Appendix R. Ecology of neonate loggerhead turtles inhabiting pelagic fronts near Florida Current (Source: Witherington 1997).

ECOLOGY OF NEONATE LOGGERHEAD TURTLES INHABITING PELAGIC FRONTS NEAR THE FLORIDA CURRENT

Interim Report to the National Marine Fisheries Service

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INTRODUCTION

Although the pelagic phase of sea turtle life history is poorly known, two principal assumptions persist in guiding biological thought and conservation decisions pertaining to pelagic sea turtle ecology. The first of these working hypotheses is that neonate/juvenile sea turtles are passive drifters that inhabit frontal boundaries near major currents in the open ocean and a second is that these young sea turtles forage upon the surface biota within these fronts. Unfortunately, there have been no detailed ecological studies that would support of refute these hypotheses. Study of pelagic turtles has been difficult, largely due to the inaccessibility of the areas they inhabit.

The present study seeks to test these and other hypotheses on the ecology of neonate loggerhead turtles. Capture of neonate loggerheads, behavioral observations, and sample collections from turtles and from their habitat were conducted within a region of the Atlantic Ocean off Florida where young loggerhead turtles are regularly found. These post-hatchlings (estimated to be 5-60 days old) are found within debris lines 20-40 NM from shore near the western boundary of the Florida Current. On days of acceptable weather, an average of 12 post-hatchling loggerheads have been observed for each hour spent searching (Witherington, 1994). This area provides a unique opportunity to study the ecology of pelagic turtles.

A pilot study of post-hatchling loggerheads at the edge of the Florida Current found an alarming frequency of debris ingestion (Witherington, 1994). Tar or plastics were found in the lavaged stomach contents of 56% of sampled loggerheads and 63% of these turtles had tar adhering to their jaws.

This study has the following objectives.

1. Characterize the behavior of pelagic post-hatchling loggerheads. Address the questions: Are pelagic loggerheads passive drifters? Do they favor areas within fronts that have a specific current speed and direction? Do post-hatchling loggerheads have an affinity for specific types of objects (e.g., sargassum, woody debris, plastics)?

2. Characterize the habitat where post-hatchling loggerheads are found. Address the questions: Are the areas where post-hatchlings are found true oceanic fronts (shear boundaries between two water masses)? How accurately do the occurrence of sargassum and the presence of true frontal boundaries predict the presence of post-hatchlings?

3. Characterize food choice of post-hatchling loggerheads. Address the questions: What are post-hatchling loggerheads eating? What potential food items and ingestion hazards are present in their foraging areas? What are the preferences for

ingested items based upon frequency of ingestion and availability in the water? What are the origins of plastics and tar found in the stomachs of turtles and in the waters they inhabit?

WORK ACCOMPLISHED, 10-1-96 TO 11-30-97

Eighteen trips were made to a region of the Atlantic, east of Cape Canaveral, Florida, near the 40 fathom contour at approximately 28.5 N and 80.0 W. Trips were made during the period of hatchling emergence activity on nearby nesting beaches and spanned the period of 22 July through 1 October 1997. The vessel used on these trips was a 6.5 m cuddy cabin with a 150 hp outboard motor.

Within the target region, visible lines of sargassum, grass, foam, or debris, were sought as areas where neonate turtles could be found. Measurements of position (latitude and longitude), water surface temperature, conductivity, and current speed and direction, were made within each line encountered and at points located 0.1 NM on either side of the line. Temperature and conductivity were measured with a YSI model 30 meter and current measurements were made by tracking a current drogue with a Garman global positioning receiver. Additional notes describing the surveyed habitat were made such as extent of sargassum, width of the debris line, and weather and sea conditions.

Following these initial measurements, timed searches were made as the vessel moved at idle speed (approximately 2.5 kts) through the center of the debris line. As turtles were observed, notes were made on the time of the observation, position, and species of turtle. Observed turtles fell into four categories:

1. Turtles observed but not captured. These data will be used with data from captured turtles to calculate a catch-per-unit-effort and a species frequency index.

2. Turtles captured by dip net only and released. In addition to time, position, and species data, these turtles were weighed, measured for straight-line carapace length and width, and given an oral exam for the presence of tar.

3. Turtles captured with a debris sampler and released. This capture technique (described below) was used to collect nearby floating debris with each turtle. In addition to the information collected for turtles described above, gastric/esophageal lavages were conducted to sample recently ingested items.

4. Turtles found dead and collected. These turtles were given necropsies and a quantified examination of gut contents.

Debris Sampling/Turtle Capture

The device used for capturing turtles and nearby debris was a modified dip net. The mesh of the net was replaced with a funnel of 500 micron stainless steel mesh which connected to a 300 micron mesh removable sample bag. The opening of the net was circular and 70 cm in diameter.

As turtles were observed ahead of the moving vessel, the sampler was placed into the water, left in for a count of two seconds, and withdrawn in such a way that the turtle and debris in the immediate area were collected. Turtles were removed from the sample bag, processed, and released, and the remaining contents of the bag were sealed in an airtight plastic bag and placed on ice for later examination. In the laboratory, the debris sample was weighed and the biomass of constituent items was approximated using the technique described below.

Gastric and Esophageal Lavage

Turtles chosen for gastric/esophageal samples were inverted, and their mouth opened to receive a 3-mm outside-diameter flexible vinyl tube. A reference point on the tube aided in its insertion into the stomach. Filtered sea water was introduced into the stomach and esophagus by hand-pumping a rubber ear-wash bulb connected to the tube. Items flushed from the turtle were caught in a 500 micron-mesh sieve. There were no detectable adverse effects from the procedure. Lavage samples were washed with seawater into glass vials and stored on ice for later examination.

Biomass Approximation for Debris Samples, Lavage Samples, and Gut Contents

After weighing, large samples (such as most of the debris samples) were first reduced in size by randomly dividing them and discarding portions selected by coin toss. Samples were cut until they fit easily onto a 8.4 cm^2 grid (6x6) of filter paper. After samples were drained on the filter paper, a clear acrylic plate with a 6x6 grid etched into it, was placed over the sample on the filter paper. One centimeter posts supporting the acrylic plate kept the plate from crushing the sample.

The sample was then placed on the stage of a binocular dissecting microscope with a 10x10 square graticule in one eyepiece. The sample was surveyed by matching the outer margin of the graticule grid to each of the 36 squares of the etched acrylic plate overlying the sample. Descriptions of items to the lowest possible taxon were made for four graticule intercept-points at each of the 36 overlying grid squares. In smaller samples (such as in all of the lavage and gut samples) the entire contents of the sample was surveyed and all graticule intercept points were examined.

Turtles Captured and Samples Collected

A total of 293 posthatchling loggerheads were observed. Of these, 241 were captured. Sixty-five of the captured loggerheads have associated debris samples and gastric/esophageal samples. Forty-nine loggerheads were observed but not captured and three were found dead and were collected.

Gas chromatograms were generated at the petroleum chemistry laboratory, University of South Florida, for 20 tar samples from 19 loggerheads. Most of these samples came from jaw scrapings. Analysis is pending on the age, origin, and refinement of the samples. Determinations of tar in other lavage and jaw samples were made by observations of solubility in dichloromethane.

No green turtle posthatchlings were observed. In the 1997 season approximately one in 66 hatchlings leaving East Florida nesting beaches was a green turtle (FDEP/FMRI Index Nesting Beach Survey unpublished data). That no green turtles were observed in 293 observations of posthatchling turtles may reveal something of the disparate distributions of these two species.

Necropsies were performed and gut contents were sampled for the three posthatchling loggerheads found dead in debris lines in addition to one green turtle and six loggerhead posthatchlings that washed onto East-central Florida beaches. Analyses are pending.

STUDY PERIOD AND DELIVERABLES

The study period for the project is October 1996 through March 1998. Analysis will be complete by February 1998 and a final project report to NMFS will be completed by March 1998. Manuscripts describing the findings of this study will be submitted to peer reviewed journals and reprints of ensuing publications will be forwarded to NMFS.

LITERATURE CITED

Witherington, B. E. Flotsam, jetsam, post-hatchling loggerheads, and the advecting surface smorgasbord, in *Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation*, Bjorndal, K. A., A. B. Bolten, D. A. Johnson, and P. J. Eliazar, Comps., NOAA Technical Memorandum NMFS-SEFSC-351, 1994, 166.