

CONSERVATION ASPECTS OF SEA TURTLES IN MARANHÃO ISLAND, SÃO LUIS, BRAZIL

ASPECTOS DA CONSERVAÇÃO DE TARTARUGAS MARINHAS NA ILHA DO MARANHÃO, MUNICIPALITY OF SÃO LUIS, BRASIL

Ana Beatriz Nunes RIBEIRO¹; Larissa BARRETO²; Luis Eduardo de Souza RIBEIRO²; Randolpho Rocha AZEVEDO³

1. Programa de Pós graduação em Biodiversidade Tropical, Universidade Federal do Amapá, Macapá, AP, Brasil. anabeatricenunes@yahoo.com.br; 2. Departamento de Oceanografia e Limnologia, Universidade Federal do Maranhão, São Luiz, MA, Brasil; 3. Departamento de Biologia - Centro de Ciências Biológicas e da Saúde, Universidade Federal do Maranhão, São Luiz, MA, Brasil.

RESUMO: Visando obter informações sobre as espécies de tartarugas marinhas que ocorrem na Ilha, iniciaram-se levantamentos de encalhes e pesca acidental desses animais em parceria com comunidades pesqueiras da ilha, de junho de 2006 a outubro de 2007. São cinco as espécies de tartarugas marinhas que habitam a zona costeira brasileira e todas elas foram encontradas em São Luís tais como: tartaruga cabeçuda (*Caretta caretta*), tartaruga de pente (*Eretmochelys imbricata*), tartaruga de couro (*Dermochelys coriacea*), tartaruga oliva (*Lepidochelys olivacea*), e tartaruga verde ou aruanã (*Chelonia mydas*). Foram observados filhotes recém eclodidos de *E. imbricata* (demonstrando atividade reprodutiva na região). Todos os espécimes adultos e juvenis localizados vivos ou mortos estavam com alguma marca ou indícios característicos de interação com a pesca como marcas de emalhes de redes de pesca, espinhel ou golpes de faca na cabeça ou na região do casco. Esses animais estão em situação de risco de extinção devido ao consumo por comunidades pesqueiras, muitas vezes ocasionadas pela pesca acidental e pela ausência de informação dos pescadores sobre a adequada devolução ao mar. Portanto os esforços de conservação destes animais devem se concentrar não somente na atividade reprodutiva, mas na conscientização sobre pesca e consumo ilegal junto às comunidades pesqueiras da zona costeira. Neste aspecto a importância deste trabalho foi delinear os principais impactos sobre as espécies para melhorar sua proteção nas praias e a relação com as atividades de pesca na Ilha. Os resultados desta pesquisa podem levar à intensificação de esforços de conservação dessas espécies da zona costeira de toda a Ilha do Maranhão, incluindo também São José de Ribamar, Paço do Lumiar e Raposa, inserindo-as no programa nacional de conservação de espécies em risco de extinção.

PALAVRAS-CHAVE: Zona costeira. Conservação. Comunidades pesqueiras. Tartarugas marinhas. Interação.

INTRODUCTION

There are seven species of sea turtles around the world and of these five habits the Brazilian coast such as: Loggerhead turtle (*Caretta caretta*), Hawksbill turtles (*Eretmochelys imbricate*), Leatherback turtle (*Dermochelys coriacea*), Olive turtle (*Lepidochelys olivacea*) and Green turtle (*Chelonia mydas*) (Icmbio 2011). Currently, all five species belong to the Red List of Threatened Species IUCN (IUCN 2010). The belief that species are globally threatened forces to the high level of protection of these species and encourages conservation on a global level (BRODERICK et al. 2006).

Effects on sea turtle populations primarily reflect the conditions imposed on these, as natural and man-made environmental stresses, which may include among these terrestrial habitat loss and pollution of beaches, degradation of aquatic environments and effects of mortality from fishing activities, either directly or indirectly (LUTCAVAGE et al. 1997). The vulnerability

of populations of turtles is linked to various threats such as habitat degradation (LAGUEUX et al. 2003), incidental capture or interaction with fisheries (FERRAROLI et al. 2004) and climate change (GLEN; MROSOVSKY 2004)

For turtles, the major threats result from catching by fishing communities. Gill nets and pelagic long line catch cause the death of large numbers of adult animals. The fishing in the ocean for tuna and swordfish, through the use of long lines causes serious damage to both populations of sea turtles – especially the leather and loggerhead species that have pelagic habits. These animals are attracted to the bait by long line (TAMAR - IBAMA 2003).

On the Maranhão Island there were no studies or a more detailed monitoring of the occurrence of sea turtles until the project QUEAMAR (Quelônios Aquáticos do Maranhão) began studies of the group in 2000. Thus, the objective of this study is to delineate aspects of conservation at the Island to provoke the intensification of efforts to conserve these

species in the coastal zone of the island of Maranhão, São Luís. We hope these results can be useful to be applied to the other municipalities of the Island such as: São José de Ribamar, Paço do Lumiar and Raposa.

MATERIAL AND METHODS

Study Site

The coordinates 02° 24'26''S and 44°01'53''W; 2°45'45''S and 44°21'30''W;

2°33'52''S and 44°03'12''W; and 02°33'59''S and 49°22'37'', mark the boundaries of the Island of Maranhão. Its climate is tropical rainy, with a predominance of rainfall in the months of January to April. The average annual temperature hovers around 28°C (ESPIG et al. 2005). In the island of Maranhão there are four towns: São Luís, São José de Ribamar, Raposa and Paço do Lumiar (Figure 1). This island is located in the area of Golfão Maranhense, between the Bay of São Marcos and São José Bay (IBGE 2011).

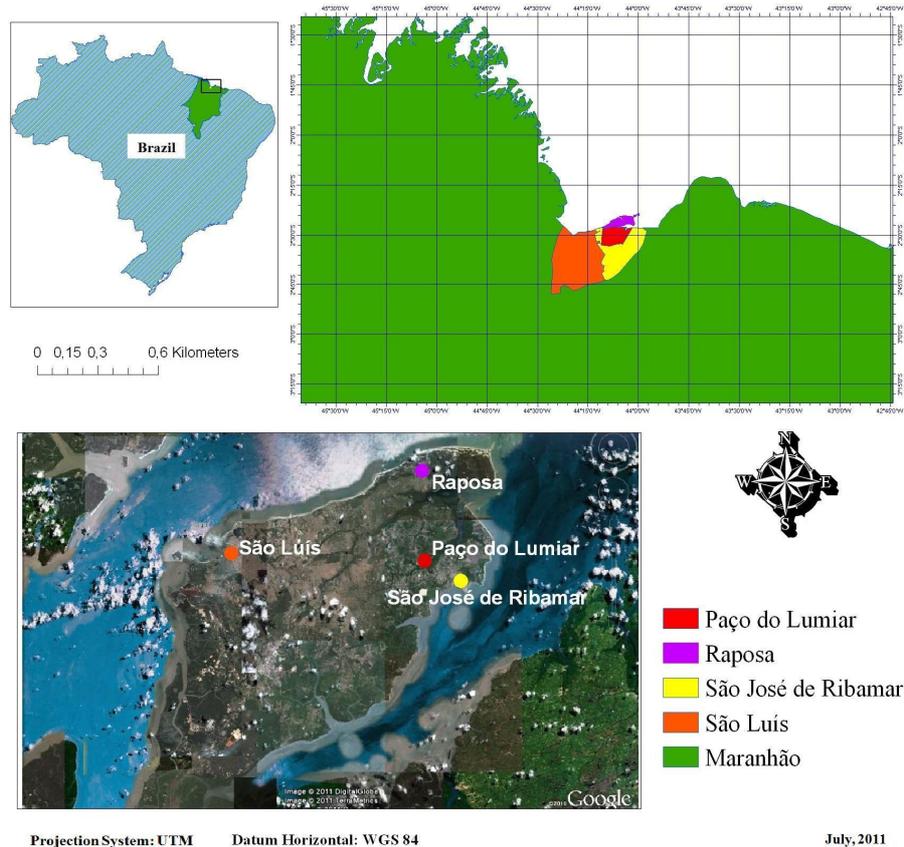


Figure 1. Island of Maranhão and the four municipalities

METHODS

The beaches were monitored weekly during the reproductive period (June to December) and other information of strandings was obtained in partnership with the community. The community reported to the research team about the strandings, so they went to the location to remove the animal, do the identification (species and sexual dimorphism) and measurements (curved carapace length maximum) based on Wyneken (2001). The monitoring of stranding on beaches for sea turtle species were conducted by the location of live or dead animals, species identification and subsequent identification of the cause of death (if combined with fishing accident, intentional or not).

The survey period of stranding occurred from June 2006 to October 2007. All animals were photographed for identification and cataloged. Each animal was observed in carapace and plastron to observe the marks of gill nets, knives, hooks or shark bites.

RESULTS

The five species (*Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys olivacea*, *Caretta caretta*, and *Dermochelys coriacea*) occurring in Brazil were identified on the Maranhão Island. As a result of the monitoring of the stranding were observed 11 specimens, one of *D. coriacea*, one of *L. olivacea*, one of *C. caretta* and eight of *C.*

mydas (Table 1). For the species *E. imbricata* were observed two depredated nests, observed the presence of these hatchlings in a nest on the island of Curupu, in Raposa municipality (in the extreme north of the island).

Stranded animals observed deaths were associated with fishing artifacts, such as fish hook

caught in the esophagus of a living specimen of juvenile *C. mydas*; brands of fishing nets in dead adult specimen of *D. coriacea*; knife marks on the head or carapace of most individuals found dead or alive.

Table 1. Location, size and cause of death of the species of sea turtles found on the island of Maranhão.

Location	Species	Carapace length (cm)	Sex	Cause of death
São Luis	<i>Chelonia mydas</i>	120	Male	Fishing net
	<i>Chelonia mydas</i>	48	Juvenile	–
	<i>Chelonia mydas</i>	40	Juvenile	Drowning
	<i>Chelonia mydas</i>	29.5	Juvenile	Shark bites
	<i>Lepidochelys olivacea</i>	–	Juvenile	–
São José de Ribamar	<i>Chelonia mydas</i>	56	Juvenile	Knives
	<i>Chelonia mydas</i>	62	Juvenile	Unidentified
Raposa	<i>Chelonia mydas</i>	–	Female	Capture to consumption
	<i>Chelonia mydas</i>	127	Female	–
	<i>Caretta caretta</i>	66	Juvenile	–
	<i>Dermochelys coriacea</i>	166	Female	Fishing net

DISCUSSION

In Brazil, most fishing are concentrated in the inland water with the use of gill nets, thrown overboard and maintained so that the turtles become trapped and die. Marcovaldi et al. (1998) consider this the main cause of death of turtles along the entire coast. Catches also show interaction with the fishing in the Island, while some specimens found dead or alive, bears marks of network or hooks. There is no reasonable justification for the fact that almost every turtle conservation efforts around the world are concentrated only in the protection of spawning areas (CROUSE et al. 1987). What you might notice is that the concentration of fishery interaction studies with these animals should be higher, as well as consideration of the reproductive areas, environmental studies should combine with socioeconomic studies for the conservation of species and the increase in environmental education for conservation. We stress the importance of monitoring of population fluctuations of adults to understand their population dynamic.

What often occurs is that the animal can come and passed gilled in the nets, even

accidentally (GALLO 2001). Due to the ignorance of the fishermen, they throw the animal in the sea, causing their death by drowning and later the animals are found on the beaches with marks of gill nets.

Today the beaches of São Luis are much disturbed and maybe for this we do not observe sea turtles coming up to the beach to reproductive activity, but we observe in a less disturbed beach (Curupu Island) nests of *E. imbricata*. It is likely that this and other species in past periods used these beaches for nesting. It is relevant that sea turtles return to beaches where they were born to nest (SCHROEDER; MURPHY 2000), so these areas of probable breeding of sea turtles should be monitored to ensure the reproduction of the species.

In the monitoring activities of strandings in partnership with the local community, there were reports that decades ago constant spawning of different species of sea turtles were observed in northern of Maranhão Island (Island of Curupu). On the other hand, there were reports that with the expansion of the human population to the beaches and the consumption of turtles stranded, breeding activity decreased in the region.

Sea turtle nests were found only on the Island of Curupu in an uninhabited area and largely preserved, where juvenile and adult animals have been

identified across Sao Luis in stranding associated with fishing gear. The geographic distribution of spawning *E. imbricata* follows mostly from the coast of Bahia, Sergipe and southern coast of Rio Grande do Norte their spawning in lower concentrations in Paraíba, Ceará and Espírito Santo (MARCOVALDI et al 2011), not being reported nests on the coast of Maranhão for this species, this is the first report.

According to Heppel et al. (2003) sea turtles are unlikely to be able to sustain even moderate levels of captures, especially if populations are already at minimum population size. In the case of endangered species, conservation efforts should focus on populations and their habitats. From the results it was noted that the conservation efforts in this area should focus on interactions with fisheries and fishing communities, through management strategies and other care to animals caught in gill nets or hooks, leading to conservation populations of sea turtles and their habitats.

The results showed that many specimens (seven) were killed by gill nets in fishing nets or

hooks. Sea turtle nests were only observed in a region largely preserved in the north of the São Luis (Curupu Island), inhabited only by a small community of fishermen, but the two nests found were predated by animals. One nest completely predated and the other with some hatchlings, released on the same beach.

Considering the interaction with the fishing of these animals should be encouraged the environmental education efforts and the management of sea turtles linked to the fishing communities in Cooperation with institutes that care of these animals in Brazil like IBAMA, reducing the impacts on populations and conserving the stocks of the species. These facts are relevant in order to consider further efforts on the conservation of these species in the coastal region of Maranhão.

ACKNOWLEDGMENTS

We thank CNPQ, Fundação de Amparo à Pesquisa no Maranhão (FAPEMA), and Universidade Federal do Maranhão for the financial and logistical support throughout the work. We thanks to the team of QUEAMAR PROJECT (coordinated by L. Barreto) and especially to Joab and the community of Island Curupu.

ABSTRACT: In order to obtain information about the species of sea turtles that occur on the island of Maranhão, São Luis, surveys were started through observations of catching and stranding of these animals in partnership with fishing communities, from June 2006 to October 2007. There are five species of sea turtles that inhabit the coastal area of Brazil and all of them were observed in Maranhão Island, São Luís, such as: loggerhead turtle (*Caretta caretta*), hawksbill turtles (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), olive turtle (*Lepidochelys olivacea*) and green turtle (*Chelonia mydas*). It was observed puppies newly hatched of *E. imbricata* (indicating reproductive activity). All adult and juvenile specimens found dead or alive were observed with some injury due fishing artifacts such as fishing gill, fishing nets, long lines or knife blows on the head or on the hull. These animals are at risk of extinction due to the consumption by fishing communities, caused by catch and the lack of information of the fishermen how to manage the returning of the animals to the sea. For this reason, conservation efforts for these animals should focus not only on reproductive activity, but in raising awareness of illegal fishing and consumption by the fishing communities along the coastal zone. In this aspect, the importance of this work was to delineate the main impacts on these animals to improve the protection at the beaches and the fishing activities on the Island. The results of this research may lead to the intensification of efforts to conserve these species in the coastal zone of all the island of Maranhão, including also the municipalities of São José de Ribamar, Paço do Lumiar and Raposa to insert them at the national conservation program of endangered species.

KEYWORDS: Coastal zone. Conservation. Fishing communities. Sea turtles. Interaction.

REFERENCES

BRODERICK, A. C.; FRAUENSTEIN, R.; GLEN, F.; HAYS, G. C.; JACKSON, A.L.; PELEMBE, T.; RUXTON, G.D.; GODLEY, B.J. Are green turtles globally endangered? *Global Ecology and Biogeography*, **Global Ecology and Biogeography**, Oxford, v. 15, p. 21–26. 2006.

CROUSE, D.; CROWDER, L. B.; CASWELL, H. A. Stage-Based Population Model for Loggerhead Sea Turtles and Implications for Conservation. **Ecology**, Tempe, n. 68, v. 5, p. 1412-1423. 1987.

ESPIG, S. A.; ARAUJO, E. P.; PARENTE, J. W. Estudos das Unidades de Paisagem da Ilha do Maranhão: delimitação e dinâmica. In: XII Simpósio Brasileiro de Sensoriamento Remoto. **Anais...**, Goiânia, Brasil, 16-21, INPE, p. 2607-2609. 2005.

FERRAROLI, S.; GEORGES, J.Y.; GASPAR, P.; MAHO, Y.L. Where sea turtles meet fisheries. **Nature**, London, n. 429, p. 521-522. 2004.

GALLO, B. Ubatuba-entre a mata e o oceano. **Revista do TAMAR**, v. 4, p. 13-14. 2001.

GLEN, F.; MROSOVSKY, N. Antigua revisited: the impact of climate change on sand and nest temperature at a hawksbill turtle (*Eretmochelys imbricata*) nesting beach. **Global Change Biology**, Oxford, v. 10, n. 12, p. 2036-2045. December 2004.

HEPPEL, S.S.; SNOVER, M.L.; CROWDER, L.B. Sea Turtle Population Ecology, Chapter 11 In: PETER L. LUTZ and JOHN A. MUSICK (Ed). **The biology of sea turtles II**. CRC Press, Boca Raton. p. 275-306. 2003.

IBGE, 2011. Documentação Territorial do Brasil – São Luis – Maranhão. Electronic Database accessible at <http://biblioteca.ibge.gov.br/visualizacao/dtbs/maranhao/saoluis.pdf>. Downloaded on 13 June 2011.

ICMBIO – Instituto Chico Mendes de Conservação da Biodiversidade. Número Temático: Avaliação do Estado de Conservação das Tartarugas Marinhas. **Biodiversidade Brasileira**. Ano 1, n1. 2011.

IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. Electronic Database accessible at www.iucnredlist.org Downloaded on 02 May 2011.

LAGUEUX, C.J.; CAMPBELL, C.L.; MCCOY, W.A. Nesting and conservation of the hawksbill turtle, *Eretmochelys imbricata*, in the Pearl Cays, Nicaragua. **Chelonian Conservation and Biology**, v. 4, n. 3, p. 588-602. 2003.

LUTCAVAGE, M.; PLOTKIN, P.; WITHERINGTON, B.E.; LUTZ, P. Human impacts on sea turtle survival. Chapter 15 In: PETER L. LUTZ AND JOHN A. MUSICK (Ed). **The Biology of Sea Turtles**. CRC Press, Boca Raton. p. 387-409. 1997.

MARCOVALDI, M. A.; BAPTISTOTTE, C.; CASTILHOS, J. C.; GALLO, B. M. G.; LIMA, E. H. S. M.; SANCHES, T. M.; VIEITAS, C. F. ACTIVIDADES DEL PROYECTO TAMAR en las areas de alimentación de tortugas marinas en Brasil. **Noticiero de Tortugas Marinas**, n. 80, p. 5-7. 1998.

MARCOVALDI, M. A.; LOPEZ, G. G.; SOARES, L. S.; SANTOS, A. J. B.; BELLINI, C.; SANTOS, A. S. D.; LOPEZ, M. Avaliação do Estado de Conservação da Tartaruga Marinha *Eretmochelys imbricata* (Linnaeus, 1766) no Brasil. **Biodiversidade Brasileira**, v. 1, p. 20-27. 2011.

SCHROEDER, B., MURPHY, S. Prospecciones Poblaciones (Terrestres y Aéreas) en Playas de Anidación. In: K. L. ECKERT, K. A. BJORN DAL., F. A. ABREU-GROBOIS, M. DONNELLY (Ed.). **Técnicas de Investigación y Manejo para la Conservación de las Tortugas Marinas**. UINC/CSE Grupo Especialista em Tortugas Marinas. Publicación N°. 4, (Traducción al español). 2000.

TAMAR – IBAMA/ Fundação Pró - Tamar. **Revista do Tamar**. Venture Gráfica e Editora. Brasil. Ano 8, n. 6, 2003.

WYNEKEN, J. **The Anatomy of Sea Turtles**. U.S. Department of Commerce NOAA Technical Memorandum NMFS-SEFSC-470, 1-172 pp. 2001.