# Decline of the Nesting Population of Hawksbill Turtles at Tortuguero, Costa Rica

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## Introduction

The hawksbill (*Eretmochelys imbricata*) is a marine turtle with a circumtropical distribution and considerable commercial value. The scutes that cover the shell of this species are the source of tortoiseshell, which has been in international trade for several centuries. Although reports of the decline of this species in the Caribbean have been made over many years (Carr et al. 1966; Carr & Stancyk 1975; Carr & Meylan 1980; Meylan & Mack 1983; Bjorndal et al. 1985), substantial trade in this species has only recently been reduced. From 1970 to 1988, tortoiseshell from approximately 272,700 hawksbills was imported into Japan from the Caribbean (Donnelly 1989). In 1990, 12,886 kg of tortoiseshell (equivalent to about 12,200 hawksbills) were exported from the Caribbean to Japan (Canin 1991). These turtles were drawn from a region for which the maximum estimate of nesting female hawksbills each year is only 5,000 (Meylan 1989). Japanese authorities agreed to decrease the import quota of tortoiseshell to 5,000 kg as of August 1991, to end the importation of tortoiseshell in December 1992, and to withdraw Japan's reservation on hawksbills under the Convention on International Trade in Endangered Species (CITES) in July 1994 (Donnelly 1991).

Despite this decrease in international trade, there is continued interest in exploitation of Caribbean hawksbills (Balazs 1992). The demography and movements of hawksbills are poorly known, and this lack of knowledge precludes thorough evaluation of utilization schemes. A small nesting population of hawksbills has been monitored since 1956 at Tortuguero, on the Caribbean coast of Costa Rica. In this paper, we present the trend in numbers of nesting hawksbills at Tortuguero, Costa Rica, and the extent of documented movements of female hawksbills tagged at Tortuguero.

## Methods

Each year, the northernmost 8 km of the 35-km nesting beach at Tortuguero is patrolled nightly at one-hour intervals from early July to mid-September. Female turtles encountered during their nesting emergence are tagged with flipper tags that bear an identification number, a return address, and an offer of a reward for the return of the tag. Not all nesting hawksbills are encountered during these patrols, but because beach coverage has been consistent since 1972, we assume the annual encounter efficiencies are equivalent.

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## Results and Discussion

There has been a significant decline in the number of nesting hawksbills encountered from 1972 to 1991 (Fig. 1; $p = 0.014$; $r^2 = 0.291$; df = 19). The first year used in this analysis is 1972 because prior to that year patrol effort was not standardized. This decline continues the trend reported earlier for this population. In 1966, Carr et al. noted the "gloomy" survival outlook for the Tortuguero hawksbill population, based on reports from turtle fishermen of steep decreases in their catch. Carr and Stancyk (1975) calculated the number of hawksbills encountered per unit of patrol effort for two four-year periods at Tortuguero and found a substantial change from 2.3 in 1956–1959 to 0.60 in 1970–1973. The equivalent value for 1988–1991 is 0.35 hawksbills, indicating a continuing decline. Bjorndal et al. (1985) reported a significant decline in carapace length of nesting turtles from 1955 to 1977, which suggested that the population was not stable. Carapace length of hawksbills has not been measured since 1977, so further analysis of this trend is impossible.

The number of nesting hawksbills at Tortuguero (Fig. 1) varies in consecutive years. This variation is a common phenomenon in sea turtle populations (Carr 1980) and is due, at least in part, to the fact that individual females of most sea turtle species do not reproduce in consecutive years. Eleven hawksbills at Tortuguero have been recorded nesting in two different years: 2 after 2 years, 5 after 3 years, 3 after 4 years, and 1 after 6 years. The longer intervals of 4 and 6 years may be accurate intervals or may represent females that were missed in an intervening nesting season. One hawksbill has now been recorded in three different years at Tortuguero; the first interval was 3 years and the second 2 years.

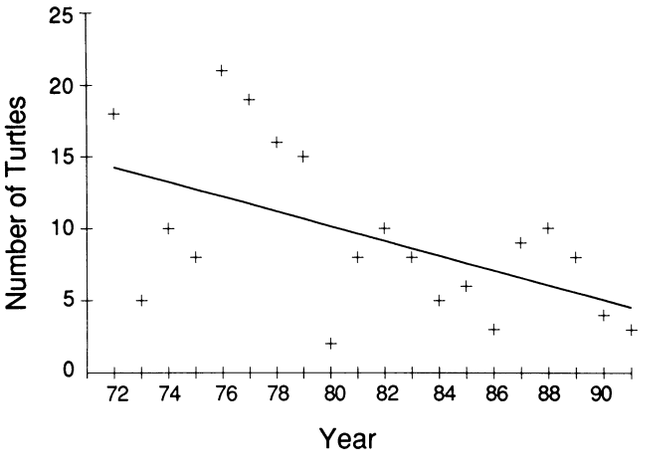


*Figure 1. The number of hawksbills encountered in the 8-km patrol area at Tortuguero, Costa Rica. The regression equation is* y = *49.8–0.503X, and the downward trend is significant* (p = *0.014*; $r^2$ = *0.291*; *df = 19).*

Changes in interbreeding intervals in individuals are common in sea turtles (Carr & Carr 1970) and also contribute to the variation in annual nesting numbers. Because of this variation, populations must be monitored for many years before a trend can be established.

Most of the Tortuguero nesting beach is included in the Tortuguero National Park. Hawksbills have been granted legal protection, which is enforced by park guards, although there are still incidents of poaching (C. Campbell and P. Pritchard, personal communication). The fact that the decline in nesting hawksbills has continued despite protection for hawksbills in Costa Rica underscores the importance of regional management for this species. Protection at the nesting beach is not sufficient; the population must be managed carefully throughout its range to prevent its loss. Marine turtles move great distances and may cross many international boundaries during their development. For the Tortuguero hawksbill population, we have information only on the movements of tagged females when they leave the nesting beach at the end of the reproductive season. Tags from 11 hawksbills have been returned to us by fishermen outside of Costa Rican waters. One was recaptured near Colon, Panama, eight have been returned from the Miskito Cays region off the coast of Nicaragua, and two from Honduras. The greatest minimum distance between Tortuguero and a recapture point was 850 km for a turtle recaptured at Isla Guanaja, Honduras. These four countries, however, almost certainly do not comprise the entire distribution of this population. All life stages of this population, including adult males, juveniles, and pelagic post-hatchlings, probably move through the waters of many Caribbean nations.

## Conclusions

The population of hawksbills that breeds at Tortuguero, Costa Rica, has suffered a continuous decline since monitoring of the population began in 1956. To manage this shared resource successfully, all countries within the range of the population must be identified through further research, and these nations must be brought into region-wide management programs.

## Acknowledgments

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