IN-WATER SURVEYS FOR SEA TURTLES IN TWO NATIONAL PARKS OF THE DOMINICAN REPUBLIC

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Introduction

Despite the poor conservation status of hawksbills in the Caribbean (Meylan 1999) and their continued exploitation in the region (Fleming 2001, Chacón 2002), relatively few studies have been conducted on their foraging grounds. There is a particular need for such studies to understand migration/residence patterns, local distribution, and to estimate abundance and population trends. A reliable estimation of growth rates in the wild is also necessary for estimates of age to maturity, as well as the use of most demographic models.

In the spring of 1996, we started conducting in-the-water surveys at Jaragua National Park and the adjacent area of Cabo Rojo in southwestern Dominican Republic (DR). Soon, we identified a number of hawksbill foraging habitats and started an intensive tagging and monitoring study. The results from that work have been presented elsewhere (e.g. León & Diez 1999, León & Bjorndal 2001, León & Mota 2003).

To achieve a more complete assessment of the situation of sea turtles on foraging areas in other parts of the country, during week-long trips in December 2005, April 2006, and December 2006 we conducted surveys in potential near-shore sea turtle foraging areas of Montecristi Underwater National Park and del Este National Park (**Fig. 1**). These areas were selected because previous studies indicated they contained extensive seagrass and coral reef areas, including the largest reef formation of the country: the Montecristi barrier reef (Vega et al. 1997, Geraldes 2003). Also, as a result of those studies, benthic community maps were available, which helped us plan our surveys. In the case of del Este National Park, there was also a previous study that indicated the presence of hawksbills there (Diez et al. 2003).

Figure 1. Map of the Dominican Republic, showing the two study sites for this study and our previous study area (c). Area (a) is Montecristi Underwater National Park, (b) is del Este National Park and (c) is Jaragua National Park-Cabo Rojo.

Methods

During the first field trip (Dec 2005) we inspected a number of areas using snorkeling, boat transects and a fishing net. However, we desisted from using the net because 6 juvenile sharks and no turtles were entangled on our first attempt to use it. Apparently, the shallow area where we had intended to set it (Los Ingleses, Saona island) is a nursery area for lemon sharks (*Negaprion brevirostris*).

After potential sites were identified, turtle surveys consisted of one-hour long, daytime snorkeling censuses in hard-bottom/coral reef habitats with a depth of 15 m or less. We counted all turtles sighted by species, and whenever possible, captured them by hand while free diving, following the method of Diez & van Dam (1994). In these surveys there were usually three to five experienced snorkelers, followed by another assistant on board a small boat. In Los Ingleses, we could not conduct snorkeling surveys because water depth was less than 1 m. Therefore, we surveyed turtles by boat transects of approximately 3 km long. During boat transects, two or three observers stood at the bow and two at the aft visually scanning the surface of the water while the vessel moved at approximated 5 knots in a straight line. When turtles were sighted, we tried capturing them using the rodeo technique, that is, by jumping over them and catching them by hand (Ehrhart & Ogren 1999, see **Fig. 2**).

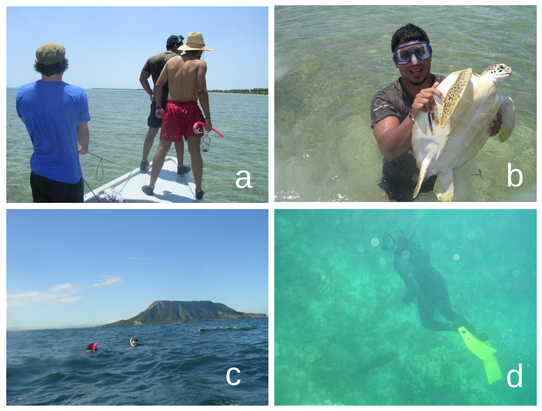

Figure 2. Survey techniques. (a) and (b) = boat surveys at Los Ingleses, Saona Island (del Este National Park), (c) and (d) = snorkelling surveys at Montecristi Underwater National Park.

All captured turtles were brought to the vessel for data collection. Curved carapace length (CCL) was obtained using a metric fiberglass tape. Here, CCL is the length from the nuchal notch to the posteriormost tip of the carapace. We also measured the mass (in kg) of each turtle and took photographs of its dorsal view and of the left side view of head scutes. All turtles were tagged in both front flippers using Inconel or plastic tags (Dalton Jumbo Rototag). To determine the location of each capture and to release the animals as near as possible to where they were first sighted, the geographic position of all individuals was obtained using a GPS receiver.

Results

Del Este National Park

A total of 33.7 survey hours were conducted in del Este National Park, yielding 57 sea turtle sightings (37 hawksbills, 17 green and 3 undetermined, see **Fig.3** for distribution of transects and sightings). Captured hawksbills ranged in size from 22.1-55.6 cm CCL (n = 14) and greens from 31.1- 50.6cm (n = 3, **Fig. 4**). Mean sighting frequency per survey unit is shown in **Fig. 5**.

Hawksbills and green turtles were found in seagrass beds and coral reef habitats, particularly in southern Saona Island (**Fig. 6**). Most of the sighted turtles (43, 75%) came from Los Ingleses, a shallow seagrass site.

Two green turtles were also sighted in northwestern Saona, near Catuano channel and one near the eastern tip of Saona, but these sites were dropped from following surveys due to high water turbidity and intermediate water depth (2-3 m), which precluded both of our survey methods (snorkeling and boat transect) to be properly conducted.

Figure 3. Distribution of surveys (transect lines) and turtle distribution (colored circles) in del Este National Park.

Montecristi Underwater National Park

In Montecristi, survey effort was lower than in del Este National Park due to the prevailing rough sea conditions and high water turbidity. This is because the Montecristi coast is facing the Atlantic Ocean, with little protection from landmasses nearby. Nevertheless, we completed 15 hours of snorkeling surveys on coral reef areas, yielding sightings of three hawksbills and one green turtle (but two of the hawksbill captures corresponded to the same individual from Banquera Seca captured on successive field trips, see **Fig. 7** for transect and turtle distribution and **Fig. 8** for habitat views).

All turtles sighted were small juveniles (24.7 and 29.3 cm CCL). Mean sighting frequency for 14 surveys was very low 0.21 turtles per hour (SD = 0.43) and 0.07 (SD = 0.46) for hawksbills and green turtles, respectively (**Fig. 5**).

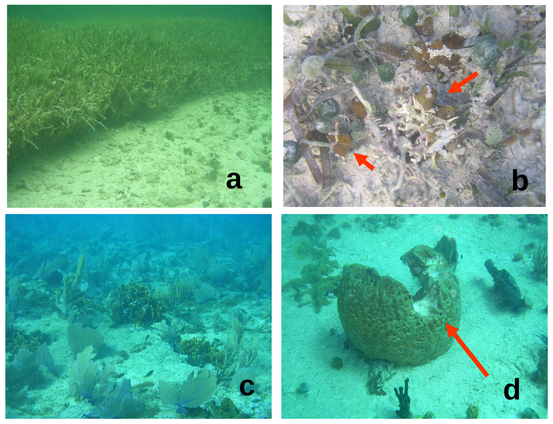

Figure 6. Habitats surveyed in southern Saona Island (del Este National Park): (a) and (b) Seagrass beds at Los Ingleses, with (b) showing sponge *Chondrilla nucula*, (c) and (d) = coral reef at Arrecife de Cacón, with (d) showing sponge *Geodia neptuni* with possible hawksbill bite mark.

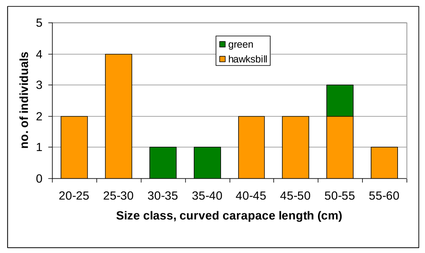

Figure 4. Sizeclass distribution of captured turtles.

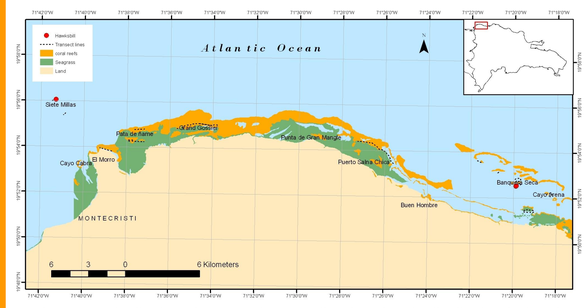

Figure 7. Distribution of surveys (transect lines) and turtle distribution (colored circles) in del Montecristi Underwater National Park.

Discussion

Relative Abundance

Sighting frequency during snorkeling surveys in del Este and Montecristi National Parks was considered low, especially when compared with our other study area in the country, Jaragua National Park-Cabo Rojo, where the mean for hawksbills is 3.9 turtles x hour (SD = 2.4, n = 109 surveys) and for greens 0.27 (SD = 0.62, n = 109; León, unpublished data). Fisher divers consulted in both areas said they occasionally saw hawksbills in deeper reefs, while fishing for food or the aquarium trade using diving compressors (hookah) at depths greater than 20 m. It would be important to verify this information, however, such depths would preclude the use of our regular snorkeling surveys.

For boat surveys conducted in Los Ingleses (Saona Island) we can only compare with data gathered in a similar fashion on a previous visit by Diez, Vélez-Zuazo and van Dam in June 2003 (Diez et al 2003). These authors report a relative sighting frequency of 7.7 turtles per hour obtained from three one-hour surveys. Although here we standardized by distance (given unequal time of our surveys), if we calculate sightings per hour, we obtain a mean of 2.9 (range = 1.0-5.3, SD = 1.8). This difference could be due to variability in survey methods, replications, water visibility conditions, or yearly, seasonal and even diurnal variations in turtle abundance at this site. Only further surveys that account for these factors will help clarify this.

The low sighting frequency in both National Parks could be caused by many factors, including poor habitat/food availability conditions (but see below), lower regional abundance, or the historically intense exploitation of sea turtles in the country. Although it is illegal, law enforcement is poor and turtle meat and shell are commonly traded and consumed in the DR (Marte et al 2002, Fleming 2001). Another possible explanation would be high incidental capture, particularly in fishing nets. Even though we saw a few nets on shore, no nets were found deployed during our surveys in either park. In any case, these results should be considered preliminary, since not all possible sites in both parks could be explored, and more survey replicates in each site would be needed to establish our findings more firmly.

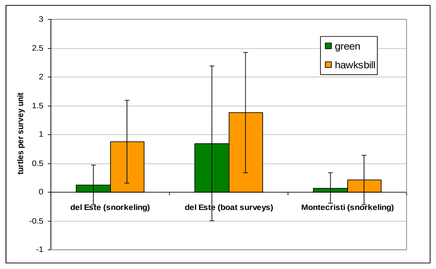

Figure 5. Mean relative sighting frequency per survey unit. In del Este National Park, survey units were one-hour snorkeling surveys or 3km-long boat surveys at Los Ingleses site. For Montecristi, survey units were 1h snorkeling surveys. Bars show one standard deviation from the mean.

Turtle habitats

Despite the low numbers of turtles observed, we found what appeared to be suitable habitat conditions in both parks. Even some of the reefs in Saona island, like Arrecife de Cacón, greatly resembled some of the hard bottom areas where we regularly see hawksbills in Jaragua-Cabo Rojo. Also, many hawksbill prey sponges were common. In particular, the sponge *Geodia neptuni*, a known prey species of hawksbills in the Caribbean (Meylan 1988, León & Bjorndal 2002), was relatively abundant in Saona, and we even found some with large bite marks that could be caused by hawksbills (**Fig. 6**). Similarly, in Montecristi many habitats seemed adequate, with the sponges *Chondrilla nucula* and *Cynachira* sp. growing conspicuously. Therefore, we believe other reasons than habitat/food availability must be responsible for the low sighting frequency observed.

But perhaps the most interesting site visited was Los Ingleses in southern Saona Island (del Este National Park), first reported by Diez et al (2003), which showed many unique features. Both green and hawksbill turtles regularly forage in this shallow area. This site is characterized by seagrass beds protected by a reef breaker forming a lagoon, where water depth ranges from 0.5 to 2 meters. The dominant seagrass species are turtle grass (*Thalassia testudinum*) and manatee grass (*Syringodium filiforme*). This is different from many hawksbill studies, which associate this species with hard bottom/coral reef habitats (Carr & Stancyck 1975, Witzell 1983, Limpus 1992; Van Dam & Diez 1997; but see Bjorndal & Bolten 1988). Although we didn't conduct diet studies, one hawksbill was seen foraging among the seagrass blades. There, we found the sponge *Chondrilla nucula* growing in its erect form (not the incrusting one commonly found in reefs). Furthermore, this area seemed to provide refuge sites for turtles. Large submerged rocks (some with live but also long-dead coral) were found in certain areas, and on one occasion we found a hawksbill resting inside a crevice of one of them.

Also, some areas showed steep cuts in the seagrass bed where large sand areas were exposed. On the vertical wall of some of these cuts there were crevices where once we saw a hawksbill take refuge, becoming almost completely hidden from sight. Thus, it appears that this seagrass area is providing similar features to hawksbills as a reef in terms of food availability and refuge from predators. However, it is also possible that, given the shallowness of the area, both green and hawksbill turtles forage there during the day and move to nearby, deeper reefs for protection at night.

Even though our study did not contemplate nesting surveys, the importance of Saona island as a sea turtle habitat is also supported by recent evidence of nesting hawksbills in its southern beaches (Jesús Tomás, unpublished data for 2006). More beach surveys will be conducted in 2007 to better document nesting numbers. This, together with the presence of juvenile green and hawksbill turtles in is nearshore areas, singles out del Este National Park as one of the important areas remaining for sea turtles in the Dominican Republic, deserving attention from local authorities and the scientific community.

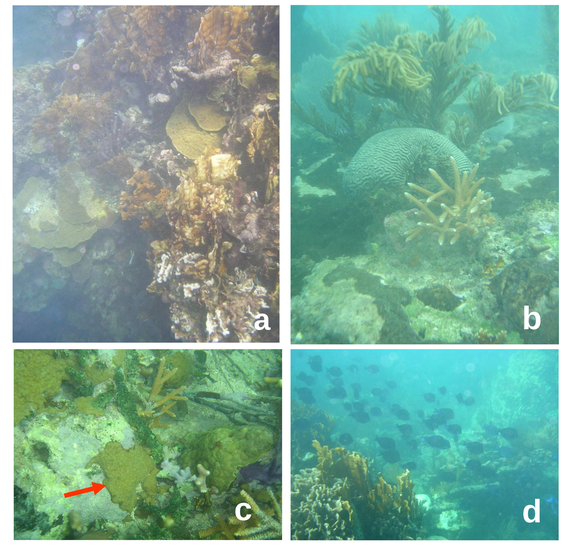

Figure 8. Habitats surveyed in Montecristi Underwater National Park. (a) coral ledge in Banquera Seca, near Buen Hombre (b) Bajo de la Cordillera Larga, (c) Arrecife Pata de ñame, near Montecristi, with arrow pointing at sponge *Chondrilla nucula*, and (d) Bajo de la Mata near Buen Hombre.

Acknowledgments

This study was made possible through support provided by the Office of Regional Sustainable Development, Bureau for Latin America and the Caribbean, U.S. Agency for International Development and The Nature Conservancy, under the terms of Award No. EDG-A-00-01-00023-00 for the Parks in Peril Program. We would also like to thank our excellent field assitants, Pelagio Paulino, Domingo Rivas, Isidro Debora, Gregorio Gómez, Roni Montolí, Jorge Broca, Gustavo Olivieri, Yessica Castro, Haydée Domínguez, and Laura Perdomo. S. Aucoin and Y. León also thank Disney Animal Kingdom, Western Pacific Regional Fisheries Management Council, US National Marine Fisheries Service, US Fish and Wildlife Service and the Sea Turtle Symposium for a travel grant. Additional support to attend the meeting for Y. León was obtained through the Central Caribbean Program of The Nature Conservancy, and for S. Aucoin through Wildlife Preservation Canada.

References

Bjorndal KA, Bolten AB. 1988. Growth rates of immature green turtles, *Chelonia mydas*, on feeding grounds in the southern Bahamas. Copeia 1988: 555-564

Carr A, Stancyck S 1975. Observations on the ecology and survival outlook of the hawksbill turtle. Biological Conservation 8: 161-172.

Chacón D 2002. Diagnóstico sobre el comercio de las tortugas marinas y sus derivados en el Istmo Centroamericano. Red Regional para la Conservación de las Tortugas Marinas en Centroamérica (RCA), San José, Costa Rica.

Diez CE, van Dam RP (1994) Foraging ecology and population dynamics of the hawksbill (*Eretmochelys imbricata*) at Mona Island, Puerto Rico. Technical report. NMFS and the Puerto Rico Department of Natural Resources, Miami, Florida.

Diez CE, Vélez-Zuazo X, van Dam, RP 2003. Hawksbill turtles in seagrass beds. Marine Turtle Newsletter 102: 8-10.

Ehrhart LM, Ogren LH 1999. Studies in foraging habitats: capturing and handling turtles. In Eckert, K L, Bjorndal, KA, Abreu-Grobois, FA, Donnelly, M (eds). Research and management techniques for conservation of sea turtles. IUCN/SSC Marine turtle specialist group publication no.4 pp61-64.

Fleming EH 2001. Swimming against the tide. Recent surveys of exploitation, trade, and management of marine turtles in the Caribbean. In. TRAFFIC North America, Washington DC, USA

Geraldes FX 2003. The coral reefs of the Dominican Republic. In: Cortés, J.E. (ed) Latin American coral reefs, pp 77-90. Elsevier Science.

León YM, Diez CE 1999. Population structure of hawksbill turtles on a foraging ground in the Dominican Republic. Chelonian Conservation and Biology 3:230-236

León YM, Bjorndal KA 2002. Selective feeding in the hawksbill turtle, an important predator in coral reef ecosystems. Marine Ecology Progress Series 245:249-258

León YM, Mota JM 2003. A Caribbean juvenile hawksbill turtle aggregation: Lessons from a 6-year study. Poster presentation at the 23rd Annual Symp on Sea Turtle Biology and Conservation, Malaysia.

Limpus C 1992 The hawksbill turtle, *Eretmochelys imbricata*, in Queensland: Population structure within a southern Great Barrier Reef feeding ground. Wildlife Research 19:489-506

Marte A, Ferreiras E, Vanderhorst P. 2002. Preliminary study of tortoiseshell trade in the Dominican Republic. Poster presented at the 22nd Annual Symposium on Sea Turtle Biology and Conservation.

Meylan A 1988. Spongivory in hawksbill turtles: A diet of glass. Science 2:393-395.

Meylan A 1999. Status of the hawksbill turtle (Eretmochelys imbricata) in the Caribbean region. Chelonian Conservation and Biology 3:177-184

Van Dam RP, Diez CE 1997. Diving behavior of immature hawksbill turtles (*Eretmochelys imbricata*) in a Caribbean reef habitat. Coral Reefs 16: 133-138.

Vega M, Chiappone M, Delgado GA, Wright R, Sullivan KM 1997. Evaluación ecológica integral del Parque Nacional del Este, República Dominicana. The Nature Conservancy, Virginia.

Witzell, WN 1983. Synopsis of biological data on the hawksbill turtle, *Eretmochelys imbricata* (Linnaeus, 1766). FAO Fish. Synopsis No. 137. 78pp.