Sea Turtles

Unit 25

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INTRODUCTION

Sea turtles are highly migratory and widely distributed throughout the world's oceans. The six species found in U.S. waters are the loggerhead, Kemp's ridley, olive ridley, green, leatherback, and hawksbill. In the Pacific Ocean, all these species except the Kemp's ridley inhabit either the U.S. Exclusive Economic Zone (EEZ) or the high seas. Nesting populations of the green turtle and the hawskbill occur in the Hawaiian Archipelago and American Samoa. With rare exception, the loggerhead, leatherback, and olive ridley do not nest in U.S. Pacific states or territories. The loggerhead, Kemp's ridley, green, hawksbill and leatherback are commonly found in U.S. Atlantic waters, while the olive ridley inhabits South Atlantic Ocean waters. Significant nesting assemblages of the loggerhead, leatherback, green, and hawksbill are found in the southeastern United States and in the U.S. Caribbean. The current status of U.S. sea turtles, based on research conducted at major nesting beaches, is summarized in Table 25-1.

All six species of sea turtles found in the United States (7 species worldwide) are currently listed either as endangered or threatened under the Endangered Species Act (ESA). The Kemp's ridley, hawksbill, and leatherback are listed as endangered throughout their ranges. The loggerhead and olive ridley are listed as threatened. The green turtle is also listed as threatened, except the Florida nesting population and the Pacific Mexico breeding population, which are listed as endangered. The authority to protect and conserve sea turtles in the marine environment is vested in the National Marine Fisheries Service (NMFS), while the U.S. Fish and Wildlife Service (USFWS) has principal responsibility at the Federal level for protection of sea turtles on land (nesting beaches).

SPECIES AND STATUS

Atlantic Region

Historical data on the size of sea turtle populations are limited or nonexistent. Complicating the question of population size is the need for a long time-series of data to understand the population dynamics of these species which have complex life histories. Standardized surveys of selected nesting beaches were implemented in the United States in the late 1980's. These surveys, which count the number of nests laid per year, provide an indirect estimate of the adult female population and an indication of whether this population is declining, stable, or increasing.

In recent years, our knowledge of sea turtle biology has been enhanced by the use of tools to understand the genetic identity of different nesting assemblages. Three subpopulations of loggerheads have been identified in the southeastern United States, and a fourth nests along the Yucatán coast of Mexico. Adult and immature turtles from these four subpopulations mix with each other on the foraging grounds. Most loggerhead nesting occurs along Florida's east coast where the annual number of nests deposited has remained relatively stable (about 65,000 nests/year), with evidence of some increases in recent years. In contrast, nesting of the subpopulation north of Cape Canaveral, Florida, has continued to decline (about 6,700 nests/year), and little is known about the small subpopulation that nests in the Florida Panhandle (about 500 nests/year).

The Kemp's ridley inhabits coastal waters throughout the Mid- and southeast Atlantic and the Gulf of Mexico. The Kemp's ridley is unusual in that it nests almost exclusively along one stretch of beach in the State of Tamaulipas on the Carib-

Table 25-1
Status and trends of principal sea turtle nesting populations in the U.S. Atlantic and Pacific regions.

Region and species	Location of principal nesting populations[1]	Historic number of females nesting annually	Current number of nesting females	Trend in nesting population	Status in U.S.[2]
Atlantic region					
Loggerhead, northern subpopulation[3]	Northern Florida–North Carolina	>7,800	3,700	Decreasing	T
Loggerhead, southern Florida subpopulation[3]	Central Florida–southwest Florida	Unknown	40,000	Increasing	T
Loggerhead, Florida Panhandle subpopulation[3]	Florida Panhandle	Unknown	350	Unknown	T
Green[4]	Florida	Unknown	675	Increasing	T, E
Kemp's ridley[5]	Mexico	>40,000	954	Increasing	E
Leatherback[6]	Florida, U.S. Virgin Islands, Puerto Rico	Unknown	160	Stable	E
Hawksbill[7]	U.S. Virgin Islands, Puerto Rico	Unknown	367	Unknown	E
Pacific region					
Loggerhead[8]	Japan	Unknown	1,000	Stable	T
Green[9]	Hawaii, Mexico	Unknown	1,000	Increasing	T
Olive ridley[10]	Mexico, Costa Rica	Unknown	350,000	Increasing	T
Leatherback[11]	Mexico, Costa Rica, Maylasia, Irian Jaya	Unknown	985	Decreasing	E
Hawksbill[12]	Hawaii	Unknown	30–40	Stable	E

[1]Sea turtles in the U.S. Atlantic and Pacific regions originate from nesting populations in the U.S. and foreign countries.
[2]T = threatened. E = endangered.
[3]Estimated total number of nesting females in the population based on 4.1 nests/female/year and a 2.5-year remigration interval.
[4]Average number of females nesting annually based on 3.5 nests/female/year for 1993–97.
[5]Number of females nesting in 1997 based on 2.5 nests/female/year.
[6]Average number of females nesting annually based on 5.3 nests/female/year for 1993–97 for Florida, Sandy Point (U.S. Virgin Islands), and Culebra Island (Puerto Rico).
[7]Average number of females nesting annually based on 4.5 nests/female/year for 1994–98 for Mona Island (Puerto Rico). Nesting also occurs at other beaches in Puerto Rico and the U.S. Virgin Islands.
[8]Estimate of current Japanese nesting population is an aggregate of 1995 survey results for principal nesting beaches.
[9]Estimate of current total Hawaiian nesting population is based on doubling the estimate of nesters at East Island in 1997. Despite growth in the Hawaiian nesting population, concern remains over the increasing incidence of fibropapillomatosis. The trend of the nesting population in Mexico is decreasing.
[10]Estimated number of nesters at La Escobilla beach, Oaxaca, Mexico, in 1996. Nesting also occurs at other beaches in Mexico and in Costa Rica.
[11]Current nesting population estimate is for Mexico only, and based on an estimated 5,222 nests in 1996 on principal nesting beaches.
[12]Current nesting population estimate for Hawaii is based on surveys through 1997 by the U.S. Fish and Wildlife Service.

bean coast of Mexico. This single population underwent a dramatic decline since 1947, when, on a single day, 40,000 Kemp's ridleys were filmed coming ashore to nest. The population plummeted to fewer than 1,000 females nesting annually through the early 1980's. Today, under strict protection, the population appears to be in the earliest stages of recovery (Figure 25-1). The increase can be attributed to two primary factors — full protection of nesting turtles and their nests in Mexico and the requirement to use turtle excluder devices (TED's) in shrimp trawls both in the United States and Mexico.

The green turtle nesting population in the southeastern United States appears to be stable. Based on genetic information, subpopulations throughout the North and South Atlantic commingle on the foraging grounds, but only one population nests in the continental United States—along Florida's east coast. The annual number of nests fluctuates greatly, usually alternating between high and low years. In recent years, the number of nests deposited annually has ranged from less than 450 to over 3,800.

The leatherback is widely distributed in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. In the United States, the largest nesting assemblages of leatherbacks are found in the U.S. Virgin Islands, Puerto Rico, and Florida. Nesting data for these locations have been collected since the early 1980's and indicate that the annual number of nests is likely stable; however, information regarding the status of the entire leatherback population in the Atlantic is lacking.

The hawksbill is most commonly found in the Caribbean, but also regularly occurs in southern

Florida and southern Texas. Within the continental United States, a small amount of nesting occurs in southern Florida. The largest nesting assemblages of hawksbills in the United States are found at Mona Island, Puerto Rico; Buck Island, U.S. Virgin Islands; and at other sites in the U.S. Virgin Islands and Puerto Rico. There is clear and convincing evidence that hawksbill populations in the Atlantic have been greatly depleted during the 20th century as a result of overharvest for trade in products made from their shell.

Pacific Region

In the Pacific, most reproductive colonies of the olive ridley are in continental coastal areas and rarely on oceanic islands. Although large nesting assemblages of olive ridleys are found along the Pacific Coast of Mexico and Central America, there continues to be significant pressure on this population from harvest of eggs and incidental capture in trawl and longline fisheries.

Major North Pacific nesting populations of the loggerhead occurs in Japan and, in the South Pacific, in Australia. At different stages of their life cycle loggerheads occupy oceanic waters and coastal benthic habitats around continents. In the open ocean they are apt to be associated with convergence zones, oceanic fronts, and boundary currents. Loggerheads have been recorded in waters around the Northern Mariana Islands, American Samoa, and Hawaii but are uncommon there. The status of loggerhead populations in most areas of the Pacific is unknown due to a lack of historical data on their distribution and abundance. However, long-term data on nesting and foraging populations in Queensland, Australia, indicate that loggerheads are declining in that area.

The leatherback is a pelagic species that probably occurs near all U.S. Pacific islands, is often sighted in U.S. west coast waters, and is widely distributed on the high seas. Principal leatherback nesting populations occur in the Solomon Islands, Irian Jaya, Papua New Guinea, Mexico, Costa Rica, and peninsular Malaysia. Leatherbacks are seriously declining at all major nesting beaches throughout the Pacific. The decline is dramatic along the Pacific Coasts of Mexico and Costa Rica and coastal Malaysia. Nesting along the Pacific Coast of Mexico declined at an annual rate of 22% over the last 12 years, and the Malaysian population represents 1% of the levels recorded in the 1950's. The collapse of these nesting populations was precipitated by a tremendous overharvest of eggs, direct harvest of adults, and incidental mortality from fishing.

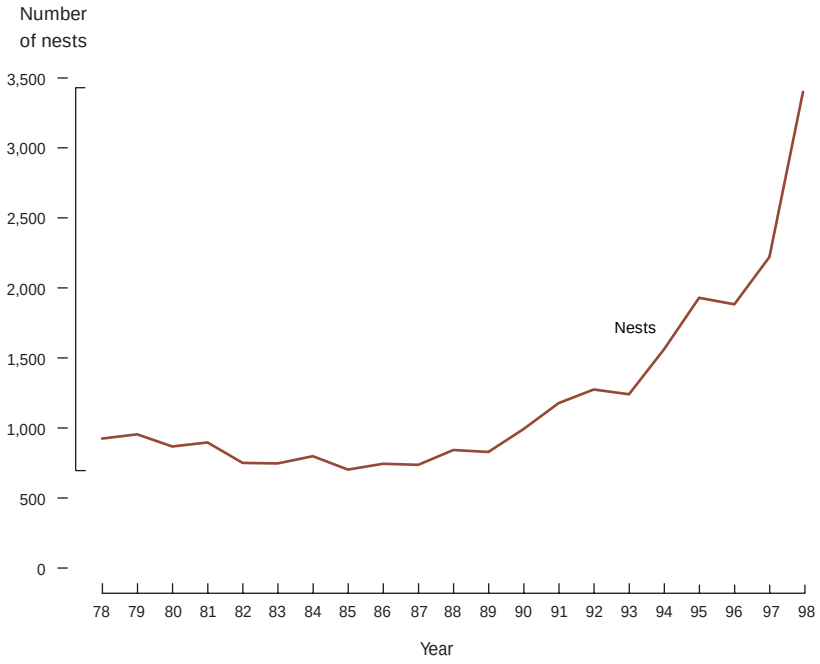

Figure 25-1
Number of Kemp's ridley nests observed annually at Rancho Nuevo, Tepehuajes, and Barra delTordo, Mexico, 1979–98 (Gladys Porter Zoo, 1997; R. Marquez M.[1], unpublished data).

The hawksbill is typically more insular than other sea turtles and is usually associated with coral reefs. Although not all U.S.-flag islands in the central-western Pacific have been surveyed, the hawksbill and the green turtle probably occur at most of them. The USFWS estimates that 30–40 hawksbills nest on the Main Hawaiian beaches each year, primarily along the east coast of the island of Hawaii. The number of hawksbills present in American Samoa and Guam is unknown, but nesting has been observed at Rose Atoll and the Manua Islands in American Samoa. The status of the hawksbill throughout the Pacific is unknown, but continued exploitation of hawksbills for their shells in areas outside the United States makes them a special conservation concern. The most important

[1]R. Marquez M., SEMARNAP/INP, CRIP-Manzanillo, Program Nacional de Tortugas Marinas, P. Ventanas S/N, A.P. 591, Manzanillo, Colima, Mexico 28200

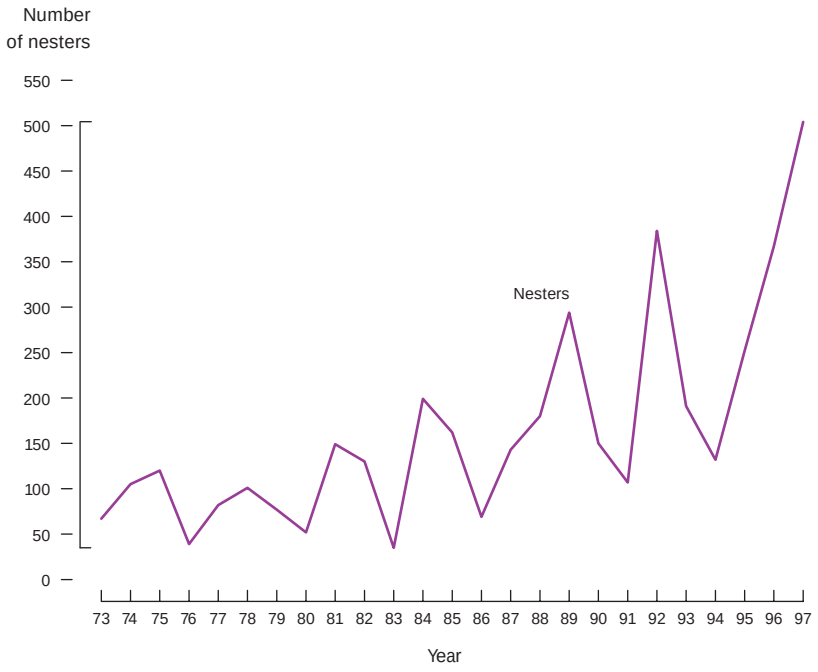

Figure 25-2
Population estimates for nesting green turtles on East Island.

conservation achievement in recent years was Japan's decision to end the import of hawksbill shell. Further declines are possible if trade is renewed.

The green turtle is the most widely distributed sea turtle species in U.S. Pacific waters, particularly in Hawaii. A USFWS nesting survey found that in 1997 about 500 green turtles nested at East Island, a small, sandy islet at French Frigate Shoals in the Northwestern Hawaiian Islands, where about 50% of all Hawaii green turtle nesting is assumed to occur. The green turtle nesting population at East Island appears to have tripled since NMFS initiated the annual surveys in 1973 (Figure 25-2). The increase in Hawaiian green turtle nesting is attributed to a reduction of human-caused mortality after enactment of the ESA in 1974. The historic level of green turtle nesting in Hawaii is unknown. In American Samoa the primary nesting beach is at Rose Atoll where an estimated 25 to 35 females nest annually. The number of green turtles in Guam is unknown, and only sporadic nesting has been recorded there.

ISSUES

Bycatch and Fisheries Interactions

Sea turtles are threatened by multiple factors, most of which are human-related. A principal concern is incidental capture in commercial fisheries. Trawls, longline, and gillnet fisheries pose the greatest threats. Prior to the implementation of TED regulations, the National Academy of Sciences estimated that a maximum of 44,000 sea turtles, mostly loggerheads and Kemp's ridleys, were killed annually in the Gulf of Mexico and southeastern U.S. Atlantic shrimp fishery. While TED use is mandated for the shrimp fishery and some of the summer flounder trawl fishery, recent mortality events indicate that significant mortality is still occurring in some areas as a result of these or other trawl fisheries. Sea turtles are also taken and killed in pelagic longline, gillnet, and lobster trap lines. Of particular concern are the gillnet fisheries for coastal species, including sharks, and the longline and gillnet fisheries for swordfish, tuna, and sharks.

Propeller strikes and vessel collisions also pose significant threats to sea turtles, especially in areas of high human population, where recreational boat traffic is heavy and coastal ports are active.

Habitat Concerns

Coastal development can deter or interfere with nesting, affect nest success, and degrade foraging habitats for sea turtles. Nesting beaches of the southeastern United States and Hawaii are essential to the recovery and survival of sea turtles. Many nesting beaches have already been significantly degraded or destroyed. Nesting habitat is threatened by rigid shoreline protection or "coastal armoring" such as sea walls, rock revetments, and sandbag installations. Many miles of once productive nesting beach have been permanently lost to this type of shoreline protection. Additionally, nesting habitat can be negatively impacted by beach nourishment projects that result in altered beach and sand characteristics that affect nesting activity and nest success. Artificial beachfront lighting, increased human activity, and beach driving

also seriously threaten species recovery. In light of these issues, conservation and long-term protection of sea turtle nesting habitats is an urgent and high priority need.

Marine Debris

Ingestion of marine debris can be a serious threat to sea turtles. When feeding, sea turtles can mistake debris for natural food items. An examination of the feeding habits of loggerhead hatchlings inhabiting offshore convergence zones revealed a high incidence of tar and plastic ingestion. Some types of marine debris may be directly or indirectly toxic, such as oil. Other types of marine debris, such as discarded or derelict fishing gear, may entangle and drown sea turtles.

Disease

A disease known as fibropapillomatosis (FP), originally identified in green turtles, but now affecting loggerheads and olive ridleys as well, has emerged as a serious threat to their recovery. The disease is most notably present in green turtles of Hawaii, Florida, and the Caribbean. FP is expressed as tumors which occur primarily on the skin and eyes, and the disease can be fatal. In Hawaii, green turtles afflicted with FP have a high incidence of tumors in the oral cavity, whereas oral tumors have not been found in Florida or other areas. The cause of the disease remains unknown. The disease has been systematically monitored in several locales in Hawaii. At a study site on southern Molokai, for example, where tumors were virtually unknown before 1988, the prevalence of tumored sea turtles ranged from 42 to 56% during the 1995–97 surveys. In Florida, up to 50% of the immature green turtles captured in the Indian River Lagoon are infected, and there are similar reports from other sites in Florida, including Florida Bay, as well as from Puerto Rico and the U.S. Virgin Islands. In Florida, the disease has been found to affect up to 13% of loggerheads inhabiting Florida Bay. FP appears to be the chief threat to full recovery of the Hawaii green turtle population, and the disease could hinder the recovery of green turtle populations elsewhere as well. Research to determine the cause of this disease is a high priority.

Progress

In 1998, the NMFS and USFWS published recovery plans for five species of Pacific sea turtles and one distinct nesting population. Plans are underway to revise some of the U.S. Atlantic recovery plans which were completed in the early 1990's. These plans describe and prioritize the actions which are necessary to conserve and recover the species.

Significant progress is being made in the monitoring of Hawaiian green turtles by the NMFS and the USFWS. A 5-year series of saturation surveys, completed in 1992, led to the development of rigorous quantitative methods to estimate the nesting population. Progress is also being made in monitoring juvenile and subadult Hawaiian green turtles in their nearshore habitat. Significant progress has also been made in collaboration with Mexico and the USFWS to establish and maintain more comprehensive nesting beach surveys for Kemp's ridleys.

Progress has been made in the study of migratory movements of post-nesting sea turtles, to identify routes of travel and resident foraging grounds. NMFS scientists have conducted highly successful satellite telemetry studies with post-nesting Hawaiian and Florida green turtles and Florida loggerheads.

A multidisciplinary research program is underway to study the cause and effects of FP. Research has been initiated on the possible etiologies of the disease, including viruses, parasites, and environmental pollutants. Recent research has demonstrated the involvement of both a retrovirus and a herpesvirus. In addition to field and laboratory research, statistical analysis and modeling studies are underway to link FP incidence and severity to key aspects of green turtle population dynamics and assess impacts of the disease on population recovery.

In the Hawaii and Atlantic pelagic longline fisheries for tuna and swordfish, the incidental take of sea turtles is being monitored through a logbook and observer program. Workshops have been held to formulate research techniques to assess the population level effects of hooking and entanglement and to identify ways to reduce or mitigate incidental capture. In related research, satellite

transmitters have been deployed on sea turtles hooked incidentally in the longline fishery to track post-release movements to better understand the long-term effects of hooking. Linkages between sea turtle movements and oceanographic processes are also being studied. Computer simulation models are under development to better assess the impacts of the Hawaii-based longline fishery.

In the last decade considerable efforts have been expended to elucidate sea turtle management units through the use of genetic tools. There is a high degree of genetic structuring within ocean basins for all species except the leatherback. These genetically distinct management units arose as a result of genetic isolation facilitated by the species' natal homing. While the animals do appear to segregate when nesting, they commingle on the foraging grounds, sometimes thousands of miles away from their natal beach (where they hatched). The analyses of genetic material from turtles incidentally taken in various fisheries can tell us which populations are being impacted. The Hawaii-based longline fishery interacts with loggerheads from Japan, green turtles from Hawaii and Mexico, and leatherbacks from both the eastern Pacific (Mexico or Costa Rica) and the southwestern Pacific (Irian Jaya, Malaysia, or Solomon Islands). Analyses for olive ridleys are currently in progress. In the Atlantic, the longline fisheries of the eastern Atlantic and the Mediterranean interact with loggerheads from the western Atlantic (primarily United States). Loggerheads inhabiting foraging habitats along the east coast of the U.S. originate from the United States, Mexico, and Brazil. Green turtles in the same area come from Florida, the Caribbean, and the South Atlantic Ocean (east and west).

Progress has been made in our understanding of the life history of Kemp's ridleys, loggerheads, and green turtles at various study sites in Florida, North Carolina, and the northwestern Gulf of Mexico. A number of current studies are investigating the use and importance of these inshore and nearshore habitats. Critical habitat for the green turtle has been designated for the nearshore foraging grounds off Culebra, Puerto Rico, and for the hawksbill in Mona and Monita Islands. NMFS has conducted considerable research on the use of various kinds of tags to mark and identify sea turtles in order to collect important biological information during their life history such as growth, survival rates, and age of maturity.

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