

Name _____

Date _____

Lesson 2: Where is the best spot to eat striped bass from the Hudson ?

Part 1: In this activity, you will be comparing PCB levels in striped bass found in the Hudson River at the Troy Dam with four other locations in the Hudson in 2011. Here are some questions to get you started.

1. Why might fish found in different parts of the river have different concentrations of PCBs?
Please list at least three different reasons:

<i>Different aged fish spend time in different parts of the river</i>
<i>Different parts of the river are more or less contaminated with PCBs</i>
<i>Fish from different areas may accumulate more or less fat</i>
<i>Fish from different areas may vary in size</i>

2. Everyone will compare PCB levels in striped bass from the Troy Dam site (river mile 153) with another site downstream. The Troy Dam site is the farthest north, and is closest to the source of PCB's in the Hudson. The other sites are listed below. In this case, "river mile" describes how far a site is from the spot where the river meets the ocean. The junction between the river and the ocean is considered "river mile 0".
- Catskill (river mile 113)
 - Poughkeepsie (river mile 76)
 - Haverstraw Bay (river mile 36)
 - George Washington Bridge (river mile 12)

Circle the site you have been assigned *besides* the Troy Dam site. Now, state a hypothesis about how you think the PCB levels might differ in fish between the two locations, and justify your hypothesis. Remember, a hypothesis is a testable statement.

<i>This will vary with the student data.</i>
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3. Open the excel data file for your location. Each file will have several sheets - one with combined data, and one for each location. Find the average and range of the total PCB levels in the striped bass at Troy and at your location for 2011:

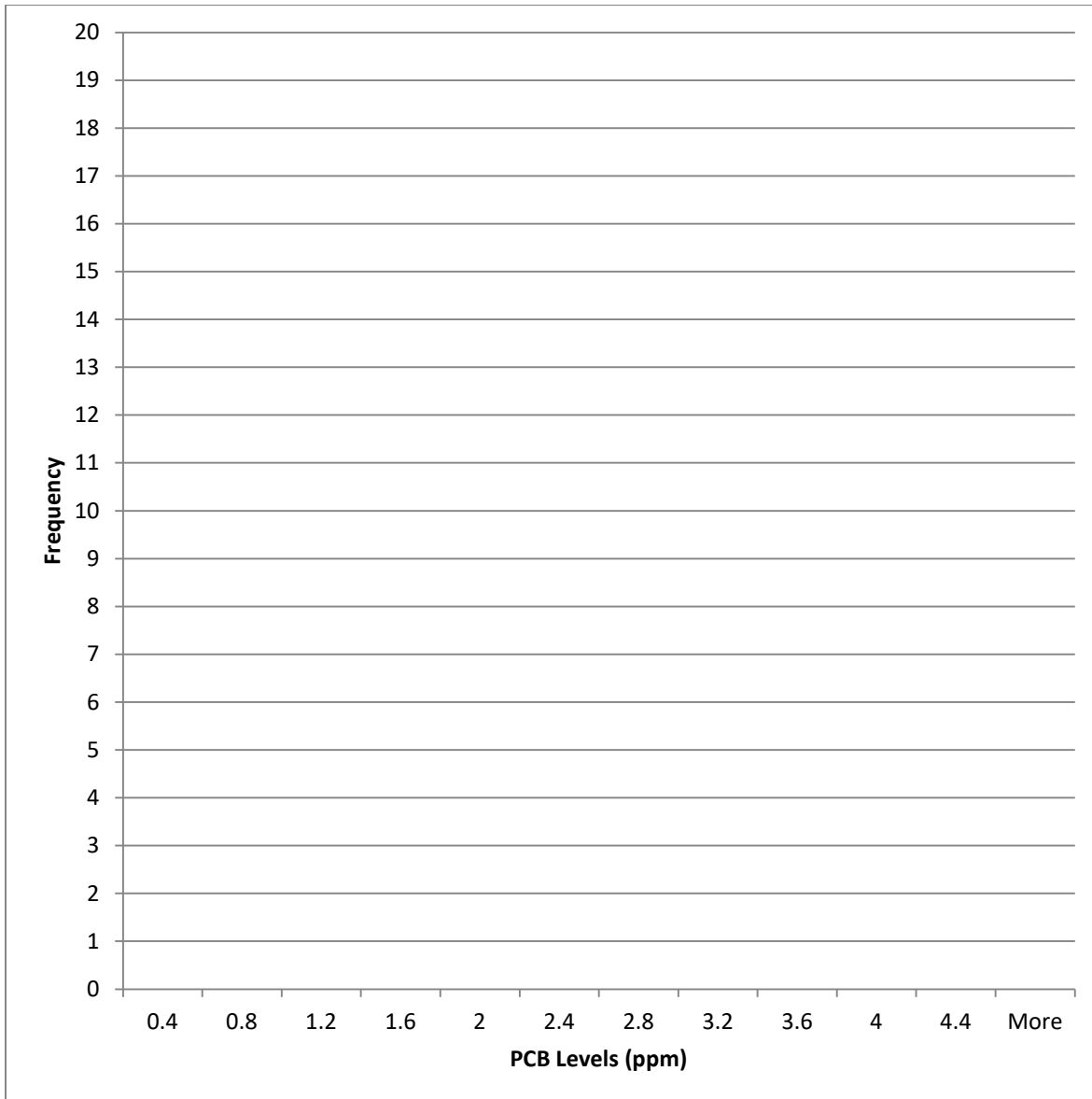
Location	Average	Range
Troy	<i>This will vary with the student data.</i>	

4. Which location has more variability, based on the range?

This will vary with the student data.

5. Create a frequency graph like you did in Lesson 1 for the samples from each location, using the same x-axis for each graph. “Bins” or ranges of PCB levels and frequencies or counts for the Troy data are given to you in the table below. Write the name of your site in the right hand column and the number of fish in that sample within each range of PCBs. Then use the blank chart to make your graph. Use different colors or patterns to distinguish the two different locations. This will look similar to a double bar graph. *Note: Excel does provide a histogram function, but it may be easier to graph this by hand!*

Bin	Site: Troy Dam	Site (fill in):
	Frequency	Frequency
0-0.4	6	
0.41-0.8	3	
0.81-1.2	3	
1.21-1.6	0	
1.61-2	2	
2.01-2.4	1	
2.41-2.8	0	
2.81-3.2	1	
3.21-3.6	1	
3.61-4	2	
4.01-4.4	0	
More than 4.41	2	

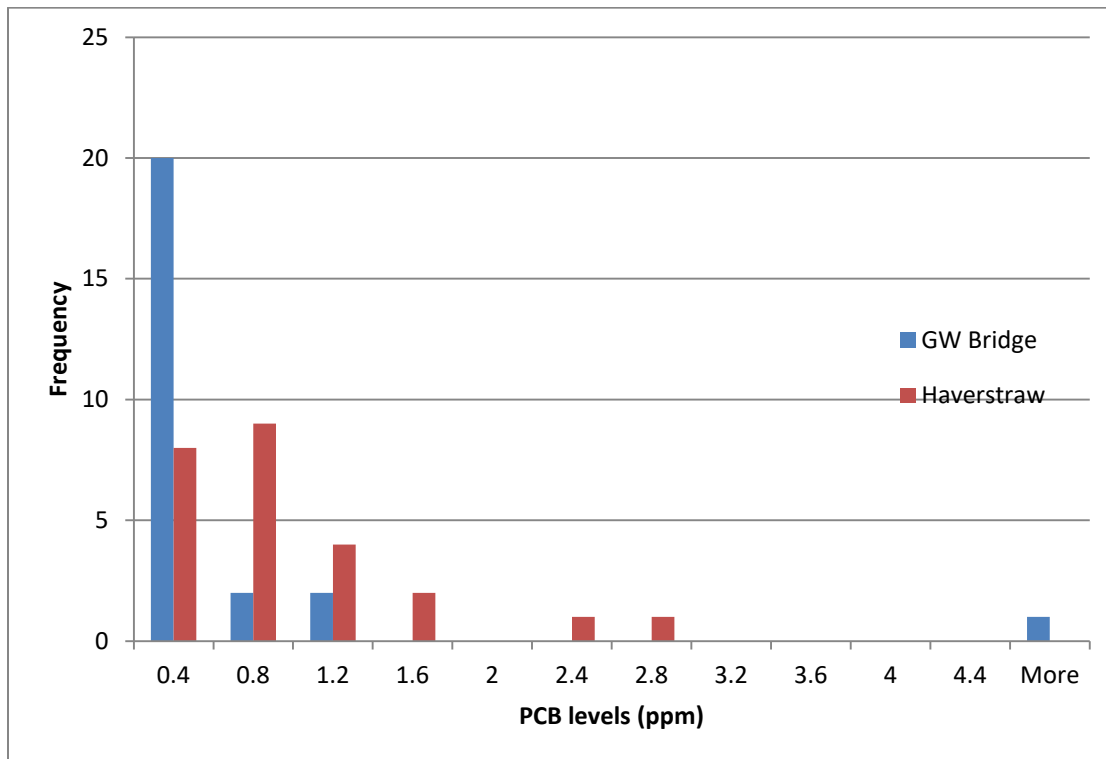


6. Based on the average and ranges, and the visual of the graph, do you think the averages at the two locations are significantly different?
- Circle: Yes/No
 - Why?

This will vary with the student data.

Part 2: Examining Patterns in Space and Time

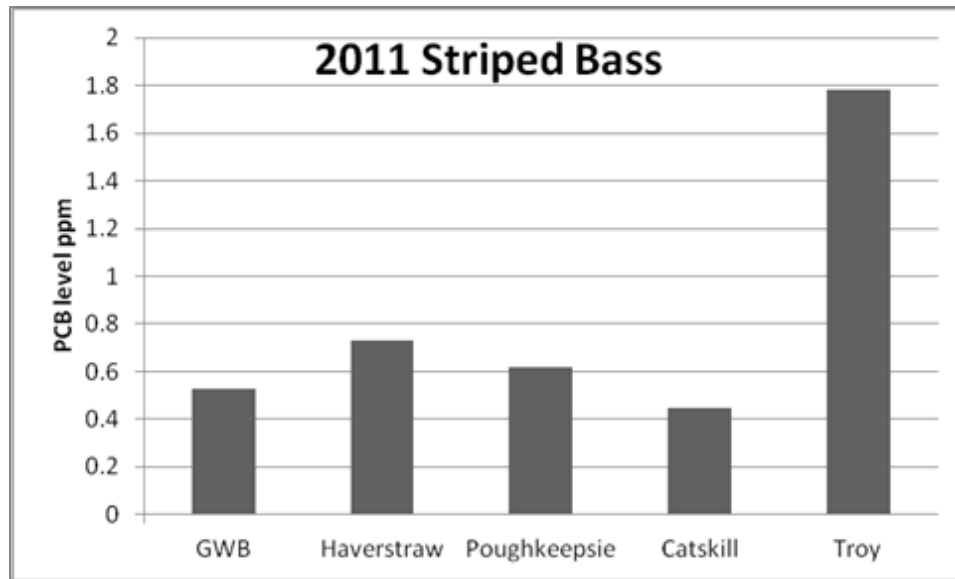
7. Look at the frequency graphs of data from fish sampled at the George Washington Bridge and Haverstraw Bay in 2011. The average PCB levels were 0.729 ppm at Haverstraw Bay and 0.52 ppm at the GW Bridge.



8. Looking at the graph, decide whether you think that fish are more contaminated at Haverstraw Bay as compared to the GW Bridge. Why or why not?

Fish are more contaminated at Haverstraw Bay because there is a higher percentage of fish that have higher levels at that site. There was a single fish at GW Bridge that had very high levels, but otherwise the levels are very low.

9. Share the average from your site with the class. Draw the average PCB levels found at each site on the single graph below. Draw a star over the bars that you think are significantly different from the Troy site. The Troy site has been added for you.



10. At which location were the striped bass the most contaminated in 2011?
11. At which location were the striped bass the least contaminated in 2011?
12. How did the relationship you saw in your two locations compare with your hypothesis?

This will vary with the student data.

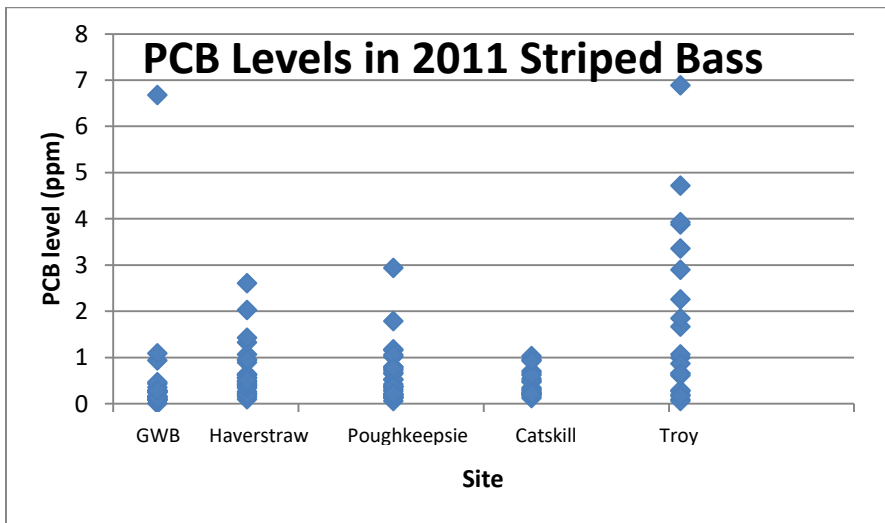
13. Make a claim, supported by evidence, about the relationship between location and PCB contamination.

Claim: PCBs are highest in Troy compared with other places in the Hudson
Evidence: More Striped Bass near Troy have high levels of PCBs

14. At your site, every fish had a different level of PCBs. Why do you think there were differences between the PCB contamination levels in the fish at your site? Include at least two possible reasons.

1. Fish are different ages
2. Fish have different amounts of fat
3. Fish are different sizes
4. Fish spend different amounts of time in contaminated areas

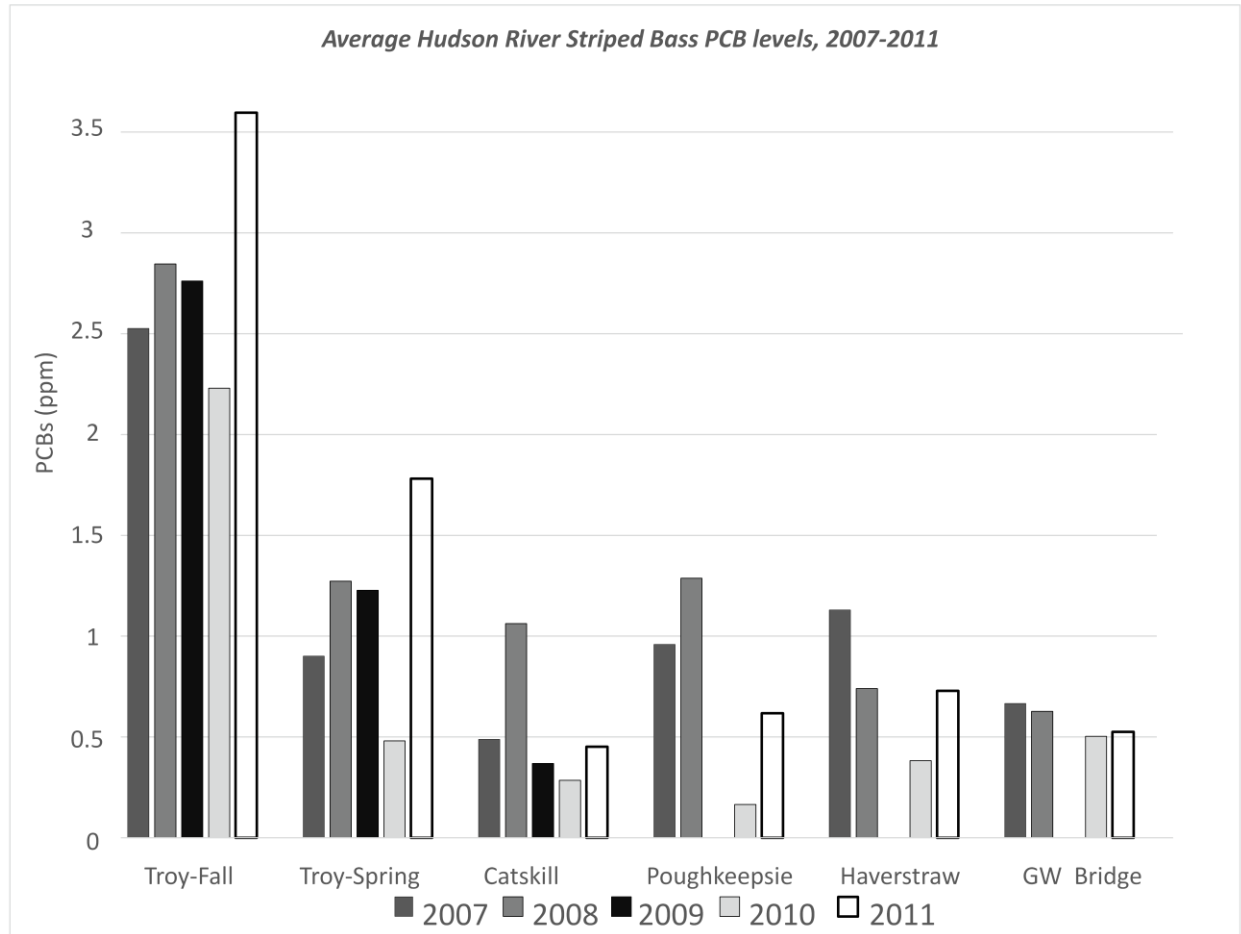
15. Think about the summary graph of averages you created, and the more detailed graph below (the scatterplot of all 2011 striped bass data). In this graph, each point represents the PCB level in one striped bass that was sampled. What are you missing when you only see an average? Use the box below to answer.



Location	# samples
George Washington Bridge	25
Haverstraw	25
Poughkeepsie	30
Catskill	20
Troy	31

When only looking at averages, you do not see how the values cluster around that average and if there are outliers. For instance, most GWB fish are actually lower than Catskill, but there was one fish with very high PCBs that was caught there.

16. How variable are PCB levels in Striped Bass over several years? Use these summary data to describe the differences between locations. Note that Troy was sampled in both the spring and the fall.



There are a number of differences between locations across years. Troy in the fall is always higher than other locations. However, in some locations there is a lot of variation between years, such as Poughkeepsie, and others it is relatively consistent, such as GW Bridge.

17. If you had to advise a fisherman about eating fish from the Hudson, what would you say? Why?

This will vary with the student opinion.