

- 1) Calculate the percentages of shrimp infected with black gill for each month in 2004 and 2013. Round to the nearest whole number (15 pts total).

**Calculation: (Column A ÷ Column B) x 100 = Column C**

Black Gill Infections near S\_\_\_\_\_ Sound, \_\_\_ in 2004

	A	B	C
Month	Number of Shrimp with Black Gill	Number of Shrimp Caught	% of Shrimp with Black Gill
June	0	34	
July	0	83	
August	0	54	
September	19	70	
October	4	7	
November	13	36	
December	0	10	

Black Gill Infections near S\_\_\_\_\_ Sound, \_\_\_ in 2013

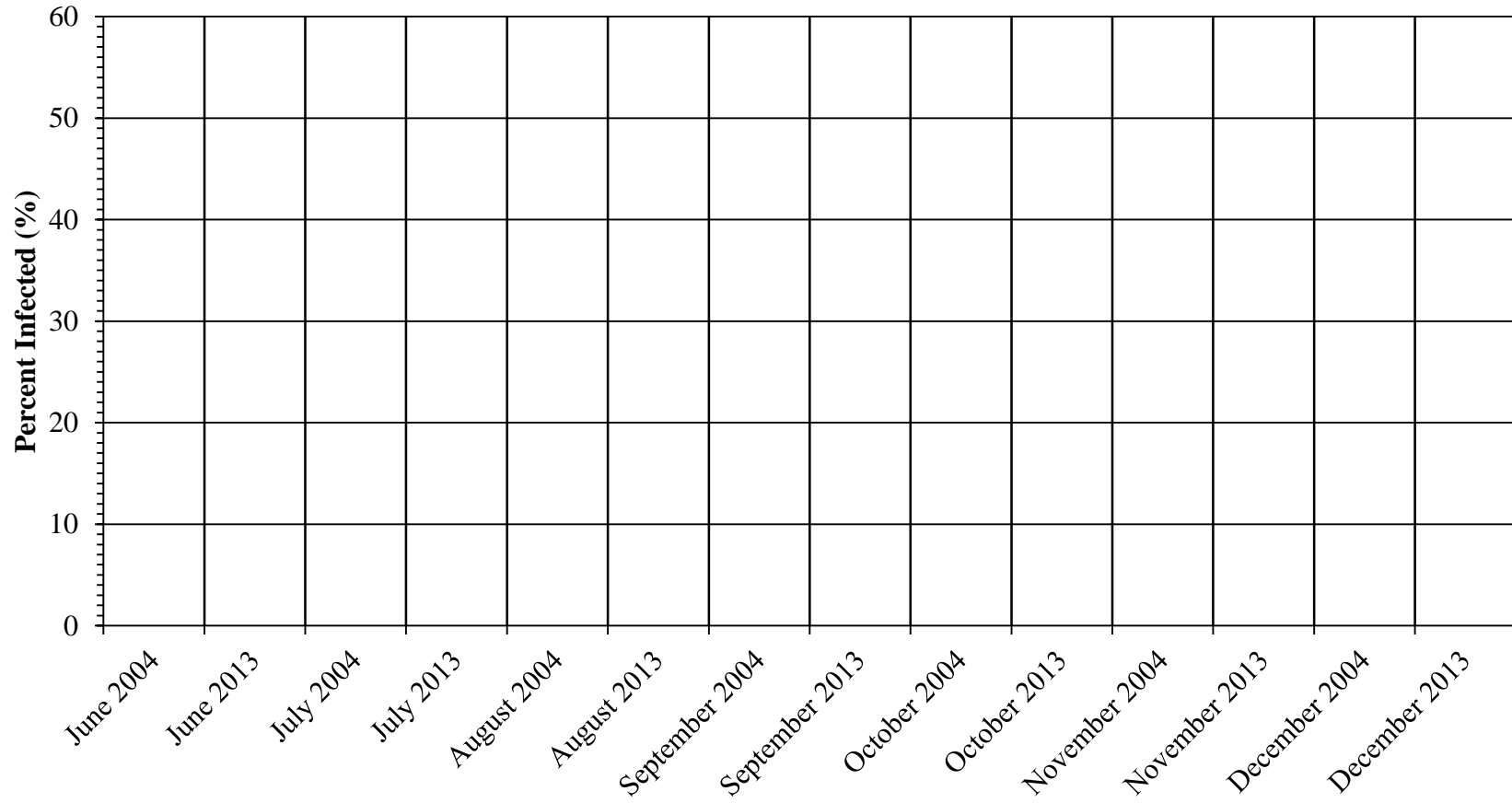
	A	B	C
Month	Number of Shrimp with Black Gill	Number of Shrimp Caught	% of Shrimp with Black Gill
June	0	85	
July	0	38	
August	4	9	
September	20	40	
October	5	10	
November	0	46	
December	0	50	

- 2) Make a bar graph using the percentages that you calculated (separate sheet) (20 pts).
- 3) The highest percentages of infected shrimp were observed during which months of each year? (5 pts.)
- 2004: \_\_\_\_\_
- 2013: \_\_\_\_\_

- 4) No infected shrimp were observed during which months of each year? (5 pts.)  
2004: \_\_\_\_\_  
2013: \_\_\_\_\_
- 5) The highest percentage of infected shrimp was observed during which month for both years? (5 pts.) \_\_\_\_\_
- 6) The highest percentage of shrimp infected with black gill was observed during which year? (circle one) (5 pts.)                      2004                      2013
- 7) Why do you think black gill was observed during some months and not others? (Write in complete sentences) (15 pts.)
- 8) How could you test whether your explanation for question 7 is actually happening, or may occur in the future? (Write using complete sentences) (15 pts.)
- 9) Consider the similarities and differences between the 2004 and 2013 data. What do you predict that black gill infections will be like during each month next year? (Write using complete sentences) (15 pts.)

Too Much Black Gill? (20 pts. total)

Graph the percentages of shrimp infected with black gill in 2004, then in 2013. Use a different color or pattern for each year.



Month & Year

Key	
<input type="checkbox"/>	2004
<input type="checkbox"/>	2013

Catch Me If You Can Worksheet

Name \_\_\_\_\_

1. Draw a picture of a shrimp, Atlantic Croaker (fish), and a shrimp boat above each word.  
Draw arrows from the prey "→" to the predators (10 pts).

Shrimp Boat

Shrimp

Atlantic Croaker

2. A food chain shows only one way that energy can be transferred from prey to a predator. A food web shows multiple ways that energy can be transferred from a variety of prey items to multiple predators when the prey is consumed. Is the drawing above is an example of a food chain or food web (circle one) (10 pts)?

Food chain

Food web

Write using complete sentences.

3. How does the black gill parasite affect shrimp? (15 pts.)
  
  
  
  
  
  
  
  
  
  
4. How does the black gill parasite affect shrimpers? (15 pts.)
  
  
  
  
  
  
  
  
  
  
5. Do you think shrimpers care whether the shrimp that they catch have black gill? Why or why not? (15 pts.)
  
  
  
  
  
  
  
  
  
  
6. Do you think people want to eat shrimp with black gill? Why or why not? (15 pts.)
  
  
  
  
  
  
  
  
  
  
7. Do you think it is beneficial to close the shrimping season for a couple of months out of the year? If yes, why? If no, how would you change the shrimping laws? (20 pts.)

- 1) Calculate the percentages of shrimp infected with black gill for each month in 2004 and 2013. Round to the nearest whole number (15 pts total).

**Calculation: (Column A ÷ Column B) x 100 = Column C**

Black Gill Infections near S\_\_\_\_ Sound, \_\_ in 2004

	A	B	C
Month	Number of Shrimp with Black Gill	Number of Shrimp Caught	% of Shrimp with Black Gill
June	0	34	<b>0</b>
July	0	83	<b>0</b>
August	0	54	<b>0</b>
September	19	70	<b>27</b>
October	4	7	<b>57</b>
November	13	36	<b>36</b>
December	0	10	<b>0</b>

Black Gill Infections near S\_\_\_\_ Sound, \_\_ in 2013

	A	B	C
Month	Number of Shrimp with Black Gill	Number of Shrimp Caught	% of Shrimp with Black Gill
June	0	85	<b>0</b>
July	0	38	<b>0</b>
August	4	9	<b>44</b>
September	20	40	<b>50</b>
October	5	10	<b>50</b>
November	0	46	<b>0</b>
December	0	50	<b>0</b>

- 2) Make a bar graph using the percentages that you calculated (separate sheet).
- 3) The highest percentages of infected shrimp were observed during which months of each year? (5 pts.)      2004: October

2013: September and October

- 4) No infected shrimp were observed during which months of each year? (5 pts.)

2004: June, July, August, and December

2013: June, July, November, and December

- 5) The highest percentage of infected shrimp was observed during which month for both years? (5 pts.) October

- 6) The highest percentage of shrimp infected with black gill was observed during which year? (circle one) (5 pts.) 2004 2013

- 7) Why do you think black gill was observed during some months and not others? (Write using complete sentences) (15 pts.)

**Black gill could vary due to seasonal variations in water temperature. The water temperature may have been warm to moderately cool during the months that black gill was observed, and the shrimp may have also been abundant. When a shrimp loses their parasite when they molt, the parasite may find another host quicker if another shrimp is close by.**

- 8) How could you test whether what you stated in question 7 is actually happening, and may occur in the future? (Write using complete sentences) (15 pts.)

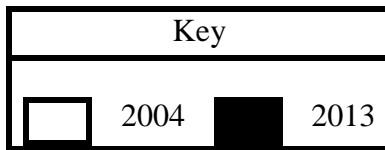
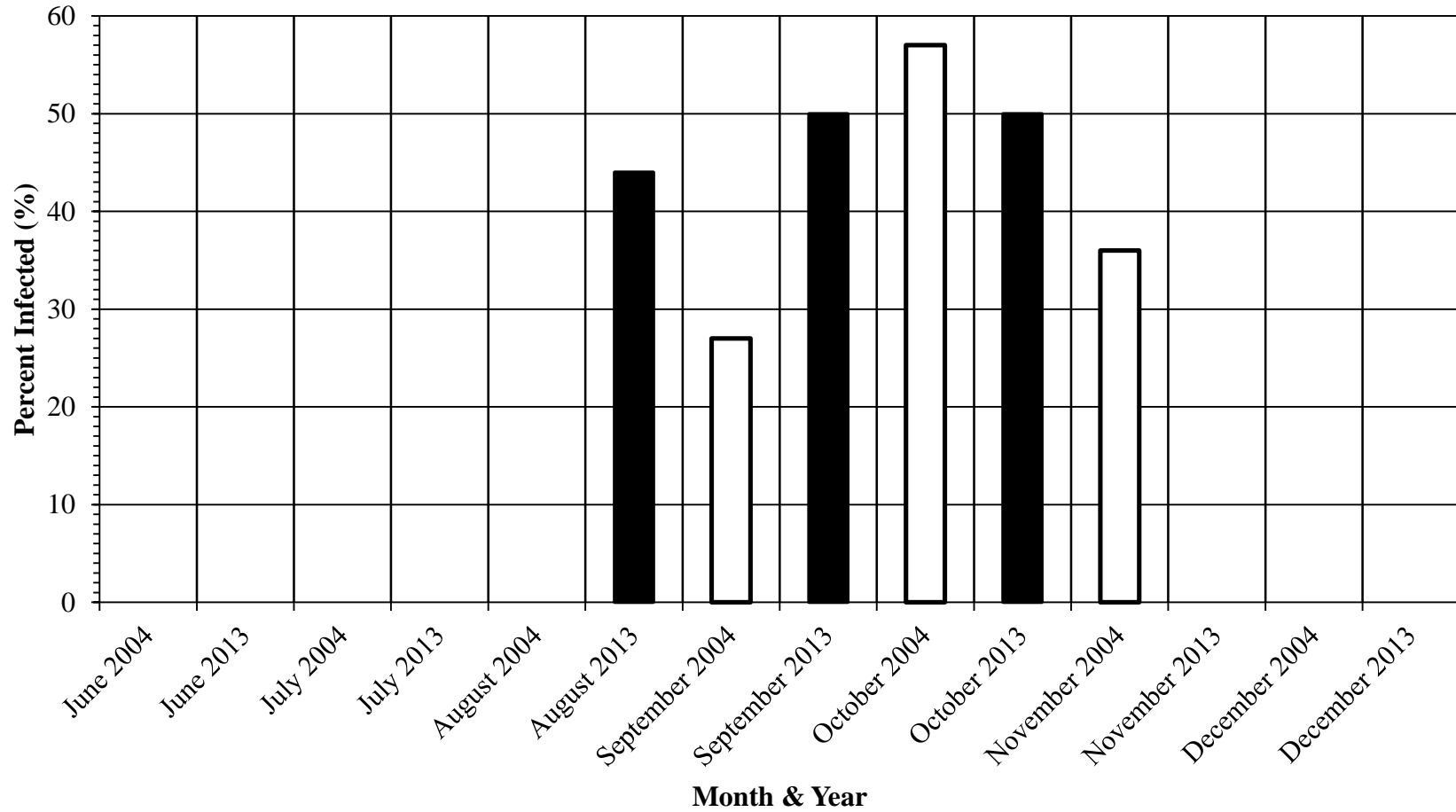
**Example: This could be tested in a controlled environment such as a laboratory, where the temperature and number of shrimp can be manipulated. Two tanks would be set up in the laboratory, each containing the same number of parasites. The temperature in the tanks would be raised every two weeks by 10 degrees. Three shrimp would be placed in one tank and twenty shrimp in the other. From this experiment, I expect to see more shrimp infected as the temperature in the tank increases. The parasites in the tank with 20 shrimp will infect shrimp more rapidly than in the tank with 3 shrimp. The results observed in this experiment could be compared to future temperature changes and changes in black gill observed in the ocean.**

- 9) Consider the similarities and differences between the 2004 and 2013 data. What do you predict that black gill infections will be like during each month next year? (Write using complete sentences) (15 pts.)

**Over the next year, I predict that black gill infections will primarily be seen in September and October. Shrimp may be infected with black gill during August and November, depending on if the water temperature or other water conditions are similar to what was observed in September and October of 2004 and 2013. Shrimp will not be infected with black gill in June, July, or December.**

Too Much Black Gill? (20 pts. total) **Answer Key**

Graph the percentages of shrimp infected with black gill in 2004, then in 2013. Use a different color or pattern for each year.

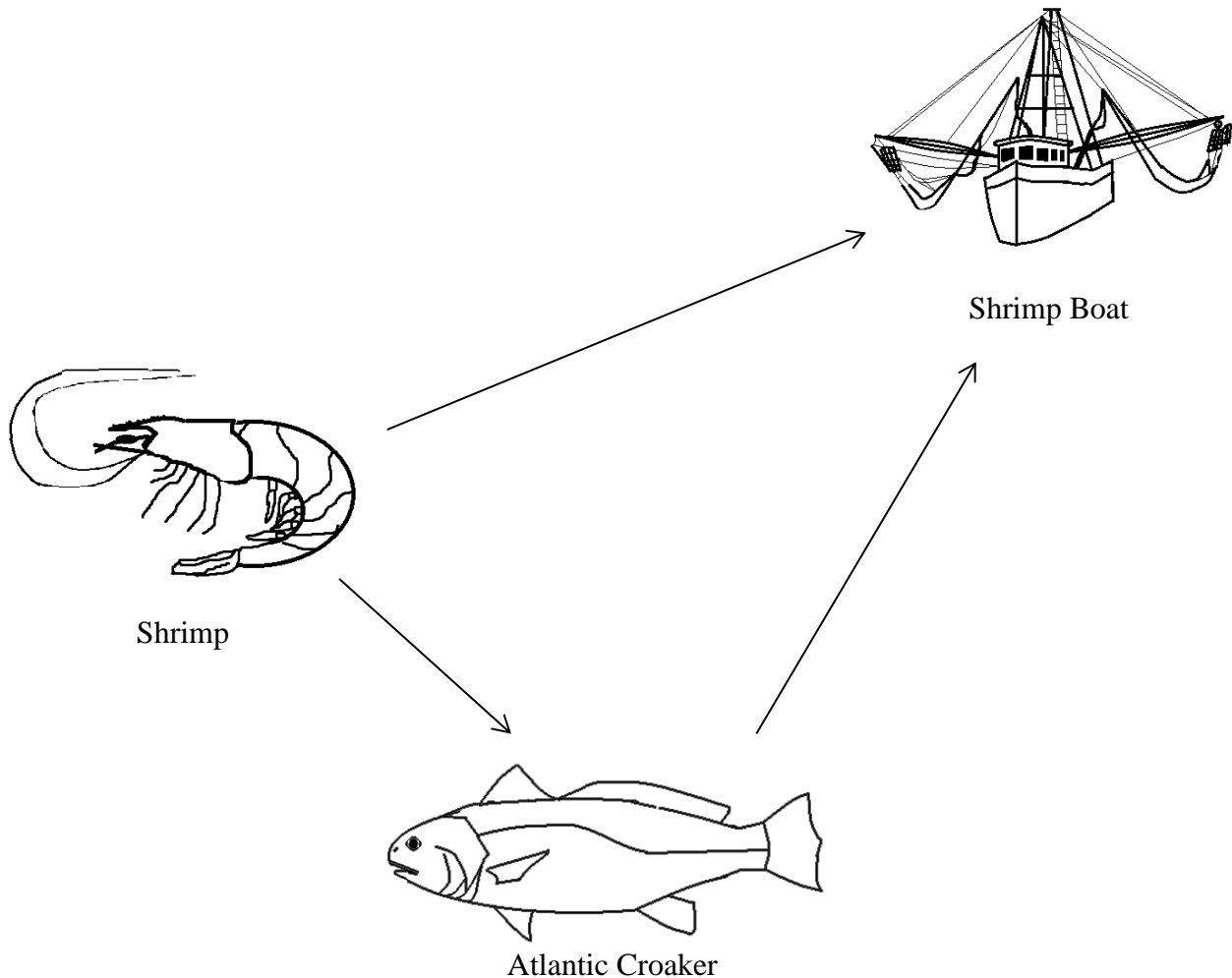




## Catch Me If You Can Worksheet

Name Answer Key

1. Draw a picture of a shrimp, Atlantic Croaker (fish), and a shrimp boat above each word.  
Draw arrows from the prey "→" to the predators (10 pts).



2. A food chain shows only one way that energy can be transferred from prey to a predator. A food web shows multiple ways that energy can be transferred from a variety of prey items to multiple predators. Is the drawing above is an example of a food chain or food web (circle one) (10 pts)?

Food chain

 Food web

Write using complete sentences.

3. How does the black gill parasite affect shrimp? (15 pts.)  
**The black gill parasite affects the ability of shrimp to respire, and potentially reduces the amount of energy shrimp have to escape predators such as the shrimper and Atlantic Croaker. This condition may also affect the ability of shrimp to cope with extreme temperature fluctuations.**
  
4. How does the black gill parasite affect shrimpers? (15 pts.)  
**Shrimp with black gill are less able to escape predators such as Atlantic Croaker, and shrimpers have to outcompete those predators to catch shrimp. It may also be tough for shrimpers to sell shrimp with black gill to seafood markets or consumers who think that the infected shrimp are not safe to eat.**
  
5. Do you think shrimpers care whether the shrimp that they catch have black gill? Why or why not? (15 pts.)  
**Shrimpers care whether their shrimp have black gill because it impacts their ability to sell their shrimp. Consumers who are not aware of black gill may not want to purchase shrimp with black gill due to the discoloration caused by the parasite. Therefore, shrimpers may have to devote more effort to removing the heads of shrimp with black gill before selling them to consumers or seafood markets.**
  
6. Do you think people want to eat shrimp with black gill? Why or why not? (15 pts.)  
**Consumers who are not aware of black gill and/or that the condition does not impact people who consume infected shrimp maybe alarmed by the black discoloration under the gill caused by the parasite, and may choose not to eat the shrimp. People who are informed about black gill may choose to eat shrimp with this parasite.**
  
7. Do you think it is beneficial to close the shrimping season for a couple of months out of the year? If yes, why? If no, how would you change the shrimping laws? (20 pts.)  
**Implementing some type of management strategy is important to conserve the shrimp population for future seasons. Managing the season by only allowing shrimpers to shrimp during a couple of months out of the year is one regulation method that allows the shrimp population to rebuild while the season is closed. However, this method may cause shrimpers to focus more on catching shrimp than reducing bycatch. If I could change the shrimping laws, I would allow shrimpers to shrimp throughout the entire year, but limit the amount of shrimp that they catch. I would also encourage them to sell their bycatch rather than wasting the unwanted catch.**