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Status and Distribution of the Hawksbill Turtle, *Eretmochelys imbricata,* in the Wider Caribbean Region

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Identity and Description

The generic name *Eretmochelys* was introduced by Fitzinger (1843). The specific name imbricata is attributed to Linnaeus (1766) and refers to the over-lapping nature of the carapace scutes (see Eckert, 1995a). Common Caribbean vernacular names include hawksbill (English), carey (Spanish), tartaruga de pente (Portuguese), and tortue imbriqueé (French).

The genus is currently considered to be monotypic. Two subspecies, *E. i. imbricata* in the Atlantic Ocean and *E. i. squamata* in the Pacific Ocean, have been described on the basis of differences in coloration and carapace shape (see Witzell, 1983 for review). However, the criteria have proven unreliable in distinguishing the two forms and subspecific designations are rarely used (Meylan, 1984; Pritchard and Trebbau, 1984).

The following combination of characteristics distinguishes the hawksbill from other sea turtles: two pairs of prefrontal scales between the eyes; thick, posteriorly overlapping scutes on the carapace; five vertebral scutes and four pairs of costal (lateral) scutes on the carapace; two claws on each flipper; and an alternating (asymmetrical) terrestrial gait. The head is relatively narrow and elongate. The beak tapers to a point, giving the animal a "bird-like" appearance.

The carapace is heart-shaped in the youngest turtles and becomes more elongated (oval) as the turtle matures. The sides and rear portions of the carapace are typically serrated in all but very old animals. The epidermal scutes that overlay the carapace bone are commonly referred to as "tortoiseshell" or "bekko" and are prized in commerce. These scutes are often richly patterned with irregularly radiating streaks of brown and black on an amber background. The scutes of the plastron are usually clear yellow, with little or no dark pigmentation.

The hawksbill is a small to medium sized turtle. The average size of a nesting female typically does not exceed 95 cm (straight carapace length, SCL) for Caribbean nesting assemblages, and often this average value is closer to 85-90 cm SCL. Weight data are uncommon, but it appears that adults average 80-85 kg in the Caribbean Sea. Hatchlings are uniform in color, usually gray or brown. They average 42 mm SCL (range: 39–46 mm) and range in weight from about 14–20 g.

For informative summaries and greater detail, see Carr et al. (1966), Witzell (1983), Pritchard and Trebbau (1984), Meylan (1984), Groombridge and Luxmoore (1989), NMFS/ FWS (1993), Eckert (1995a, b), Van Dam (1997), and Pritchard and Mortimer (1999).

Ecology

Hawksbills utilize different habitats at different stages of their life cycle. It is widely believed, based on sightings, strandings and gut content analyses, that post-hatchling hawksbills are pelagic and find shelter in weedlines associated with convergence zones. *Sargassum* and floating debris, such as Styrofoam, tar balls and plastic bits (common components of weedlines), are consistently found in the stomachs of young turtles. Hawksbills reenter coastal waters when they reach about 20–25 cm carapace length.

Coral reefs provide foraging grounds for young juveniles, as well as subadults and adults. Reef ledges and caves provide shelter during periods of rest and refuge from predators. Hawksbills are also found around rocky outcrops and high-energy

shoals, as well as mangrove-fringed bays and estuaries (NMFS/ FWS, 1993). Sponges are the principal diet of hawksbills once they take up residence in coastal waters. A high density turtle population may play a significant role in maintaining sponge species diversity in nearshore benthic communities in the Caribbean (van Dam and Diez, 1997).

Meylan (1988) found that sponges contributed 95.3% of the total dry mass of all food items in the digestive tract samples from 61 animals from seven Wider Caribbean countries (19 sites in the Lesser Antilles, the Dominican Republic and Caribbean Panama). Investigators have also found an almost exclusive dietary preference for sponges by hawksbills feeding on the Cuban coastal shelf (Anderes Alvarez and Uchida, 1994). The predominance of specific taxa in the digesta suggests a degree of selectivity, perhaps related to distinctive properties of the sponges with respect to spongin and collagen (Meylan, 1985). This highly specific diet, with prey species dependent on filter-feeding in hard-bottom communities, makes the turtle vulnerable to deteriorating conditions on coral reefs.

Reproduction

Data from tag returns, satellite telemetry, and genetic analyses indicate that adult Caribbean hawksbills can travel long distances between foraging and nesting grounds (e.g., Meylan, 1999; Bass, 1999a). Hawksbills typically nest on low- and high-energy beaches in tropical latitudes. Females may select small pocket beaches and, because of their small body size and agility, they can cross fringing reefs that limit access by other species. There is a wide tolerance for nesting substrate and nests are typically placed under woody vegetation.

Hawksbills exhibit strong site fidelity to specific breeding grounds, returning at 2–5 year intervals throughout their reproductive years. A period of courtship and mating is followed by a nesting season that occurs mainly between July and October; in some locations nesting is recorded year-around. Egg-laying is principally nocturnal, although rare daytime nesting does occur. Only gravid females emerge from the sea. The entire nesting process (including emergence from and return to the sea) lasts 1–3 hours (NMFS/FWS, 1993).

In Antigua, West Indies, the region's most comprehensive long-term demographic study of nesting hawksbills, individuals deposit an average of five nests per nesting season at intervals of 14-16 days. Tagged females have been observed to lay as many as 12 clutches of eggs per season (Melucci et al., 1992). Clutch size is variable, averaging 155 eggs in Antigua (Richardson et al., 1999), 137 eggs in Mexico (Isla Aguada, Yucatán) (Frazier, 1991), and 136 eggs in Brazil (Marcovaldi et al., 1999). Eggs are approximately 40 mm in diameter. Incubation is variable depending on ambient temperature, but generally lasts about 60 days.

As in other sea turtles, sex determination is largely temperature-dependent with cooler temperatures favoring males and warmer temperatures favoring females (Mrosovsky et al., 1995). Hatch success is relatively high, with typically greater than 75% of the eggs producing hatchlings that reach the sea. mtDNA analysis has shown that Caribbean nesting populations can be distinguished genetically, and that foraging "populations" are mixed assemblages consisting of individuals drawn from multiple nesting grounds (Bass, 1999; Díaz-Fernández et al., 1999).

Threats

Hawksbills face the same threats that endanger all sea turtles, including marine debris and pollution, the illegal harvest of eggs and turtles, increased use and development of the coastal zone, beachfront lighting, incidental catch, etc. (Eckert, 1995b, c). Sadly, they are also singled out for their own special threat: humans find their shells highly attractive. Experts believe that the killing of hundreds of thousands of wild hawksbills in recent decades to service the shell trade has contributed substantively to population declines in the Caribbean and worldwide (Milliken and Tokunaga, 1987; Canin, 1991; WIDECAST, 1992; Meylan and Donnelly, 1999).

Conservation Status

The hawksbill is listed as Critically Endangered by the World Conservation Union (Baillie and Groombridge, 1996). The species is listed on Annex II of the Protocol to the 'Cartagena Convention' concerning Specially Protected Areas and Wildlife (SPAW Protocol), Appendix I of the Convention on

International Trade in Endangered Species of Wild Fauna and Flora (CITES), and Appendices I and II of the Convention on Migratory Species (CMS). The species is also included in the annexes to the Western Hemisphere Convention, a designation intended to convey that their protection is of "special urgency and importance."

A global status review by IUCN concluded that the hawksbill was suspected or known to be declining in 56 of 65 geopolitical units where information was available (Groombridge and Luxmoore, 1989). The review stated, "the entire Western Atlantic-Caribbean region is greatly depleted." Despite evience of population increases at some sites supporting long-term demographic studies, such as the increases in the Yucatán Peninsula of Mexico (Garduno et al., 1999), current levels of nesting may be far lower than previously estimated. Meylan (1999b) recently reported declining populations in 22 of 26 geopolitical units for which "some status and trend information is available."

Despite widespread protective legislation, an unsustainable and virtually unregulated level of legal and illegal take (for meat, eggs, shell) continues unabated in many countries and poses a significant threat to the survival of the species in the region. Hawksbills also are especially vulnerable to habitat loss because they rely upon coral reefs, one of the most endangered marine habitats (Meylan and Donnelly, 1999). Nearly all countries in the Caribbean host fewer than 100 nesting females per year (Meylan, 1989, 1999). The most recent federal status review of the hawksbill turtle in the United States recognized that numerous threats still exist, despite two decades of protection by the U.S. Endangered Species Act (Eckert, 1995b); hawksbills in other countries face many of these same threats, though they are less comprehensively documented.

Conclusions

Priority actions need to be undertaken at national and international levels if Caribbean populations of hawksbill sea turtles are to be conserved for the future. These include the identification, protection and long-term monitoring of essential feeding, resting and nesting areas; the identification, status assessment and long-term monitoring of critical life stages; identification, quantification and mitigation of important sources of mortality; support for law enforcement; an emphasis on international cooperation and the sharing of information; and increased public awareness and participation in sea turtle (and general marine) conservation and management initiatives (Eckert, 1995a; WIDECAST, 1998).

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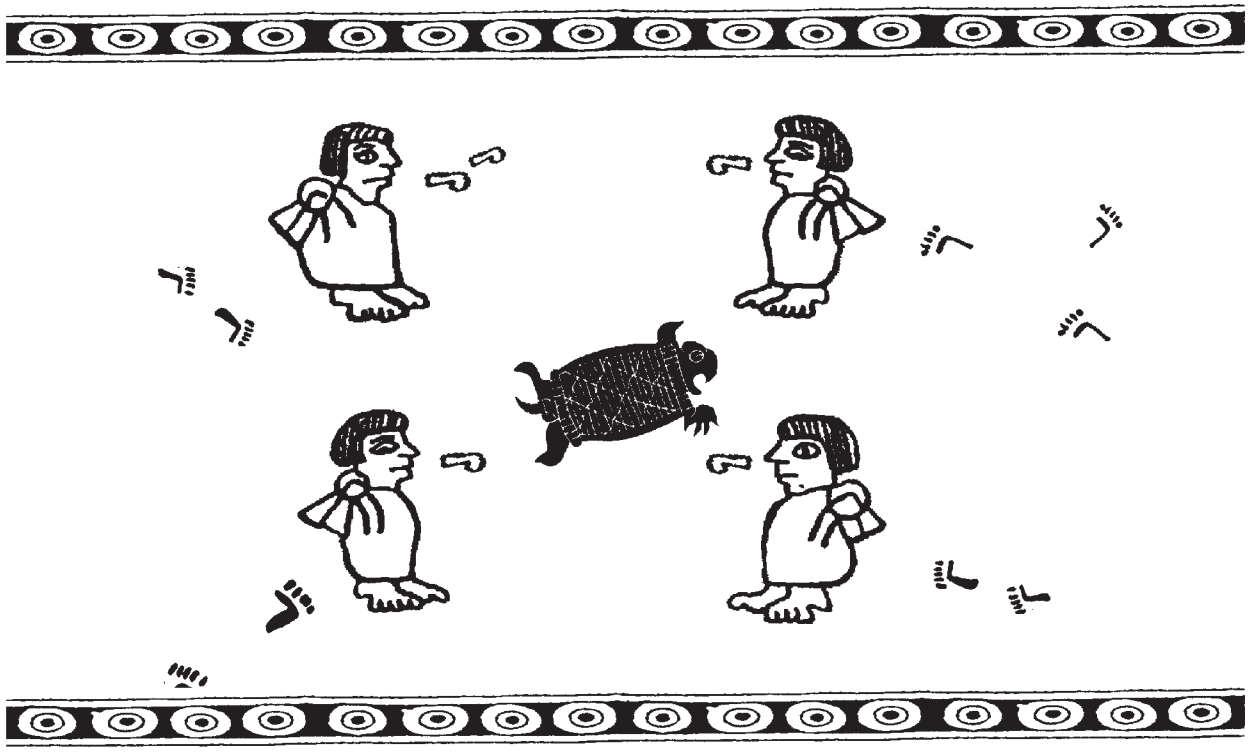
PROCEEDINGS



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About the cover

The designs for the cover were extracted from various Mexican pre-Columbian codices. The human figures, footprints, and the speech symbols were taken from the *Códice Boturini*, also known as *Tira de la Peregrinación*, which depicts the migration of the Mexicas (ancient Aztecs) towards the Valley of Mexico. The turtle figure in the center comes from an ancient Mayan codex. We felt that this symbolism, taken from pre-Colombian art, well reflected the nature and purposes of the people attending the workshop — bringing together many people, traveling from far and wide, to dialogue about marine turtles.