Datasets for Animal Tracking

Grade Levels: Elementary and Middle School

Length of Lesson Sequence: 60 Minutes

Brief Description:
Numerous datasets are available on the internet and are free to use, but many educators are unaware of these opportunities and how to incorporate firsthand research into lessons. Satellite telemetry data from individual organism tracking experiments has been valuable to conservation scientists, but can also be used as an educational tool in elementary science classrooms. Elementary school teachers will be led through an activity in which they find online datasets from individual animal tracking observations and use them to create paper and digital maps of the individual’s travels. Participants will also be shown how to use the internet to calculate the distance an animal traveled. Elementary school teachers can use this knowledge in their own classrooms to create exciting maps and lessons for their students, or to teach upper elementary students how to use the websites themselves to explore the fascinating biology that can only be studied through satellite telemetry.

Content Statements/Standards Covered:

Benchmarks noted for Michigan Elementary Science

I.1.E.1 - Generate questions about the world, based on observation.
I.1.E.5 - Develop strategies and skills for information gathering and problem solving.
II.1.E.1 - Develop an awareness of the need for evidence in making decisions scientifically.
III.4.E.2 - Explain how physical and behavioral characteristics of organisms help them to survive in their environments.

Prerequisite Knowledge:

Before beginning this lesson, students are expected to be able to
• read a map (figure out which direction is north, tell the difference between land and water, etc.)
• find locations on a map by latitude and longitude coordinates

Objectives of Lesson:

At the conclusion of the lesson, students will be able to
• find online datasets from observations that have tracked individual animals
• calculate the distance traveled by individual animals
• make a map of where the animal traveled
• explain why scientists track animals
Materials and Resources

- Computers with a spreadsheet program and internet access for every 2 participants
- Digital projector and projector screen
- Maps of North America or of the ocean with latitude/longitude lines for each participant

Definition (from www.dictionary.com)
- Telemetry - the science and technology of automatic measurement and transmission of data using radio or satellite signals from remote sources to receiving stations for recording and analysis

Strategy

- Learning cycles: learning useful knowledge by participating in practices (model, coach, fade)

Observations, patterns, and explanations

In the chart below, describe the connected observations, patterns, and explanations or models that you will use for your session.

<table>
<thead>
<tr>
<th>Observations or experiences (examples, phenomena, data)</th>
<th>Patterns (laws, generalizations, graphs, tables, categories)</th>
<th>Explanations (models, theories)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online datasets listing data collected for individual animal tracking observations</td>
<td>Maps made which show where the animals traveled</td>
<td>Correlations made between an animal's movement / home range and environmental conditions / trophic status</td>
</tr>
<tr>
<td></td>
<td>Graphs showing the distance traveled per unit time</td>
<td></td>
</tr>
</tbody>
</table>

Application: Model-based Reasoning

Inquiry: Finding and Explaining Patterns in Experience

Introduction/Anticipatory Set

A story will be shared about a scientific study (James et al. 2005) that was initiated to use individual organism telemetry data in attempt to learn more about how to approach conservation of critically endangered Atlantic leatherback sea turtles. Accidental capture and death during fishing operations threaten the status of these long-lived organisms. Previous knowledge of the species' habitat was collected through fishermen observations and small-area behavioral studies, which caused conservation efforts to be focused on a very small portion of the species' habitat. By using telemetry to track individual organisms for up to a year as they move, scientists found that turtles spent much more time at northern latitudes than had been previously realized, and were
experiencing high rates of accidental death (Figure 1). The scientists were able to conclude that fishing practices need to be adjusted, because excluding fishing from small areas will only displace it to other areas where they pose just as much of a risk to the turtles. Conservation actions must be expanded to larger areas of the marine habitat in order to save the species from eventual extinction.

Figure 1  Spatial use by 38 leatherback turtles equipped with Argos satellite tags in waters off Nova Scotia, Canada. Colour denotes the number of days turtle(s) were observed in each hexagon (width: 0.719° longitude, largest height: 0.709° latitude). US pelagic longline reporting areas: (a) Mid-Atlantic Bight, (b) Northeast Coastal and (c) Northeast Distant. Area (c) extends eastward to ~20° longitude and northward to 55° latitude, and was closed to US pelagic longline vessels to protect marine turtles. Area (d), Grand Banks. Dashed line: 1000 m depth contour.

Activities of the Session

• Introduction activity as stated above will include pictures and graphs from the study to display on a screen to stress the importance of tracking animals for conservation purposes
• Tracking animals can also be a great way to learn more of the basic biology of certain organisms, and are fun and easy to learn at the elementary school age
• Class participants will work in groups of two or three and will be asked to make sure their own computers are on
• Participants will do the activity as outlined in the Animal Tracking Datasets Exercise

Conclusion

• Students will be asked to share how they might use organism tracking datasets in their own classrooms, and it will be opened for a short discussion.
• Students should be informed any additional information about tracking animals, including potential costs listed on the websites:  
  http://www.spacetoday.org/Satellites/Tracking/SatTracking.html

Assessment

Students may be assessed on their ability to make a map and calculate distance traveled using a dataset with latitude and longitude of an individual species. They may also be assessed on their ability to make predictions about animals whose movements they haven’t mapped yet.

Modifications and Accommodations (Optional)

• Students will work in groups of two or three, so those that do not feel comfortable working on the computer can observe another student.  
• If computers are not available, the teacher can find the data on one computer and have the students map it on sheets of paper.  
• For younger grades, the teacher can make the map and the students can interpret the movements of the animal.

Extensions (Optional)

• Students can make correlations between an animal’s travels and the environment  
• Students can make conclusions about home ranges of animals in different trophic levels and different thermo-regulation mechanisms.  
• Students can map other animals’ movements using datasets found on the other websites listed at the end of this lesson plan.

Literature Cited


Blank Maps

• For other datasets, the teacher can make a blank map using the website  
  http://www.aquarius.ifm-geomar.de/make_map.html  
  - Find the farthest extent that the animal traveled in each direction and enter those degrees of latitude and longitude into the form  
  - To make a black and white map suitable for printing out, select the “b/w map” option  
  - If you have certain features on the map, such as cities, that you want to name and you know their latitude and longitude, you can also plot those  
  - After you create the map, right click on it, copy it, and paste it into Word to print
Internet Resources
Space for Species
http://www.spaceforspecies.ca/
   Latitude and longitude data, blank maps, weather, and habitat maps for a leatherback turtle, eider, caribou, polar bear, and peregrine falcon. Also has an educator’s zone for teaching ideas.

Ocean Ambassadors
http://www.oneocean.org/ambassadors/track_a_turtle/results/turtle_profiles.html
   Latitude and longitude data and blank maps for several turtles near the Philippines. Really cool interactive maps! Also interpretations of why the turtles journeyed where they did and tons of information about turtles and why and how scientists track them.

Whale Net
http://whale.wheelock.edu/Welcome.html
   Latitude and longitude data, maps, blank maps, and background information about several dozen dolphins, porpoises, seals, and sea turtles

Animal Planet’s DIY Animal Spies
http://animal.discovery.com/convergence/spyonthewild/diyspies/diyspies.html
   Instructions for how to track marine animals using Whale Net, how to track migrating birds, and some links to websites with blank maps

Alaska SeaLife Center
http://www.alaskasealife.org/master/animal_tracking/index.html
   Latitude and longitude data, maps, background information, and videos for five rehabilitated seals

International Wolf Center
   Township, range number, section number, and background information for several dozen wolves in Superior National Forest, but need a map they sell to plot the locations

The College Science Classroom
   How to use data and maps from the International Wolf Center in a college setting

Meet the Swans
http://www.bsc-eoc.org/lpbo/swans/eachswan.html
   Maps of individual swan migration routes

Tagging of Pacific Pelagics
http://las.pfeg.noaa.gov/TOPP_recent/index.html
   Maps of sharks, cetaceans, seals, sea turtles, and birds. Can click on big map (or on tables below) to get maps of individual animals’ journeys displayed over maps of sea temperature, chlorophyll-a, and currents. Can also do a day-by-day progression through all the records of animals of any particular species.

Sara Parr Syswerda
http://kbsgk12project.kbs.msu.edu
Santa Cruz Predatory Bird Research Group  
http://www2.ucsc.edu/scpbrg/migration.htm  
Maps of individual bald eagle migration routes  

Ressources Naturelles et Faune Quebec  
http://www.mrnf.gouv.qc.ca/english/wildlife/maps-caribou/maps.jsp  
Weekly maps of caribou herd locations 2005-2006  

Space Today  
http://www.spacetoday.org/Satellites/Tracking/SatTracking.html  
Talks about why scientists track animals, different ways to track animals, and some case studies of what scientists have learned from different groups of animals  

USGS – Northern Prairie Wildlife Research Center  
A critique of wildlife radio tracking and its use in national parks