Potential Hawksbill Prey Items Among Dive Sites in Roatán, Honduras

Dustin Baumbach[1,2], Christian Hayes[1,2], Marsha Wright[2,3], Marta Macpui[4], Lidia Salinas[2,5], Stephen G. Dunbar[1,2,5]

[1]Marine Research Group, Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, CA 92350; [2]Protective Turtle Ecology Center for Training, Outreach, and Research, Inc. (ProTECTOR), Colton, CA 92324; [3]Department of Biological Sciences, Oakwood University, Huntsville, AL 35896; [4]Roatán Marine Park, Roatán, Bay Islands, Honduras; [5]Protective Turtle Ecology Center for Training, Outreach, and Research, Inc. (ProTECTOR) Honduras, Tegucigalpa, Honduras

Introduction

- Hawksbills have been listed as critically endangered under the International Union for Conservation of Nature's Red List since 1996 (Meylan & Donnelly, 1999).
- This is, in part, due to anthropogenic factors, such as pollution and hunting for their shells, meat, and eggs (Chacón, 2004).
- These anthropogenic factors should be mediated internationally as turtles migrate between nesting and foraging sites and *vise versa*.
- Hawksbills are known to be spongivores in the Caribbean (Meylan, 1988) with sponge foraging supported by observations in Honduras by Dunbar et al. (2008) and Berube et al. (2012).
- This turtle species is also suggested to be a contributor to healthy reefs by limiting sponge competition and distribution (Leon & Bjorndal, 2002).
- The Bay Islands of Honduras consists of three different islands, one of which is the island of Roatán, where the Roatán Marine Park (RMP) is located (Figure 1).
- The RMP is a marine protected area patrolled daily by park rangers to prevent illegal fishing and taking of turtles.
- This area has only been recently identified as an important area for sea turtle populations.
- Hawksbills have been observed foraging within the park, yet the prey species they utilize are essentially unknown.

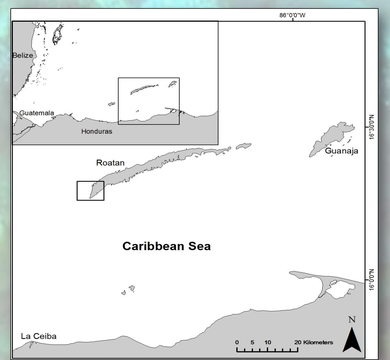

Figure 1. Study area of West End on the island of Roatán (main map) with respect to mainland Honduras (inset map).

Methods

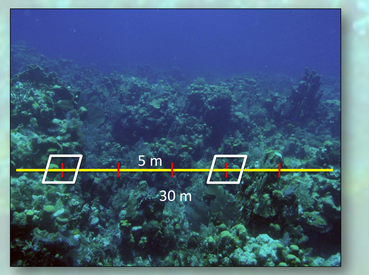

Figure 2. Visual representation of habitat analysis using transects. Yellow represents 30 m transect line with red lines representing markers for quadrate placement every 5 m.

- Turtles were followed to observe their foraging habits during 15-20 min intervals.
- After turtles were observed foraging on specific prey items, small samples were collected and stored in NaCl.
- To assess prey item distribution, reef transects were conducted for 13 individual dive sites.
- A 30 m transect line was divided into six sections, 5 m apart and placed over a random section of reef (Figure 2).
- A 1 m^2 quadrate was laid over the transect line at each of the six marks.
- Photos were taken approximately one meter above the quadrate.

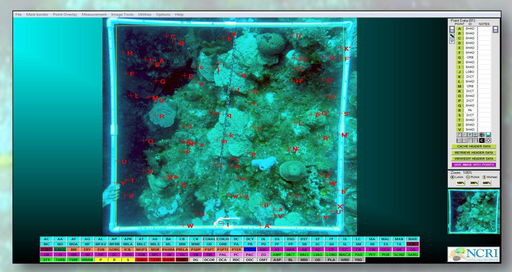

Figure 3. Quadrate coral analysis using the Coral Point Count with Excel extensions program. Letters placed on the photo can be specified for species using species codes.

- Photos of each quadrate were edited in Photoshop CS6 to bring out the natural color of the habitat and to improve photo clarity.
- Photos were then uploaded to the Coral Point Count with Excel extensions (CPCe) program to identify species and calculate relative abundance.
- The quadrate was split into a grid of three columns and three rows in which 81 random points were distributed throughout and labeled by letter (A – Z, a – z, A' – Z', and a' – c') (Figure 3).
- Any species that lay underneath a point was identified using Human & Deloach (2013), Human, Deloach, and Wilk (2013), and personal communication with Dr. Klaus Rüetzler.

Results

- One dive site consisted of 81 – 120 turtles sighted with remaining sites having from 1 – 80 turtles sighted (Figure 4).
- Turtles were observed foraging on both algae (Figure 5A) and sponge (Figure 5B) species.
- Thirty-five individual turtles were observed foraging, revealing the highest percentage foraging only on algae (Figure 6).
- Turtle prey items collected consisted of sponges in the genus *Geodia,* and algae genera *Halimeda*, *Lobophora*, and *Dictyota*. The only red algae found could not be identified (Table 1).
- Comparisons among sponge (Figure 7A) green (Figure 7B), and brown (Figure 7C) algae showed brown algae to be more abundant.

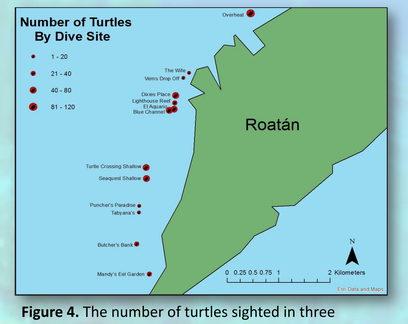

Figure 4. The number of turtles sighted in three months within the 13 dive sites where transects were conducted.

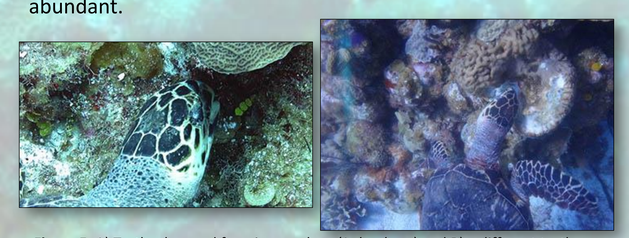

Figure 5. A) Turtle observed foraging on algae (*Lobophora*) and B) a different turtle observed foraging on a sponge (*Geodia*).

Figure 6. Percentage of turtles observed foraging on different prey items.

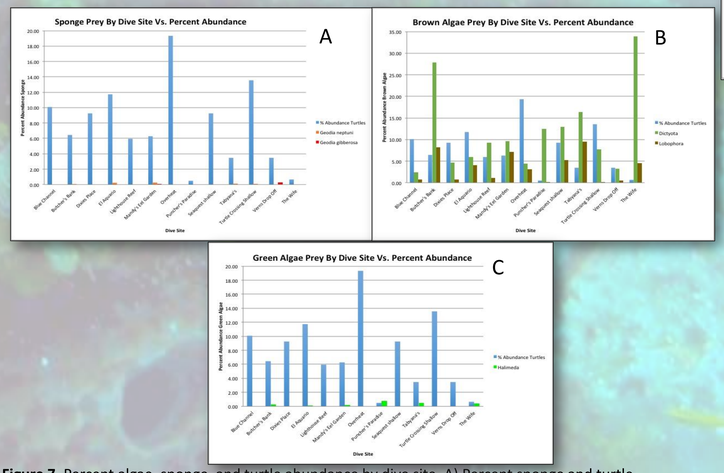

Figure 7. Percent algae, sponge, and turtle abundance by dive site. A) Percent sponge and turtle abundance; B) Brown algae and turtle abundance; C) Green algae and turtle abundance.

Table 1. Observed hawksbill prey items categorized into type of organism (left) and genus and species (right).

Type of Organism	Genus/Species
Sponge	*Geodia neptuni*
	Geodia gibberosa
Green Algae	*Halimeda*
Brown Algae	*Lobophora*
	Dictyota
Red Algae	Unknown

Conclusion

- During the three month period of this study (June – August) it appears that hawksbill prey item preference consisted mainly of algae within this region.
- Bell (2013) found a similar prey item preference for algae in the northern Great Barrier Reef during the Austral winter.
- We suggest that, with continuing climate change and potential for declining coral and sponge abundance, there may be nutritional advantages to consuming algal species where increased abundance of algae may occur.
- Continued management of the RMP through daily patrols may facilitate hawksbill reef habitat improvement and potential hawksbill population recovery.

Acknowledgements:

Funding was provided by ProTECTOR and the Department of Earth and Biological Sciences at Loma Linda University. We thank the Roatán Marine Park for providing assistance and equipment, Coconut Tree Divers, West End Divers, and Splash Inn, as well as Oscar from the RMP for transportation to dive sites. For support while on Roatán we thank Jimmy Miller. We also thank all the volunteers who assisted conducting transects throughout this study and Dr. Klaus Rüetzler for helping to identify sponge species. We acknowledge the organizations of SAG and Digepesca and also Lidia Salinas for in country support.

Literature Cited:

Bell, I. 2013. Algivory in hawksbill turtles: *Eretmochelys imbricata* food selection within a foraging area on the Northern Great Barrier Reef. *Marine Ecology*, 34: 43-55.

Berube, M. D., Dunbar, S. G., Rützler, K. & Hayes, W. K. 2012. Home range and foraging ecology of juvenile Hawksbill sea turtles (*Eretmochelys imbricata*) on inshore reefs of Honduras. *Chelonian Conservation and Biology*, 11(1): 1-12.

Chacón, D. 2004. Caribbean hawksbills – An introduction to their biology and conservation status. In: WWF – Regional Program for Latin America and the Caribbean, San José, Costa Rica. Pp. 70.

Dunbar, S. G., Salinas, L. & Stevenson, L. 2008. In-Water Observations of Recently Released Juvenile Hawksbills (*Eretmochelys imbricata*). *Marine Turtle Newsletter*, 121: 5-9.

Human, P. and N. Deloach. 2013. Reef Coral. New World Publications, Inc., Jacksonville, Fl. Pp. 274.

Human, P., N. Deloach, and L. Wilk. 2013. Reef Creature. New World Publications, Inc., Jacksonville, Fl. Pp. 306.

León, Y.M. and K.A. Bjorndal. 2002. Selective feeding in the hawksbill turtle, an important predator in coral reef ecosystems. Marine Ecology Progress Series 245: 249-258.

Meylan, A. B. 1988. Spongivory in Hawksbill turtles: a diet of glass. *Science*, 239(4838): 393-395.

Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN Red List of threatened animals. Chelonian Conservation and Biology 3: 200-224.