

**SEA TURTLE SAMPLING IN THE KEY WEST  
NATIONAL WILDLIFE REFUGE, FLORIDA.  
INTERIM REPORT, AUGUST 2004**

**SUBMITTED TO:**

FLORIDA FISH AND WILDLIFE  
CONSERVATION COMMISSION  
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FFWCC



The Norcross Wildlife Foundation

## **INTRODUCTION**

Inwater Research Group Inc. was contracted by Florida Fish and Wildlife Conservation Commission (FFWCC) to conduct three sea turtle sampling trips in the Key West National Wildlife Refuge (KWNWR) using methods described in the scope of work report previously submitted to FFWCC. Between July 12 and July 17, 2004 Inwater Research Group Inc. conducted the first of these three sampling trips. This interim report presents data collected during this sampling effort and provides a brief synopsis of our results. Future sampling trips associated with this contract are scheduled for August 30 – September 4, 2004 and the spring of 2005. This report complies with the terms and conditions set forth in FFWCC Purchase Order number S7701 622244.

## **METHODS**

The KWNWR is located between latitudes  $24^{\circ} 40'$  N and  $24^{\circ} 27'$  N and between longitudes  $82^{\circ} 10'$  W and  $81^{\circ} 50'$  W, beginning approximately one kilometer west of Key West out to the west of the Marquesas Keys (Figure 1). For practical purposes we have divided the refuge into four distinct regions. These included the Marquesas region ( $50 \text{ km}^2$ ), the North region ( $43 \text{ km}^2$ ) the Central region ( $53 \text{ km}^2$ ) and the South region (Figure 2).

The Marquesas region encompasses 14 distinct islands that encircle an open basin. Mooney Harbor is located inside this complex of keys and contains shallow seagrass beds dotted with sponges, bomb craters, and serpentine deep water channels. To the north and east of the Marquesas, extensive sea grass beds are found in one to three meters of water and to the west in four to six meters of water large *Syringodium* beds can be found interspersed with expansive sand areas and sponge habitat. A myriad of coral patch reefs and sponge/hardbottom habitats can be found to the south and the southeast of the islands in three to five meters of water.

The North region includes the waters surrounding Cottrell, Little Mullet and Big Mullet Keys. Cottrell Key is surrounded by shallow tidal flats and sea grass beds with the exception of a fringe coral reef located just off its northwest shore. This reef extends for approximately one kilometer and has water depths that range from five meters to less than one meter. The Mullet Keys have deep water channels that encircle them and only a few narrow channels flow through the tidal flats. West of Little Mullet Key are extensive flats of turtle grass with a few large channels that lie northeast of Boca Grande Bank.

The Central region includes eight of the keys to the east and south of the Lakes Passage. The Lakes Passage is a shallow, but wide basin that runs from Archer Key west to Boca Grande Key. This area contains a mix of seagrass and sponge/hardbottom habitats. The area south of Crawfish Key west to Woman Key contains habitat that we describe as sponge gardens found in one to four meters of water. Additionally, excellent hardbottom, seagrass and sponge habitats can be found west of Barracouta Key in one to two meters of water.

The South region is mostly open water, but includes many of the barrier reefs, rock keys and shoals that sit along the Keys outer coral reef chain. To date we have surveyed very little of the southern region. Although, during a one day trip in 2003 we

were able to survey the Middle Ground shoal and Sand Key area, which sit approximately 6 and 10 km due south of Crawfish Key, respectively.

Regardless of region, turtles were captured using the rodeo method described by Ehrhart and Ogren (1999). This method entails sighting, pursuing and capturing turtles from a small boat. The method is favored for its effectiveness of capture and for its safety for the captured turtle. During capture efforts we used GPS start and end waypoints to delineate transect lengths and calculate catch-per-unit-effort (CPUE). These CPUE measurements quantify sea turtle abundance within the refuge and are comparable to other study sites where this technique is employed. Habitat types were also identified during captures to help determine if habitat partitioning exists between species.

Morphometric data were collected for each turtle captured using calipers and a flexible tape. Turtles were also weighed and photographed before release. Tumors associated with FP were measured and recorded on a standardized tumor score sheet. The total tumor score was used to assign turtles to a severity category (Work and Balazs, 1999). Turtles were tagged with a National Band and Tag Inconel # 681 tag applied to the trailing edge of each front flipper and a PIT tag was inserted into the right front flipper at a point above the second proximal trailing scale.

Blood samples from all turtles were taken for genetic, sex ratio and disease analysis. We drew blood from the cervical sinus using a sterile Vacutainer with no additive (Owens and Ruiz 1980). A 22 gauge 1" needle was used on small juveniles, while a 1½" was used on subadults. We collected approximately 7 ml from each turtle and add a few drops to a lysis buffer in a 1:10 ratio, gently shook the mixture and stored it in a cool dark place. This blood will be used for later mtDNA haplotype analysis to determine the turtle's origin (Encalada et al. 1996). The remaining blood was placed in a sterile Vacutainer with lithium heparin and spun for ten minutes in an Adams Physician centrifuge. Plasma was then pipetted into two 1.8 ml vials; one for testosterone radioimmunoassays to determine sex and the other for a study of fibropapillomatosis by collaborating researchers at the University of Florida.

Food items caught in the esophagus of green turtles were sampled using the lavage technique (Balazs, 1980). A clear flexible PVC tube was lubricated with vegetable oil and inserted down the length of the esophagus to the middle of the gular scute. The diameter of the tube was either 1/4 " or 3/8" depending on the size of the turtle. Sea water was pumped into the tube using a veterinarian's double action stomach pump and the tube was moved gently back and forth along the esophagus. Food items were collected from the backwash into a five gallon bucket. The collected food items were then placed in a four percent formalin-seawater solution for later analysis.

After all measurements and samples were taken (about 25 minutes), each turtle was released in the area where captured.

## **RESULTS AND DISCUSSION**

### *Total Sightings and Captures*

We sighted a total of 151 sea turtles during our six days of surveys in July 2004. These sightings included 68 loggerheads (*Caretta caretta*), 75 green turtles (*Chelonia mydas*), seven hawksbills (*Eretmochelys imbricata*) and one unidentified to species. For

the third year in a row, no Kemp's ridleys (*Lepidochelys kempii*) were sighted. All sighting locations were recorded and compiled according to study area within the KWNWR (Table 1 – 3).

Sea turtle captures within the KWNWR during July 2004 included 23 loggerheads, nine green turtles and two hawksbills. Loggerheads ranged in size from 57.0 to 98.1 cm SCL with a mean of 74.8 cm (Table 4). Five loggerheads captured in July were considered adult males and one an adult female using 85.0 cm SCL as a minimum length for adult classification. Green turtles captured in the refuge ranged in size from 37.3 to 84.5 cm SCL with a mean of 58.2 (Table 5). The two hawksbills captured during July measured 40.5 cm and 43.2 cm SCL (Table 6). Capture success was defined as number of turtles captured divided by number of turtles sighted (Table 7). Overall capture success for this sampling period was 22.7%.

### *Recapture events*

During this sampling period we recaptured one subadult loggerhead that had originally been tagged and released by our group on September 8, 2003 just north of Barracouta Key. This turtle was recaptured on July 14, 2004 in the same area off Barracouta Key and marks the fourth recapture event for this project since 2002. All recaptured turtles have been loggerheads and all were recaptured near their original capture site.

### *Fibropapillomatosis (FP)*

Fibropapillomas were identified on two of the nine green turtles captured during July 2004. Both turtles were captured west of the Marquesas Keys and they were two of the largest green turtles captured by the project to date. These animals showed the first signs of FP that we have ever seen on green turtles in the refuge, however the overall FP rate for sea turtles in the refuge remains low at 1.3%. Before this sampling trip we had documented just one loggerhead with tumors associated with this disease.

### *Significant findings*

In July our team made several important discoveries. The first and possibly most significant was the discovery of an area just west of the Marquesas Keys that appears to hold green turtles of a size class rarely seen in Florida. The habitat at this site is different than any other we have worked in the refuge. It consists of large expanses of *Syringodium* beds and sand stretches with intermittent sponge habitat in four to six meters of water (Appendix 1). Four green turtles were captured at this site that ranged in size from 69.3 to 84.5cm SCL (Appendix 1). These turtles were among a total of 12 large green turtles sighted in this area over an 8 hour period. To put this in perspective, of over 3900 green turtles captured at the St. Lucie Power Plant between 1976 and 2003 less than 1.8% fell within this size range (M. Bresette pers. comm.).

This site may also hold significant numbers of adult green turtles as at least two were sighted, but eluded capture. Remarkably, small juvenile green turtles which are commonly sighted throughout the rest of the refuge were not present at this site. The

possibility of size class partitioning among green turtles in the refuge is supported by the fact that less than six kilometers away numerous juvenile green turtles can be found in Mooney Harbor. This is an area where green turtles over 60cm SCL have never been sighted.

It is notable that two of the large green turtles captured at the site west of the Marquesas had tumors associated with FP. Although these turtles were lightly afflicted, it is troublesome because they are the first cases we have seen among KWNWR green turtles. Up to this point we believed that the turtles found in the pristine waters of the refuge were FP free. One possibility is that these turtles had recently migrated from areas such as the Indian River Lagoon or Florida Bay where FP is at epizootic levels. More study is needed to determine what the FP rate is at this site and how severely these turtles are being afflicted.

These remarkable sightings and captures suggests that the area west of the Marquesas serves as a foraging ground for large subadult and adult green turtles. More study of this area is needed to verify our initial findings, but this could be the first foraging ground of its kind ever found within the contiguous United States.

In July we also gathered important information on how tide affects small green turtles that inhabit the shallow waters of Mooney Harbor. During our previous sampling trips, we had only worked the flats area of Mooney Harbor during incoming tides because there was not enough water at low tide. We had sighted numerous green turtles in Mooney harbor on previous surveys, but they were widely distributed over the expanse of shallow grass flats and difficult to capture because of their speed.

In July we entered Mooney Harbor on a falling tide and worked two dead end channels where we had sighted and captured a few green turtles in the past. These channels are between 350 – 1000 meters long, 60 meters wide, two to four meters deep with sand bottoms and completely surrounded by very shallow grass flats. What we found in these channels at low tide was extraordinary; they were teeming with small green turtles. We estimated that there were a minimum of 25 green turtles in the large channel and another 10 or more in the smaller channel. As the tide dropped we could spot green turtles 50 to 100 meters away pushing a small wake as they made their way across the increasingly shallow grass flats to these deeper channels.

It's possible that the green turtles in Mooney Harbor use these dead end channels as a refuge from the falling water and large predators. At high tide these turtles can be found foraging on grass flats in less than a meter of water where it would be difficult for large sharks to venture. At low tide it appears they move to the deeper dead end channels to avoid being stranded by the ebbing tide. These holes may also provide a safe haven from large sharks, which are frequently seen in the deeper channels that run in and out of the Marquesas Keys. Within Mooney Harbor there are many of these dead end channels and we believe this same tidal scenario occurs at each of them.

During one day at this site we captured three green turtles, a loggerhead and a hawksbill. Capture success was low because the water depth made it extremely difficult to use the rodeo method. On upcoming sampling trips we will revisit these areas on a falling tide with a special net that will stretch across the width of the channels. Snorkelers will then be deployed at one end and begin herding turtles toward the net. We believe this will be a highly effective capture method and will help us learn more about the green turtles found in Mooney Harbor.

Overall this sampling period was one of the most productive to date, not only in terms of our recent discoveries, but also in the number of sightings and captures. This sampling period produced more loggerhead and green turtle sightings than any sampling period for the previous two years. We also continue to consistently sight hawksbill turtles on almost every foray into the refuge. We believe that the KWNWR contains important habitat for at least three species of sea turtles and provides foraging grounds for a wide range of size classes. This project will continue to collect data on sea turtles found in the KWNWR and over time develop a comprehensive set of baseline data that will benefit the management of these endangered species and their habitats.

### **ACKNOWLEDGEMENTS**

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# FIGURES

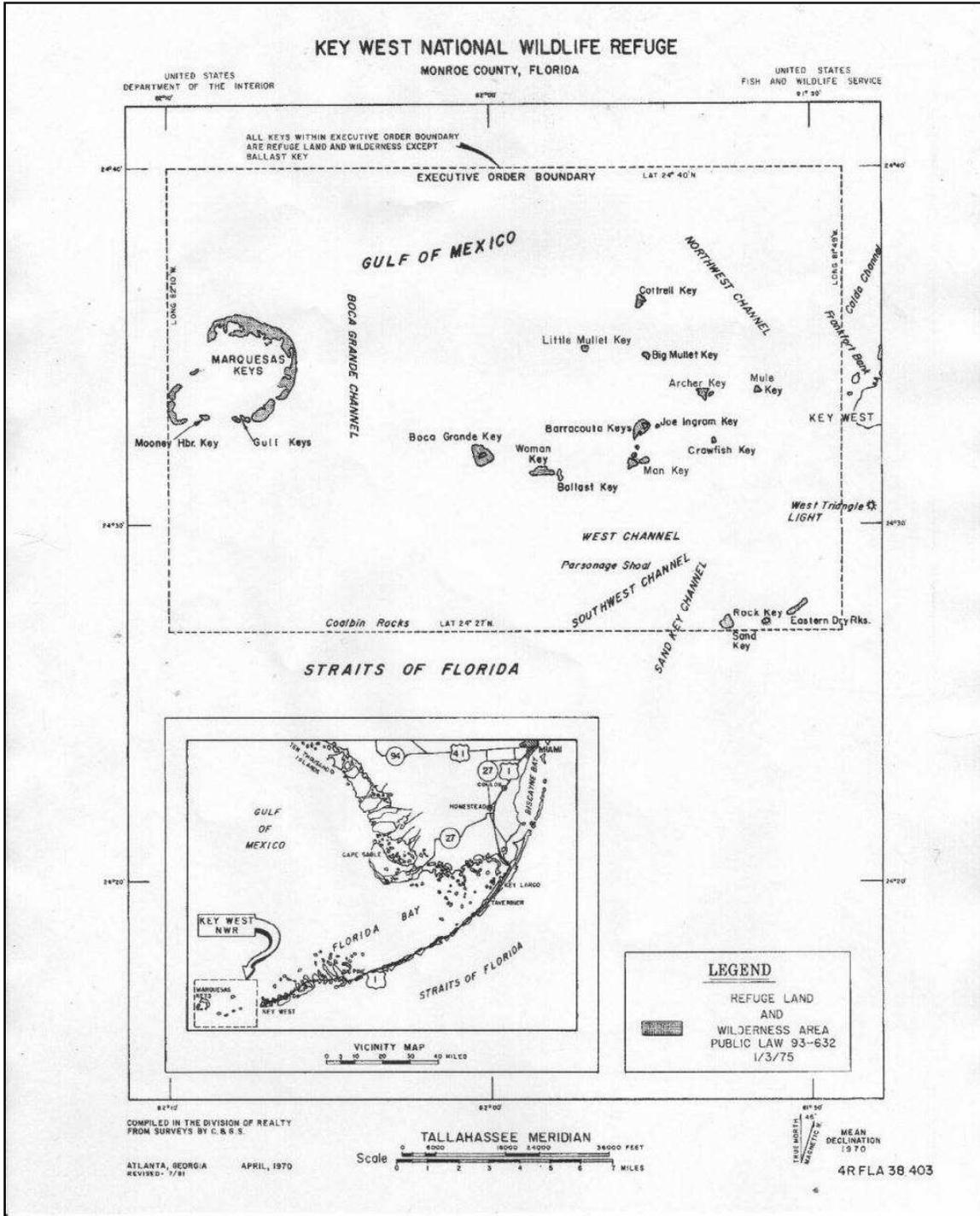


Figure 1. Map of the Key West National Wildlife Refuge in relation to Key West in the Florida Keys, U.S.A..

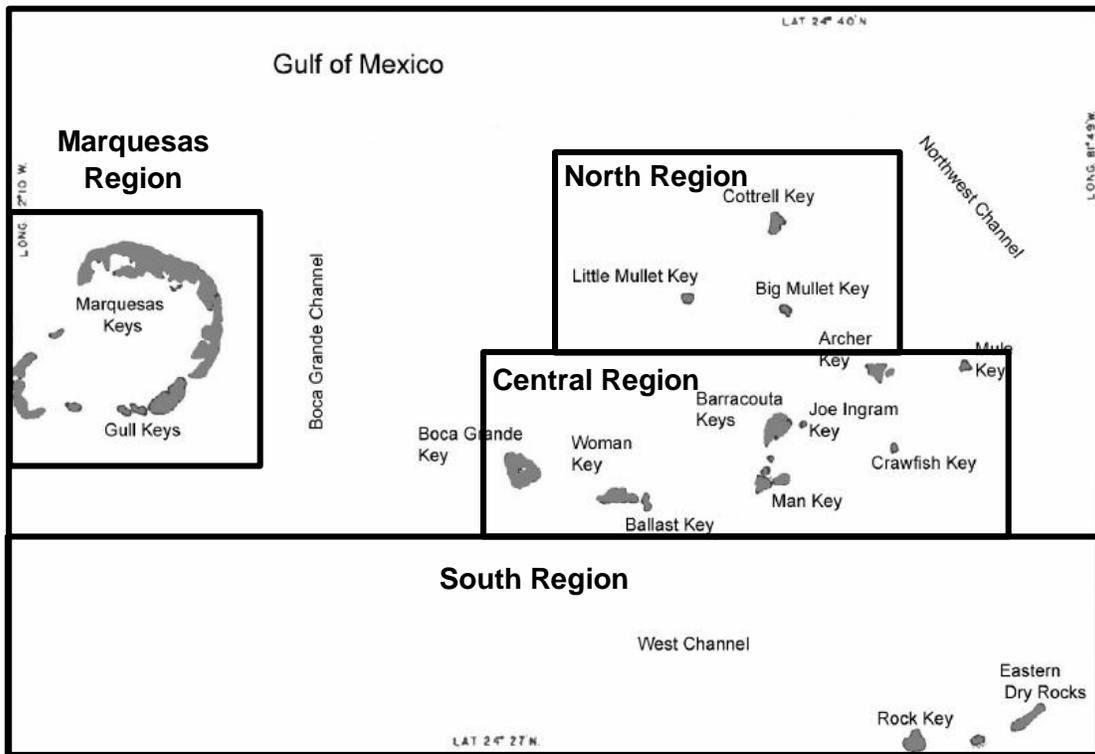


Figure 2. Map of the Key West National Wildlife Refuge showing the location of selected regions for study.

# **TABLES**

## **APPENDIX 1.**



Syringodium and sand habitat west of the Marquesas Keys, Florida



Six kilometers west of the Marquesas Keys where large green turtles were captured.



Large green turtle (*Chelonia mydas*) captured west of the Marquesas Keys.



Hand capture of a green turtle (*Chelonia mydas*) west of the Marquesas Keys.



Green turtle (*Chelonia mydas*) captured west of the Marquesas Keys.



Large green turtle (*Chelonia mydas*) prior to release, west of the Marquesas Keys.