

Project Update: March 2010

Home Range as a Tool for Conservation Efforts of Sea Turtles at the north Pacific coast of Costa Rica

Introduction

The Hawksbill turtle (*Eretmochelys imbricata*) is distributed along the tropical regions in the Pacific, Atlantic and Indic Oceans. This species is currently in critic danger of extinction according with the International Union for the Conservation of Nature (Meylan and Donnelly, 1999; IUCN 2009). The main reasons for the reductions of hawksbill populations are the human consumption of eggs and meet, industrial fisheries bycatch, habitat destruction and the use of the carapace for artisanal handicrafts (Groombridge y Luxmore, 1989).

Along the Eastern Pacific Ocean, hawksbills were apparently common to abundant as recently as 50 years ago in near shore from Mexico to Ecuador (Cliffton et al. 1982). At the present, the hawksbill is rare and sometimes nonexistent in most of the localities. However, recent effort to provide essential information on the Eastern Pacific hawksbills have identified the presence of a few nesting beaches remaining at different countries such as El Salvador, Nicaragua, Costa Rica and Ecuador (Hawksbill Initiative of the Eastern Pacific - ICAPO).

Due to the lack of information about the Eastern Pacific hawksbill population (IUCN 2005) more studies are needed to understand its biology and natural history. For this, we first need to identify not only the nesting sites, but the feeding grounds where hawksbills aggregate to develop and feed.

In Costa Rica, the occurrence of hawksbills in nesting beaches is rare. Gaos et al. (2006) reported the presence of a few nesting females in the beaches of Caletas, Punta Banco and Caña Blanca. Until now no feeding aggregation areas have been documented along the Costa Rican Pacific coast, which is essential information for the local and regional recovery of the hawksbill population.

The present study document and analyze the spatial use of hawksbill turtles in a feeding ground located at the north boundaries of the Caletas-Arío Wildlife Refuge at the north coast of Costa Rica.

Methodology

Study site

The study is being conducted at Punta Coyote, located in the northern edge of the Caletas Arío Wildlife Refuge (CAWLR), in Guanacaste, the northern coast of Costa Rica (Fig. 1). Waves and tidal currents are the main dynamic forces acting on this site. The sea bottom in Punta Coyote is mainly covered by rocky outcroppings, where different sponge species are common. Rocky bottom surrounds Punta Coyote, covering approximately 70 ha around the coast, with an average depth of 9.61 ± 4.36 m.

The CAWLR includes a total of 19,846 ha of Marine Protected Area, with a 12 mile extension from land to sea, where unsustainable fishing activities, such as shrimp trawling, gillnetting, surface long lining, and compressor diving are prohibited (MINAE 2005).

The local fishermen economy depends exclusively on spotted rose snappers (*Lutjanus guttatus*) fishing in the adjacent waters of the CAWLR, including Punta Coyote. Local fishermen and the Costa Rican Environmental Ministry (Minae) have improved the use of bottom long line fishing to avoid sea turtle

bycatch. However, poachers are still a threat for hawksbills, as they fish with gillnets in summer at Punta Coyote (local fishermen personal comments).

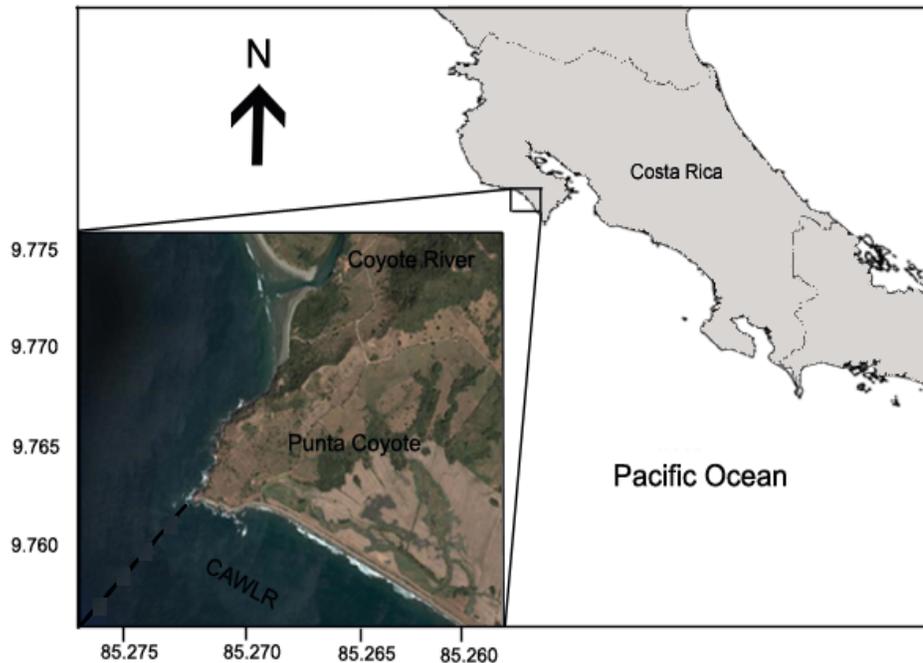


Fig 1. Study site. Punta Coyote is located at the northern edge of the Caletas-Arío Wildlife Refuge (CAWLR)

Turtle capture and size

To date, turtle capture efforts have been conducted at Punta Coyote in July and August 2009. Turtles were captured with an entanglement net (80 x 10 m, mesh size = 45 cm) placed perpendicular to the coast. The net was placed during daytime hours and monitored at 2 h intervals. After capture, turtles were placed on a vessel where the curve carapace length (CCL) was measured (± 0.1 cm) with a measuring tape, from the anterior nuchal scute to the posterior most edge of the carapace.

Tracking

Three hawksbill turtles were fitted with sonic coded transmitters (V16, VEMCO). To attach the transmitters we affixed them with two 2 mm width zip ties across two 3 mm diameter holes drilled in one of the most posterior marginal scutes. Finally, we put fiberglass cloth and resin to reinforce the attachment (Balazs et al. 1996).

Tracking efforts were carried out from a 30 feet vessel with a 50 hp motor. We used omnidirectional and directional hydrophones in conjunction with a receiver (VR100, VEMCO) to detect the transmitter signal and finally to sight the instrumented animals. GPS points and depth data were recorded for each turtle sighting.

To avoid turtle disturbance, the tracking vessel was maneuvered slowly at ~ 20 m from the animal, until we sighted it visually or by estimating the distance from the strength of the sonic signal at 6 gain with the directional hydrophone.

Analysis of home range

The home range analysis was performed with the Arc View version 3.2 geographic information system (Arc View GIS) software (Environmental Research Systems Institute; Redlands, USA). We estimated home range areas with Minimum Convex Polygon (MCP) and Fixed Kernel Density (FKD) methods using the animal movement analyst extension for the Arc View. The MCP home range was estimated by connecting the peripheral locations from a group of fixed sighting data. The MCP home range represents the total estimated area transverse by an animal (Harris et al., 1990). The FKD home ranges were calculated with least cross validation as a smoothing factor parameter (Silverman 1986). A 95% utilization distribution (UD) was used to estimate the overall home range used by a turtle, whereas a 50% UD was used to establish the center of activity (core areas) according to Worton (1989).

Results

A total of three hawksbill turtles, measuring from 29.6 to 30.3 cm (mean = 68.83 ± 0.28 cm) were tracked. Tracking duration ranged from 37 to 46 days (mean = 41 ± 4.58 days) with an average of 28 ± 8 sightings per turtle (Table 1).

The home range areas and core activity areas of the tracked turtles are presented in Table 2 and Figs. 2. Turtles were sighted in a depth ranging from 2.5 to 19.6 m (mean = 8.50 ± 3.10 m). Turtle established a home range outside the CAWLR and the core activity areas of the three tracked turtles coincide at the same site (El Cambute), where we registered the major depth (~ 12 m) in the first 100 m from the coast line. Substrate composition where turtles were sighted was always rocks covered by different species of sponges and tunicates.

Table1. Summary of the three tracked turtles. SCL: Straight carapace length; CCL: curve carapace length; M: male; F: female; U: undetermined

Turtle # ID	SCL (cm)	CCL (cm)	Mass (kg)	Sex (M/F/U)	Tracking interval (dd/mm/yy)	Total days	no. of sightings
EI1	68.5	58.6	29.6	m	22/07/09 - 05/09/09	46	37
EI2	69	58.5	30	m	27/07/09 - 05/09/09	40	25
EI3	69	60	30.3	m	31/07/09 - 05/09/09	37	23

Table2. Summary of the home range and core activity areas size. MCP: minimum convex polygon; FKD: fixed kernel density; ha: hectares

Turtle # ID	100% MCP (ha)	95% FKD (ha)	50% FKD (ha)
EI1	32.42	48.43	6.93
EI2	68	93.73	10.23
EI3	21.39	36.24	8.76
Mean \pm SE	40.60 ± 14.06	59 ± 17.48	8.64 ± 0.95

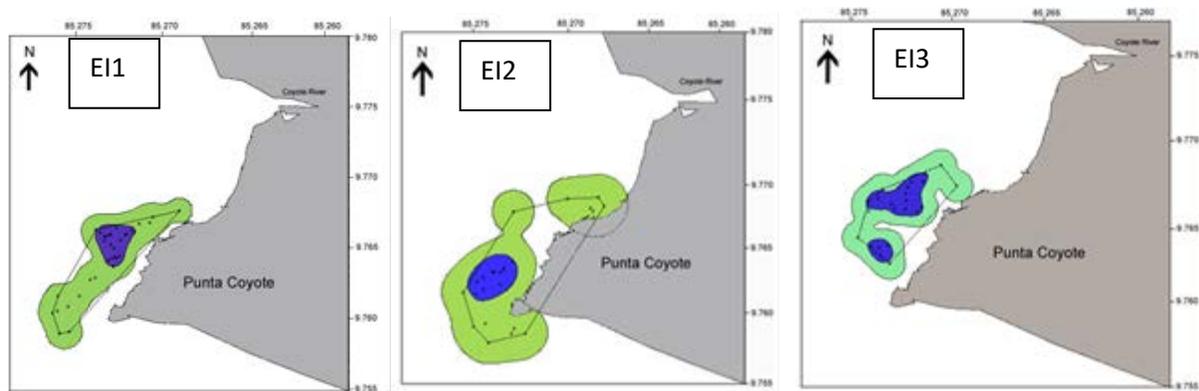


Fig. 2 Home range maps of the three tracked turtles. Solid polygons are 100% minimum convex polygons (MCP), and color areas are 95% (blue) and 50% (green) fixed kernel density estimator areas.

Preliminary conclusions

- 1) Hawksbill turtles aggregate in Punta Coyote and show site fidelity to this feeding ground.
- 2) Hawksbill turtles in Punta Coyote established a home range near the coast on the rocky substrate.
- 3) Core activity areas of the three tracked turtles coincide in the same site, and correspond to the deepest part of the first 100 m from the shore of Punta Coyote.
- 4) Hawksbill turtles in Punta Coyote aggregate in the boundaries of the Caletas-Ario Wildlife Refuge, where no management for fisheries is applied.

Work In Progress

- We are tracking other 4 turtles that were captured on February 2010.
- We continue with the effort to capture other individuals to record population biological data to characterize this hawksbill aggregation.
- We are performing environmental education activities with local schools and with the local community.
- We have developed a cleaning program with two local persons at Playa Coyote. We weekly collect the garbage at this site as it may contribute some dangerous materials to the sea, and may represent a threat for the hawksbills at Punta Coyote (located in the front of Playa Coyote).

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