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U.S. SEA TURTLES:

A COMPREHENSIVE OVERVIEW OF SIX TROUBLED SPECIES

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oceana.org/seaturtles

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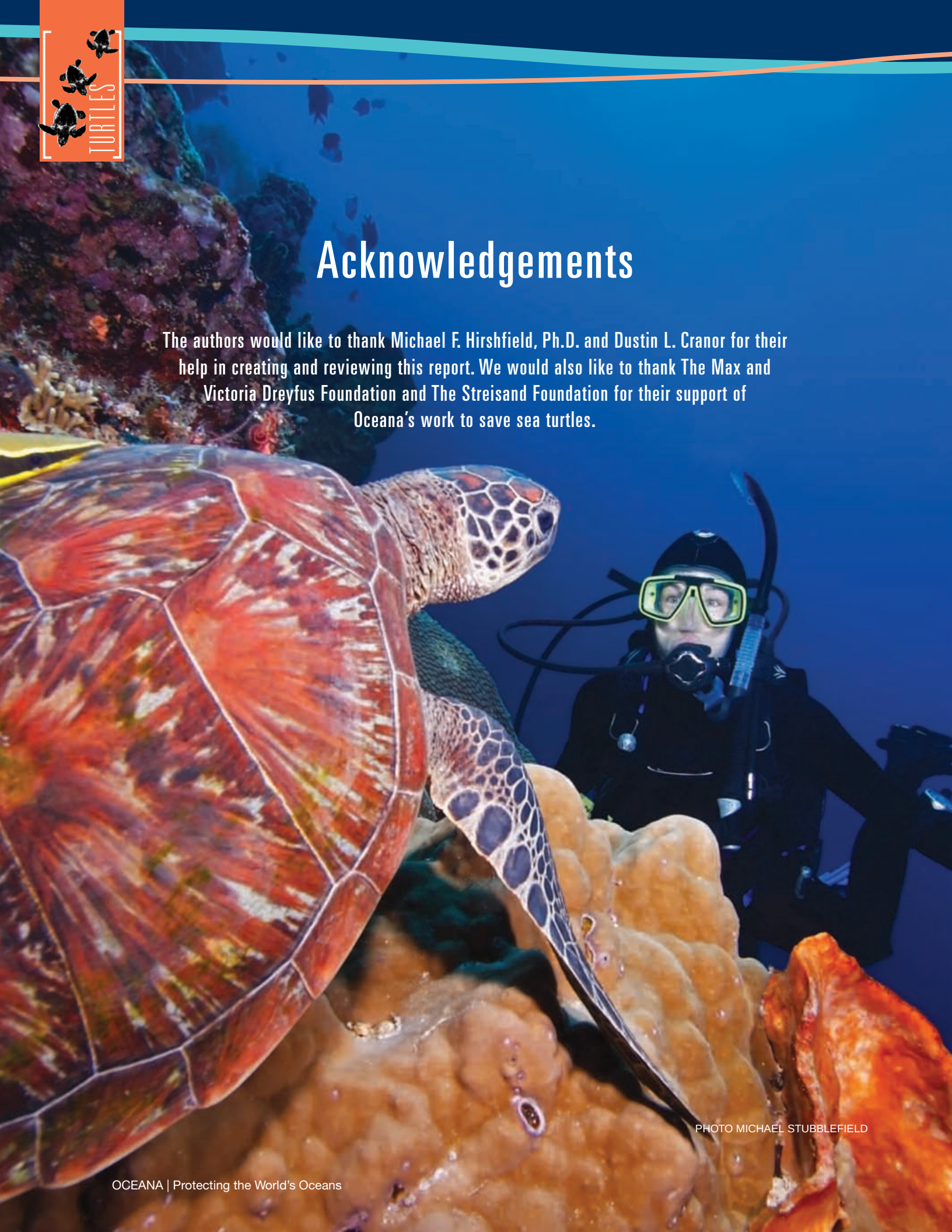

PHOTO MICHAEL STUBBLEFIELD

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EXECUTIVE SUMMARY

Sea turtles have been swimming the oceans for more than 100 million years. They have persisted through natural predators, climatic changes and even the mass dinosaur extinction, and have proven to be important ecologically, economically and culturally both in the United States and abroad.

Nonetheless, modern day activities of humans are killing sea turtles at a rate faster than many populations can sustain. In fact, each of the sea turtle species found in U.S. waters is listed as either "threatened" or "endangered" under the Endangered Species Act (ESA) – which means they may be driven to extinction in the foreseeable future.

Six species of sea turtles inhabit U.S. waters: green (*Chelonia mydas*), hawksbill *(Eretmochelys imbricata)*, Kemp's ridley *(Lepidochelys kempii)*, leatherback *(Dermochelys coriacea*), loggerhead *(Caretta caretta)* and olive ridley *(Lepidochelys olivacea)*. A seventh species, the flatback *(Natator depressus*), resides only in the waters around Australia and Papua New Guinea.

A variety of factors have led to the decline of sea turtle populations and the need for ESA listings. Technological advances in gear, navigation and vessel capabilities have contributed to making commercial fishing one of the largest causes of sea turtle mortality worldwide. Additional threats caused by humans include marine debris, pollution, coastal development, poaching, vessel strikes, invasive species and climate change.

For decades, sea turtle conservation efforts have encouraged responsible fishing practices and habitat protections. These efforts have resulted in increased numbers for some sea turtle populations. For other populations, however, the outlook is increasingly grim. The current status of most sea turtle populations highlights the need for more stringent conservation measures to counteract the increasing threats they face on land and in the water.

PHOTO TIM CALVER

SEA TURTLES IN DECLINE

Having graced the oceans for more than 100 million years, sea turtles represent some of the most ancient species on Earth. As history tells it, sea turtles were once so abundant that sailors could step out of their boats and amble from sea to shore by using their shells as stepping stones.[1]

Today, the scene is much different. All around the world, humans have driven sea turtle populations to the brink of extinction. Unintended catch, or "bycatch," of sea turtles in commercial fisheries, poaching of sea turtles and their eggs, coastal development, trade of sea turtles and their parts and poor enforcement of conservation laws all have contributed to the worldwide decline of their populations.

Species	Population Status Under Endangered Species Act
Green	Endangered (Florida & Mexico's Pacific coast breeding colonies); Threatened (all other areas)
Hawksbill	Endangered
Kemp's Ridley	Endangered
Leatherback	Endangered
Loggerhead	Threatened
Olive Ridley	Endangered (Mexico's Pacific coast breeding colonies); Threatened (all other areas)

Table 1: The population status of each sea turtle species that inhabits U.S. waters as listed under the Endangered Species Act [2]

PHOTO OCEANA/MAR MAS

PHOTO OCEANA/CARLOS PEREZ

Within the United States, all six species of sea turtles are listed as “threatened” or “endangered” under the Endangered Species Act (ESA).[3] Enacted in 1973, the ESA requires all federal departments and agencies to conserve endangered and threatened plants, fish and wildlife. The federal government must also protect important habitat needed for the survival and recovery of listed species. Under the ESA, it is illegal to possess, sell, transport, kill, harass, harm, import or export any listed species in the United States unless special permits have been granted.[4]

The goal of listing a species under the ESA is to get that species off the list as quickly as possible by protecting it from further damage and rebuilding its population. Unfortunately, the federal government has not adequately used the tools available under the ESA to achieve the recovery of sea turtle populations. All six species have been listed under the ESA for more than 30 years. Not a single one has recovered.

PHOTO OCEANA/MAR MAS

All around the world, humans have driven sea turtle populations to the brink of extinction.

PHOTO NOAA

THE VALUE OF SEA TURTLES

Ecologically

Sea turtles are a cornerstone of healthy oceans and play a critical part in both marine and terrestrial environments. Sea turtles play an important role in the nutrient cycle on land, particularly during nesting season, by moving organic compounds from foraging grounds – where they feed in the ocean – to nutrient-poor coastal habitats near nesting beaches.[5] This transport supports the growth of plants and animals in coastal habitats.

Sea turtles also help maintain a healthy marine food web. An individual hawksbill, for example, eats more than 1,000 pounds of sponges off coral reefs each year, which helps keep reefs healthy and teeming with life.[6,7] Greens graze on aquatic vegetation, which increases the productivity and nutrient content of seagrass beds. A multitude of species, including fish and crustaceans, depend on those nutrients to survive.[8] Leatherbacks help keep the base of the food web balanced by feeding on jellyfish, which eat fish larvae. A decline in leatherback populations could result in an overabundance, or "bloom," of jellyfish. Such a bloom would allow jellyfish to out-compete small fish for limited food resources, an act that could trickle up the food chain and affect even large ocean predators like sharks, swordfish and tuna.[9] Jellyfish blooms have been documented in several parts of the world, including the Gulf of Mexico, Bering Sea, East China Sea[10] and the Mediterranean.[11]

PHOTO MARTY SNYDERMAN

Economically

Sea turtles are a popular attraction and, with the advent of eco-tours and conservation-focused volunteerism, they have contributed a great deal to the tourism industry. Travelers can responsibly view sea turtles in the wild or assist with scientific research, while their regular appearance on nearby beaches, reefs and seagrass beds boosts the revenues of coastal resorts, tour operators and dive shops.

A 2008 survey revealed that 76 percent of scuba divers from the United States were willing to pay an additional fee in return for an increased likelihood of seeing a sea turtle in the wild.[12] The average additional fee divers were willing to pay was $29.63.[13] Using a conservative estimate that the 1.2 million active scuba divers from the United States take an average of five dive trips per year, the annual aggregated value of the increased opportunity to see a sea turtle in the wild was calculated to be $177.8 million.[14] This survey demonstrates the immense economic incentive for conserving sea turtle populations.

> Sea turtles are invaluable to the health of natural ecosystems, contribute to global economies and are central to cultural identity in many countries.

Culturally

In addition to their ecological and economic impacts, sea turtles are central figures in the heritage and folklore of many cultures around the world, including those of the United States. North America is referred to as "Turtle Island" by many Native American tribes, including the Iroquois, Abenaki and Huron.[15]

In Japan, sea turtles symbolize longevity and happiness, and, in China, they are a symbol of life, good luck and protection.[16] Most coastal communities in India do not eat sea turtles because they are worshipped as an incarnation of one of the Hindu gods.[17] In Indonesia and Mexico, the Kei Islanders and Seri Indians, respectively, celebrate sea turtles as their ancestors.[18] Kei Islanders recognize the seven ridges of the leatherback shell as representations of the seven local villages and believe that their meat is sacred.[19] In the upper Gulf of California, the Seri people believe the leatherback rose from the water to create their home, the island of Tahéjöc, where the ridges of the shell are still visible as the mountain ranges.[20] Sea turtles, with the leatherback being the most sacred, have formed the nutritional, material, artistic and spiritual core of the Seri people, and are respected and celebrated to this day.[21]

PHOTO TIM CALVER

SEA TURTLE LIFE CYCLE

Sea turtles are air-breathing reptiles that lay their eggs on land. Female sea turtles of most species nest at night, although Kemp's ridleys and olive ridleys also nest during the day.[22] The nesting female crawls onshore, excavates a sandy pit using her hind flippers, deposits a clutch of eggs and re-covers the pit with sand. Once a female lays all of her eggs, she immediately returns to the water. The sex of the sea turtles is determined by nest temperature, with more females hatching at higher temperatures.[23] During this underground incubation period, a number of factors place the eggs at risk, including flooding of the nest by tides and excess rainfall; beach erosion; crushing by people and motorized vehicles; and predation by animals such as wild dogs, raccoons and foxes.[24]

Figure 1: Sea turtle life cycle

Hatchlings break through their eggshells, or "pip," after an incubation period of roughly six to 10 weeks.[25] After emerging from their sand-covered nesting chamber, hatchlings use the natural light of the moon and other visual cues to guide them on their journey to the ocean.[26] During their seaward crawl, hatchlings are in danger of predation by humans, birds and animals. In addition, disorientation by artificial lighting also poses a serious threat, leading sea turtles to wander away from the water and become stranded or crushed by motorized vehicles. The threats do not stop there.


PHOTO MICHELLE FABIE


PHOTO TIM CALVER

> Some of the larger and slower growing sea turtle species, such as the loggerhead, do not reach sexual maturity until they are more than 30-years-old.

Once in the water, hatchlings must avoid natural predators like birds and fish. They also face a gauntlet of human-caused threats, such as fisheries bycatch, chemical pollution, channel dredging, marine debris and vessel collisions, during their voyage to locate safe feeding grounds and, later, nesting grounds.

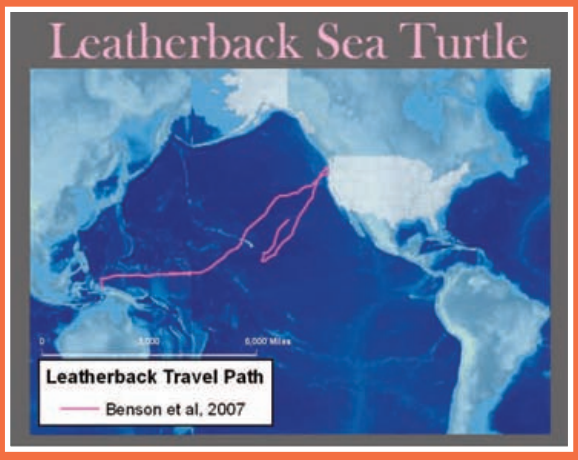
Some of the larger and slower-growing sea turtle species, such as the loggerhead, do not reach sexual maturity until they are more than 30-years-old.[27] Other smaller species, such as the Kemp's ridley, can reach maturity as young as 10 years of age.[28] Once a female sea turtle reaches maturity, she migrates with the guidance of the Earth's magnetic field and other cues to the same area where she was born.[29] There, she deposits her eggs and carries on the ancient cycle of a sea turtle's life.


PHOTO DANIELLE BUONANTONY


PHOTO PBS.ORG

Sea turtles migrate hundreds, or even thousands, of miles between breeding and foraging grounds. Researchers have found a way to track these movements by affixing sea turtles with satellite tags. A single line on a satellite tracking map represents the path followed by one individual sea turtle. Tagging numerous male and female sea turtles of different species and ages allows researchers to identify movement patterns. These patterns reveal information about sea turtle distribution, travel distances, foraging activities and areas that should be protected as important habitat.

Figure 2: A satellite tagged leatherback migrates across the Pacific Ocean[30]



Leatherback satellite tracking data, collected by Benson, S.R., et al. 2007 in cooperation with the Tagging of Pacific Predators (TOPP) program[31]

SEA TURTLES IN THE UNITED STATES

Six sea turtle species inhabit U.S. waters and each has a different habitat range, foraging niche, physical appearance and role in the ecosystem. Some sea turtles nest in other countries and move to U.S. waters later in life, while other species nest in the United States, but then spend large portions of their lives swimming the world's oceans.

In the United States, sea turtle nesting for various species occurs in Hawaii, Puerto Rico, the U.S. Virgin Islands, along the southeastern coast of the continental United States and in some of the U.S. island territories such as Guam and the Northern Mariana Islands. The southeastern United States, in particular, provides important nesting habitat for green, Kemp's ridley, leatherback and loggerhead sea turtles. Despite differences in nesting locations, behavior and physical appearance, these sea turtle species share a common story: an existence that is threatened by human activities.

Species	Incubation Duration (days)	Clutch Size (eggs per nest)	Clutch Count (nests per event)	Nesting Event Interval[32] (years between nesting events)	Max. Adult Weight (pounds)	Max. Adult Length (feet)
Green	48-74	100-200	≤ 6	2-3	309-507	2.6-4.3
Hawksbill	58-75	50-200	3-4	2-3	132	3.3
Kemp's Ridley	45-60	50-185	2-3	1-2	100	2-2.3
Leatherback	60-70	100-150	≤ 10	2-3	2,020	4.9
Loggerhead	46-71	100-150	3-7	2-3	330-550	3.9
Olive Ridley	45-62	30-170	3-4	1-2	100	2.5

Table 2: Sea turtle average nesting and life history statistics[33]


PHOTO STEPHEN M. SCHELB

Green Sea Turtle

ENDANGERED/THREATENED

Florida & Mexico Breeding Colony/All other areas


PHOTO MICHELLE SCHARER

Hawksbill Sea Turtle

ENDANGERED


PHOTO NPS

Kemp's Ridley Sea Turtle

ENDANGERED

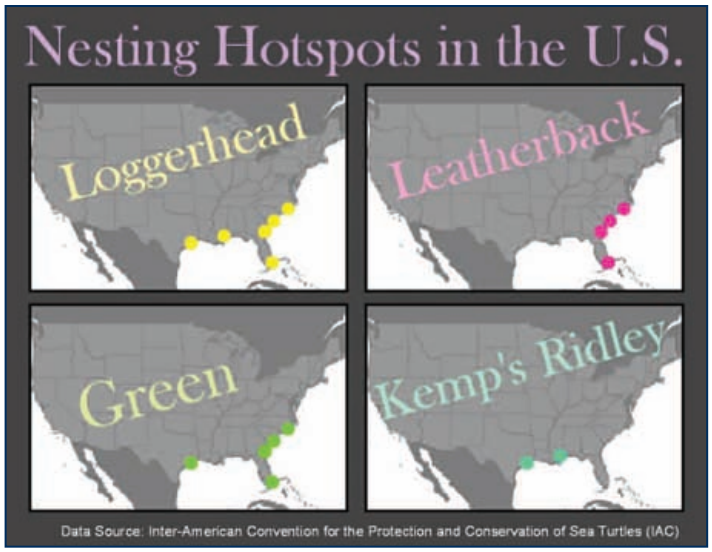


Figure 3: Sea turtle nesting hotspots, by species, in the southeastern United States[34]


PHOTO SUE RANGER/MCS

The southeastern United States, in particular, provides important nesting habitat for green, Kemp's ridley, leatherback and loggerhead sea turtles.


PHOTO SMITHSONIAN MUSEUM

Leatherback Sea Turtles

ENDANGERED


PHOTO GARY YOSS

Loggerhead Sea Turtles

THREATENED


PHOTO KEDAR GORE

Olive Ridley Sea Turtles

ENDANGERED/THREATENED

Mexico Breeding Colony/All other areas

PHOTO TIM CALVER

Green Sea Turtles

(Chelonia mydas)

Thanks to conservation efforts over the past several decades, select populations of greens in the Pacific and Atlantic oceans are rebounding.

Status: **Endangered (Mexico & Florida); Threatened (all other areas)**

Greens inhabit tropical and subtropical waters throughout the world. They are primarily herbivores, feeding chiefly on grasses, plants and other vegetation. Due to the low nutrient value of their grass and algae-dominated diet, greens are the only species of sea turtles that lay out on beaches to soak up vitamin D from the sun's rays.[35] In 1998, after habitat loss and seagrass bed degradation was linked to the decimation of sea turtle populations in the Caribbean region, the National Marine Fisheries Service (NMFS) designated critical habitat, a protected area essential for conservation of the species, for greens in coastal waters around Puerto Rico.[36] In the southeastern United States, juvenile greens have seasonal home ranges distributed around rich patches of food. They spend the majority of daylight hours foraging and rest under protective reef shelters at night.[37]

In the southeastern United States, greens nest primarily in Florida. More than half of the greens that nest in Florida do so in the Archie Carr National Wildlife Refuge, located on the state's central east coast.[38] In the Pacific, green nesting habitats are located in Japan, the Northwestern Hawaiian Islands and Australia.[39] Two of the largest green nesting grounds are Tortuguero in Costa Rica and Ascension Island in the Atlantic Ocean.[40] Ascension Island is a small volcanic outcrop, approximately 34 square miles in size, where greens nest in droves from January to May each year.[41]

PHOTO MICHELLE FABIE

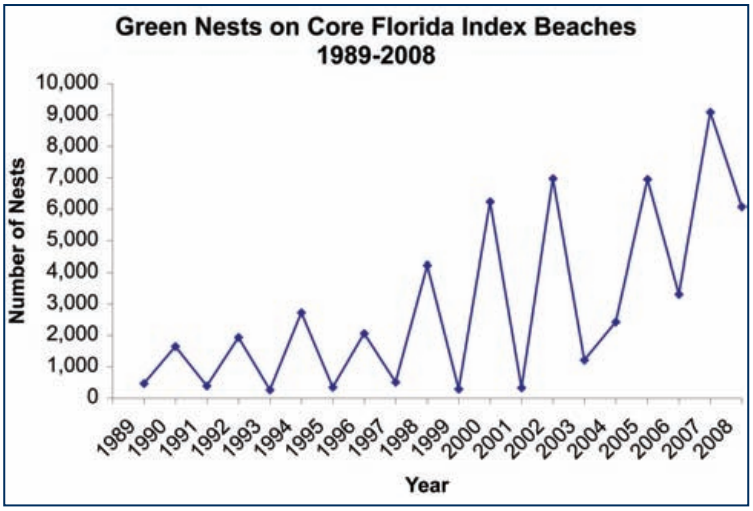


Figure 4: Green nests on core index beaches in Florida from 1989 to 2008[42]

Figure 5: Green habitat range[43]

Fisheries bycatch, debris ingestion, sea turtle consumption by humans, beach erosion, urban development and vessel strikes are ever-present, human-caused threats to greens.[44] In fact, these threats have led to the global decline of greens by at least 37 percent, and possibly more than 70 percent, during the last 140 years.[45] Greens ingest plastics and fishing line when foraging on seagrass, algae and other marine plants. The ingestion of these foreign objects blocks their intestines, prohibits proper growth and can even result in death.[46] Outside of the United States, people in some countries continue to eat greens and their eggs. Killing sea turtles for consumption has driven nesting populations to historically low numbers in many areas of the world. Decreases in green populations are particularly worrisome because they are considered an "indicator" species, as their abundances often reflect the health of seagrass ecosystems.[48]

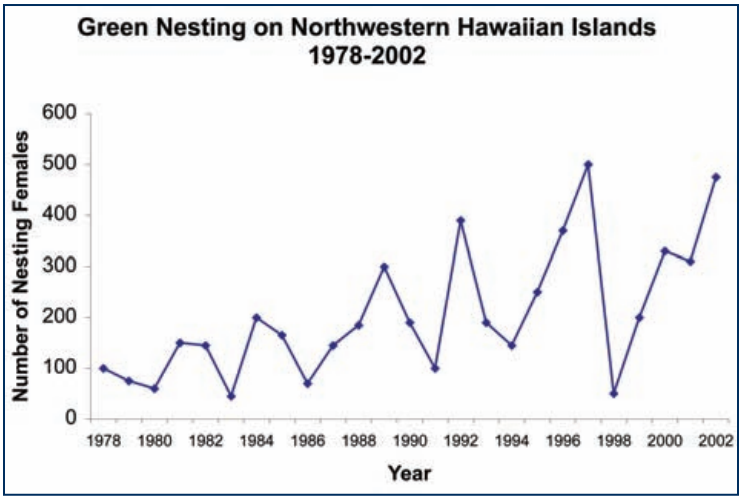


Figure 6: Number of green females nesting in the Northwestern Hawaiian Islands from 1978 to 2002[47]

Thanks to conservation efforts over the past several decades, select green populations in the Pacific and Atlantic oceans are rebounding. In Hawaii, the mean annual nesting abundance has increased from 83 females in the 1970s to 400 females during the most recent monitoring period (2002-2006).[49] Numbers of greens in the waters surrounding Hawaii, as well as the number of sea turtles basking in the sun, have also increased in recent years.[50] In the Atlantic, Archie Carr National Wildlife Refuge has witnessed a long-term trend of increasing nest abundances due to strict conservation laws that prevent harm to nests and restrict development that would affect nesting beaches. In 2007, nearly 4,500 nests were counted in the refuge,[51] a stark contrast to the mere 198 nests counted in 2001 and similar numbers counted in the 1980s.[52] Although conservation efforts appear to be helping green populations recover in some areas, the species has a long way to travel before it reaches historic population levels.

PHOTO ASGHAR MOBARAKI

Hawksbill Sea Turtles

(Eretmochelys imbricata)

Status: **Endangered**

Hawksbills are named for their distinctive beaks that curve sharply at the end. Juvenile hawksbills feed primarily on seagrass and algae, while adults use their strong beaks to eat invertebrates, sponges, oysters, corals and crustaceans such as crabs.[53] By feeding on sponges and other reef species, hawksbills help maintain healthy and balanced coral reef ecosystems.[54]

Hawksbills are not highly migratory and, more than any other sea turtle species, prefer to remain closer to shore. In the United States, hawksbills are most commonly found offshore of Texas, Puerto Rico, the U.S. Virgin Islands and Florida's Atlantic coast. Hawksbills found in the Gulf of Mexico typically originate from nesting beaches in Mexico.[55] The largest hawksbill nesting aggregations in the United States are located on Mona Island of Puerto Rico and Duck Island of the U.S. Virgin Islands.[56] Although the population of nesting females has increased slightly on these two islands, the overall Atlantic hawksbill population has decreased by 80 percent since the early 1900s.[57] Hawksbill populations in the Pacific and Indian oceans have declined by 95 percent and 78 percent, respectively.[58] The historically crowded eastern Pacific nesting beaches in Mexico and Ecuador are now vacant reminders of the severely depleted hawksbill population.[59]

PHOTO SUE RANGER/MCS

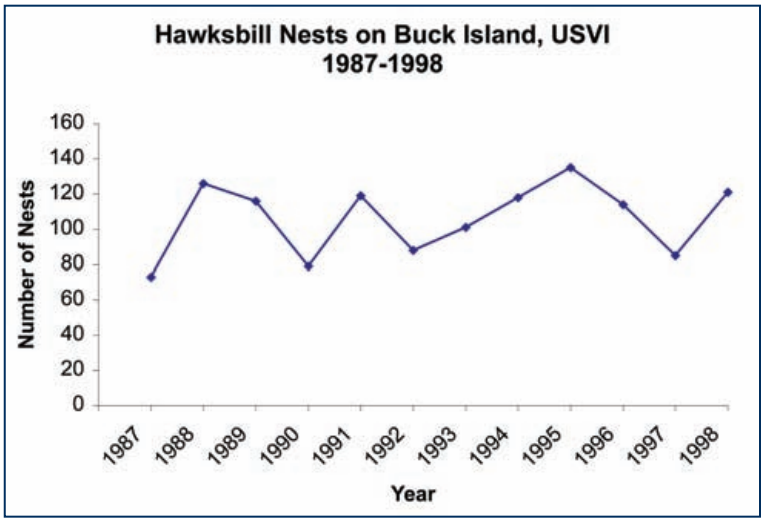


Figure 7: Number of hawksbill nests on Buck Island, U.S. Virgin Islands, from 1987 to 1998[60]

Figure 8: Hawksbill habitat range[61]

PHOTO GARY YOSS

These dramatic declines in hawksbill populations are largely a result of human exploitation. Humans have killed millions of hawksbills for their beautifully patterned shells, which are brown with splashes of yellow, orange and red mottling.[62] In the Caribbean, hawksbill shells were once highly prized and were carved into hair clips, combs, jewelry and other decorative items.[63] Additional threats to hawksbill populations include entanglement in fishing gear and ingestion of plastic debris.[64]

Hawksbills are now protected in the Caribbean and many other regions under Appendix I of the Convention on International Trade in Endangered Species (CITES). All international trade of hawksbills and hawksbill products is prohibited between signatory nations, although it is probable that illegal trafficking continues.[65] Despite prohibitions against killing hawksbills or taking their eggs, hawksbill products are still openly available in the Dominican Republic and Jamaica.[66]

By feeding on sponges and other reef species, hawksbills help maintain healthy and balanced coral reef ecosystems.

PHOTO INGRID L. YAÑEZ

PHOTO NPS

Kemp's Ridley Sea Turtles

(Lepidochelys kempii)

Status: **Endangered**

Kemp's ridleys, the smallest sea turtles in the world, are named after Richard M. Kemp, a fisherman from Key West, Fla., who first submitted the species for identification in 1906.[67] Kemp's ridleys are found only in the North Atlantic, extending from the Gulf of Mexico to Newfoundland and from Western Europe to northern Africa. Most Kemp's ridley nesting occurs at Rancho Nuevo in Tamaulipas, Mexico, just south of the Texas border on the Gulf of Mexico.[68] Tracking studies have shown that in the United States, adult female Kemp's ridleys that nest along the Texas coast typically migrate eastward along the Louisiana coastline towards the Mississippi River Delta, where they may forage for months.[69] Juvenile Kemp's ridleys generally do not travel as far as adults. In rare exceptions, adult female Kemp's ridleys that nest in Texas migrate as far as the Florida Panhandle.[70]

Kemp's ridleys feed opportunistically, taking advantage of whatever food is easily available. They feed primarily on crabs, jellyfish, snails, bivalves, tunicates, fish, insects and fins of cownose rays. Because spider, portunid and purse crabs are slow moving creatures, they make easy targets for a hungry Kemp's ridley, especially a juvenile that has not yet perfected its hunting skills.[71]

PHOTO THANE WIBBELS

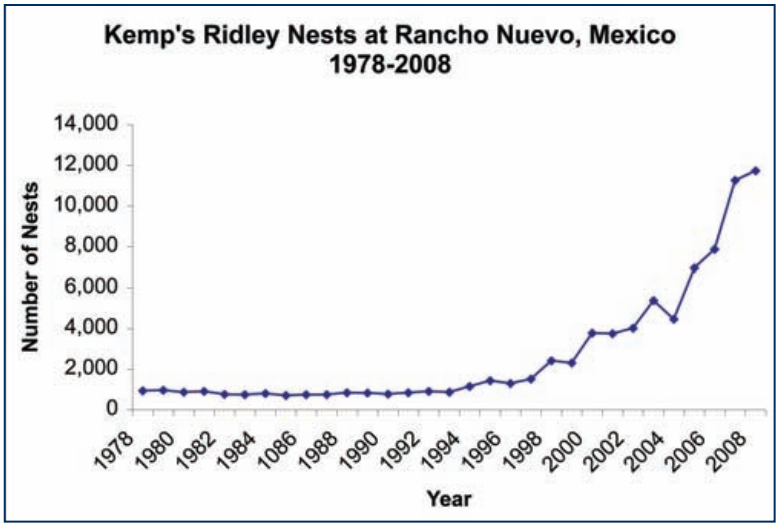


Figure 9: Number of Kemp's ridley nests on their main nesting beach, Rancho Nuevo, Mexico, from 1978 to 2008[72]

Figure 10: Kemp's ridley habitat range[73]

PHOTO KIM BASSOS-HULL

Kemp's ridleys grow up to two feet in length and reach sexual maturity faster than the larger, slower-growing sea turtle species. They can reach maturity as young as 10 years of age.[74] Kemp's ridleys nest in massive groups called "arribadas" on the beaches of the western Gulf Coast of Mexico, particularly on the beach at Rancho Nuevo, mainly during daylight hours between May and July.[75] Arribadas can consist of hundreds to thousands of females emerging from the ocean together to lay their eggs at the same nesting beach each year. Decades ago, before humans devastated their population, a single arribada was estimated to number up to 40,000 Kemp's ridleys. But in the 1980s, the arribada size declined to as few as 200 sea turtles or less.[76]

Kemp's ridleys, once considered the most endangered sea turtles in the world,[77] are making a comeback. The current nesting numbers have increased to an estimated 4,047 females nesting in 2006 from just 247 estimated in 1985.[78] Kemp's ridleys faced two major threats, egg collection for consumption and capture in shrimp trawls, which are massive fishing nets that are dragged along the ocean floor. As these problems are being addressed, the population is increasing. In the 1990s, up to 55,000 loggerheads and Kemp's ridleys were killed each year in shrimp trawls.[79] Today, U.S. shrimp trawls are required to use Turtle Excluder Devices (TEDs), which provide an escape route for caught sea turtles. Thanks to TEDs, most Kemp's ridleys escape alive.

Survival of the Kemp's ridleys still depends heavily on international conservation efforts. The continued use of TEDs and increased enforcement of TED regulations are essential. Because Kemp's ridleys only nest in a very limited area, habitat destruction, whether caused by nature or humans, could drastically reduce their population.[80] For example, climate change could restrict the nesting beaches even further and threaten the populations by altering prey distribution and abundance. Climate change also could affect the Kemp's ridleys sex ratios as a result of increased sand temperatures.[81]

> **Kemp's ridleys, once considered the most endangered sea turtles in the world, are making a comeback.**

PHOTO NPS

PHOTO TIM CALVER

Leatherback Sea Turtles

(Dermochelys coriacea)

Status: **Endangered**

As their name implies, leatherbacks have soft, scaleless, leathery shells with seven distinctive ridges. Because they are so different from other species of sea turtles, they are placed in their own scientific family, Dermochelyidae. Leatherbacks are the largest sea turtles in existence. The largest measured leatherback weighed in at 2,020 pounds,[82] about 200 pounds heavier than a Smart Car.[83] Leatherbacks can grow up to 6.5 feet in length.[84]

Found in the tropical, temperate and equatorial waters of the Atlantic and Pacific oceans, leatherbacks have the widest spatial distribution of any reptile in the world.[85] Leatherback nesting in the United States only occurs in Puerto Rico, the U.S. Virgin Islands and southeast Florida, but they can be found swimming as far north as the Canadian waters of the Gulf of Maine.[86] The Pacific leatherback spends a significant portion of time in ocean waters off the west coast of the United States from north-central California to Oregon and Washington. This area comprises critical foraging habitat for the highly endangered Pacific leatherback.[87] Of all sea turtles, leatherbacks spend the most time in the open ocean. Their bodies are built for diving into cold waters, to depths of as much as 3,200 feet, to find their jellyfish prey.[88]

Leatherbacks are renowned for their transoceanic migrations. A 2007 study showed just how far these giant reptiles can travel: one sea turtle migrated across the entire Pacific, originating in Indonesia and traveling more than 12,000 miles

PHOTO TIM CALVER

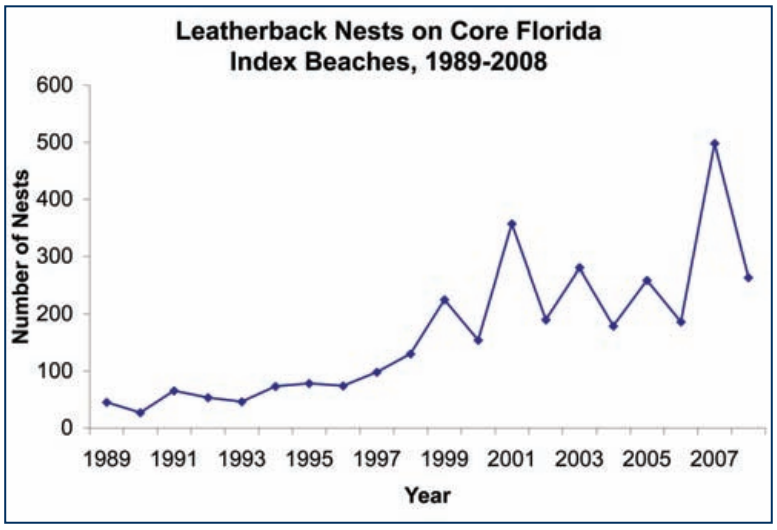


Figure 11: Number of leatherback nests on core Florida Index beaches from 1989 to 2008[89]

Figure 12: Leatherback habitat range[90]

PHOTO RUSTIN CRANDALL

> The largest measured leatherback weighed in at 2,020 pounds, about 200 pounds heavier than a Smart Car.

before reaching the west coast of the United States.[91] The tagged leatherback spent two years foraging near Hawaii, Washington and Oregon before returning to its nesting grounds in the western Pacific Ocean.

Pacific leatherback populations have experienced catastrophic declines due to unsustainable fishing practices, with nesting activity in Mexico, Costa Rica and Indonesia decreasing by up to 90 percent.[92] If current trends continue, Pacific leatherbacks could be extinct in the next few decades.[94] Unlike in the Pacific, Atlantic leatherback populations appear to be rebounding thanks to conservation efforts.[95] The number of nests laid in Florida increased from 473 in 2004 to 1,442 in 2007.[96] However, leatherbacks, even in the Atlantic, are still at great risk. Human threats, such as bycatch in commercial fisheries, habitat degradation, poaching for meat consumption and capturing and killing leatherbacks for medicinal use, continue to jeopardize the survival of the species.

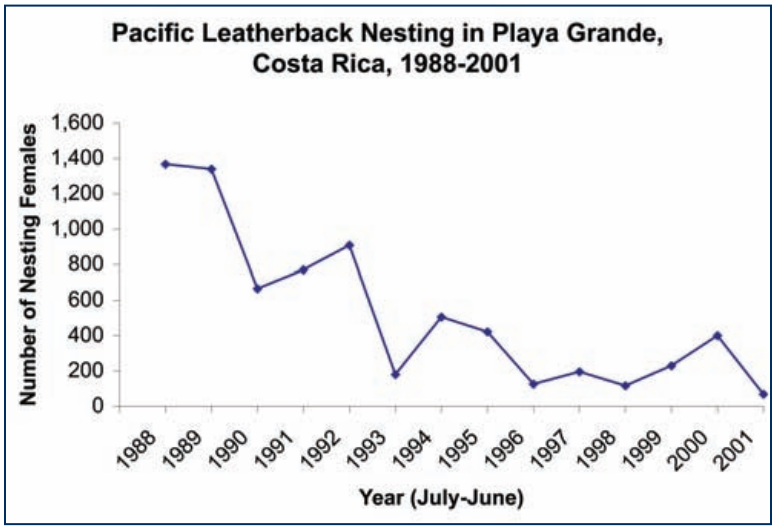


Figure 13: Number of female leatherback nesting in Playa Grande, Costa Rica, from 1988 to 2001[93]

PHOTO GUILLAUME FEUILLET/KWATA NGO

PHOTO GARY YOSS

Loggerhead Sea Turtles

(Caretta caretta)

Status: **THREATENED**

Loggerheads are aptly named for their block-shaped heads, which are large in comparison to their body size. Adult loggerheads grow to an average of 300 pounds and their muscular jaws allow them to eat crabs, clams, snails and other hard shelled invertebrates. They typically forage in estuaries, along the continental shelf and on drifting seaweed patches in the open ocean.[97]

Loggerheads call a wide range of temperate and tropical habitats in the Atlantic, Pacific and Indian oceans home. In the United States, loggerheads nest on beaches along the Atlantic Ocean and Gulf of Mexico from Texas to North Carolina. The beaches of southern Florida host the second largest loggerhead nesting colonies in the world and account for more than 90 percent of their nesting in the United States.[98] Hatchlings use ocean currents to aid their transoceanic journey across the Atlantic. Loggerheads grow and forage in the open ocean for 6.5 to 11.5 years before returning to nearshore waters.[99]

PHOTO CORY WILSON

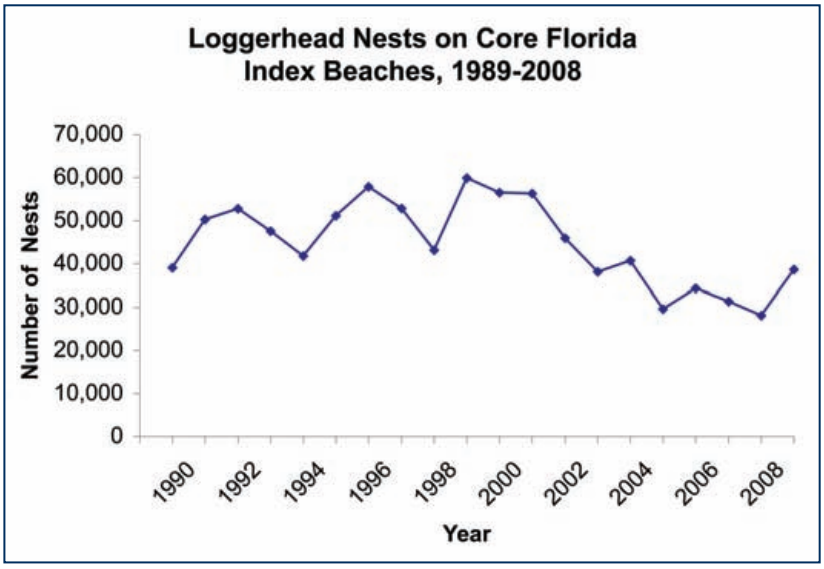


Figure 14: Number of loggerhead nests on core index beaches in Florida from 1989 to 2008[100]

Figure 15: Loggerhead habitat range[101]

PHOTO OCEANA/JUAN CUETOS

Outside of the United States, loggerheads nest in dense concentrations in Oman, Japan and eastern Australia. Female loggerheads in the North Pacific have declined by more than 80 percent during the past two decades due to habitat loss, fishing pressure and other human activities.[102]

Data show that loggerhead nesting subpopulations in the North Atlantic are declining and that the single greatest manmade threat to this population is bycatch in commercial and artisanal fisheries.[103] Nesting has decreased significantly in the United States, Caribbean and along the Yucatan Peninsula of Mexico. Nesting in Florida has declined by more than 40 percent since 1998.[104] Bycatch in a number of fisheries, including those using longlines, gillnets, trawls and scallop dredges, have significantly contributed to this decline.[105]

Loggerhead nesting in the North Pacific has also suffered substantial decline. The annual loggerhead nesting population in Japan declined 50 to 90 percent in the 1990s with possibly as few as 1,000 females breeding annually.[106] While there may have been a substantial increase in nesting in more recent years, there are significant threats to juvenile and adult loggerheads as they migrate from nesting beaches in Japan across vast stretches of the North Pacific, including juvenile foraging grounds off Baja California, Mexico.

Loggerheads grow and forage in the open ocean for 6.5 to 11.5 years before returning to nearshore waters.

PHOTO JEFF JANOWSKI

PHOTO KEDAR GORE

Olive Ridley Sea Turtles

(Lepidochelys olivacea)

Status: **Endangered** (Pacific Coast of Mexico); **Threatened** (all other areas)

Olive ridleys get their name from their olive-colored shells.[107] They feed opportunistically on crustaceans, jellyfish, snails, algae and seagrass,[108] and inhabit the tropical waters of the Atlantic, Pacific and Indian oceans. The olive ridley is the most abundant sea turtle in the world. While olive ridleys have been known to inhabit coastal areas, they are most commonly found in the open ocean.[109]

Olive ridleys nest in more than 60 countries worldwide, although they are not known to nest in the United States.[110] Like the Kemp's ridley, olive ridleys usually nest three or four times per season in synchronized arribadas; however, they may also nest solitarily.[111] Historically, one of the largest olive ridley nesting beaches was in Orissa, India, where approximately 610,000 sea turtles laid their eggs in a single week in 1991.[112] In recent years, the Orissa population has suffered severe fisheries related mortality. More than 90,000 dead and dying sea turtles washed ashore between 1994 and 2003.[113]

PHOTO DR. MICHAEL EBNER

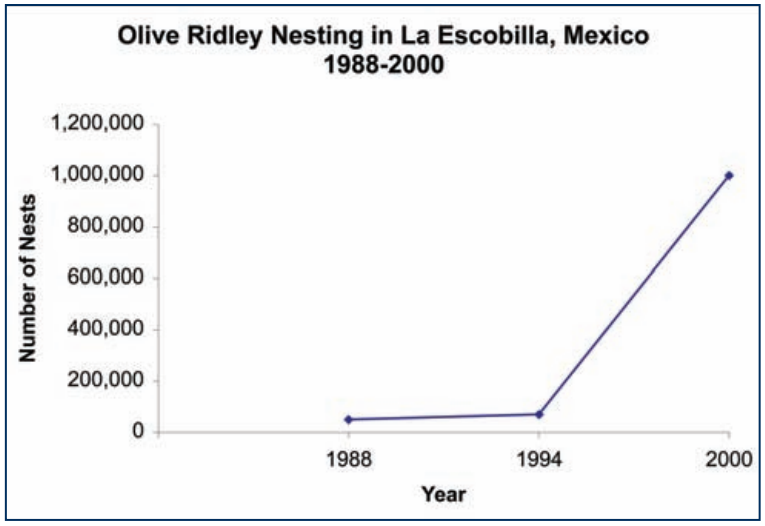


Figure 16: Number olive ridley nests in La Escobilla, Mexico, from 1988 to 2000[114]

Figure 17: Olive ridley habitat range[115]

The global population of olive ridleys has decreased by more than 30 percent from historic levels.[116] Their population decline has been primarily due to the human consumption of sea turtle meat and eggs and the use of their skin in the production of leather goods. Conservation efforts have helped slow the decline of olive ridleys in Mexico, Costa Rica and Indonesia. Today, olive ridley populations are declining each year, more slowly than were seen in the recent past, making future conservation efforts both hopeful and critical for the recovery of this species. [117]

> **The olive ridley is the most abundant sea turtle in the world.**

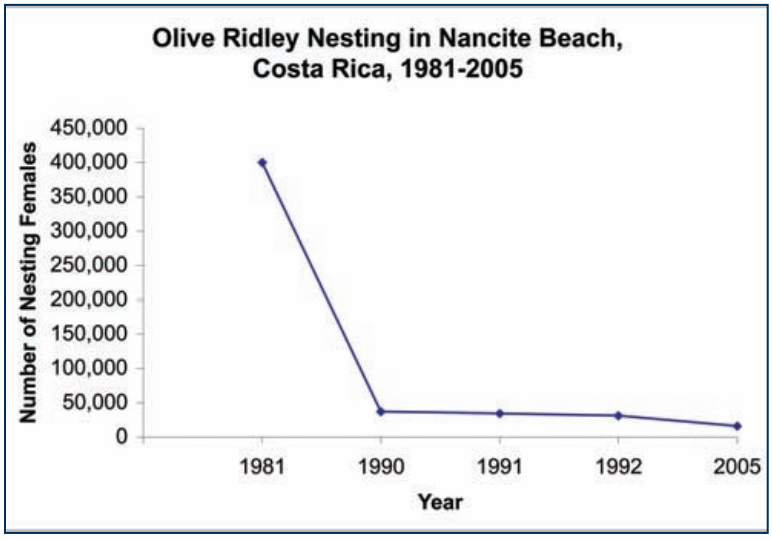


Figure 18: Number of olive ridley nesting females in Nancite Beach, Costa Rica, from 1981 to 2005[118]

THREATS TO SEA TURTLES

Sea turtles may have survived the mass extinction of the dinosaurs, but human activities are proving too much for many species that inhabit U.S. waters to endure.

Fisheries Bycatch

Incidental catch, or bycatch, in commercial fisheries is one of the largest sources of mortality for sea turtles in the United States. The level of sea turtle bycatch varies by gear type, season and location of fishing activity. For example, vessels operating within important foraging habitats, migration routes or in coastal waters near nesting beaches during nesting season are likely to have a greater chance of interacting with sea turtles.

Trawls: A trawl is an open-mouthed, funnel-shaped net that is towed through the water column or dragged along the sea floor. Trawl fisheries operate throughout the year and target a variety of species, including shrimp, flounder, cod, groundfish, black sea bass, scallops and squid. Shrimp trawls have historically had the highest bycatch rates of any fishery in the United States. To combat the risk of mortality, vessels targeting shrimp and summer flounder are required to use Turtle Excluder Devices (TEDs), a grid of bars made of metal or other strong material that is sewn into a trawl net to allow sea turtles to escape. TEDs allow shrimp or fish to move through the trawl to the back of the net, while deflecting the sea turtles to an escape hatch or flap of netting. When installed properly and of the proper size, TEDs can lead to a 97 percent reduction in the number of sea turtles that remain trapped in trawl nets. Unfortunately, as of 2009, the only federally managed trawl fisheries that require the use of TEDs are those targeting shrimp and summer flounder.[120]

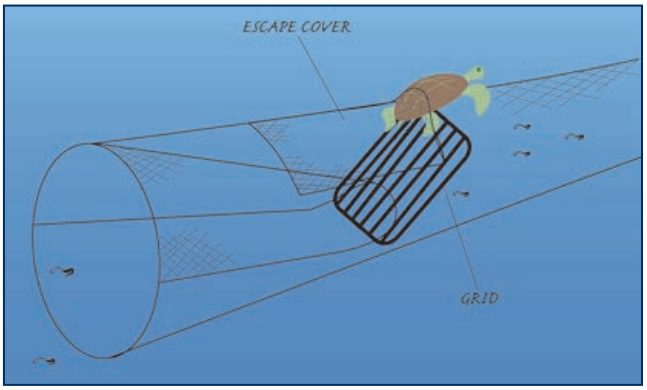


Figure 20: Turtle Excluder Device[121]

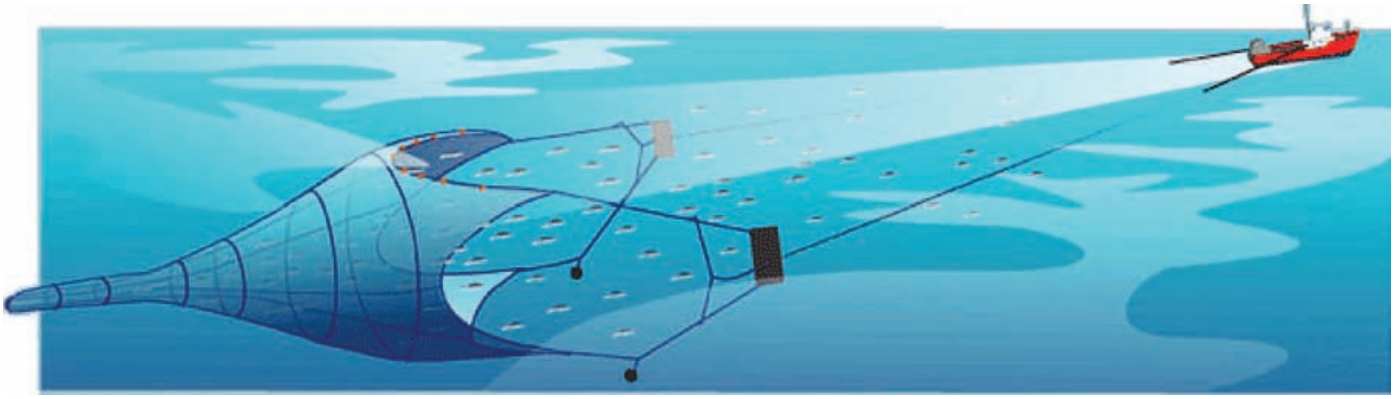


Figure 19: Pelagic Trawl[119]

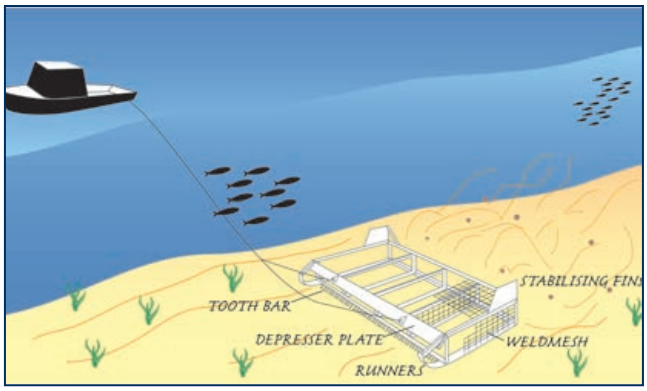


Figure 21: Scallop Dredge[122]

Dredges: Animals that live on the seafloor, such as scallops and clams, are often caught using a method known as "dredging." Dredging is a destructive method of fishing that involves dragging a heavy metal frame and bag made of metal chain links, often weighing several thousand pounds, along the seafloor. Dredges rake up bottom habitat, including corals and sponges, while collecting scallops and other bottom-dwelling species. Dredges also entrap or crush other organisms such as sea turtles.

Longlines: Longlines target tuna, swordfish, grouper, sharks and other species. In U.S. fisheries, the mainline or primary fishing line of a longline is typically between five and 40 miles in length. This lengthy mainline floats in the water column, suspended by buoys (pelagic longline), or is anchored to the seafloor (bottom longline). Smaller lines called gangions or snoods branch off the mainline, and each one holds hooks baited with squid, mackerel or other fish. Billions of hooks are set each year around the world.[123] Hooks are ingested by sea turtles and snagged on their shells and flippers. Sea turtles can also get wrapped up in the gear, which can cut off circulation leading to the loss of limbs or death. Bottom longlines typically cause a high mortality rate because sea turtles caught on the hooks and trapped underwater, are unable to breathe and drown. To reduce the amount of bycatch, fishermen can switch from hooks shaped like a "J" to circle hooks shaped like a "G." Sea turtles are less likely to be caught by circle hooks, and the hooks are more difficult for them to swallow so injuries tend to be less serious. Longliners can also use fish instead of squid for bait – research shows the use of fish bait decreases the likelihood of hooked sea turtles. These steps, in combination with closures based on when sea turtles are in a specific area as well as fishing effort restrictions, can greatly reduce, if not eliminate, the catch of sea turtles.

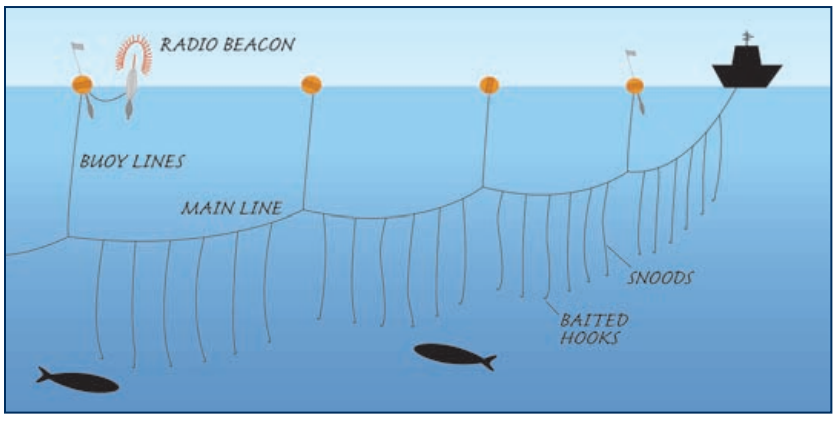


Figure 22: Pelagic Longline[124]

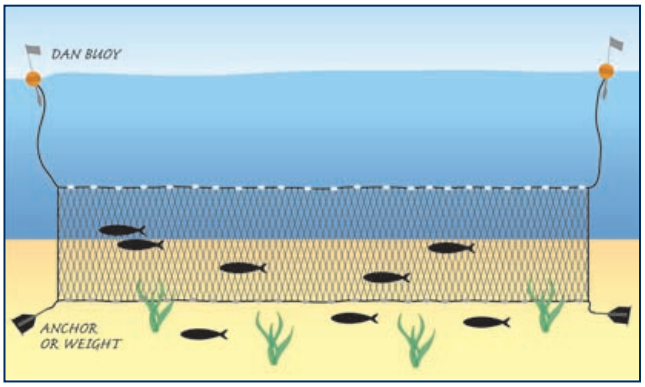


Figure 23: Anchored Bottom Gillnet[125]

Gillnets: A gillnet is a mesh web of fishing line that drifts or sinks in the water column or can be anchored to the seafloor. Gillnets are used to catch sharks, swordfish and other fish species but are highly unselective. Some gillnets can extend for miles and are often left underwater for long periods of time. A fish swims into the invisible netting, and, as it swims in reverse to dislodge itself, its gills become caught in the filament. Sea turtles also become entangled in the netting and, unable to return to the surface, drown. Although they are banned on the high seas, in the United States, drift gillnets are still used off the coasts of California and Oregon, and anchored gillnets are used along the East Coast.

Purse Seines: Purse seines are typically set using two boats – a small skiff and a launch vessel. The skiff encircles a school of fish, dragging one end of the net behind. After a complete circle is made, the launch vessel tightens a rope to close the bottom of the net. Generally, purse seines are not left underwater for extended periods of time, so the risk of sea turtle mortality from forced submergence is relatively low compared to other gear types. However, capture of marine wildlife like sea turtles, dolphins and sharks in purse seines presents a serious and continuing problem.

Pound Nets: Pound nets are stationary fishing stations that can extend more than 15 feet in length and are used to catch striped bass, crab, flounder, menhaden and spot and red drum, among other species.[126] The system has three sections: a fence-like "leader" that blocks fish from swimming past it, a net wall that forces animals to swim towards the pound, and a pound net that serves as the actual entrapment basin. As sea turtles swim parallel to shore, their path is blocked by the leader and serious injury or drowning can result from entanglement of their fins or heads.[128] Recent studies have shown that decreasing the mesh size and increasing net stiffness can lower bycatch rates of sea turtles in pound nets.

Beyond fisheries bycatch, human-caused threats to sea turtles include coastal development, pollution, intentional capture, invasive species, vessel strikes and climate change.

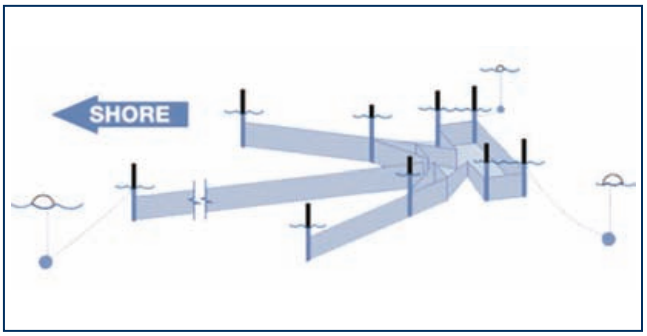
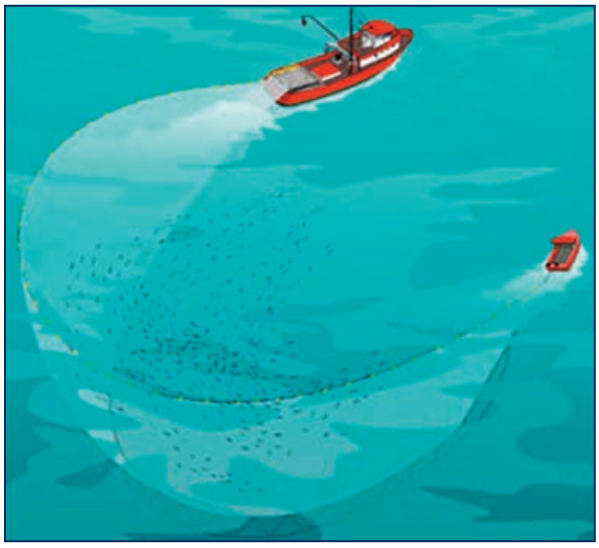


Figure 25: Pound Net[129]



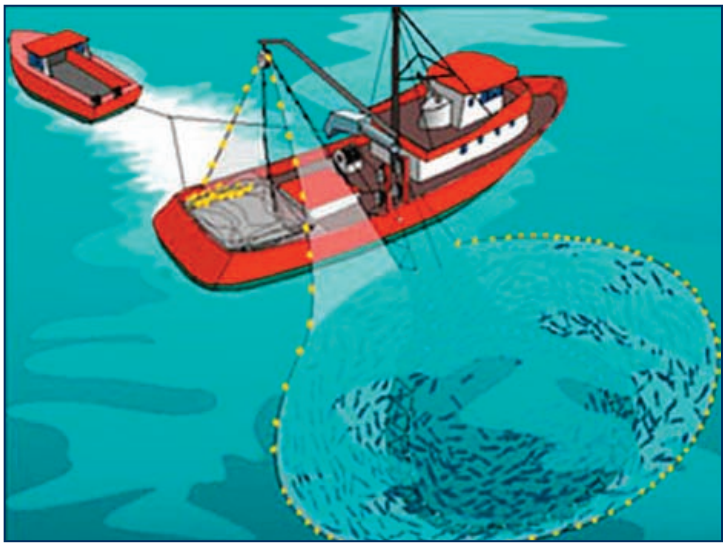


Figure 24: Purse Seine[127]

Coastal Development: Optimal sea turtle nesting habitats are dark, quiet beaches with little or no detectable human presence. With the buildup of piers, hotels, parking lots and residential zones along the U.S. coastlines, female sea turtles are forced to use inferior nesting places. Compromising the quality of nesting beaches leads to reduced hatchling survival, a deterrence of nesting and even eggs shed at sea.[130] Artificial lighting can interfere with the nesting behaviors of adult females. Unnatural lights also confuse sea turtle hatchlings as they find their way from nest to sea by moving toward the brightest area. In an undeveloped area, this is the natural light of the night sky reflecting off the ocean, but shoreside artificial lighting misdirects them away from their journey to the open sea. Instead, disoriented hatchlings crawl landward toward street lamps and hotel room lights, leading to almost certain death from dehydration, exhaustion, predators and motor vehicles.[131]

Pollution: Pollutants can cause injury, disease and death to marine organisms. Even people living in landlocked states have a major impact on the health of the oceans and on the health of sea turtles. Thousands of toxic chemicals, such as PCBs, mercury and copper, are dumped or carried by streams and rivers into the oceans. They originate from homes, factories, farms, roads, automobiles and cruise liners. These contaminants accumulate in the tissues of sea turtles and can harm their health, such as immuno-suppression and hormonal imbalances.[132] Scientists believe that there may be a link between exposure to agricultural pollutants and the spread and prevalence of fibropapillomatosis, a disease in sea turtles that causes tumors to grow on their eyes, intestinal tracts, lungs, mouth and heart.[133] This disease is the most common cause of disability and death among greens in Hawaii.[134] Oil spills pose another risk for sea turtles worldwide, possibly leading to immunosuppression and other chronic health issues.[135] In addition to chemical pollutants, sea turtles can be severely injured or killed by marine debris and "ghost" nets and lines lost or abandoned by fishermen.

Each year, more than six million tons of trash enters the oceans, with plastics constituting up to 90 percent.[136] Marine debris poses an entanglement and ingestion hazard to sea turtles. It reduces sea turtles' abilities to forage, grow and survive. A study conducted on young loggerheads found that 15 percent of those examined had ingested plastics in large enough quantities to block their normal stomach functions.[137] Plastics pose an even greater threat to leatherbacks. A 2009 study estimated that one-third of adult leatherbacks have ingested plastic, with bags being the most common item. Plastic bags mimic jellyfish, their preferred food.[138] The cause of death for nine percent of the sea turtles reviewed for the study was plastic blocking their digestive tracts.[139]

PHOTO OCEANA/JUAN CUETOS

Vessel Strikes: Sea turtles cannot breathe under water. Their regular ascent to the surface for air puts them directly in the path of boats. Commercial and personal watercraft are major hazards to sea turtles, particularly in shipping lanes and during peak tourism months when millions of recreational boaters congregate in coastal areas. Among sea turtles found stranded and dead on Florida beaches, collisions with boats is the most common identifiable source of trauma.[140] Injuries from boat propellers include amputated flippers, fractured shells, brain injuries and broken bones.[141] Although not all of these injuries result in immediate death, they may inflict injuries or increase stress, which ultimately affect a sea turtle's ability to forage, migrate, escape from predators and reproduce.

Intentional Killing: The killing of sea turtles and removal of their eggs for ritual, food, crafting of decorative objects or use of their skin as leather still occurs in many places around the world, including the United States. Poaching, or illegally killing a sea turtle, is known to occur on some nesting beaches in southern Florida, although strict regulations and beach patrols have helped diminish this problem.[142]

Invasive Species: Invasive species are species of plants, animals or insects that have been introduced into an area where they are not found naturally. They can wreak havoc on native species by out-competing them for space and food, or acting as predators. For sea turtles, non-native species, such as fire ants, rats, red foxes and even domestic and feral dogs, pose a serious threat because they dig up their nests and eat their eggs.

Climate Change: Climate change is expected to worsen the stresses that sea turtle populations already face. Climate change is likely to cause severe storms, increase beach erosion and raise sea levels, all of which will affect sea turtle nesting.[143] In addition to changes in nesting behavior, climate change has the potential to alter the sex ratio of the hatchlings and modify ocean currents and sea turtle migration routes.[144] Furthermore, as oceans absorb higher levels of carbon dioxide, they become more acidic. Increased ocean acidification could dissolve the shells of preferred sea turtle prey, such as mollusks and crustaceans, and lead to a massive disruption of the oceanic food web.[145]

PHOTO NOAA

A CONSERVATION CHALLENGE

Sea turtles pose a unique conservation challenge. They spend a small part of their lives on land and the rest in the water, making their populations difficult to quantify. They are slow to reach sexual maturity. They are highly migratory, crossing political jurisdictions and social boundaries on their voyage from foraging grounds to nesting beaches and back. In many areas, large strides have been made towards protecting nesting beaches, reducing poaching and modifying or prohibiting certain types of fishing gears. Nevertheless, the current rate of progress is not sufficient to achieve population recoveries.

After 30 years of protection under the U.S. Endangered Species Act (ESA), all six species of sea turtles that inhabit U.S. waters still remain "threatened" or "endangered" with extinction. Clearly, too little has been done to protect sea turtles from human-induced threats. The question is, will we step up to the conservation challenge or simply allow sea turtles to vanish from the world's oceans.

PHOTO TIM CALVER

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Loggerhead sea turtle with a satellite tag used to gather data for future conservation efforts

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