

GALAPAGOS SEA TURTLES

by

Derek Green

INTRODUCTION

Fritz and Carmen Angermeyer, resident in the archipelago these last 40 years, were the first to tag turtles: two in 1964, and ten in 1966. Between 1970-1975 Peter Pritchard tagged and measured females on several nesting beaches and gathered data on clutch size, hatchling size, and hatchling scalation. This work was expanded by Miguel Cifuentes during the 1973-1975 nesting seasons to include hatching success.

Between 1975-1980 I conducted an in-depth investigation of Galápagos sea turtles. Since the main objectives, materials, methods, and a general outline of the project have appeared in Noticias No. 33 and in reports on file at the CDRS, they will not be repeated here. The following, in very general terms, are a few of the results from the study.

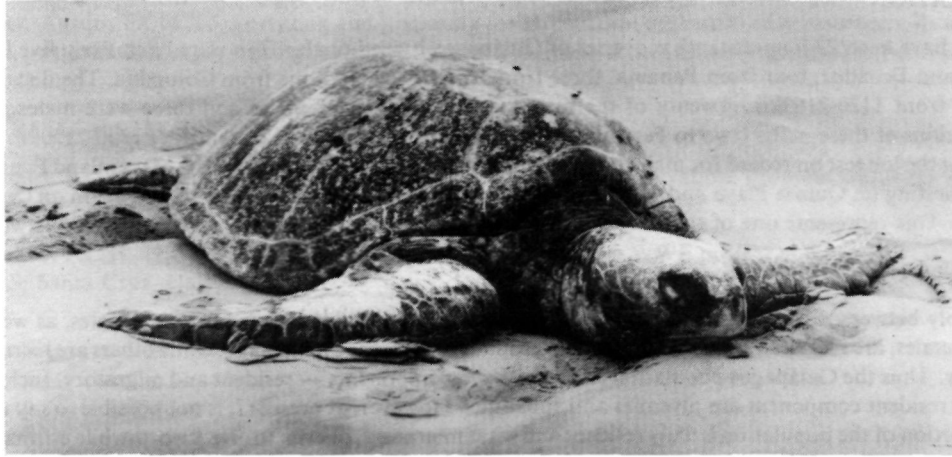
SPECIES PRESENT

The most common species in the Galápagos is the east Pacific green turtle, *Chelonia mydas agassizii* (Bocourt 1868), which occurs in large numbers and is the only species known to nest within the archipelago. Two morphotypes are recognized: the typical dark form known locally as *tortuga negra* and a rare sterile form with a yellowish carapace and a yellow-orange plastron, known locally as *tortuga amarilla*. The hawksbill turtle, *Eretmochelys imbricata* (Linnaeus) — local name *carey* — although encountered occasionally, is not known to nest. The leatherback turtle, *Dermochelys coriacea* (Linnaeus), has been sighted only three times in recent years.

REPRODUCTION

Copulating pairs of green turtles can be seen almost year-round (I lack sightings only for April) especially in protected bays, inlets, and lagoons such as Turtle Cove. However, the numbers vary greatly; they are rare from May through August, start to increase noticeably in late September, peak around mid-December, become sporadic during February, and rare again in March. The male, recognizable by his long tail which protrudes an average 26cm beyond the posterior edge of his carapace, mounts the female after courtship, from behind, hooks the pollex claws of his foreflippers under the anterior margin of her carapace, and hooks his powerful tail and sometimes his hindflippers under the posterior margin. Once settled in this position the couple may remain joined for as long as six hours. A mating pair is often accompanied by a 1-6 "escort" males which, presumably in an attempt to dislodge the successful male, often bite at his neck, shoulders, tail and flippers. The damage is sometimes severe enough to expose the bones, especially in the hindflippers. Occasionally the escorts are females.

Nesting occurs on all major islands except Rábida, Pinzón, Genovesa and possibly Fernandina. The most important beaches are Quinta Playa and Bahía Barahona on southern Isabela, Las Salinas on Baltra, Las Bachas on northern Santa Cruz, and Espumilla on Santiago. Oviposition starts around early December and lasts until the end of June, with a peak in late February/March. It thus coincides with the hot or wet season. Most nesting females emerge between 1900 hours and midnight, usually within two hours either side of high tide, rarely by daylight or at low tide. Upon reaching an area above the high-water mark, the female starts to sweep the sand backwards with her foreflippers. This gradually results in the formation of a pit; the top of the carapace is now level with the beach surface. Next, the hindflippers excavate the egg chamber into which about 84 eggs are deposited. The turtle then covers the eggs, fills the pit with sand and returns to the sea. The whole process takes 3-3½ hours and the eggs are left at a depth of 60cm. Not all landings result in successful nesting. Some turtles return to the sea without ever reaching the high-water mark; others excavate several egg chambers and yet still do not lay. At Quinta Playa there was an average of 2.7 landings to each successful nesting; at the other study sites the ratio was even higher. One female may lay up to seven clutches in a single season at intervals of approximately two weeks, with an average of about three clutches per female.



A female green turtle basking at Quinta Playa, southern Isabela *Photo by Derek Green*

The incubation period (the time between oviposition and the emergence of the largest group of hatchlings) ranges from 45-75 days with an average of 55 days. The hatchlings take some 3-7 days to reach the surface from the egg chamber. Hatching success varies from beach to beach. At Baltra, where there is little egg predation, about 70% of the eggs hatch. On the other hand, due to a predatory scarabeid beetle, *Trox suberosus*, and feral pigs, the hatch rate on Quinta Playa is only 40%, while on Espumilla nest destruction by feral pigs reduces the rate to a mere 1%.

Hatchlings usually emerge at night, 50% between 18.00-21.00 hrs. Emergence is rapid, the hatchlings seemingly bubbling out of the sand in a continuous stream. Then under cover of darkness they make their way to the sea, a journey of 1-15 minutes depending upon the distance to the water's edge. During this short journey, however, the young turtles run a gauntlet of predators. The most important of these predators is the ghost crab, *Ocypode gaudichaudii*. Another crab predator, the land hermit *Coenobita compressus*, although incapable of running down a normal healthy hatchling, will occasionally pick off weak or lethargic ones. The yellow-crowned night heron, *Nyctanassa violacea*, is the most prevalent nocturnal avian predator. However, these birds are highly territorial and, since it takes them approximately 15 minutes to swallow a single hatchling, only one turtle per nest is lost to them. Feral cats and black rats also occasionally take hatchlings. Despite this gauntlet, in excess of 96% of the hatchlings emerging at night reach the sea. Those that emerge by day, although rare, are less fortunate and suffer attack by frigate-birds, pelicans, lava gulls, great blue herons and possibly Galápagos buzzards. Hatchling loss is usually high — perhaps 50% in some cases. Once in the ocean, the neonates fall prey to a variety of fish including groupers and sharks, and to birds such as frigates. The extent of hatchling mortality through marine predators, although presumably high, is completely unknown.

FEEDING AND GROWTH

Green turtles in Galápagos feed predominantly on algae although they also take the leaves and bark of the red mangrove, *Rhizophora mangle*, and possibly other mangroves as well. Turtles can be found feeding along most coasts where algae are available. Growth rates are extremely slow. Juveniles and subadults with a straight carapace length (SCL) of 40-50cm grow about 1cm a year, and those with an SCL of 50-60cm, about 0.3cm a year. The rate becomes even slower as the turtle approaches sexual maturity. Thus a 40cm juvenile of unknown age (the smallest green turtle caught in Galápagos had an SCL of 39cm) may require some 50-90 years to reach 66.7cm, the size of the *smallest* nesting female recorded thus far in Galápagos.

MIGRATION

There have been 23 long-distance recoveries of Galápagos-tagged turtles. Ten were from Peru, five from mainland Ecuador, four from Panama, three from Costa Rica, and one from Colombia. The distances range from 1120-2160km. Twenty of the recaptured turtles were females and three were males. The migrations of these males (two to Peru and one to Costa Rica, minimum distances of 1300-2150km) are among the longest on record for males. One of the females, recaptured off the coast of mainland Ecuador after nesting on Quinta Playa and re-released with her tags intact, subsequently nested again on Quinta Playa. This represents one of the few recorded instances of two-way migration anywhere in the world.

POPULATION SIZE

Possibly between 1200-3500 females nest annually in the archipelago. Some of these females, as well as some males, are recruited from distant feeding grounds outside the archipelago, while others are recruited locally. Thus the Galápagos population consists of two components — resident and migratory. Included in the resident component are juveniles and subadults. However, at present it is not possible to say what proportion of the population is truly resident and what migratory, or even to give a worthwhile estimate of its size.

DISCUSSION

The pig problem, especially at Espumilla, is a very serious one. In Galápagos, as elsewhere, green turtles are known to return to nest after absences of 2-6 years not only to the same vicinity but usually to the same beach. Thus a female, once established as an Espumilla turtle, is likely to remain as one. A hatching success of less than 1% over a long period of time, coupled with a 50-year wait for sexual maturity, might severely hamper the recruitment of young females into the nesting population and thus gradually result in fewer and fewer nesting females at Espumilla. The Galápagos National Park Service has been operating a pig eradication programme on Santiago for several years, but it seems to be having very little effect on the "beach pigs". I strongly urge that this programme be immediately extended to include the Espumilla pigs (and those on Quinta Playa and Bahía Barahona), followed by the erection of fences for long-term protection. The fences at Espumilla could perhaps be placed behind the lagoons to avoid clashing with tourism.

The problem of whether or not to deal with *Trox suberosus* involves how the beetle first arrived in the islands. If it was introduced inadvertently by livestock imported from the mainland it should be considered an introduced species and steps taken to eliminate it. However, if it arrived under its own power (*T. suberosus* is a strong flier) it should be left alone, even though it does cause substantial damage to turtle nests.

A longer-term threat facing turtles is the removal of sand from the beaches for construction purposes. Much of this sand comes from beaches where very little nesting occurs, but some is also taken from Baltra, an important nesting site, although outside the boundaries of the National Park.

Despite so many years of field study it is still not possible to make a good estimate of the size of even the nesting population, let alone the total population. This stems largely from the fact that the beaches under study total only 6.8km, albeit the most intensively used 6.8km of the archipelago's 50km of beaches. Thus a census of all the nesting beaches during the peak of the season is badly needed. In the interests of safety, the census of the non-study beaches should take place in the daytime and should be timed so that the counting of nests (or tracks) is made over the same 2-3 day period. Any possible fluctuations over such a period can be checked against counts on the same days at the normal study beaches. Although ideally the census should be of fresh nests/tracks, i.e. either from the night before or from the previous 2-3 nights, distinguishing one night's nests from another's may be difficult; hence minimum and maximum counts should be included. Such a project would prove expensive, as it would exceed the normal resources of the National Park Service and the Darwin Station in ships and manpower. The more personnel used the more varied would be the experience and thus the interpretation of "fresh" tracks. However, it is a necessary step. Pritchard (1972, 1975) has made the only known survey of the beaches and his reports, on file at the CDRS, should be consulted in planning any census.

Since leaving the islands in September 1980 I have been working at the Texas Memorial Museum, 2400 Trinity, Austin, TX 78705, analyzing and preparing for publication the results of my research. Research on sea turtles in Galápagos is being continued by Mario Hurtado of the Instituto Nacional de Pesca (INP), Guayaquil.

LITERATURE CITED

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