Plotting and Prediction: Track Sea Turtles and Predict Their Routes

Developed By Cathy Payne

Background: The Tour de Turtles race has occurred annually since 2008 to spread awareness about the plight of sea turtles globally. There are 7 species of sea turtles worldwide. 6 species are listed as Endangered and the 7th is listed as Threatened. Scientists have been working together to discover how sea turtle species can be saved from becoming extinct. Human activities have been identified as the primary causes of the decline in sea turtle populations, so it is human activity that needs to be altered to save the sea turtles. In order to know exactly how human activity impacts sea turtle populations, we need to know where the turtles spend their time in the ocean. By attaching a small satellite transmitter to the carapace (top shell) of a sea turtle, scientists can track their movement, thereby allowing them to know how to make more informed decisions about how we can help save the turtles.

This lesson will provide an opportunity for students to understand how scientists use technology to better understand the world around us by plotting coordinate locations of sea turtle tracking data on a map. Students will have opportunities to predict future locations of turtles in this year's race by comparing data from previous years.

Objectives: Students will understand how to plot coordinates on a map, make predictions based upon historical evidence, and determine the cause and effect relationship between humans and their environment.

Target Audience: Grade 5, but easily adapted for middle grades and high school students

Preparation:

Download and read the *Sea Turtle Migration Tracking Educator's Guide*, for background information on sea turtles and the tracking program for yourself.

Print the map of the Caribbean and Atlantic and make enough copies for each student to have one. Make an addition set if you decide to have students track turtles in the Tour de Turtles race this year. (https://conserveturtles.org/educational-initiatives-educator-resources/)

Print and make copies of the turtle tracking coordinate data. Make enough copies for each student to have data for one turtle.

Pre-lesson on graphing coordinates, if needed.

Browse the features of the Tour de Turtles website

Materials: Photocopies of maps and coordinates, world map for entire class to view, access to internet to track current race and to do extra research if desired, rulers to assist with plotting coordinates

Activity:

1. Introduction/Probe, *15-20 minutes*. Using a large world map that the class can view at once, tell he class that you are going to be following sea turtles who are competing in a race called Tour de Turtles. Place a marker (post-it notes work fine) showing the starting point for one of the turtles you selected during a preparatory visit to the TourdeTurtles.org. Ask your students if they can predict how far the turtle will swim in 90 days. Record their prediction and the answers to the following questions on a chart (paper, whiteboard or smart board). If students use a journal to record lessons, ask them to record in their notebook as you or a note taker records on the class chart. Save the chart to revisit throughout the lesson.

How fast can a sea turtle swim?

Where will the turtle be in 3 months?

Will it swim in a straight line?

Does it know if is taking part in a race?

How can we follow the turtles?

What do we know about sea turtles?

2. Geographic coordinate plotting practice – *1 hour*. Distribute one map of the Caribbean and Atlantic to each student (http://conserveturtles.org/educators.php?page=activities). If they have limited background knowledge of longitude and latitude you will need to do a pre-lesson on the basic concept of graphing coordinates. Review how to graph coordinate locations on a map by reminding students of the following:

A negative sign before a longitude coordinate means that the coordinate is west of the Prime Meridian.

Latitude runs parallel to the equator. Each degree of latitude measures about 69 miles. Latitude is 0 degrees at eh equator and 90 at the poles (a negative means it is south of the equator)

Longitude runs north to south, or perpendicular to the equator. The distance measured between lines of longitude varies because of the curvature of the Earth, so we cannot make specific measurements of distances between degrees of longitude on our maps. The is an excellent distance calculator available on the NOAA.gov website: http://www.nhc.noaa.gov/gccalc.shtml

The numbers for degrees of latitude are listed on the y-axis

The numbers for the degrees of longitude are written on the x-axis

Where the two points meet on the map is the geographic location of the coordinate

The Global Positioning System (GPS) uses these coordinates to communicate location. GPS uses a minimum of 24 satellites positioned in Earth orbit to provide locations for the entire globe. The tracked sea turtles have transmitters that 'talk' to the satellites to communicate their location.

After reviewing how to plot coordinates, distribute sheets of coordinates from previously tracked turtles downloaded from http://conserveturtles.org/educators.php?page=activities. You can distribute the same coordinates to all students or you can distribute multiple sets of coordinates for variety. Ask students to connect each coordinate to the next with a line as they are graphing. They should not wait until the end to connect the dots as some turtle routes are quite convoluted! After students complete their coordinates, visit the website for Sea Turtle Conservancy as a class and locate the maps for the turtles the students plotted (link to page below). Compare student maps to the actual maps. Discuss with students why their maps were alike or dissimilar to those on the website. Were errors made plotting? Discuss with students other things that are tracked with GPS. Possible answers should include, cars, smartphones, and other animals (even great white sharks!).
3. Follow-up, ongoing. Students can work in groups or as a class to follow the progress of sea turtles in this year's Tour de Turtles race online at www.tourdeturtles.org . Distribute blank maps of the Caribbean and Atlantic like those used in the plotting activity. Ask students to predict where their turtle will be in 90 days using evidence from the historical data plotted in the last activity. Students can make one map for each turtle in the race. Check online daily or weekly for updated location for each turtle. There may not be coordinates available, but you can mark the approximate location for each turtle on your map. Students can add information about their turtle to their map. Information can be found in the Educator's Guide or on the sites listed below. Information includes species traits, feeding habits, causes for sea turtle population decline, etc. Review the chart that the class completed at the beginning to the lesson and see how their answers have changed. Students should be able to hold a discussion using evidence to back up their claims.

Web Resources:
Tour de Turtles homepage. Easy to navigate for students:
http://tourdeturtles.org

Blank maps and coordinate sets for turtles from previously tracked turtles:
http://www.conserveturtles.org/educators.php?page=activities

Google maps of tracks for previously tracked turtles. This is where you will locate the maps for the turtles plotted in the activity:
http://www.conserveturtles.org/satellitetracking.php

Extension activities:

Watch video clips of turtles available on www. conserveturtles.org

Students can present research projects on the 7 different sea turtle species globally

Students create posters detailing threats to sea turtles

Celebrate the winning turtle by creating a lesson on the cause for which the turtle raced. Students can design and implement a service project to help the cause (bake sale to raise funds for the cause, posters, lessons they design to educate younger students in your school about the cause, etc.)

Explore the Signals of Spring website for other animals that are tracked. The program is designed for middle and high school, but there are relevant resources available to browse such as maps of tracks of other animals. http://www.signalsofspring.net

Class discussions about how to select one cause to assist, using evidence and logic to select one final cause.

Adopt a turtle as a class on the Tour de Turtles website.

Common Core State Math Standards:

CCSS.Math.Content.5.G.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).
CCSS.Math.Content.5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Next Generation Science Standards:

5-LS2 Ecosystems: Interactions, Energy, and Dynamics
5-ESS1 Earth's Place in the Universe
5-ESS2 Earth's Systems
5-ESS3 Earth and Human Activity
MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
MS-ESS3 Earth and Human Activity

This lesson plan was funded by a grant awarded from the Sea Turtle Grants Program. The Sea Turtle Grants Program is funded from proceeds from the sale of the Florida Sea Turtle License Plate. Learn more at http://www.helpingseaturtles.org