SWOT
report
Volume XII
The State of the World's Sea Turtles
SPECIAL FEATURE
Africa
ALSO INSIDE: SATELLITE TRACKING | LOGGERHEAD STATUS | HAWKSBILL SHELL TRADE

After being photographed in open water, an octopus slipped through the hands of the photographer's friend and landed on the carapace of a passing turtle to create this captivating image. © MICHAEL B. HARDIE. ALL RIGHTS RESERVED. CREATIONSCAPE.COM / INSTAGRAM: CREATIONSCAPE; FRONT COVER: Mating green turtles embrace in dramatic fashion near Europa Atoll in the Éparses Islands of the southwest Indian Ocean. © THOMAS P. PESCHAK

Editor's Note

The Forest and the Trees

At a remote lodge nestled in a patch of verdant tropical rainforest overlooking the Gulf of Guinea on the island of São Tomé, experts from a handful of African countries assembled in June 2016 to consolidate their efforts to conserve sea turtles and their habitats. In talks and roundtable discussions—as well as over meals and cocktails; during beach walks; and in late night conversations in French, Portuguese, Spanish, English, and local languages—the motivated and energetic group members told stories of their research and observations. They also drew conclusions, formulated strategies, and brainstormed ways through which their nonprofit, government, university, and community partners could better and more urgently protect the nature they love and achieve greater synergy through cooperation.

A suggestion arose from the group: "Let's combine our data and produce a regional overview and maps of biogeography for Central Africa"—similar to what some had seen for South America in *SWOT Report*, vol. XI, just a few months earlier. "Can we do it?" asked one group member. "Why not try?" replied another. "Why stop with our region? What about the rest of West Africa?" said a third. And finally, someone said, "Hey, I can make some calls and engage sea turtle folks from southern and eastern Africa and the southwest Indian Ocean too. So let's make it happen for all of Africa!"

Thus began a fast-paced effort to rally support for and recruit the contributions of people dedicated to understanding and protecting African sea turtles from more than 30 countries and territories. The culmination of their collaboration can be found on pages 14–29 of this volume in the special feature "The Sea Turtles of Africa," which contains the first comprehensive maps of sea turtle biogeography for the African continent and a region-by-region overview of the sea turtle situation in Africa. Other articles in this volume touch on recent sea turtle research and conservation efforts, as well as on threats to turtles ranging from beach armoring to industrial spills, coastal development, shell trade, and more. As always, we hope these pages will inspire and be useful to all sea turtle conservationists regardless of where they are and what issues they work on.

The experiment in cooperation among African turtle conservationists that is presented herein is a powerful example of how data sharing can help us all to see the forest and the trees at once. Only when local scale data are shared and combined can we begin to see broader regional and global patterns that would not have been visible from our individual perspectives.

We are grateful to all of SWOT's data contributors worldwide who form the "droplets" of knowledge, energy, and enthusiasm that help our community manifest as an "ocean"-sized force for conservation.

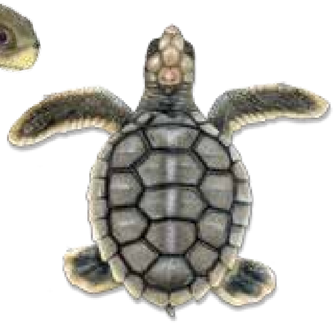
Thank you all,

Roderic B. Mast

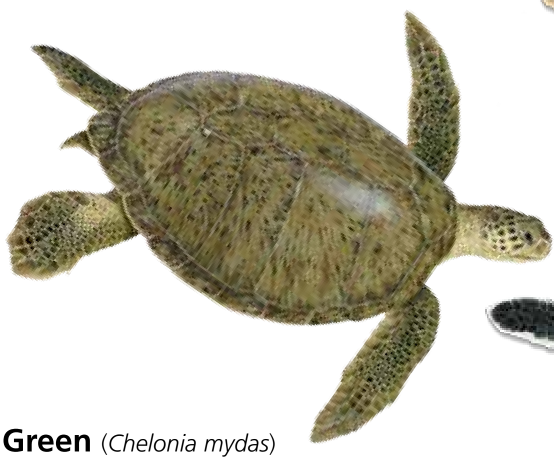
Loggerhead hatchlings being held for release in iSimangaliso Wetland Park, KwaZulu-Natal, South Africa.
© ROGER AND PAT DE LA HARPE PHOTOGRAPHY

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: (a) the unique family *Dermochelyidae*, which consists of a single species, the leatherback, and (b) the family *Cheloniidae*, which comprises the six species of hard-shelled sea turtles.

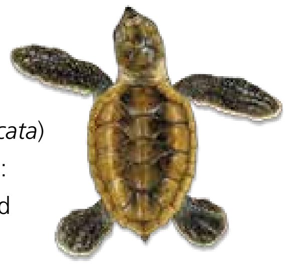
Flatback (*Natator depressus*)
IUCN Red List status: Data Deficient



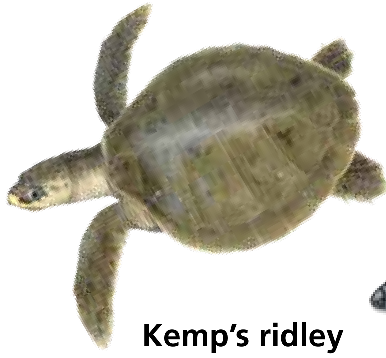

Green (*Chelonia mydas*)
IUCN Red List status: Endangered


Leatherback
(*Dermochelys coriacea*)
IUCN Red List status:
Vulnerable

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

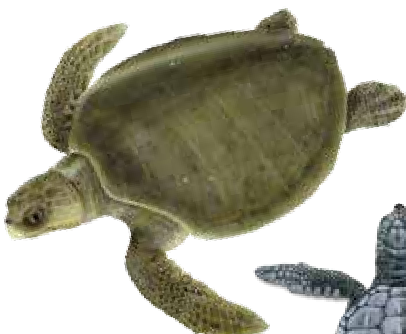



Hawksbill
(*Eretmochelys imbricata*)
IUCN Red List status:
Critically Endangered




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


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




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

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THIS PAGE: A loggerhead turtle swims above *Posidonia oceanica* seagrass near Zakynthos Island, Greece. This seagrass species, found only in the Mediterranean, is used by turtles for sleeping, resting, and camouflage. © KOSTAS PAPAFITSOROS
ILLUSTRATIONS, AT LEFT: © DAWN WITHERINGTON

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FEATURES

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

The Benefits and Costs of Satellite Tracking

By NATHAN J. ROBINSON, PILAR SANTIDRIÁN TOMILLO, and FRANK V. PALADINO

The invention of small, durable, low-cost satellite transmitters in the 1980s enabled scientists to accurately track the movements of sea turtles worldwide. Since then, the use of satellite transmitters has proliferated, and they generate data that have revolutionized our understanding of sea turtle ecology and played a vital role in conservation efforts. We have reaped many benefits from using satellite transmitters; however, their potentially detrimental effects often remain overlooked.

The primary use of satellite transmitters is to determine where animals go. Knowledge of sea turtle movements helps us to prioritize our conservation efforts on the areas where they can have the biggest effects. Such knowledge can help to define the borders of Marine Protected Areas or to facilitate the establishment of multinational agreements and conventions. Data on sea turtle movement patterns can even be used to focus conservation measures in a spatially or temporally dynamic manner. For example, satellite tracking studies conducted on loggerhead turtles north of Hawaii discovered that these turtles primarily inhabit waters colder than 18.5° C. With this knowledge, the TurtleWatch initiative, led by the National Oceanic and Atmospheric Administration, now makes daily recommendations on where to fish in an effort to minimize interactions with sea turtles. Those recommendations are based on remotely sensed sea surface temperature data.

Researcher Jeanne Mortimer watches as a satellite-tagged hawksbill turtle returns to the sea in the Seychelles. © RAINER VON BRANDIS / SAVE OUR SEAS FOUNDATION

> Until we fully understand how satellite telemetry devices affect the behavior, physiology, and fitness of their hosts, we will not be able to maximize their potential for conservation.

Satellite telemetry is also a versatile tool for engaging people in marine conservation. Maps illustrating long-distance sea turtle migrations can captivate community members, stakeholders, students, and donors. Tracking data have even been used as the basis of hypothetical sea turtle "races," including the Great Turtle Races of 2007 and 2009, as well as the annual Tour de Turtles. Those online events have been wildly successful, reaching millions of people. Such telemetry-driven outreach campaigns have raised funding for conservation, increased popular support for conservation-focused legislation, enticed people to volunteer for conservation projects, and created incentives for people to live in a more ecologically friendly manner. Such benefits might be difficult to quantify, but they are nevertheless important.

Whenever an animal-borne device is deployed, however, it has an unavoidable effect on the host animal. Some of those effects, such as handling stress, may last only a few hours. In other cases, the effects may persist for as long as the device remains attached and may include reducing attractiveness to a potential mate, increasing susceptibility to predators, impeding natural movements, or altering the aerodynamics or hydrodynamics of the host in ways that increase energetic costs.

Only rarely have telemetry studies acknowledged the negative effects those devices might have on the organism being studied. Even less frequently have studies attempted to measure those negative effects, and this is especially true for sea turtles. One study did measure the effects that deployed carapace-mounted cameras had on foraging green turtles; it observed that animals displayed abnormal activity levels for the first six hours after being captured. Other studies have shown that leatherback turtles with high-drag transmitters swim slower and may even follow different migratory pathways than do their counterparts tracked with lower-drag satellite transmitters.

Those detrimental effects may appear subtle at first, but they could hint at bigger problems. First, it is important to consider that if a satellite transmitter alters its host's behavior, the data generated will not faithfully reflect the movements of a nontagged individual. Consequently, such behavior alteration limits the usefulness of data intended to infer natural behavior and, in extreme cases, may even negate the purpose of the study. Second, small changes in the behavior and physiology of satellite-tracked turtles could affect their reproductive output or survival rates. For example, a reduction in swim speed could lower a turtle's ability to catch food or could increase the energetic cost of migration. The latter could, in turn, reduce the energy available for reproduction or increase the potential for starvation, a serious concern for postnesting females given their huge energetic investment in egg production. The effects of satellite transmitters on survival rates or reproductive fitness of sea turtles have not been studied, but worrying trends have been noted for other species. Flipper-tagged king penguins were 16 percent less likely to survive and produced 39 percent fewer chicks than their nontagged counterparts. Similar studies using mark-recapture data to assess survival rates of satellite-tracked sea turtles would therefore be very illuminating.

Satellite telemetry has been—and continues to be—a key tool for conservation. The maps on pages 26–27 of this volume of *SWOT Report*, for instance, allow us to see the big picture of African sea turtle movements in ways we could not have dreamed of a few decades ago. Without the important insights provided by satellite transmitters, it is easy to envision a world where global efforts toward the conservation of sea turtles would be far less focused and effective than they are today. In our desire to unlock the secrets of sea turtle movement patterns, however, we have often overlooked the negative effects that these devices might have. Until we fully understand how satellite telemetry devices affect the behavior, physiology, and fitness of their hosts, we will not be able to maximize their potential for conservation. We therefore recommend that sea turtle researchers make every attempt to both minimize and quantify the potentially negative effects of these devices. If we can achieve this goal, we will keep reaping the benefits from satellite telemetry for many years to come. ■

Urbanization

Chips Away Turtle Habitats in West-Central Africa

By ALEXANDRE GIRARD and SHAYA HONARVAR

This brief glimpse of trends related to sea turtles and coastal development in West-Central Africa highlights the need for stronger national governance and for urban planning that considers the protection of natural habitats, not merely short-term economic considerations.

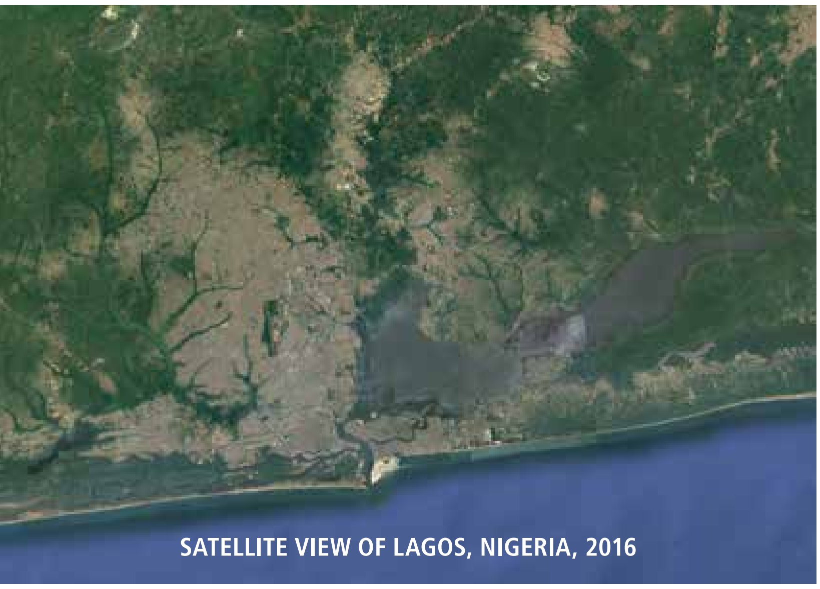
One of the most insidious threats to sea turtles in West-Central Africa is the impact of coastal development. Comparisons of past and present satellite images show strikingly rapid development over the past two decades in particular. Two coastal towns that illustrate this phenomenon well are the megacities of Lagos, Nigeria, and Pointe-Noire, Republic of the Congo. Urban expansion and coastal settlement in those cities have brought increased light and ocean pollution and more vessel traffic. As a result, more adult sea turtles and nests have been lost to human predation.

For years, cultural and socioeconomic factors in West-Central Africa—including the lure of modernity and the urban lifestyle, as well as the desire for steady employment—have driven migration from rural to urban areas. Lagos is now the largest city in Africa, home to an estimated 21 million inhabitants. With 1.1 million people and growing, Pointe-Noire is the Republic of the Congo's second-largest city (after Brazzaville, with 2 million people) and the most rapidly growing one. Indeed, 70 percent of that nation's population now lives in the urban sprawl between Brazzaville and Pointe-Noire.

This vertiginous urban growth has occurred for the most part without planning or regulation. Thus, the environmental impact has been devastating. One unexpected driver of growth has been the availability of low-cost motorcycles from China. Motorcycles have created jobs for moto-taxi drivers and they provide affordable transportation for countless African commuters. Motorcycles also provide affordable access to the remote outskirts of urban areas, including areas extending well beyond paved roads. This increased access allows for uncontrolled development in the wetland, hill, bush, and plateau areas surrounding Pointe-Noire—areas that have rapidly become a grid of building plots and a tangle of seemingly arbitrary dirt roads.

Urbanization throughout West-Central Africa has also brought a shift in cultural mores. A significant transition has occurred from traditional land ownership to a cadastral-based land tenure system, whereby people are quick to build and occupy plots to establish ownership.

Beyond providing cheap motorcycles, China has left its imprint on African cities through the implementation of special economic zones (SEZs). Such zones facilitate investment through reduced taxes and improved access to international trade. China has been acquiring, selling, and funding industrial development in SEZs since the 1970s, deeply reshaping African cities. SEZs often are organized around a deep-sea port and thus lead to expansion of cities along coastlines. The Republic of the Congo will start constructing



Satellite images show the dramatic growth of the coastal cities of Lagos, Nigeria, and Pointe-Noire, Republic of the Congo, over the past 26 years. The expansion of urban development along West-Central Africa's coast also brings increases in light pollution, vessel traffic, ocean pollution, and other changes that impact turtle habitats. MAP DATA: GOOGLE, IMAGE LANDSET / COPERNICUS, DATA SIO, NOAA, U.S. NAVY, NGA GEBCO, US DEPT OF STATE GEOGRAPHER

its first SEZ in 2017 in Pointe-Noire Bay, centered on a mineral and container ship port. Southward coastal urban sprawl in Pointe-Noire was already affecting important olive ridley and leatherback nesting beaches. The new SEZ is poised to launch an assault on important green turtle feeding grounds at Pointe-Indienne, the cape bordering the Pointe-Noire Bay to the north. A race against the clock has begun to create a Marine Protected Area in Loango Bay to stem those impacts to the Pointe-Indienne feeding ground.

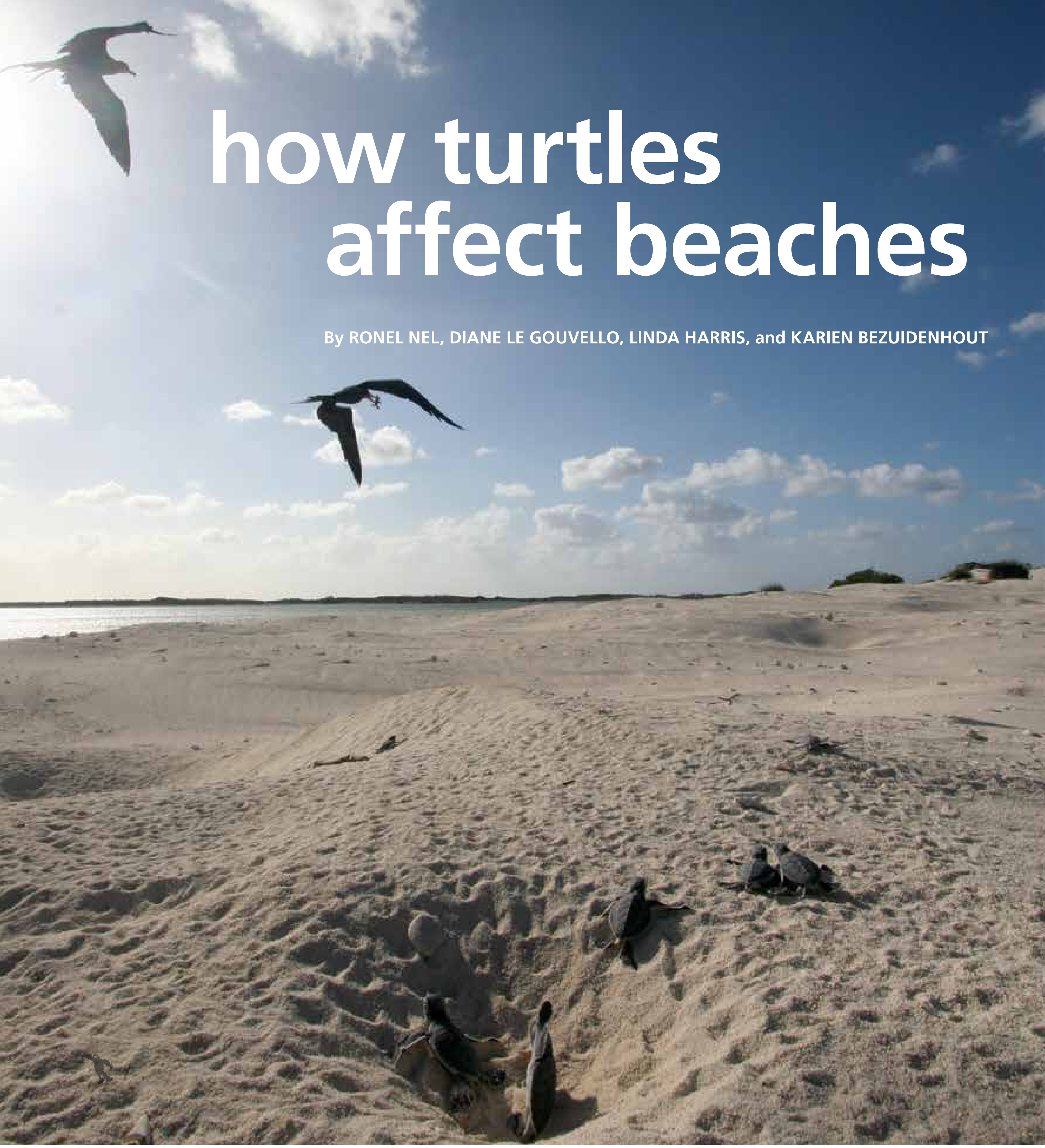
In Nigeria, two SEZs associated with ports are driving the coastal urban sprawl of Lagos: the Badagry Free Trade Zone in the west and the Lekki Free Trade Zone in the east. Those SEZs are predicted to increase threats to the already affected 100-kilometer (62-mile) coastline of the Lagos suburbs, the site of significant leatherback and olive ridley nesting.

Many other SEZ and port hub projects are expected in the next decade, fueled by growing competition between shipping lines in Europe and China to develop new West African hubs. Such projects will involve at least six new major ports and an array of smaller ones and will represent billions of dollars in foreign investment. One such container port in Kribi, along Cameroon's southern coast, is already triggering increased human settlement and coastal development in Lolabé, near an area designated to become a Marine Protected Area (Kribi Campo MPA) that hosts sea turtle feeding grounds and nesting beaches.

This brief glimpse of trends related to sea turtles and coastal development in West-Central Africa highlights the need for stronger national governance and urban planning that considers the protection of natural habitats, not merely short-term economic considerations. From a sea turtle conservation perspective, territorial planning relies on knowledge—often incomplete—about nesting sites, feeding grounds, and migratory routes. Filling those data gaps is one important way that conservation researchers and civil society organizations can become involved and can help to influence decisionmakers. Our collective goal and responsibility must be to improve cooperation among players in the conservation community, researchers, government decisionmakers, and members of the private sector. All stakeholders must resolve to build and adhere to sustainable development strategies and urbanization policies that are driven not only by investors but also by national authorities responsible for preserving coastal natural resources and ecosystems. ■

how turtles affect beaches

By RONEL NEL, DIANE LE GOUVELLO, LINDA HARRIS, and KARIEN BEZUIDENHOUT



Research attention has recently shifted toward understanding the complex ecological roles of sea turtles as transporters of nutrients, hosts for epibionts, and sustainers of healthy seagrass beds and coral reefs. Although those relationships are undeniably important, to date we have not been successful at fully quantifying all of them or uncovering the interdependencies between them. One such set of unanswered questions pertains to the functional value of sea turtles to intertidal beach ecosystems. Researchers have long recognized the strong relationship between beaches and turtles, but past research typically has focused only on the beach conditions required to ensure successful incubation. We rarely ask the inverse: What is the value of sea turtles and the nutrients they bring to sandy beach ecosystems? Although pioneer sea turtle scientists such as Karen Bjorndal have investigated nutrient budgets for turtles and dunes, the relationship between turtle-derived nutrients and beach and nearshore ecosystems remains a mystery.

People living on temperate shores are familiar with phenomena such as the salmon run, in which entire ecosystems emerge from winter hibernation, starving for nutrition and desperately waiting for the salmon to arrive. Hungry bear cubs and their mothers, along with a whole suite of predators and scavengers ranging from other fish to birds and even insects, await the seasonal nutrient pulse as an opportunity to gorge themselves on adult salmon, their eggs, and fry. Fish-derived nutrients are enormous drivers in the terrestrial, freshwater, and coastal ecosystems where salmon runs occur.

Sea turtle nesting is no different; it creates a massive nutrient pulse into otherwise nutrient-poor beach ecosystems. Unlike the riparian vegetation or conifer forests of salmon habitat, however, intertidal beaches have no noticeable primary production. In fact, sea turtle nesting typically occurs on the backshores of tropical beaches, areas that are devoid of vegetation and adjacent to clear, nutrient-starved seas. Temperate beaches contain long-term diatom accumulations, and nutrient inputs also are maintained by washed-up algal wrack or cast-up kelp, which breaks down and is recycled through the beach systems. In the absence of plants or algae on most turtle beaches, however, intertidal systems rely solely on outside inputs, such as those brought by sea turtles, to drive ecosystem processes.

Turtle-derived nutrients provide a rich, albeit unpredictable, source of carbon and nitrogen to beaches and dunes. Although turtle eggs typically are deposited above the high-tide mark, fauna traverse the beach, feeding on eggs and hatchlings both above and below the high-tide line, thereby moving those nutrients widely. Such fauna include vertebrates, such as monitor lizards, snakes, honey badgers, birds, and other regionally specific species, and larger invertebrates, such as ghost crabs. Decaying nests are also invaded by ants and other insects and by meiofauna, such as nematodes (see images below), and are processed by microbes and bacteria, thus releasing nutrients into the groundwater that ultimately leach back into nearshore environments.

A recent investigation in South Africa aimed to untangle and quantify some of those complicated relationships. Even though South Africa hosts modest sea turtle populations, years of study have yielded a good deal of knowledge about beach ecosystems. The investigation surveyed the dependence of invertebrate macrofauna (creatures greater than one millimeter in diameter, e.g., ghost crabs) and the responses of meiofauna (creatures no more than one millimeter in size that move between the sand grains, e.g., nematodes) with regard to turtle nutrients. Ghost crabs, plough snails, and mole crabs were collected from high- and low-density turtle nesting areas, and tissues were analyzed using stable isotopes to assess their overlap with turtle hatchling and egg signatures. Carbon and nitrogen isotopes generally indicate trophic level, following the principle of "you are what you eat" (see *SWOT Report*, vol. IX, pp. 28–29).

The results showed a strong, direct correlation between turtle nutrients and meiofauna living in the sand. The abundance of nematode worms, for example, rose by several orders of magnitude within a few days of a nesting occurrence, with densities increasing from 10–100 nematodes per sample to a peak of 100,000–1,000,000 in just 10 days. Stable isotope analysis also confirmed that ghost crabs feed on sea turtle eggs and hatchlings, but not exclusively. Surprisingly, even plough snails, scavengers that live buried in the sand on the low shore, incorporate some sea turtle in their diet. Nutrient pulses are short lived, and their processing is rapid; nests that are preyed on seem to be processed within about 10 days of the eggs being broken when dug up or when punctured by ghost crabs and ants.

Combining all that information confirms that beach and dunes act as a unit and that turtle nutrient inputs in the form of eggs or hatchlings are important to the functioning of both. Turtle-induced nutrient pulse was detectable even on long, highly dynamic beaches in South Africa that had modest turtle densities. Those types of responses would be even more important and pronounced on shorter, less energetic beaches, such as are found on islands, or on beaches with higher nest densities, such as those of ridley turtle arribadas.

Knowing that natural predation on turtle eggs and processing by interstitial fauna are important ecosystem processes has strong conservation implications. Sea turtle protection programs avidly protect turtle nests to maximize hatchling production and to ensure hatchlings' safe passage to the water. That protection is understandable because sea turtle populations are depleted and the mortality rate, especially for younger turtles, is high. Conservation endeavors also are critical to right the wrongs of human interference. On reasonably pristine beaches, however (such as iSimangaliso Wetland Park, South Africa), where human interference with the environment is minimal, natural predation must be recognized as an important ecosystem process and should be allowed to function normally if possible.

To most sea turtle conservationists witnessing the destruction of turtle nests or the capture of hatchlings by predators, realizing that turtle-derived nutrients are an essential food source in beach ecosystems may be only a small consolation. The survival gauntlet on the beach, however, is no more forgiving on the predator-rich African savannahs or in open ocean systems. Nature is cruel, but it is also balanced. We need those interactions to maintain healthy coastal ecosystems. ■

Microscope images of nematode worms (pink) in beach sand following the predation of a sea turtle nest reveal how meiofauna benefit from the nutrients that sea turtles bring to the beach. © DIANE LE GOUVELLO; AT LEFT: Frigatebirds prey on hatchling green turtles in the Éparses Islands. The important roles that sea turtles play in beach ecosystems are not yet fully understood. © JÉRÔME BOURJEA

COASTAL ARMORING AND RISING SEAS PUT A SQUEEZE ON TURTLES

By SCOTT EASTMAN and GARY APPELSON

Global concern is growing about the current and future impacts of sea-level rise that will likely affect coastal property owners, beach-based economies, and sea turtle nesting beaches. Coastal erosion is bad for all those factions, yet effective long-term solutions to confront the rising tide of beach erosion are few and far between.

One stopgap strategy to protect homes and coastal infrastructure from beach erosion is through coastal armoring by constructing seawalls to deflect wave energy and hold back the surf. Vertical seawalls made of rocks, concrete, metal, or wood that parallel the shoreline can provide short-term protection for beachfront property, but they do nothing to protect the beach and dunes. They also pose a major threat to sea turtles by exacerbating erosion of nesting habitat and, ultimately, reducing the area of available nesting habitat from both the seaward and terrestrial sides of the beach. Moreover, seawalls interfere with natural shoreline processes (i.e., nearshore sand transport and onshore sand deposition). Without sand placement on the seaward side of seawalls, nesting habitat will continue to decrease as the beach berm lowers and erodes.

Seawalls are usually built on beaches with significant coastal erosion, so they interact with waves and surf during high tides and storm events such as nor'easters and tropical cyclones. Wave energy typically is dispersed as waves run up a sloping beach, but when waves hit a seawall, their energy is deflected back onto the beach immediately in front of and to either side of the wall, resulting in increased beach erosion. Worse yet, as the beach erodes in front of a seawall, it is more frequently inundated; the resulting saturated sand is even more susceptible to erosion than dry sand because it does not allow water to percolate down, which results in waves carrying more sand back from the beach as they recede. Seawalls also "lock up" the sand behind them, thereby preventing it from nourishing and rebuilding beaches and reducing the beaches' ability to recover naturally after storms. Because seawalls can increase sand loss on neighboring properties as well, they create a domino effect that encourages the construction of more seawalls, which has in many places resulted in long stretches of armored beach.

Rising seas and increasing global temperatures, coupled with armored shorelines and coastal development, have placed a squeeze on sea turtles and their nesting habitats. That effect is especially pronounced in Florida, U.S.A., where almost one-half of the state's beaches are considered critically eroded and almost 25 percent of the shorelines are already armored by seawalls, rock revetments, or large geotextile sand-filled tubes. Seawalls can deter sea turtles from nesting, resulting in increased non-nesting emergences or false crawls. Sometimes sea turtles can even become trapped behind those structures. Nests that are deposited in front of seawalls are also more prone to inundation, and indeed one of the most significant causes of sea turtle egg mortality in Florida is inundation on eroded beaches.

Predicted increases in human population and shoreline development, combined with increasing sea-level rise, can mean only that sea turtle nesting beach pressures will continue to grow worldwide. It is time to sound the alarm and to seek less-damaging adaptive management strategies to combat beach erosion that will protect beaches and coastal infrastructure while simultaneously ensuring suitable sea turtle nesting habitats for the future. More research is required to understand coastal dynamics and to determine adaptation strategies in changing coastal systems, and stakeholders must work proactively to remove, minimize, or mitigate the impacts of coastal development on sea turtles.

In the Archie Carr National Wildlife Refuge in Florida, which is home to the greatest density of nesting sea turtles in North America, the pressure from property owners to construct seawalls increases following erosive storm events. The local government responds by protecting the nesting habitats: building, restoring, and replanting protective dunes with native vegetation immediately after the storms, thereby decreasing the need for seawalls. A group of leading conservation organizations and other stakeholders in Florida have come together to begin the process of education and change. They have joined forces to create a documentary and webinar series called "Ahead of the Tide." The series explores the problems associated with sea-level rise and beachfront armoring, and it suggests solutions to better ensure long-term nesting beach protection. Suggestions include strategic sand placement, smarter shoreline development policies to encourage more landward placement of homes and infrastructure, and better management of navigational inlets that disrupt the flow of sand along the beach and greatly exacerbate erosion of downdrift beaches. For more information, visit http://aheadofthetide.org. ■

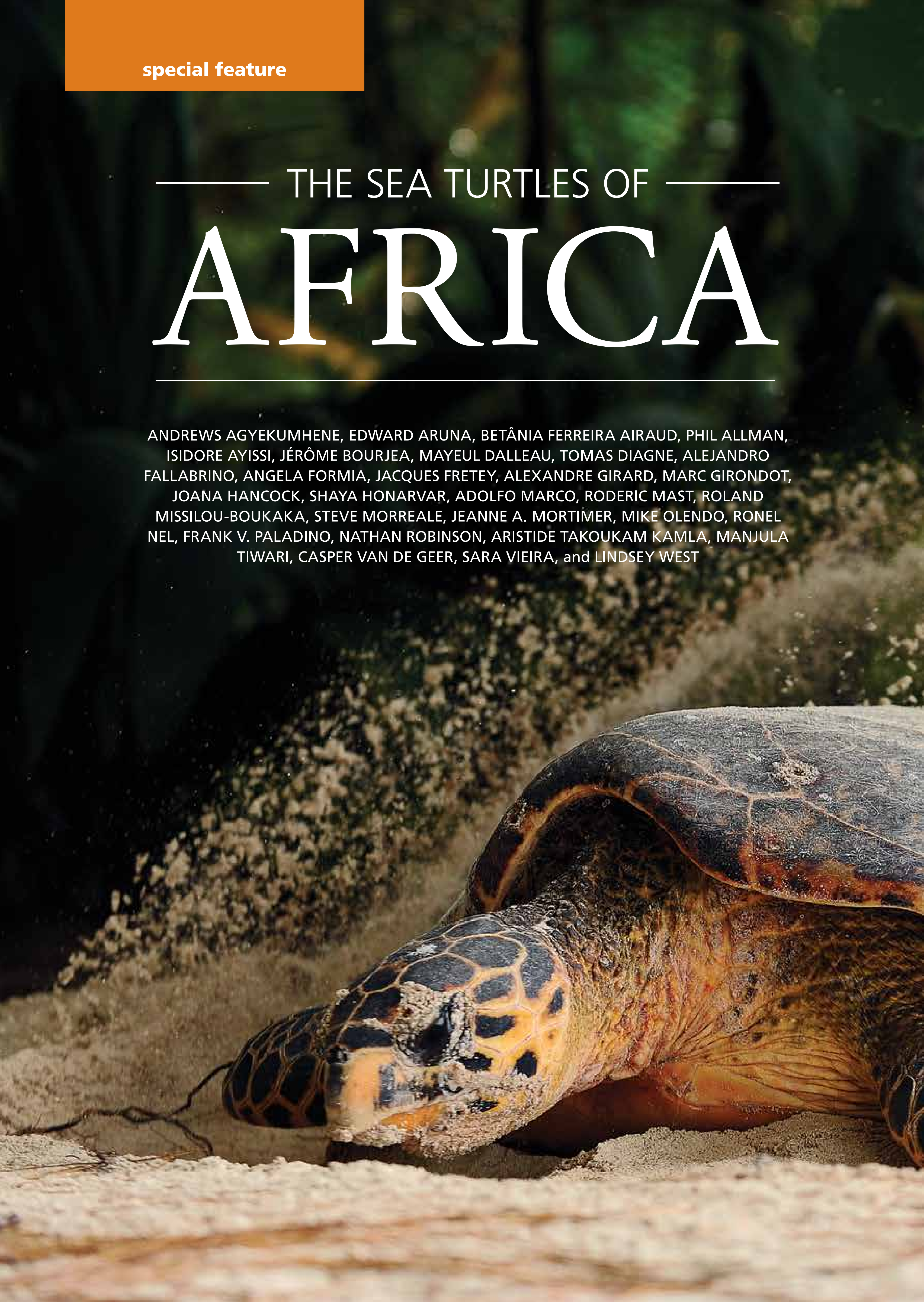
AT RIGHT: Rising seas and coastal armoring visibly impact sea turtle nesting habitat in Vilano Beach, Florida, U.S.A. © SCOTT EASTMAN

It is time to sound the alarm and to seek less-damaging adaptive management strategies to combat beach erosion…

special feature

THE SEA TURTLES OF AFRICA

ANDREWS AGYEKUMHENE, EDWARD ARUNA, BETÂNIA FERREIRA AIRAUD, PHIL ALLMAN, ISIDORE AYISSI, JÉRÔME BOURJEA, MAYEUL DALLEAU, TOMAS DIAGNE, ALEJANDRO FALLABRINO, ANGELA FORMIA, JACQUES FRETEY, ALEXANDRE GIRARD, MARC GIRONDOT, JOANA HANCOCK, SHAYA HONARVAR, ADOLFO MARCO, RODERIC MAST, ROLAND MISSILOU-BOUKAKA, STEVE MORREALE, JEANNE A. MORTIMER, MIKE OLENDO, RONEL NEL, FRANK V. PALADINO, NATHAN ROBINSON, ARISTIDE TAKOUKAM KAMLA, MANJULA TIWARI, CASPER VAN DE GEER, SARA VIEIRA, and LINDSEY WEST



Africa's sea turtles were once among the least studied in the world, and mounting threats to their survival, such as fishing, poaching, coastal development, and pollution, still require further study and urgent attention. Today, a growing number of institutions and individuals are shedding new light on sea turtle science, and they are helping find solutions to the continent's sea turtle and ocean conservation challenges.

Africa is bounded by seemingly limitless turtle habitats in the Atlantic and Indian Oceans and in the Mediterranean and Red Seas to the north and northeast. The principal challenge to fully understanding Africa's sea turtles is the enormous scale and complexity of the task. Africa's 54 countries (63 political territories) cover approximately one-third of the land surface of Earth—an area the size of China, India, the United States, and most of Europe combined. The African coastline stretches some 26,000 kilometers (16,150 miles) across 71 degrees of latitude (7,881 kilometers/4,897 miles) and 68 degrees of longitude (7,548 kilometers/4,690 miles). Africa also encompasses an enormous exclusive economic zone (EEZ), with an ocean footprint of approximately 6,023,900 square kilometers (3,743,100 square miles). Africa's human diversity is equally unbounded, with thousands of distinct linguistic groups and tribal cultures overlain by hundreds of years of colonial history in many areas. For example, South Africa alone has a dozen official languages.

We have chosen to exclude the Mediterranean and Red Seas (to be addressed by SWOT in the future) and to focus in this article and accompanying maps only on Africa's continental shores, from the Straits of Gibraltar in Morocco to the Horn of Africa in Somalia, plus the offshore archipelagos and island nations, including the Canary Islands (Spain), Cabo Verde, Bijagós (Guinea-Bissau), Bioko (Equatorial Guinea), São Tomé and Príncipe, Madagascar, the Comoros, Mauritius, La Réunion (France), and the Seychelles, to name a few of the largest. This sizable area comprises 33 countries and their territories and is a zone of superlative global importance for sea turtles (see maps, pp. 24–29).

Five of the world's seven sea turtle species (leatherbacks, olive ridleys, green turtles, hawksbills, and loggerheads) inhabit these waters and nest on Africa's continental shores—from Mauritania south to Angola on Africa's Atlantic coast, and from South Africa north to Somalia on the Indian Ocean coast, plus the aforementioned archipelagos. Even the Kemp's ridley, endemic to the North Atlantic and the Gulf of Mexico, occasionally wanders into African waters. The only sea turtle species completely absent from Africa is the Australian flatback.

Sea turtles are among the most widely ranging creatures on Earth, and many sea turtles that nest outside Africa spend time in African waters as well. Those seasonal visitors may have hatched on distant shores in South America, the Caribbean, and the Central Atlantic (Ascension Island). Similarly, turtles born on West African beaches can be found throughout the Atlantic and Caribbean, and green and loggerhead turtles born on Africa's Indian Ocean shores travel far north to the Arabian Peninsula. Leatherbacks that nest in South Africa and nearby Mozambique migrate through the frigid waters around the Cape of Good Hope to forage off Namibia. Some African turtles barely migrate at all, spending their whole lives as local residents (see inset, p. 21). Of the 58 sea turtle subpopulations worldwide (called regional management units, or RMUs), 18 overlap with Africa and its Indian and Atlantic Ocean islands.

All African sea turtles are facing human-made threats, and pressure from humans has taken an enormous toll. The ecological footprint of all African countries increased by 240 percent from 1961 to 2008, according to the Global Footprint Network, due to growing populations and increased per capita consumption. By 2050, Africa's population is projected to reach as high as 2.47 billion people, this compared to 1.02 billion in 2010 and 0.294 billion in 1961. Turtles are an important component of local culture and practices for many African coastal communities, and have provided food and other traditional uses for millennia. Over the centuries, human impacts to turtles have evolved from subsistence-level hunting to more severe and pervasive threats, often driven by widespread poverty and food shortages. Today, sea turtles in Africa face threats from fisheries, consumption of adults and eggs, boat strikes, pollution, and climate change. Moreover, many coastal areas of Africa are developing significant infrastructure that is fueling habitat loss, and deep-sea ports are springing up like mushrooms to meet the tremendous global demand for African resources (see pp. 8–9).

In response to growing threats and increasing environmental awareness, most coastal African countries have enacted laws specifically to protect sea turtles. All the coastal countries of Africa are also parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora and the Convention on Biological Diversity, and all but Namibia and Sierra Leone are parties to the Convention on Migratory Species. In addition, two intergovernmental agreements focus on sea turtles on both sides of Africa: the Indian Ocean South East Asian Marine Turtle Memorandum of Understanding and the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa.

Regional networks also play an increasingly important role in organizing the African sea turtle movement, including the Gold Coast Sea Turtle Conservation Network, the Sea Turtle Professional Network in Central Africa (Rastoma), and the Western Indian Ocean–Marine Turtle Task Force. Since 2014, the *African Sea Turtle Newsletter*, produced by the Ocean Ecology Network, has served as a multilingual communications tool among the continent's far-flung sea turtle researchers.

PREVIOUS SPREAD: A hawksbill turtle nests on the beach of D'Arros Island in the Amirante Islands of the Seychelles. The Seychelles are home to the most important hawksbill nesting populations in the western Indian Ocean and home to one of the largest national populations in the world. © THOMAS P. PESCHAK

NORTHWEST AFRICA

Morocco to Guinea, and the Canary and Cabo Verde Archipelagos

The region from Morocco to Guinea on continental Africa straddles two major geomorphological domains: (a) the coastal dunes of the Sahel in Morocco and Senegal and (b) the vast river deltas from southern Senegal south to Guinea. The former is characterized by arid deserts that abut the coast, and the latter is a maze of deltas, cliffs, estuaries, and mangrove lagoons. The continental shelf in this zone extends 30 kilometers (19 miles) from the coast, except in Guinea-Bissau, where it broadens to 200 kilometers (124 miles). Cold, nutrient-rich upwellings support high levels of marine productivity in this region, and the main marine turtle foraging and nesting areas can be found in these rich waters at sites such as Banc d'Arguin National Park (Mauritania), the transboundary Biosphere Reserve of the Senegal River's lower delta (Mauritania–Senegal), the Saloum Delta (Senegal), the Bolama Bijagós Archipelago Biosphere Reserve (Guinea-Bissau), and the Tristão–Alcatraz Marine Protected Area (Guinea).

In chronicles dating from the 15th century, explorers provide accounts of abundant sea turtles throughout West Africa and the nearby archipelagos of the Canary Islands (Spain) and Cabo Verde, as well as of their widespread exploitation at the time. Today, loggerheads nest predominantly in Cabo Verde; green turtles in Guinea-Bissau's Bijagós Archipelago; and, sporadically, olive ridleys, leatherbacks, hawksbills, and loggerheads along the coast from Mauritania to Guinea-Bissau.

Southern Morocco reported large numbers of nesting turtles in the late 1950s, but more recent reports suggest a dramatic decline. In 2008, the Association for the Protection of Sea Turtles in Morocco was formed to address that dire situation. The presence of primarily juvenile loggerheads and leatherbacks in Moroccan waters suggests that the area may be an important foraging or developmental habitat or a migratory corridor.

Lying about 570 kilometers (350 miles) off the coast of Senegal, the Cabo Verde Archipelago boasts the third-largest loggerhead rookery in the world. Up to 20,000 nests are laid on Boa Vista Island alone in some seasons, representing 85 percent or more of the nesting in Cabo Verde. The Northeast Atlantic loggerhead RMU is listed as among the 11 most threatened sea turtle populations (see *SWOT Report*, vol. VII, 28). Despite national laws, active conservation projects, and some military protection, turtles are still hunted in Cabo Verde, and coastal construction and tourism pressures are also exacting a serious toll. On some beaches, poachers kill up to 90 percent of nesting females and harvest the eggs. To address the protection of this globally important sea turtle population, a Cabo Verdean sea turtle network called TAOLA was founded in 2009.

Loggerheads, green turtles, and leatherbacks are found in the waters around the Canary Islands, but hawksbills and Kemp's ridleys are rare. The Canary Islands are of greatest significance as foraging and migratory habitats for sea turtles from both sides of the Atlantic Ocean. Young loggerheads often are observed between the Canaries and Madeira as well, likely migrants following the Gulf Stream from North American nesting beaches. Young green turtles also are observed during the summer months off Gran Canaria and Lanzarote.

Mauritania still harbors small numbers of nesting turtles, including an aggregation of green turtles, south of the capital, Nouakchott. A local project, Digmile, has worked with the Mauritanian Institute for Oceanographic Research and Fisheries (IMROP) at this site since 2014 and has noted sporadic loggerhead nesting. An alarming outcome of IMROP's surveys has been the discovery of hundreds of stranded juvenile and adult loggerheads, presumably killed in fishing nets while foraging in the rich nearshore waters. Mauritania's Banc d'Arguin National Park is an important foraging area for green turtles from the Bijagós Archipelago. Despite 20th-century reports of nesting leatherbacks in Mauritania and Senegal, such sightings are extremely rare today, although the area seems to be an important foraging zone for leatherbacks from the Americas.

Senegalese coastal waters are well known as a migratory corridor, and four East Atlantic species (green, loggerhead, olive ridley, and leatherback) are known to nest sporadically in the country. Very little is understood about their abundance and seasonality. Hawksbills appear to be even rarer. The African Chelonian Institute (ACI) conducts beach surveys in northern Senegal from Dakar to St. Louis (a distance of 184 kilometers, or 114 miles) to assess sea turtle and cetacean mortality on those remote and little-developed shores. An astonishing 65 dead sea turtles of four species were found in the first of those surveys. Researchers believe that the massive mortality is a result of bycatch impacts from the very intensive offshore fishing in the region. ACI is now working with partners to find ways to reduce such tragic and unsustainable loss.

Green turtles also nest on the tiny coast of The Gambia between Bakau and Kartung, where the nongovernmental organization (NGO) Turtle SOS The Gambia monitors and protects the 27 kilometers (17 miles) of beach and conducts public awareness programs for communities and tourists. Noteworthy numbers of immature green turtles live in The Gambia's nearshore waters.

Little is known about the frequency of olive ridley and hawksbill turtles in this subregion, although both species are known to nest in the Bijagós Archipelago (Guinea-Bissau) and on Katrack Island (Guinea). The National Center for Fisheries Science in Boussoura (CNSHB), the Guinean Kaloe Kurè Project, and the French Association Chélonée have been working together to learn more about sea turtles on Katrack and to do outreach with local communities there.

Guinea-Bissau has one of the most important nesting populations of green turtles in the world at Bijagós, a coastal archipelago comprising 88 islands and islets, covering an area of nearly 10,000 square kilometers (6,214 square miles). Five sea turtle species have been confirmed in Bijagós, including at Poilão Island where about 40,000 green turtle nests were recorded in 2014 and perhaps thousands more on nearby islands. The olive ridley is the second most abundant species in Bijagós, with roughly 90 nests annually on Orango Island. A few dozen hawksbill and leatherback nests have also been reported. Loggerhead nests are very rare, but a few carapaces have been found in the archipelago, indicating that it may be nonbreeding habitat for the species. For a full description of the importance of Guinea-Bissau's sea turtles, see *SWOT Report*, vol. XI, 40–41.

WEST AFRICA

Guinea to Nigeria

The south-facing coastline of West Africa—encompassing the countries of Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo, Benin, and Nigeria—is a mosaic of high-energy beaches, mangrove estuaries, and pockets of coastal rainforest. The estuaries in this zone are nurseries for many important coastal fisheries, and the longshore current traveling through the Gulf of Guinea is a highway for migrating marine mammals and turtles. The region is rich in tradition and culture and is home to more than 100 ethnic groups that have managed their marine resources for centuries.

Historical records indicate that loggerheads, hawksbills, green turtles, leatherbacks, and olive ridleys (in order of increasing abundance) nest throughout this region. Political, economic, and social barriers, however, have prevented long-term research and conservation programs from fully understanding the biogeography and demography of sea turtles. There is little doubt that the region's turtles face significant threats from poaching, fishery interactions, habitat degradation, and oil exploration. Those hazards underscore the importance of prioritizing baseline population and distribution studies for monitoring the long-term health of sea turtles and their habitats.

Guinea has a nesting population of olive ridleys, hawksbills, and green turtles, and the Kaloe Kurè Project supports community-

based nest protection in the country's Tristão Archipelago. Similar community-based work takes place in Sierra Leone and Liberia to protect nesting leatherbacks, green turtles, hawksbills, loggerheads, and olive ridleys. Five species of sea turtles have been documented in Sierra Leone, but only green and leatherback turtles routinely nest in the area. The highest density of nesting in Sierra Leone occurs on the Turtle Islands, Sherbro Island, and Turner's Peninsula. The Reptile and Amphibian Program of Sierra Leone was recently formed to introduce education programs as a tool for reducing the primary threats of mortality in that country: fishery bycatch, sand mining, and poaching for food and ornamental use of the carapaces. Sea Turtle Watch and Save My Future Foundation in Liberia work in local communities to curtail the widespread harvest of sea turtles on beaches and at sea. These groups collect baseline data on the nesting species there, which are leatherbacks, greens, olive ridleys, and hawksbills. It is estimated that up to 95 percent of the nests may be poached in some coastal areas.

The Sea Turtle Project in Côte d'Ivoire has worked along the country's entire coastline since 2001 to help community members develop eco-friendly businesses as an alternative to poaching eggs and nesting turtles. The project has documented green turtle, olive ridley, and leatherback nesting, but to date it has not observed hawksbills or loggerheads. The most important nesting beach in Côte d'Ivoire is near the village of Mani, adjacent to the Liberian border. Since 2009, the NGO Conservation des Espèces Marines has been monitoring 30 kilometers (19 miles) of coastline there and supporting community development projects, such as solar power and fresh water wells. Those efforts have substantially improved local livelihoods and strengthened sea turtle conservation efforts.

The Ghana Turtle Research Project (GTRP) began a long-term tagging project in 2006 that has documented green, leatherback, and olive ridley turtles nesting on multiple beaches. Only two loggerhead nests have been confirmed in the past three years, but anecdotal reports indicate that loggerheads may be more frequent visitors to Ghana. Although fishermen and wildlife officers report seeing hawksbills nesting occasionally, the GTRP has not been able to confirm that information. Ghanaian communities practice traditional taboos against harming sea turtles, but the effectiveness of those taboos in modern times is diminishing (see pp. 40–41). Cape Coast University and the University of Ghana are working with GTRP to test modified fishing gear to reduce sea turtle bycatch.

Recent surveys in Togo and Benin indicate that olive ridley and leatherback turtles may be the only two species nesting in those countries; however, fishermen routinely catch green turtles (primarily juveniles and subadults) and hawksbills as well. Market surveys indicate that sea turtle meat and fat are routinely consumed, and may even be imported from other countries. During recent arrests in Togo and Benin, sea turtle shells were seized, along with large quantities of elephant ivory, indicating that sea turtles may be threatened as part of a well-organized wildlife trafficking network.

The Nigerian Institute for Oceanography and Marine Research has documented hawksbill, green, leatherback, and olive ridley turtles nesting along the Nigerian coastline, but the organization has not confirmed loggerhead nesting to date.

Threats to sea turtles abound in nations on the Gulf of Guinea. Rich oil reserves have resulted in significant development that severely threatens coastal habitat (see pp. 8–9). High fish productivity has resulted in increased commercial and artisanal fishing pressures, and local fishers, in particular, use small-mesh nets that are likely increasing turtle mortality. Recent increases in palm oil and petroleum exports have also led to the creation of ports, which often displace turtle nesting beaches. Fortunately, the number of conservation NGOs working in the region continues to increase as well, and those organizations are demonstrating significant success in reducing poaching and harvesting of nesting females. Noteworthy progress is also being made to reduce sea turtle bycatch through the use of alternative fishing gear and methods. Nigeria is also one of only two countries—along with Gabon—that have formally adopted the use of turtle excluder devices in their shrimp-trawling fleets.

A female leatherback turtle nests in front of Enokyi Village in western Ghana, an area monitored by the Bahari Karuna Project, www.wildseas.org. © KOSTAS PAPAFITSOROS

CENTRAL WEST AFRICA

Cameroon to Angola

The Central African countries are Cameroon, Equatorial Guinea (including Bioko Island), Gabon, São Tomé and Príncipe, the Republic of the Congo, the Democratic Republic of the Congo, and Angola. All five eastern Atlantic turtle species are known to nest in this part of the continent, although loggerheads are rare, having been reported only anecdotally on beaches in the Republic of the Congo. Leatherbacks and olive ridleys are common nesters from September to March, followed in abundance by green turtles and hawksbills.

This region is also home to some remarkable and globally significant sea turtle phenomena, including the largest leatherback rookery in the world, centered in Gabon and ranging south into the northern part of the Republic of the Congo. From September to April, more than 125,000 leatherback clutches are laid on these beaches, representing an estimated 20,500 breeding females per year and 41,000 breeding females overall. The island of Bioko (Equatorial Guinea) boasts the second-highest number of nesting leatherbacks in western Africa, as well as the second highest number of nesting green turtles in the eastern Atlantic (behind Poilão in Guinea-Bissau; see earlier in this article).

The tiny island nation of São Tomé and Príncipe also harbors important sea turtle nesting and feeding sites and is home to what is believed to be the last significant hawksbill rookery in the eastern Atlantic. Hawksbills nesting at Príncipe Island possess a unique genetic haplotype that has been reported in foraging populations in the western and eastern Atlantic but at no other nesting site in the world. This genetically distinct hawksbill subpopulation is at extremely high risk of extinction because the number of females is believed to be fewer than 50. Hence, preserving the subpopulation is among the top 11 sea turtle conservation priorities worldwide (see *SWOT Report*, vol. VII, 26).

Olive ridley turtles also nest throughout the region but without the synchronized, large-scale nesting spectacles (called *arribadas*) found in the American Pacific and Orissa, India. Gabon's olive ridley nesting population has recently been reported as the biggest in the Atlantic, with nearly 10,000 clutches per year and possibly more than 8,000 breeding females. Nesting density seems to increase farther south, possibly reaching its peak in Angola.

Central Africa also harbors important feeding grounds for green turtles and hawksbills among the many estuaries, bays, seagrass beds, and rocky substrates found along the coast, along the fringes of the continental shelf, and surrounding the many islands of the EEZ. At the border between Gabon and Equatorial Guinea lies one such feeding area, Corisco Bay. Others include Pointe-Indienne in the Republic of the Congo, the rocky grounds around Kribi and Limbé in Cameroon, adjacent to the mainland of Equatorial Guinea, and other sites in southern São Tomé and Príncipe.

Sea turtles face a wide variety of hazards throughout West-Central Africa, including coastal development and the threats that accompany it, such as light and plastic pollution, deposition of logging timbers, and other beach obstructions. More important, large numbers of turtles fall prey to unsustainable egg take and bycatch of adult turtles by coastal fisheries. In the Republic of the Congo, the NGO Rénatura has worked to facilitate the release of many of the thousands of incidentally captured green turtles at Pointe-Indienne, but artisanal fishing impacts remain a significant threat throughout the region. Industrial fisheries are also evolving rapidly in the Gulf of Guinea, including longlines and trawlers, and growth is likely to increase. Since 2012, the government of Gabon has implemented a program of onboard observers who record catch and bycatch data, and treat and release captured sea turtles on pelagic industrial vessels. Despite these ameliorating measures, growing evidence suggests that industrial fisheries in the Gulf of Guinea are severely depleting marine resources, including sea turtles.

Illegal take of nesting female turtles and their eggs also remains a significant threat, despite many new laws protecting sea turtles, such as those enacted in Republic of the Congo and Gabon in 2011 and in São Tomé and Príncipe in 2014. In addition, the creation of a national park system in Gabon in 2002 placed approximately 58 percent of the coastline under protection. The Gabon Sea Turtle Partnership (a network of national and international organizations protecting sea turtles in Gabon) estimates that 80 percent of the leatherback and olive ridley nests (the two most common nesting species) now occur within protected areas, where poaching has been virtually eliminated. Notwithstanding some local success stories, however, the enforcement of nature protection laws is insufficient and continues to be a significant challenge throughout western Central Africa.

Attention to sea turtle conservation in Central Africa began in earnest in 1998, with the European Community's ECOFAC program (a program for the conservation and rational use of forest ecosystems in Central Africa, commonly called Ecosystèmes Forestiers d'Afrique Centrale). Since then, local NGOs have flourished, including groups such as the Kitabanga Project in Angola; ACODES in the Democratic Republic of the Congo; Rénatura and Wildlife Conservation Society in the Republic of the Congo; Agence Nationale des Parcs Nationaux, Agence Nationale des Pêches et de l'Aquaculture, Aventures sans Frontières, Centre National des Données et des Informations Océanographiques, Fondation Liambissi, Ibonga, Manga, Wildlife Conservation Society, and World Wildlife Fund in Gabon (all of which are coordinated under the umbrella of the Gabon Sea Turtle Partnership); Instituto Nacional de Desarrollo Forestal y Manejo de Areas Protegidas–Tortugas Marinas de Guinea Ecuatorial, Bioko Marine Turtle Program, and Bioko Biodiversity Protection Program in Equatorial Guinea; MARAPA and Associação Tartarugas Marinhas in São Tomé; Príncipe Trust in Príncipe; and Tube Awu, Kudu A Tube, Association Camerounaise de Biologie Marine, and African Marine Mammal Conservation Organization in Cameroon. Many of the aforementioned groups have worked together since 2012 as part of a regional network, Rastoma, that is showing great promise as an organizer for sea turtle conservation in Central Africa and beyond.

Positive news for turtles comes with the designation of new Marine Protected Areas (MPAs) in places such as Gabon, where the government aims to protect more than 20 percent of its EEZ and has also committed to sustainable fisheries management. Other MPAs have been proposed at Loango Bay (Republic of the Congo), which would encompass the Pointe-Indienne green turtle feeding ground, and the Manyange na Elombo-Campo Marine National Park (southern Cameroon).

SOUTHERN AFRICA

Namibia, South Africa, and Mozambique

The southwestern tip of the African continent is not typically associated with sea turtles, as it is cradled by the cold Benguela Current off its western shores. This area is highly productive and hosts an abundance of marine life and associated human activities, including multiple commercial and artisanal fisheries. Seals, seabirds, sharks, cetaceans, and sea turtles enjoy the abundance of pelagic resources off the Namibian coast, but those creatures also suffer the impact of intense extractive activities.

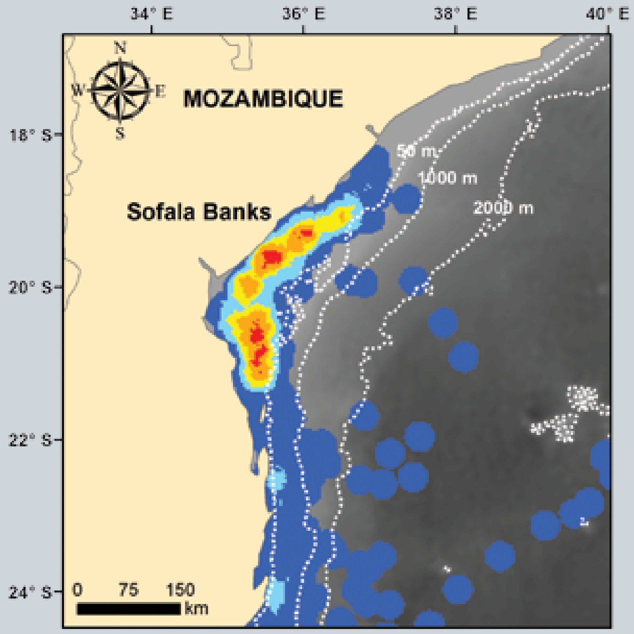
Leatherbacks, in particular, enjoy the rich marine productivity provided by the Benguela Current. Satellite tracking and flipper tag returns indicate that leatherbacks from three RMUs (Gabon, Brazil, and the Southwest Indian Ocean) frequent the waters off Namibia. Researchers have also recorded strandings of sea turtles along Namibia's Skeleton Coast, possibly a result of lethal interactions with fisheries, but no sea turtle nesting is known to take place along the Atlantic coastline of either Namibia or South Africa.

Sea turtle nesting in South Africa occurs only on the Indian Ocean coastline and is restricted to a 200-kilometer (124 mile) stretch of beach in KwaZulu-Natal that borders Mozambique. There, the largest portion of loggerhead and leatherback turtle nesting in the southwest Indian Ocean can be found. South Africa's 53-year-long conservation and monitoring program is one of the longest continuous sea turtle monitoring and protection efforts in the world and is arguably one of the greatest conservation success stories on the African continent. Sea turtle protective legislation was introduced at the turn of the 20th century and has been heavily enforced since the mid-1960s, when active conservation and monitoring started on 60 kilometers (37 miles) of beach. Since then, loggerhead numbers have doubled to about 1,000 nesting females per season, and leatherbacks are stable at approximately 100 females per season. The nesting and inter-nesting habitats and the offshore reefs are well protected in a contiguous marine and terrestrial protected area known as the iSimangaliso Wetland Park, a World Heritage Site. Green turtles and hawksbills also are present and are frequently sighted by SCUBA divers and fishers, but very little is known about them. Genetic samples have been collected and are yet to be analyzed, but most of those individuals probably come from rookeries in the Mozambique Channel.

The Mozambique Channel, bounded by Mozambique and Madagascar, is rich in marine biodiversity and hosts nesting populations of four turtle species—loggerhead, leatherback, green turtle, and hawksbill—with foraging olive ridleys frequenting the east African and west Malagasy seaboard. Along the Mozambique coast, loggerheads and leatherbacks nest in the south, and green turtles and hawksbills nest on the country's central and northern beaches. Sea turtle monitoring programs led by NGOs, local authorities, tour operators, and special interest groups have done an amazing job for more than two decades. Three consistent programs exist in Mozambique, providing monitoring and protection in the south (Ponta de Ouro), south-central (Inhambane), and north (see pp. 44–45), with nine locations being monitored and

LEATHERBACK COASTAL FORAGING COHORT IN MOZAMBIQUE

By NATHAN ROBINSON, STEVE MORREALE, and FRANK PALADINO



High-use habitats for foraging leatherback turtles (shown in red and orange) in the Sofala Banks of Mozambique. This area represents a relatively unique example of leatherback turtles remaining resident in shallow coastal waters year round.

Leatherback turtles conduct some of the longest migrations in the animal kingdom, traveling across entire ocean basins and confounding conservation efforts for this species. A promising discovery has recently been made concerning the leatherback turtles nesting in the iSimangaliso Wetland Park of South Africa. More than half of the females nesting at this globally important rookery seem to *not migrate* to distant foraging areas but rather forage in the coastal waters and the nearby Mozambique Channel a mere (at least in leatherback terms) 500 kilometers (310 miles) away. Moreover, this cohort seems to remain resident year round in shallow waters (less than 50 meters [164 feet] deep) in a relatively small area. As these foraging leatherback turtles share the Sofala Bank with the Mozambican shrimp-trawling fishery—a fishery with known sea turtle bycatch—a unique opportunity presents itself to encourage the creation of a spatially explicit protected area or to use bycatch mitigation tools, such as turtle excluder devices. The Mozambique Channel is a unique marine hotspot, because of not only the rare presence of a resident coastal aggregation of leatherback turtles, but also an array of other noteworthy and endangered marine megafauna, including dugongs, whale sharks, mantas, numerous cetaceans, and even coelacanths!

16 organizations involved. Satellite tracking has highlighted the coastal waters of Mozambique as a critical feeding area for loggerheads and leatherbacks from South Africa and for green turtles from all Indian Ocean nesting sites (especially from the Bazaruto and Quirimbas areas). Those same foraging grounds are also important for hawksbill nesting.

Despite increased attention to turtle conservation in this region, many shared challenges remain. Traditional use of eggs and turtles still takes place, and gillnet, trawl, and longline fisheries affect turtles at sea. The greatest emerging concern along the east African seaboard is the rapid expansion of hydrocarbon extraction in places such as northern Mozambique. The real impact of such activities remains to be seen.

EAST AFRICA AND THE INDIAN OCEAN ISLANDS

Tanzania, Kenya, Somalia, Madagascar, Mauritius, the French Overseas Territories, the Comoros, and the Seychelles

The southwest Indian Ocean principally hosts four species of nesting sea turtles: hawksbills in the tropical north, leatherbacks and loggerheads in the south, and green turtles throughout. A fifth species, the olive ridley, is known only as a sporadic nester, although it is a frequent forager in the region. Green turtles, hawksbills, and olive ridleys nest on the mainland and on the island coasts of Kenya, Tanzania, and Somalia, although the turtles of Somalia have been poorly studied because of the country's longstanding political turmoil.

Five sea turtles are found in Kenya: greens, olive ridleys, and hawksbills nest and forage there, and leatherbacks and loggerheads forage only. The Lamu Seascape hosts one of the largest breeding colonies for Kenyan greens, accounting for more than half of the turtle nests reported for the entire Kenyan coast. Lamu is a rich biotope that faces a multitude of threats stemming from increasing human populations, including wildlife and resource exploitation, to infrastructure development (harbors and ports) and climate change. Around Watamu, on the central Kenyan coast, Local Ocean Conservation (LOC) monitors nesting beaches and ensures the safety of nests laid there. LOC also runs a turtle rehabilitation center, leads a successful bycatch release program that has conducted more than 15,000 rescues, and does education and outreach work in local communities. On Kenya's south coast, LOC also runs the Diani Turtle Watch program, led by a team of volunteers who are trained to monitor, relocate, and excavate nests. As in Lamu, nesting beaches in Watamu, Malindi, and Diani are under threat from development, and turtles coming up to nest are at risk from poachers.

In Madagascar, loggerhead and leatherback turtles nest in the south in unknown numbers that seem to be significantly lower than the numbers found along the facing coasts of Mozambique and South Africa. In north and west Madagascar, nesting hawksbills and green turtles occur, especially on the small islets, such as Nosy Iranja.

In the Mascarene Islands, marine turtle nesting is rare today in Mauritius and the French territory of La Réunion, although old texts testify to a glorious and abundant past for sea turtles there, primarily green turtles and hawksbills. St. Brandon, an isolated group of small islands near Mauritius, may still host some important nesting activity, and nesting hawksbills have recently been reported on Rodrigues as well, although both situations require further study. Mascarene waters host important developmental habitats, including inshore areas that are used by hawksbill and green turtles and pelagic habitats occupied by all five species. Subadult loggerheads have been satellite tracked from La Réunion to as far north as Oman, where they probably originated, suggesting a developmental cycle for those animals that encompasses the complete ocean basin.

The Seychelles hosts the most important nesting populations of hawksbill turtles in the region and one of the largest national populations in the world. In 1994, after implementing a compensation and reinstallation program for artisans in response to overexploitation of the species, the Seychelles passed highly effective legislation that banned trade in hawksbill shells. Hawksbills reach their greatest abundance in the Inner Islands and the Amirantes groups of the Seychelles, and they occur in much smaller numbers in the remote southern islands. In contrast, only small numbers of green turtles nest in the Inner Islands and Amirantes, but the species is abundant in the southern islands, especially in the Aldabra group (Aldabra, Assumption, Cosmoledo, and Astove).

France (Éparses Islands—Europa, Juan de Nova, Glorieuses, Tromelin—and Mayotte) and the Comoros (Mohéli) also host very important nesting populations of green turtles, and very small numbers of hawksbill turtles nest there too. Those island groups together make up one of the global hotspots for nesting green turtles. A continuum of seagrass beds throughout the region constitutes one of the world's principal foraging areas for juvenile and adult green turtles.

Southwest Indian Ocean turtles are victims of many small- and large-scale threats. The marine habitats and low-lying island nesting beaches throughout the region may be severely affected by climate change and sea-level rise in the decades to come. Despite that sea turtle meat is occasionally toxic and has led to numerous cases of human mortality in small villages, capture of turtles for food is still a major threat in the region, as it is throughout Africa; satellite tracking indicates that the practice is specifically occurring in East Africa and Madagascar. In north Madagascar, near the Radama Islands, massive poaching events targeting green turtles have been reported in recent years as well, and an organized market selling turtle products to Asia is suspected.

As elsewhere in Africa, local NGOs and communities are taking a lead in conservation and research, including Sea Sense in Tanzania and the World Wildlife Fund and Local Ocean Trust in Kenya. In Madagascar, the Wildlife Conservation Society recently created two locally managed MPAs that will protect sea turtles and encompass the most important nesting sites identified for green and hawksbill turtles in the country. Blue Ventures also manages MPAs together with local fishing communities in the village of Andavadoaka in western Madagascar, a region culturally associated with high poaching levels. At La Réunion Island, collaboration between longline fisheries and the Kélonia Sea Turtle Care Center rescues some 20 turtles each year. In the Seychelles, a national network of more than 20 long-term beach-monitoring programs collects scientific data, creates community awareness about conservation of turtles and their habitats, and patrols the beaches to prevent poaching. Efforts are also being made to reduce sea turtle bycatch through the introduction of turtle excluder devices in the Mozambique industrial shrimp fishery in the Sofala Bank, led by Mozambique's National Fisheries Research Institute (IIP) and WWF-Mozambique as part of the BYCAM project. Purse seine fisheries operating in the western Indian Ocean are making progress in reducing interactions between turtles and fish aggregating devices (FADs) by working to develop ecological FADs under the recommendations of the Indian Ocean Tuna Commission. The Spanish purse seine fleets have implemented measures in the Seychelles to reduce damage caused by FADs that wash ashore in the outer islands.

Conclusion

The past three decades of attention from researchers and conservationists from many sectors have allowed us to place Africa's sea turtles on the global map for the first time ever. What was once a gaping hole in our global understanding of sea turtles is now being slowly but surely filled by hundreds of committed people from dozens of national, regional, and globally interested entities, at scales ranging from individual beach workers up to corporate boardrooms and multinational decisionmakers.

As elsewhere on Earth, Africa's sea turtles are flagship species. Our improved knowledge of their biogeography, natural history, and relationships with humans fuels the growing movement to protect not only sea turtles, but also the habitats they represent and the hundreds of millions of interdependent life forms therein, including humans. Through the lens of Africa's sea turtles, we begin to see how human impacts—such as unchecked coastal development, climate change, and broad-scale unsustainable fishing—represent threats to human survival as well. Confronting what is known among conservationists and developers as the *African conundrum*—that is, the desperate and immediate need for economic development and poverty alleviation versus the long-term need and moral responsibility to protect biodiversity for the future—is the challenge that lies ahead. ■

SWOT FEATURE MAPS: AFRICA

The following pages (24–29) feature the first comprehensive maps of sea turtle nesting biogeography and satellite telemetry in Africa and the Western Indian Ocean. They were produced in collaboration with dozens of individuals and organizations and with special assistance from Jérôme Bourjea, Mayeul Dalleau, Alexandre Girard, Marc Girondot, Shaya Honarvar, and Jeanne Mortimer.

Nesting Biogeography

The maps of sea turtle nesting biogeography (see pp. 24–25 and 26–27) feature nesting data from 253 locations along the Atlantic and Indian coasts of Africa and from the islands of the western Indian Ocean, as far east as the Seychelles. We have also mapped protected areas (which appear in pink) to highlight the protection afforded to many key sea turtle nesting sites, as well as to draw attention to current gaps in protection. The nesting data used to create the maps were provided voluntarily to SWOT or were sourced from literature. The data come from almost 80 sources. Each data point is numbered to correspond with a record that includes detailed metadata and source information (see pp. 48–52).

In creating the maps, we used the most recent available data from each nesting site; if the available data were more than 10 years old or the nesting count for the record was unquantified, we labeled the site as "unquantified," represented as a black square (see map legend). Data from all species present at a nesting site were combined to determine the size of a representative pie chart at each site; each chart is color coded to indicate the proportion of each species nesting at that site. If a species composed less than 5 percent of the total nesting abundance at a multispecies nesting site, it was not shown in the chart but is included in the citations (see pp. 48–52). In some cases, data from multiple nesting sites were combined (at the discretion of the data providers) to make the nesting numbers easier to interpret on the maps.

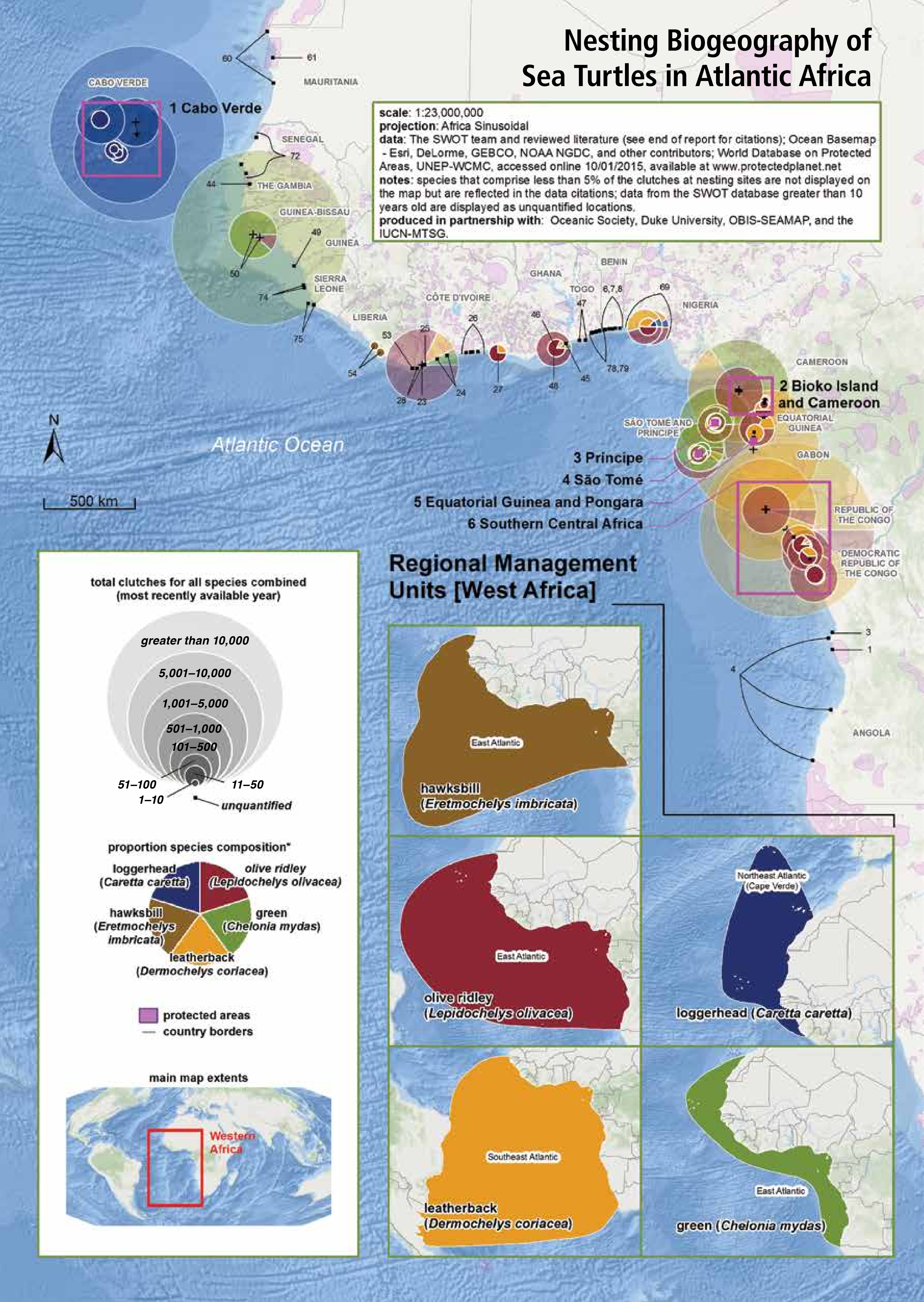
The nesting maps display all data as annual numbers of clutches. When a different count type was provided by the data source (for example, crawls), we converted those counts to clutches using regionally appropriate conversion factors. Conversion factors were derived from nearby nesting sites of the same species that reported nesting activity in multiple types of counts. It is important to note that the number of clutches is not the same as the number of nesting female turtles.

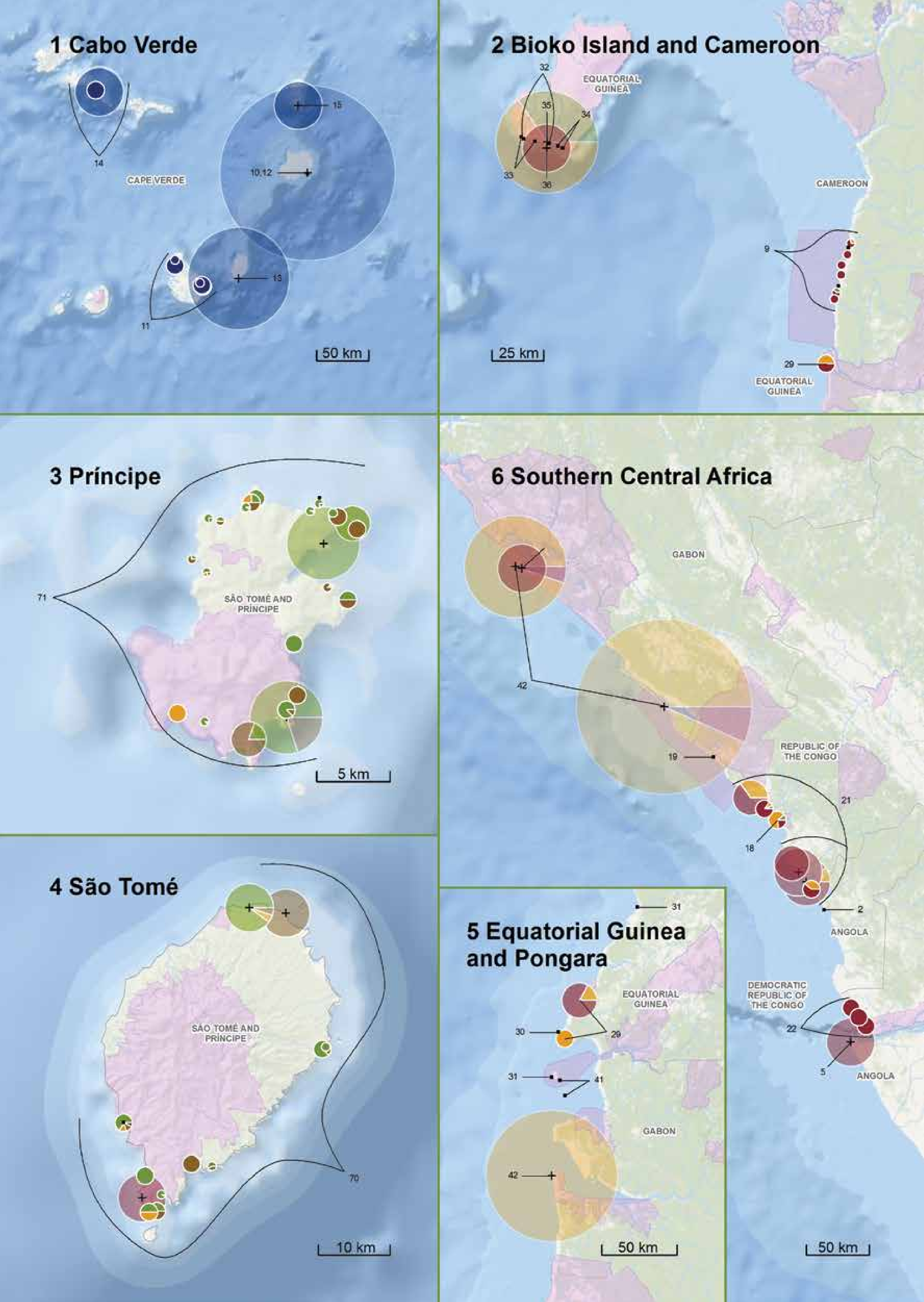
Satellite Telemetry

The map of sea turtle satellite telemetry on pages 26–27 presents combined data from 294 satellite-tracked sea turtles representing five species (loggerhead, green, leatherback, hawksbill, and olive ridley), as well as data for each species individually. These data are overlaid with information on regional management units (inset maps, p. 27). Known nesting sites (but not abundances) are also mapped as black squares. In the map, we included only tracks from tags deployed in Africa and the Western Indian Ocean, thereby excluding some turtles that have been tracked from outside of Africa into African waters. Data were provided voluntarily to SWOT by more than 27 partners; details of each project can be found in the data citations on pages 51–52. For more information on the mapping methodology, see the map's legend.

Most of the contributed nesting and satellite telemetry data, as well as the entire SWOT global database, can be found online at http://seamap.env.duke.edu/swot.

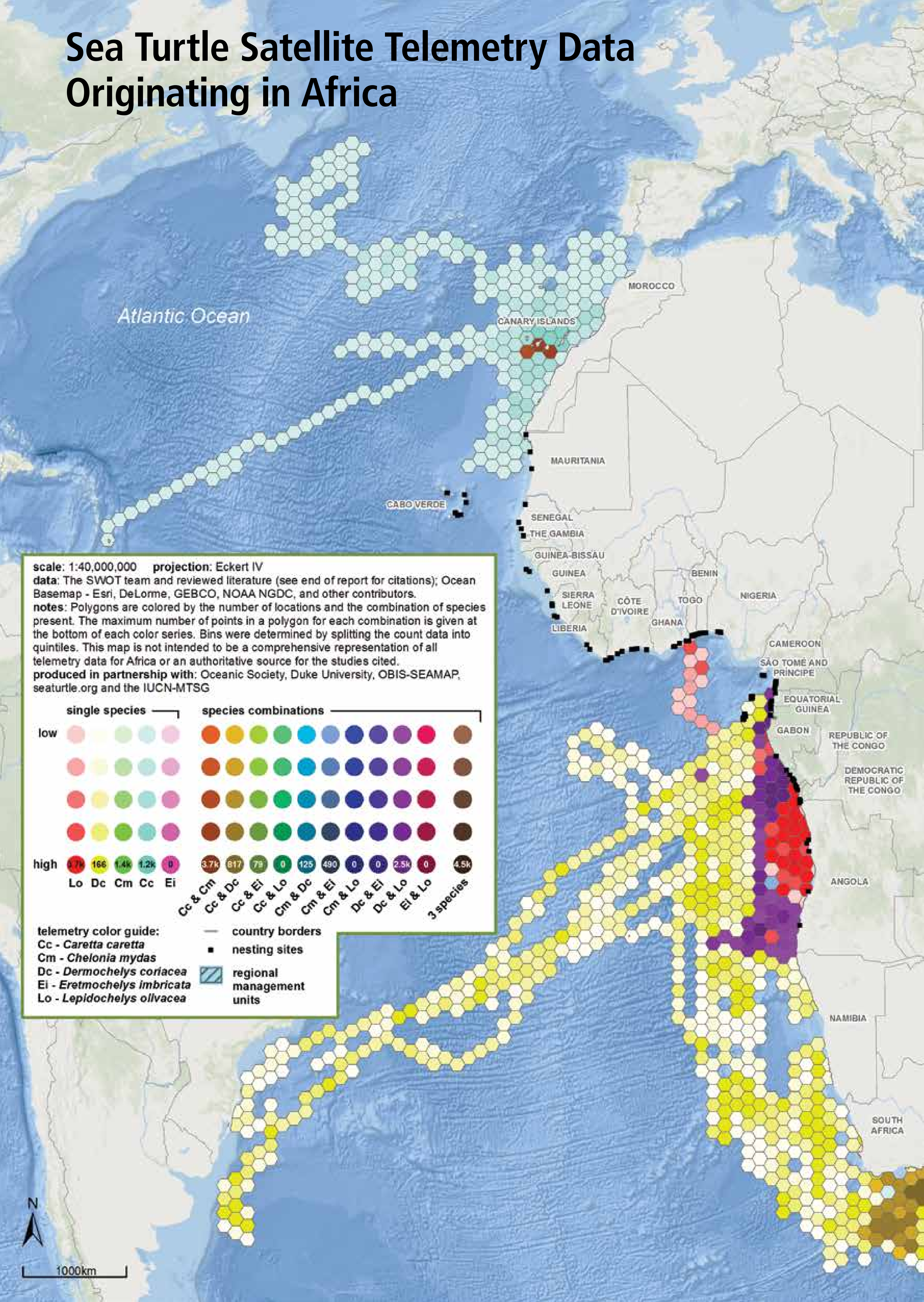
Nesting Biogeography of Sea Turtles in Atlantic Africa

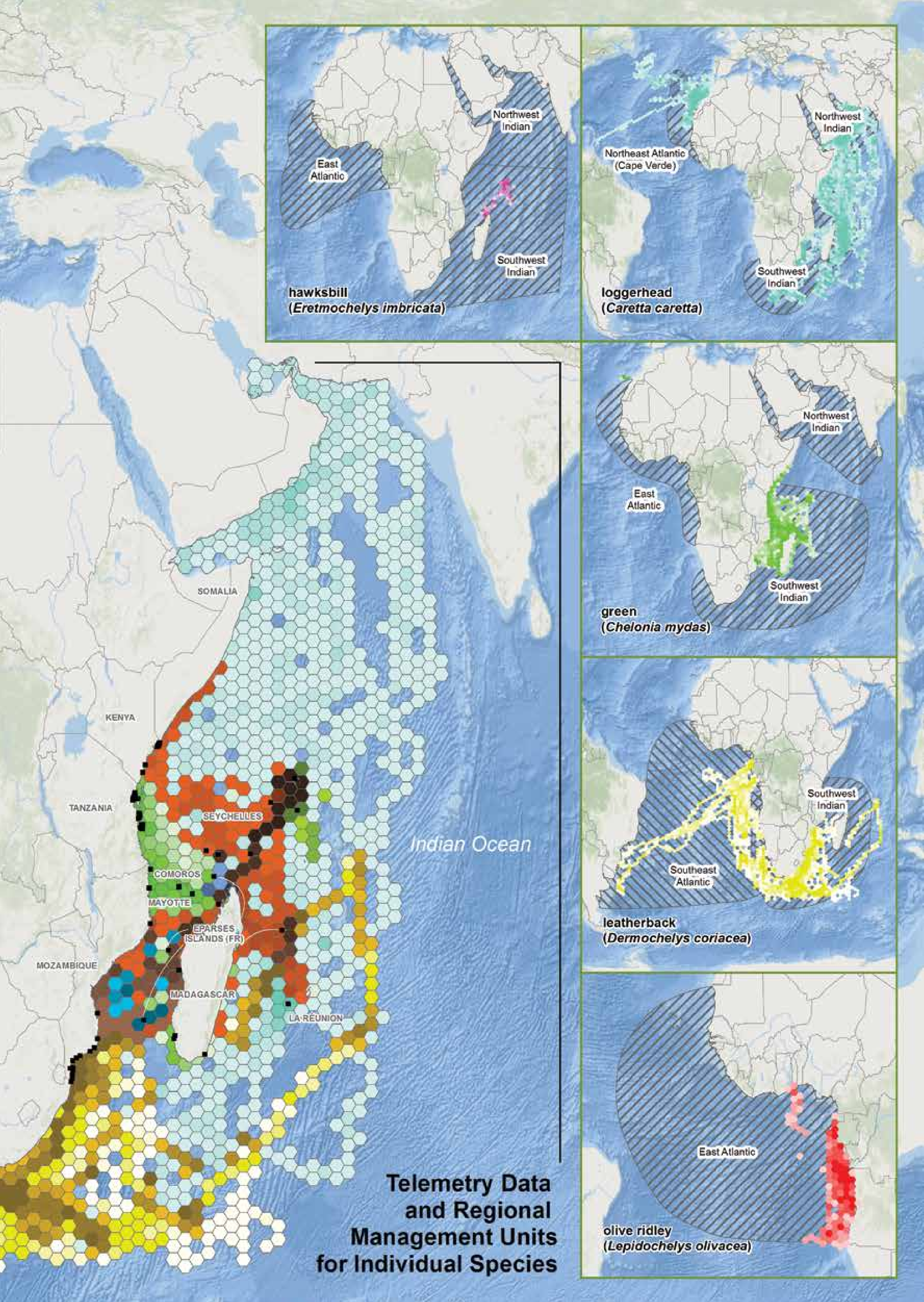




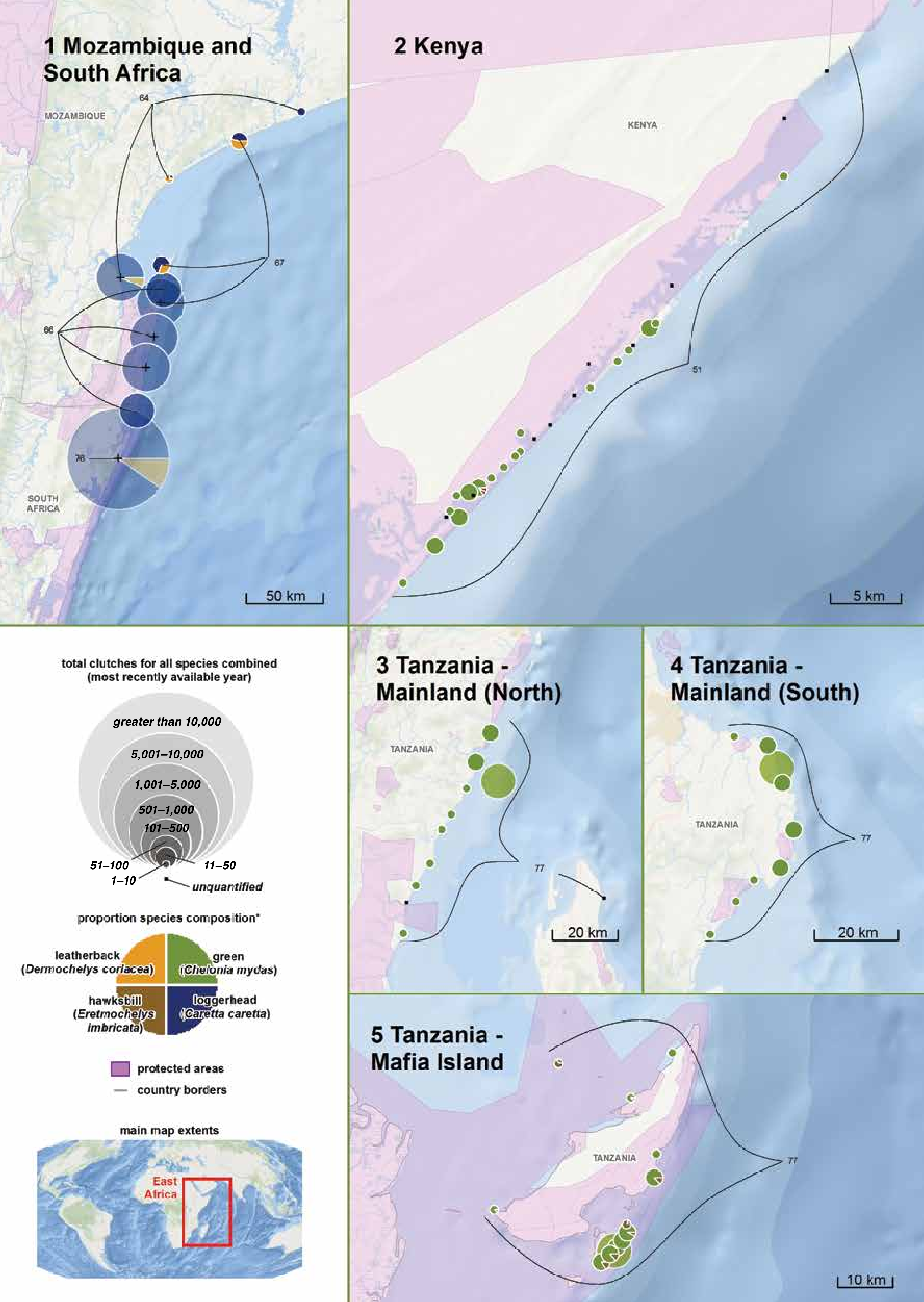
1 Cabo Verde
14
CAPE VERDE
15
10,12
13
11
50 km
2 Bioko Island and Cameroon
32
EQUATORIAL GUINEA
35
34
33
36
CAMEROON
9
25 km
29
EQUATORIAL GUINEA
3 Príncipe
71
SÃO TOMÉ AND PRÍNCIPE
5 km
6 Southern Central Africa
GABON
42
19
REPUBLIC OF THE CONGO
21
18
2
ANGOLA
DEMOCRATIC REPUBLIC OF THE CONGO
22
5
ANGOLA
50 km
4 São Tomé
SÃO TOMÉ AND PRÍNCIPE
70
10 km
5 Equatorial Guinea and Pongara
31
EQUATORIAL GUINEA
30
29
31
41
GABON
42
50 km

Sea Turtle Satellite Telemetry Data Originating in Africa



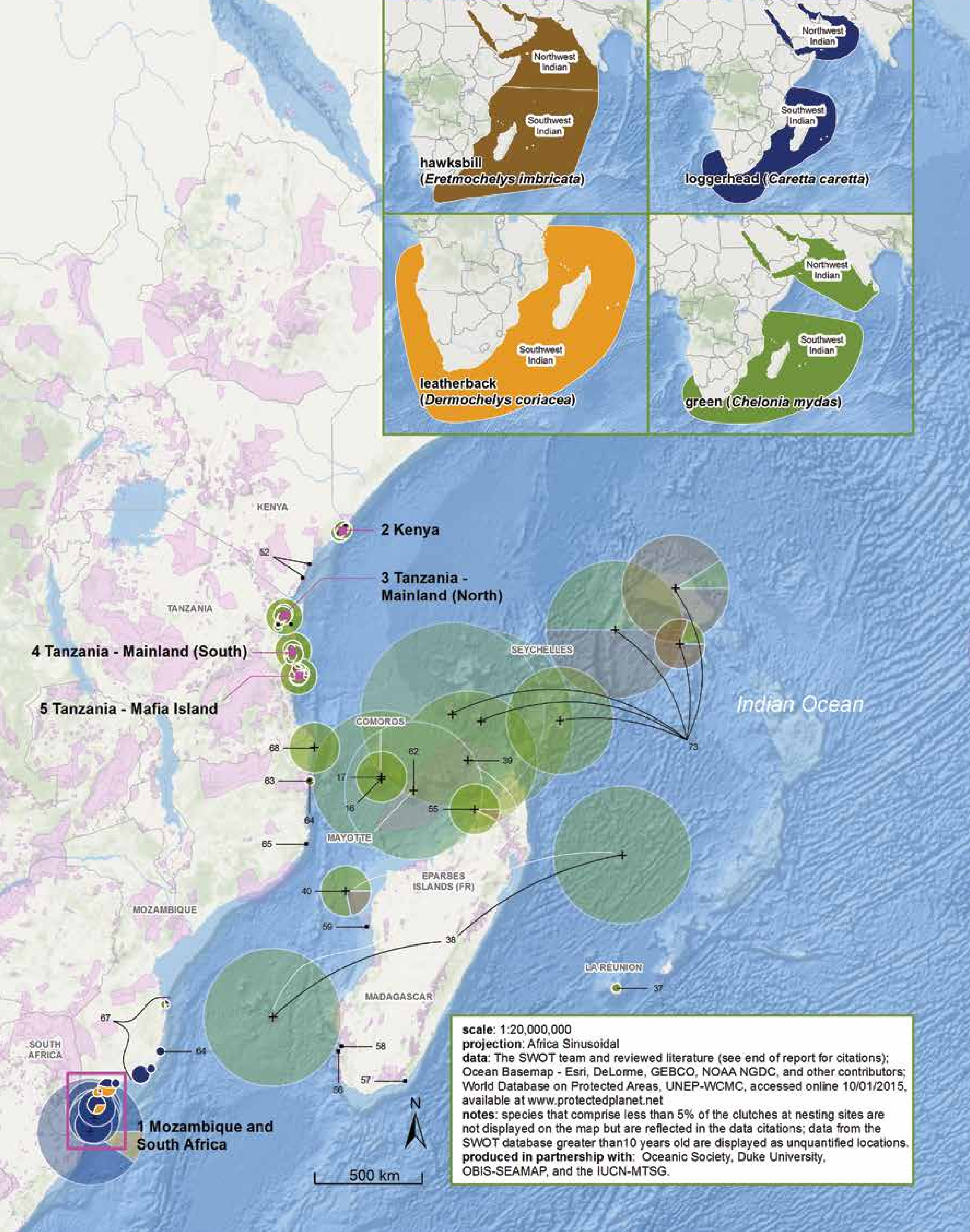


Telemetry Data and Regional Management Units for Individual Species



1 Mozambique and South Africa
MOZAMBIQUE
SOUTH AFRICA
64
67
66
76
50 km
2 Kenya
KENYA
51
5 km
3 Tanzania - Mainland (North)
TANZANIA
77
20 km
4 Tanzania - Mainland (South)
TANZANIA
77
20 km
5 Tanzania - Mafia Island
TANZANIA
77
10 km
total clutches for all species combined (most recently available year)
greater than 10,000
5,001–10,000
1,001–5,000
501–1,000
101–500
51–100
11–50
1–10
unquantified
proportion species composition*
leatherback (Dermochelys coriacea)
green (Chelonia mydas)
hawksbill (Eretmochelys imbricata)
loggerhead (Caretta caretta)
protected areas
country borders
main map extents
East Africa

Nesting Biogeography of Sea Turtles in the Southwest Indian Ocean



THE CONSERVATION STATUS OF LOGGERHEAD POPULATIONS WORLDWIDE

By PAOLO CASALE and BRIAN J. HUTCHINSON

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is probably the most popular tool for determining conservation status and comparing the extinction risk of different plant and animal species. To conduct Red List assessments, experts use a standard set of criteria that have been developed and tested for decades. For wide-ranging species—and especially for globally distributed species, such as sea turtles—a single assessment for the whole species may not capture the situation of the multiple geographically or demographically separate subpopulations. For example, a species may be considered abundant globally, yet certain distinct populations of that species may be facing extinction.

In 2010, the IUCN's Marine Turtle Specialist Group (MTSG) identified subpopulations—called *regional management units*—for each sea turtle species and started to assess the extinction risk of each. The first species assessed at the subpopulation level was the leatherback in 2013 (see *SWOT Report*, vol. XI, pp. 28–31). The loggerhead was similarly assessed in 2015. The loggerhead assessment concluded that, of the 10 loggerhead subpopulations, four qualified for a high-risk

A male loggerhead turtle swims off of Zakynthos Island, Greece. According to a new IUCN Red List Assessment, loggerheads are now considered "vulnerable" globally. © KOSTAS PAPAFITSOROS

category such as endangered or critically endangered, two were considered near threatened, and four were ranked least concern on the basis of past or projected trends, abundance, or distribution.

In addition to allowing comparisons of the conservation status of different subpopulations, the new Red List assessments provide useful inputs for conservation strategies. For instance, the "least concern" category indicates that a sea turtle population has successfully benefited from past or current conservation efforts and that (a) the key threats have been successfully identified and addressed, and (b) conservation actions should be continued, otherwise the population will be in trouble again. Conversely, a "threatened" category (e.g., endangered or critically endangered) indicates that past or current conservation efforts may not be sufficient (or their effects are not evident yet), possibly because the key problems have not been identified. In that respect, the loggerhead Red List assessment can provide useful insights for conservation action at regional levels. Completing similar Red List assessments for all sea turtle species will be a tremendous step forward in addressing the challenge of conserving sea turtles worldwide.

GLOBAL – Vulnerable

The loggerhead turtle is categorized as vulnerable globally for two reasons: (a) the global population is estimated to have declined 47 percent since long-term monitoring studies began between 10 and 50 years ago, and (b) the causes of the decline have not ceased. The global decline for loggerheads is mainly driven by one subpopulation (the northwest Indian Ocean subpopulation). This subpopulation, which was once very large, has declined precipitously. This case shows that global assessments for wide-ranging species such as sea turtles can be misleading because the decline or even extinction of one subpopulation does not necessarily imply a global-scale species extinction risk. Because we aim to preserve not just the species but also its regional populations, however, subpopulation Red List assessments are much more meaningful and useful for conservation.

MEDITERRANEAN SEA – Least Concern

The Mediterranean subpopulation of loggerheads breeds along the coasts of the eastern Mediterranean basin (with only a few nests recorded in the western Mediterranean), and its marine habitat extends throughout the entire Mediterranean Sea. The subpopulation is classified as least concern because the available long-term nest monitoring data show an overall modest increase. The Mediterranean subpopulation should be considered entirely conservation dependent, however, because the observed population increases are the result of decades of intensive conservation programs, especially at key nesting sites.

NORTHEAST ATLANTIC OCEAN – Endangered

The northeast Atlantic loggerhead subpopulation nests in the Cape Verde archipelago, with a few nests also recorded in Mauritania and Guinea. Its marine habitats extend across a large area off northwest Africa, spreading out to the Azores in the northwest down to the coastal areas of Sierra Leone in the southeast. The subpopulation is considered endangered because the vast majority of nesting habitat is concentrated in a relatively small area in Cape Verde and is subject to continuing anthropogenic pressure (e.g., intensive sand extraction and tourism development), which is causing an ongoing decline in habitat area, extent, and quality.

NORTHEAST INDIAN OCEAN – Critically Endangered

The northeast Indian subpopulation nests on the beaches of Sri Lanka, and its marine habitats are thought to extend throughout a large marine area around and to the east of Sri Lanka, including the Bay of Bengal, and as far east as offshore areas of Myanmar and Sumatra, Indonesia. The population is considered critically endangered because of its extremely small size: the number of nests laid annually is thought to be fewer than 25.

NORTH PACIFIC OCEAN – Least Concern

The North Pacific loggerhead subpopulation nests along the eastern coast of Japan and inhabits a vast marine area covering nearly the entire North Pacific Ocean, from the waters of the South China Sea off Vietnam in the west, to the western coast of the United States and Baja California, Mexico, in the east. The subpopulation is ranked least concern because the combined long-term nesting population trend is increasing; this status should be considered conservation dependent, however, because it results from intensive long-term protection of nesting habitat in Japan.

NORTHWEST ATLANTIC OCEAN – Least Concern

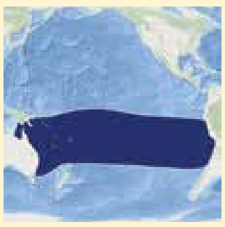
The northwest Atlantic loggerhead subpopulation nests throughout the southeast United States and the Caribbean region, with the most significant nesting aggregations in Florida, Georgia, and South Carolina in the United States, and along the Yucatán Peninsula of Mexico. Its marine habitat encompasses nearly the entire Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean. Long-term studies of this large and widespread population show an overall increase (of 2 percent), although the population is declining at a number of individual beaches.

NORTHWEST INDIAN OCEAN – Critically Endangered

The primary nesting sites for northwest Indian Ocean loggerheads are in Oman (Masirah Island) and, to a lesser extent, Yemen, and their marine habitats encompass the Gulf of Aden and Arabian Gulf. This subpopulation is considered critically endangered because observations have revealed a decline of about 70 percent since nest monitoring began, and that decline is projected to reach more than 90 percent by 2043 because of the ongoing nature of threats, including fisheries bycatch, egg predation, and coastal development.

SOUTHEAST INDIAN OCEAN – Near Threatened

The southeast Indian Ocean subpopulation of loggerheads nests in Western Australia and inhabits the waters of western and northern Australia, East Timor, and Indonesia. It is probably one of the largest loggerhead subpopulations, with more than 2,500 females estimated to be nesting annually. The subpopulation is considered near threatened because it nests over a relatively small area, and our knowledge about the population's status and threats is incomplete. Known threats include predation by foxes, vehicular traffic, light pollution associated with industrial development, and fisheries bycatch, although the impact of threats has not been fully evaluated.



SOUTH PACIFIC OCEAN – Critically Endangered

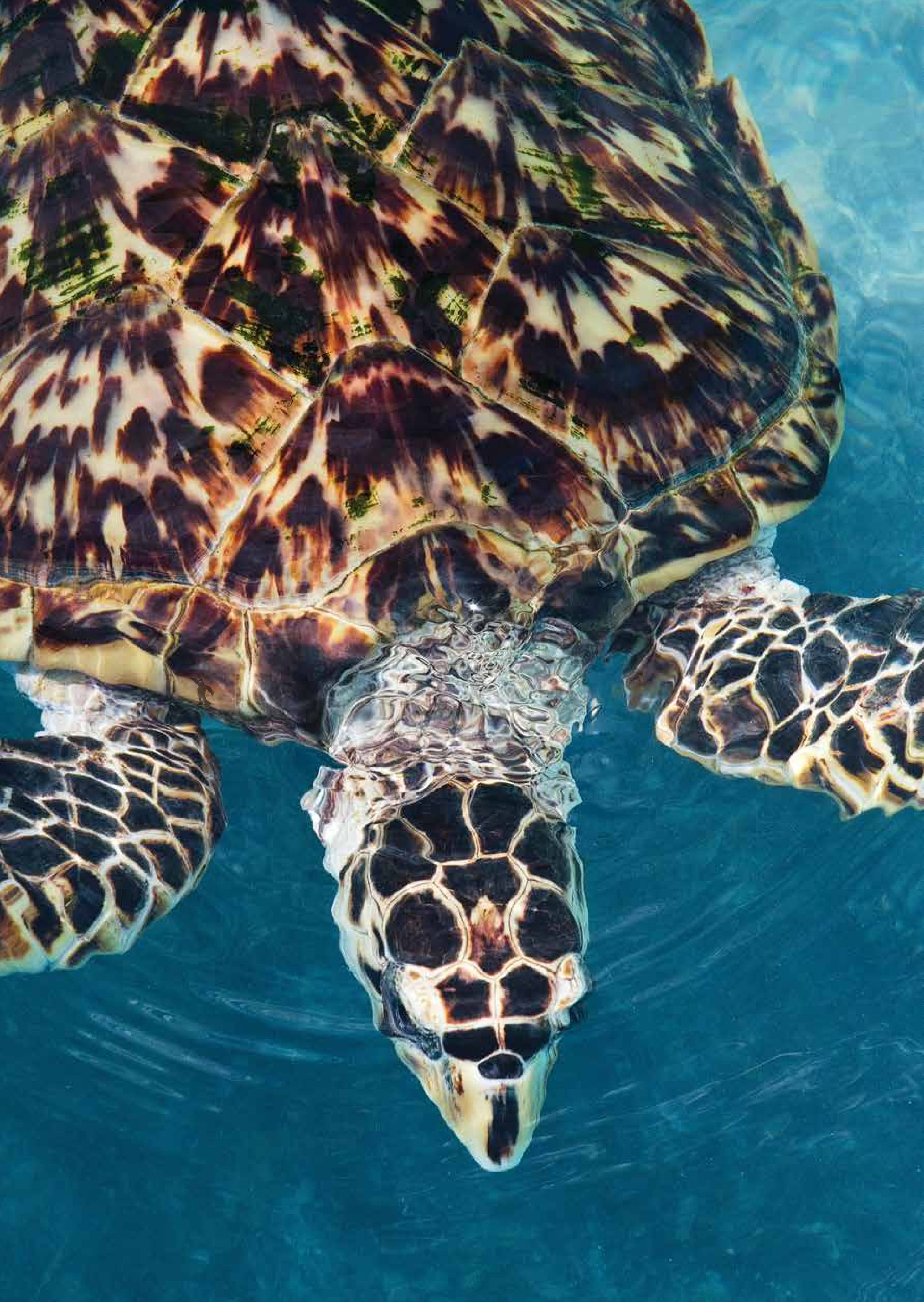
The South Pacific Ocean loggerhead subpopulation nests in eastern Australia and New Caledonia, and its marine habitats extend across a broad swath of the southern Pacific to the coasts of Peru and Chile in South America. This subpopulation is critically endangered because the nesting population in eastern Australia, where most nesting takes place, has declined by greater than 80 percent since the mid-1970s and continues to decline today because of effects that have not ceased and are not completely understood.

SOUTHWEST ATLANTIC OCEAN – Least Concern

Southwest Atlantic loggerheads nest along the coast of Brazil and inhabit waters of the southwest Atlantic Ocean, from northern Brazil to southern Argentina. Long-term monitoring of nesting beaches in Brazil shows an overall increase in this subpopulation, leading to the classification of least concern. The southwest Atlantic subpopulation should be considered conservation dependent because its current status is the result of decades of intense conservation programs, especially at nesting sites, that, if removed, would likely result in an immediate population decline.

SOUTHWEST INDIAN OCEAN – Near Threatened

The southwest Indian Ocean loggerhead subpopulation nests primarily on the northeast coast of South Africa in southern Mozambique and in southern Madagascar, and its marine habitats encompass the southwest Indian Ocean, as far north as Somalia; east to the Seychelles, Mauritius, and Reunion; and south around the Cape of Good Hope to coastal Namibia in the west. Long-term monitoring data from South Africa show an overall population increase, but the population qualifies as near threatened because of its small nesting distribution and limited number of nesting beaches.



Tortoiseshell

TOO RARE TO WEAR

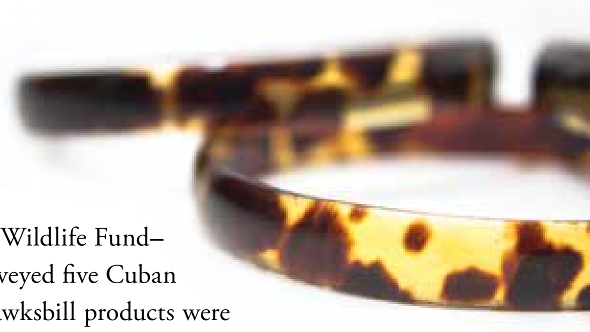
By BRAD NAHILL and WALLACE J. NICHOLS

Hawksbill shell, commonly called tortoiseshell, has been a precious commodity for centuries, and countless millions of turtles have been killed to supply craft markets along trade routes spanning the globe (see "Trade Routes for Tortoiseshell" in *SWOT Report*, vol. III, pp. 24–25). The industry slowed significantly with the inclusion of the hawksbill in the Convention on International Trade in Endangered Species (CITES) in 1977 and with Japan's 1992 ban on trade in *bekko* (the Japanese name for hawksbill shell). Market forces also played a key role in that many of the popular items formerly made from hawksbill (e.g., buttons, combs, eyeglass frames) are now more cheaply made from plastic—a rare example of how the proliferation of plastics has actually benefited sea turtles.

Although hawksbills now enjoy greater legal protections, the illegal trade in shell is still a grave threat to the species, both in Asia, where large seizures have recently been made in China and Vietnam, and in Latin America, where tortoiseshell is sold openly in markets and shops. Hawksbills remain critically endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, and populations continue to decline, with the notable exceptions of hawksbills in the Caribbean, where Cuba (the former top exporter of hawksbill shell to Japan) has stopped hunting, and in the Eastern Pacific, where previously unknown nesting areas have been identified in El Salvador and Nicaragua. Nonetheless, a strong recovery for hawksbills in the Western Hemisphere seems unlikely if the local sale of hawksbill shell trinkets is not effectively curtailed.

A 2002 WIDECAST (Wider Caribbean Sea Turtle Conservation Network) survey of hawksbill shell products in seven Central American countries found significant evidence of sales in Honduras, Nicaragua, Costa Rica, and Panama and less evidence of sales in Belize, Guatemala, and El Salvador. In Nicaragua, researchers for a 2012 study by Fauna & Flora International visited 169 souvenir shops and vendors and found hawksbill shell products for sale at 90 percent of them, including 16,000 rings, bracelets, and other products sold primarily to American and European tourists.

Fundación Tortugas del Mar, a previous SWOT grant recipient in Colombia, recently published a five-year study of tortoiseshell sales in the Caribbean tourist destination of Cartagena. The study found that the market is controlled by a relatively small number of vendors (between 15 and 24, depending on the year) that sell 1,800 to 2,800 pieces per year. The Cartagena trade may be supplied in part by shell harvested in Venezuela, where a separate study done by the Grupo de Trabajo en Tortugas Marinas del Golfo de Venezuela documented significant hunting of hawksbills by the Wayuu indigenous people, who report selling carapaces for up to US$300 for export to Colombia.



THIS PAGE: Hawksbill shell bracelets. © HAL BRINDLEY / TRAVELFORWILDLIFE.COM; AT LEFT: The hawksbill turtle's beautiful shell has been a precious commodity for centuries, contributing to the species' global decline. © PETE OXFORD

In Cuba, sale of hawksbill shell is no longer allowed, yet tortoiseshell products are still sold openly in local markets. A World Wildlife Fund–Cuba study in 2014 surveyed five Cuban cities and found that hawksbill products were being sold in 69 percent (29 of 42) of souvenir shops. The highest totals were found in the cities of Trinidad and Havana, where 90 percent and 65 percent of shops, respectively, were found selling tortoiseshell.

Too Rare To Wear is a newly formed coalition that is tackling the issue of hawksbill shell sales to tourists in Latin America and the Caribbean. This coalition of more than 40 conservation and tourism groups from across the region is conducting a regionwide survey of more than 30 tourist sites in eight countries to further determine the availability of tortoiseshell products and to help direct future action. The campaign will also focus on outreach to travelers to teach them how to recognize and avoid hawksbill shell when shopping for souvenirs. Efforts will be targeted at the most critical destinations according to the results of the initial survey.

Too Rare To Wear will reach travelers through media outlets and social media with graphics, guides, and videos and by working with leading tour operators to educate clients who are heading to Latin America for their vacation. Travelers are encouraged to sign a pledge to avoid tortoiseshell products and the vendors who sell them. In addition, Too Rare To Wear will work with local partners to support outreach campaigns in tourist hotspots to reach travelers at local markets and tourism businesses.

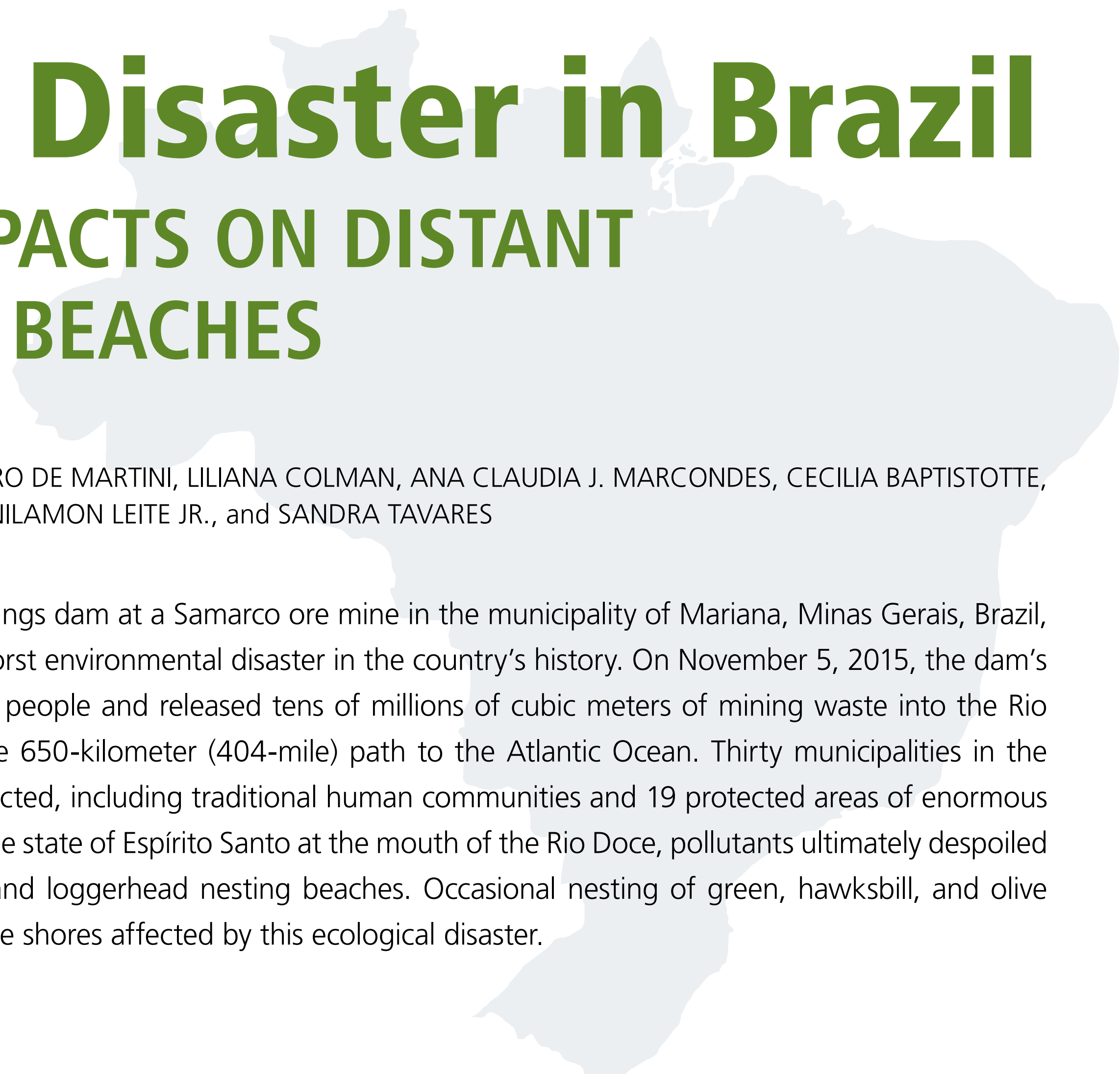
Ultimately, a major factor in whether the market for tortoiseshell continues is the demand for the product. Few outreach efforts have focused on travelers as the source of the demand, but if that market can be reached effectively, the economic incentive to hunt hawksbills for their carapace can be significantly reduced. ■

A Dam Disaster in Brazil

AND ITS IMPACTS ON DISTANT SEA TURTLE BEACHES

By JOÃO CARLOS THOMÉ, EVANDRO DE MARTINI, LILIANA COLMAN, ANA CLAUDIA J. MARCONDES, CECILIA BAPTISTOTTE, GABRIELLA TIRADENTES PIZETTA, NILAMON LEITE JR., and SANDRA TAVARES

The recent collapse of a tailings dam at a Samarco ore mine in the municipality of Mariana, Minas Gerais, Brazil, is now being called the worst environmental disaster in the country's history. On November 5, 2015, the dam's collapse led to the deaths of 19 people and released tens of millions of cubic meters of mining waste into the Rio Doce, thereby affecting its entire 650-kilometer (404-mile) path to the Atlantic Ocean. Thirty municipalities in the Rio Doce basin were directly affected, including traditional human communities and 19 protected areas of enormous natural and ecological value. In the state of Espírito Santo at the mouth of the Rio Doce, pollutants ultimately despoiled globally important leatherback and loggerhead nesting beaches. Occasional nesting of green, hawksbill, and olive ridley turtles also occurs along the shores affected by this ecological disaster.



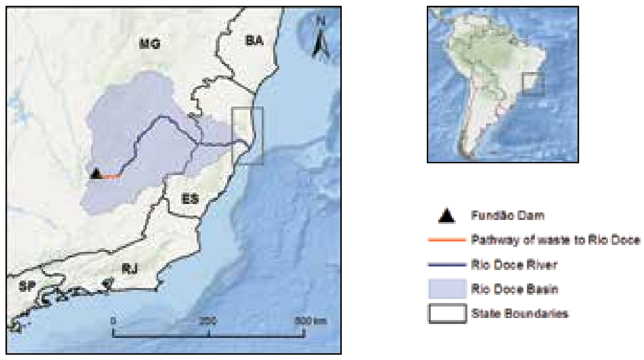
Leatherback turtles in Brazil belong to a distinct subpopulation that is considered critically endangered by the International Union for Conservation of Nature (see *SWOT Report*, vol. XI, pp. 28–31) because of its small size and restricted nesting range. In fact, the beaches in Espírito Santo are the only known regular nesting area for these genetically and biogeographically unique animals. Nests occur there in small but increasing numbers (50–200 nests per year). The area is also an important nesting ground for loggerhead turtles, with typically more than 2,000 nests laid per year in the state and a record number of more than 4,000 for 2015–16 during the tragedy.

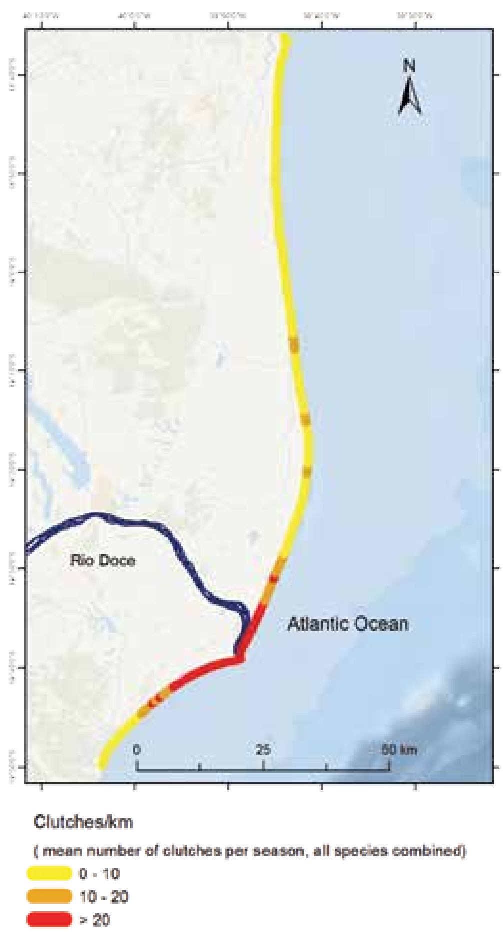
The waste plume from the Rio Doce reaches hundreds of kilometers into the sea to the north and south of the river mouth, and it changes shape and size daily, depending on oceanographic and climatic conditions. The Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) monitors the plume using helicopters and satellite imagery. IBAMA calculates that the dam's collapse has affected about 8,860 square kilometers (5,500 square miles) of ocean adjacent to Espírito Santo and the neighboring Brazilian states of Bahia and Rio de Janeiro. Because most of the waste remains in the Rio Doce basin and continues to flow to the sea, the areas must be monitored over time to fully understand the long-term impacts on beaches, mangroves, sediments, and wildlife, such as phytoplankton, zooplankton, crustaceans, fish, cetaceans, birds, and sea turtles. The results of these studies confirm elevated levels of iron, arsenic, cadmium, lead, and other metals in the waters, soils, and wildlife. Contamination of crustaceans and fish has already led authorities to ban fishing near the mouth of the Rio Doce and to enact other measures to protect human health.

Projeto TAMAR has been monitoring sea turtle nesting in the area annually since 1982. During the nesting season from September 2015 to March 2016, standard beach-monitoring procedures were carried out, and nests from areas exposed to tidal flooding or erosion were relocated. After the Samarco incident, nests laid near the river mouth were also relocated to prevent hatchlings from having their first ocean contact in polluted waters. No apparent change took place in the distribution of nests following the disaster, although hatchlings may have suffered nonlethal impacts that would be too difficult to measure at the outset. Such impacts, if any, may not be evident until those animals return as reproductively active adults in 20 to 30 years. To fully understand the long-term impacts of the spill on turtles and their habitats, we will need to investigate nest sediments, heavy metals in the eggs and tissues of nesting females, and blood samples from nesting females, as well as investigate reproductive fitness and hatchling success. Those parameters will be added to long-term research on leatherback reproduction and population trends being conducted by Projeto TAMAR in collaboration with the University of Exeter, United Kingdom.

On March 2, 2016, Samarco, Vale, and BHP Billiton (partners in the venture) signed a legal agreement with the government of Brazil, the states of Minas Gerais and Espírito Santo, and their respective environmental agencies. The agreement sets out general rules to remediate and compensate for the spill's environmental and socioeconomic impacts. It also calls for monitoring and studying the affected areas for the short and long terms in conjunction with Brazilian universities and other partners, including the Fundaçao Renova, an institution created to mitigate and repair damage from the Samarco spill.

Among other important lessons, this disaster serves as an unfortunate example of the weakness of legal requirements for risk assessment and impact studies related to mining activities in Brazil. Large-scale accidents, such as the Samarco incident, typically exceed the spatio-temporal emergency response planning of companies, government agencies, and nongovernmental organizations, yet the waste plume that can arise from those types of disasters respects no boundaries. To ensure that such disasters are effectively prevented in the future, industries must work hand-in-hand with all stakeholder government agencies, nongovernmental organizations, universities, and citizens from the earliest stages of project design. Such proactive collaboration is our only hope of preventing similar disasters in the future. ■

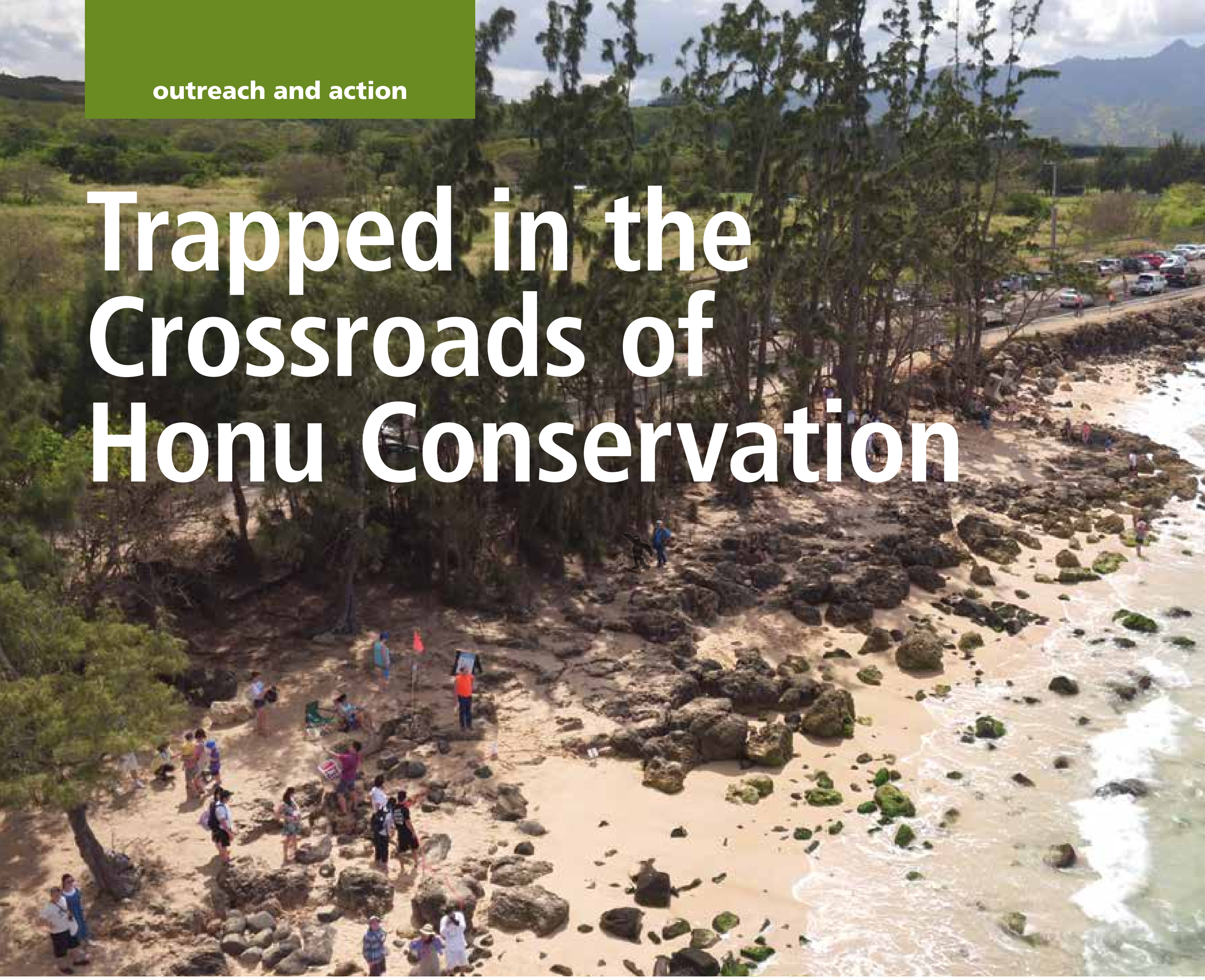




Data: Brazilian states – IBGE; Reproductive data, seasons 2010–11 to 2014–15 (before the disaster) – SITAMAR; Rio Doce Basin – ANA-MMA' Ocean Basemap – Esri Projection: SIRGAS 2000.

ABOVE: Maps showing the basin of the Rio Doce, the location of the Fundão Dam, the pathway of waste from the dam to the sea, and the density of sea turtle nesting near the mouth of the Rio Doce. © CENTRO TAMAR-ICMBIO

AT LEFT: An aerial photograph of the mouth of Brazil's Rio Doce shows the distant impact of a tailings dam failure 650 kilometers (404 miles) upstream. The beach is home to globally important leatherback and loggerhead nesting populations. © CENTRO TAMAR-ICMBIO



Trapped in the Crossroads of Honu Conservation

By IRENE KELLY and JENNIFER HOMCY

It is no secret that the Hawaiian green turtle population is recovering. The International Union for Conservation of Nature Red List classified the population as "least concern" in 2012, and the 2015 Endangered Species Act global status review concluded that Hawaii's population of approximately 4,000 nesting females per year was increasing at a rate of 5.4 percent annually, a significant achievement compared with only 37 nesters in 1973! The success of the Hawaiian green turtle, however, means that local *human* communities now face some new and unexpected challenges.

Sea turtles are a key part of Hawaii's cultural and economic heritage. Historically, Hawaii's abundant green turtles (or *honu* in Hawaiian) were overharvested, causing their numbers to drop precipitously during the 20th century. In the 1970s, state and federal protections were enacted, and the population responded as a result of strong commitments by native Hawaiians, residents, and wildlife managers. In the years that followed, the state experienced a tangible cultural and economic shift, as society moved from extractive to nonextractive uses of honu. Tourism is sea turtles' principal economic value in Hawaii now, and honu have become a globally recognized symbol of Hawaii's stature as one of the world's top vacation destinations.

Today, honu are thriving in Hawaiian waters, and people are learning to live, work, and recreate around them. They are so abundant, in fact, that one would be hard pressed to go to the beach and *not* see a turtle in the surf or basking on the shore. Some residents are happy about the honu's resurgence, whereas others express annoyance. Fishermen, for example, are challenged to cast a line in some spots without hooking a turtle. Beachgoers, too, must now share the beach with honu, because Hawaii is one of the few places in the world where turtles of both sexes and different age classes routinely emerge to rest on land. Honu sightings are a sought-after tourist attraction, and the turtles' easy accessibility has not gone

Today, honu are thriving in Hawaiian waters, and people are learning to live, work, and recreate around them.

unnoticed by the nature tourism industry, which brings visitors by car, van, and tour bus.

Although ecotourism can help improve public conservation awareness, it can also lead to irresponsible actions that may disturb resting or foraging turtles. Record tourist visitation and the soaring popularity of social media (announcing where honu may be seen at any moment) mean that interactions between people and sea turtles are frequent. Unfortunately, the potential exists for harmful and disrespectful interactions between people and turtles and between people with disparate interests. Managers are now confronted with the new challenge of finding ways to promote marine tourism experiences that are economically viable while balancing visitor expectations with the needs of the species, the environment, and the local culture. Furthermore, managing the intense pressure placed on local communities that find themselves trapped at the crossroads of conservation and their daily lives, with insufficient infrastructure to support the current and growing visitor numbers, has become an enormous challenge.

Over the past 20 years, Hawaii has witnessed a sharp increase in marine tourism, from surfing to SUPing (standup paddleboarding), snorkeling, diving, kayaking, boating, and wildlife-viewing tours. Such tourism has led to growing infrastructure needs, ranging from restroom and parking facilities to traffic control on land and at sea. Residents in some areas report that it is common to sit in two hours of traffic for what would once have been a 15-minute drive. The frustration and anger are palpable, and many locals describe the delays and disorder caused by the hordes of tourists as "turtle traffic."

Sadly, the feelings of reverence for honu felt by native Hawaiians and locals with generational ties to certain beaches or watersheds are now being overshadowed by frustration and conflict. Furthermore, some native Hawaiians or locals who may see an individual honu as their ʻaumākua (spiritual guardian) now harbor resentment when confronted with the disrespect paid to those animals by tourists who approach too closely for a "selfie" with a resting turtle, or when off-island interlopers attempt to tell the natives how to behave around what they perceive to be "their" honu. The "us versus them" animosity that such interactions have engendered is intense and undeniable.

At Laniakea Beach on the North Shore of Oahu, tourists park illegally and run across a busy two-lane highway to see basking turtles, thereby creating a turtle traffic bottleneck. Such conflict is on the rise throughout Hawaii as more and more turtles bask on beaches throughout the state and as communities struggle to make sense of their changing landscapes. The frustration deepens further as locals feel increasingly isolated—even abandoned—by the very agencies that are responsible for managing these conflicts. Wildlife enforcement officers commit almost no resources to enforcing harassment laws because no amount of human disturbance seems to deter turtles from thriving. The state of Hawaii and the Hawaii Tourism Authority (HTA) actively promote increasing tourism but simultaneously seem to resist costly infrastructure investments in roads, traffic management, parking, sidewalks, and parks or the implementation and enforcement of mandatory certification programs for ecotourism operators.

On the positive side, a number of community-based programs have emerged at two beaches on Oahu and Maui to manage and reduce negative human–turtle interactions. Volunteers dedicate time to educational outreach that promotes low-impact practices, such as viewing sea turtles from a respectful distance of at least 10 feet (3 meters). When people follow environmentally responsible guidelines, the turtles' basking or foraging behavior exhibits little change, and tourists are able to enjoy honu while still getting their desired photos. Two managed beaches are just a start toward dealing with the statewide pressures. Thus, the National Oceanic and Atmospheric Administration (NOAA) and its local partners are actively working with HTA to encourage lawful and responsible marketing and messaging, to manage visitor expectations, and to promote respectful honu viewing by tourists.

Our modern green turtle story continues to evolve and is far from complete. We find ourselves at an important crossroads in defining our new norm and accepting the variable landscape of species recovery affecting both honu and people in Hawaii. ■

An aerial view of Laniakea Beach on the North Shore of Oahu, Hawaii, shows how people stopping to watch a basking turtle contributes to traffic on the adjacent two-lane highway. © PAUL JAVIER

Traditional Taboos
Help Save Ghana's Sea Turtles

By PHIL ALLMAN and ANDREWS AGYEKUMHENE

The nation of Ghana in West Africa may be familiar to outsiders as the first sub-Saharan country in Africa to gain independence from colonialism, or as the first African nation visited by Barack Obama after he became president of the United States, or, more likely, for its soccer team (the Black Stars), which consistently upsets the teams of bigger nations. People who visit Ghana, however, know the country for the love its citizens show for their cultural heritage. Ghanaians are extremely proud of their country and show their infectious passion for tradition through their music and dance, their festivals, and even their livelihoods.

The presence of juju priests and fetish shrines in many communities serves as a reminder of longstanding religious traditions that integrate physical objects and spells in the worship of ancestral spirits or gods. The traditional strictures and taboos are often tied to conserving nature and protecting water bodies, forests, and animals. At least three major ethnic groups along Ghana's 550-kilometer (341.75 miles) coast respect a traditional rule that restricts fishing on Tuesdays, for instance, because Tuesdays are widely accepted as the day when the sea goddess and her children rest. When asked about the consequences of someone fishing on a Tuesday, Asua Kpakpa, a fisherman from Accra, simply stated, "If you dare go, you will see what human beings are not supposed to see on the high seas." If fishermen break the directive, they must face tribal leaders to account for their actions.

Some coastal communities also forbid fishing during certain times of the year. Others dictate fishing methods, and some even fully prohibit the consumption of certain fish species. When prohibited species are captured, they must be released unharmed because they are considered beloved children of the sea goddess, Mami Water. The traditional mores and rules may have originated as tools to increase community-based fishery management, to enhance fish production, or to protect fingerling-size fish from premature harvest. Indeed, many of the forbidden species are now known to have extremely low reproductive rates such that intense harvest could lead to local extinction. In the absence of scientific knowledge, traditional regulations have likely preserved many vulnerable fish species over the centuries.

Fishing communities in Ghana also respect a taboo against touching, harming, killing, or eating sea turtles. Recent surveys covering Ghana's entire coast indicate that this widely respected taboo serves two primary conservation functions: (a) making fishermen more aware of the five different species of sea turtles and (b) making fishermen more willing to protect turtles on land and in the sea.

The most common traditional story regarding the origin of the sea turtle taboo comes from the Ga and Akan ethnic groups of central Ghana. Members of those groups tell the tale of their ancestors being caught in a storm at night while fishing. The boat sank, and as the men were struggling to stay afloat, a group of sea turtles appeared and helped them back to shore. A similar story told by the Nzema and Ahanta groups in the west recounts that a slave ship was caught in a storm when a group of sea turtles rammed the hull of the sinking ship, bit off the shackles of the enslaved Ghanaians, and then helped them to reach the shore and freedom.

The Dangbe people of eastern Ghana, who live along the mouth of the Volta River, tell a more elaborate story dating back to the time that the Ashanti Empire was expanding eastward into Dangbe lands.

A wildlife guard watches a nesting leatherback turtle in Ada Foah, Ghana. © FRANS LANTING / WWW.LANTING.COM

The Ashanti outnumbered and overpowered the Dangbe, pushing them to the edge of the Volta River, where they were trapped between the river and a brutal Ashanti force. Just before the Ashanti warriors arrived for what may have been the deciding battle, sea turtles and crocodiles appeared in the river. The crocodiles lined up to form a bridge for the Dangbe people to safely retreat across the river, and the sea turtles assisted the injured and elderly who were unable to walk across the crocodile bridge. The sea turtles and crocodiles then dived back into the deep, preventing the Ashanti forces from crossing the river. The Dangbe people are still grateful to the crocodiles and sea turtles for saving the lives of their ancestors, and both animals are fully protected in that region of Ghana to this day.

Unfortunately, sea turtle conservation in Ghana has become more complicated than simply promoting traditional taboos. The tribal animist foundations on which these taboos are based are rapidly eroding because of the spread of secularism and the rise of Christianity and Islam among Ghanaians. Many of the customs and beliefs associated with traditional practices are now relegated to festivals and the tourism sector. Forest habitats in Ghana that once were protected as shrines are now being cleared for agricultural use. Freshwater habitats that once were protected as the homes of very powerful gods are now being polluted and overfished. Likewise, along the coast, fishing activity on Tuesday has become more common.

Transmigration also plays a role in the breakdown of those nature-protecting taboos. Many of today's coastal fishermen moved from inland communities, where hunting and agriculture have become increasingly difficult. Those fishermen do not adhere to the traditional stories of the coastal ethnic groups and, as a result, are routinely seen breaking traditional codes that date back hundreds of years. Sea turtles that are captured in fishing nets are more often slaughtered and sold at market than released as in days past because fishermen, locked in to a cash economy, must recover the expense of repairing the damaged net. Even nesting sea turtles are now poached in many coastal communities because of the large quantity of meat that one animal can provide.

The Ghana Turtle Research Project (GTRP) has worked for more than 10 years to engage community members in sea turtle conservation as a way of celebrating their culture and tradition. The GTRP helps communities establish and promote sea turtle ecotourism, works with fishermen to reduce sea turtle bycatch, and strives to empower local communities to take leading roles in implementing an array of programs that protect sea turtles and their habitats. More than 50 community members have created a volunteer network that helps in those efforts. The GTRP works to restore and reinforce Ghanaians' pride in their culture and traditions of nature protection and to ensure that the sea turtles that Ghanaians believe once helped their ancestors win battles, survive the sea's wrath, and attain freedom from the bonds of slavery will continue to enjoy the reverence they deserve. ■

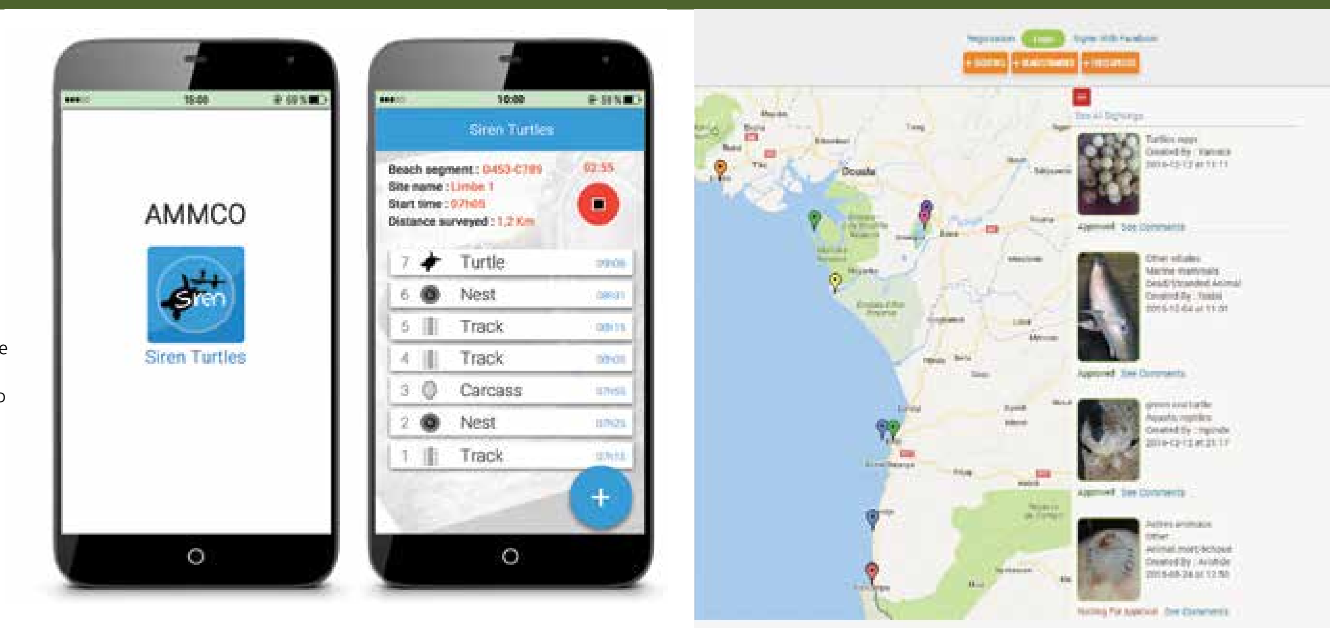
A New App Aids African Turtle Researchers

By ARISTIDE TAKOUKAM KAMLA

Marine megafauna, such as sea turtles and manatees, provide valuable ecosystem services, and the absence of those creatures in an ecological community can lead to severe imbalance. Up-to-the-minute data on megafauna presence and abundance are often hard to acquire, especially in places such as rural Africa, where obtaining data can be complex, expensive, and hampered by the absence of trained scientists. When the animals being studied also face hunting pressure as a result of poverty, weak legislation, or poor enforcement, the job of data collection can be even more challenging. The absence of accurate, up-to-date data can make conservation of these important creatures and their habitats very difficult.

To confront that challenge, in 2015 the African Marine Mammal Conservation Organization (AMMCO)—a Cameroon-based nongovernmental organization—created the first mobile phone application, SIREN, dedicated specifically to marine megafauna data collection in West Africa. SIREN is available on the Android phone platform in English and French. It provides a user-friendly, inexpensive way to acquire opportunistic data on marine megafauna in West Africa that can be used to guide conservation efforts. AMMCO staff members and partners piloted the application by providing smartphones with the SIREN app installed to 10 fishers from coastal Cameroon. The app enabled the participants to collect and record data (date, time, GPS location, species, identification photo, and more) on large marine animals whenever such animals were spotted. More than 100 sightings were recorded during the pilot study, and the corresponding data were shared with the SIREN database. AMMCO will make final adjustments to the app and has plans to promote and scale up the use of SIREN in West Africa and elsewhere in 2017.

In collaboration with Rastoma, the West African Sea Turtle Network, AMMCO is also developing a new version of the SIREN app, called SIREN-Turtles, to be used exclusively for sea turtle nest-monitoring research. Its purpose is to advance simple and systematic collecting and sharing of monitoring data about nesting beaches on a broad scale in Africa and beyond. SIREN-Turtles is being designed for use both online and offline and will be available in iOS, in Android, and through a web interface. The app will be produced in French and English, and other languages will be added in the future. SIREN-Turtles will facilitate temporal and spatial data gathering and will ensure secure data storage, quick processing, easy sharing, and enhanced comparability of data among multiple projects. Because data collected through SIREN-Turtles will match SWOT Minimum Data Standards for Nesting Beach Monitoring (see *SWOT Report*, vol. VI, p. 47), it will readily interface with SWOT's global database and with other local-, national-, or regional-scale databases. SIREN-Turtles will allow users to manage data online and to easily generate and export statistics and graphs. The app accepts data on live or dead turtles, nest data, and other biological parameters, as well as information on threats and conservation issues. SIREN-Turtles will open a whole new world for sea turtle researchers, thus enabling them to easily gather and use data to support decision making and to improve the protection of sea turtles locally, nationally, and globally. ■



THIS PAGE: Screenshots from the SIREN-Turtles mobile phone application, which is designed to facilitate sea turtle nesting data collection, and the online map interface displaying reported observation data. © AMMCO; AT RIGHT: A SIREN app user reports an observation in Lake Ossa, Cameroon. © AMMCO

Magic & Mixed Feelings in Turtle Paradise

By ISABEL SILVA

The words *island paradise* conjure a certain image in the mind, likely a place where one would go to experience what Dr. Wallace J. Nichols calls *Blue Mind*—"A mildly meditative state characterized by calm, peace, unity, and a sense of general happiness and satisfaction with life in the moment." And for readers of *SWOT Report*, this paradise likely has sea turtles, too, and palpable "turtle power." Earth rests balanced on the back of a turtle, after all, according to many indigenous cultures for which turtles are part of their spiritual family, laden with traditional significance and magic as well as practical value. Turtles have always been currency: meat, shells, eggs, decorations, even aphrodisiacs. Turtles, turtle stories, and turtle culture ignite passions and can drive people to the frontier where truth meets belief.

In the Northern Mozambique Channel lies an island called Vamizi, which has been at the center of trade, food production, and power struggles in the Indian Ocean since the 16th century. Today it is recognized as one of the planet's most magnificent and expensive island resorts—and a turtle conservation success story of magical proportions. Vamizi attracted conservation projects and scientists even before the resort's first guests were welcomed by none other than Nelson Mandela and Graça Machel, Mozambique's former first lady.

During more than a decade of conservation, Vamizi's 1,500 native residents have entirely turned away from their longstanding tradition of daily turtle consumption. The story appears to be an inspiring example of organization, innovation, and perseverance led by the hard-working Vamizi Conservation Team of Joana Trinidade, Isabel Silva, Cardoso Lopes, Wakati Daude, Raufo Mijai, and Momade Issa.

The remarkable evolution to zero turtle consumption began more than a decade ago. Turtles were always on Vamizi: hawksbills feeding between the coral reefs and green turtles coming to nest. Before the tourism lodge was built, the turtles were eaten, as seen in countless old photos. The turtle project started in 2003 by protecting nesting beaches. The Vamizi Conservation Team hired the best and most experienced turtle poachers to conduct nightly patrols. They found and marked the nests, digging them up after the eggs hatched to count the eggs and to free hatchlings trapped deep in the sand. Tourists assisted with measuring and marking the turtles, and fishermen and tourists

A storm brews above the idyllic waters of Vamizi Island, Mozambique. © TIM DYKMAN

gathered together to release the baby turtles. Villagers were amazed, asking, "Why do the tourists wake up in the middle of the night to see our turtles?"

Thrilled by their initial successes, the team began to reward fishermen who brought turtles that had been caught in their fishing nets. They organized theater performances, wrote songs, and created activities that put turtles in the spotlight. The program was so successful that the team was invited to other communities to talk about the importance of sea turtles and to show how turtles, by attracting tourists, had changed the lives of local people for the better. In a country where poverty makes turtle meat and eggs a very attractive source of inexpensive protein, giving up consuming turtles is an extraordinary achievement. The hard work and investment of the Vamizi Conservation Team and the commitment of the local villagers truly made Vamizi a magical oasis for turtles.

Or so people thought.

Recently, social scientists who visited Vamizi marveled that they never saw turtles being killed and that everyone positively affirmed that "in Vamizi, no one kills or eats turtles." The scientists conducted days of interviews, in which a surprising truth was uncovered about the team's perceived success when one villager offered a new clue in whispered tones, saying, "The turtles of Vamizi have a spell…. They receive a poison injection from the scientists, and if you eat one, you will die."

The Vamizi Conservation Team's pride and confidence were shaken, and their dream of magic was clouded by mixed feelings. On further questioning, they discovered that the local community had ceased to eat turtles not for reasons of conservation, nor in solidarity with the team, but rather because they believed that the tags used for research were actually "casting a spell." For years, the team had been attaching metal flipper tags on nesting turtles, affixing them with sturdy tagging pliers. When the villagers first observed this unusual (to them) procedure, the rumor quickly spread that the scientists were injecting the turtles with poison so that the villagers would die if they ate them.

For now, Vamizi's turtles are safe, and the newly emerging truths about local motivations for ceasing turtle consumption have served to harden the resolve of the Vamizi Conservation Team. They pledge to continue the work and to redouble their efforts to educate and engage residents, lodge guests, and all other stakeholders about the importance of conserving Vamizi's magical sea turtles—a key component of this island paradise. ■

Acting Globally

SWOT Small Grants 2016

Since 2006, SWOT small grants have helped field-based partners around the world realize their research and conservation goals. To date, we have given 65 grants (including the ones that follow) to 56 partners in more than 47 countries. SWOT grants are awarded annually to projects in each of SWOT's three areas of focus: (a) networking and capacity building, (b) science, and (c) education and outreach. The following are updates from each of our seven grantees in 2016. Visit **www.SeaTurtleStatus.org** to apply for a 2017 SWOT small grant!

CABO VERDE

Fundação Maio Biodiversidade

Cabo Verde is home to the third largest loggerhead rookery in the world, and Maio Island hosts the second most important nesting population in the archipelago. Despite Fundação Maio Biodiversidade's successful community-based sea turtle protection and monitoring program, a high rate of poaching and egg harvesting by locals remains. A 2016 SWOT grant will be used to train six local community members to monitor beaches and to act as ambassadors in communicating with their communities about sea turtle conservation. Hatchling releases will be conducted with local schoolchildren, community leaders and fishers, and members of a high school ecology club.

GHANA

Wildseas

Wildseas has worked with artisanal fishermen since 2011 to secure the release of sea turtles captured by fishers in the Gulf of Guinea. Fisheries bycatch is the single largest threat to the four sea turtle species that occur in the area. A 2016 SWOT grant will be used to expand the organization's Safe Release Program, which increases fisher awareness of sea turtle conservation and bycatch release methods. More than 700 adult turtles have already been successfully released through the program. The Safe Release Program will expand to the Shama fishing port, where an estimated 150 adult turtles are captured annually. Educational meetings will be held with the chief fishermen and with local boat owners to explain the project's objectives and benefits and to inform them of their crucial role in ensuring the program's success.

PHILIPPINES

Wildlife Friendly Enterprise Network

The Wildlife Friendly Enterprise Network (WFEN) will use its 2016 SWOT grant to develop onsite and online materials for the launch of its Sea Turtle Friendly program at various hotel properties in the Philippines. The new program aims to engage the hospitality industry in on-the-ground sea turtle conservation by certifying and highlighting businesses that have adopted expert-recommended best practices for sea turtle conservation. The materials produced with the SWOT grant will be targeted to tourists visiting hotels certified as Sea Turtle Friendly, and will highlight the sea turtle species found in the area, the hotel's efforts to support conservation, and the ways tourists can support sea turtle conservation during and beyond their stay. Materials will be tailored individually to each property and its guests and will be distributed online, onsite, and in-room at hotel properties.

CAMEROON

Association Camerounaise de Biologie Marine (ACBM)

Cameroon is an important foraging and nesting area for four species of sea turtles. In partnership with the Regional Sea Turtle Conservation Network of Central Africa (Rastoma), ACBM uses its beach-monitoring program to promote alternative incomes for people who earn their living in the sea turtle bushmeat trade. ACBM's 2016 SWOT grant will support the organization's 2016/2017 nest-monitoring program in southern Cameroon. Through the program, government and educational institutions will conduct field surveys with the help of local community volunteers. Data and observations will help to inform the creation of a national marine park and to strengthen the SWOT database and maps for the region.

GRENADA

Ocean Spirits

Grenada is home to a large concentration of nesting leatherbacks, which Ocean Spirits has been working to protect since 1999. In addition to making nightly patrols, Ocean Spirits conducts educational programs for local community members. A 2016 SWOT grant will build on the organization's existing education and public awareness projects and will help to launch a Sea Turtle Junior Ranger Program, which will select and empower 14 children from communities near key leatherback nesting sites. The program will include classroom and field-based activities, such as rainforest tours, nest excavations, hatchling releases, and nightly beach surveys. At the end of the nesting season, students will have the opportunity to share their experience with local community members.

MADAGASCAR

Association CEDTM – Kélonia

The Anosy region of Madagascar is home to some of the few remaining loggerhead nesting sites in the country, from which eggs are still harvested for consumption by locals with few economic alternatives. Using a 2016 SWOT grant, Association CEDTM – Kélonia will work closely with communities along this important coastline to raise awareness of sea turtle conservation and to implement nest protection. A known and respected local leader will coordinate the project, and villagers who participate will be paid twice the market price for each egg that hatches. Monitoring data will be collected and shared to further inform loggerhead sea turtle conservation in the area.

SENEGAL

African Chelonian Institute

All four sea turtle species occurring in Senegalese waters have a high mortality rate because of fishery pressures. The African Chelonian Institute (ACI) is working to better document the problem and its impact on turtles. ACI and IUCN Senegal conducted intensive beach surveys along a 184-kilometer (114-mile) stretch of the Senegalese coastline, documenting all strandings, performing necropsies, and sampling genetics from carcasses, and searching for signs of fishery interaction or other human-induced hazards. ACI used its 2016 SWOT grant to fund part of its continued efforts to conduct monthly beach surveys for one year to better inform stranding, nesting, and sighting data. The information collected will serve to initiate discussions with government agencies and fishers to explore possible methods to reduce fishery bycatch mortality.

SWOT Data Contributors

AFRICA

We are grateful to all who generously contributed their sea turtle data for inclusion in the maps on pages 24–29. We are especially grateful to the following individuals who went above and beyond to help coordinate and facilitate data contributions: Jérôme Bourjea, Mayeul Dalleau, Alexandre Girard, Marc Girondot, Shaya Honarvar, and Jeanne Mortimer. We simply could not have done this without you—**thank you**.

GUIDELINES OF DATA USE AND CITATION

The data that follow correspond directly to the maps on pages 24–29. In the case of nesting data included in the maps on pages 24–25 and 28–29, every data record is numbered to correspond with its respective point on the map. To use data for research or publication, you must obtain permission from the data provider(s).

Nesting Data Citations

DEFINITIONS OF TERMS

Clutches: A count of the number of nests of eggs laid by females during the monitoring period. **Crawl:** A female turtle's emergence onto the beach to nest. Such counts may include false crawls. **Nesting females:** A count of nesting female turtles observed during the monitoring period. **Year:** The year in which a given nesting season ended (e.g., data collected between late 2015 and early 2016 are listed as year 2016).

Nesting data are reported here from the most recent available nesting season. Beaches for which count data are not available are listed as "unquantified." A reported count of "N/A" indicates no data were reported for that species at the respective site. Additional metadata are available for many of the data records and may be found online at http://seamap.env.duke.edu/swot.

ANGOLA

DATA RECORD 1

Data Source: **(1)** Brian, C. 2007. Sea turtle nesting in Angola: Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007). **(2)** Carr, T., and N. Carr. 1991. Surveys of the sea turtles of Angola. *Biological Conservation* 58 (1): 19–29.
Nesting Beaches: Luanda (north) to Rio Longa (south)
Years: 2004 (*Dermochelys coriacea*) and 1985 (*Lepidochelys olivacea*) **Species and Counts:** *Dermochelys coriacea*—108 clutches; *Lepidochelys olivacea*—100 clutches
SWOT Contact: Conrad Brian

DATA RECORD 2

Data Source: Carr, T., and N. Carr. 1991. Surveys of the sea turtles of Angola. *Biological Conservation* 58(1): 19–29.
Nesting Beach: Cabinda Province
Year: 1983 **Species and Count:** *Lepidochelys olivacea*—5 clutches

DATA RECORD 3

Data Source: Ron, T. 2006. Leatherback nesting in Angola. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. I (2006).
Nesting Beaches: Beaches along the coast of the Cabinda Province in the north to Baia Farta
Year: 2002 **Species and Count:** *Dermochelys coriacea*—unquantified
SWOT Contact: Tamar Ron

DATA RECORD 4

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): 224–31.
Nesting Beaches: Benguela Province; Namibe Province; Palmeirinhas
Years: 2006, 2003, and 2005, respectively
Species and Counts: *Lepidochelys olivacea*—unquantified; *Chelonia mydas*—unquantified; *Dermochelys coriacea*—4 clutches, and *Lepidochelys olivacea*—120 clutches, respectively.
SWOT Contact: Tamar Ron

DATA RECORD 5

Data Source: Wildlife Conservation Society and Angola Liquid Natural Gas. 2009. *Marine Turtle Research and Conservation in the Sereia Peninsula, Angola: End of Season Report, June 2009*. Unpublished report.
Nesting Beaches: Sereia Peninsula from Ponta do Padrão to Sereia Beach
Year: 2008 **Species and Count:** *Lepidochelys olivacea*—181 clutches

BENIN

DATA RECORD 6

Data Source: Dossou-Bodjrenou, J. S., and A. Tehou. 2002. The status of efforts to protect Atlantic sea turtles in Benin (West Africa). In A. Mosier, A. Foley, and B. Brost (eds.), *Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation*, NOAA Technical Memorandum NMFS-SEFSC-477. Miami, FL: NOAA.
Nesting Beaches: Djegbadji; Grand-Popo; Hilla-Conji; Somo; Togbin
Year: 1999 **Species and Counts:** *Dermochelys coriacea*—unquantified

DATA RECORD 7

Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/ Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beaches: Beaches of Benin
Species and Counts: *Lepidochelys olivacea*—unquantified

DATA RECORD 8

Data Source: *Nature Tropicale. 2006.* Rapport d'activités n 0010/PTM/NT: Suivi écologique et protection des tortues marines sur le littoral du Benin (2005–2006).
Nesting Beaches: Avlo Embouchure and Gbecon (Grand-Popo)
Year: 2005 **Species and Counts:** *Dermochelys coriacea*—8 nesting females and 17 clutches, respectively
SWOT Contact: Joséa S. Dossou-Bodjrènou

CAMEROON

DATA RECORD 9

Data Source: Kudu Project—Cameroon component (Kudu à Tubé), A. Ayissi, H, Angoni, and J. Fretey. 2017. Sea turtle nesting in Cameroon: Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Bekolobé; Boussibelika; Ebodjé; Eboundja; Elombo; Ipeyendjé; Lolabé; Mbenddji; Nlendé
Years: 2014 for all except Lolabé, which is 2013
Species and Counts: *Chelonia mydas*—1 clutch at Ebodjé and 2 nests at Ipeyendjé; *Dermochelys coriacea*—2 clutches at Eboundja, 0 at all other beaches; *Lepidochelys olivacea*—5, 4, 1, 5, 0, 3, 5, 6, and 0 clutches, respectively.
SWOT Contacts: Isidore Ayissi and Hyacinthe Angoni

CABO VERDE

DATA RECORD 10

Data Source: López-Jurado, L. F., P. Sanz, and E. Abella. 2007. Loggerhead nesting on Boa Vista, República de Cabo Verde. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007).
Nesting Beach: Laiedo Texeira
Year: 2005 **Species and Count:** *Caretta caretta*—5,396 clutches
SWOT Contacts: Elena Abella-Perez, Luis Felipe López-Jurado, and Paula Sanz

DATA RECORD 11

Data Source: **(1)** Loureiro, N. S. 2009. Personal communication. In C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot. **(2)** Loureiro, N. S. 2010. Personal communication. In C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot.
Nesting Beaches: Mangue de Montenegro; Ribeira da Prata; Tarrafal; Achada Baleia; Praia Baixo
Years: 2008, 2008, 2008, 2009, and 2009, respectively **Species and Counts:** *Caretta caretta*—1, 19, 2, 23, and 15 clutches, respectively
SWOT Contact: Nuno de Santos Loureiro

DATA RECORD 12

Data Source: **(1)** Marco, A., E. Abella, A. Liria-Loza, S. Martins, O. López, S. Jiménez-Bordón, M. Medina, C. Oujo, P. Gaona, B. J. Godley, and L. F. López-Jurado. 2012. Abundance and exploitation of loggerhead turtles nesting in Boa Vista Island, Cabo Verde: The only substantial rookery in the eastern Atlantic. *Animal Conservation* 15: 351–60. **(2)** Marco, A., E. Abella, S. Martins, A. Liria-Loza, S. Jiménez Bordón, M. E. Medina Suarez, C. Oujo Alamo, O. López, and L. F. López-Jurado. 2013. The coast of Cape Verde constitutes the third largest loggerhead nesting population in the world. In J. Blumenthal, A. Panagopoulou, and A. F. Rees (eds.), *Proceedings of the Thirtieth Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-640. Miami, FL: NOAA.
Nesting Beaches: Beaches of Boa Vista Island
Year: 2009 **Species and Count:** *Caretta caretta*—19,950 clutches

DATA RECORD 13

Data Source: Martins, S., Soares, F., Abella, E., Koenen, F., and A. Marco. 2013. Importance of the Island of Maio (Cape Verde) for current and future loggerhead conservation in the eastern Atlantic. In T. Tucker, L. Belskis, A. Panagopoulou, A. F. Rees, M. Frick, K. Williams, R. LeRoux, and K. Stewart (eds.), *Proceedings of the Thirty-Third Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFC-645. Miami, FL: NOAA.
Nesting Beaches: Beaches of Maio Island
Year: 2012 **Species and Count:** *Caretta caretta*—1,001–5,000 clutches

DATA RECORD 14

Data Source: Rocha, P. R., Melo, T., Rebelo, R., and P. Catry. 2015. A significant nesting population of loggerhead turtles at the Nature Reserve of Santa Luzia, Cabo Verde. *Chelonian Conservation and Biology* 14(2): 161–66.
Nesting Beaches: Achados Beach, Santa Luzia Island; Francisca Beach, Santa Luzia Island; Palmo Tostão Beach, Santa Luzia Island
Years: 2013, 2013, and 2011, respectively
Species and Counts: *Caretta caretta*—286, 277, and 13 clutches, respectively

DATA RECORD 15

Data Source: Taylor, H., and J. Cozens. 2010. The effects of tourism, beachfront development and increased light pollution on nesting loggerhead turtles *Caretta caretta* (Linnaeus, 1758) on Sal, Cape Verde islands. *Zoologia Caboverdiana* 1(2): 100–11.
Nesting Beaches: Beaches of Sal Island
Year: 2010 **Species and Count:** *Caretta caretta*—357 clutches

COMOROS

DATA RECORD 16

Data Source: **(1)** Bourjea, J., M. Dalleau, S. Derville, F. Beudard, C. Marmoex, A. M'Soili, D. Roos, S. Ciccione, and J. Frazier. 2015. Seasonality, abundance, and fifteen-year trend in green turtle nesting activity at Itsamia, Moheli, Comoros. Endangered Species Research 27: 265–76. **(2)** Dalleau, M., S. Ciccione, J. A. Mortimer, J. Garnier, S. Benhamou, and J. Bourjea. 2012. Nesting phenology of marine turtles: Insights from a regional comparative analysis on green turtle (*Chelonia mydas*). *PLoS ONE* 7(10): e46920. **(3)** Bourjea, J. 2017. Sea turtle nesting in Itsamia, Comoros. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Itsamia (five beaches)
Years: 2000–2006 **Species and Count:** *Chelonia mydas*—5,000 estimated clutches per year
SWOT Contacts: Dhoihirdine Ahamada Bacar, Anfani M'Soili, Mayeul Dalleau, Claire Jean, Stéphane Ciccione, and Jérôme Bourjea

DATA RECORD 17

Data Source: **(1)** Kélonia/Ifremer TORSOOI database. **(2)** C3/HUPPE. 2010. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. VI (2011).
Nesting Beaches: Fomboni-Hoani

Year: 2010 **Species and Count:** *Chelonia mydas*—134 clutches
SWOT Contacts: Jérôme Bourjea, Stéphane Ciccione, Chris Poonian, and Claire Jean

CONGO, REPUBLIC OF THE

DATA RECORD 18

Data Source: (1) Bréheret, N., T. Bourget, A. Berry, and A. Girard. 2012. *Rapport d'activité du programme d'étude et conservation des tortues marines au Congo: Saison 2011–2012.* Rénatura. **(2)** Breheret, N., A. Berry, J.-G. Mavoungou, and A. Girard. 2013. *Study and Conservation of Sea Turtles Nesting in the Republic of Congo: Season 2012–2013.* Rénatura. **(3)** Breheret, N., S. Pourcel, J.-G. Mavoungou, and A. Girard. 2014. *Study and Conservation of Sea Turtles Nesting in the Republic of Congo: Season 2013–2014.* Rénatura.
Nesting Beach: Bas-Kouilou Sud
Year: 2013 **Species and Counts:** *Chelonia mydas*—2 clutches; *Dermochelys coriacea*—11 clutches; *Lepidochelys olivacea*—4 clutches
SWOT Contacts: Nathalie Bréheret and Jean-Gabriel Mavoungou

DATA RECORD 19

Data Source: (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. Bréheret, 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
Year: 2005 **Species and Counts:** *Lepidochelys olivacea*—302 clutches

DATA RECORD 21

Data Source: Rénatura Congo. 2017. Sea turtle nesting in Republic of the Congo: Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Bas-Kouilou Nord; Bellelo and Longo-Bondy; Cabinda Frontier; Djeno; Mvassa; Pointe-Noire
Year: 2014 **Species and Counts:** *Chelonia mydas*—2, 0, 0, 1, 5, and 0 clutches, respectively; *Dermochelys coriacea*—3, 20, 9, 17, 9, and 2 clutches, respectively; *Lepidochelys olivacea*—27, 37, 14, 150, 175, and 69 clutches, respectively
SWOT Contacts: Nathalie Bréheret and Jean-Gabriel Mavoungou

CONGO, DEMOCRATIC REPUBLIC OF THE

DATA RECORD 22

Data Source: Mbungu, S., C. Collet, A. Girard, and M. Girondot. 2013. *Nesting Report ACODES 2012.*
Nesting Beaches: Nsiamfumu; Tonde; Banana
Year: 2013 **Species and Counts:** *Lepidochelys olivacea*—19, 39, and 48 clutches, respectively
SWOT Contact: Samuel Mbungu Ndamba

CÔTE D'IVOIRE

DATA RECORD 23

Data Source: Peñate, J. G. 2017. Sea turtle nesting in Côte d'Ivoire. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beach: Mani-Kablaké
Year: 2015 **Species and Counts:** *Chelonia mydas*—47 clutches; *Dermochelys coriacea*—64 clutches; *Lepidochelys olivacea*—504 clutches
SWOT Contact: José Gómez Peñate

DATA RECORD 24

Data Source: Fretey, J. 1999. Repartition des tortues du genre Lepidochelys Fitzinger, 1843. I. L'Atlantique ouest. *Biogeographica* 75(3): 97–117.
Nesting Beaches: Dagbego; Monogaga
Year: 1999 **Species and Counts:** *Lepidochelys olivacea*—unquantified at both sites

DATA RECORD 25

Data Source: (1) Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany. **(2)** Fretey, J. 1999. Repartition des tortues du genre Lepidochelys Fitzinger, 1843. I. L'Atlantique ouest. *Biogeographica* 75(3): 97–117.
Nesting Beaches: Many; Dodo
Species and Counts: *Eretmochelys imbricata*—unquantified; *Lepidochelys olivacea*—unquantified

DATA RECORD 26

Data Source: Gómez, J. 2006. Projet de conservation de tortues marines en Côte d'Ivoire. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007).
Nesting Beaches: Abréby; Addah; Jacqueville; Noumouzou; Taki to Blieron
Years: 2004, 2005 (Taki to Blieron only)
Species and Counts: *Dermochelys coriacea*—3, 7, 15, 6, and unquantified clutches, respectively
SWOT Contact: José Gómez Peñate

DATA RECORD 27

Data Source: Gómez, J. 2012. Sea turtle nesting in Côte d'Ivoire. Personal communication. In. C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot.
Nesting Beach: Mondoukou
Year: 2010 **Species and Counts:** *Dermochelys coriacea*—11 clutches; *Lepidochelys olivacea*—32 clutches
SWOT Contact: José Gómez Peñate

DATA RECORD 28

Data Source: (1) Gómez, J. 2006. Projet de conservation de tortues marines en Côte d'Ivoire. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007). **(2)** Góomez, J., B. Sory, and K. Mamadou. 2003. A preliminary survey of sea turtles in the Ivory Coast. In J. A. Seminoff (ed.), *Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation.* NOAA Technical Memorandum NMFS-SEFSC-503. Miami, FL: NOAA.
Nesting Beaches: Pitike; Soublake
Years: 2004 (*Dermochelys coriacea*), 2001 (*Lepidochelys olivacea*) **Species and Counts:** *Dermochelys coriacea*—121 and 41 clutches, respectively; *Lepidochelys olivacea*—72 and 50 clutches, respectively
SWOT Contact: José Gómez Peñate

EQUATORIAL GUINEA

DATA RECORD 29

Data Source: Fallabrino, A., and TOMAGE. 2016. Sea turtle nesting in Equatorial Guinea. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Ilende; Nendyi; Tika
Years: 2015 (Ilende and Tika), 2011 (Nendyi)
Species and Counts: *Dermochelys coriacea*—1–25, 1–25, and 1–25 clutches, respectively; *Lepidochelys olivacea*—25–100, N/A, and 1–25 clutches, respectively
SWOT Contact: Alejandro Fallabrino

DATA RECORD 30

Data Source: Formia, A. 1999. Les tortues marines de la baie de Corisco. *Canopée* 14: i–ii.
Nesting Beach: Cabo San Juan
Year: 1999 **Species and Count:** *Lepidochelys olivacea*—unquantified

DATA RECORD 31

Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series* no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beaches: Beaches north of Bata; Corsico Island
Year: 2001 **Species and Counts:** *Chelonia mydas*—unquantified at all sites; *Lepidochelys olivacea*—none and unquantified, respectively

DATA RECORD 32

Data Source: (1) Hearn, G. W., H. Rader, and J. L. Bradsby. 2006. Leatherback nesting in Bioko Island, Equatorial Guinea. In *SWOT Report—State of the World's Sea Turtles*, vol. 1 (2006). **(2)** Tomás, J., B. J. Godley, J. Castroviejo, and J. A. Raga. 2010. Bioko: Critically important nesting habitat for sea turtles of West Africa. Biodiversity and Conservation 19(9): 2699–2714.
Nesting Beaches: Beach B; Beach D
Years: 2005 (*Dermochelys coriacea* and *Eretmochelys imbricata*), 1997 (*Chelonia mydas* and *Lepidochelys olivacea*) **Species and Counts:** *Chelonia mydas*—444 and 218 clutches, respectively; *Dermochelys coriacea*—132 and 575 clutches, respectively; *Eretmochelys imbricata*—0 clutches at both sites; *Lepidochelys olivacea*—19 and 28 clutches, respectively
SWOT Contact: Gail W. Hearn

DATA RECORD 33

Data Source: (1) Rader, H., S. Nsue Esono, J. Bradsby, W. Morra, and G. Hearn. 2006. Leatherback nesting in Bioko Island, Equatorial Guinea. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007). **(2)** Tomás, J., B. J. Godley, J. Castroviejo, and J. A. Raga. 2010. Bioko: Critically important nesting habitat for sea turtles of West Africa. *Biodiversity and Conservation* 19(9): 2699–2714.
Nesting Beaches: Beach A; Beach C; Beach E
Years: 2005 (*Dermochelys coriacea* and *Eretmochelys imbricata*), 1997 (*Chelonia mydas* and *Lepidochelys olivacea*)
Species and Counts: *Chelonia mydas*—464, 17, and 3 clutches, respectively; *Dermochelys coriacea*—137, 571, and 712 clutches, respectively; *Eretmochelys imbricata*—0, 2, and 0 clutches, respectively; *Lepidochelys olivacea*—5, 0, and 10 clutches, respectively
SWOT Contact: Gail W. Hearn

DATA RECORD 34

Data Source: Tomás, J., B. J. Godley, J. Castroviejo, and J. A. Raga. 2010. Bioko: Critically important nesting habitat for sea turtles of West Africa. *Biodiversity and Conservation* 19(9): 2699–2714.
Nesting Beach: Beach F
Year: 1997 **Species and Counts:** *Chelonia mydas*—109 clutches; *Dermochelys coriacea*—649 clutches; *Eretmochelys imbricata*—0 clutches; *Lepidochelys olivacea*—22 clutches

DATA RECORD 35

Data Source: Honarvar, S., D. B. Fitzgerald, C. L. Weitzman, E. M. Sinclair, J. M. Escara Echube, M. O'Connor, and G. W. Hearn. 2016. Assessment of important marine turtle nesting populations on the southern coast of Bioko Island, Equatorial Guinea. *Chelonian Conservation and Biology* 15(1): 79–89.
Nesting Beaches: Bioko Island—southern
Year: 2013 **Species and Counts:** *Chelonia mydas*—2,571 crawls; *Dermochelys coriacea*—3,010 crawls; *Eretmochelys imbricata*—5 crawls; *Lepidochelys olivacea*—176 crawls
SWOT Contact: Shaya Honarvar

DATA RECORD 36

Data Source: Tomás, J., J. Castroviejo, and J. A. Raga. 1999. Sea turtles in the South of Bioko Island (Equatorial Guinea). *Marine Turtle Newsletter* 84: 4–6.
Nesting Beaches: Beaches between Punta Oscura and Punta Santiago
Year: 2006 **Species and Counts:** *Lepidochelys olivacea*—150 clutches

FRENCH OVERSEAS TERRITORIES —ÉPARSES ISLANDS, LA RÉUNION, MAYOTTE

DATA RECORD 37

Data Source: (1) Jean, C., S. Ciccione, S. Bourjea, and M. Dalleau. 2017. Sea turtle nesting in French Southern Territories. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Ciccione, S., and J. Bourjea. 2006. Nesting of green turtles in Saint-Leu, Réunion Island. *Marine Turtle Newsletter* 112: 1–3. **(3)** Ciccione S., and J. Bourjea. 2010. Nesting beach revegetation and its influence on green turtle (*Chelonia mydas*) conservation in Réunion Island. *Indian Ocean Turtle Newsletter* 11: 50–52.
Nesting Beaches: La Réunion
Year: 2015 **Species and Counts:** *Chelonia mydas*—1 clutch
SWOT Contacts: Claire Jean, Stéphane Ciccione, Jérôme Bourjea, and Mayeul Dalleau

DATA RECORD 38

Data Source: (1) Jean, C., S. Ciccione, J. Bourjea, and M. Dalleau. 2017. Sea turtle nesting in French Southern Territories. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Le Gall, J. Y., P. Bosc, D. Chateau, and M. Taquet. 1986. Estimation du nombre de tortues vertes femelles adultes *Chelonia mydas* par saison de ponte à Tromelin et Europa (Océan Indien) (1973–1985). *Océanographie Tropicale* 21(1): 3–22. **(3)** Lauret-Stepler, M., J. Bourjea, D. Roos, D. Pelletier, P. Ryan, S. Ciccione, and H. Grizel. 2007. Reproductive seasonality and trend of *Chelonia mydas* in the SW Indian Ocean: A 20 yr study based on track counts. *Endangered Species Research* 3: 217–227. **(4)** Derville, S., C. Jean, M. Dalleau, J. Y. Le Gall, S. Ciccione, and J. Bourjea. 2015. Monitoring green turtles and nests on Tromelin Island reveals stable reproduction and population parameters over time. *Chelonian Conservation and Biology* 14(1): 11–20.
Nesting Beaches: Europa and Tromelin (Éparses Islands)
Year: 2015 **Species and Counts:** *Chelonia mydas*—20,727 and 14,787 crawls, respectively
SWOT Contacts: Claire Jean, Stéphane Ciccione, Jérôme Bourjea, and Mayeul Dalleau

DATA RECORD 39

Data Source: (1) Jean, C., S. Ciccione, J. Bourjea, and M. Dalleau. 2017. Sea turtle nesting in French Southern Territories. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Dalleau, M., S. Ciccione, J. A. Mortimer, J. Garnier, S. Benhamou, and J. Bourjea. 2012. Nesting phenology of marine turtles: Insights from a regional comparative analysis on green turtle (*Chelonia mydas*). PLoS ONE 7(1): e46920. **(3)** Bourjea. J., S. Cicclone, M. Lauret-Stepler, C. Marmoex, and C. Jean. 2011. Les Îles Éparses: 25 ans de recherche sur les tortues marines. *Bulletin de la Société Herpétologiue de France* 139–140: 95–111.
Nesting Beaches: Glorieuses (Éparses Islands)
Year: 2015 **Species and Count:** *Chelonia mydas*—9,615 crawls
SWOT Contacts: Claire Jean, Stéphane Ciccione, Jérôme Bourjea, and Mayeul Dalleau

DATA RECORD 40

Data Source: (1) Jean, C., S. Ciccione, J. Bourjea, and M. Dalleau. 2017. Sea turtle nesting in French Southern Territories. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Lauret-Stepler, M., S. Ciccione, and J. Bourjea. 2010. Monitoring of marine turtles reproductive activities in Juan de Nova, Éparses Islands, South Western Indian Ocean, based on tracks count and width. *Indian Ocean Turtle Newsletter* 11: 18–24.
Nesting Beaches: Juan de Nova (Éparses Islands)
Year: 2015 **Species and Counts:** *Chelonia mydas*—382 crawls; *Eretmochelys imbricata*—63 crawls
SWOT Contacts: Claire Jean, Stéphane Ciccione, Jérôme Bourjea, and Mayeul Dalleau

DATA RECORD 62

Data Source: (1) Quillard, M., and K. Ballorain. 2017. Sea turtle nesting in Mayotte. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Quillard, M. 2011. Les tortues marines à Mayotte: Bilan des actions de protection et perspectives. *Bulletin de la Société Herpétologique de France* 139–140: 113–129. **(3)** Philippe J.-S., J. Bourjea, S. Ciccione, K. Ballorain, S. Marinesque, and Z. Glenard. 2014. *Plan national d'actions en faveur des tortues marines des territoires français de l'Océan Indien: La Réunion, Mayotte et Îles Éparses (2015–2020).* Vols. 1–4. Ministère de l'Écologie, du Développement durable et de l'Énergie, Direction de l'Environnement, de l'Aménagement et du Logement de La Réunion. **(4)** Bourjea, J., J. Frappier, M. Quillard, S. Ciccione, S. Roos, G. Hughes, and H. Grizel. 2007. Mayotte Island: Another important green turtle nesting site in the South West Indian Ocean. *Endangered Species Research* 3: 273–282. **(5)** Bourjea, J., and M. Dalleau. In preparation. Red List Assessment: Green turtle, *Chelonia mydas*, Southwest Indian Ocean subpopulation.
Nesting Beaches: Mayotte Island (combined data from Moya [2 beaches] and Saziley [6 beaches])
Years: 2014 (Moya), 2015 (Saziley) **Species and Count:** *Chelonia mydas*—2,598 crawls (Moya) and 6,288 estimated clutches per year (Saziley)
Nesting Beach: Mayotte Island (all beaches)
Year: 2013 **Species and Count:** *Eretmochelys imbricata*—50 crawls
SWOT Contacts: Mireille Quillard, Katia Ballorain, and Jérôme Bourjea

GABON

DATA RECORD 41

Data Source: Formia, A. 1999. Les tortues marines de la Baie de Corisco. *Canopée* 14: i–ii.
Nesting Beaches: Hoco Island; Mbanye Island
Year: 1999 **Species and Counts:** *Lepidochelys olivacea*—unquantified at both sites

DATA RECORD 42
Data Source: Girard, A., M. C. Godgenger, A. Gibudi, J. Fretey, A. Billes, D. Roumet, G. Bal, N. Bréhéret, A. Bitsindou, H. Van Leeuwe, B. Verhage, S. Ricois, J. P. Bayé, J. Carvalho, H. Lima, E. Neto, H. Angoni, I. Ayissi, C. Bobeya, J. Folack, J. R. Ngueguim, and M. Girondot. 2016. Marine turtles nesting activity assessment and trend along the Central African Atlantic Coast for the period of 1999–2008. *International Journal of Marine Science and Ocean Technology* 3(3): 21–32.
Nesting Beaches: Pongara; Gamba; Mayumba
Year: 2006 **Species and Counts:** *Chelonia mydas*—25, 10, and 20 clutches, respectively; *Dermochelys coriacea*—6,900, 2860, and 35,000 clutches, respectively; *Eretmochelys imbricata*—5, 10, and N/A clutches, respectively; *Lepidochelys olivacea*—72, 155, and 2,500 clutches, respectively
SWOT Contacts: Alexandre Girard and Marc Girondot

DATA RECORD 43
Data Source: **(1)** Mounguéngui, G.-A., and B. Verhage. 2007. Update after Five Years of Marine Turtle Monitoring in Gamba, Gabon (2002–2007). Gamba, Gabon: Ibonga ACPE and World Wildlife Fund. **(2)** Mounguéngui, G.-A., and B. Verhage. 2008. *Activités de recherche et de suivi des tortues marines sur les plages de Gamba au Gabon.* Gamba, Gabon: Ibonga ACPE and World Wildlife Fund. **(3)** Verhage, B., E. B. Moundjim, and S. R. Livingstone. 2006. *Four years of Marine Turtle Monitoring in the Gamba Complex of Protected Areas, Gabon, Central Africa, 2002–2006.* Gamba, Gabon:World Wildlife Fund.
Nesting Beach: Pont Dick
Years: 2004 (*Eretmochelys imbricata*), 2007 (*Lepidochelys olivacea*) **Species and Counts:** *Eretmochelys imbricata*—0 clutches; *Lepidochelys olivacea*—61 crawls
SWOT Contacts: Bas Verhage and Aimee Leslie

GAMBIA, THE

DATA RECORD 44
Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beaches: Niumi National Park (Sine-Saloum)
Species and Count: *Chelonia mydas*—unquantified

GHANA

DATA RECORD 45
Data Source: **(1)** Adjei, R., G. Boakye, and S. Adu. 2001. Organisational profile: Ghana Wildlife Society. *Marine Turtle Newsletter* 93: 11–12. **(2)** Beyer, K., W. Ekau, and J. Blay. 2002. Sea turtle nesting and the effect of predation on the hatching success of the olive ridley (*Lepidochelys olivacea*) on Old Ningo Beach, Ghana, West Africa. In A. Mosier, A. Foley, and B. Brost (compilers), *Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation*, NOAA Technical Memorandum NMFS-SEFSC-477. Miami, FL: NOAA.
Nesting Beach: Ningo-Prampram
Year: 2001 **Species and Counts:** *Dermochelys coriacea*—unquantified

DATA RECORD 46
Data Source: Agyekumhene, A., and P. Allman. 2016. Sea turtle nesting in Ghana. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beach: Winneba
Year: 2015 **Species and Counts:** *Chelonia mydas*—5 clutches; *Dermochelys coriacea*—2 clutches; *Lepidochelys olivacea*—84 clutches
SWOT Contact: Andrews Agyekumhene

DATA RECORD 47
Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animal Secretariat, Bonn, Germany.
Nesting Beaches: Ada-Foah; Keta-Anloga; Ningo-Prampram
Species and Counts: *Lepidochelys olivacea*—unquantified at all sites

DATA RECORD 48
Data Source: Wildlife Division of the Forestry Commission. 2011. Sea turtle nesting in central region of Ghana. Final annual reports from an ongoing nesting beach survey.
Nesting Beach: Warabeba
Year: 2011 **Species and Counts:** *Chelonia mydas*—1 clutch; *Dermochelys coriacea*—1 clutch; *Lepidochelys olivacea*—10 clutches
SWOT Contact: Andrews Agyekumhene

GUINEA

DATA RECORD 49
Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beaches: Beaches of Roume Island
Species and Count: *Eretmochelys imbricata*—unquantified

GUINEA-BISSAU

DATA RECORD 50
Data Source: Ferreira Airaud, M. B, A. Regalla, and Institute for Biodiversity and Protected Areas of Guinea-Bissau. 2015. Sea turtle nesting in Bijagós Archipelago, Guinea-Bissau. Personal communication. In C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot.
Nesting Beaches: Orango National Park and Poilão (Bijagós Archipelago)
Years: 2014 (*Chelonia mydas* and *Eretmochelys imbricata*), 2013 (*Lepidochelys olivacea* and *Dermochelys coriacea*) **Species and Counts:** *Chelonia mydas*—424 clutches and 41,042 crawls, respectively; *Dermochelys coriacea*—1 and N/A clutches, respectively; *Eretmochelys imbricata*—N/A and 2 clutches, respectively; *Lepidochelys olivacea*—55 and N/A clutches, respectively
SWOT Contacts: M. Betânia Ferreira Airaud and Aissa Regalla

KENYA

DATA RECORD 51
Data Source: Olendo, M. I., and World Wildlife Fund Kenya. 2017. Sea turtle nesting in Kenya. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Ashuwei; Chandani; Chole; Chongo Katiti; Chunduni; Ishakani; Kitanga Kikuu; Kitanga Kipiya; Kitangani; Kiunga Mwini; Kiwayu; Kongoale; KSV; Kui; Magogo; Mdoa; Mkokoni; Mongo Shariff; Mongoni; Mtumumwe; Mvundeni; Mwanabule; Ngazini; Porcupine; Rubu; Tangome; Usini; WWF/KWS [all beaches are in Lamu County]
Year: 2015 **Species and Counts:** *Chelonia mydas*—1, 22, 0, 1, 0, 0, 34, 3, 0, 2, 4, 10, 11, 0, 5, 1, 1, 34, 1, 0, 1, 6, 0, 7, 0, 0, 0, and 8 clutches, respectively; *Eretmochelys imbricata*—1 clutch (Kongoale); *Lepidochelys olivacea*—1 clutch (Kongoale)
SWOT Contact: Mike Izava Olendo

DATA RECORD 52
Data Source: **(1)** Okemwa, G. M., and A. Wamukota. 2006. An overview of the status of green turtles (*Chelonia mydas*) in Kenya. In M. Frick, A. Panagopoulou, A. F. Rees, and K. Williams (eds.), *Proceedings of the Twenty-Sixth Annual Symposium on Sea Turtle Biology and Conservation.* Athens, Greece: International Sea Turtle Society. **(2)** Okemwa, G. M., S. Nzuki, and E. M. Muenis. 2004. The status and conservation of sea turtles in Kenya. *Marine Turtle Newsletter* 105: 1–6.
Nesting Beaches: Watamu; Mombasa
Year: 2000 **Species and Counts:** *Chelonia mydas*—2 and N/A clutches, respectively; *Lepidochelys olivacea*—4 and 8 clutches, respectively

LIBERIA

DATA RECORD 53
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 Beaches: Probable nesting on extreme southern beaches
Year: 2007 **Species and Counts:** *Lepidochelys olivacea*—unquantified

DATA RECORD 54
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 Beaches: Bafu Bay; Borgor Point
Year: 2006 **Species and Counts:** *Eretmochelys imbricata*—7 and 8 clutches, respectively

MADAGASCAR

DATA RECORD 55
Data Source: **(1)** Jean, C., S. Ciccione, J. Bourjea, M. Dalleau, and I. Vandry. 2017. Sea turtle nesting in Iranja Kely, Madagascar. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017). **(2)** Bourjea, J., S. Ciccione, and R. Ratsimbazafy. 2006. Marine turtles surveys in Nosy Iranja Kely, North-Western Madagascar. *Western Indian Ocean Journal of Marine Science* 5(2): 209–12.
Nesting Beach: Iranja Kely
Year: 2015 **Species and Counts:** *Chelonia mydas*—208 clutches; *Eretmochelys imbricata*—17 clutches
SWOT Contacts: Claire Jean, Stéphane Ciccione, Jérôme Bourjea, Mayeul Dalleau, and Ignace Vandry

DATA RECORD 56
Data Source: Frontier-Madagascar. 2003. *Artisanal and traditional turtle resource utilisation in South West Madagascar.* Toliara, Madagascar: U.K. Society for Environmental Exploration and Institute of Marine Sciences, University of Toliara.
Nesting Beaches: Beaches around Besambay and Maromena
Year: 2004 **Species and Counts:** *Caretta caretta*—unquantified

DATA RECORD 57
Data Source: **(1)** Gladstone, N. 2007. Loggerhead nesting in Madagascar. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007). **(2)** Gladstone, N., F. Andriantahina, and B. Soafiavy. 2003. *Azafady Project Fanomena Final Report.* Unpublished manuscript.
Nesting Beaches: Beaches between Fort-Dauphin and Manantenina
Year: 2004 **Species and Counts:** *Caretta caretta*—26–100 clutches
SWOT Contact: Nancy Gladstone

DATA RECORD 58
Data Source: United Nations Environment Programme—World Conservation Monitoring Centre. The Marine Turtle Interactive Mapping System (IMAPS): Green turtle nesting data. http://stort.unep-wcmc.org/imaps/IndTurtles/viewer.htm. Accessed 2010.
Nesting Beach: Tulear
Year: 1999
Species and Counts: *Chelonia mydas*—100–500 nesting females

DATA RECORD 59
Data Source: Leroux, G. 2005. *Réseau interdisciplinaire pour une gestion durable de la biodiversité marine: Diagnostic environnemental et social autour des tortues marines dans le Sud-ouest de l'Océan Indien.* Geneva: Geneva International Academic Network.
Nesting Beach: Barren Isles Archipelago
Year: 2005 **Species and Counts:** *Chelonia mydas*—unquantified

MAURITANIA

DATA RECORD 60
Data Source: Arvy, C., A. T. Dia, F. Colas, and J. Fretey. 2000. Records of *Caretta caretta* in Mauritania. *Marine Turtle Newsletter* 88: 8.
Nesting Beaches: Levrier Bay and Tânît Bay
Year: 1997 **Species and Counts:** *Caretta caretta*—unquantified at both sites

DATA RECORD 61
Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beach: Banc d'Apos
Species and Counts: *Chelonia mydas*—unquantified
***For Data Record 62, see French Overseas Territories, above.**

MOZAMBIQUE

DATA RECORD 63
Data Source: Costa, A. 2007. Re*port of Marine Turtle Conservation in Quirimbas National Park, Cabo Delgado.* Marine Programme, World Wildlife Fund Mozambique, Maputo, Mozambique.
Nesting Beaches: Paquissico Tchawane Beach and Lemani Beach
Year: 2005 **Species and Counts:** *Eretmochelys imbricata*—unquantified at both sites
SWOT Contact: Alice Costa

DATA RECORD 64
Data Source: Costa, A., and A. Mate. 2009. Sea turtle nesting in Mozambique. Personal communication. In C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot.
Nesting Beaches: Bazaruto National Park; Manhica; Milibangalala; Quirimbas National Park; Tofo; Xai-Xai
Year: 2008 **Species and Counts:** *Caretta caretta*—141, 4, and 2 clutches (Milibangalala, Tofo, and Xai-Xai, respectively); *Chelonia mydas*—1 clutch (Quirimbas National Park); *Dermochelys coriacea*—8 and 10 clutches (Manhica and Milibangalala, respectively); *Eretmochelys imbricata*—1 clutch (Quirimbas National Park); *Lepidochelys olivacea*—1 clutch (Bazaruto National Park)
SWOT Contacts: Alice Costa and Alfredo Mate

DATA RECORD 65
Data Source: Costa, A., H. Motta, M. A. M. Pereira, E. J. S. Videira, C. M. M. Louro, and J. João. 2007. Marine turtles in Mozambique: Towards an effective conservation and management program. *Marine Turtle Newsletter* 117: 1–3.
Nesting Beaches: Primeiras and Segundas Islands
Year: 2004 **Species and Count:** *Chelonia mydas*—unquantified

DATA RECORD 66
Data Source: Fernandes, R. S., J. Williams, and J. Trindade. 2016. *Monitoring, Tagging and Conservation of Marine Turtles in Mozambique: Annual Report 2015/16.* Centro Terra Viva, Maputo, Mozambique.
Nesting Beaches: Monte Mutondo to Ponta Mucombo; Ponta do Ouro to Ponta Malongane; Ponta Malongane to Monte Mutondo; Ponta Mucombo to Cabo de Santa Maria
Year: 2015 **Species and Counts:** *Caretta caretta*—385, 100, 936, and 157 crawls, respectively; *Dermochelys coriacea*—2, 3, 36, and 9 crawls, respectively
SWOT Contacts: Miguel Gonçalves and Raquel Fernandes

DATA RECORD 67
Data Source: Mate, A. 2010. Sea turtle nesting in Mozambique. Personal communication. In C. Y. Kot, E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot.
Nesting Beaches: Bazaruto National Park; Bilene; Dubela-Mucombo; Inhaca Island; Manhica; Zavala; Zavora
Year: 2009 **Species and Counts:** *Caretta caretta*—2, 6, 165, 20, 2, 11, 4 clutches, respectively; *Chelonia mydas*—3 clutches (Bazaruto National Park); *Dermochelys coriacea*—1, 7, and 9 clutches (Bazaruto National Park, Bilene, and Inhaca Island, respectively)
SWOT Contact: Alfredo Mate

DATA RECORD 68
Data Source: **(1)** *Vamizi Island Conservation and Community Report 2014–2015.* Pemba, Mozambique: Cabo Delgado Biodiversity and Tourism Company. **(2)** Fernandes, R. S., J. Williams, and J. Trindade. 2016. *Monitoring, Tagging and Conservation of Marine Turtles in Mozambique: Annual Report 2015/16.* Maputo, Mozambique: Centro Terra Viva. **(3)** Garnier, J., N. Hill, A. Guissamulo, I. Silva, A. Debney, and B. Godley. 2012. Status and community-based conservation of marine turtles in the northern Querimbas (Mozambique). *Oryx* 46(3): 359–67
Nesting Beach: Vamizi Island
Year: 2015 **Species and Count:** *Chelonia mydas*—189 clutches
SWOT Contact: Alfredo Mate

NIGERIA

DATA RECORD 69

Data Source: Girondot, M., and A. Girard. 2017. Sea turtle nesting in Nigeria. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Eastern Beach; Port Lekki Beach; Western Beach
Years: 2013, 2014, 2013 **Species and Counts:** *Chelonia mydas*—1–25, 1–25, and 1–25 crawls, respectively; *Dermochelys coriacea*—26–100, 32, and 26–100 crawls, respectively; *Lepidochelys olivacea*—26–100, 45, and 26–100 crawls, respectively
SWOT Contacts: Adegbile Oyeronke Mojisola, Marc Girondot, and Alexandre Girard

SÃO TOMÉ AND PRÍNCIPE

DATA RECORD 70

Data Source: (1) ATM/MARAPA. *Tatô Program—Sea Turtle Conservation Project of the Island of São Tomé, Technical Report 2015/16*. **(2)** MARAPA. 2017. Sea turtle nesting in São Tomé. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Comprida; Giga; Inhame and Cabana (combined); Jalé; Malanza; Micoló, Tartaruga, and Fernão Dias (combined); Planta; Rolas (all beaches); São Miguel; Tamarindos and Governador (combined); Xixi; Crija; Porto Alegre; Celeste (all in São Tomé)
Years: 2015, 2012 (*Dermochelys coriacea* at Comprida and Malanza) **Species and Counts:** *Chelonia mydas*—14, 1, 49, 829, 1, 13, 54, 36, N/A, 3, 26, 8, 49, and 6 crawls, respectively; *Dermochelys coriacea*—2, N/A, 2, 13, 1, 4, 1, N/A, N/A, 1, 2, 1, 1, and N/A crawls, respectively; *Eretmochelys imbricata*—2, N/A, 8, 17, 2, N/A, 5, 78, 1, 1, 1, 12, 7, and 5 crawls, respectively; *Lepidochelys olivacea*—2, N/A, N/A, 4, N/A, 249, 1, N/A, N/A, 202, N/A, N/A, N/A, and N/A crawls, respectively
SWOT Contacts: Sara Vieira, Hipólito Lima, Joana Hancock, and Betânia Ferreira

DATA RECORD 71

Data Source: Bollen, A., and Fundação Príncipe Trust. 2017. Sea turtle nesting in Príncipe. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Ponta Marmita; Portinho; Praia Banana; Praia Boi; Praia Bom Bom; Praia Bumbo; Praia Burras; Praia Cabinda; Praia Cemiterio; Praia Franguinha; Praia Grande; Praia Grande do Infante; Praia Lola; Praia Macaco; Praia Margarida; Praia Micoto; Praia Montanha; Praia Popa; Praia Prainha; Praia Ribeira Ize; Praia Rio São Tome; Praia Santa Rita; Praia Seca; Praia Sundy; Praia Uba; Preda Furada (all on Príncipe Island)
Year: 2015 **Species and Counts:** *Chelonia mydas*—0, N/A, N/A, 45, 24, 1, 1, 31, 41, N/A, 683, 522, 4, 8, 0, 33, 1, N/A, 17, 1, 48, N/A, 90, 1, 9, and N/A clutches, respectively; *Dermochelys coriacea*—N/A, N/A, 1, 4, N/A, 1, N/A, N/A, 0, N/A, 2, 3, N/A, 4, N/A, 2, 1, N/A, N/A, N/A, 2, 1, N/A, N/A, and N/A, and N/A clutches, respectively; *Eretmochelys imbricata*—4, 1, 8, 9, N/A, 2, N/A, 2, 6, 1, 9, 1, 1, 3, 1, 10, 2, 0, N/A, 1, N/A, 0, 6, 4, 10, and 1 clutches, respectively
SWOT Contact: An Bollen

SENEGAL

DATA RECORD 72

Data Source: Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. *CMS Technical Series*, no. 6. United Nations Environment Programme/ Convention on the Conservation of Migratory Species of Wild Animals Secretariat, Bonn, Germany.
Nesting Beaches: Beaches near Guéréo; Beaches on the Saloum Delta; Langue de Barbarie
Species and Counts: *Chelonia mydas*—N/A, N/A, and unquantified clutches, respectively; *Eretmochelys imbricata*—unquantified, unquantified, and N/A clutches, respectively

SEYCHELLES, REPUBLIC OF

DATA RECORD 73

Data Source: Data from the Republic of Seychelles were submitted by Jeanne A. Mortimer of the Turtle Action Group of Seychelles and were based on studies conducted by the following stakeholders: Alphonse Foundation; Banyan Tree Hotel, Mahé; Beachcomber Sainte Anne Resort; Bird Island Lodge; Constance Lémuria Resort, Praslin; Cousine Island Company; Denis Private Island; Desroches Foundation, Farquhar Foundation; Fregate Island Private; Global Vision International Seychelles; Green Island Foundation; Island Conservation Society; Marine Conservation Society Seychelles; Nature Seychelles, North Island Seychelles; Save Our Seas Foundation/D'Arros Research Centre; Seychelles Islands Foundation; Seychelles Ministry of Environment, Energy and Climate Change; Seychelles National Parks Authority; Silhouette Foundation; and WiseOceans.
Nesting Beaches: Inner Islands, including all islands on the Seychelles Bank (i.e., all the Granitic Islands, Bird Island, and Denis Island); Platte and Coëtivy islands; Amirante Islands (including all islands on the Amirantes Bank plus Desroches Island and the islands of the Alphonse Atoll and the St. François Atoll); Providence and Farquhar atolls; Cosmoledo and Astove atolls; Assumption Island and Aldabra Atoll
Year: 2015 **Species and Counts:** *Chelonia mydas*—101–500, 51–100, 1,001–5,000, 1,001–5,000, >10,000, and >10,000 clutches per year, respectively; *Eretmochelys imbricata*—1,000–5,000, 101–500, 1,000–5,000, 51–100, 51–100, and 51–100 clutches per year, respectively
SWOT Contact: Jeanne A. Mortimer

SIERRA LEONE

DATA RECORD 74

Data Source: Aruna, E. 2007. Loggerhead nesting in Sierra Leone. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. II (2007).
Nesting Beaches: Hamilton and Lumley
Year: 2007 **Species and Counts:** *Caretta caretta*—0 and unquantified clutches, respectively; *ermochelys coriacea*—0 and unquantified clutches, respectively; *Lepidochelys coriacea*—unquantified clutches at both sites
SWOT Contact: Edward Aruna

DATA RECORD 75

Data Source: Siaffa, D. D., E. Aruna, and J. Fretey. 2003. Presence of sea turtles in Sierra Leone (West Africa). In J. A. Seminoff (ed.), *Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. Miami, FL: NOAA.
Nesting Beaches: Baki; Sherbro
Year: 2007 **Species and Counts:** *Lepidochelys coriacea*—unquantified clutches at both sites

SOUTH AFRICA

DATA RECORD 76

Data Source: Nel, R. 2016. *Turtle Monitoring and Research Report: 2013/14 and 2014/15 Seasons*. Unpublished report.
Nesting Beaches: Kosi Mouth to Sodwana; Mabibi to Sodwana
Years: 2013, 2014 **Species and Counts:** *Caretta caretta*—3,828 and 3,890 clutches, respectively; *Dermochelys coriacea*—353 and 414 clutches, respectively

TANZANIA

DATA RECORD 77

Data Source: Joynson Hicks, C., and L. West. 2017. Sea turtle nesting in Tanzania. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
Nesting Beaches: Amani Gomvu; Baleni; Boza; Buyuni; Buyuni Kuu; Bweni; Choba; Gezaulole; Jiwe la Mzungu; Jojo; Kikokwe; Kimbiji; Kipumbwi; Kishiko Kikubwa; Kungwi; Kuruti; Madete; Manda; Maziwe Island; Mbutu; Mchuni; Mkwaja; Mlongo; Mnemba Island; Mvinjeni; Pemba Mnazi; Sange; Shungimbili; Stahabu; Ushongo; Wimbi; Yale Yale Puna; Yuyuni
Years: 2015, 2015, 2013, 2015, 2008, 2015, 2015, 2011, 2015, 2015, 2015, 2015, 2012, 2015, 2015, 2013, 2015, 2012, 2015, 2015, 2015, 2011, 2015, 2015, 2015, 2015, 2015, 2010, 2014, 2015, 2014, 2015, and 2015, respectively **Species and Counts:** *Chelonia mydas*—59, 3, 1, 12, 2, 3, 16, 3, 31, 9, 21, 20, 1, 88, 13, 1, 0, 10, 68, 15, 15, 3, 8, unquantified, 36, 2, 7, 3, 1, 7, 1, 12, and 24 clutches, respectively; *Eretmochelys imbricata*—N/A, N/A, N/A, N/A, N/A, N/A, N/A, N/A, 2, 1, N/A, N/A, N/A, N/A, 2, N/A, N/A, 2, N/A, N/A, 3, N/A, 1, N/A, N/A, N/A, N/A, 6, N/A, N/A, 4, N/A, and 2 clutches, respectively
SWOT Contacts: Catharine Joynson Hicks and Lindsey West

TOGO

DATA RECORD 78

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 J. A. Seminoff (ed.), *Proceedings of the Twenty-Second Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-503. Miami, FL: NOAA.
Nesting Beaches: Togo
Year: 2002 **Species and Counts:** *Lepidochelys olivacea*—unquantified

DATA RECORD 79

Data Source: Segniagbeto, G. H. 2006. Leatherback nesting in Togo. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. I (2006).
Nesting Beaches: Agbodrafo; Gbétsogbé; Kodjoviakope; Kotokoucondji; N'Lessi; Palm
Year: 2003 **Species and Counts:** *Dermochelys coriacea*—19, 1, 4, 1, 4, and 1 nesting females, respectively
SWOT Contact: Gabriel Hoinsoude Segniagbeto

Telemetry Data Sources

The following data records refer to satellite telemetry datasets from tags that were deployed in Africa and the southwest Indian Ocean and were combined to create the map on pages 26–27. These data were generously provided to SWOT by the people and partners listed subsequently. As the data were mapped, obviously erroneous points (e.g., on land) were filtered. Some datasets were filtered before being shared with SWOT and were not filtered further. The map is for illustrative purposes and should not be considered an authoritative source of tracking data for the studies cited. Records that have a SWOT ID can be viewed in detail in the SWOT online database and mapping application at http://seamap.env.duke.edu/swot, which contains additional information about the projects and their methodologies.

To save space, the following abbreviations are used in the data source fields below: **(1)** "STAT" refers to Coyne, M. S., and B. J. Godley. 2005. Satellite Tracking and Analysis Tool (STAT): An integrated system for archiving, analyzing and mapping animal tracking data. *Marine Ecology Progress Series* 301: 1–7. **(2)** "SWOT Online Database" refers to Kot, C. Y., E. Fujioka, A. DiMatteo, B. Wallace, B. Hutchinson, J. Cleary, P. Halpin, and R. Mast. 2015. The State of the World's Sea Turtles Online Database: Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University. http://seamap.env.duke.edu/swot. When listed, these sources indicate that the dataset was contributed online through STAT or SWOT.

Project Title: TAG Satellite–Tracked Green Sea Turtles from Seychelles 2012 under Southwest Indian Ocean Fisheries Project (SWIOFP)
Project Partners: TAG, Ifremer, Kélonia, and D'Arros Research Centre
Metadata: 4 adult *Chelonia mydas*; tags deployed in Seychelles.
Data Sources: (1) Mortimer, J. 2012. *Satellite Tracking of Post-nesting Green Turtles* (*Chelonia mydas*) from *St. Joseph Island, Amirantes Group, Seychelles*. Field Report to SWIOFP C5. **(2)** Bourjea, J., J. A. Mortimer, J. Garnier, G. Okemwa, B. J. Godley, G. Hughes, M. Dalleau, C. Jean, S. Ciccione, and D. Muths. 2015. Population structure enhances perspectives on regional management of the Western Indian Ocean green turtle. *Conservation Genetics* 16(5): 1069–83.
SWOT Contact: Jeanne Mortimer

Project Title: Post-nesting Migration of Adult Green Turtles from Moya (Mayotte) under SWIOFP, 2011–2012
Project Partners: Crucial Aquifer Recharge Area (CARA) Ecology, Direction de l'Environnement de l'Aménagement et du Logement de Mayotte, Conseil Départemental de Mayotte, Ifremer, and Kélonia
Metadata: 12 adult *Chelonia mydas*; tags deployed in Mayotte.
Data Sources: Dalleau, M. 2013. *Ecologie spatiale des tortues marines dans le Sud-ouest de l'Océan Indien : Apport de la géomatique et de la modélisation pour la conservation*. PhD thesis, University of La Réunion.
SWOT Contacts: Katia Ballorain and Mayeul Dalleau

Project Title: Post-nesting Migration of Adult Green Turtles from Itsamia (Mohéli, Comoros)
Project Partners: ADSEI, Parc National de Mohéli, and Kélonia
Metadata: 13 adult *Chelonia mydas*; tags deployed in Mohéli, Comoros.
Data Sources: Dalleau, M., and J. Bossert. *Programme opérationnel de coopération territoriale (Océan Indien): Actions de coopération entre le CEDTM (Réunion, France) et Mohéli (Union des Comores) pour la conservation de l'environnement marin—Rapport final.*
SWOT Contact: Mayeul Dalleau

Project Title: DYMITILE Project: Post-nesting Migration of Adult Green Turtles in the Southwest Indian Ocean (Éparses Islands, Mohéli)
Project Partners: Ifremer and Kélonia
Metadata: 51 adult *Chelonia mydas*; tags deployed in Éparses Islands (France) and Mohéli, Comoros.
Data Sources: (1) Bourjea, J., S. Ciccione, and M. Dalleau. 2013. DYMITILE—DYnamique MIgratoire des Tortues marines nidifiant dans les ILEs françaises de l'Océan Indien. Ifremer, France. http://doi.org/10.13155/28050 **(2)** Dalleau, M. 2013. *Ecologie spatiale des tortues marines dans le Sud-ouest de l'Océan Indien: Apport de la géomatique et de la modélisation pour la conservation. PhD thesis, University of La Réunion.*
SWOT Contacts: Jérôme Bourjea and Mayeul Dalleau

Project Title: Leatherback Turtles of South Africa
Project Partners: The Leatherback Trust, Purdue University, Nelson Mandela Metropolitan University, KZN Wildlife, iSimangaliso Wetland Park Authority, and Oceans and Coasts
Metadata: 20 adult female *Dermochelys coriacea*; tags deployed in South Africa.
Data Sources: Robinson, N. J., S. J. Morreale, R. Nel, and F. V. Paladino. 2016. Coastal leatherback turtles reveal conservation hotspot. *Scientific Reports* 6: 37851.
SWOT Contact: Nathan Robinson

SWOT ID: 1448

Project Title: Angola LNG Olive Ridley Tracking Project
Project Partners: West Australian Sea Turtle Satellite Tracking Project
Metadata: 10 adult female *Lepidochelys olivacea*; tags deployed in Angola.
Data Sources: (1) Pendoley, K. 2016. Angola LNG Olive Ridley Tracking Project. Data downloaded from OBIS-SEAMAP

(http://seamap.env.duke.edu/dataset/1448) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=263). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Kellie Pendoley

SWOT ID: 1452
Project Title: Gabon 2007–08: Mayumba, Leatherback Turtles
Project Partners: Parc National de Mayumba, Wildlife Conservation Society, Aventures Sans Frontières, Seaturtle.org, and University of Exeter
Metadata: 7 adult female *Dermochelys coriacea*; tags deployed in Mayumba National Park, Gabon.
Data Sources: **(1)** Witt, M., A. C. Broderick, M. S. Coyne, A. Formia, S. Ngouessono, R. J. Parnell, G. P. Sounguet, and B. J. Godley. 2008. Satellite tracking highlights difficulties in the design of effective protected areas for critically endangered leatherback turtles *Dermochelys coriacea* during the inter-nesting period. *Oryx* 42(2): 296–300. **(2)** Witt, M. 2016. Gabon 2007–08: Mayumba, Leatherback Turtles. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1452) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=270). **(3)** STAT. **(4)** SWOT Online Database.
SWOT Contact: Matthew Witt

SWOT ID: 1454
Project Title: Gabon 2008–09: Mayumba and Pongara, Leatherback Turtles
Project Partners: Parc National de Mayumba, Wildlife Conservation Society, the Gabon Turtle Partnership, Aventures Sans Frontières, Seaturtle.org, and University of Exeter
Metadata: 10 adult female *Dermochelys coriacea*; tags deployed in Pongara National Park (n = 6) and Mayumba National Park (n = 4), Gabon.
Data Sources: **(1)** Witt, M. J., E. A. Bonguno, A. C. Broderick, M. S. Coyne, A. Formia, A. Gibudi, G. A. M. Mounguengui, A. Moussounda, M. NSafou, S. Nougessono, R. J. Parnell, G. P. Sounguet, S. Verhage, and B. J. Godley. 2011. Tracking leatherback turtles from the world's largest rookery: Assessing threats across the South Atlantic. *Proceedings of the Royal Society* B 278: 2338–2347. **(2)** Witt, M. 2016. Gabon 2008–09: Mayumba and Pongara, Leatherback Turtles. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1454) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=340). **(3)** STAT. **(4)** SWOT Online Database.
SWOT Contact: Matthew Witt

SWOT ID: 1456
Project Title: Gabon 2009–10: Pongara, Leatherback Turtles
Project Partners: University of Exeter, Seaturtle.org, the Gabon Sea Turtle Partnership, Parcs Gabon, and Wildlife Conservation Society
Metadata: 2 adult female *Dermochelys coriacea*; tags deployed in Pongara National Park, Gabon.
Data Sources: **(1)** Witt, M. J., E. A. Bonguno, A. C. Broderick, M. S. Coyne, A. Formia, A. Gibudi, G. A. M. Mounguengui, A. Moussounda, M. NSafou, S. Nougessono, R. J. Parnell, G. P. Sounguet, S. Verhage, and B. J. Godley. 2011. Tracking leatherback turtles from the world's largest rookery: Assessing threats across the South Atlantic. Proceedings of the Royal Society B 278: 2338–2347. **(2)** Witt, M. 2016. Gabon 2009–10: Pongara, Leatherback Turtles. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1456) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=466). **(3)** STAT. **(4)** SWOT Online Database.
SWOT Contact: Matthew Witt

Project Title: Juvenile loggerheads (1999–2000) tagged in the Canary Islands
Project Partners: Universidad de Las Palmas de Gran Canaria and Sociedad Herpetológica Española
Metadata: 5 juvenile *Caretta caretta*; tags deployed in the Canary Islands.
Data Sources: Universidad de Las Palmas de Gran Canaria and Sociedad Herpetológica Española. 2017. Program number 01602: Proyecto Life B4-3200/97/247 de apoyo a la conservación del delfín mular (*Tursiops truncatus*) y la tortuga común (*Caretta caretta*) en Canarias. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
SWOT Contact: Nuria Varo-Cruz

Project Title: Cousin Island Post-nesting Hawksbills
Metadata: 5 adult female *Eretmochelys imbricata*; tags deployed in Seychelles, postnesting.
Data Sources: Mortimer, J. A., and G. H. Balazs. 1999. Post-nesting migrations of hawksbill turtles in the Granitic Seychelles and implications for conservation. 19th Annual Sea Turtle Symposium, South Padre Island, TX.
SWOT Contact: Jeanne Mortimer

Project Title: Movements of Late Juvenile Loggerhead Sea Turtles from Réunion Island (COCA LOCA Project)
Project Partners: Kélonia and Ifremer
Metadata: 22 adult *Caretta caretta*; tags deployed in La Réunion (France).
Data Sources: Dalleau, M., L. Hoarau, M. Lalire, P. Gaspar, C. Tardy, S. Jaquemet, J. Bossert, S. Ciccione, and J. Bourjea. 2016. *COCA LOCA: Connectivity of Loggerhead Turtle (Caretta caretta) in Western Indian Ocean: Implementation of Local and Regional Management*. Final Report.
SWOT Contacts: Mayeul Dalleau and Jérôme Bourjea

SWOT ID: 439
Project Title: Leatherback Tracking in South Africa
Metadata: 9 *Dermochelys coriacea*; tags deployed in South Africa.
Data Sources: **(1)** Luschi, P., J. R. E. Lutjeharms, P. Lambardi, R. Mencacci, G. R. Hughes, and C. G. Hays. 2006. A review of migratory behaviour of sea turtles off southeastern Africa. South African Journal of Science 102: 51–58. **(2)** Luschi, P., A. Sale, R. Mencacci, G. R. Hughes, J. R. E. Lutjeharms, and F. Papi. 2003. Current transport of leatherback sea turtles (*Dermochelys coriacea*) in the ocean. Proceedings of the Royal Society B: Biological Sciences 270 (suppl. 2): 129–132. **(3)** Lambardi, P., J. R. E. Lutjeharms, R. Mencacci, C. G. Hays, and P. Luschi. 2008. Influence of ocean currents on long-distance movement of leatherback sea turtles in the Southwest Indian Ocean. *Marine Ecology Progress Series* 353: 289–301.
SWOT Contact: Paolo Luschi

SWOT ID: 496
Project Title: Canary Islands—OAG (Observatorio Ambiental Granadilla)
Project Partners: Observatorio Ambiental Granadilla, Sociedad para el Estudio de Cetáceos en el Archipiélago Canario, Centro de Gestión de Biodiversidad del Departamento de Biología de la Universidad de Las Palmas de Gran Canaria, Centro de Recuperación de Fauna Silvestre del Cabildo Insular de Gran Canaria
Metadata: 19 juvenile *Caretta caretta*; tags deployed in Canary Islands.
Data Sources: **(1)** Machado, A., V. Martín, L. F. López-Jurado, and P. Calabuig. 2016. Canary Islands—OAG. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/496) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=315). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Antonio Machado

SWOT ID: 1003
Project Title: Movement Patterns of Nesting Green Turtles in Tanzania
Project Partners: Sea Sense
Metadata: 4 adult *Chelonia mydas*; tags deployed in Tanzania.
Data Sources: **(1)** West, L. 2016. Movement patterns of nesting green turtles in Tanzania. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1003) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=918). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Lindsey West

SWOT ID: 1014
Project Title: Ifremer/Kélonia Satellite-Tracked Late Juvenile Loggerhead Sea Turtles from Reunion Island, 2008–2012
Project Partners: Ifremer, CLS, and Kélonia
Metadata: 17 juvenile *Caretta caretta*; tags deployed in La Réunion (France).
Data Source: Dalleau, M., B. Simon, J. Sudre, S. Ciccione, and J. Bourjea. 2014. The spatial ecology of juvenile loggerhead turtles (*Caretta caretta*) in the Indian Ocean sheds light on the "lost years" mystery. Marine Biology 161(8): 1835–1849.
SWOT Contacts: Mayeul Dalleau and Jérôme Bourjea

SWOT ID: 1024
Project Title: Maluane/Zoological Society of London (ZSL) Turtle Conservation Project in Mozambique: Green Turtles
Project Partners: Marine Turtle Research Group of University of Exeter, ZSL, and Maluane
Metadata: 8 *Chelonia mydas*; tags deployed in Mozambique.
Data Sources: **(1)** Maluane and ZSL Turtle Conservation Project. 2016. Maluane/ZSL Turtle Conservation Project in Mozambique: Green Turtles. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1024) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=204). **(2)** Garnier, J., N. Hill, A. Guissamulo, I. Silva, A. Debney, and B. Godley. 2012. Status and community-based conservation of marine turtles in the northern Querimbas (Mozambique). *Oryx* 46(3): 359–367. **(3)** STAT. **(4)** SWOT Online Database.
SWOT Contacts: Julie Garnier and Jérôme Bourjea

SWOT ID: 1118
Project Title: AICM Satellite-Tracked Loggerhead Sea Turtles from Mozambique, 2012, under SWIOFP
Project Partners: Associação para Investigação Costeira e Marinha (AICM), Ifremer, and Kélonia
Metadata: 3 adult female *Caretta caretta*; tags deployed in Mozambique.
Data Sources: **(1)** Pereira, M. A. M., E. J. S. Videira, P. M. B. Gonçalves, and R. S. Fernandes. 2014. Post-nesting migration of loggerhead turtles (*Caretta caretta*) from Southern Mozambique. *African Sea Turtle Newsletter* 1: 48–51. **(2)** Videira, E., M. Dalleau, J. Bourjea, and M. Pereira. 2015. AICM satellite-tracked loggerhead sea turtles from Mozambique, 2012, under SWIOFP. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1118) on 2/12/2017. **(3)** SWOT Online Database.
SWOT Contact: Eduardo Videira, Mayeul Dalleau, Jérôme Bourjea, and Marcos Pereira

SWOT ID: 1120
Project Title: University of Eldoret Satellite-Tracked Green Sea Turtles from Kenya, 2012, under SWIOFP
Project Partners: World Wildlife Fund Kenya, University of Eldoret, Kenya, Ifremer, and Kélonia
Metadata: 3 adult female *Chelonia mydas*; tags deployed in Kenya.
Data Sources: **(1)** Machaku, R., M. Dalleau, and J. Bourjea. 2014. University of Eldoret satellite-tracked green sea turtles from Kenya, 2012, under SWIOFP. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1120) on 2/12/2017. **(2)** SWOT Online Database.
SWOT Contacts: Mike Olendo, Rose Machaku, Mayeul Dalleau, and Jérôme Bourjea

SWOT ID: 1170
Project Title: La Tortuga Verde en las Islas Canarias/Green Turtles in the Canary Islands
Project Partners: Asociación para el Desarrollo Sostenible y Conservación de la Biodiversidad, Departamento de Biología de la Universidad de Las Palmas de Gran Canaria, Centro de Recuperación de Fauna Silvestre del Cabildo de Gran Canaria, Centro de Recuperación de Fauna Silvestre la Tahonilla del Cabildo de Tenerife
Metadata: 3 *Chelonia mydas*; tags deployed in Canary Islands
Data Sources: **(1)** Liria, A. 2016. La tortuga verde en las islas Canarias/Green turtles in the Canary Islands. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1170) on 12/19/2016, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=988). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Ana Liria

SWOT ID: 1215
Project Title: Gabon 2014: Olive Ridley Sea Turtles
Project Partners: Gabon National Parks Agency; CENAREST (Centre National de la Recherche Scientifique et Technologique); Gabon Sea Turtle Partnership; Fondation Liambissi; Ibonga; Wildlife Conservation Society; World Wildlife Foundation; Stanford University; University of California, Santa Cruz; Marine Conservation Institute, and the Marine Turtle Research Group at the University of Exeter
Metadata: 6 adult *Lepidochelys olivacea*; tags deployed in Gabon.
Data Sources: **(1)** Maxwell, S. 2016. Gabon 2014: Olive Ridley Sea Turtles. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1215) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=1047). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Sara Maxwell

SWOT ID: 1328
Project Title: Gabon Olive Ridley Tracking Project: Pongara National Park, 2015
Project Partners: Gabon National Parks Agency, CENAREST (Centre National de la Recherche Scientifique et Technologique), Gabon Sea Turtle Partnership, Old Dominion University, Wildlife Conservation Society Gabon, and the Marine Turtle Research Group at the University of Exeter
Metadata: 10 adult *Lepidochelys olivacea*; tags deployed in Gabon.
Data Sources: **(1)** Maxwell, S. 2016. Gabon Olive Ridley Tracking Project: Pongara National Park, 2016. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1328) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=1165). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Sara Maxwell

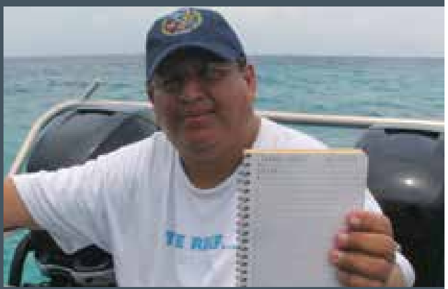
SWOT ID: 1444
Project Title: Canary Islands
Project Partners: LIFE *Caretta caretta*
Metadata: 9 juvenile *Caretta caretta*; tags deployed in Canary Islands.
Data Sources: **(1)** Cruz, N. 2016. Canary Islands. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1444) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=886). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contact: Nuria Cruz

SWOT ID: 1459
Project Title: Ghana Olive Ridley Project
Project Partners: Seaturtle.org; Florida Gulf Coast University; Hlamhi Association for Turtle Conservation and Hope (HATCH); University of Ghana; and Ghana Wildlife Division, Forestry Commission
Metadata: 4 adult *Lepidochelys olivacea*; tags deployed in Ghana.
Data Sources: **(1)** Coyne, M. 2017. Ghana Olive Ridley Project. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1459) on 2/12/2017, originated from STAT (http://www.seaturtle.org/tracking/index.shtml?project_id=468). **(2)** STAT. **(3)** SWOT Online Database.
SWOT Contacts: Michael Coyne and Phil Allman

Project Title: Post-nesting Leatherback and Loggerhead Turtles in South Africa
Metadata: 14 adult female *Dermochelys coriacea* and 20 adult female *Caretta caretta*; tags deployed in South Africa.
Data Source: Harris, L. R., R. Nel, H. Oosthuizen, M. Meÿer, D. Kotze, D. Anders, S. McCue, and S. Bachoo. 2015. Paper-efficient multi-species conservation and management are not always field-effective: The status and future of West Indian Ocean leatherbacks. Biological Conservation 191: 383–390.
SWOT Contact: Ronel Nel and Linda Harris

Project Title: Mahé Seychelles Hawksbill Project
Project Partners: Marine Conservation Society Seychelles, Marine Unit of the Ministry of Environment (Seychelles), local schools, and the Wildlife Clubs of Seychelles
Metadata: 4 adult *Eretmochelys imbricata*; tags deployed in Mahé, Seychelles.
Data Source: Rowat, D. 2017. Mahé Seychelles Hawksbill Project. Personal communication. In *SWOT Report—State of the World's Sea Turtles*, vol. XII (2017).
SWOT Contact: David Rowat

In Memoriam



COURTESY OF ISAIAS' FRIENDS & COLLEAGUES

Isaias Majil (1974–2017)
A native of Corozal, Belize, Isaias was a highly respected leader in the study and protection of sea turtles in his country. He began his career as a biologist for the Bacalar Chico Marine Reserve before moving into management, where his contributions expanded to encompass Belize's entire Marine Protected Area portfolio and beyond. His work is recognized throughout the Mesoamerican Reef System. Among his many roles, Isaias served as chair of many national working groups, including the Coral Reef Monitoring Network, the Sea Turtle Conservation Network, and the Glover's Reef Advisory Committee. He also played an important part in the Inter-American Convention for the Protection and Conservation of Sea Turtles. He will always be remembered by his friends and family for his love of sea turtles. In his daughter's words, "My daddy loved turtles so much.… I will always remember the times he explained to me about turtles."

COURTESY OF THANE WIBBELS

Jack Woody (1933–2016)
Jack was known and loved in the sea turtle conservation community and will be remembered as a conservation hero. As the national sea turtle coordinator for the U.S. Fish and Wildlife Service (FWS), Jack championed the protection of the Kemp's ridley in every way possible, and he is credited as one of the pioneers in developing the USA—Mexico joint program to protect and recover the Kemp's ridley nesting sites in Rancho Nuevo, Mexico. He also pioneered efforts to reestablish nesting colonies at Padre Island National Seashore in Texas. Within the span of his career with FWS, Jack's conservation efforts extended to other wildlife, including migratory birds, manatees, and endangered fish. In 2013, he was given the International Sea Turtle Society (ISTS) Lifetime Achievement Award.

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