

Sea Turtle Tracking



VIRGINIA
AQUARIUM
& MARINE SCIENCE CENTER

Students use turtle tracking data to calculate the range, speed and direction of the animal's migrations.

Duration

Preparation: 10 minutes

Activity: 60 minutes

Supplies

- Background Sheet (1 per student or group)
- Map (1 per student or group)

Background

All species have a natural range. Range is defined as the area in the world where a particular plant or animal is normally found. For example, the range of the green turtle includes tropical and subtropical waters worldwide. Leatherback sea turtles, on the other hand, range from tropical to subarctic waters and migrate many thousands of kilometers between feeding and nesting grounds. Since sea turtles spend virtually all their lives in the ocean, they are very hard to observe and study directly. Historically, tagging has been the single most valuable activity in advancing our understanding of sea turtles and their conservation needs in relation to complex life cycles, migrations, and growth rates. In many cases, a commitment to years of systematic tagging may be necessary to achieve certain objectives. However, in some instances the tagging of even a few turtles, particularly at nesting beaches where tagging has never been conducted, can yield valuable insight into migrations and the locations of non-nesting feeding areas.

Turtles may be tagged several ways. Many researchers attach a metal tag to the front or rear flipper. Turtles may also be tagged using internal tags which are injected under the skin using a special needle. These tags are then read with an electronic "scanner"; each tag has a unique number. These internal tags, called Passive Integrated Transponder (PIT) tags, are not lost as frequently as the metal flipper tags. Turtles may also be identified by natural characteristics, like injuries or barnacle patterns on the carapace. In these cases, photographs are taken in order to identify the turtle later. Researchers can also attach a tracking device to the turtle. A satellite tracking device sends a great deal of information to a special satellite in orbit around the Earth, and the researcher can then retrieve that information. Satellite tracking provides excellent data but is very expensive. In the following activity you will analyze data collected from a green sea turtle satellite-tagged in Virginia and released.

Tiki Jr. was found floating by a vacationing kayaker on July 25th, 2007, off Croatan Beach, in Virginia Beach. The kayaker observed Tiki Jr. and noticed that she was entangled, immediately called the Virginia Aquarium Stranding Response Team, and then kayaked back out to Tiki Jr. to stay with her until help arrived. Stranding staff struggled to locate a boat to rescue the turtle and thanks to the generosity of Bob "Tiki" Robinson and his 53' Fin Seeker sport fishing boat, Tiki Jr. was quickly located and rescued. Tiki Jr. was entangled in a whelk pot buoy line that had 35 pounds of mussels attached to it. Once the VAQ Stranding Response Team disentangled Tiki Jr., this line had left what appeared to be a superficial impression on her right flipper as well as an abrasion on her left eye. She was taken back to the VAQ Stranding Center for rehabilitation.

At first it appeared as if the flipper injury would heal quickly and that Tiki Jr. would be released within a month of her rescue. However, after a few weeks, the lack of circulation had apparently done its damage and the tissue began to die. With a lot of help, Tiki Jr. then made a surprising recovery and was released with a healthy, healed flipper. Because of

community efforts, like Dr. Brad Nadelstein of Animal Eye Care, Dr. Kenneth McIntyre, a human wound care specialist, the Heritage Store for donating the 10-12 pounds of vegetables that Tiki Jr. ate on a daily basis, and the general public for donating funds, Tiki Jr. was able to be released healthy and with a satellite transmitter. Also, volunteers and staff spent hours each day, treating Tiki Jr. to make sure that her flipper was saved and that she could go back to the wild as quickly as possible. Tiki Jr. was released October 20th, 2007, from Back Bay National Wildlife Refuge in Virginia Beach.

Instructions

1. Pass out copies of the Student Background and Statistics Card to each student or group. Have students read the background information as a reading assignment or read it aloud in class.
2. Pass out copies of the turtle tracking map. There are two options of maps – black and white or colored to use with your students. Students should start by locating where they live on the map.
3. On the back of the background information sheet, find the latitude and longitude data on the Statistics Card.
4. Review the concepts of **latitude** and **longitude**, if necessary:
 - a. Latitude refers to the lines that run horizontally across maps or globes. Latitude is measured in degrees from the equator. All latitude lines above the equator are north latitudes.
 - b. Longitude refers to the lines that run vertically on a map or globe. Longitude is measured in degrees from Greenwich, England. The longitude lines west of Greenwich are west longitudes.
5. To practice using the map, perform the following example with the students. A city has the following coordinates: 37.5 degrees north latitude and 77.4 degrees west longitude. First locate where these two coordinates meet. Mark this point on the map with a pencil. The next city has the coordinate 36.8 degrees north, 76 degrees west. Mark this point on the map.
6. Determine the distance and direction between these two points (create a straight line between them and estimate distance with the scales at the bottom of the map). Ask the students what these cities are (Richmond, VA and Virginia Beach, VA).
7. Distribute the Tracking Worksheet. The students can work individually or in teams to answer the questions on the worksheet. NOTE: For question #12, the data point for 11/26/07 seems to be an outlier. This may have been due to a malfunction in the GPS or some unknown occurrence, but only Tiki Jr. knows for sure.
8. After completing the activity, students can view Tiki Jr.'s track at: http://www.seaturtle.org/tracking/index.shtml?tag_id=65799a. There is also completed maps with the coordinates in the lesson plan that you can show or pass out for them to compare their plots.
9. Here is a little more information about Tiki Jr.'s travel and why she went where she went.

Green sea turtles are attracted to estuaries with a high level of sea grass beds. Sea grass beds can be identified by the level of Chlorophyll-A, measured by Photosynthetic Active Radiation (PAR) imagery. Three foraging areas (Pamlico Sound in North Carolina, St. Helena Sound in South Carolina, and coastline between Cocoa Beach and Plantation Keys in Florida) have been identified by NASA satellites to have high Chlorophyll production, in comparison to other traveling zones used by Tiki Jr.'s coordinates.

Background Information



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Tiki Jr.’s Background Information

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Tiki Jr.'s Statistics Card



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Species: Green Turtle

Life Stage: Adult

Gender: Female

Release Date: 10/20/2007

Release Location: Back Bay NWR

Last Location: 6/2/2008

Date	Water Depth (m)	Days Since Release	Travel Speed (km per hour)	Latitude	Longitude
Oct. 20, 2007	-0.53	1	14.47	36.8	-76.0
Oct. 23, 2007	-2.13	3	2.79	35.2	-75.5
Nov. 4, 2007	-0.98	16	3.49	34.6	-76.5
Nov. 10, 2007	-0.58	21	1.86	34.0	-77.9
Nov. 14, 2007	-0.62	25	9.58	33.3	-79.2
Nov. 22, 2007	-4.09	33	1.68	31.9	-81.0
Nov. 26, 2007	7.43	37	1.75	30.3	-81.5
Dec. 8, 2007	-11.20	49	3.34	26.8	-80.0
Feb. 24, 2008	-8.42	130	0.51	24.5	-81.1

Sea Turtle Tracking Worksheet



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Using the Tiki Jr. Statistics Card, mark the locations for the GPS readings. Answer the questions below.

1. What were the latitude and longitude where the turtle nested on October 20, 2007? Mark this point on the tracking map. _____
 2. How many miles did the turtle travel between October 20, 2007 and October 23, 2007? Assume Tiki Jr. swam in a straight line. _____
 3. How many miles did the turtle travel between October 23, 2007 and November 4, 2007? Assume Tiki Jr. swam in a straight line. _____
 4. Determine how the number of miles between the readings from October 20, 2007 and November 4, 2007. _____
Why is this not the total of questions 2 and 3? _____

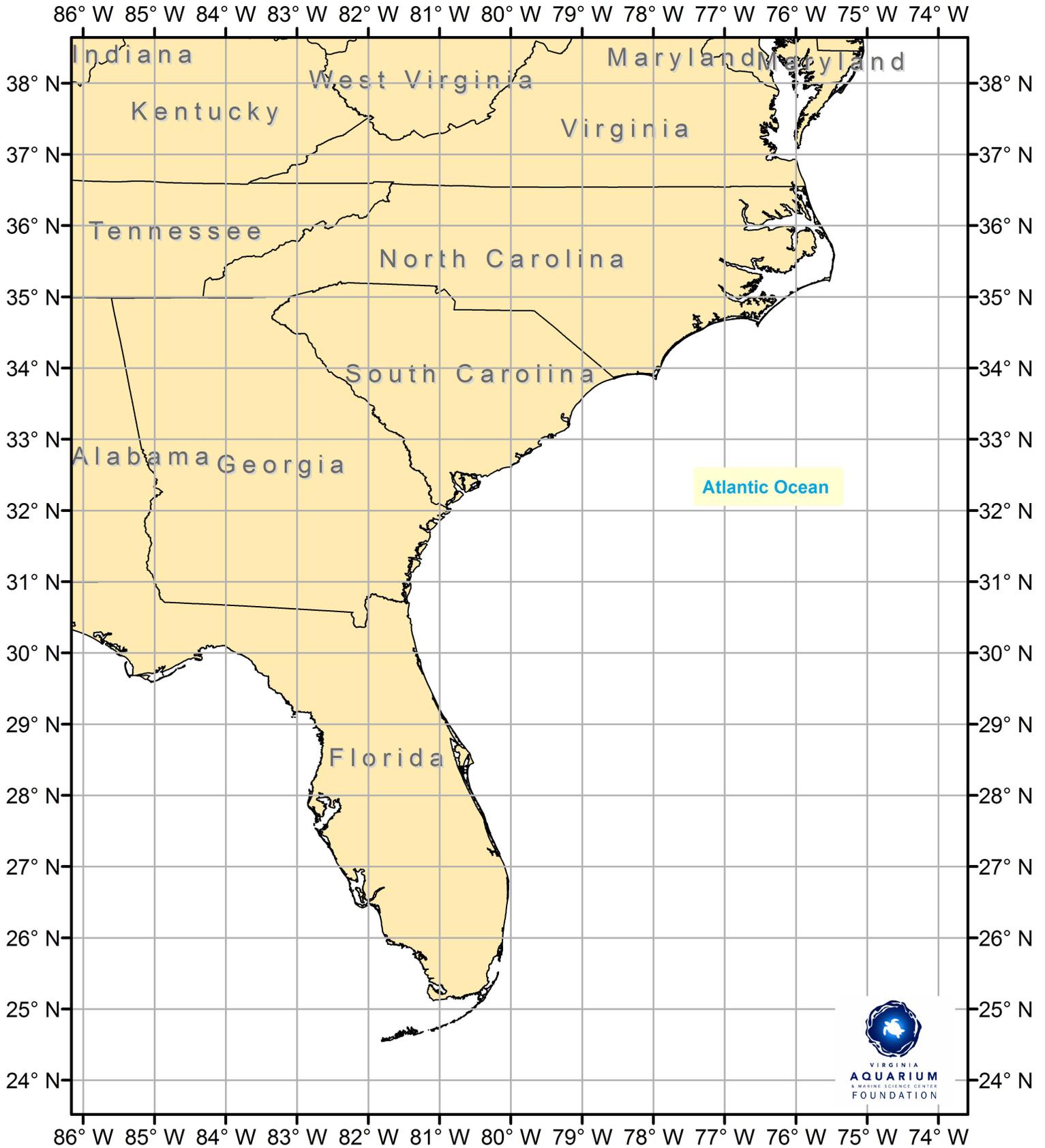
 5. On November 4, 2007, Tiki Jr. was off the coast of _____ (state).
 6. What is the date of first GPS reading off of the coast of Georgia? _____
 7. What month was Tiki Jr. found? _____
 8. Which months was Tiki Jr. off the coast of Florida? _____
 9. In what direction was Tiki Jr. heading during the first 50 days of her travel?

 10. Why do you think Tiki Jr. moved in this direction?

 11. As an adult green sea turtle, what does Tiki Jr. eat? _____
 12. What about the November 26, 2007 data point seems unusual?

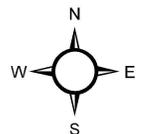
- What would we consider this data point? _____

"Tiki Jr.'s" Satellite Tag Data

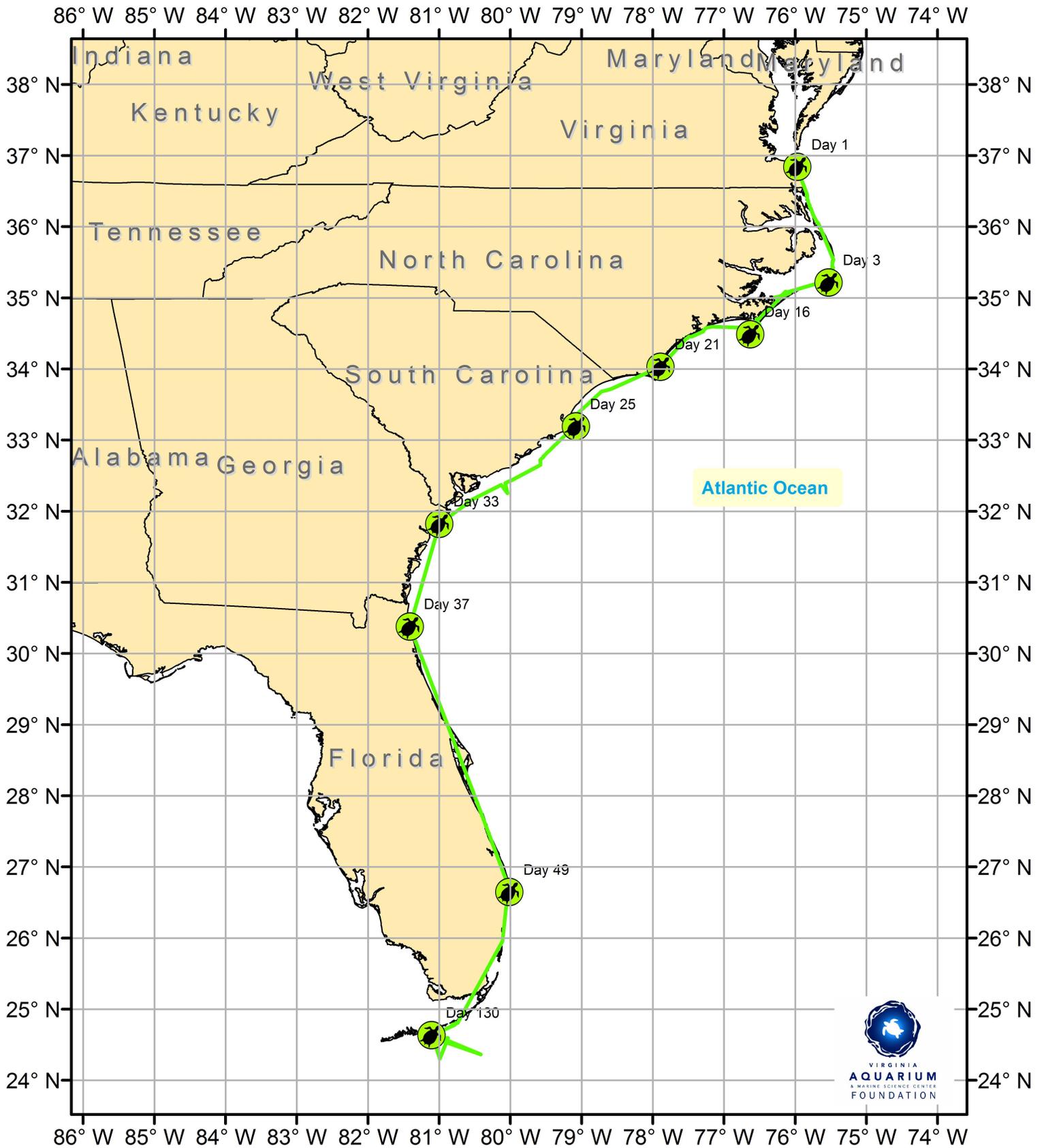


0 30 60 120 Miles

0 50 100 200 Kilometers



"Tiki Jr.'s" Satellite Tag Data

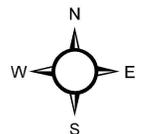


0 30 60 120 Miles

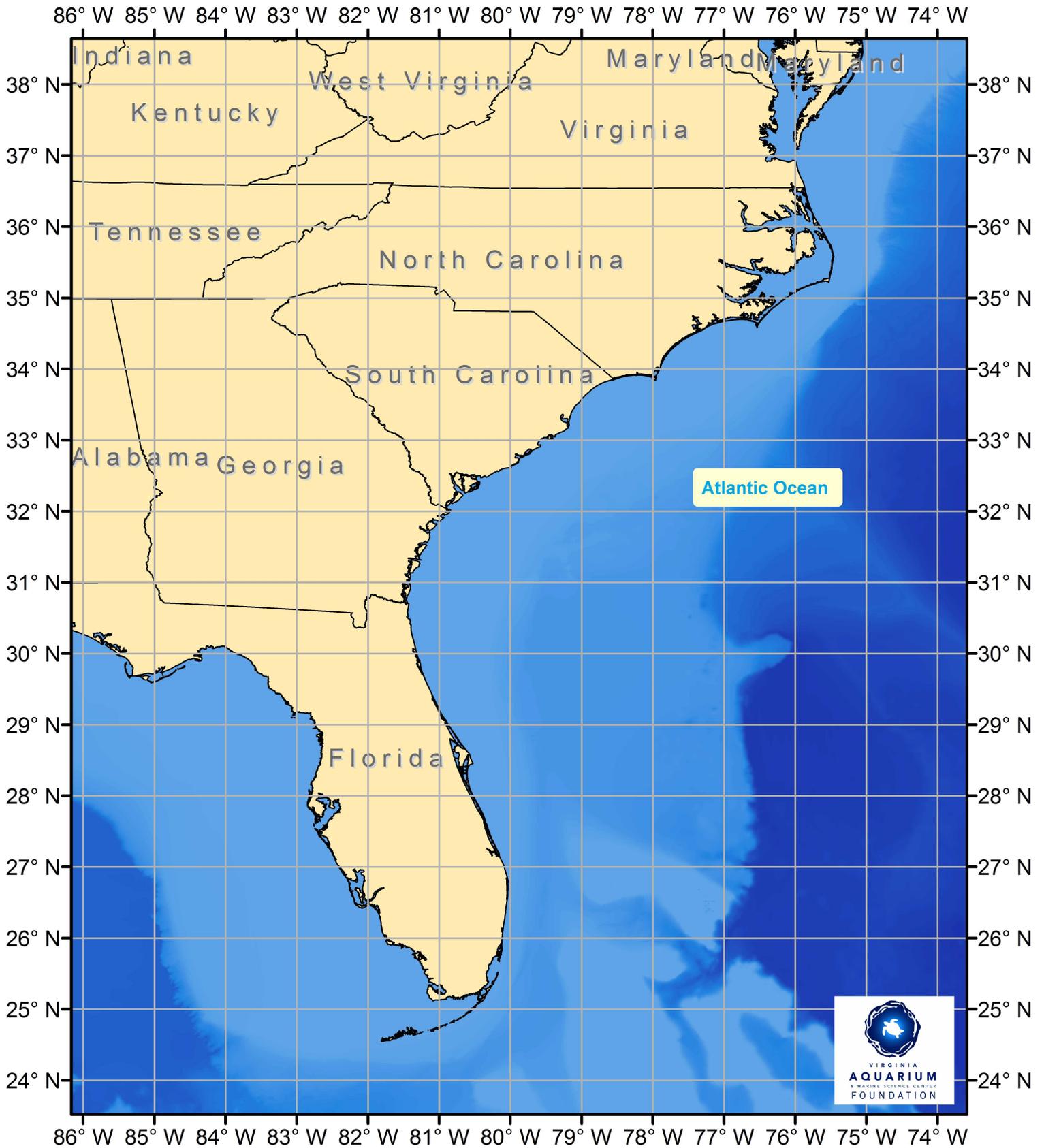


Tiki Points
Tiki Line

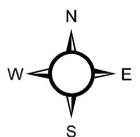
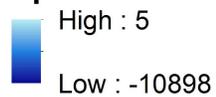
0 50 100 200 Kilometers



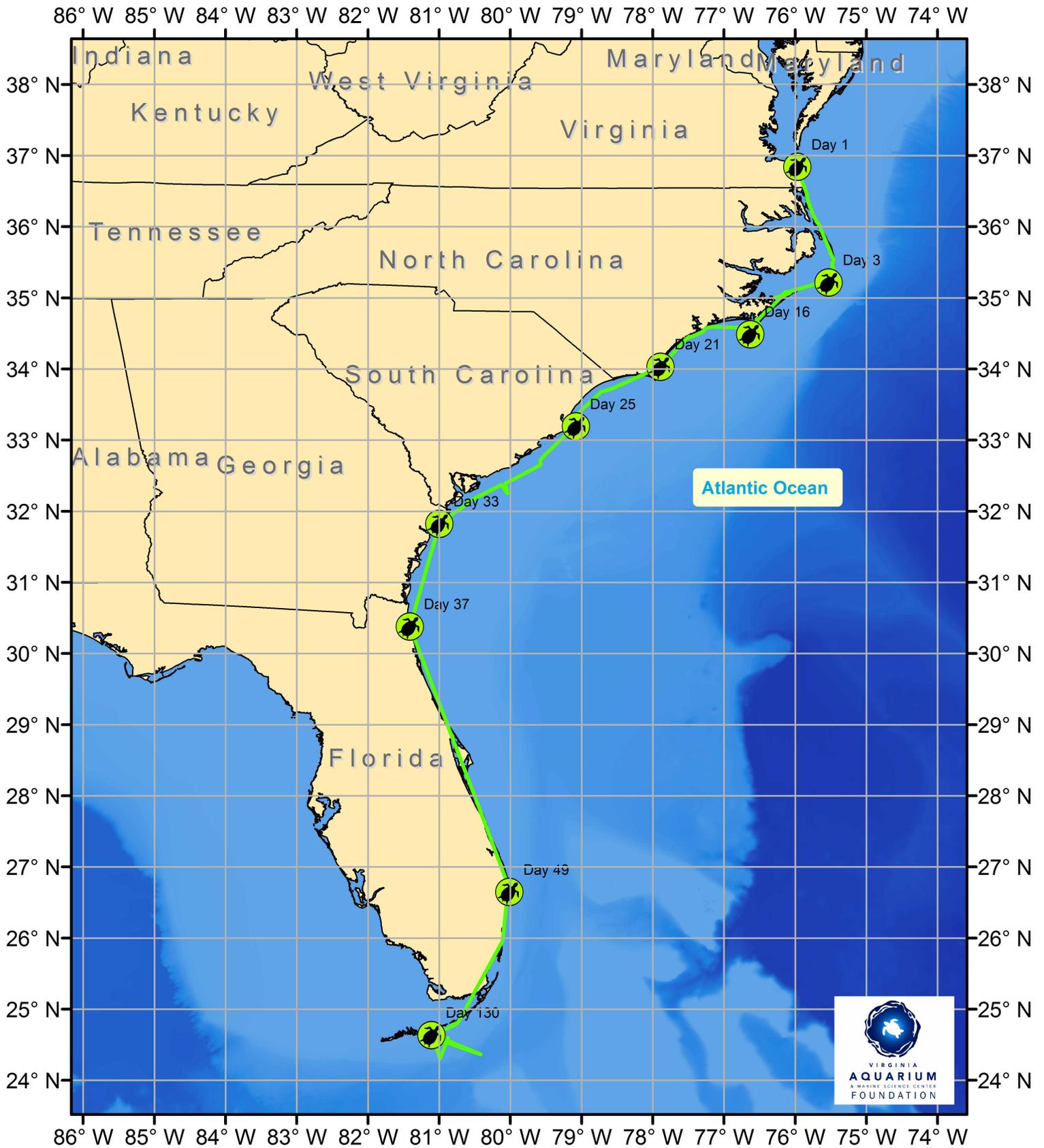
"Tiki Jr.'s" Satellite Tag Data



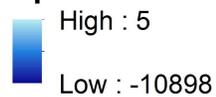
Depth in Meters



"Tiki Jr.'s" Satellite Tag Data



Depth in Meters



Tiki Points



Tiki Line

0 30 60 120 Miles



0 50 100 200 Kilometers

