

LARGE PELAGICS RESEARCH CENTER
SEMI-ANNUAL PROGRESS REPORT
Report: #4 Reporting Period: 5/01/2007 – 05/31/2008

Project Title: Spatial Ecology of Marine Turtles in the Eastern Atlantic

Principal Investigator(s): Michael Coyne, Brendan Godley, Mike Fedak

1. Purpose of the Project:

Through an integration of satellite tracking, remote sensing, modeling and novel informatics we will investigate a series of questions:

- What are the migratory and four-dimensional (X,Y,Z,T) foraging strategies undertaken by the study species?
- How are these strategies influenced by oceanographic conditions?
- What are the oceanographic conditions that serve as habitat for the study species?
- How can this knowledge be used to mitigate interaction with commercial fisheries?
- In tandem, we aspire to contribute significantly to capacity within the LPRC and the wider animal tracking field through our use, development and promotion of the Satellite Tracking and Analysis Tool:
 - All data will be stored in an effective clearing-house where it will be available for future intra and cross-taxa analysis.
 - All appropriate data management and analytical techniques developed during the course of this project will be incorporated into STAT for use by other investigators, which currently include over 100 projects and 2000 tags.
 - Selected tracks available through the online tracking interface of STAT will help promote the work of this project at the LPRC.

2. Progress during the last six months:

During the last six months we planned to deploy satellite tags on 5 leatherback sea turtles at Mayumba National Park in Gabon. These tags were successfully deployed during February 2008 and two tags continue to transmit. Deployment of the 5 tags was part of an agreement with the Gabon Ministry of Environment to evaluate a new attachment technique. Based on the results of this preliminary deployment the Ministry has agreed that the remaining 10 satellite tags may be deployed in November of 2008. The Large Pelagics Research Center grant has also allowed us to leverage partnerships with other organizations working in the region, providing access to data from an additional 3 leatherbacks. We now have data from a total of 19 Gabonese leatherback turtles. All satellite tags intended for loggerhead turtles on the island of Boa Vista, Cape Verde, have been deployed and all have completed transmissions. A total of 25 tags were successfully deploy on loggerhead sea turtles in the Cape Verde Islands.

We have archived and are processing oceanographic data necessary for integration with animal movement data. All location data collected to date have been sampled for a broad

suite of coincident oceanographic data (e.g. bathymetry and sea surface temperature, chlorophyll, height, currents).

3. Preliminary Data:

A total of 25 loggerhead turtles were tagged in the Cape Verde Islands. Six with SMRU SRDL tags and 19 with Sirtrack Kiwisat 101 tags. Previous studies have suggested that the loggerhead population at Boa Vista displayed phenotypically linked foraging behavior, with larger adults feeding neritically on the coastal shelf and smaller adults feeding pelagically. To this end we aimed to tag a wide distribution of adult-sized animals to further test this finding and possibly identify the critical size separating the two foraging modes. We were able to tag animals ranging in size from 74.5 to 103 cm CCL.

Results support previous findings with one exception. A relatively small turtle (68124 Fogo, 82.5 cm CCL) appeared to feed neritically. All other individuals 90 cm CCL and smaller appear to be feeding pelagically.

We used satellite telemetry to describe patterns of habitat utilization during the interesting period for leatherback turtles nesting at Mayumba National Park in Gabon. The National Park includes critical nesting grounds and a Marine Protected Area (MPA) to 15 km offshore. Turtles dispersed widely from the nesting beach spending $62 \pm 26\%$ of tracking time outside of the protected confines of the National Park. This propensity to disperse is likely to increase the chance of deleterious interactions with fisheries in the region. Patterns of habitat utilization indicate the need for wider spatial scale planning on the West African continental shelf to enhance protection of leatherback turtles while seasonally occupying these habitats in great numbers for breeding and nesting. Spatial analyses with oceanographic data are in progress and several peer-review publications are in preparation.

4. Plans for the next six months to year:

During the next year we plan to:

- Continue our ecological analysis of data coming in from Cape Verde loggerheads and Gabon leatherbacks.
- Deploy 10 satellite tags on leatherback sea turtles in Gabon.
- Complete aggregation and evaluation of oceanographic datasets.
- Model relationship between sea turtle movements and oceanographic conditions.

5. Dissemination

Publications:

Witt MJ, Broderick AC, Coyne MS, Formia A, Ngouesso S, Parnell RJ, Sounget G-P, Godley BJ (in press) Satellite tracking highlights difficulties in the design of effective protected areas for leatherback turtles during the interesting period. *Oryx* 42:296-300. Papers relating loggerhead and leatherback movements to oceanographic conditions are in preparation.

Workshops:

The Gabon portion of this work garnered an invitation for the PI to the South Atlantic Sea Turtle Network meeting held in Brazil during May 2008. This work was a major focus of the meeting and held up as an example of outstanding efforts in the study of sea turtles in the South Atlantic.

Conferences:

Preliminary results on aspects of this work were presented at the 2nd International Symposium on Tagging and Tracking of Marine Fish with Electronic Devices held during October 2007 in San Sebastian, Spain.

Manuals, Protocols:

This work has resulted in the successful development of a new protocol for satellite tag attachment on leatherback sea turtles (see Attachment 1). Full details of the technique will be published following refinement of the technique during the final tag deployment scheduled to take place during November 2008.

Outreach Activities: The tracks of turtles in the Cape Verde and Gabon projects have been available on the seaturtle.org website since their release. The site has been used for both public education and outreach purposes and to inform other investigators of opportunities for potential collaboration. All maps on the site are updated daily in near real-time.

The most recent deployments are available at the link below:

http://www.seaturtle.org/tracking/?project_id=270

Patent, Copyright, Invention Disclosure Activity:

6. Collaborators and Personnel:

Dr. Michael Coyne, Duke University
Dr. Brendan Godley, University of Exeter at Cornwall
Lucy Hawkes, PhD student, University of Exeter at Cornwall
Matthew Witt, PhD student, University of Exeter at Cornwall
Dr. Patrick Halpin, Duke University
Dr. Mike Fedak, University of St. Andrews
Pedro Lopez Suarez, Natura 2000 Cabo Verde
Dr. Luis Felipe Jurado, University of the Canary Islands
Dr. Angela Formia, WWF Gabon
Bas Verhage, WWF Gabon

7. Students:

Lucy Hawkes, PhD June 2007 – Migratory and nesting ecology of the loggerhead sea turtle in Cape Verde and the USA

Matthew Witt, PhD September 2007 – Integrating sea turtle satellite tracking data with oceanographic datasets

8. Images and Captions:



Figure 1: Attachment1.jpg Credit: seaturtle.org/tracking
Caption 1: Photo of new keel attachment method used to attach specially designed Kiwisat 101 satellite transmitters to leatherback sea turtles in Gabon.

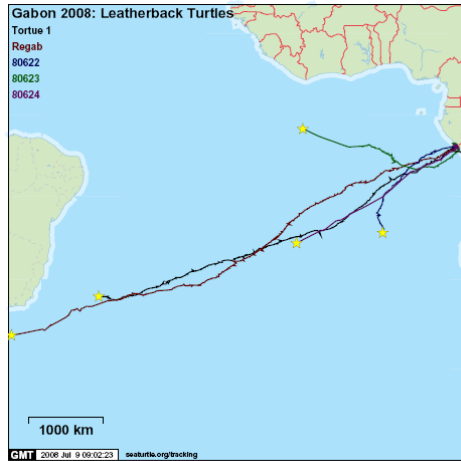


Figure 2: Attachment2.pdf Credit: seaturtle.org/tracking
Caption 2: Tracks of 5 satellite tagged leatherback sea turtles from Mayumba National Park, Gabon, in the South Atlantic, as of 9 July 2008.