

Eel Migration in the Hudson River Estuary (High School)

Time: one 40-minute class period

Setting: Classroom

Objectives: Students will understand variability in the abundance of American eels (*Anguilla rostrata*) in tributaries of the Hudson River by comparing data from different locations over time.

Overview: This lesson should follow a comprehensive introduction to the DEC Eel Project. Students should enter this lesson with knowledge about the American Eel species (*Anguilla rostrata*) and its life cycle, how the data is collected, why the project is important, and the basic geography of the Hudson River estuary. Some resources are linked in the materials section to help introduce the Eel Project. In this lesson, students will:

1. *Model* the geographic location of each eel sampling site relative to one another and the Hudson River estuary.
2. *Describe* the variability between sampling sites.
3. *Identify* trends in number of eels collected at an individual site.
4. *Hypothesize* why variability exists between sites and over time.

Materials:

- Whiteboard with dry erase marker for each group (10)
- Mile marker map
- Computers
- Google Maps
- Student worksheet
- Sticky notes
- [Data and graphs from the Eel Project 2008-2017](#)
- Exit tickets

Engage:

1. Students should break up into 10 groups consisting of 1-3 students each. Students should have the following materials with them: computer, whiteboard and dry erase marker, Eel Project graph for their site.
2. Assign each group one of the following sampling sites: Hannacroix Creek, Saw Kill, Black Creek, Crum Elbow, Fall Kill, Quassaick Creek, Indian Brook, Furnace Brook, Minisceongo Creek, Richmond Creek. Students write the name of their site and the mile marker on the white board. Mile marker number is determined using a map.
3. Students line up in the hall from NYC (south) to Albany (north) according to their mile marker. Teacher facilitates a quick geographic discussion about site order. Students calculate the distance between their site and the closest site on either side.
4. Students line up under their river mile and calculate the distance of the site(s) on either side in order to orient themselves on the river.

5. Teacher facilitates a group discussion about the journey of the eels through the Hudson River estuary and the geographic obstacles they may face. Students should be familiar with this information from earlier discussions of eel migration.

Explore:

1. Distribute the corresponding DEC Eel Project data to each group. This data is the average Catch Per Unit Effort (CPUE) for each year at each site. A sheet with the data for each sampling location as well as a graph can be found in [this folder](#). You can print the graphs, or have students work on the graphs using Google Sheets. If students are working in Sheets, students will need to make their own copy of the data before they make any changes.
2. Students use the I² method (What I See & What It Means statements) to describe the graph using sticky notes.
3. Students give a short presentation to the groups with the two closest sampling locations about the trends they observed. Richmond Creek would present to Minisceongo Creek and Furnace Brook, Indian Brook would present to Quassaick Creek and Fall Kill, Crum Elbow would present to Black Creek, Saw Kill and Hannacroix Creek.
4. In these multi-site groups and using the [Eels by Location](#) complete dataset, students should come up with a question about the relationship between time, Hudson River Mile and CPUE of glass eels. Students create a graph in Excel showing CPUE glass eel data and the new variable. After creating the graph, students describe the trends they observe using the I² method again.

Explain:

- Students develop a claim using evidence and reasoning to support their claim and then give a short presentation to the class as a group.

Extend:

- After students calculate the distance of the closest site(s), students could also find the latitude and longitude of these sites and create a Google Map.
- Class discussion/focus questions:
 1. What similarities and differences did you notice about the sample sites and the CPUE glass eels found at each site?
 2. What factors (biotic or abiotic) could affect the numbers found at each site? Some things to consider might be depth, width, and shoreline habitat, average temperature in March-May for that site and year, precipitation, or other ideas that the students think of.
- Think-Pair-Share: “What other information would you need to know to answer the question: Do you expect to see the same trends at your site in the future?”
- Lead a discussion about characteristics of the graph around the following questions: Is this the best type of graph to represent the data? Is there a better way to represent the data? Why do we use graphs to represent data? What do you like about the graph? What would you like to see different about the graph?

Evaluate:

- Students complete the following exit ticket: *What information about abiotic or biotic factors would you want in order to further investigate this phenomenon?*

Lesson Resources

Resources: The following resources can be used to introduce the Eel Project and understand the story of the American Eel before doing the lesson.

The Eels Incredible Journey: DEC Student Reading and Questions

http://www.dec.ny.gov/docs/remediation_hudson_pdf/hrlpeel.pdf

Growing Up as an American Eel: DEC Lifecycle Student Worksheet

http://www.dec.ny.gov/docs/remediation_hudson_pdf/hrlpk3eel.pdf

Eel Project Report 2008-present

http://www.dec.ny.gov/docs/remediation_hudson_pdf/082415eelreport.pdf

Introduction to the Eel Project: DEC Powerpoint

http://www.dec.ny.gov/docs/remediation_hudson_pdf/eelpres.pdf

Current Year Eel Project Results: DEC Powerpoint

http://www.dec.ny.gov/docs/remediation_hudson_pdf/082415eelresults.pdf

Chris Bowser's Eel Presentation: YouTube video

<https://www.youtube.com/watch?v=laHMR0dT-1s>

American Eel Populations in Hudson River Tributaries: Cary Institute Data Jam Data Set

https://www.caryinstitute.org/sites/default/files/public/downloads/page_2016/level_2_eels_in_hudson_river_metadata_012218.pdf