

Name _____

Date _____

Lesson 3: Which fish should I eat?

The Hudson River is a complicated ecosystem, and that makes deciding whether to eat fish complicated too! In this lesson, we will examine four species of fish: Striped bass, Catfish (channel and white), Brown bullhead, and Yellow perch.

Part 1: Review Questions

1. List the factors that can affect PCB concentrations in living organisms:

Fat level, age, size, where they live, what they eat, how much of their lives they spend in the Hudson

2. Make a guess about which species will have the highest PCB concentrations, and which species will have the lowest, using your background knowledge of fish and the reading from Lesson 1. Give your highest species a #1, and your lowest species a #4. Be ready to defend your choice!

_____ Striped bass _____ Catfish _____ Yellow Perch _____ Brown Bullhead



Part 2: Species Cards

You will receive a Species Information Card for one of the species above. Review the information in your small group, and be sure you understand all the information about your fish.

1. Calculate the average % lipid (fat) levels from the four years of data that are provided:

SB:4.22 Cat:6.11 YP:0.54 BB:2.3_____

2. Then, fill out the graphic organizer below as your classmates share information about their fish:

	Yellow perch	Catfish	Striped bass	Brown bullhead
Size	<input checked="" type="checkbox"/> Small (<8 in) <input type="checkbox"/> Medium (8-20 in) <input type="checkbox"/> Large (>20 in)	<input type="checkbox"/> Small (<8 in) <input checked="" type="checkbox"/> Medium (8-20 in) <input type="checkbox"/> Large (>20 in)	<input type="checkbox"/> Small (<8 in) <input type="checkbox"/> Medium (8-20 in) <input checked="" type="checkbox"/> Large (>20 in)	<input type="checkbox"/> Small (<8 in) <input checked="" type="checkbox"/> Medium (8-20 in) <input type="checkbox"/> Large (>20 in)
Lifespan	<input checked="" type="checkbox"/> < 9 years <input type="checkbox"/> 9-20 years <input type="checkbox"/> > 20 years	<input type="checkbox"/> < 9 years <input checked="" type="checkbox"/> 9-20 years <input type="checkbox"/> > 20 years	<input type="checkbox"/> < 9 years <input type="checkbox"/> 9-20 years <input checked="" type="checkbox"/> > 20 years	<input checked="" type="checkbox"/> < 9 years <input type="checkbox"/> 9-20 years <input type="checkbox"/> > 20 years
Habitat	<input checked="" type="checkbox"/> Fresh <input checked="" type="checkbox"/> Brackish <input type="checkbox"/> Salty	<input checked="" type="checkbox"/> Fresh <input checked="" type="checkbox"/> Brackish <input type="checkbox"/> Salty	<input checked="" type="checkbox"/> Fresh <input checked="" type="checkbox"/> Brackish <input checked="" type="checkbox"/> Salty	<input checked="" type="checkbox"/> Fresh <input checked="" type="checkbox"/> Brackish <input type="checkbox"/> Salty
Life cycle	<input checked="" type="checkbox"/> Lives near "home" <input type="checkbox"/> Migrates long distances	<input checked="" type="checkbox"/> Lives near "home" <input type="checkbox"/> Migrates long distances	<input type="checkbox"/> Lives near "home" <input checked="" type="checkbox"/> Migrates long distances	<input checked="" type="checkbox"/> Lives near "home" <input type="checkbox"/> Migrates long distances
Feeding	<input type="checkbox"/> Primary and secondary consumer <input checked="" type="checkbox"/> Secondary only	<input checked="" type="checkbox"/> Primary and secondary consumer <input type="checkbox"/> Secondary only	<input type="checkbox"/> Primary and secondary consumer <input checked="" type="checkbox"/> Secondary only	<input checked="" type="checkbox"/> Primary and secondary consumer <input type="checkbox"/> Secondary only
Average % lipid:	<i>See above</i>	<i>See above</i>	<i>See above</i>	<i>See above</i>
Average % lipid category	<input checked="" type="checkbox"/> Low (< 1%) <input type="checkbox"/> Medium (1-5%) <input type="checkbox"/> High (> 5%)	<input type="checkbox"/> Low (< 1%) <input type="checkbox"/> Medium (1-5%) <input checked="" type="checkbox"/> High (> 5%)	<input type="checkbox"/> Low (< 1%) <input checked="" type="checkbox"/> Medium (1-5%) <input type="checkbox"/> High (> 5%)	<input type="checkbox"/> Low (< 1%) <input checked="" type="checkbox"/> Medium (1-5%) <input type="checkbox"/> High (> 5%)
Using this information, predict whether each fish species will have "low" or "high" levels of PCBs.	<input checked="" type="checkbox"/> Low <input type="checkbox"/> High	<input type="checkbox"/> Low <input checked="" type="checkbox"/> High	<input type="checkbox"/> Low <input type="checkbox"/> High	<input type="checkbox"/> Low <input type="checkbox"/> High
Explain your reasoning for your choice.	<i>Because YP are small, short-lived, and don't have a lot of fat, they should have low PCBs</i>	<i>Because catfish are medium sized, long-lived, stay in the Hudson and have a lot of fat, they should have high PCBs</i>	<i>Because SB are large and long-lived and have some fat, they could have high PCBs, but they leave the Hudson and reduce their exposure so they may also have low PCBs</i>	<i>Because BB are medium sized, stay in the Hudson and have some fat, they could have high PCBs, but they are short-lived so PCBs could be low also.</i>

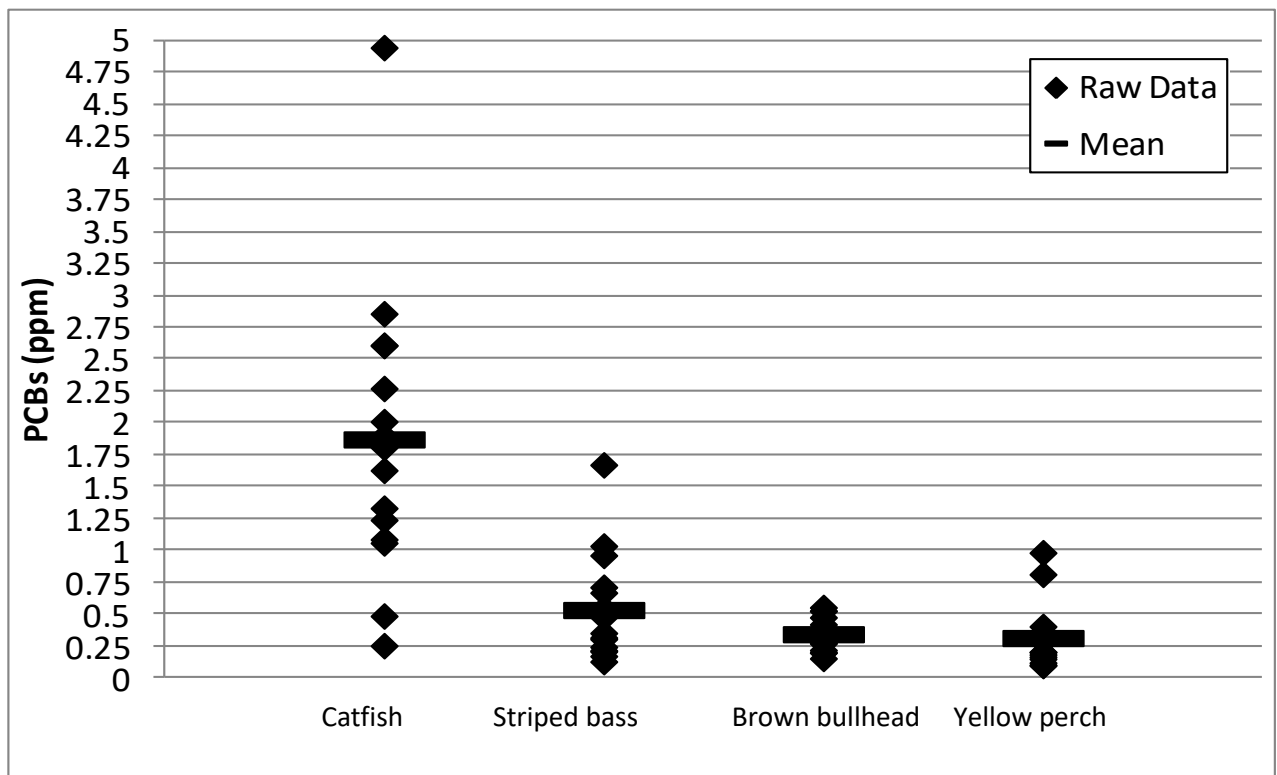
3. Which fish do you think will have the highest PCB concentration, given the situation(s) below? Circle your answer for each question.

- You catch two fish: **a striped bass** and **a brown bullhead**. Based only on their feeding habits, which species do you think will have the higher PCB concentration?
- You catch two fish, **one that is 36 inches long** and **one that is 4 inches long**. Based only on their size, which fish do you think will have the higher PCB concentration?
- You catch two fish of the same size: **a catfish** and **a striped bass**. Based only on their migratory habits, which species do you think will have the higher PCB concentration?
- You catch two fish of the same size: **a catfish** and **a brown bullhead**. Based only on their % lipid levels, which do you think will have the higher PCB concentration?

Part 3: PCB Data

You will receive PCB data for your fish species for 2011. Select at least 15 data points and plot them as points above the name of your fish species. Be ready to share your results with the class. These fish were collected in Poughkeepsie and Catskill, NY.

Then, calculate an average for your data and mark it on the graph: _____



Part 4: Summarizing Results

1. Why do you think there were differences between the PCB contamination levels in your fish species in 2011? Include at least two possible reasons.

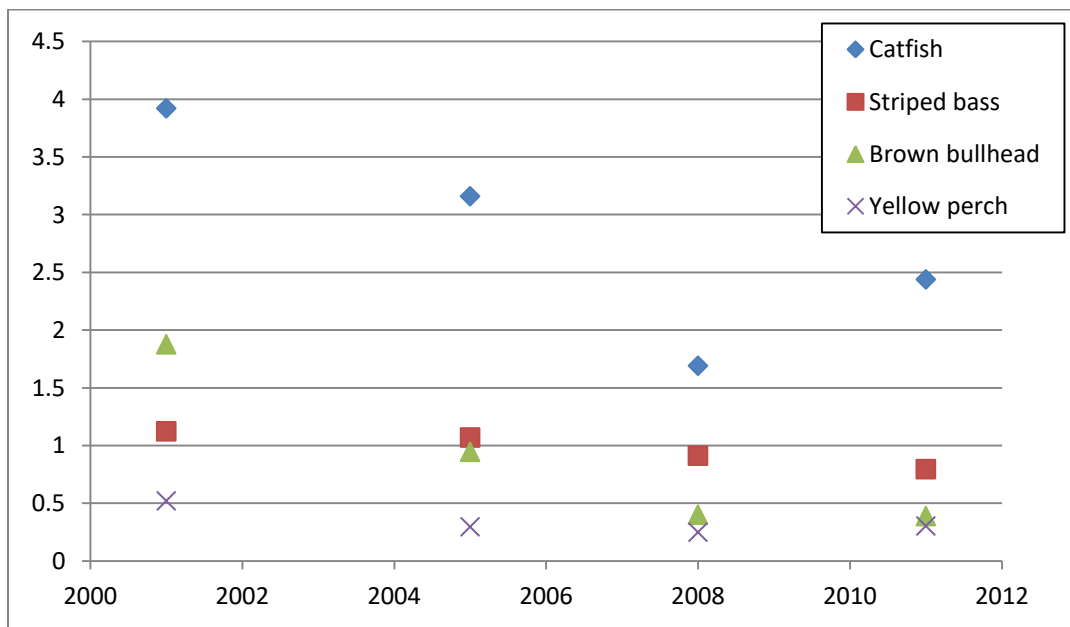
Fat level, age, size, where they live, what they eat, how much of their lives they spend in the Hudson

2. As a class, fill out the rest of your graph with data from other groups of the four fish species for 2011. Then, your teacher will make a bar graph of the averages for all species. Based on these graphs, which fish species has the highest PCB levels, and why?

Catfish, due to fat levels

3. Here are data for all of the four fish species, for four years. These data are averages of multiple samples from each year, from all locations. The number of samples that were used to calculate each average is provided in the table:

	# samples 2001	# samples 2005	# samples 2008	# samples 2011
Catfish	15	27	27	22
Striped bass	251	250	214	130
Brown bullhead	23	19	21	21
Yellow perch	52	19	20	19



- a. Which species has the highest overall PCB contamination level (claim)? ___*Catfish*___
- b. Given what you have learned in other lessons, what are some potential gaps of this dataset that might influence your claim?

Differences in location may influence the level of PCBs and increase variability, and also the size and age of fish

- c. In order to be more confident in your claim, what else would you like to know?

Where the fish were caught and at what time of year, how big and old they were

4. Your teacher will show you a graph of the average % lipid levels in the four fish species. Use these data to create a scientific argument (claim, evidence, & reasoning) for the relationship between PCB levels in fish and % lipid levels.

Claim: when lipid levels go up, PCBs go up

Evidence: catfish have the highest lipid levels and PCBs, YP have the lowest fat and also the lowest PCBs. There is a strong correlation between fat and PCBs

Reasoning: These factors vary together, which indicates that they are related to each other

5. Based on what you have learned, what do you think is the most important reason that species differ in their PCB contaminant level? Explain your reasoning.

Lipid level, since this is most strongly correlated with PCB level

6. Based on this activity, do **you** now feel more or less comfortable eating fish from the Hudson River? Why or why not? If you are not comfortable, what else would you need to know in order to make a decision?

This is an opinion question