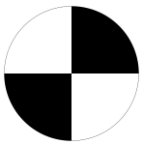
Student Sheet
Filtration by Freshwater Mussels Lab

Introduction:
Turbidity is a measure of the relative clarity of water: the greater the turbidity, the murkier the water. Turbidity increases as a result of suspended solids in the water that reduce the transmission of light.

Turbidity can be measured using a simple device called a Secchi disk. This disc is divided into black and white quadrants. In this laboratory activity, miniature Secchi disks were used to measure water turbidity to determine if the mussels were filtering the water and reducing water turbidity.



Freshwater mussels live in the substrate of many freshwater streams and rivers, quietly filtering large volumes of water for most of their long lives. As they filter the water, they extract nutrients and other suspended particles, changing the properties of the water around them.

In this experiment, changes in water clarity as a result of the freshwater mussels feeding behavior is examined. Freshwater mussels were used in 9.5 L (2.5 gallon) aquaria. Yeast was used as the turbidity-producing agent. Miniature Secchi disks were used to measure changes in turbidity.

Objectives:
Analyze the results obtained from the experimental activity on filtration by freshwater mussels. Determine if the mussels are filtering the water and reducing water turbidity.

Materials
Freshwater mussels, Housing for the mussels--aquaria or plastic containers, water from the mussels' natural environment or dechlorinated tap water, sand, aquarium pumps and a single air stone for each aquarium, yeast, large glass stirring rod, miniature Secchi disks.

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Procedure

In this experiment, there are four experiment set-ups:

- Experimental 1: 9.5 L (2.5 gallons) water from the mussels' natural environment or dechlorinated tap water, 5 cm of sand, aquarium pump and a single air stone, yeast suspension (one gram of bakers yeast dissolved in 250 mL of pond water), and three freshwater mussels.
- Experimental 2: 9.5 L (2.5 gallons) water from the mussels' natural environment or dechlorinated tap water, 5 cm of sand, aquarium pump and a single air stone, yeast suspension (one gram of bakers yeast dissolved in 250 mL of pond water), and three freshwater mussels.
- Control 1: 9.5 L (2.5 gallons) water from the mussels' natural environment or dechlorinated tap water, 5 cm of sand, aquarium pump and a single air stone, yeast suspension (one gram of bakers yeast dissolved in 250 mL of pond water), and NO MUSSELS.
- Control 2: 9.5 L (2.5 gallons) water from the mussels' natural environment or dechlorinated tap water, 5 cm of sand, aquarium pump and a single air stone, NO YEAST, and three freshwater mussels.

Before taking a turbidity reading, all aquaria were stirred for 30 seconds with a stir rod, being careful not to disturb the substrate or the mussels if present. The turbidity of the water was then measured with the mini-Secchi disks. Turbidity measurements were taken every 15 minutes thereafter in each aquarium, C1, C2, E1, E2, for a period of 90 minutes using the same stirring procedure prior to conducting the experiment.

At the conclusion of the experiment, mussels were immediately removed from the aquaria and placed into fresh water.

Results:

Time (minutes)	E-1 (cm)	E-2 (cm)	Experimental Average (cm)	C-1 (cm)	C-2 (cm)

Graph the data from the Secchi disk transparency measures over time.

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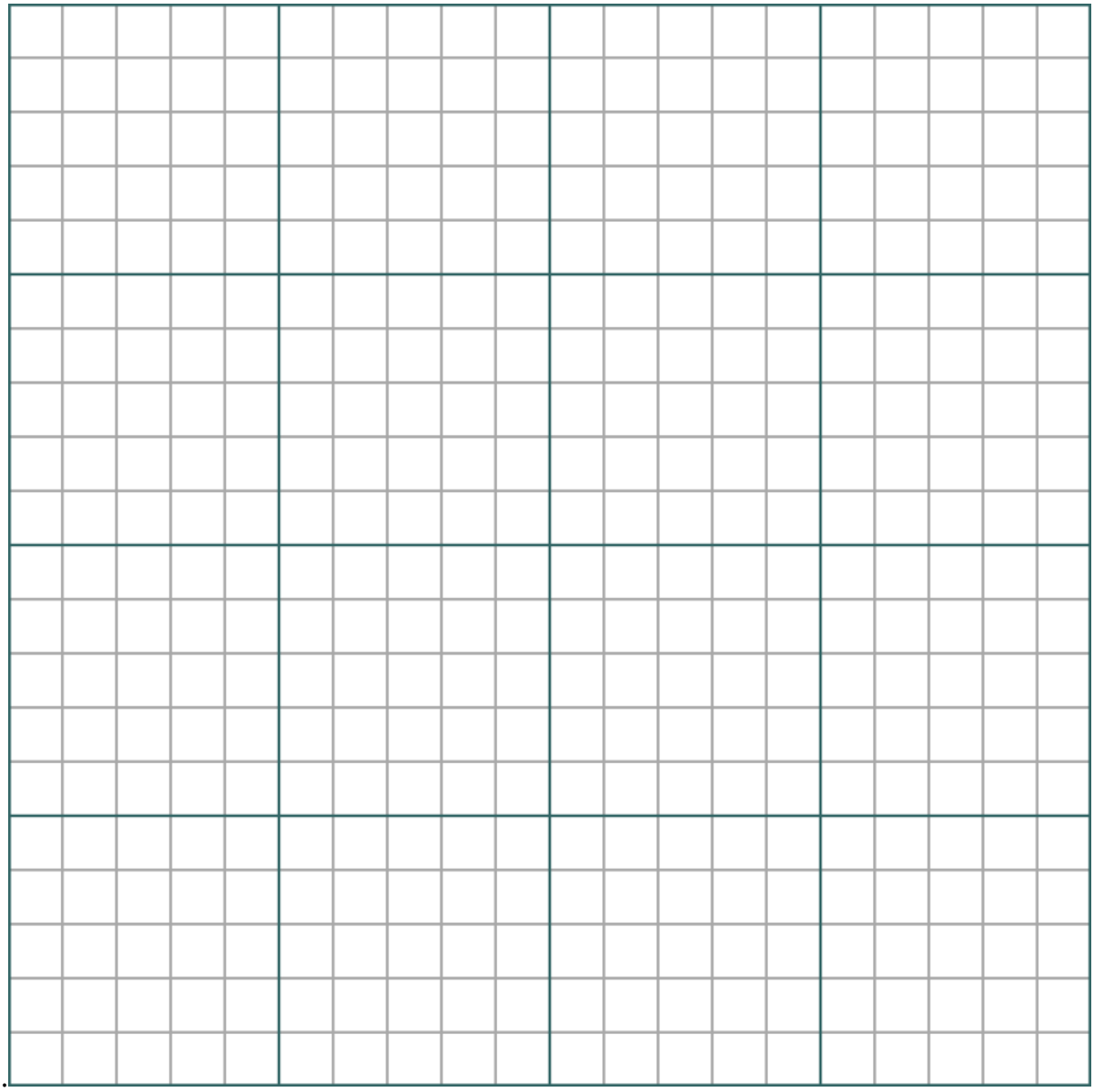

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Analysis:
This laboratory exercise collected the data on the filtration behavior of freshwater mussels. Yeast was used as the turbidity-producing agent because mussels can filter single celled organisms effectively. Filter feeding can result in a significant reduction in turbidity.

1. What affects water turbidity?
2. Describe the control aquarium C1.
3. Why do you think that this was the set up for the control aquarium C1?
4. Describe the control tank C2.
5. Why do you think that this was the set up for the control aquarium C2?
6. One of the controls is a negative control, meaning that no response is expected. Which one of the controls, C1 or C2 do you think is a negative control and why?
7. Did water clarity, due to filter feeding, increase within a 90 minute period? Explain using data in Table 1.
8. Explain what happened to control 1 within a 90 minute period using data recorded in Table 1.
9. What might this data suggest?
10. What would you hypothesize as a cause for the change in water clarity even if mussels are not present?
11. Explain what happened to control 2 within a 90 minute period using data recorded in Table 1.
12. Based on the data given, can you predict water clarity after 3 hours?
13. After analyzing the given data, what do you think is the role of mussels in the aquatic ecosystem?
14. What do you think would happen to aquatic ecosystems if the freshwater mussel population would decrease?