

Food Chain Dynamics In A Simple Ecosystem

Based on a procedure developed by Hudon and Finnerty, 2013

Interactions among organisms in different trophic levels and the effects organisms have on their environment are important factors shaping community and ecosystem structure and function. To investigate these factors, we will construct a simple food chain in a semiclosed ecosystem and observe what happens over the course of a two-week experiment.

The food chain consists of a producer (algae) and a single consumer (brine shrimp). Brine shrimp (*Artemia salina*) are an crustacean related to crabs and lobsters. They hatch from cysts and are easily grown in lab. The larva, called a *naupilus*, are active swimmers, that develop into the mature adult form in a few days. The mature adults are grazers that feed on algae. The algae, (*Platymonas* sp.) are unicellular and are also a swimmer.

Procedure

1. To conduct the experiment, you will work in groups and construct an ecosystem. You need to alter some aspect of the community to test the relationship between different trophic levels. This mean you should consider altering wither the amount of algae or number of brine shrimp. One of the first things to consider is how to determine the concentration of algae in our culture. How do you think this can be done?
2. While some members of your group are, determining the concentration of algae, the remainder of the group should obtain six glass jars and lids. Using lab tape, label you jars with group name, lab section identifier, and replicate number. Once you have determined how many algae you want to ad to the jar, add the appropriate amount of seawater to bring the volume to 100ml.
3. We started a brine shrimp culture several days before lab started. Collect some shrimp and count out the number of brine shrimp you will need. Make sure they are hatched and alive.
4. Once the concentration of algae is determined, add the appropriate amount of stock to each jar, bringing the total volume in the ecosystem to approximately 100ml.
5. The ecosystems will be placed in an illuminated incubator for two weeks. At the end of the experiment, you will count the number of live brine shrimp in each jar and determine the final concentration of algae remaining in the ecosystem.

Questions

1. What questions do you think this experiment is addressing?
2. What is the hypothesis being testing for this study?
3. What are the variables being manipulated?

4. What do you predict will happen?
5. What do you think will be the importance of the results?
6. Are there any additional data you might need to collect? Why?
7. What aspects of the experiment should be discussed as a class so that there is uniformity in procedure and data collection among groups?
8. How should the data be analyzed? What values should you calculate and what comparisons should you make? Why?
9. How can the data be most effectively presented? Why?
10. Once you have completed the study, what experiments would you propose to do next? Why?

References

Hudon, D. and J.R. Finnerty. 2013. To build an ecosystem: an introductory lab for environmental science and biology students. *The American Biology Teacher* 75:186-192.