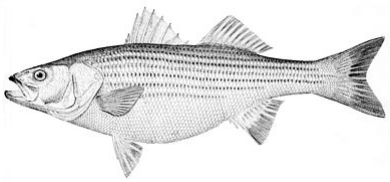
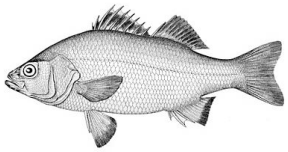
Designing A Study

You are a science research student in Yonkers, close to the Beczak Environmental Center (RM 18.5). You want to design a study to identify **all the types of fish** that live in the Hudson River. At this location on the Hudson River the water is a mix of salt water and fresh water, called **brackish**. The water is **brackish** in this part of the river since there is a mix of salt water moving upriver from the Atlantic Ocean and freshwater moving downriver from streams and rivers that empty into the Hudson. If you travel south on the river the water gets saltier, while if you go north, the water becomes fresh.

1. Will it be possible to design a study to locate and identify each **individual** fish in the Hudson River? _____ YES _____NO

SAMPLING: If you cannot count all the fish directly, you can gather information about the fish population through a method called **sampling**. To **sample** means to look at a smaller piece, or a subset, of the whole population. Another word for the whole population is the **parent** population. A good **sample** looks approximately the same as the whole (**parent**) population…only smaller. This is called a **representative sample** since the small population represents or mirrors the **parent** population. If you design your study correctly you can learn a lot about your **parent** population from **sampling**.

HURRAY! You learn about Hudson River Snapshot Day, and as a part of this event fish are caught, identified and counted at Beczak's Habirshaw Park. You find 3 years of fish data from the Beczak site posted on the Snapshot Day website! The list below shows what fish were collected each of those three years on Snapshot Day at Habirshaw Beach using a 30 foot seine net.

Snapshot Date	Atlantic Silversides 	Striped Bass 	Winter Flounder 	White Perch 
10/6/04	11	18	1	1
10/12/05	1	0	0	0
10/12/06	5	1	0	3
3 Year Total	**17**	**19**	**1**	**4**

2. Here you have three years of data, each was collected (a) **at the same place**, (b) **using the same equipment** and (c) **at the same time of year**. These are all important things to consider in designing a study. Why would it be important to consider each of these items in designing your study (give at least one reason supporting each item [(a), (b) and (c)], and one reason why each item could be a problem in a study design.)

Submitted by LDEO/HBRW

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3. Based on the chart above you conclude that there are a total of 4 different types of fish present in the Hudson River and you write your report based on this information. When you meet with your research advisors what do you think they will say about your findings:

a. Is the fish tally above a **representative sample** of all the types of fish in the Hudson River? List at least two reasons why you think it is, or it is not.

b. Scientists are always interested in doing more testing to see if their study is repeatable, or if there might be another explanation for the **findings** (conclusions) in the study. How could you test your results to see if your conclusions were right?

c. List some ways you could improve the design of this study to be sure you get a **representative sample** of all the types of fish found in the Hudson River?

NOTE: It is important to note that the fish tally collected for Snapshot Day is a **sampling** from the fish population in the Hudson River. This is important information or **data** for us to collect and does give us valuable information. However, it is not enough **data** to tell us about the full fish population in the Hudson River.

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Your advisor asks you to work further on this study and get more complete information. HURRAY! You find that Beczak seined several times a week over several months, from April through August in 2006, and has tallied and posted their results. Listed below is a tally of what they caught.

	American Eel	Atlantic Silverside	Atlantic Tomcod	Banded Killifish	Bluefish	Herring	Largemouth Bass	Mummichog	Northern Pipefish	Striped Anchovy	Striped Bass	Striped Sea Robin	Flounder (Winter & Summer)	White Perch	Bluegill Sunfish	White Sucker	Carp	Naked Goby	Bay Anchovy	Atlantic Croaker	White Mullet
April 06	2	0	0	0	1	0	0	0	0	0	3	0	0	4	1	0	0	0	0	0	0
May 06	22	2	4	6	0	5	0	3	1	24	31	0	0	22	0	2	1	1	1	0	0
June 06	9	0	4	1	2	0	0	3	0	0	3	0	0	24	1	0	0	2	372	16	1
July 06	9	21	0	0	8	0	1	2	0	0	60	0	10	56	0	0	0	0	27	21	1
Aug. 06	5	15	0	2	0	11	0	5	0	1	81	1	4	20	0	0	0	0	27	6	3
Totals	**47**		**8**	**9**		**16**	**1**		**1**	**25**		**1**		**126**	**2**		**1**		**427**	**43**	**5**

3. You now have data collected (a) **at the same place**, (b) **using the same equipment** but at (c) **different times of the year.** This change from your earlier study design is important to consider. Can you provide at least one reason why this change would improve your study design?

4. Complete the totals boxes and to find which fish they caught the most samples of when seining.

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5. List the top 4 species caught during this sampling period.
   a.
   b.
   c.
   d.

6. Do the top four samples caught match the four species caught at this location on Snapshot Day 2004-2006?

7. What will you put in your report to explain why the results of this sampling period do not match the results from Snapshot Day 2004-2006?

8. Based on the information above you come up with a new conclusion. You conclude there are actually a total of 21 different types of fish present in the Hudson River and you turn in your report with this information. When you meet with your research advisors what do you think they will say about your **findings** (conclusions):

d. Is the fish tally above a **representative sample** of all the types of fish in the Hudson River? List at least two reasons why you think it is, or it is not.

e. Scientists are always interested in doing more testing to see if their study is repeatable, or if there might be another explanation for the **findings** (conclusions) in the study. How could you test your results to see if you were right?

f. List at least two weaknesses in your study design? What are some ways you could improve the design of this study to be sure you get a **representative sample** of all the types of fish found in the Hudson River?