SWOT report

Volume V

The State of the World's Sea Turtles

INSIDE:

STUDYING SEA TURTLES AT SEA

CHANGING BEHAVIORS FOR CONSERVATION

POLICY CHANGES PROTECT TURTLES IN THE BAHAMAS

AND MORE …

KEMP'S *and* OLIVE RIDLEYS

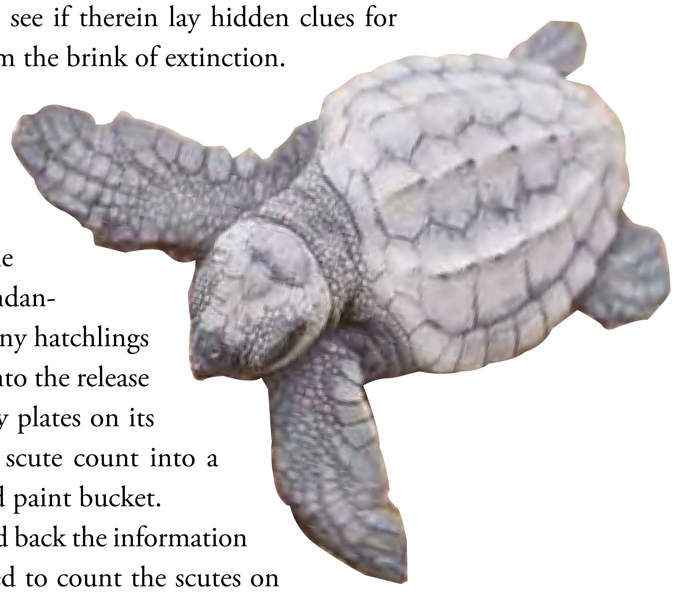
SMALL TURTLES, BIG SECRETS

"Flying Honu," recently published in *The Shorebreak Art of Clark Little,* captures a green sea turtle swimming in the Hawaiian surf. © CLARK LITTLE / CLARKLITTLE.COM

Editor's Note

The Ridleys—Reasons for Hope

I recently found a bundle of cassette tapes in my basement among some old research materials. I was taken back in time, hearing my own youthful voice droning "13-5-5-5-13" [cricket sounds, bird call], "13-5-5-5-13" [dog barking, splash], "13-5-5-5-13," and on and on for hours. A slight variation would occasionally sneak in—"13-5-5-5-14" or "13-5-6-5-13" —and it was those anomalies that piqued my curiosity. *Scutes* are the external plates on a turtle's shell, and one summer, 30 years ago, I decided that I would count the carapacial scutes of as many Kemp's ridley turtles as I could lay my hands on. I wanted to better understand that variation and to see if therein lay hidden clues for bringing this disappearing species back from the brink of extinction.



I was in Rancho Nuevo, Mexico, working for the bi-national Kemp's ridley project. I had a lot of time on my hands, and I wanted a minimally invasive research project that might yield results to guide the conservation of this, the world's most endangered sea turtle species. So, as each of the tiny hatchlings emerged from its nest, and before it went into the release bucket, I took a moment to count the tiny plates on its carapace and to recite aloud the five-part scute count into a cassette recorder propped atop an upturned paint bucket.

Later, by candlelight in my tent, I played back the information and transcribed it to data sheets. I managed to count the scutes on 5,919 turtles that summer. To this day, the first thing I mindlessly do with any turtle—be it a live specimen, a photograph, or even a turtle knick-knack or stuffed toy—is to make a quick scute count. I can't help it. Although my first major research effort went largely unnoticed, I am very proud to have been a small part of what is now a remarkable ongoing success story—the recovery of the Kemp's ridley. This species still has a long road ahead before its population reaches the shockingly high levels seen in film footage from 1947. But, it appears to be on the mend, with consistent increases for the past several years because of the hard work, tenacity, and boldness of Mexican and American conservationists who have been laboring since the 1960s (see page 35 for a timeline of the Kemp's ridley recovery).

The close cousin of the Kemp's ridley—the olive ridley—also gives us hope. Today, it is without question the most abundant of the world's sea turtle species. Yet it also faced—and will continue to face—its share of hazards, including a period of many years of systematic harvesting of adults at its largest mass nesting site: Playa Escobilla in Oaxaca, Mexico (see the Special Feature on pages 26–35 for a discussion of mass nesting). The slaughterhouse was shut down long ago, illegal harvest is vastly reduced, and now more than a million olive ridleys nest anually at Escobilla.

These two hardy creatures serve as examples of how conservation can make a difference when practiced soundly and steadfastly. They are hopeful reminders of the importance of staying the course in our efforts to address the challenges that sea turtles and their ocean habitats face around the world.

Roderic B. Mast

Visit **www.SeaTurtleStatus.org** to learn more about Rod's work in Rancho Nuevo.

THIS PAGE: A Kemp's ridley hatchling leaves the nest. Using the scute-counting method described above, how many scutes can you count? © THANE WIBBELS
AT LEFT: The hatchery at Rancho Nuevo, Mexico, the beach at which more than 40 percent of all Kemp's ridley nesting occurs. Protection of nesting females, their eggs, and their hatchlings over the past 30 years has helped to bring Kemp's ridleys back from the brink of extinction. © DOUG PERRINE / SEAPICS.COM

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2011 Crystal Drive, Suite 500
Arlington, VA 22202
U.S.A.
+1-703-341-2400
www.SeaTurtleStatus.org

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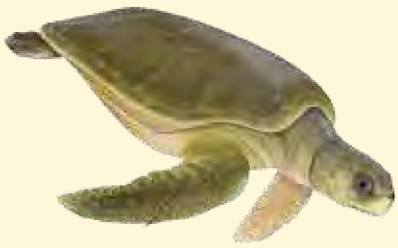
meet the turtles

The seven sea turtle species that grace our oceans belong to a unique evolutionary lineage that dates back at least 110 million years. Sea turtles fall into two main subgroups: the unique family *Dermochelyidae,* which consists of a single species, the leatherback; and the family *Cheloniidae,* which comprises the six species of hard-shelled sea turtles.



Flatback *(Natator depressus)*
IUCN Red List status: Data Deficient

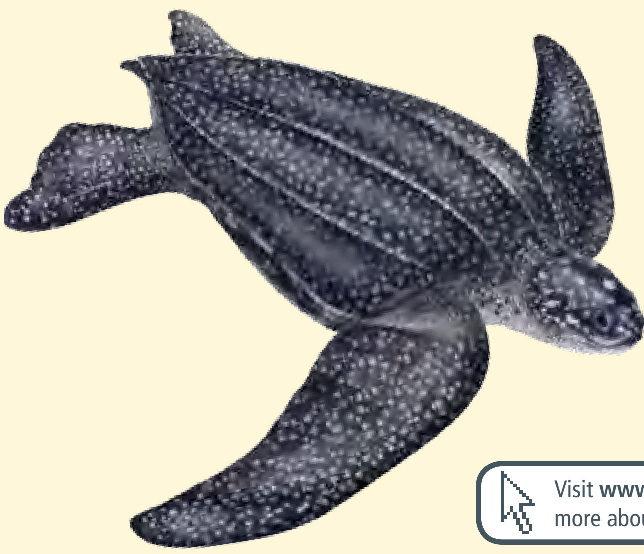
Kemp's ridley *(Lepidochelys kempii)*
IUCN Red List status: Critically Endangered

Green *(Chelonia mydas)*
IUCN Red List status: Endangered

Loggerhead *(Caretta caretta)*
IUCN Red List status: Endangered

Hawksbill *(Eretmochelys imbricata)*
IUCN Red List status: Critically Endangered

Olive ridley *(Lepidochelys olivacea)*
IUCN Red List status: Vulnerable



Leatherback
(Dermochelys coriacea)
IUCN Red List status:
Critically Endangered

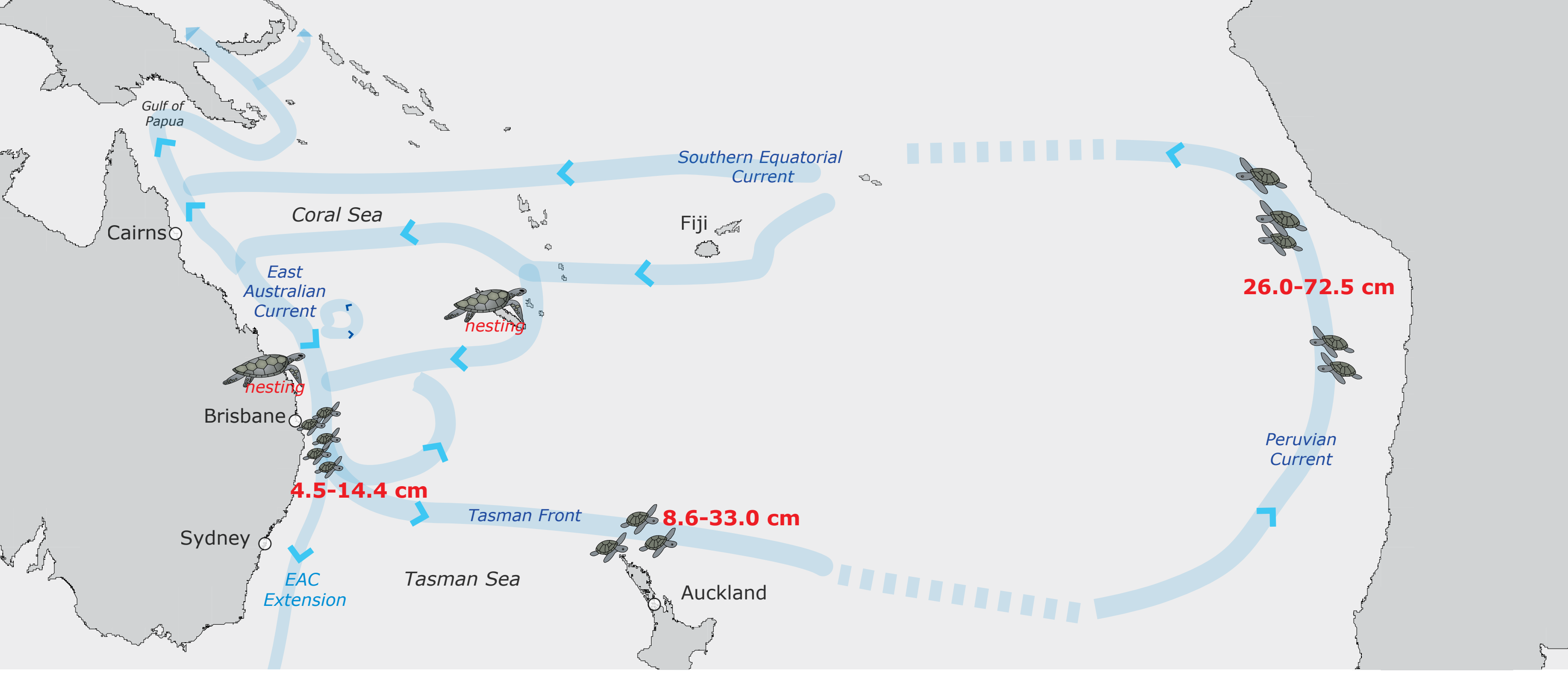
Visit **www.SeaTurtleStatus.org** to learn more about all seven sea turtle species!

table of contents

THIS PAGE, FROM TOP TO BOTTOM: © BRIANSKERRY.COM, © DAVE SHERWOOD / WILDFILEPHOTO.COM, © OCEAN REVOLUTION FRONT COVER: Olive and Kemp's ridleys are the only sea turtle species to nest en masse, synchronously; many thousands of turtles come ashore to nest in a single event—a phenomenon called an "arribada," such as the one pictured here at Ostional, Costa Rica. © DAVE SHERWOOD / WILDFILEPHOTO.COM AT LEFT: © DAWN WITHERINGTON

Find Mr. Leatherback! How many times can you spot Mr. Leatherback's distinctive silhouette in this issue of *SWOT Report?* Check the SWOT Web site at www.SeaTurtleStatus.org for the correct answer!

&research status



Takin' a Ride on the EAC

… across the Southern Pacific Ocean

By MICHELLE BOYLE, NANCY FITZSIMMONS, COLIN LIMPUS, SHALEYLA KELEZ, XIMENA VELEZ-ZUAZO, and MICHELLE WAYCOTT

According to that loveable loggerhead Crush—the surfer-dude sea turtle from the movie *Finding Nemo*—the East Australia Current (EAC) is a sea turtle highway, where turtles hitch a free ride from one place to another, and this observation isn't too far from the truth. New research has revealed that the EAC plays a critical role in transporting turtles between habitats across the southern Pacific Ocean.

Tiny loggerhead hatchlings—4 centimeters (1.6 inches) long—emerge from nesting beaches on the *western* side of the southern Pacific Ocean in Australia and New Caledonia, while larger juveniles—up to 73 centimeters (29 inches) long—are often captured in longline fisheries off Peru and northern Chile, on the far *eastern* side of the Pacific Ocean, where loggerheads do not nest! So what explains the discovery of the different-sized loggerheads on opposite sides of the same ocean? The key piece to this transoceanic puzzle is found in turtle DNA. Nesting female sea turtles show a high degree of fidelity to their natal beaches; as a result, turtles hatched in the same place bear the same genetic signatures. In areas where turtles from multiple populations aggregate, such as coastal feeding grounds, scientists can gather tissue samples and can study the turtles' genetic signatures to determine where the animals originated as hatchlings, which is also where they will likely return to breed as adults. Hence, genetic studies are crucial to understanding sea turtle migratory patterns.

A team of Australian and Peruvian researchers used genetic techniques and the size distributions of juvenile turtles to reveal that larger juveniles found off South America have the same genetic signatures as the nesting females in Australia and New Caledonia. This similarity demonstrates that juvenile loggerheads found across the southern Pacific Ocean belong to the same population, originate from the same nesting beaches, and thereby follow transoceanic migration patterns similar to those observed in loggerheads in the northern Pacific (nesting in Japan and feeding off the coast of Mexico) and northern Atlantic oceans.

According to the new findings, researchers think that the loggerhead life cycle in the southern Pacific Ocean works as follows: when post-hatchlings swim offshore after emerging from the southwest Pacific nesting rookeries, they encounter the southward-flowing current of the South Pacific Gyre—the EAC. As the EAC swings away from the Australian coast and travels in an eastward direction, it slingshots the little turtles across the southern Pacific toward Peru and Chile.

This discovery highlights the importance of international collaboration to study and protect animals that inhabit entire oceans during their lives. It also shows that Crush was right: the best way to get to your destination—especially if you're a sea turtle near the EAC—is to go with the flow. ■

THIS PAGE, FROM TOP TO BOTTOM: The puzzle of the loggerhead life cycle in the southern Pacific Ocean is solved by tracing the path of the currents. A recent genetics study showed that little loggerheads from Australia and New Caledonia, small juveniles in New Zealand, and larger juveniles in Peru belong to the same population, which is connected by major currents that link opposite sides of the southern Pacific Ocean. Blue arrows indicate currents, and red text indicates turtle body size. © MICHELLE BOYLE A loggerhead turtle swims in The Bahamas. © DOUG PERRINE / SEAPICS.COM AT LEFT: A researcher at Rancho Nuevo, Mexico, scans a nesting Kemp's ridley for an internal microchip (PIT) tag, which contains a unique code that is used to identify her each time she nests. © DOUG PERRINE / SEAPICS.COM

Big Eyes, Big Boats, and Home Videos

Studying Sea Turtles at Sea

By LINDSEY PEAVEY, BOB PITMAN, SCOTT BENSON, JIM HARVEY,
BILL WATSON, TANYA GRAHAM, and KERRY KOPITSKY

Our landlubber species has done a fantastic job plodding along thousands of kilometers of coastlines around the world while counting and protecting nesting sea turtles and their progeny. However, we know very little about the life history and ecology of sea turtles in the environment where they spend the vast majority of their lives: the sea. After all, they are *sea* turtles, not *beach* turtles. To truly understand how these animals live, we need to get wet. We can't simply walk into the surf and think that we understand turtles' oceanic lifestyles.

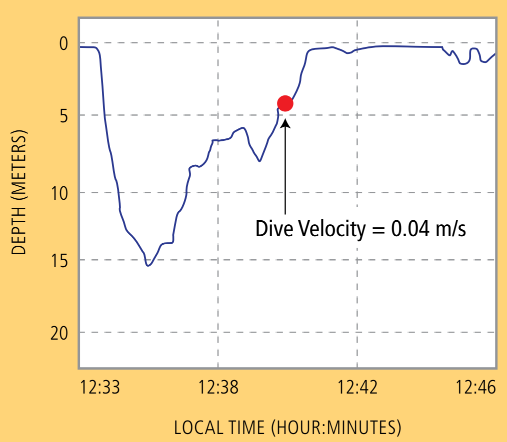
Data from satellite tags deployed onto sea turtles have revealed that they can traverse thousands of open blue kilometers, far away from any patch of land. To observe sea turtles in their element first-hand, some researchers rely on boats—big boats—as well as airplanes, turtle-borne video cameras, and other sophisticated tools. Modern technology allows scientists to follow turtles *wherever* they go, to see what they see, and thus to better understand and protect them in their watery world.

At-Sea Turtle Research in the Eastern Tropical Pacific Ocean

During the 1960s to 1980s, commercial purse-seine fishing for yellowfin tuna in the eastern tropical Pacific Ocean (ETP) caused the incidental death of more than four million dolphins. Since that time, the U.S. National Marine Fisheries Service (NMFS) has conducted survey cruises to monitor dolphin populations in an area larger than the African continent, spanning more than 20 million square kilometers (7.7 million square miles) of open Pacific Ocean. Shipboard observers use high-powered mounted binoculars, or "big eyes," to search for dolphin schools. Beginning in 1992, observers were also trained to identify and record sea turtles. In the same year, an opportunistic capture program was initiated to identify, measure, weigh, tag, and release individual turtles at sea. Today, more than 1,000 turtles have been processed and released in this manner, often hundreds of kilometers from the nearest mainland.

Spotting turtles with high-powered binoculars is one endeavor, but how do you capture a free-swimming turtle in the open ocean? When a turtle is spotted—and weather permits—NMFS observers first launch a rigid-hulled inflatable boat and then capture the animals by hand by jumping into the water and grabbing their carapaces—the "rodeo" method. Olive ridleys have a handy habit of basking at the surface for long intervals, which makes locating them quite easy. Researchers capture turtles in a wide range of different ages and sizes in this way.

Despite the challenges of traversing an endlessly blue study site for months at a time, the benefits of long-term monitoring of sea turtles at sea are unquestionable. Data gathered at sea augment beach population monitoring to provide a much more comprehensive view of turtles' life history. Olive ridleys declined during the 1960s and 1970s because of human consumption of their meat and eggs, combined with incidental mortality of those caught in fishing gear. Following redoubled protection in Mexico and Central America, nesting populations increased, some-



times dramatically. At Playa Escobilla, Mexico, for instance, olive ridley abundance increased from approximately 50,000 nests in 1988 to more than 1 million nests in 2000 (see Special Feature, pages 26–35). Encouragingly, at sea turtle counts confirmed these beach censuses: estimated ridley abundance from at-sea observations in the ETP increased from fewer than 1 million to more than 3 million turtles between 1992 and 2006.

Today, the olive ridley is by far the most common turtle in the offshore waters of the ETP. Although many sea turtle populations require urgent conservation action to prevent further declines or even extinctions, olive ridleys—as a testament to successful conservation efforts—are probably abundant enough in the ETP that scientists can begin to explore their potentially important, but largely unknown, ecological role in the marine environment. Cruising the *real* wild blue yonder in big boats is a great way to study that role.

Getting a Turtle's View of Its World

If shipboard surveys of open ocean expanses give us a broad-brush view of turtles' locations in the ocean, then focused, in-depth research in discrete marine areas can help us see the turtles' world the way they see it, literally.

Of all marine turtle species, leatherbacks are probably the most difficult to study at sea, largely because they are almost always on the move—usually at great distances from shore—and, with a few exceptions, because they tend not to aggregate in known feeding areas. One such exception is the California Current ecosystem along the western U.S. coast, which is a corridor of ocean productivity that hosts many large marine food webs, including important areas where Pacific leatherbacks forage for their favorite food: jellyfish. During the past decade, genetic analyses and satellite telemetry studies have revealed that leatherbacks feeding in the California Current belong to the population that nests primarily in Indonesia.

It's a long way between feeding areas in cold, foggy California waters and tropical Indonesian nesting beaches (see *SWOT Report, Vol. 3,* page 17, showing the nearly 13,000-mile migration route of one Pacific leatherback). So leatherbacks have to be quite proficient at finding and acquiring enough energy to fuel their trip. Scientists have long wondered how these enormous creatures are able to meet the huge energy demands of such a journey while consuming such low-energy

THIS PAGE: Researchers record behavioral and morphometric data on a juvenile olive ridley that was captured by hand while at sea. © LINDSEY E. PEAVEY / NOAA NMFS SWFSC PRD PERMIT # 774-1714
BELOW, FAR LEFT: This graph of a leatherback's dive profile shows the leatherback's vertical movements through the water during a single dive. The red dot on the graph marks the point at which the still frames at right were recorded. SECOND FROM LEFT THROUGH FAR RIGHT: This sequence of 5 still images was taken from video footage of a leatherback eating a sea nettle jellyfish. Videos from sea turtle-borne cameras are used by researchers to study sea turtles' behaviors. © SCOTT BENSON, JIM HARVEY, BILL WATSON PREVIOUS SPREAD: A leatherback glides through rich, soupy waters off Nova Scotia, Canada, while eating a jellyfish. The clean, dark spot on its carapace was cleared by researchers to attach a video camera that allowed the leatherback to record its own "home video." © BRIANSKERRY.COM

prey. By some estimates, leatherbacks need to consume approximately 20–30 percent of their body weight in jellyfish per day—roughly 50 gallons—just to meet their nutritional needs.

Over the past few years, using spotter planes and a boat specially designed to haul leatherbacks out of the water for study, researchers in California's Monterey Bay have captured and later released dozens of turtles equipped with satellite transmitters. Data from these animals, as well as from others tagged in Indonesia while nesting, have revealed that leatherbacks typically move from coastal U.S. waters into the eastern tropical Pacific Ocean for several months; then they return to temperate California waters in pursuit of jellyfish. These findings show that leatherbacks need two or more consecutive years at the California Current jellyfish buffet before being able to migrate back across the Pacific to reproduce.

> Modern technology allows scientists to follow turtles wherever they go, to see what they see, and thus to better understand and protect them in their watery world.

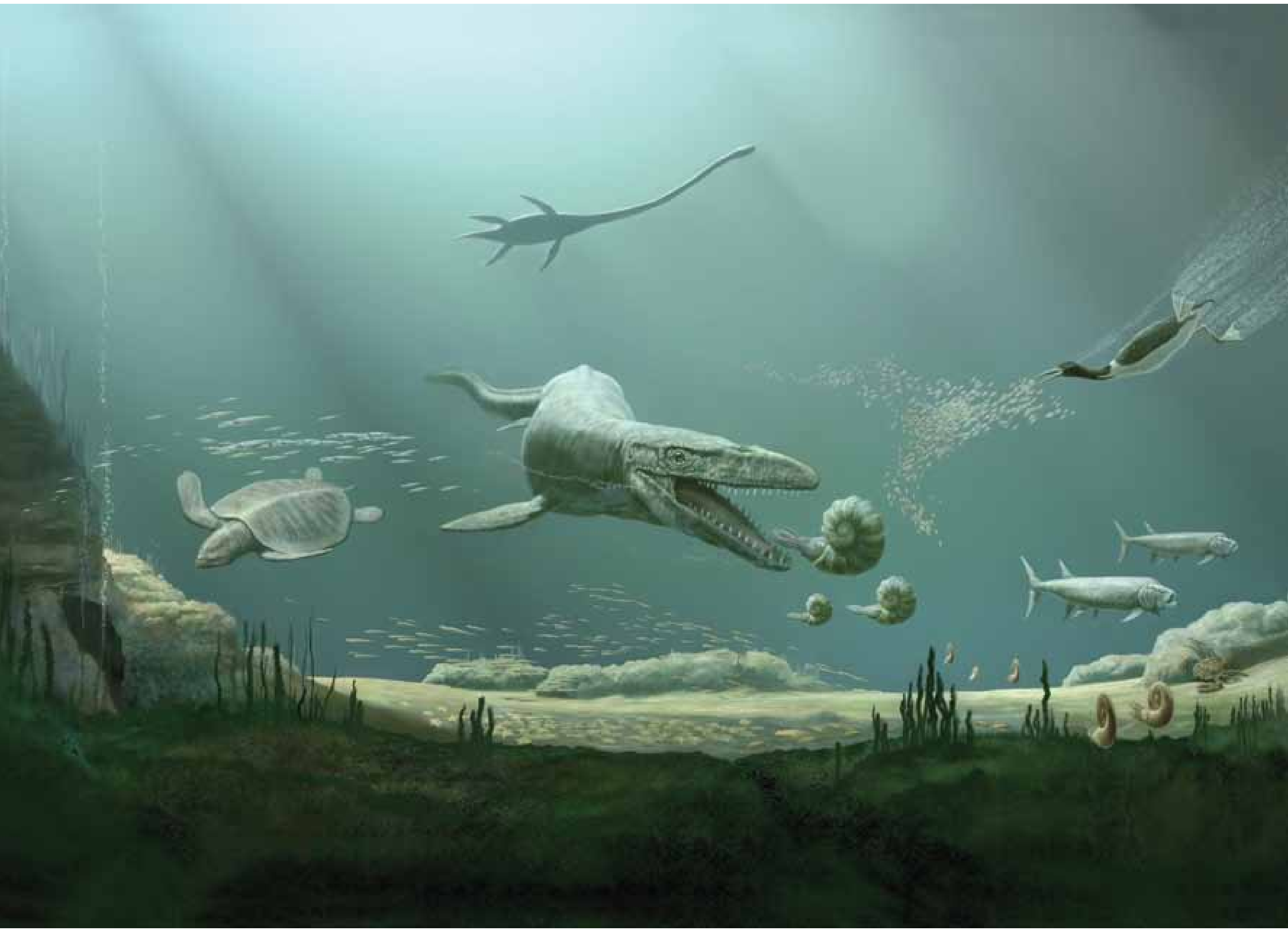
To get a better view of the leatherback-jellyfish relationship, scientists left the slippery decks of their boat and took to the air. Fine-scale aerial surveys have documented highly dynamic spatial patterns of co-occurrence between leatherbacks and jellyfish species in the California Current. They also have demonstrated that jellyfish abundance fluctuates on seasonal, annual, and even decadal scales, which means that leatherbacks must carefully cue in on ocean conditions in order to position themselves in the right locations to coincide with high jellyfish availability.

For all their advantages, boats, planes, and transmitters permit observation of leatherback feeding behavior only at the water's surface. For a deeper perspective on leatherbacks' activities while out of sight, researchers deployed suction cup-mounted time-depth recorders and video cameras on turtles to obtain detailed dive profiles and data on prey selection and consumption rates. These turtle "home videos" showed leatherbacks ascending from shallow dives to consume jellyfish aggregated close to the surface, and they further revealed that leatherbacks targeted the largest jellyfish species with the highest carbon content (*Chrysaora fuscescens*). In fact, leatherbacks appear to be picky eaters: they munched on only the most carbon-rich portions of the jellyfish, consuming parts of multiple jellies on each dive (see video sequence on pages 10–11).

So, by observing leatherbacks in their own dining room, we have learned—not surprisingly—that they eat what's good for them and that they eat a lot of it. Preliminary calculations based on the videos suggest that a single turtle might gulp down several hundred *tons* of jellyfish each year, underscoring the importance of the leatherbacks' role within the California Current ecosystem and showing how leatherbacks might consume enough jellyfish to support their long journey west to breed.

Whether by boat, plane, satellite, or camcorder, scientists are beginning to glimpse the previously unknown world of sea turtles, one big ocean or one jellyfish buffet at a time. ■

A research team heads back to the "mother ship" after a day on the water studying free-swimming sea turtles.

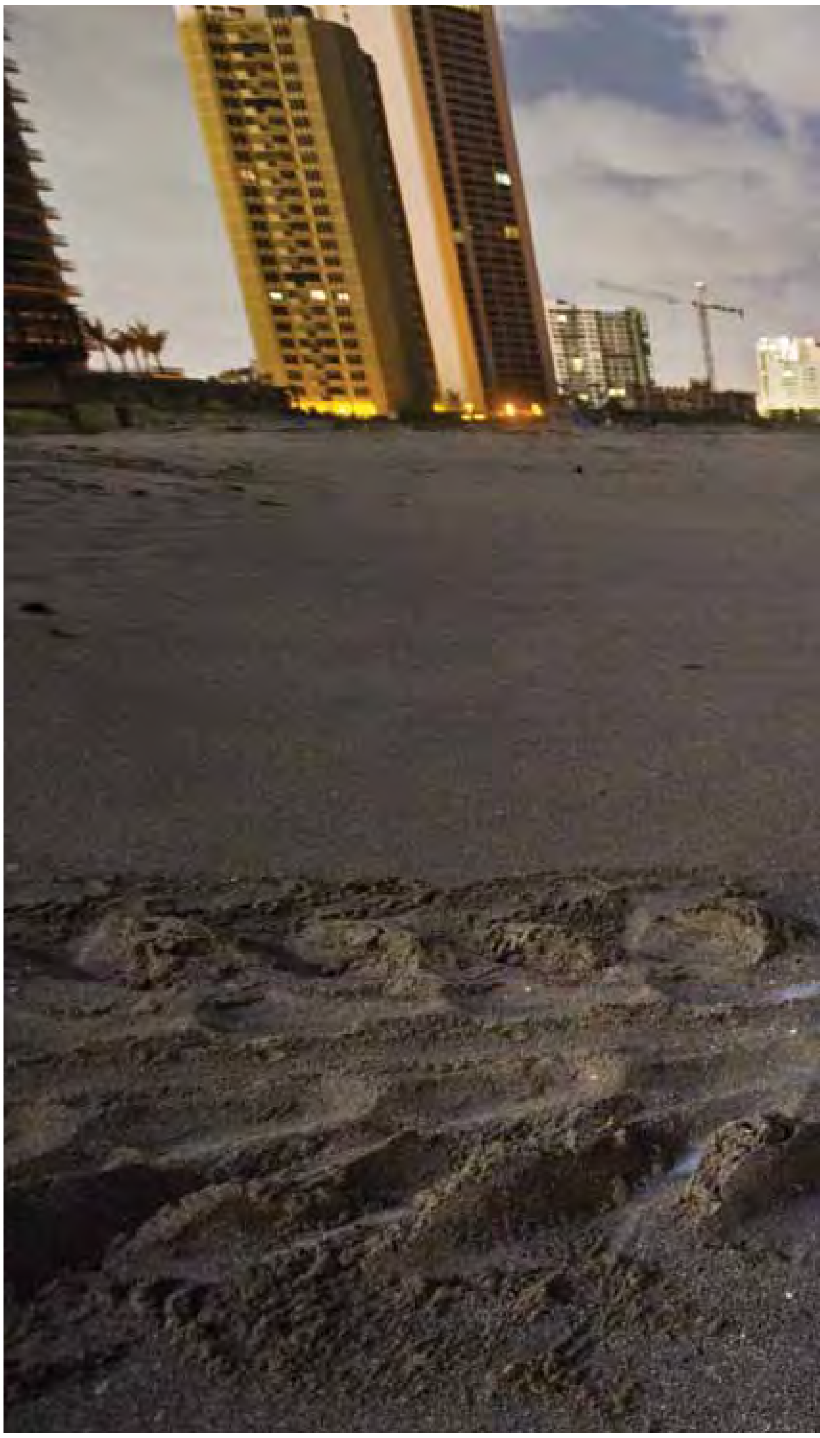


How Sea Turtles Have Weathered Past Climate Changes

By BRIAN W. BOWEN and BRYAN WALLACE

Climate change has become one of the hottest topics in international news cycles and has entered the lexicons of the public and policymakers. Although vast uncertainty remains about the timing and extent of climate change, there is growing consensus about the need to address its specter. While many scientists race to generate predictive models of future scenarios, understanding how natural systems have responded to past climate changes can also provide a valuable window on what's to come.

Ancestors of today's sea turtles roamed the oceans over a hundred million years ago, surviving conditions both much warmer and much cooler than those today. These fluctuations altered nesting beaches, foraging habitats, and numerous other environmental conditions affecting sea turtles. Despite all the changes, sea turtles swim on. Studies of how they responded to large-scale changes in Earth's climate could reveal what will be necessary for them to survive the forecast for the near future. A forensics team—"sea turtle CSI" (Crime Scene Investigators)—can combine evidence from past events with current knowledge of sea turtle life history into a coherent picture of what's possible for the future. For this information, we turn to unlikely sources: rocks, snails, penguins, and the history recorded in sea turtle DNA.



Some Like It Hot

How sea turtles select nesting beaches remains a topic of scientific curiosity with important implications for how sea turtles might respond to the future loss (and gain) of today's nesting beaches. All sea turtle species show different degrees of nest site fidelity. This tendency toward the familiar, coupled with the narrow temperature range needed for embryonic development—26°C–32°C (79°F–90°F)—indicates that sea turtles are indeed vulnerable to beach habitat loss that might occur under some climate change projections.

Ocean temperatures increased after the last Ice Age about 12,000 years ago. At that time, sea turtles might have nested at the southern tip of Florida, United States. Further north, the climate was too cold, as evidenced by fossil records showing that cold-water snails occurred in southern Florida, while today these snails occur much further north. Likewise, loggerhead turtle nesting spread northward after the last glacial period, to the present-day limit in Virginia. Around the same time, loggerhead and green turtles colonized the Mediterranean Sea, which had been too cold to support nesting during the Ice Age.

Such historical climate records demonstrate that sea turtle nesting can, over time, slide up and down along coastlines to accommodate the appropriate temperature range for egg incubation. Once an appropriate habitat opens up—like the Mediterranean Sea—turtles can colonize it within a few dozen generations. Archie Carr, the father of modern sea turtle biology, hypothesized that rare "gravid waifs" (females carrying fertilized eggs) might depart their natal nesting site to colonize a new habitat. In this way, sea turtles have been adjusting to natural climate change for millions of years.

Some Like It Cold

During glacial periods, some areas get colder than others, which can result in loss of habitat for sea turtles. For example, genetic evidence indicates that all sea turtles in the eastern Pacific Ocean are recent arrivals. The leatherback, olive ridley, and green turtles (and probably hawksbills) that presently nest and feed in the eastern Pacific are all descendants of colonists from elsewhere in the Pacific. So, why the recent colonization?

Cold water in the eastern Pacific Ocean extends well into the tropics and all the way to the equator during glacial periods, as shown by the world's northernmost presence of penguins on the Galapagos Islands, near the equator in the eastern Pacific. These cold-adapted birds followed a corridor of frigid water from Antarctica all the way to the equator during glacial conditions. The conditions that favored expansion of the penguin's habitat also eliminated sea turtle nesting and feeding habitats in the eastern Pacific. To match this back-and-forth pattern of accessible ocean and beach real estate, sea turtles moved into and out of the eastern Pacific.

So, although warming conditions allowed sea turtles to extend their range into higher latitudes, colder conditions may have eliminated nesting in places like the eastern Pacific Ocean and Mediterranean Sea. However, as glaciers receded and oceans warmed, sea turtles readily re-colonized these areas. The lesson is that although a location might not be viable as sea turtle habitat today, wait until tomorrow (geologically speaking).

And Some Have Nowhere to Go

So far, we have seen that sea turtles can move into and out of regions in response to climate change and on a time scale of hundreds of turtle

Although sea turtle populations have responded to past climate changes by moving to new nesting beaches, coastal development limits the potential for sea turtles to respond similarly to current and future changes in their nesting habitats. © JIM RICHARDSON / NATIONAL GEOGRAPHIC STOCK PREVIOUS PAGE: Sea turtles have been swimming the seas for millions of years. They have outlived many of their reptilian brethren, like the mosasaurs and plesiosaurs illustrated in this mural of marine life during the Cretaceous period (144 million to 65 million years ago). Understanding how sea turtles responded to past climate changes could paint a picture of how they would survive threats from present-day climate change. © KAREN CARR

generations. They can adjust to warming trends by shifting their ranges into higher latitudes, but this shift is possible only on a sandy coastline. On most continents, higher latitude coastlines are dominated by rocky habitat with few beaches. Thus, as turtles move away from the tropics under future warming scenarios, they might have nowhere to go.

Furthermore, even when sea turtles can shift their nesting habitat, they could be imperiled not only by rocky habitat, but also by condominiums. In some areas, beachfront construction makes even sandy beaches unsuitable for sea turtle nesting. In anticipation of future climate change, adaptive efforts like coastal setbacks—inland tracts of land that are parallel to beaches and are left devoid of development—can build resilience into coastal areas and can buffer against loss of nesting habitat.

The Shifting Climate Means Shifting Habitat for Sea Turtles

Clearly, sea turtles are survivors. They have weathered radical climate changes in the past 100 million years. However, they have never faced anthropogenic changes of the scope and speed proposed for the coming decades. Researchers are working to understand the factors that will affect sea turtles under future scenarios, especially in forecasting habitat shifts. The persistence of sea turtles through previous climate crises tells us that they might not stay in the same places they are today. But if they have the appropriate time and space, they could continue navigating the oceans for another 100 million years. ■

policy & economics

Policy Changes Protect Sea Turtles in The Bahamas: Long-term Efforts Rewarded

By KAREN A. BJORNDAL and ALAN B. BOLTEN

Sea turtles from throughout the Greater Caribbean come to the extensive shallow banks of The Bahamas archipelago to feed. Until recently, the exploitation of sea turtles was still legal under Bahamian law (except for hawksbills, which have been protected since 1986). In September 2009, an important victory for the protection of sea turtles occurred when the government of The Bahamas declared a complete ban on the directed take of sea turtles:

> *The Fisheries Regulations governing marine turtles have been amended to give full protection to all marine turtles found in Bahamian waters by prohibiting the harvesting, possession, purchase, and sale of turtles, their parts, and eggs. The new regulations also prohibit the molestation of marine turtle nests.… The commitment to the conservation and preservation of these species while in Bahamian waters has been demonstrated by the introduction of protective measures and safeguards over the past two decades, starting with the actions taken to safeguard the hawksbill turtle in 1986.*

Although political will was the essential force behind this victory, decades of research and education laid the groundwork for this success, and they serve as an example of how conservation can be driven by the long-term contributions of many people and organizations from a variety of sectors. For the past 30 years, we have conducted research on the biology and distribution of sea turtles in The Bahamas, in collaboration with the Bahamas National Trust. Our results have demonstrated the need to end the adverse effects of exploitation on turtle populations. We have worked with the Department of Marine Resources and several nongovernmental organizations, including the Bahamas National Trust, the Bahamas Reef Environment Educational Foundation, The Nature Conservancy Bahamas Program, WIDECAST, the Caribbean Conservation Corporation, and the Bahamas Sea Turtle Conservation Group, which have all been working to improve protection for sea turtles in The Bahamas. During this time, conservation awareness has been on the rise throughout the archipelago thanks to education efforts in many schools and at community meetings. Through these long-term efforts, the stage was set for total protection of sea turtles.

In 2008, the tipping point occurred on Easter Sunday, when a particularly egregious case of cruelty to an adult loggerhead turtle along a major roadway in Nassau was viewed by hundreds of people and was featured in local newspapers. This incident and the resulting public outcry initiated a grassroots effort by the Bahamas Sea Turtle Conservation Group that included an international e-mail campaign and, ultimately, proved effective in creating the political will that led to the new regulations.

Policy change is an important step. However, just as it has taken decades to arrive at this important juncture, it will take a continued commitment to ensure that such legislative changes become a reality. Enforcement of the ban in this nation of 700 islands will be challenging, and monitoring of the ban's effectiveness will be especially important in the years ahead. With support from the Disney Worldwide Conservation Fund, we have been monitoring populations in foraging areas throughout The Bahamas for many years, and we will use these studies as baselines to assess changes in abundance and distribution of sea turtles.

The important past efforts of local and international scientists, conservationists, policymakers, educators, activists, and citizens must remain strong into the future, and education will be critical to the ban's long-term success. We hope that the leadership demonstrated by the government of The Bahamas serves as an example for other nations throughout the Caribbean, and throughout the world, in which sea turtles remain in need of protection. ■

THIS PAGE: Five of the world's seven species of sea turtles are found in The Bahamas, a sprawling archipelago covering more than 10,000 square kilometers (3,861 square miles). © AIRPHOTO / JIM WARK AT LEFT: Men unload their catch of green turtles in Nassau, The Bahamas, in this image from 1946. As evidenced by this historical photograph, sea turtles have been captured and consumed in The Bahamas for decades, a practice that was legal until 2009. © MARIE HANSEN / TIME & LIFE PICTURES / GETTY IMAGES

Trials *and* Tribulations

OF TURTLE EXCLUDER DEVICES

By NICOLAS J. PILCHER and CAROLYN ROBINS

Turtle excluder devices (TEDs) have been shown to reduce sea turtle bycatch in trawl fisheries across the world, but their implementation in different fisheries has varied greatly. In the eyes of a turtle conservationist, it is hard to believe that any fisher would want to fish without a TED. Yet fishers often see things differently, and as with the use of any tool, the use of TEDs must be mastered through experience. When TEDs were originally introduced in the United States, fishing fleets battled with regulators and conservationists over TED requirements. However, today TEDs are widely accepted as part of the bycatch solution and are mainstreamed into daily fishing activities throughout the United States. Elsewhere, TED uptake has also faced challenges. The following stories of two trawl fisheries in drastically different socioeconomic settings illustrate the challenges and successes of putting TEDs to work around the world.

An employee of Samies Girl Fresh Seafood Market in Brisbane, Australia, displays shrimp caught using TEDs. Kristina and Harry Georges, owners of Samies Girl, proudly advertise their support for sea turtle conservation; not only do they sell shrimp caught exclusively through the use of TEDs, but they also sell insulated, reusable bags whose proceeds benefit sea turtle research and education as part of their Save Our Sea Turtles Foundation. © CALEN OFFIELD

Australia's Northern Prawn Fishery

In the early 1990s, Australia's Commonwealth Scientific Industrial Research Organisation estimated that the country's Northern Prawn Fishery (NPF) incidentally caught 5,000–6,000 sea turtles during August to November of each year, of which 39 percent likely died. In light of these statistics, various research organizations conducted experiments with TEDs and other bycatch reduction devices (BRDs). Most research projects were conducted in cooperation with the fishing industry. In 1989, the issue of sea turtle interactions with trawl operations grew more relevant with the passing of U.S. Public Law 101-162, section 609, which requires TED-compliant certification (or equivalent bycatch reduction measures) for all countries exporting shrimp to the United States.

Subsequently, scientists and gear technologists began working in cooperation with fishers and net builders to test and develop mitigation measures for turtle bycatch in the NPF. Teams of observers and gear technologists spent time on NPF vessels demonstrating how TEDs work, comparing target and nontarget catches in nets with TEDs versus those with regular gear, modifying TEDs to suit the vessels, and assisting fishers in making TEDs workable. Fisher participation in the programs was voluntary. In addition to the work done on vessels, hands-on workshops and port visits were conducted, newsletters and videos were distributed, trial TEDs and BRDs were loaned to fishers, and an incentive program that recognized individual contributions in the use of these devices was created. Fishers became involved in research to address bycatch issues, and several became turtle-handling mentors, thereby assisting other fishers in becoming more turtle safe.

Although TEDs have proved to be a benefit to both sea turtles and fishers in the NPF, the adoption of TEDs was initially feared by many fishers. Some were concerned about safety issues; they imagined the large metal TEDs might injure crew members. Others assumed that target catches would diminish, and some feared an added financial burden. Most of these fears were put to rest as fishers modified TEDs to suit their own fishing styles and gear. Because of the collaborative process through which TEDs were introduced into the fishery, fishers and net builders had the opportunity to design and test their own ideas. If their designs were effective, their use was permitted. Ultimately, subsequent studies to assess catch and mortality rates of sea turtles in the NPF demonstrated that TED use reduced sea turtle bycatch to fewer than 200 turtles per year from more than 5,000 before TEDs were used. At the same time, prawn catch was down only 3 to 6 percent—a small decrease that was easily compensated for by the higher quality of the catch when using TEDs, because contact with turtles in the nets was resulting in high levels of low-quality, "soft or damaged" product.

In 2000, six months after TEDs became mandatory in the NPF, the U.S. embargo of Australian shrimp was lifted. By then, most of the NPF fleet had voluntarily adopted TEDs, and little enforcement was necessary to ensure compliance. Bycatch monitoring by trained fishers has now become an ongoing program, and fishers and net builders continue to design and test new types of BRDs with gear technicians, scientists, and managers.

Today, the NPF is considered among the most progressive shrimp trawl fisheries in the world. There is a longstanding collaborative culture in this fishery, and over time, trust and respect have built up between fishers and scientists. The gradual and supportive approach that was adopted before TEDs became mandatory was one of the keys to the effort's success. Through this process, fishers had the opportunity to see and use the gear, collect the data needed to make decisions, and participate by designing and testing their own ideas. They accepted that sea turtle bycatch existed, and they helped solve the problem, in partnership with managers, scientists, and gear technicians. The fishing industry was not just a part of the problem; it became a fundamental part of the solution.

Sabah, Malaysia, Trawl Fishery

In the early 1980s, the Malaysian Fisheries Department attempted to introduce TEDs in Malaysian shrimp trawl fisheries. Regrettably, the plan lacked the clarity and comprehensive education and outreach that proved successful a few years later in the NPF. The effort was confounded following the enactment of the U.S. shrimp embargo in 1989, when India, Malaysia, Pakistan, and Thailand jointly and successfully contested the TED requirement as a contravention of World Trade Organization policy. A subsequent appeal by the U.S. government failed, and Malaysian fishers continued to fish without TEDs. Eventually, the U.S. certification requirement prevailed. However, the Malaysian Fisheries Department's effort to introduce TEDs had failed, and the status quo of not using TEDs remained intact.

Chief among the reasons that TEDs were not adopted by Malaysian trawl fishers was the general fact that creating a hole in a net, which is part of TED installation, is contrary to much of what a fisher has learned. Indeed, Malaysian trawl fishers spend substantial amounts of time repairing holes in their nets. Convincing them to actively create a 1 to 2 meter (3.3 to 6.5 foot) hole in their nets is a difficult task, particularly when the suggestion comes from a stranger who is also not a fisher.

In light of this challenge, recent efforts to re-introduce TEDs in the state of Sabah, Malaysia, by a local nonprofit organization—the Marine Research Foundation (MRF)—in partnership with the Sabah Department of Fisheries have used a different strategy. Rather than presenting TEDs principally as a way to reduce turtle bycatch, the MRF effort (begun in 2006) has emphasized TEDs' other abilities, such as reducing fuel costs, improving catch quality, and decreasing net repair and downtime.

Drawing from lessons learned in Australia's NPF and elsewhere, the renewed TED effort in Sabah has also focused on developing personal relationships with fishers and on creating a collaborative process for TED trials and implementation. Biologists have been working side by side with fishers to test and adapt TEDs to local boat design and fishing practices, while developing personal relationships that have been critical to the program's success thus far. Furthermore, a recently organized visit

Fortunately, we have observed that when TEDs are adopted, fishers who use them rarely want to go TED-less.

by Malaysian trawl fishers and fisheries officers to the U.S. National Marine Fisheries Service station in Pascagoula, Mississippi, has had a major positive effect on the program's success. During their visit, the fishers and fisheries officers witnessed complete (100 percent) TED use firsthand, tested TEDs under real fishing conditions, and spoke with fishers who use them daily.

Currently, the TED project in Sabah is voluntary, but efforts are under way to have TED regulations included in Malaysia's Fisheries Act. Voluntary use of TEDs is still gradual among the broader Sabah trawl fishery, but the initial efforts by MRF, the Sabah Department of Fisheries, and a small group of fishers are already having a great effect in raising awareness about TEDs and in dispelling many common fears about their use. The program continues to expand its work to include new fishers in new ports, with the hope that many will adopt TEDs on a voluntary basis or become better informed and prepared should TED use become mandatory.

Both of the examples—Australia and Malaysia—and the pioneering efforts in U.S. fisheries suggest that the key ingredients to success in TED implementation are voluntary fisher collaboration from the start, and a gradual approach that is based on personal relationships. TED adoption is likely to fail without support from fishers and a wide range of stakeholders. Fortunately, we have observed that when TEDs are adopted, fishers who use them rarely want to go TED-less. In the meantime, the lessons gleaned through the trials and tribulations of TED implementation around the world offer valuable advice for the road ahead. ■

Staff members from the Marine Research Foundation (Malaysia) work with local fishers to install TEDs in their trawl nets. © NICOLAS J. PILCHER

PAGE 18: A juvenile loggerhead escapes a trawl net through a turtle excluder device (TED) during research in Florida, U.S.A. TEDs are designed to release turtles from trawl nets through an escape hatch, while still allowing shrimp and other target species to enter the net. © 2010 NORBERT WU / NORBERTWU.COM PAGE 19: The distinct bars of a TED are visible amid a pile of fishing nets in Queensland, Australia. © CALEN OFFIELD

Jessy, the Flying Yapese

TRADITIONAL KNOWLEDGE SUPPORTS RESEARCH IN THE WESTERN PACIFIC OCEAN

By TAMMY MAE SUMMERS and IRENE KINAN KELLY

Slipping beneath the waves, he pulls himself deeper with his arms, careful not to break the surface—the sound barrier—as he flies downward. Below the surface, he floats, suspended for a moment, contemplating, calculating, and anticipating his quarry's next move. Without warning, he descends with one arm outstretched, his fins efficiently slicing through the last seconds of his prey's peace.

After disappearing into the depths, he suddenly emerges from the darkness with something light in color—the white underbelly and flippers of a sea turtle, which flap with urgency as it panics, squirms, and attempts to rid itself of this unwelcome hitchhiker. As the freediver gently guides his trophy upward, they spin together in a slow waltz, passing through light beams refracted from the intense tropical sun above. Gracefully they ascend, helping each other to the surface and their next life-giving breath. Jessy Hadpei has caught another green turtle.

Jessy was taught the art of turtle catching by village elders in Ulithi, Yap, Micronesia, where he grew up hunting sea turtles as a means to provide food for his community. Village tradition requires that after catching a turtle, one must present it to the chief, who then decides whether it can be eaten or released. When turtles were taken without the chief's permission, both the perpetrators and the entire island community were penalized through restrictions in boating or fishing that essentially prevented the community from harvesting seafood. This culturally enforced conservation practice thus limited the number of sea turtles caught.

Jessy still hunts turtles—for research—in the waters surrounding Saipan in the Commonwealth of the Northern Mariana Islands (CNMI). The local CNMI government, Division of Fish and Wildlife, actively sought and negotiated for Jessy's unique free-diving skills, because the use of nets or boat capture by "rodeo" techniques is not feasible in this part of the western Pacific Ocean. During the 2008–2009 field season, Jessy captured an impressive 78 green and 2 hawksbill turtles for biometric investigations and genetic sampling. This work contributes directly to analyses of regional connectivity in sea turtle populations that inform the management policy of the U.S. National Marine Fisheries Service. This partnership is a win-win-win situation in which (a) Jessy is employed to do what he loves (free-diving and fishing), (b) the CNMI has a blossoming in-water capture program, and (c) the sea turtles in Saipan have received some measure of increased protection.

This story is not unlike the success of other global programs that have gained positive research and conservation benefits through the integration of community members with indigenous knowledge. Jessy executes his work with pride, gratitude, and respect for the village elders who taught him the traditions and who entrust him to uphold them. Today, the program—with Jessy at its core—continues to evolve as more and more local agencies and community stakeholders get involved, thus contributing their strengths and abilities to reduce poaching and the effects of development for the conservation and management of sea turtles in the CNMI. ■

THIS PAGE: Coming up from a free dive, Jessy Hadpei brings a green turtle to the surface as part of research efforts in the Northern Mariana Islands. © CHRISTOPHER ALEPUYO AT LEFT: Jessy grew up catching turtles in Micronesia, where they are a traditional food source for his community. Today, he is putting his skills to use by catching turtles for research. © CHRISTOPHER ALEPUYO

LAS BAULAS NATIONAL MARINE PARK

An Enduring Hope

By ROTNEY PIEDRA

When I began working at Costa Rica's Las Baulas National Marine Park *(Parque Nacional Marino Las Baulas,* or PNMB), first as a student in 1994 and then as park director in 1998, I was ready to commit myself to a life in conservation. By then, I had already heard the saying that "conservation is not an easy task" many times, and I would hear it many more.

But it was not until I began to experience the battles and frustrations of the work firsthand that I truly understood the meaning of those words. Looking back at my time here and the decades of conservation history at PNMB, I realize that countless lessons are to be learned, not only about this particular park, but also more broadly about the complex interplay of conservation and economic development that occurs in protected areas everywhere. In spite of the challenges we have faced, my colleagues and I remain committed to our cause, now more than ever.

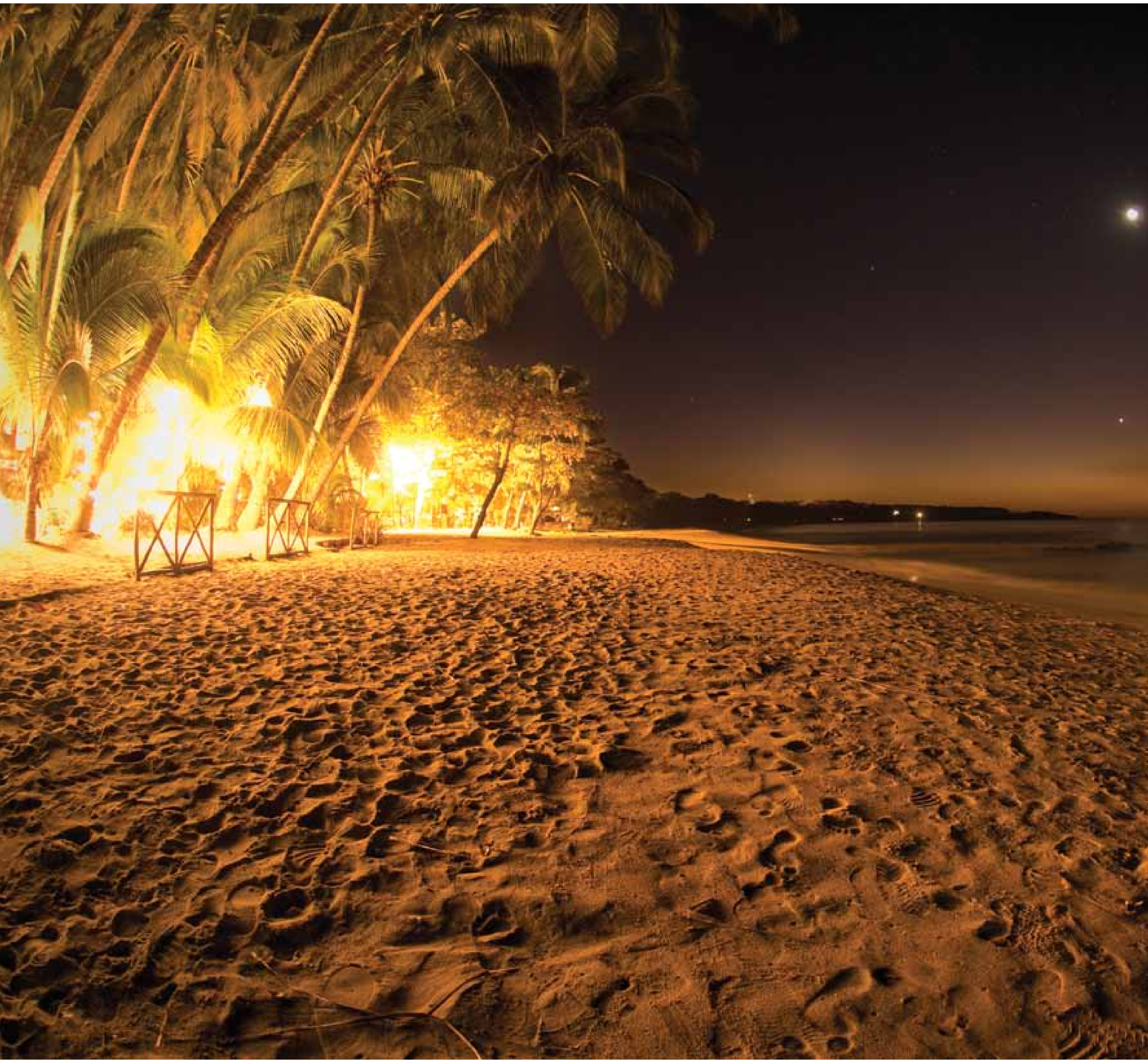
In 1995, after years of work by biologists and community members, the PNMB was established through Costa Rican law in recognition of its importance to leatherback turtles. The park's boundaries extended along the coast to include several beaches—Playa Carbon, Playa Ventanas, Playa Grande, and Playa Langosta—and a 75-meter-wide (246-foot-wide) strip of land extending inland from the beaches, forming a 125-meter-wide (410-foot-wide) strip of protection. In addition to the beaches, the adjacent lands encompass mangrove estuaries as well as maritime forest and dry tropical forest habitats. The newly formed park also included some privately owned properties. This last category has caused bitter debate to this day, and the resolution of that debate will be a critical element in the future of PNMB, its leatherbacks, and the many other species and ecosystems it protects.

Although supporters of the park knew that the government would likely take several years to acquire all of the land within the PNMB's boundaries, they were hopeful that this acquisition would occur eventually. After all, from a scientific standpoint, PNMB's importance for conservation is unquestionable. Leatherbacks in the eastern Pacific Ocean have declined by more than 90 percent in the past two decades, and the 6 kilometers (3.7 miles) of beach within the park host nearly half of the entire nesting population of the eastern Pacific.

In most ways, PNMB has been a tremendous success for leatherbacks. The two primary threats that led to their decline—harvesting of eggs and incidental capture in fisheries—have been eliminated within the park. All that remains is to ensure a natural ecosystem in which female leatherbacks can continue to safely nest, their eggs can incubate, and their hatchlings, undisturbed, can make their way back to the sea. Unfortunately, the struggle to guarantee these conditions is far from over, and the path ahead is unclear.

Currently, the most serious threat to the sanctity of this protected area is coastal development. In coastlines north and south of PNMB, sleepy seaside villages have been transformed into luxury resort destinations, with their associated bright lights, restaurants, clubs, and marinas. Developers now have focused their sights on PNMB, one of the few remaining undeveloped areas on Costa Rica's northwest coast. The unresolved issue of private inholdings within the park boundaries has led to constant quarrelling between those who seek to change the park boundaries to allow for development and those who oppose such actions, which would jeopardize leatherbacks and their nesting habitats.

It's possible that the best opportunity for consolidation of the park occurred during its creation, when development interests were not as strong or as complex. At that time, there were relatively few privately owned lands within the park. Since then, however, many of those lands



Just outside the boundary of Las Baulas National Marine Park, Costa Rica, lies the popular tourist destination of Tamarindo, where light from beachside developments floods the beach. Up the road, the park, which hosts half of all leatherback nesting in the eastern Pacific Ocean, faces the increasing threat of development. © JASON BRADLEY / BRADLEYPHOTOGRAPHIC.COM

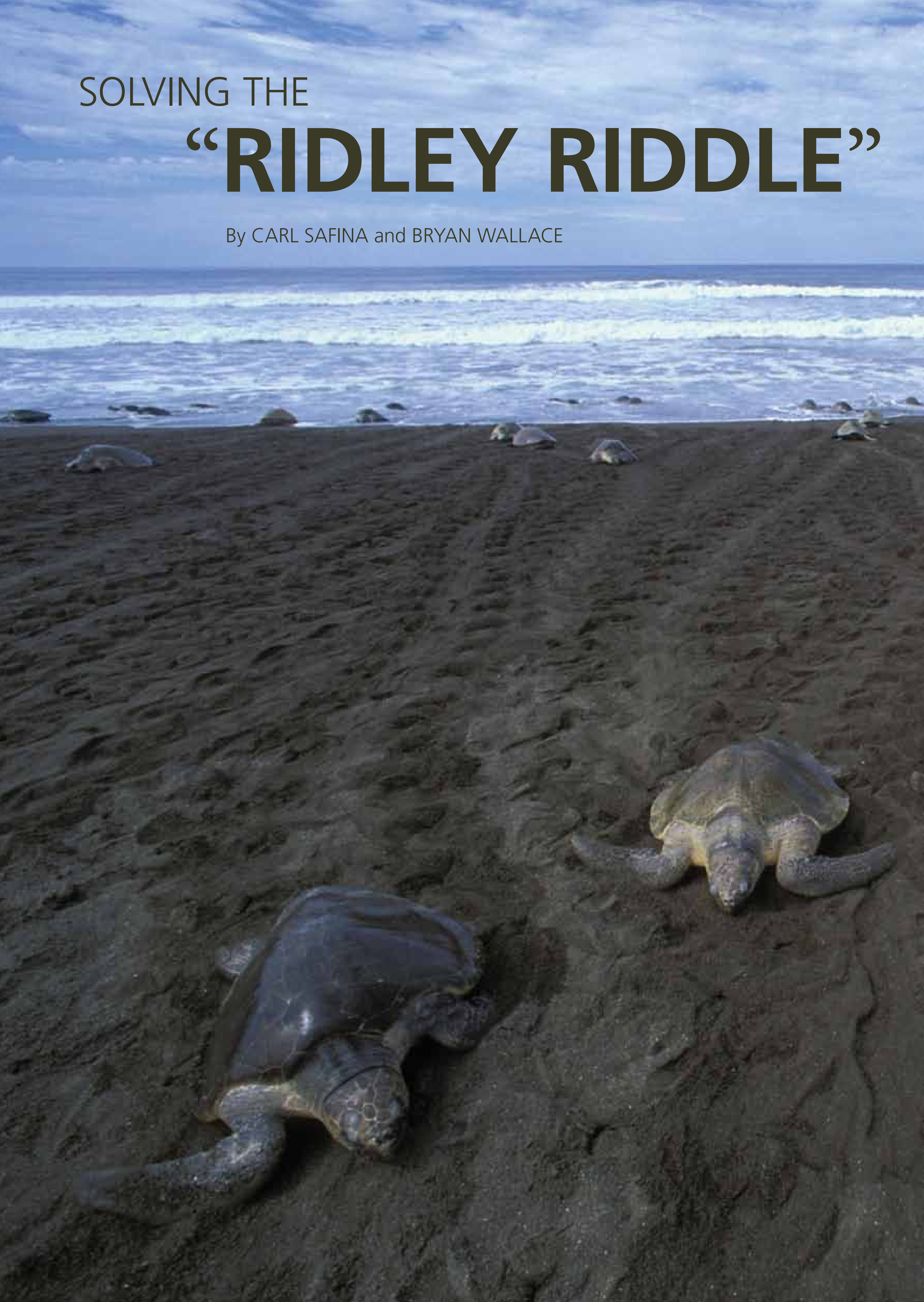
have been parceled and sold to other private landowners, despite being located within the park and, ultimately, being subject to expropriation by the Costa Rican government at any time. Moreover, many years have passed since the establishment of the park, during which the government made no attempt to expropriate the private lands, leaving many landowners with the impression that the government might never do so.

Today, because of the government's decades of inactivity to consolidate the park, it's common to hear arguments about legal insecurities of landowners within the park and of developers. However, those who purchased land within the park boundaries either ignored this important fact or mistakenly believed that the private status of the land was inviolate. Regardless, a solution to the current impasse must be found to ensure a safe future for leatherbacks.

Fortunately, those who support the park and its turtles are many: local guides, park rangers, researchers, volunteers, nongovernmental organizations, private businesses, and—importantly—residents of Playa Grande (the main beach within the park) who have recently become more engaged with efforts to enforce and manage the protected area. PNMB is a site of great pride both nationally and internationally as well as an important refuge for marine and coastal resources in Costa Rica. It is my steadfast hope that past and present conservation efforts in this extraordinary park will lead to permanent protection, peace, and survival of leatherback turtles. ■

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** 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 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. . . ."

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

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).[1] We converted data reported as number of nesting females using 3.1 clutches per female for Kemp's ridleys,[2] or regionally appropriate conversion factors for olive ridleys (between 1.4 and 3 clutches per female[3]). 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** to see SWOT's interactive map with leatherback, loggerhead, hawksbill, flatback, olive ridley, and Kemp's ridley nesting data.

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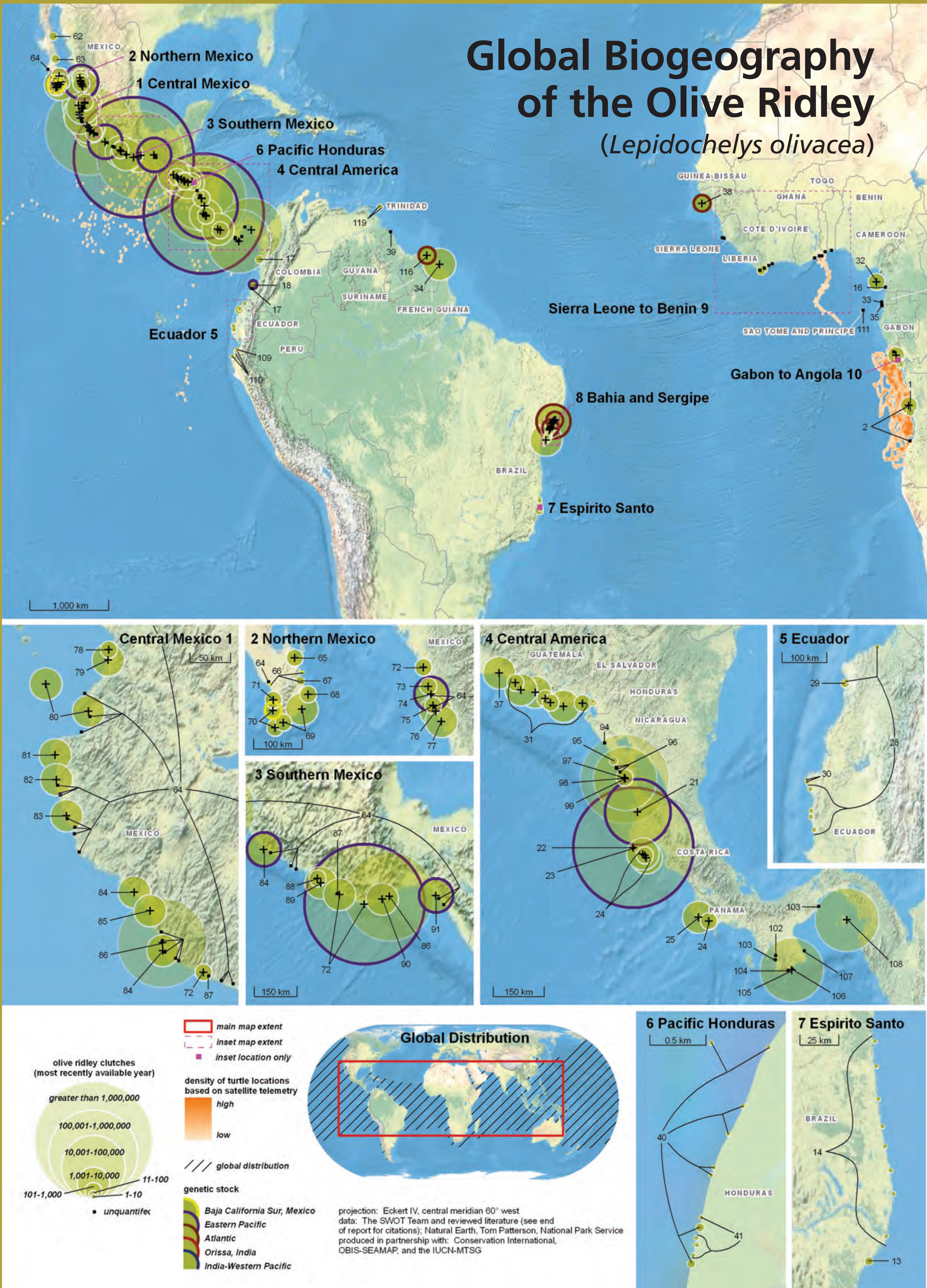
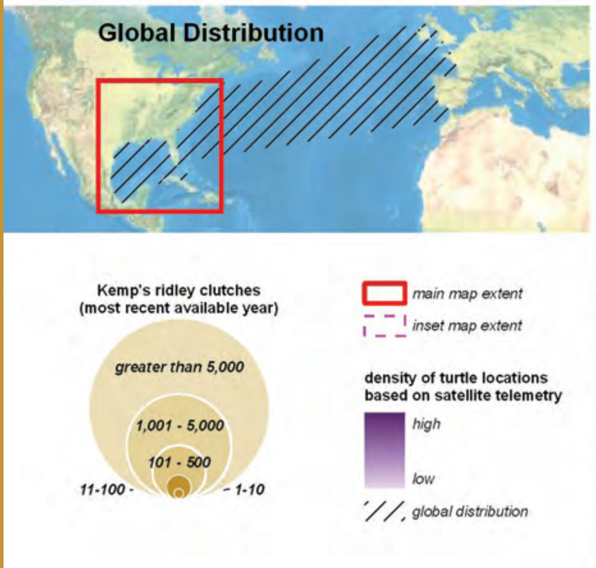
3. van Buskirk, J., and L. B. Crowder. 1994. Life history variation in marine turtles. *Copeia* 1994(1):66–81.

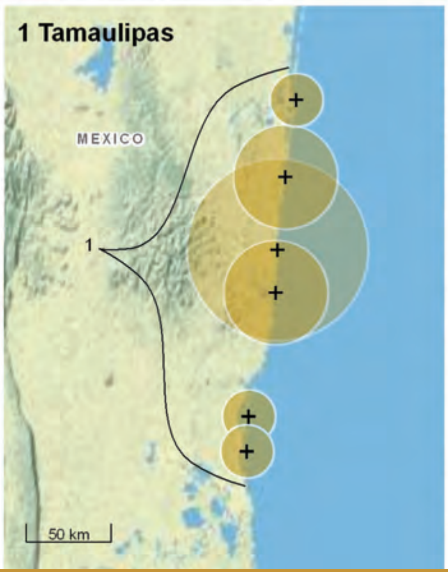

Global Biogeography of the Olive Ridley
(Lepidochelys olivacea)
2 Northern Mexico
1 Central Mexico
3 Southern Mexico
6 Pacific Honduras
4 Central America
Ecuador 5
8 Bahia and Sergipe
7 Espirito Santo
Sierra Leone to Benin 9
Gabon to Angola 10
MEXICO
COLOMBIA
ECUADOR
PERU
BRAZIL
TRINIDAD
GUYANA
SURINAME
FRENCH GUIANA
GUINEA-BISSAU
SIERRA LEONE
LIBERIA
COTE D'IVOIRE
GHANA
TOGO
BENIN
CAMEROON
SAO TOME AND PRINCIPE
GABON
1,000 km
Central Mexico 1
50 km
2 Northern Mexico
100 km
3 Southern Mexico
150 km
4 Central America
GUATEMALA
EL SALVADOR
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
5 Ecuador
6 Pacific Honduras
0.5 km
7 Espirito Santo
25 km
Global Distribution
olive ridley clutches
(most recently available year)
greater than 1,000,000
100,001-1,000,000
10,001-100,000
1,001-10,000
11-100
101-1,000
1-10
unquantified
main map extent
inset map extent
inset location only
density of turtle locations based on satellite telemetry
high
low
global distribution
genetic stock
Baja California Sur, Mexico
Eastern Pacific
Atlantic
Orissa, India
India-Western Pacific
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

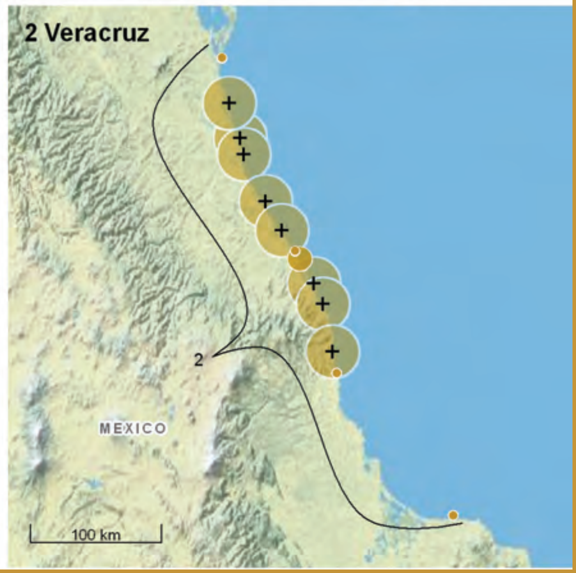
PAKISTAN
15 Andhra Pradesh
101
Gujarat 11
INDIA
100
OMAN
16 West Bengal to Bangladesh
121
120
93
MYANMAR
52
17 Andaman and Nicobar Islands
Maharashtra to Karnataka 12
43
49
50
THAILAND
VIETNAM
Lakshadweep Archipelago 13
117
121
47
48
Sri Lanka 14
BRUNEI
59
60
MALAYSIA
15
EQUATORIAL GUINEA
KENYA
61
57
56
INDONESIA
55
ANGOLA
9
Northern Territory 18
AUSTRALIA
MOZAMBIQUE
92
Sierra Leone to Benin 9
BENIN
TOGO
COTE D'IVOIRE
GHANA
112
SIERRA LEONE
LIBERIA
27
36
118
12
58
26
250 km
11 Gujarat
INDIA
42
44
43
100 km
12 Maharashtra to Karnataka
45
43
INDIA
43
46
100 km
16 West Bengal to Bangladesh
INDIA
BANGLADESH
10
53
11
100 km
14 Sri Lanka
SRI LANKA
113
114
114
115
100 km
17 Andaman and Nicobar Islands
54
43
INDIA
54
43
125 km
15 Andhra Pradesh
INDIA
10 km
51
Bahia and Sergipe 8
25 km
13
BRAZIL
14
13
10 Gabon to Angola
50 km
GABON
35
19
CONGO
20
1
ANGOLA
13 Lakshadweep Archipelago
75 km
47
INDIA
18 Northern Territory
200 km
4
5
6
7
3
AUSTRALIA
8

Global Biogeography of the Kemp's Ridley

(*Lepidochelys kempii*)







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).

1946 — **40,000 nests**

Andrés Herrera makes 32 flights along a 90-mile stretch of Mexican beach north of Tampico, and on June 18, 1947, films an estimated 40,000 nesting females at Rancho Nuevo.

1961 — **~6,000 nests**

Henry Hildebrand screens the Herrera film at the American Society of Ichthyologists and Herpetologists conference, thereby solving the "riddle" of where Kemp's ridleys nest. **In 1963,** Hildebrand publishes the first account of Kemp's ridley nesting. The same year, Dearl Adams relocates 98 eggs to South Padre Island to re-establish a nesting colony in Texas. Although no hatchlings survive, Adams' attempt marks the beginning of international efforts to help the Kemp's.

1966 — **5,991 nests**

The first Mexican turtle camp is established near the town of Rancho Nuevo by a team including Humberto Chávez, Martín Contreras and Eduardo Hernández. Efforts expand in 1968, when Peter Pritchard of the Florida Audubon Society assists in the deployment of Mexican Marines to aid in the protection efforts.

1978 — **924 nests**

A bi-national team is formed, headed by René Márquez Millán (Instituto Nacional de la Pesca) and Pritchard, with support from Jack Woody (U.S. Fish and Wildlife Service) and Patrick Burchfield (Gladys Porter Zoo). For the next decade, beach protection and research are redoubled, including an imprinting/head-start experiment that sends more than 22,000 eggs to South Padre Island, Texas, U.S.A. This practice consists of turtles being raised in captivity for a year, and then tagged and released throughout the Gulf of Mexico.

1987 — **737 nests**

New U.S. Regulations are enacted requiring the use of TEDs by all U.S. shrimp trawls, and also by foreign fleets that sell shrimp to the U.S. Prior to these regulations, the U.S. shrimp fleet alone had caught over 47,000 sea turtles annually. Following these landmark changes to U.S. law, Mexico declares a total ban on the capture of sea turtles and the use of sea turtle products in May 1990.

1996 — **1,288 nests**

Donna Shaver (U.S. National Park Service) documents the first nest on South Padre Island, Texas, made by a tagged Kemp's ridley from the imprinting/head-start experiment. Turtles from the experiment are confirmed to nest in Texas nearly every year thereafter.

2004 — **4,463 nests**

In contrast to historically scant nesting in Texas, 42 Kemp's ridley nests are documented. Thirteen of these nesters originate from the imprint/head-start experiment, and others are new nesters from the wild population.

2009 — **16,273 nests**

Two major nesting events are recorded on the Mexican coast, with estimated numbers of 5,000 and 6,000 turtles each. Nesting in Texas continues to break records each season, reaching nearly 200 nests in 2009.

Visit **www.SeaTurtleStatus.org** to see an extended, multimedia Kemp's ridley timeline.

& outreach action

Traditional and Modern Cultures Unite in Pursuit of Healthy Oceans

By TIM DYKMAN

More than 80 percent of the world's truly wild locales are home to indigenous peoples. Many nations with these locations are rising to the challenge of diminishing oceanic resources by pairing traditional protections with new tools and strategies. The Kuna of Panama and the Comcáac of Mexico are at the forefront of a growing global network of indigenous communities organized and mentored by Ocean Revolution through the Native Oceans program funded by The Christensen Fund.

Native Oceans provides indigenous leaders with a forum, a set of tools, and a network capable of combating rising threats to wild and healthy oceans. Since Native Oceans members hosted the January 2008 International Sea Turtle Society Symposium in Loreto, Mexico, many have participated in a series of exchanges expanding protections to new oceans and new sea turtle cultures.

The first of the exchanges took place in November 2008 when Comcáac community members from Mexico visited the Dhimuuru Rangers and the Torres Straits communities of Australia. Working with the Northern Australian Indigenous Land and Sea Management Alliance's Dugong and Sea Turtle Management Project, the Comcáac patrolled Dhimuuru sea country, tagged green turtles on Dowar Island, and fished the remarkably resilient community-managed fishing areas of the Great Barrier Reef. The Australians successfully encouraged the Comcáac to seek financing of turtle and habitat protections from their government agencies, as the Australians had done. Members of the Torres Straits Regional Authority, motivated by what they learned about the dire situation facing sea turtle populations in Mexico and the cultural sacrifice by the Comcáac people in stopping their turtle hunt, quickly created eight new community resource management areas and developed plans for managing their own marine territories by customary methods.

THIS PAGE: Members of the Comcáac Nación of Sonora, Mexico, traveled to the Kuna community of Armila, Panama, to participate in a leatherback hatchling release ceremony. Because of decimated leatherback populations, the Comcáac have not been able to have this ceremony in their homeland for over 30 years. © TIM DYKMAN AT LEFT: Summer interns from the Karen Beasley Rehabilitation Center assess the health of a female loggerhead that washed up on a beach in North Carolina, U.S.A. © NEIL EVER OSBORNE / NEILEVEROSBORNE.COM

Also in 2008, a major leatherback nesting area was discovered in Armila, Panama. Kuna tribes have been protecting the leatherbacks for hundreds of years. Armila and Yandup (a significant hawksbill nesting area), more than nine hours apart by boat, are now working together to stop the killing of all turtles in Panama. They are demanding a return to historic Kuna protections to rebuild populations decimated by years of habitat destruction and by demands for turtle products for medicinal and consumptive purposes. Joining forces with the Comcáac through a Native Oceans exchange is providing a means to that end.

Though the leatherback is the most powerful icon in Comcáac culture, the last encounter with it in Hant Comcáac occurred in 1983. For two generations, the stories, songs, dances, and language associated with the leatherback have not reached the young people of the tribe. In May 2009, at the height of the nesting season, 20 Comcáac community members (elders, adults, and children) traveled to Kuna Yala to perform their leatherback ceremony for the first time in 27 years. The two communities alternated singing, dancing, storytelling, game-playing, and chanting with documentation, measurement, nest protection, and exchange of centuries of traditional behavioral science.

Indigenous communities often use a complex, adaptive integration of science, economics, culture, and spirituality in their stewardship of nature. Sea turtle habitat and nesting areas managed by indigenous citizens and by scientists function better than neighboring areas. When fortified by modern conservation science, efforts by these groups will significantly increase the likelihood that we can achieve our common goal of healthy oceans. Their plea is simple: sea turtles are part of our protected family. When our family comes to you in your home, please do not hunt them for commercial products. Let them reproduce, protect them from the attacks of predators, and do not let them die helplessly in fishing nets. Give them clean places to nest and feed. Respect them and love them, as they are also part of your family. ■

Changing Our Behavior, Changing Our World

By MICHAEL MATARASSO and LUCY YARNELL

Aware of the importance of reef habitats to their fisheries, local communities in Raja Ampat have begun to patrol their waters against cyanide and blast fishing. This community patrolman keeps watch in his dugout canoe near the island of Batanta, Raja Ampat. © CI / STERLING ZUMBRUNN

No matter who we are or where we live, we all affect the environment through our daily behavior. The food we eat, the clothes we wear, the work we do, and the leisure activities we pursue affect the world around us—from coral reefs to farmlands, from sea turtles to ourselves.

Our own behavior is, in fact, the direct cause of many of the most pressing environmental problems we now face, including the status of sea turtles. Human-induced hazards, such as fisheries bycatch, direct take, coastal development, pollution and pathogens, and climate change, are among the top drivers of sea turtle population decline. Thus, embarking on a path toward sea turtle conservation is, in large part, embarking on a path to change human behavior. It is no easy path to tread.

Research and practice corroborate what most of us sense on a gut level: we humans are complex, as are the ways we behave. In any given situation, from our most habituated routine to our most spontaneous impulse, an intricate web of knowledge, attitudes, skills, alternatives, and barriers combine to influence our actions.

Despite this laundry list of factors, most of the conservation community's effort to alter environmentally harmful behaviors has focused solely on increasing knowledge and changing attitudes. Although this work is often vitally important, research indicates that improving knowledge and changing attitudes alone rarely affect long-term behavior. No matter how much people learn or how deeply they want to behave differently, if significant obstacles such as high cost, gaps in technology and infrastructure, or discouraging policies exist, then lasting change will not take place. For us to achieve the long-term results we seek, we must better include the affected communities in strategic planning and strive for a more holistic approach to behavior change—one that addresses all of the factors that drive human behavior.

A model that has proved successful in confronting diverse conservation problems in equally diverse communities is the *Targeting Behavior* methodology. This technique is rooted in significant community participation. It generates strategies that not only increase knowledge and change attitudes, but also create the framework for people to overcome significant barriers and to make lasting changes in their behavior.

"Targeting Behavior" in Action: Raja Ampat

The Indonesian archipelago of Raja Ampat includes more than 1,500 islands of karst limestone, lush forests, white sandy beaches, and vast expanses of ocean teeming with some of the richest marine biodiversity on Earth. With 75 percent of all known coral species, more than 1,000 fish species, 5 species of sea turtles, and an array of marine mammals, it has been called the "Jewel of the Coral Triangle."

The area is also home to a growing human population that is largely dependant on ocean resources for nourishment and income. Tourism is increasing, economic needs are on the rise, and pressures on natural resources are quickly mounting. Conservationists are concerned that unless current behaviors change, Raja Ampat's unique marine ecosystems will be irreversibly harmed.

In March 2007, a group of community representatives, local authorities, and nongovernmental organizations met in Raja Ampat to develop an education and communication campaign aimed at supporting local conservation efforts. They used the *Targeting Behavior* methodology.

At the start of the week-long workshop, the team identified marine degradation from overextraction and pollution as Raja Ampat's primary conservation problem and prioritized six behaviors as the chief contributors to this problem: blast fishing, turtle hunting and egg collection, cyanide fishing, trash disposal, overfishing of certain species, and coral mining. Workshop participants explored these behaviors inside and out, thereby analyzing the root causes, effects, and groups involved. They evaluated new, sustainable practices that might replace the unsustainable ones, paying particular attention to the barriers that would need to be overcome for those alternatives to be adopted.

For example, the practices of sea turtle hunting and egg collection in Raja Ampat are deeply rooted in tradition as ways to generate food and income. Workshop participants therefore recognized that for these behaviors to change, local people would need alternative sources for both. Their solution was to include a plan to develop a sustainable piggery as part of the education and communication strategy. Now in its second year of operation, the piggery is a successful business that produces both organic meat and "biogas," a fuel made from manure.

Raja Ampat's "pigs-for-turtles swap" was born directly out of the 2007 participatory workshop, in which community representatives worked with other stakeholders to analyze environmental concerns and assess local needs.

This practical pigs-for-turtles swap has been introduced alongside targeted marine conservation education that was developed directly from surveys of local knowledge, skills, and attitudes. This holistic approach to solving an environmental problem has made it possible for local behaviors and awareness to shift together, greatly increasing the likelihood that these changes will become permanent.

As a whole, the sea turtle conservation community has demonstrated its commitment to helping people around the world find ways of living in harmony with sea turtles. Through the deep involvement of local stakeholders, the targeting behavior methodology offers a way to channel that commitment into productive campaigns for behavior changes that can make long-lasting differences. The key is to remember that each community of people who live with and affect sea turtles is different, that each challenge is different, and that identification of the right solution begins with investing time in understanding why people do what they do. ■

Visit **www.SeaTurtleStatus.org** to download a step-by-step guide for creating comprehensive behavior-change strategies with the *Targeting Behavior* methodology.]

Steps toward Changing Behavior

Analyze problems and behaviors.	Identify drivers and target groups.	Analyze alternatives and barriers.	Assess learning needs.	Select tools and develop a plan.	Implement.	Evaluate.
What's going on here? Analyze the environmental problems in the area, the behaviors that trigger these problems, and the root causes of those behaviors for identification of which behaviors most need to be addressed.	**Who's involved?** Identify and target the specific groups that are directly and indirectly affecting the problem you're trying to solve. These targets include both groups that are directly threatening the environment and those that influence the groups.	**What are our options?** Determine what alternative practices exist to replace the destructive behavior you're trying to influence. What barriers might need to be overcome for those alternatives to be adopted?	**What's missing?** Assess the learning needs of your target audiences with knowledge, skill, and attitude surveys for each target group to ensure that your program is meeting the needs of those upon whom its success relies.	**What will resonate?** Using survey results, strategically select creative communications and learning tools to inform, engage, motivate, and build capacity of your target groups. Include program objectives, activities, personnel, impact indicators, means of monitoring, funding, timeline, and next steps.	**Put your plans into action.** Develop and produce the tools you've selected. These tools might include workshops, interactive activities and events, print materials, video products, radio spots, exhibits, maps or models, theater, puppets and costumes, and more.	**Take stock.** Understand what's working and what's not as you measure success and progress toward your goals.

TOTEBAGS FROM TRASH HELP TURTLES AND TAMARINS

By ANNE SAVAGE, IADER LAMILLA, and ROSAMIRA GUILLEN

Pollution and poverty are among the greatest challenges to development of effective conservation programs for endangered species. As human populations have increased, the number of plastic bags that litter the landscape has also grown, creating a serious threat to wildlife on land and at sea. We have created a model program in Colombia called Proyecto Tití that alleviates the threats posed by plastic bags, while empowering women in rural communities by teaching them practical skills that help generate income for their families. When human needs are met through stable incomes, rural communities are better able to help protect wildlife for the future.

A small charismatic monkey, the endemic cotton-top tamarin *(Saguinus oedipus),* locally referred to as *mono tití cabeciblanco,* serves as the flagship species for Proyecto Tití. In communities near its native habitat in northern Colombia, we have built a network of artisans (ASOARTESANAS) who collect plastic bags before they enter the waste stream. The artisans use this raw material to crochet eco-mochilas, beautiful tote bags made from plastic that would otherwise be littering the environment. The proceeds from the sale of eco-mochilas—now sold worldwide—go to the local communities where they are produced and support long-term programs to protect cotton-top tamarins in Colombia.

Exposure to and ingestion of plastic bags is not only a problem for terrestrial wildlife in Colombia, but also a major hazard for sea turtles. When sea turtles eat plastic bags, they can develop intestinal blockages as well as suffer poisoning by chemicals that leach from the plastics. Thus, efforts to reduce the amount of waste in our oceans are essential. Proyecto Tití established a partnership with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) in order to host a training session with local artisans from coastal areas of Costa Rica, Nicaragua, and Panama to teach the techniques used in making eco-mochilas with recycled plastic bags. This initiative has resulted in a trained group of women who produce products for sale both to local tourists who are visiting sea turtle nesting beaches, as well as to international markets.

With this simple idea, we have already recycled more than two million plastic bags in Colombia alone, and we provide jobs to more than 300 women in rural communities. The positive results achieved through this waste-reduction initiative, the entrepreneurial spirit evoked in rural communities with scarce economic options, and the renewed interest in conservation by rural stakeholders make this program an excellent candidate for replication wherever one finds plastic waste and communities in need of economic advancement. Other people in Bangladesh, Brazil, Ecuador, Sri Lanka, and the United Kingdom have been similarly inspired to form cooperatives that empower women, increase local incomes, and engage rural communities in conservation by creating small-scale industries that produce environmentally friendly goods. Some groups, such as U.K.-based Turtle Bags (www.turtlebags.co.uk), use sea turtles as a logo and iconic reminder of why it is important to reduce plastic pollution. Another effort, spearheaded by Projeto TAMAR in Brazil (see *SWOT Report, Vol. 4,* page 35), has developed a full-scale retail business that sells locally produced crafts to generate income directly supporting sea turtle conservation efforts in that country.

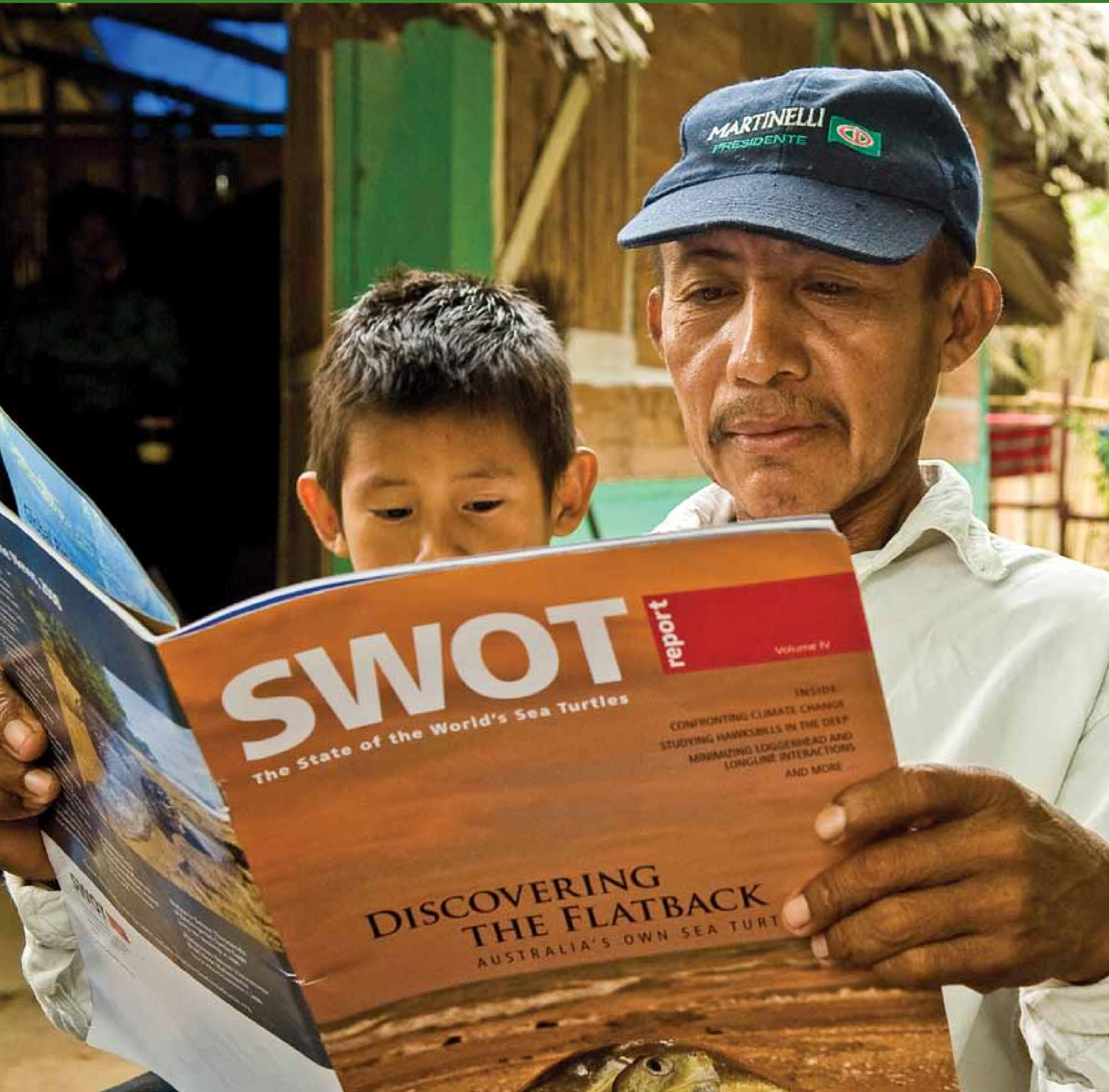
Initiatives such as Proyecto Tití that create environmental entrepreneurs in impoverished rural communities have been shown to generate tangible economic returns. These initiatives have long-lasting, positive conservation returns by providing alternatives to hunting, poaching, or activities that exploit wildlife. Perhaps most important, they foster a conservation ethic for future generations by demonstrating how environmentally friendly industries, such as the production of eco-mochilas, are both profitable and good for nature.

THIS PAGE, TOP TO BOTTOM: Eco-mochila artisans collect old plastic bags before they can cause harm to wildlife. © PROYECTO TITÍ Made from 100–120 plastic bags each, eco-mochilas have kept more than two million plastic bags from entering Colombia's waste stream. © PROYECTO TITÍ Increasing plastic debris threatens Proyecto Tití's flagship species, the cotton-top tamarin (*Saguinus oedipus*), as well as sea turtles. © PROYECTO TITÍ AT LEFT: International sales of eco-mochilas help these artisans generate income to support their families. © PROYECTO TITÍ

For more information on Proyecto Tití, visit www.proyectotiti.com, or see the following publication: Savage, A., R. Guillen, I. Lamilla, and L. Soto. 2009. Developing an effective community conservation program for cotton-top tamarins (*Saguinus oedipus*) in Colombia. *American Journal of Primatology* 71: 1–12. ■

Visit **www.SeaTurtleStatus.org** to see Mr. Leatherback star in a music video about using reusable bags.

the SWOT team



SWOT Year in Review 2009

The SWOT Team now numbers in the hundreds. Data contributors, authors, photographers, and locally based researchers and conservationists from more than 70 countries now participate in this ever-growing network dedicated to building, improving, and using a global-scale data set to guide conservation of sea turtles and their ocean habitats. The team has been very busy of late, and the past year has ushered in many new tools to help expand its reach.

SWOT Strengthens Its Bond with OBIS-SEAMAP

In 2009, after much preparation and anticipation, the SWOT database was merged with the OBIS-SEAMAP (Ocean Biogeographic Information System-Spatial Ecological Analysis of Megavertebrate Populations) database, and the SWOT online application was launched on SEAMAP's Web site, http://seamap.env.duke.edu/swot. The Duke University-based OBIS-SEAMAP project is a spatially referenced online database that aggregates marine mammal, seabird, and sea turtle data from across the globe. It is also a founding partner of SWOT (involved in the effort since 2004) and is now home to SWOT database manager and spatial analyst Andrew DiMatteo.

In addition to viewing SWOT data on the SWOT Web site, users can interact with SWOT data in the SEAMAP environment, which also displays information from other marine species and oceanographic features. The SEAMAP interface allows various options for sorting SWOT data (e.g., by species, by country, or by nesting abundance). All SWOT data providers also prominently feature where their data are displayed. We encourage all those involved in sea turtle conservation to check out the SEAMAP site and to take advantage of the many applications and tools that are available for download and use.

Visit **www.SeaTurtleStatus.org** to download *Reporte SWOT, Vol. 3,* our first Spanish translation.

THIS PAGE: An employee of Amigos Para la Conservación de Cabo Pulmo excavates an olive ridley nest in Cabo Pulmo National Park, Baja California Sur, Mexico. © BRIAN J. HUTCHINSON
AT LEFT: Kuna Sahila Carlos Lopéz reads *SWOT Report, Vol. 4,* with his son in Armila, Kuna Yala, Panama. © THOR MORALES

SWOT Report, Vol. 3 en Español!

The long-awaited translation and redesign of *SWOT Report, Vol. 3* into Spanish is complete and available on the SWOT Web site! We have distributed printed copies of *Reporte SWOT, Vol. 3* to SWOT team members throughout Latin America, where the copies are already being used as part of local conservation efforts. Our goal is eventually to translate and print all volumes of *SWOT Report* in Spanish and French as resources become available.

SWOT Data Are in Demand!

A primary goal for SWOT is to be a global clearinghouse of sea turtle data for applied conservation research initiatives. Over the past year, SWOT has received multiple requests to use SWOT nesting site data in various types of studies, such as analyses of sea turtle nesting habitat under future climate change scenarios. SWOT data were also used in the figures included in a story about leatherbacks, titled "Ancient Mariner," in the May 2009 issue of *National Geographic.* Although SWOT continues to maintain strict protections for data providers, we are excited to facilitate the use of this comprehensive, global sea turtle database for efforts that can help advance sea turtle and marine conservation.

Simplified Data Submission Processes

SWOT continues to strengthen protections for data providers and to make the processes for data submission and requests more efficient. On the submission side, we have translated the SWOT data submission form to Spanish (French is coming soon). In addition, we are working with the developers of the SWOT Web site (www.SeaTurtleStatus.org) to create a guided user interface for online data submission. We have also updated and simplified the processes for requesting SWOT data and have made improvements to the SWOT–SEAMAP Terms of Use for data providers. ■

Thanks to the SWOT Team, as always, for all of their contributions to these important efforts.

Acting Globally

2009 SWOT Outreach Grants

SWOT Report's success is measured by the success of those who use it. For the fourth consecutive year, SWOT has distributed small grants to help organizations put *SWOT Report* to work in reaching their outreach goals. Through their hard work and dedication, these five grant recipients have helped make 2009 a successful year for all of us!

Fundación Tierra Ibérica—Senegal

The Casamance coastline in southern Senegal is an area where mangroves, tropical forest, marine islands, and beaches combine to form a unique ecosystem mosaic of high natural value. For the past 30 years, an armed secessionist conflict has prevented these natural wonders from being well explored, researched, and documented. However, in 2008, with support from the University of Salamanca, Fundación Tierra Ibérica was able to conduct a study of the coastal zone from The Gambia to the Casamance River. The study revealed the presence of several marine turtle species that are being threatened by incidental and intentional capture by artisanal fishermen, and it recommended implementing a sea turtle education program for natural resource managers and partner organizations. A 2009 SWOT Outreach Grant helped support Fundación Tierra Ibérica's sea turtle training course in the town of Kafountine, where the main artisanal fishing port is located. During the course, more than 20 people from different government and private institutions made presentations and were provided *SWOT Reports* and other materials on sea turtle biology, threats, and management and research techniques. The course concluded with a visit to the fishing port to directly engage local fishermen.

Fundación Tierra Ibérica staff members lead a sea turtle training course at an artisanal fishing port in Senegal. © FUNDACIÓN TIERRA IBÉRICA

A sea turtle drawing contest among students decides who will have the honor of painting a mural on Karumbé's new Marine Turtle Center. © KARUMBÉ

Karumbé Marine Turtle Center—Uruguay

Uruguayan organization Karumbé promotes the preservation of marine wildlife through research and environmental education, focusing in particular on flagship species such as sea turtles. The Karumbé Marine Turtle Center, near the capital city of Montevideo, is a unique space designed to support and advance the conservation of sea turtles and their habitats. In 2009, a SWOT Outreach Grant helped fund Karumbé's ongoing education and awareness program along the Uruguayan coast. During the campaign, Karumbé staff members used *SWOT Reports* while leading discussions in schools, teaching workshops at universities, and meeting with fishermen in villages. Karumbé also held a sea turtle drawing contest among schoolchildren, using the beautiful photographs in the *SWOT Reports* as inspiration. The winning team was awarded the honor of painting a mural on the wall of Karumbé's new Marine Turtle Center, which is due to open in early 2010. The center, aimed at schoolchildren, fishermen, and tourists, will feature exhibits on the importance of responsible fisheries, the threats of marine pollution, and the challenges of climate change.

Visit **www.SeaTurtleStatus.org** to apply for a 2010 SWOT Outreach Grant!

EARTHCARE—The Bahamas

EARTHCARE's Grand Bahama Island Sea Turtle Awareness Campaign was developed to help generate and demonstrate local support for the Bahamian government's sea turtle harvesting ban, which went into effect September 1, 2009 (see page 17). Over the course of the campaign, which ran through April 2010, trained volunteers traveled to schools and libraries throughout Grand Bahama to give educational presentations and to encourage student involvement. During the presentations, students learned about sea turtle biology; threats, such as poaching, overharvesting, habitat destruction, and pollution; and the government's recent ban. Students were then encouraged to write directly to the Minister of Fisheries to let him know their feelings about laws that should be implemented to help protect sea turtles in The Bahamas. By the end of the campaign, *SWOT Reports* had been distributed to all schools, colleges, and libraries on the island of Grand Bahama.

After attending an Earthcare presentation, a student writes a letter to the Minister of Fisheries about the importance of sea turtle conservation in The Bahamas. © EARTHCARE

AlTo staff conduct Conservation Awareness Campaign meetings in Tompotika schools. © TITAYANTO PIETER

The Alliance for Tompotika Conservation—Indonesia

The Tompotika peninsula sits at the extreme eastern tip of the central arm of the island of Sulawesi, Indonesia. There, the Alliance for Tompotika Conservation/Aliansi Konservasi Tompotika (AlTo) works with local villages to protect sea turtles and other endangered species from the primary local threat of poaching. In their sea turtle work, AlTo staff members partner with local villagers to patrol beaches and to travel throughout the area to conduct community awareness campaigns using *SWOT Reports* and other educational materials. Now in its second year, the turtle field program and awareness campaign has not only protected thousands of adult turtles and eggs but also reached thousands of Tompotikans with a conservation message that has both resonated and been embraced. Recently, awareness campaign participants from the village of Taima prevented a poacher on a nearby island from slaughtering 26 sea turtles for market. After unsuccessfully confronting the poacher themselves, the people traveled three villages away to find a policeman who could enforce the antipoaching law they had learned about through AlTo's campaign.

Local Ocean Trust–Watamu Turtle Watch—Kenya

Despite protective international and Kenyan legislation in place since 1977, sea turtles along the Kenyan coastline continue to be extensively exploited for their eggs, meat, and oil, as well as being caught in large numbers as bycatch. LOT-WTW works toward protecting sea turtles through a wide range of programs, including bycatch compensation, nest and hatchling protection, turtle rescue and rehabilitation, and local outreach and education. A 2009 SWOT Outreach Grant supported LOT-WTW's ongoing education work. This work includes (a) school programs with lectures, visits to the turtle rehabilitation center, arts competitions, and marine science career development; (b) tourist programs with hotel talks, beach cleanups, and turtle release events; and (c) fisher programs with presentations at key ports and the LOT Marine Education Center. Together with educational posters and stickers, *SWOT Reports* were distributed to activity participants and proved particularly useful in helping LOT-WTW staff members communicate the global scope of sea turtle conservation with local Kenyan communities that have long perceived it as an isolated problem.

Kenyan fishermen learn about sea turtles during a LOT-WTW education program. © LOT-WTW

SWOT Team Profiles

Visit **www.SeaTurtleStatus.org** to watch video interviews with SWOT Team members!

Dr. René Márquez Millán (Mexico)

From 1963 to 2001, I researched sea turtles at Mexico's Instituto Nacional de la Pesca, or INP. Currently, I am the vice president of the Scientific Committee of the Inter-American Convention for the Conservation of Sea Turtles. I have seen firsthand and participated in the organization of the incredible work to protect sea turtles in my country. Kemp's ridley nesting numbers at the beach in Rancho Nuevo were a mere 740 in 1988 and grew to more than 16,000 by 2009 as a result of a bi-national project between Mexico and the United States (INP–National Marine Fisheries Service). On Playa Escobilla in Oaxaca, there were only 57,000 olive ridley nests in 1987, and by 2006, that number grew to more than 1 million as a result of the National Sea Turtle Conservation Program. *SWOT Report* supports and advances activities of sea turtle conservation efforts such as these around the world, and I am grateful for its success. **Interesting Fact.** René was integrally involved in developing the landmark legal decree banning sea turtle take and consumption in Mexico that was passed on June 1, 1990.

Carolyn Robins (Australia)

Since 1991, I have assisted commercial fishers in their quest toward an environmentally sustainable and turtle-friendly industry. I have worked for the Bureau of Rural Sciences in Canberra and for the Commonwealth Scientific and Industrial Research Organisation in Brisbane to compile and analyze fishery data, and I am currently conducting fishery data analysis and marine turtle mitigation research as a private consultant with Belldi Consultancy. *SWOT Report* is an important tool for my line of work. It helps commercial fishers understand why they need to care, and it fosters in them not only a personal appreciation for sea turtles and their niche in a healthy ocean, but also an understanding of their role as fishermen in ensuring that their industry participates in positive ways. **Interesting Fact.** Carolyn co-produced an educational film that is used in thousands of schools internationally to help children develop an appreciation for sea turtles and to inform students of ways to help in conservation efforts.

Kartik Shanker (India)

I have been an Assistant Professor at the Centre for Ecological Sciences of the Indian Institute of Science, for four years, where I teach, supervise doctoral students, and conduct research in community ecology and biogeography. My role in sea turtle conservation is to bridge nature conservation with sustainable human development in India. I also try to inspire students and young researchers. In fact, my favorite part of the job is working with the next generation of sea turtle biologists and conservationists. *SWOT Report* helps compile and visualize the global effort in sea turtle conservation. The compilation of data and the visual representation through maps in *SWOT Report* lay a foundation for a globally synchronized effort to advance sea turtle monitoring and general knowledge of marine conservation. **Interesting Fact.** Kartik is the current president of the International Sea Turtle Society, which will host its 30th Annual Symposium in Goa, India.

Brian Skerry (U.S.A.)

I have been a photographer and diver for nearly 30 years and am fortunate to have witnessed some of the world's most amazing marine wildlife. In the course of any given year, I spend about 8 months in the field, much of which is spent underwater, and frequently find myself in environments of extreme contrast—from exploring tropical coral reefs to diving beneath Arctic ice. My photos have been featured in publications for Conservation International and the BBC as well as in magazines such as GEO, *Audubon,* and *Smithsonian Magazine,* and I've been a contract photographer for *National Geographic* Magazine for the past 12 years. My goal as a photojournalist is to tell stories that not only celebrate the mystery and beauty of the sea, but also help bring attention to the larger issues that endanger our oceans and its inhabitants. *SWOT Report* uses unique and compelling photos to illustrate the global conservation effort to study and protect not only sea turtles, but also the entire ocean. **Interesting Fact.** Brian has spent more than 10,000 hours underwater over the past 30 years.

SWOT Data Contributors

Guidelines of Data Use and Citation

The olive and Kemp's ridley nesting data below correspond directly to this report's feature maps (pages 32–34), and are organized alphabetically by country, then by data record number as listed on the map. Every data record with a point on the map is numbered to correspond with that point. The data come from a wide variety of sources and in many cases have not been previously published. To use data for research or publication, you must obtain permission from the data provider and must cite the original source indicated in the "Data Source" field of each record.

In the records that follow, nesting data are reported from the most recent available year or nesting season or are reported as an annual average number of clutches based on the reported years of study. Raw count data are reported as number of clutches, but are displayed on the maps in generalized bins (e.g., 1–10 clutches, 11–100 clutches, and so on) to facilitate interpretation. For more information on data conversions, see the box on page 31. Beaches for which count data were not available are listed as "unquantified." Additional metadata are available for many of these data records, including information on beach length, monitoring effort, and other comments, and may be found online at www.seaturtlestatus.org.

Following nesting data records, we have also included citations for satellite telemetry, genetic stocks, and information used to create the global distributions.

Special Acknowledgments

Special thanks go to Brendan Hurley for extraction, synthesis, and formatting of published data displayed in the maps. Erin Seney was extremely helpful in collecting Kemp's ridley information for the map. Michael Coyne, Brendan Godley, Kellee Koenig, Kate Mansfield, Sara Maxwell, Jack Musick, Jeff Schmid, Kartik Shanker, and Roldán Valverde also provided helpful comments to improve the maps.

OLIVE RIDLEY NESTING DATA CITATIONS

ANGOLA

DATA RECORD 1

Data Source: Carr, T., and N. Carr. 1991. Surveys of the sea turtles of Angola. *Biological Conservation* 58:19–29.
Nesting Beach: Cabinda Province **Year:** 1983 **Count:** 5 clutches
Nesting Beach: Luanda to Rio Longa **Year:** 1985
Count: 100 clutches

DATA RECORD 2

Data Source: Weir, C. R., T. Ron, M. Morais, and A. D. C. Duarte. 2007. Nesting and at-sea distribution of marine turtles in Angola, West Africa, 2000–2006: Occurrence, threats and conservation implications. *Oryx* 41(2):224–231.
Nesting Beach: Benguela Province **Year:** 2006
Count: Unquantified
Nesting Beach: Palmeirinhas **Year:** 2005 **Count:** 120 clutches

AUSTRALIA

DATA RECORD 3

Data Source: Whiting, S. 1997. Observations of a nesting olive ridley turtle in the Northern Territory. *Herpetofauna* 27(2):39–42.
Nesting Beach: Bare Sand Island, Northern Territory
Year: 1997 **Count:** Unquantified

DATA RECORD 4

Data Source: Whiting, S. D., J. L. Long, K. M. Hadden, A. D. K. Lauder, and A. U. Whiting. 2007. Insights into size, seasonality and biology of a nesting population of the olive ridley turtle in northern Australia. *Wildlife Research* 34:200–210.
Nesting Beach: Cape Van Diemen **Year:** 2004 **Count:** 798 to 3,812 (± 2 S.E.) estimated nesting females per year
SWOT Contact: Scott Whiting

DATA RECORD 5

Data Source: Hope, R., and N. Smit. Marine turtle monitoring in Gurig National Park and Coburg Marine Park. In Kennet, R., A. Webb, G. Duff, M. Guinea, and G. Hill, eds. 1998. *Proceedings of the Marine Turtle Conservation and Management in Northern Australia. Proceedings of a Workshop Held at the Northern Territory University 3–4 June 1997.* Darwin, Australia: Northern Territory University.
Nesting Beach: Greenhill Island, Northern Territory
Year: 1998 **Count:** Unquantified

DATA RECORD 6

Data Source: Limpus, C. J., and N. Preece. 1992. *One and All Expedition, 11–31 July 1992: Weipa to Darwin via Wellesley Group and the Outer Islands of Arnhem Land.* Queensland Department of Environment and Heritage, Brisbane, unpublished report.
Nesting Beach: McCluer Island, Northern Territory
Year: 1992 **Count:** Unquantified

DATA RECORD 7

Data Source: Guinea, G. F. 1990. Notes on sea turtle rookeries on the Arafura Sea Islands of Arnhem Land, Northern Territory. *Northern Territory Naturalist* 12:4–12.
Nesting Beach: Southern Arafura Sea, Northern Territory
Year: 1990 **Count:** Unquantified

DATA RECORD 8

Data Source: Gow, G. F. 1981. Herpetofauna of Groote Eylandt, Northern Territory. *Australian Journal of Herpetology* 1(2):62–70.
Nesting Beach: Groote Eylandt, Northern Territory
Year: 1981 **Count:** Unquantified

DATA RECORD 9

Data Source: Limpus, C. J., C. J. Parmenter, V. Baker, and A. Fleay. 1983. The Crab Island sea turtle rookery in the northeastern Gulf of Carpentaria. *Australian Wildlife Research* 10(1):173–184.
Nesting Beach: Crab Island, Queensland **Year:** 1983
Count: Unquantified

BANGLADESH

DATA RECORD 10

Data Source: Islam, M. Z. 2010. *Final Report: Bangladesh Sea Turtle Project, 2008–09 Nesting Season.* Marinelife Alliance, Bangladesh.
Nesting Beaches: Cox's Bazaar, Sonadia Island, and St. Martins Island **Year:** 2008 **Counts:** 132, 154, and 121 clutches, respectively
SWOT Contact: M. Zahirul Islam

DATA RECORD 11

Data Source: Rashid, S. M. A., and M. Z. Islam. Status and conservation of marine turtles in Bangladesh. In K. Shanker and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Bordal and Inoni **Year:** 1989
Counts: 4 and 6 clutches, respectively
Nesting Beach: Dubla Island, Sunderban **Year:** 1994
Count: 3 clutches
Nesting Beaches: Egg Island, Sunderban; and Mandarbaria, Sunderban **Year:** 2003 **Counts:** 1 clutch and unquantified, respectively
Nesting Beaches: Kochopia **Year:** 1985 **Count:** 6 clutches
Nesting Beaches: Kutubdia Island **Year:** 1995
Count: 7 clutches
Nesting Beaches: Moheskhali Island and Teknaf **Year:** 1987
Counts: 5 and 4 clutches, respectively
Nesting Beaches: Monkhali **Year:** 1984 **Count:** 4 clutches

BENIN

DATA RECORD 12

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Comments: No nest count data were available, but olive ridley nesting is known to occur in Benin.

BRAZIL

DATA RECORD 13

Data Source: Projeto TAMAR. 2010. Olive ridley nesting in Brazil: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Combined data for Anchieta, Comboios, Povoação, Pontal do Ipiranga, Guriri, and Itaunas (200 kilometers total) **Year:** 2008 **Count:** 37 clutches
Nesting Beaches: Combined data for Arembepe, Praia do Forte, Costa do Sauipe, and Sitio do Conde (213 kilometers total) **Year:** 2008 **Count:** 1,435 clutches
Nesting Beach: Pirambu (125 kilometers total) **Year:** 2008
Count: 4,999 clutches
SWOT Contact: Neca Marcovaldi

DATA RECORD 14

Data Source: Projeto TAMAR Database. 2007. In Dow, W., K. Eckert, M. Palmer, and P. Kramer. 2007. *An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region.* The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina.
Nesting Beaches: Abais, Barra dos Coqueiros, Boa Viagem, Cabeto, Caueira, Coqueiro, Funil, Lagoa Redonda, Mangue Seco, Ponta dos Mangues, Rato, Santa Isabel, and Tigre
Year: 2006 **Count:** 100–500 clutches annually
Nesting Beaches: Costa Azul, Dunas, Lote, Porto Saufpe, Ribeiro, Santo Antonio, Siribinha, and Vapor **Year:** 2006
Count: 25–100 clutches annually
Nesting Beaches: Barra de Itariri, Barra Nova, Barra Seca, Berta, Buraquinho, Busca Vida, Campo Grande, Conceicao da Barra, Corre N, Degredo, Guarajuba, Guriri, Imbassaf, Ipiranga, Itacimirim, Itapup, Jacufpe, Jau, Mamucabo, Massarandupi, Povoatpo, Salinas, Santa Maria, Sauipe, and Subaúma
Year: 2006 **Count:** 1–25 clutches annually
SWOT Contact: Neca Marcovaldi

BRUNEI

DATA RECORD 15

Data Source: Shanker, K., and N. J. Pilcher. 2003. Marine turtle conservation in south and southeast Asia: Hopeless cause or cause for hope? *Marine Turtle Newsletter* 100:43–51.
Comments: Nesting data were not available, but it is estimated that more than 300 olive ridley clutches are laid on beaches in Brunei each year.

CAMEROON

DATA RECORD 16

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Beaches between Kribi and Campo
Year: 1999 **Count:** Unquantified

COLOMBIA

DATA RECORD 17

Data Source: Amorocho, D. 2008. *Informe del Taller Estandarización de Metodologías en Investigación y Monitoreo para la Conservación de Tortugas Marinas en Colombia.* Convenio MAVDT–WWF.
Nesting Beaches: La Cuevita and Parque Nacional Natural Sanquianga **Year:** 2007 **Counts:** 41 clutches and unquantified, respectively
SWOT Contact: Diego Amorocho

DATA RECORD 18

Data Source: Payan, L. F. 2009. *Fortalecimiento del Programa de Monitoreo de Tortugas Marinas CIMAD–UAESPNN en el Parque Nacional Natural Gorgona.* Unpublished report.
Nesting Beach: Playa Palmeras, Parque Nacional Natural Gorgona **Year:** 2009 **Count:** 13 clutches
SWOT Contact: Diego Amorocho

CONGO

DATA RECORD 19

Data Sources: 1) Bitsindou, A. 2006. *Rapport d'activité WCS, Volet Recherches Ecologiques, recensement des tortues marines au Parc National de Conkouati-Douli—Saison 2005–2006.* **2)** Bal, G., N. Breheret, and H. Vanleeuwe. 2007. An update on sea turtle conservation activities in the Republic of Congo. *Marine Turtle Newsletter* 116:9–10.
Nesting Beach: Conkouati Lagoon, Conkouati-Douli National Park **Year:** 2005 **Count:** 302 clutches

DATA RECORD 20

Data Source: Godgenger, M. C., N. Breheret, G. Bal, K. N'Damité, A. Girard, and M. Girondot. 2009. Nesting estimation and analysis of threats for Critically Endangered leatherback *Dermochelys coriacea* and Endangered olive ridley *Lepidochelys olivacea* marine turtles nesting in Congo. *Oryx* 43:556–563.
Nesting Beaches: Bas Kouilou Sud, Bellelo, Cabinda frontier, Djeno, Mvassa, and Tchissaou **Year:** 2006 **Counts:** 2, 42, 4, 44, 10, and 49 clutches, respectively

COSTA RICA

DATA RECORD 21

Data Source: Fonseca, L. G., G. A. Murillo, G. Lenín, R. M. Spínola, and R. A. Valverde. 2009. Downward but stable trend in the abundance of arribada olive ridley sea turtles (*Lepidochelys olivacea*) at Nancite Beach, Costa Rica (1971–2007). *Chelonian Conservation and Biology* 8 (1):19–27.
Nesting Beach: Nancite **Year:** 2007 **Count:** 17,876 clutches

DATA RECORD 22

Data Source: Cháves, G., R. Morera, and J. R. Aviles. 2008. Seguimiento de la Actividad Anidatoria de las Tortugas Marinas (*Cheloniidae y Dermochelyidae*) en el Refugio Nacional de Vida Silvestre de Ostional, Santa Cruz, Guanacaste.
Nesting Beach: Ostional National Wildlife Refuge **Year:** 2008 **Count:** 1,310,489 estimated clutches
SWOT Contact: Gerado Cháves

DATA RECORD 23

Data Source: Abreu-Grobois, F. A. 2010. Olive ridley nesting at Playa Nosara, Costa Rica: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Playa Nosara **Year:** 2009 **Count:** Unquantified
SWOT Contact: Alberto Abreu-Grobois

DATA RECORD 24

Data Source: Arauz, R., M. S. Viejobueno, S. P. Sunyer, and I. Naranjo. 2009. Conservación e Investigación de Tortugas Marinas en el Pacífico de Costa Rica (Punta Banco, Refugio Nacional de Vida Silvestre Caletas-Arío, San Miguel, Corozalito). Presentado a las autoridades del Area Conservación Tempisque (ACT) del Ministerio de Ambiente, Energía y Telecomunicaciones (MINAET).
Nesting Beaches: Caletas, Corozalito, Punta Banco, and San Miguel **Year:** 2008 **Counts:** 1,210, 1,364, 213, and 165 clutches, respectively
SWOT Contact: Randall Arauz and Sandra Viejobueno

DATA RECORD 25

Data Source: Malaver, M., and D. Chacón. 2009. *Informe Peninsula de Osa Temporada 2008.* Unpublished report.
Nesting Beach: Playa Carate, Rio Oro **Year:** 2008 **Count:** 469 nesting females
SWOT Contact: Didiher Chacón

CÔTE D'IVOIRE

DATA RECORD 26

Data Source: Gomez, J. B., B. Sory, and K. Mamadou. 2003. A preliminary survey of sea turtles in the Ivory Coast. In *Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-503, compiler J. A. Seminoff, 146. Miami: National Marine Fisheries Service.
Nesting Beaches: Mani Beach, Pitike Beach, and Soublake Beach **Year:** 2001 **Counts:** 32, 72, and 50 clutches, respectively

DATA RECORD 27

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Dagbego, Many–Dodo, and Monogaga **Year:** 1999 **Count:** Unquantified

ECUADOR

DATA RECORD 28

Data Source: Baquero, A., J. P. Muñoz, and M. Peña. Olive ridley nesting in Ecuador: Personal communication. 2010. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Montañita, Bahía Drake, and Puerto López **Year:** 2008 **Counts:** 1 clutch per beach
Nesting Beaches: Mompiche and San Lorenzo **Year:** 2008 **Counts:** 2 clutches per beach
Nesting Beaches: Las Tunas and Same **Year:** 2008 **Counts:** 10 and 5 clutches, respectively
SWOT Contact: Equilibrio Azul

DATA RECORD 29

Data Source: Muñoz Pérez, J., C. A. Valle, A. Baquero Gallegos, and G. Anhalzer Anderson. 2009. *Nueva playa de anidación para Lepidochelys olivacea: Portete, Ecuador.* Simposio Regional Santa Elena 2009, Ecuador.
Nesting Beach: Portete **Year:** 2008 **Count:** 11 clutches
SWOT Contact: Equilibrio Azul

DATA RECORD 30

Data Source: Herrera, M., D. Coello, and C. Flores. 2009. *Notas Preliminares: Cabo San Lorenzo, Su Importancia Como Área de Reproducción de Tortugas Marinas en el Ecuador.* Unpublished report.
Nesting Beaches: Las Piñas and El Abra **Year:** 2007 **Counts:** 1 clutch per beach
SWOT Contacts: Daniel Rios, Dialhy Coello, and Marco Herrera

EL SALVADOR

DATA RECORD 31

Data Source: Vasquez, M., M. Liles, W. Lopez, G. Mariona, and J. Segovia. 2008. *Sea Turtle Research and Conservation, El Salvador.* Technical Report. El Salvador: FUNZEL.
Nesting Beaches: 7 beaches in Ahuachapan Department; 17 beaches in La Libertad Department; 5 beaches in La Paz Department; 9 beaches in La Union Department; 1 beach in San Vincente Department; 9 beaches in Sonsonate Department; and 6 beaches in Usulutan Department **Year:** 2008 **Counts:** 988, 1,072, 653, 166, 280, 1,873, and 1,376 clutches, respectively
SWOT Contacts: Michael Liles, Mauricio Vasquez, Wilfredo Lopez, Georgina Mariona, and Johanna Segovia

EQUATORIAL GUINEA

DATA RECORD 32

Data Source: Rader, H., M. A. Ela Mba, W. Morra, and G. Hearn. 2006. Marine turtles on the southern coast of Bioko Island (Gulf of Guinea, Africa), 2001–2005. *Marine Turtle Newsletter* 111:8–10
Nesting Beaches: Beaches between Punta Oscura and Punta Santiago, Bioko Island **Year:** 2004 **Count:** 116 clutches

DATA RECORD 33

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Corsico Island, and Cabo San Juan and beaches further north **Year:** 2001 **Count:** Unquantified

FRENCH GUIANA

DATA RECORD 34

Data Source: Kelle, L., N. Gratiot, and B. De Thoisy, B. 2009. Olive ridley turtle *Lepidochelys olivacea* in French Guiana: Back from the brink of regional extirpation? Oryx 43:243–246.
Nesting Beach: Cayenne Peninsula **Year:** 2002–2007 **Count:** 1,716–3,257 estimated clutches annually

GABON

DATA RECORD 35

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Entire coast, centered on concentration of nests, Banio Lagoon; Hoco Island; and Mbanye Island **Year:** 1999 **Count:** Unquantified

GHANA

DATA RECORD 36

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Ada-Foah, Keta-Anloga, and Ningo-Prampram **Year:** 2001 **Count:** Unquantified

GUATEMALA

DATA RECORD 37

Data Source: Muccio, C. 2010. Olive ridley nesting in Guatemala: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Hawaii **Year:** 2008 **Count:** 1,370 clutches
SWOT Contact: Colum Muccio

GUINEA-BISSAU

DATA RECORD 38

Data Source: Barbosa, C., A. C. Broderick, and P. Catry. 1998. Marine turtles in the Orango National Park (Bijagós Archipelago, Guinea-Bissau). *Marine Turtle Newsletter* 81:6–7.
Nesting Beach: Adonga, Orango National Park, Bijagos Archipelago **Year:** 1993 **Count:** 200–300 clutches per year

GUYANA

DATA RECORD 39

Data Source: Reichart, H. A. 1993. *Synopsis of Biological Data on the Olive Ridley Sea Turtle* Lepidochelys olivacea *(Eschscholtz 1829) in the Western Atlantic.* NOAA Technical Memorandum NMFS-SEFSC-336. Miami: National Marine Fisheries Service.
Nesting Beach: Shell Beach **Year:** 1993 **Count:** Unquantified

HONDURAS

DATA RECORD 40

Data Source: Dunbar, S. G., L. Salinas, and S. Castellanos. 2010. *Activities of the Protective Turtle Ecology Center for Training, Outreach, and Research (ProTECTOR) on Olive Ridley* (Lepidochelys olivacea) *in Punta Raton, Honduras.* Annual Report of the 2008–2009 Nesting Seasons.
Nesting Beaches: El Muro, La Punta, and La Puntilla **Year:** 2009 **Counts:** 3, 22, and 18 nesting females, respectively
Nesting Beaches: Don Walther, El Muerto, El Tiburon, La Cooperativa, and Palo Pique **Year:** 2009 **Counts:** 1 female per beach
SWOT Contact: Stephen Dunbar

DATA RECORD 41

Data Source: Dunbar, S. G., and L. Salinas. 2008. *Activities of the Protective Turtle Ecology Center for Training, Outreach, and Research (ProTECTOR) on Olive Ridley* (Lepidochelys olivacea) *in Punta Raton, Honduras.* Annual Report of the 2007–2008 Nesting Seasons.
Nesting Beaches: Buquete, El Patio, La Playa, La Playa North, and La Playa South **Year:** 2008 **Counts:** 1, 2, 2, 3, and 1 nesting female(s), respectively
SWOT Contact: Stephen Dunbar

INDIA

DATA RECORD 42

Data Source: Sunderraj, W. S. F., J. Joshua, and V. V. Kumar. 2006. Sea turtles and their nesting habitats in Gujarat. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Adri-Navapara, Junagadh; and Lamba, Jamnagar (both in Gujarat) **Year:** 2000 **Counts:** 5 clutches per beach
Nesting Beaches: Bada-Layja Nana, Kachchh; and Layja Nana-Mandvi, Kachchh (both in Gujarat) **Year:** 2000 **Counts:** 13 clutches per beach
Nesting Beaches: Baidher Island, Jamnagar; Bambhdai-Bada (Kachchh) and Rahij-Maktupur (Junagadh); Kharakhetar-Kuranga, Jamnagar; and Shill-Lohej, Junagadh (all in Gujarat) **Year:** 2000 **Counts:** 33, 8, 10, and 1 clutch(es), respectively
Nesting Beaches: Gundilai-Tragadi, Kachchh; and Mangrol-Bada, Junagadh (both in Gujarat) **Year:** 2000 **Counts:** 6 clutches per beach
Nesting Beaches: Kamond-Suthri, Kachchh; Mojap-Sivrajpur, Jamnagar; Navdra-Lamba, Jamnagar; and Lamba-Miyani, Jamnagar (all in Gujarat) **Year:** 2000 **Counts:** 2 clutches per beach

DATA RECORD 43

Data Source: Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Porbandhar, Gujarat; Kasarakod, Kerala; and Kozhikode, Kerala **Year:** 2006 **Counts:** 143, 30, and 18 clutches, respectively
Nesting Beaches: Cuthbert Bay; Galathea Beach, Great Nicobar Island; Ram Nagar beach, North Andaman Island; and Rutland Island (all in Andaman and Nicobar Islands) **Year:** 2003 **Counts:** 711, 255, 207, and 6 clutches, respectively
Nesting Beach: Galgibaga, Goa **Year:** 2003 **Count:** 14 clutches
Nesting Beach: Velas, Maharashtra **Year:** 2004 **Count:** 14 clutches

DATA RECORD 44

Data Source: Sunderraj, W. S. F., J. Joshua, and S. Serebiah. 2001. Sea turtles along the Gujarat Coast. *Kachhapa* 5:14–16.
Nesting Beaches: Amreli and Bhavnagar (both in Gujarat) **Year:** 2000 **Counts:** 1 and 7 clutch(es), respectively

DATA RECORD 45

Data Source: Giri, V. 2006. Sea turtles of Maharashtra and Goa. In Shanker, K., and B. C. Choudhury, eds. 2006.

Marine Turtles of the Indian Subcontinent. Hyderabad, India: Universities Press.
Nesting Beach: Agonda, Goa **Year:** 2000 **Count:** 94 clutches
Nesting Beaches: Achara, Sindhudurg, Maharashtra; Ambolgad, Ratnargiri, Maharashtra; Dahanu, Thane, Maharashtra; Kashid, Raigad, Maharashtra; Malvan, Sindhuburg, Maharashtra; Mumbai, Mumbai, Maharashtra; Neevati, Sindhuburg, Maharashtra; Redi, Sindhuburg, Maharashtra; Shiroda-Aravali, Sindhuburg, Maharashtra; Srivardhan, Raigad, Maharashtra; Velneshwar, Ratnagiri, Maharashtra; Velye, Ratnagiri, Maharashtra; Anjunem, Goa; Betul, Goa; Bogmalo, Goa; Calanguite, Goa; Kerim, Goa; Morjim, Goa; Palghar, Maharashtra; Ratnagiri, Ratnagiri, Maharashtra; and Utorda, Goa **Year:** 2000 **Count:** Unquantified

DATA RECORD 46
Data Source: Sharath, B. K. 2006. Sea turtles along the Karnataka coast. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: 15 sites in Dakshina Kannada district; and 6 sites in Utarra Kannada district (both in Karnataka) **Year:** 2000 **Count:** Unquantified

DATA RECORD 47
Data Source: Tripathy, B., K. Shanker, and B. C. Choudhury. 2006. Sea turtles and their habitats in the Lakshadweep Islands. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Agatti Island, Kalpitti Islet (Laccadive group), and Lakshadweep Islands **Years:** 2001, 2002
Counts: 16 clutches per beach
Nesting Beaches: Amindivi group; Laccadive group; Kavaratti Island, Laccadive group; and Suheli Cheriyakara, Laccadive group (all Lakshadweep Islands) **Year:** 2001 **Counts:** 13, 150, 9, and 48 clutches, respectively
Nesting Beaches: Andrott Island, Kalpeni Island (Laccadive group), and Kadmat Island (Amindivi group) (all in Lakshadweep Islands) **Years:** 2001, 2002 **Counts:** 6 clutches per beach
Nesting Beaches: Minicoy group and Minicoy Island (both in Lakshadweep Islands) **Years:** 2001, 2002 **Counts:** 2 clutches per beach

DATA RECORD 48
Data Source: Salm, R. V. 1976. Critical marine habitats of the northern Indian Ocean. Contract report to the IUCN. Morges, Switzerland: IUCN.
Nesting Beach: Kovalum, Kerala **Year:** 1976
Count: Unquantified

DATA RECORD 49
Data Source: Shanker, K., J. Ramadevi, B. C. Choudhury, L. Singh, and R. K. Aggarwal. 2004. Phylogeography of olive ridley turtles (*Lepidochelys olivacea*) on the east coast of India: Implications for conservation theory. *Molecular Ecology* 13:1899–1909.
Nesting Beaches: Chennai, Madras; Mamallapuram, Pondi; and Nagapattinam (all in Tamil Nadu) **Year:** 2000 **Counts:** 54, 600, and 180 clutches, respectively

DATA RECORD 50
Data Source: Bhupathy, S., and S. Saravanan. 2006. Marine turtles of Tamil Nadu. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Kanniyakumari to Tiruchendur, Rameswaram, Tiruchendur to Mandapam, and Tranquebar to Pazhaiyar (all in Tamil Nadu) **Year:** 2000 **Counts:** 210, 11, 1, and 18 clutch(es), respectively

DATA RECORD 51
Data Source: Tripathy, B., K. Shanker, and B. C. Choudhury. 2003. Important nesting habitats of olive ridley turtles *Lepidochelys olivacea* along the Andhra Pradesh coast of eastern India. *Oryx* 37:454–463.
Nesting Beaches: Kalingapatnam, Srikakulam, and Srikurmam (all in Andhra Pradesh) **Year:** 2001 **Counts:** 570, 264, and 283 clutches, respectively

DATA RECORD 52
Data Source: Shanker, K., B. Pandav, and B. C. Choudhury. 2004. An assessment of the olive ridley turtle (*Lepidochelys olivacea*) nesting population in Orissa, India. *Biological Conservation* 115:149–160.
Nesting Beach: Devi River mouth, Orissa; includes Rushikulya, Gahirmatha Rivers **Year:** 2003 **Count:** 150,000 to 200,000 nesting females

DATA RECORD 53
Data Source: Choudhury B. C., S. K. Das, and P. S. Ghose. 2006. Marine turtles of West Bengal. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Bijeara, Jambudwip, Kalash, and Mechua (all in Sunderban Biosphere Reserve, South 24 Parganas, West Bengal) **Year:** 2001 **Counts:** 15, 24, 10, and 13 clutches, respectively
Nesting Beach: Chaimari, Sunderban Tiger Reserve, South 24 Parganas, West Bengal **Year:** 2001 **Count:** 25 clutches
Nesting Beach: Digha–Dadanpatrabar, Medinipore, West Bengal **Year:** 2000 **Count:** 106 clutches

DATA RECORD 54
Data Source: Andrews, H., S. Krishnan, and P. Biswas. 2006. Distribution and status of marine turtles in the Andaman and Nicobar Islands. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Beaches near the Alexandria River and beaches near the Dagma River (both on the western coast of Great Nicobar Island, Andaman and Nicobar Islands)
Year: 2001 **Counts:** 163 and 57 clutches, respectively
Nesting Beach: Eastern coast, Great Nicobar Island, Andaman and Nicobar Islands **Year:** 1995 **Count:** Unquantified
Nesting Beaches: Katchal Island, Nicobar Islands; North Hut Bay, Little Andaman Island; Smith Island; and Teressa Island, Nicobar Islands (all in the Andaman and Nicobar Islands)
Year: 1993 **Count:** Unquantified
Nesting Beach: Paikat Bay, Middle Andaman Island, Andaman and Nicobar Islands **Year:** 1984 **Count:** Unquantified

INDONESIA
DATA RECORD 55
Data Source: Dermawan, A. 2002. Marine turtle management and conservation in Indonesia. In I. Kinan, ed. 2002. *Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop.* Honolulu, HI: Western Pacific Regional Fishery Management Council.
Nesting Beach: Alas Purwo National Park, East Java
Year: 2002 **Count:** 230 clutches
Nesting Beach: Meru-Betiri, East Java **Years:** 1980–1999
Count: Less than 10 clutches estimated per year

DATA RECORD 56
Data Source: Putrawidjaja, M. 2000. Marine turtles in Irian Jaya, Indonesia. *Marine Turtle Newsletter* 90:8–10
Nesting Beaches: Hamadi beach, Jayapura Bay; and Jamursba-Medi (both in Papua) **Year:** 1999 **Counts:** Unquantified and 77 clutches, respectively

KENYA
DATA RECORD 57
Data Source: Okemwa, G. M., S. Nzuki, and E. M. Mueni. 2004. The status and conservation of sea turtles in Kenya. *Marine Turtle Newsletter* 105:1–6.
Nesting Beaches: Kiunga, Mombasa, and Watamu
Year: 2000 **Counts:** 5, 8, and 4 clutches, respectively

LIBERIA
DATA RECORD 58
Data Source: Plotkin, P.T. 2007. *Olive Ridley Sea Turtle* (*Lepidochelys olivacea*) *Five-Year Review: Summary and Evaluation.* Jacksonville, FL: National Marine Fisheries Service and U.S. Fish and Wildlife Service.
Nesting Beach: Extreme southern beaches **Year:** 2007
Count: Unquantified (probable nesting)

MALAYSIA
DATA RECORD 59
Data Source: Liew, H. C. 2002. Status of marine turtle conservation and research in Malaysia. In I. Kinan, ed. 2002. *Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop.* Honolulu, HI: Western Pacific Regional Fishery Management Council.
Nesting Beach: Terengganu **Year:** 1998 **Count:** 10 clutches

DATA RECORD 60
Data Source: Bowen, B. W., A. M. Clark, F. A. Abreu-Grobois, A. Chaves, H. A. Reichart, and R. J. Ferl. 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101:179–189
Nesting Beaches: Kijal and Paka **Year:** 1994
Count: Unquantified

DATA RECORD 61
Data Source: Tisen, O. B., and J. Bali. 2002. Current status of marine turtle conservation programmes in Sarawak, Malaysia. In *Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum: NMFS-SEFSC-477, compilers A. Mosier, A. Foley, and B. Brost, 12–14. Miami: National Marine Fisheries Service.
Nesting Beach: Turtle Islands, Sarawak **Year:** 2002
Count: Unquantified

MEXICO
DATA RECORD 62
Data Source: Arista de la Rosa, E. 2009. *Informe Final El Barril, Parque San Lorenzo.* Mexico: CONANP. Unpublished report.
Nesting Beach: El Barril **Year:** 2009 **Count:** 24 clutches
SWOT Contacts: Elizabeth Arista de la Rosa and Raquel Briseño

DATA RECORD 63
Data Source: Everardo Melendez, M. 2009. *Informe Final Parque Nacional Bahia de Loreto.* Mexico: CONANP. Unpublished report.
Nesting Beach: Loreto **Year:** 2009 **Count:** 15 clutches
SWOT Contacts: Mariano Everardo Melendez and Raquel Briseño

DATA RECORD 64
Data Source: Abreu-Grobois, A. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Bahía de Los Ángeles, Boca de Tomates, Boca del Cielo, Cachan de Echeverria, Chuquiapan, Cuixmala, El Mármol, Estación Biológica Majahuas, Hotelito Desconocido, Isla Pajaritos, José Maria Morelos, La Cruz de Huanacaste, La Encrucijada, La Gloria, La Placita de Morelos, La Ticla, Las Guasimas, Magdalena, Motín de Oro Michoacán, Peñas Lázaro Cardenas, Playa Diamante, Playa Larga–San Andrés, San Francisco, Solera de Agua, Tecuan, Teopa, and Todos Santos (all in Baja California) **Year:** 2009 **Count:** Unquantified
SWOT Contact: Alberto Abreu

DATA RECORD 65
Data Source: Oceguera Camacho, K. 2009. *Reporte Temporada 2009 Anidación de Tortugas.* Unpublished report.
Nesting Beach: San Juan de los Planes **Year:** 2009
Count: 236 clutches
SWOT Contacts: Karen Oceguera Camacho and Raquel Briseño

DATA RECORD 66
Data Source: Lopez-Castro, M. C., and A. Rocha-Olivares. 2005. The panmixia paradigm of eastern Pacific olive ridley turtles revised: Consequences for their conservation and evolutionary biology. *Molecular Ecology* 14:3325–3334.
Nesting Beaches: Las Tinajas, Punta Arena, and Punta Colorada (all in Baja California Sur) **Years:** 2002–2003
Count: Unquantified

DATA RECORD 67
Data Source: Murrieta Rosas, J. L. 2009. *Informe Final.* Patronato Cabo del Este, A.C. Mexico. Unpublished report.
Nesting Beach: Los Barriles **Year:** 2009 **Count:** 70 clutches
SWOT Contacts: José Luis Murrieta Rosas and Raquel Briseño

DATA RECORD 68
Data Source: Rangel González, Z. 2009. *Informe Final Parque Nacional Cabo Pulmo.* Mexico: CONANP. Unpublished report.
Nesting Beaches: Parque Nacional Cabo Pulmo (Miramar, Barracas, Cabo Pulmo, and Frailes) **Year:** 2009
Count: 178 clutches
SWOT Contacts: Zuemy Rangel González and Raquel Briseño

DATA RECORD 69
Data Source: Tiburcio Pintos, G. 2009. *Informe Final. Red para la Protección de la Tortuga Marina en el Municipio de los Cabos, Ayto Los Cabos, Mexico.* Unpublished report.
Nesting Beaches: Faro Viejo–Estero San Jose, and San Jose–Frailes **Year:** 2009 **Counts:** 669 and 1,357 clutches, respectively
SWOT Contacts: Graciela Tiburcio Pintos and Raquel Briseño

DATA RECORD 70
Data Source: Gonzalez Payan, E., et al. 2009. *Informe anual.* Mexico: ASUPMATOMA, A.C. Unpublished report.
Nesting Beaches: El Suspiro and San Cristobal (both in Baja California Sur) **Year:** 2009 **Counts:** 436 and 298 clutches, respectively
SWOT Contacts: Elizabeth González Payan and Laura Sarti

DATA RECORD 71
Data Source: Ramirez Cruz, C. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Los Esteros–Pescadero **Year:** 2009
Count: 185 clutches
SWOT Contacts: Carlos Ramirez Cruz and Raquel Briseño

DATA RECORD 72
Data Source: Programa Nacional para la Conservación de las Tortugas Marinas. (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Bahía de Chacahua, Ceuta, and Mexiquillo
Year: 2009 **Counts:** 3,793, 897, and 667 clutches, respectively
Nesting Beach: Santuario Playa de Escobilla **Years:** 2003–2009
Count: 1,089,000 clutches on average per year
SWOT Contact: Laura Sarti

DATA RECORD 73

Data Source: Diaz Millán, V. 2009. *Informe CONANP, Mexico.* Unpublished report.
Nesting Beach: Meseta de Cacaxtla **Year:** 2009
Count: 769 clutches
SWOT Contacts: Victorio Diaz Millan and Raquel Briseño

DATA RECORD 74

Data Source: Rios, D., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: El Verde Camacho **Year:** 2009 **Count:** 1,716 clutches
SWOT Contact: Laura Sarti

DATA RECORD 75

Data Source: Barron Hernandez, J. A. 2009. *Informe Final.* Mazatlan, Mexico: Acuario de Mazatlán, Sinaloa. Unpublished report.
Nesting Beach: Playa Mazatlán **Year:** 2009 **Count:** 573
SWOT Contacts: José Barron Hernandez and Raquel Briseño

DATA RECORD 76

Data Source: Erendira Gonzalez, D. 2009. *Informe Temporada 2009.* México. Unpublished report.
Nesting Beach: Isla de la Piedra, Estrella del Mar **Year:** 2009
Count: 2,001 clutches
SWOT Contacts: Diego Erendira González and Raquel Briseño

DATA RECORD 77

Data Source: Aguilar, H. 2009. *Resultados de Conservación de Tortugas Marinas en Playa Caimanero, El Rosario, México.* Unpublished report.
Nesting Beach: Playa Caimanero, El Rosario **Year:** 2009
Count: 1,578
SWOT Contacts: Hector Contreras Aguilar and Raquel Briseño

DATA RECORD 78

Data Source: Peña Aldrete, V., and Grupo Ecologista de Nayarit, A.C. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: El Naranjo **Year:** 2009 **Count:** 257 clutches
SWOT Contacts: Vicente Peña Aldrete and Raquel Briseño

DATA RECORD 79

Data Source: Tena Espinoza, M., and M. Nuñez Bautista. 2009. *Informe Anual. Campamento Tortuguero Playa Chila, A.C. Mexico.* Unpublished report.
Nesting Beach: Playa Boca de Chila **Year:** 2009
Count: 1,299 clutches
SWOT Contacts: Marco Tena Espinoza and Raquel Briseño

DATA RECORD 80

Data Source: Flores, M., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Nuevo Vallarta and Platanitos (both in Nayarit) **Year:** 2009 **Counts:** 4,688 and 3,129 clutches, respectively
SWOT Contact: Laura Sarti

DATA RECORD 81

Data Source: Llamas González, I. 2009. *Informe Final.* Puerto Vallarta, Mexico: UDG Preparatoria Regional de Puerto Vallarta. Unpublished report.
Nesting Beach: Mayto **Year:** 2009 **Count:** 1,100 clutches
SWOT Contacts: Israel Llamas González and Raquel Briseño

DATA RECORD 82

Data Source: Pérez, A., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Mismaloya (El Playón section) **Year:** 2009
Count: 4,115 clutches
SWOT Contact: Laura Sarti

DATA RECORD 83

Data Source: Martínez, C., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Chalacatepec **Year:** 2009
Count: 4,503 clutches
SWOT Contact: Laura Sarti

DATA RECORD 84

Data Source: Abreu-Grobois, F. A., and P. Plotkin. 2009. Lepidochelys olivacea. In *IUCN 2009, IUCN Red List of Threatened Species,* Version 2009.2.
Nesting Beaches: Cuyutlan, Colima; and Maruata-Colola, Michoacan **Years:** 1999–2003 **Counts:** 1,257 and 4,198 estimated clutches annually, respectively
Nesting Beach: Piedra de Tlalcoyunque, Guerrero **Year:** 1997
Count: 1,266 estimated nesting females

DATA RECORD 85

Data Source: Hernández, A., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: El Chupadero **Year:** 2009
Count: 2,306 clutches
SWOT Contact: Laura Sarti

DATA RECORD 86

Data Source: CMT, and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Ixtapilla **Years:** 2008–2009
Count: 137,000 clutches averaged between years
Nesting Beach: Morro Ayuta **Years:** 2003–2009
Count: 174,900 clutches averaged between years
SWOT Contact: Laura Sarti

DATA RECORD 87

Data Sources: 1) Abreu-Grobois, A. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010). **2)** Sarti, L., and Programa Nacional de Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: La Zacatoza and San Juan Chacahua
Year: 2009 **Count:** Unquantified
SWOT Contacts: Alberto Abreu and Laura Sarti

DATA RECORD 88

Data Source: Ocampo, E., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Tierra Colorada **Year:** 2009
Count: 706 clutches
SWOT Contact: Laura Sarti

DATA RECORD 89

Data Source: Kutzari, A. C., and Programa Nacional de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Cahuitan **Year:** 2007 **Count:** 1,464 clutches
SWOT Contact: Laura Sarti

DATA RECORD 90

Data Source: Tavera, A., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Barra de la Cruz **Year:** 2009
Count: 1,057 clutches
SWOT Contact: Laura Sarti

DATA RECORD 91

Data Source: Neri, S., and Programa Nacional para la Conservación de las Tortugas Marinas (PNCTM) CONANP. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Puerto Arista, Chiapas **Year:** 2007
Count: 2,740 clutches
SWOT Contact: Laura Sarti

MOZAMBIQUE

DATA RECORD 92

Data Source: Costa, A., and A. Mate. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Bazaruto National Park **Year:** 2008
Count: 1 clutch
SWOT Contacts: Alice Costa and Alfredo Mate

MYANMAR

DATA RECORD 93

Data Source: Thorbjarnarson, J. B., S. G. Platt, and S. T. Khaing. 2000. Sea turtles in Myanmar: Past and present. *Marine Turtle Newsletter* 88:10–11.
Nesting Beach: Bogale River mouth **Year:** 1999
Count: 210 estimated clutches annually

NICARAGUA

DATA RECORD 94

Data Source: Torres, P., M. Chávez, and L. Salmeron. 2009. *Informe Proyecto de Conservación de Tortuga Tora* (Dermochelys coriacea) *en Playa Salamina, Villa El Carmen* (*Departamento de Managua*)*, Nicaragua. Temporada 2008–2009.* Unpublished report.
Nesting Beach: Isla Juan Venado **Year:** 2008
Count: Unquantified
SWOT Contacts: Daniel Rios and Perla Torres Gago

DATA RECORD 95

Data Source: Chávez, M., and L. Salmeron. 2009. *Informe Técnico del Proyecto de Conservación de Tortuga Tora* (D. coriacea) *en Playa Salamina, Villa El Carmen. Managua, Nicaragua. Temporada 2008–2009.* Unpublished report.
Nesting Beach: Salamina **Year:** 2008 **Count:** 13 clutches
SWOT Contacts: Daniel Rios and Perla Torres Gago

DATA RECORD 96

Data Source: Cornelius, S. 1982. Status of sea turtles along the Pacific coast of middle America. In Bjorndal, K. A., ed. *Biology and Conservation of Sea Turtles.* Washington, DC: Smithsonian Institution Press.
Nesting Beaches: Masachapa, Pochomil, and Boquita
Year: 1982 **Count:** Unquantified

DATA RECORD 97

Data Source: Torres, P. 2009. *Informe Proyecto de Conservación de Tortuga Tora* (Dermochelys coriacea) *en el Refugio de Vida Silvestre Río Escalante-Chacocente, Nicaragua. Temporada 2008–2009.* Unpublished report.
Nesting Beach: Veracruz de Acayo **Year:** 2008 **Count:** 337 clutches
SWOT Contacts: Daniel Rios and Perla Torres Gago

DATA RECORD 98

Data Source: Delegación MARENA-Rivas. 2009. *Informe de Monitoreo de Tortuga Paslama* (Lepidochelys olivacea) *en el RVS La Flor* (*Departamento de Rivas, Nicaragua*)*. Temporada 2008–2009.* Unpublished report.
Nesting Beach: La Flor **Year:** 2008 **Count:** 186,779 clutches
SWOT Contact: Daniel Rios and Perla Torres Gago

DATA RECORD 99

Data Source: Arana, J., and P. Torres. 2009. *Informe de Monitoreo de Tortuga Paslama* (Lepidochelys olivacea) *en Playa Arribada del RVS Río Escalante-Chacocente* (*Departamento de Carazo, Nicaragua*)*. Temporada 2008–2009.* Unpublished report.
Nesting Beach: Chacocente **Year:** 2008 **Count:** 58,952 clutches
SWOT Contact: Daniel Rios and Perla Torres Gago

OMAN

DATA RECORD 100

Data Source: Rees, A. F., and S. L. Baker. 2006. Hawksbill and olive ridley nesting on Masirah Island, Sultanate of Oman: An update. *Marine Turtle Newsletter* 113:2–5
Nesting Beach: Masirah Island **Year:** 2006
Count: 1,016 clutches

PAKISTAN

DATA RECORD 101

Data Source: Asrar, F. F. 1999. Decline of marine turtle nesting populations in Pakistan. *Marine Turtle Newsletter* 83:13–14
Nesting Beaches: Sandspit and Hawkes Bay **Year:** 1997
Count: 2 clutches

PANAMA

DATA RECORD 102

Data Source: MarViva. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Malena **Year:** 2009 **Count:** Unquantified
SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, Marino Abrego, Carlos Peralta, and Harold Chacón

DATA RECORD 103

Data Source: Rodriguez, J., A. Ruiz, M. Abrego, C. Peralta, and H. Chacón. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Isla Taborcillo and Morrillo **Year:** 2009
Count: Unquantified
SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, Marino Abrego, Carlos Peralta, and Harold Chacón

DATA RECORD 104

Data Source: Testimonio de Moradores de la Comunidad. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Cambutal **Year:** 2009 **Count:** Unquantified
SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, Marino Abrego, Carlos Peralta, and Harold Chacón

DATA RECORD 105

Data Source: Ruiz, A., J. Rodrigues, and M. Abrego. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Playa Marinera **Year:** 2008
Count: 14,000–17,000 nesting females

SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, and Marino Abrego

DATA RECORD 106

Data Source: Ruiz, A., J. Rodríguez, and M. Abrego. 2010. Observaciones de hembras anidantes, rastros y nidos. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Guánico Abajo **Year:** 2009
Count: Unquantified
SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, Marino Abrego, Carlos Peralta, and Harold Chacón

DATA RECORD 107

Data Source: Rodriguez, J., and J. Trejos. 2010. Observación de caparazón, testimonio de moradores. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: La Concepción (La Yeguada) **Year:** 2009
Count: Unquantified
SWOT Contacts: Jacinto Rodriguez, Argelis Ruiz, Marino Abrego, Carlos Peralta, and Harold Chacón

DATA RECORD 108

Data Source: Plotkin, P.T. 2007. *Olive Ridley Sea Turtle* (Lepidochelys olivacea) *Five-Year Review: Summary and Evaluation.* Jacksonville, FL: National Marine Fisheries Service and U.S. Fish and Wildlife Service.
Nesting Beach: Isla Canas **Year:** 2007 **Count:** Approximately 3,507 nesting females annually

PERU

DATA RECORD 109

Data Source: Hays-Brown, C., and W. M. Brown.1982. Status of sea turtles in the southeastern Pacific: Emphasis on Peru. In Bjorndal, K. A. ed. *Biology and Conservation of Sea Turtles.* Washington, DC: Smithsonian Institution Press.
Nesting Beach: Punta Malpelo **Year:** 1982 **Count:** 1 clutch

DATA RECORD 110

Data Source: Kelez. S., X. Velez-Zuazo, F. Angulo, and C. Manrique. 2009. Olive ridley *Lepidochelys olivacea* nesting in Peru: The southernmost records in the Eastern Pacific. *Marine Turtle Newsletter* 126:5–9
Nesting Beach: Caleta Grau **Year:** 2000 **Count:** 1 clutch
Nesting Beach: El Nuro **Year:** 2009 **Count:** 1 clutch
Nesting Beach: Nueva Esperanza **Year:** 2008 **Count:** 1 clutch

SÃO TOMÉ AND PRÍNCIPE

DATA RECORD 111

Data Source: Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa.* CMS Technical Series, Publication No. 6. Bonn, Germany: United Nations Environment Programme / Convention on Migratory Species.
Nesting Beaches: Praia das Conchas to Praia Juventude
Year: 2001 **Count:** Unquantified

SIERRA LEONE

DATA RECORD 112

Data Source: Siaffa D. D., E. Aruna, and J. Fretey. 2003. Presence of sea turtles in Sierra Leone (West Africa). In *Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-503, compiler J. A. Seminoff, 285. Miami, FL: National Marine Fisheries Service.
Nesting Beaches: Baki, Turtle Islands; and Sherbro **Year:** 2002
Count: Unquantified

SRI LANKA

DATA RECORD 113

Data Source: Kapurusinghe, T. 2006. Status and conservation of marine turtles in Sri Lanka. In Shanker, K., and B. C. Choudhury, eds. 2006. *Marine Turtles of the Indian Subcontinent.* Hyderabad, India: Universities Press.
Nesting Beaches: Amaduwa, Ambalangoda, Arugambay, Bussa, Buttawa, Habaraduwa, Kahawa, Kumana, Lavinia, Maggona, Mahaseeiawe, Palatupana, Panama, Patanangala, Potuwil, Seenimodara, Tangalle, Unawaluna, Uraniya, and Godavaya **Year:** 1999 **Count:** Unquantified

DATA RECORD 114

Data Source: Rajakaruna R. S., D. M. N. Dissanayake, E. M. L. Ekanayake, and K. B. Ranawana. 2009. Sea turtle conservation in Sri Lanka: Assessment of knowledge, attitude, and prevalence of consumptive use of turtle products among coastal communities. *Indian Ocean Turtle Newsletter* 10:1–13.
Nesting Beaches: Wedikanda; Kahandamodara, Hambantota District; and Rekawa, Hambantota District **Year:** 2007
Count: Unquantified

DATA RECORD 115

Data Source: Amarasooriya, K. D. 2000. A classification of the sea turtles nesting beaches of southern Sri Lanka. In Pilcher, N., and I. Ghazally, eds. *Proceedings of the Second ASEAN Symposium and Workshop on Sea Turtle Biology and Conservation.* U.K.: ASEAN Academic Press.
Nesting Beaches: Ahungalla, Galle District; Balapitiya, Galle District; Bandarawatta, Galle District; Bentota, Galle District; Bundala, Hambantota District; Duwemodara, Galle District; Induruwa, Galle District; Kahandamodara, Hambantota District; Walawemodera, Hambantota District; Warahena, Galle District; and Welipatanwila, Galle District **Year:** 1997 **Count:** Unquantified
Nesting Beach: Kosgoda, Galle District **Year:** 1997
Count: More than 400 clutches per year

SURINAME

DATA RECORD 116

Data Source: Hilterman, M. L., E. Goverse, M. T. Tordoir, and H. A. Reichart. 2008. Beaches come and beaches go: Coastal dynamics in Suriname are affecting important sea turtle rookeries. In *Proceedings of the Twenty-Fifth Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-582, compilers H. Kalb, A. S. Rohde, K. Gayheart, and K. Shanker, 140–141. Miami, FL: National Marine Fisheries Service.
Nesting Beach: Galibi National Reserve **Year:** 2008
Count: 150–200 clutches

THAILAND

DATA RECORD 117

Data Source: Chantrapornsyl, S. 1992. Biology and conservation olive ridley turtle (*Lepidochelys olivacea,* Eschscholtz) in the Andaman Sea, southern Thailand. *Phuket Marine Biological Center Research Bulletin* 57:51–66.
Nesting Beaches: Mai Khao Beach and Phra Thong Beach
Year: 1992 **Counts:** 4 nesting females per beach

TOGO

DATA RECORD 118

Data Source: Hoinsoude, G. S., J. E. Bowessidjaou, G. A. Kokouvi, F. Iroko, and J. Fretey. 2002. Plan for sea turtle conservation in Togo. In *Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-503, compiler J. A. Seminoff, 117. Miami, FL: National Marine Fisheries Service.
Nesting Beaches: Miscellaneous beaches in Togo **Year:** 2002
Count: Unquantified

TRINIDAD AND TOBAGO

DATA RECORD 119

Data Source: Livingstone, S. R. 2005. Report of olive ridley nesting on the north coast of Trinidad. *Marine Turtle Newsletter* 109:6–7.
Nesting Beach: Madamas Beach, northern coast **Year:** 1995
Count: 1 clutch
Nesting Beach: Matura Beach, eastern coast
Years: 2000–2003 **Count:** Less than 10 clutches

VIETNAM

DATA RECORD 120

Data Source: Hamann, M., C. T. Cuong, N. D. Hong, P. Thuoc, and B. T. Thuhien. 2006. Distribution and abundance of marine turtles in the Socialist Republic of Viet Nam. *Biodiversity and Conservation* 15:3703–3720
Nesting Beaches: Quan Lan Island, Quang Ninh Province; and Tra Peninsula, Da Nang City **Year:** 2006 **Counts:** Less than 10 clutches per year per beach
Nesting Beach: Quan Binh Province **Year:** 2006 **Count:** Less than 20 clutches per year

DATA RECORD 121

Data Source: Shanker, K., and N. J. Pilcher. 2003. Marine turtle conservation in south and southeast Asia: Hopeless cause or cause for hope? *Marine Turtle Newsletter* 100:43–51
Nesting Beaches: Minh Chau and Quan Lam Islands, Gulf of Tonkin; Ha Trinh Province; and Con Dao National Park
Year: 2002 **Counts:** 10 estimated clutches (estimated in order of tens) per beach

OLIVE RIDLEY TELEMETRY DATA CITATIONS

Data Source: Allman, P., M. Coyne, and A. K. Armah. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Four adult female olive ridley turtles were tagged off the west coast of Africa in December 2009.
SWOT Contact: Phil Allman

Data Sources: 1) Plotkin, P. T., R. A. Byles, D. C. Rostal, and D. W. Owens. 1995. Independent vs. socially facilitated migrations of the olive ridley, *Lepidochelys olivacea. Marine Biology* 122:137–143. **2)** Plotkin, P. T. 1994. *Migratory and reproductive behavior of the olive ridley turtle,* Lepidochelys olivacea (*Eschscholtz, 1829*) *in the eastern Pacific Ocean,* Ph.D. Dissertation. College Station, TX: Texas A&M University. **3)** Plotkin, P. T., R. A. Byles, and D. W. Owens. 1994. Post-breeding movements of male olive ridley sea turtles *Lepidochelys olivacea* from a nearshore breeding area. *Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-351, compilers Bjorndal, K. A., A. B. Bolten, D. A. Johnston, and P. J. Eliazar, 119. Miami: National Marine Fisheries Service. **4)** Plotkin, P. T., R. A. Byles, and D. W. Owens. 1994. Migratory and reproductive behavior of *Lepidochelys olivacea* in the eastern Pacific Ocean. *Proceedings of the Thirteenth Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-341, compilers B. A. Schroeder, and B. E. Witherington, 138. Miami, FL: National Marine Fisheries Service.
Metadata: There was a mix of female (n = 12) and male (n = 11) olive ridleys. Most were tracked from Nancite Beach, Costa Rica, between 1990 and 1993. One male was captured at sea off the coast of Panama. See above publications for additional information.
SWOT Contact: Pamela Plotkin

Data Source: Data supplied by Tiwi Land Council and WWF Australia. Further information is available in Whiting, S. D., J. L. Long, and M. Coyne. 2007. Migration routes and foraging behaviour of olive ridley turtles *Lepidochelys olivacea* in northern Australia. *Endangered Species Research* 3:1–9. Metadata: Eight adult female olive ridleys were tracked from Australia, with Location Classes A, B, and Z removed.
SWOT Contact: Scott Whiting

Data Source: Shanker, K., and B. C. Choudhury. Satellite telemetry of olive ridley turtles on the east coast of India. March, 2003. Presentation at the 23rd Annual Symposium on Sea Turtle Biology and Conservation. Kuala Lumpur, Malaysia.
Metadata: Four adult female olive ridleys were tracked from the east coast of India.
SWOT Contact: Kartik Shanker

OLIVE RIDLEY GENETIC STOCK CITATIONS

Note: If a nesting beach falls between two sampled beaches of the same mtDNA stock, it is considered to be in the same stock.

mtDNA Stock: Atlantic
Sampled Sites: Sergipe, Brazil (Pirambu, Punta dos Mangues, Abais); Orango National Park, Guinea Bissau; and Eilanti Beach, Galibi Nature Reserve Suriname
Data Sources: 1) Bowen, B. W., A. M. Clark, F. A. Abreu-Grobois, A. Chaves, H. A. Reichart, and R. J. Ferl. 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101:179–189. **2)** Fernandes, L. B., J. Castilhos, and S. L. Bonatto. 2004. Variabilidade no DNA mitocondrial de *Lepidochelys olivacea* (tartaruga marinha Oliva) na costa brasileira. In *50 Congresso Brasileiro de Genética, 2004, Florianópolis.*

mtDNA Stock: Baja California Sur, Mexico
Sampled Sites: Las Tinajas, San Cristobal, Punta Colorada, and Punta Arena
Data Sources: Lopez-Castro, M. C., and A. Rocha-Olivares. 2005. The panmixia paradigm of eastern Pacific olive ridley turtles revised: Consequences for their conservation and evolutionary biology. *Molecular Ecology* 14:3325–3334.

mtDNA Stock: Eastern Pacific
Sampled Sites: La Gloria; Puerto Arista, El Verde Camacho, Piedra de Tlalcoyunque, Santuario Playa de Escobilla, Mexico; Nancite and Ostional, Pacific Costa Rica; Playa Palmera, Isla Gorgona, Colombia
Data Sources: 1) Bowen, B. W., A. M. Clark, F. A. Abreu-Grobois, A. Chaves, H. A. Reichart, and R. J. Ferl. 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101:179–189. **2)** Briseño-Dueñas, R. 1998. *Variación genética en la región control del ADN mitocondrial de poblaciones de la tortuga golfina* Lepidochelys olivacea *en el Pacífico oriental y las implicaciones para su conservación.* M. Sc. Thesis. Sinaloa, México: Universidad Autónoma. **3)** Lopez-Castro, M. C., and A. Rocha-Olivares. 2005. The panmixia paradigm of eastern Pacific olive ridley turtles revised: Consequences for their conservation and evolutionary biology. *Molecular Ecology* 14:3325–3334.

4) Camacho-Mosquera, L., D. F. Amorocho, L. M. Mejía-Ladino, J. D. Palacio-Mejía, and F. Rondón-González. 2008. Caracterización genética de la colonia reproductiva de la tortuga marina golfina—*Lepidochelys olivacea*—en El Parque Nacional Natural Gorgona (Pacífico Colombiano) a partir de secuencias de ADN mitocondrial. *Boletín de Investigaciones Marinas y Costeras* 37(1):77–92.

mtDNA Stock: India–Western Pacific
Sampled Sites: McLure Island Group, Northern Arnhem Land, Northern Territory, Australia; Kijal and Paka, Malaysia; and southwestern coast of Sri Lanka
Data Source: Bowen, B. W., A. M. Clark, F. A. Abreu-Grobois, A. Chaves, H. A. Reichart, and R. J. Ferl. 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101:179–189.

mtDNA Stock: Orissa, India
Sampled Sites: Devi River mouth, Rushikulya, Gahirmatha, Orissa, India
Data Sources: 1) Bowen, B. W., A. M. Clark, F. A. Abreu-Grobois, A. Chaves, H. A. Reichart, and R. J. Ferl. 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101:179–189. **2)** Shanker, K., J. Ramadevi, B. C. Choudhury, L. Singh, and R. K. Aggarwal. 2004. Phylogeography of olive ridley turtles (*Lepidochelys olivacea*) on the east coast of India: Implications for conservation theory. *Molecular Ecology* 13:1899–1909.

KEMP'S RIDLEY NESTING DATA CITATIONS

MEXICO

DATA RECORD 1

Data Source: Gladys Porter Zoo Sea Turtle Conservation Program. 2010. Kemp's ridley nesting in Mexico. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: La Pesca; Playa Dos–Barra del Tordo; Playa Dos–Playa Tesoro, Altamira; Playa Dos–Playa Miramar, Ciudad Madero; Rancho Nuevo; and Tepehuajes **Year:** 2009 **Counts:** 361; 2,017; 408; 431; 16,273; and 1,647 clutches, respectively
SWOT Contacts: Patrick Burchfield and Jaime Peña

DATA RECORD 2

Data Source: Dow, W., K. Eckert, M. Palmer, and P. Kramer. 2007. *An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region.* The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina.
Nesting Beaches: Bahía de Cochinos–Villamar; Barra de Galindo; Boca de Lima–Barra Tecolutla; Central Nucleoelectrica Laguna Verde; Farallon-Cazones; Lechuguillas–El Llano; Santander; and Vida Milenaria **Year:** 2006
Counts: 100–500 clutches at each beach
Nesting Beaches: Cabo Rojo and Paraíso Escondido
Year: 2005 **Counts:** Less than 25 clutches at each beach
Nesting Beaches: Chachalacas and El Callejon del Pajaro and Cangrejo **Year:** 2006 **Counts:** Less than 25 clutches at each beach
Nesting Beach: Marcelino Yepez **Year:** 2006
Count: 25–100 clutches
SWOT Contact: Laura Sarti

DATA RECORD 3

Data Source: CONANP, and Comité Estatal para la Protección y Conservación de las Tortugas Marinas del Estado de Campeche. 2009. Hawksbill and Green nesting in Campeche, Mexico: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beach: Isla del Carmen **Year:** 2009 **Count:** 2 clutches
SWOT Contact: Vicente Guzmán

DATA RECORD 4

Data Sources: 1) Jaramillo, A. P. 2007. *Mexico 2006: Second Annual Report for the Inter-American Convention for the Protection and Conservation of Sea Turtles.* **2)** Guzmán, V. 2006. Dirección general de manejo para la conservación. *Informe Técnico Final del Programa de Conservación de Tortugas Marinas de Campeche, México en 2005.* **3)** Dow, W., K. Eckert, M. Palmer, and P. Kramer. 2007. *An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region.* The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina.
Nesting Beach: Isla Aquada **Year:** 2006 **Count:** Less than 25 clutches
SWOT Contact: Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)

DATA RECORD 5

Data Sources: 1) Guzmán, V. 2006. Dirección general de manejo para la conservación. *Informe Técnico Final del Programa de Conservación de Tortugas Marinas de Campeche, México en 2005.* **2)** Dow, W., K. Eckert, M. Palmer, and P. Kramer. 2007. *An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region.* The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina.
Nesting Beach: Sabancuy **Year:** 2006 **Count:** Less than 25 clutches
SWOT Contact: Universidad Autónoma del Carmen (UNACAR)

UNITED STATES OF AMERICA

DATA RECORD 6

Data Sources: 1) Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute. 2006. Nesting Activity Reports: 2005 Data. http://research.myfwc.com/features/view_article.asp?id=2377. **2)** Dow, W., K. Eckert, M. Palmer, and P. Kramer. 2007. *An Atlas of Sea Turtle Nesting Habitat for the Wider Caribbean Region.* The Wider Caribbean Sea Turtle Conservation Network and The Nature Conservancy. WIDECAST Technical Report No. 6. Beaufort, North Carolina.
Nesting Beaches: Escambia–Peridido Key, Martin County; Hobe Sound National Wildlife Refuge, Martin County; St. Lucie Inlet State Park, Volusia County; Canaveral National Seashore, Volusia County; New Smyrna Beach, Volusia County; Volusia County Beaches; Perdido Key State Park, Escambia County; Gulf Island National Seashore, Pinellas County; North Pinellas County Beaches; Middle Pinellas County Beaches; Sarasota to Siesta Key, Santa Rosa County; Navarre Beach, Lee County; and Sanibel Island West **Year:** 2005 **Counts:** Less than 25 clutches per beach

DATA RECORD 7

Data Source: Shaver, D. 2010. Kemp's ridley nesting in Texas: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Nesting Beaches: Boca Chica Beach; Bolivar Peninsula; Brazoria County, North of Surfside Beach; Brazoria County, South of Sargent Beach; Bryan Beach; Corpus Christi Bay; Galveston Island; Matagorda Island; Matagorda Peninsula; Mustang Island; North Padre Island; Quintana Beach; San Jose Island; Sargent Beach; South Padre Island; and Surfside Beach **Year:** 2009 **Counts:** 9, 1, 3, 1, 2, 1, 3, 8, 3, 2, 124, 2, 4, 1, 33, and 0 clutch(es), respectively
SWOT Contact: Donna Shaver

KEMP'S RIDLEY TELEMETRY DATA CITATIONS

Data Source: Landry, A. M., and C. L. Hughes. Satellite tracking of adult Kemp's ridley (*Lepidochelys kempii*) sea turtles. Unpublished data.
Metadata: Eight nesting females and 1 male that were treated at a rehabilitation facility have been tracked since 2007. Two tags are still currently transmitting data. Location Class Z was removed, and data were filtered for speed greater than 6.0 kilometers per hour and elevation greater than 0.5 meter.
SWOT Contact: Christi Hughes

Data Source: Mansfield, K. 2010. Personal communication (data to be presented in a forthcoming publication). In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Ten immature turtles were tracked between 1991 and 2004. Points have been filtered.
SWOT Contact: Kate Mansfield

Data Source: Morreale, S. 2010. Kemp's ridley satellite tracking in the Northeastern Atlantic: Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Three immature turtles were tracked. Contact the data provider for information.
SWOT Contact: Stephen Morreale

Data Source: Metz, T., and A. Landry, TAMUG Sea Turtle and Fisheries Ecology Research Laboratory. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Four juvenile Kemp's ridleys were tagged in a netting program. Data are filtered.
SWOT Contact: Erin Seney, Sea Turtle and Fisheries Ecology Research Laboratory, Texas A&M University, Galveston, TX.

Data Sources: 1) Seney, E. E., and A. M. Landry Jr. Forthcoming. Movement patterns of immature and adult female Kemp's ridley sea turtles in the northwestern Gulf of Mexico. **2)** Seney, E. E. 2008. *Population dynamics and movements of the Kemp's ridley sea turtle,* Lepidochelys kempii, *in the northwestern Gulf of Mexico,* Ph.D. dissertation. College Station, TX: Texas A&M University.
Metadata: Twenty-two turtles (15 immature and 7 adult females) were tracked from Galveston, TX, between 2004 and 2007. Data were filtered for speed, elevation, and Location Class Z using STAT on www.seaturtle.org.
SWOT Contact: Erin Seney, Sea Turtle and Fisheries Ecology Research Laboratory, Texas A&M University, Galveston, TX.

Data Sources: 1) Shaver, D., 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. **2)** Shaver, D., National Park Service. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Thirty-six females and 1 male are noted from Shaver and Rubio (2008). Treatment of data can be found in the methodology section of the cited paper. An additional data set of 9 adult males caught off Rancho Nuevo, Mexico, between 1997 and 2000 was also used.
SWOT Contact: Donna Shaver

Data Source: Schmid, J. R., and W. N. Witzell. 2006. Seasonal migrations of immature Kemp's ridley turtles (*Lepidochelys kempii Garman*) along the west coast of Florida. *Gulf of Mexico Science* 24(1/2):28–40
Metadata: Six immature turtles were monitored through satellite telemetry to investigate their winter migration on the west coast of Florida. See Schmid and Witzell (2006) for treatment of data.
SWOT Contact: Jeff Schmid

Data Source: Williams, J. A, and NOAA Galveston. 2010. Personal communication. In *SWOT Report—The State of the World's Sea Turtles,* vol. 5 (2010).
Metadata: Forty-four turtles (41 immature and 3 adults) were tracked throughout the Gulf of Mexico and the eastern United States. Contact the data provider for additional information.
SWOT Contact: Jo Anne Williams

KEMP'S AND OLIVE RIDLEY GLOBAL DISTRIBUTION CITATIONS

1) Abreu-Grobois, F. A., and P. Plotkin. 2009. Lepidochelys olivacea. In *IUCN 2009, IUCN Red List of Threatened Species,* Version 2009.2.
2) Brongersma, L. D. 1972. European Atlantic turtles. *Zoologische Verhandelingen* (*Leiden*) 121:1–381.
3) Brongersma, L. D. 1982. Marine turtles of the eastern Atlantic Ocean. In Bjorndal, K. A., ed. *Biology and Conservation of Sea Turtles.* Washington, DC: Smithsonian Institution Press.
4) Chavez, H., and R. Kaufman. 1974. Información sobre la tortuga marina *Lepidochelys kempi* (Garman), conferencia a un ejemplar mercado en Mexico y observado en Colombia. *Bulletin of Marine Science* 24(2):372–377.
5) Manzella, S., K. Bjorndal, and C. Lagueux. 1991. Head-started Kemp's ridley recaptured in Caribbean. *Marine Turtle Newsletter* 54:13–14.
6) Márquez-M., R. 1990. *FAO Species Catalogue, Vol. 101: Sea Turtles of the World. An annotated and illustrated catalogue of sea turtle species known to date.* FAO fisheries Synopsis No. 125, Vol. 11. Rome: Food and Agriculture Organisation.
7) Márquez, R. 1994. *Synopsis of the Biological Data on the Kemp's Ridley Turtle,* Lepidochelys kempi (*Garman, 1880*). NOAA Technical Memorandum: NMFS-SEFSC-343.
8) Moncada-G., F., A. M. Rodriguez, R. Marquez-M., and E. Carrillo. 2000. Report of the olive ridley turtle (*Lepidochelys olivacea*) in Cuban Waters. *Marine Turtle Newsletter* 90:13–15.
9) Plotkin, P. T. 2007. *Olive Ridley Sea Turtle* (*Lepidochelys olivacea*) *Five-Year Review: Summary and Evaluation.* Jacksonville, FL: National Marine Fisheries Service and U.S. Fish and Wildlife Service.
10) Plotkin, P. T., ed. 2007. *Biology and Conservation of Ridley Sea Turtles.* Baltimore, MD: Johns Hopkins University Press.
11) Pritchard, P. C. H. and P. Trebbau. 1984. *The Turtles of Venezuela.* Oxford, OH: Society for the Study of Amphibians and Reptiles.
12) Smith, H. M. and E. H. Taylor. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of snakes. *United States National Museum Bulletin* 199:1–253.
13) Wibbels, T. 2007. *Kemp's Ridley Sea Turtle* (*Lepidochelys kempii*) *Five-Year Review: Summary and Evaluation.* Jacksonville, FL: National Marine Fisheries Service and U.S. Fish and Wildlife Service.
14) Witt, M. J., R. Penrose, and B. J. Godley. 2007. Spatio-temporal patterns of juvenile marine turtle occurrence in waters of the European continental shelf. *Marine Biology* 151:873–885.

This composite image of a Kemp's ridley arribada was assembled by researchers with the U.S. Army Corps of Engineers using the 1947 film shot by Andrés Herrera.

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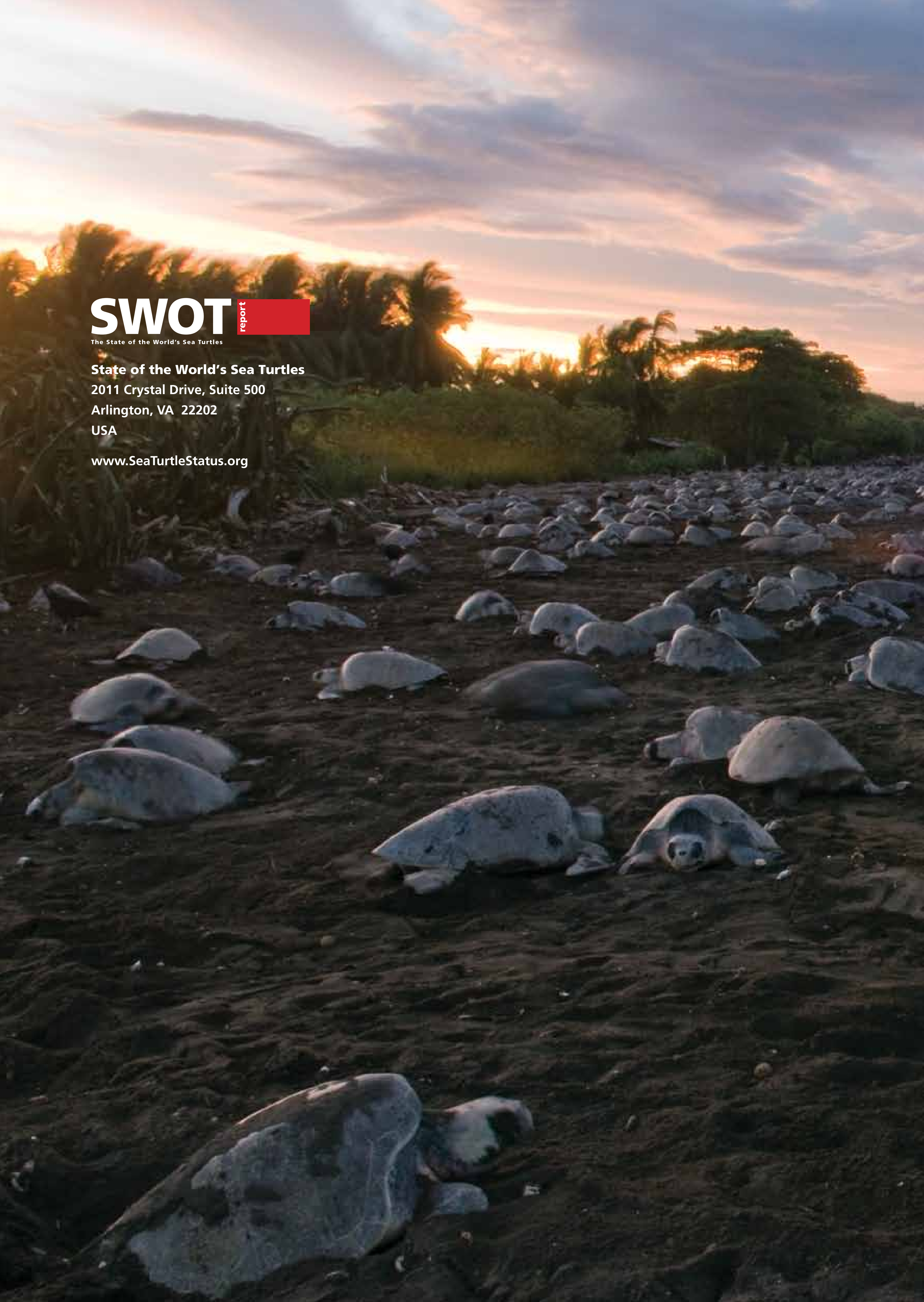
Authors and Affiliations

Scott Benson	National Oceanic and Atmospheric Administration—National Marine Fisheries Service, Southwest Fisheries Science Center, U.S.A.
Karen A. Bjorndal	Archie Carr Center for Sea Turtle Research and Department of Biology, University of Florida, U.S.A.
Alan B. Bolten	Archie Carr Center for Sea Turtle Research and Department of Biology, University of Florida, U.S.A.
Brian W. Bowen	Hawai'i Institute of Marine Biology, U.S.A.
Michelle Boyle	Queensland Environmental Protection Agency, Australia
Patrick Burchfield	Gladys Porter Zoo
Tim Dykman	Ocean Revolution, U.S.A.
Nancy FitzSimmons	University of Canberra, Australia
Tanya Graham	Moss Landing Laboratories, U.S.A.
Rosamira Guillen	Fundación Proyecto Tití, Colombia
Jim Harvey	Moss Landing Laboratories, U.S.A.
Shaleyla Kelez	Duke University Marine Laboratory, U.S.A.; and ecOceanica, Peru
Irene Kinan Kelly	National Oceanic and Atmospheric Administration—National Marine Fisheries Service, Pacific Islands Regional Office, U.S.A.
Kerry Kopitsky	National Oceanic and Atmospheric Administration—National Marine Fisheries Service, Southwest Fisheries Science Center, U.S.A.
Iader Lamilla	Fundación Proyecto Tití, Colombia
Colin Limpus	Queensland Environmental Protection Agency, Australia
Michael Matarasso	Conservation International, U.S.A.
René Márquez Millán	Scientific Committee of the Inter-American Convention for the Conservation of Sea Turtles
Lindsey Peavey	Duke University Marine Laboratory; and National Oceanic and Atmospheric Administration—National Marine Fisheries Service, Southwest Fisheries Science Center, U.S.A.
Jaime Peña	Gladys Porter Zoo
Rotney Piedra	Parque Marino Nacional Las Baulas, Ministerio del Ambiente, Energía, y Telecomunicaciones, Costa Rica
Nicolas J. Pilcher	Marine Research Foundation, Malaysia
Bob Pitman	National Oceanic and Atmospheric Administration—National Marine Fisheries Service, Southwest Fisheries Science Center, U.S.A.
Carolyn Robins	Belldi Consultancy, Australia
Carl Safina	Blue Ocean Institute, U.S.A.
Anne Savage	Disney's Animal Kingdom, U.S.A.
Kartik Shanker	Centre for Ecological Sciences of the Indian Institute of Science, India
Tammy Mae Summers	Department of Natural Resources and Environmental Management, University of Hawai'i at Mānoa, U.S.A.
Ximena Velez-Zuazo	University of Puerto Rico-Rio Piedras, Puerto Rico and ecOceanica, Peru
Bryan Wallace	Conservation International and Duke University Marine Lab, U.S.A.
Bill Watson	Moss Landing Laboratories, U.S.A.
Michelle Waycott	James Cook University, Australia
Lucy Yarnell	Conservation International, U.S.A.

FPO

Bringing Conservation into Focus

The International League of Conservation Photographers (ILCP), a consortium of professional photographers working to raise conservation awareness through photography, has provided several photos to this issue of *SWOT Report*. The SWOT Team thanks ILCP for those important contributions, which are indicated throughout the magazine with the ILCP logo.



SWOT report
The State of the World's Sea Turtles

State of the World's Sea Turtles
2011 Crystal Drive, Suite 500
Arlington, VA 22202
USA

www.SeaTurtleStatus.org