SCIENTIFIC AMERICAN FRONTIERS

TEACHING GUIDE

www.pbs.org/saf/1204

Alien Invaders

Activity 2: Grades 5-8
Aquarium Capers

In the segment "Green Invader", you learned that a shell-less snail is being considered as a biological control to combat the spread of an alien alga in the Mediterranean. It is hoped that by importing this northern Florida slug, whose anatomy is perfectly adapted to dine on the invading algae, the out-of-control growth of *Caulerpa taxifolia* might be halted without further damage to the environment.

In this classroom activity, you will culture algal "mats" on microscope slides. Then, you will observe how snails can be used to control this growth and limit the further expansion of the algae. You will also observe how snails themselves can act as pest species by feeding upon desired aquarium plants.

OBJECTIVE

This activity page will offer an experience in:

- Growing and culturing a film of algae
- Observing the grazing behavior of pond snails
- Evaluating the effectiveness of snails as a biological control

MATERIALS (Part 1)

- Microscope slides
- Wax pencil
- Petri dish
- Dissecting microscope
- Four 250mL beakers
- Spring water
- Pond snails (removed from classroom or pet store aquarium tanks)

TEACHER'S NOTE:
Students should have access to a classroom aquarium that maintains a rich community of snails and algal species.

PROCEDURE

Part 1 - Grazing snails

1. Use a wax pencil to label the edge of two microscope slides with your initials.
2. Place these slides in an aquarium that supports a rich community of algal species. Make sure that the slides are positioned so that you can observe their surface without removing the slides from the tank.
3. Examine the slides daily and record your observations on the growth of algae.
4. At the end of one week, remove the slides from the tank. Place them in a petri dish filled with spring water. Position the dish on the stage of a dissecting microscope and examine the film of algae. Record your observations on the appearance of this algal mat.
5. Fill two 250mL beakers with spring water and add one slide to each beaker.
6. Add six aquarium snails to one beaker.
7. Place both beakers in direct sunlight and in a place where they will remain undisturbed.
8. Each day, observe the algal film and snail population. Record what you see. Following each daily observation, use fresh spring water to replace any water that has been lost.
9. Maintain a log of your observations over a one-week period. Decide what features you think should be observed and measured (such as snail numbers, mat size, etc.) Make a prediction of how these values will change. Each day, record your observations. Were your predictions correct? Explain.

QUESTIONS

1. Where did the algal mat that grew over your microscope slides come from?
2. Was it necessary to expose the beakers and their contents to light? Explain.
3. Where did the oxygen required by the snails come from?
4. Suppose the snails were predators and not grazers. Would this affect the results of the experiment?

PART TWO

MATERIALS

- Sprigs of *Elodea* or other aquarium plant
- Pond snails (removed from classroom aquarium or pet store tanks)
- Forceps

PROCEDURE

1. Remove two sprigs of *Elodea* or other aquarium plant from a classroom aquarium.
2. Examine the sprigs beneath a dissecting microscope. Use forceps to remove any snails or other organisms attached to the plant. Be sure to remove clusters of snail eggs that may be attached to the plant.
3. Fill two clean 250mL beakers with spring water.
4. Place a sprig of *Elodea* in each beaker.
5. Add several pond snails to one beaker, but not the other.
6. Place one of the algae-covered slides in each of the two water-filled beakers.
7. Place both beakers in direct sunlight. Make sure that these beakers will remain undisturbed.
8. Each day, observe the plants, the algae-covered slide, and snail population. Record what you see. Following each daily observation, use fresh spring water to replace any water that has been lost.
9. Maintain a log of your observations over a one-week period. As in Part 1, decide what features you think should be observed and measured (such as snail numbers, mat size, *Elodea* size, etc.)
   Make a prediction of how these values will change.
   Each day, record your observations.
   Were your predictions correct?
   Explain.

QUESTIONS

1. Why was it necessary to remove all of the snails and other organisms from the transferred aquarium plants?
2. Was it necessary to expose the beakers and their contents to light? Explain.
3. Why were both aquarium plants and algae-covered slides used in this experiment? How is this representative of the concerns raised by the use of biological control?

EXTENSIONS

Controlling Snail Populations

To limit the damage caused by snails, aquarium keepers rely on several techniques to control their population. In one method, physical traps are used to catch the snails. Using lettuce as bait, the trap draws snails into a one-way chamber. Ongoing removal and emptying of the trap eliminates the snails from the tank environment.

Can you design a one-way trap for snails? Think about it. Create the blueprints for this baited trap. Share your design with classmates. With your instructor's approval, build and test the effectiveness of your snail trap. Was it successful? Why? How might you improve its design?

WEB CONNECTION

Aquatic Concepts
http://www.frii.com/~booth/AquaticConcepts/
Pest algae and biological control for the fish tank.

Controlling Snail Populations in the Home Aquaria
http://www.geocities.com/CapeCanaveral/4742/snail_faq.html
An article with photos about snail control in the home aquarium.

Freshwater Aquariums @ About.com
http://freshaquarium.about.com/cs/maintenance/
How to maintain your aquarium.

Caulerpa
http://www.sbg.ac.at/ipk/avstudio/pierofun/ct/caulerpa.htm
An extensive online essay about *Caulerpa's* impact in the Mediterranean.

The activities in this guide were contributed by Michael DiSpezio, a Massachusetts-based science writer and author of "Critical Thinking Puzzles" and "Awesome Experiments in Light & Sound" (Sterling Publishing Co., NY).

Academic Advisors for this Guide:
Corrine Lowen, Science Department, Wayland Public Schools, Wayland, MA
Suzanne Panico, Science Teacher Mentor, Cambridge Public Schools, Cambridge, MA
Anne E. Jones, Science Department, Wayland Middle School, Wayland, MA

www.pbs.org/saf/1204

Alien Invaders

Activity 2: Grades 5-8
Aquarium Capers

ANSWERS

QUESTIONS

1.
2. Where did the algal mat that grew over your microscope slides come from?
   (The algae were already living in the fish tank. The slides offered a fresh substrate for colonization. Microscopic spores and cells floated onto the slide and grew into an observable colony.)
3. Was it necessary to expose the beakers and their contents to light? Explain.
   (Yes. The algae require light to meet their photosynthetic needs. Without light, the algae could not survive.)
4. Where did the oxygen required by the snails come from?
   (the gas was replenished in the fresh water. It was also released by the plants during photosynthesis)
5. Suppose the snails were predators and not grazers. Would this affect the results of the experiment?
   (Yes. If they were predators, they would not feed upon the algae. The snails would starve and the algae would grow without this biological control.)

PART TWO

QUESTIONS

1. Why was it necessary to remove all of the snails and other organisms

from the transferred aquarium plants?
(To insure a reliable control, you needed to limit the introduction of snails or other grazers into the control environment.)

2. Was it necessary to expose the beakers and their contents to light? Explain.
(Yes. The algae required light to meet their photosynthetic needs. Without light, the plant will die.)
3. Why were both aquarium plants and algae-covered slides used in this experiment? How is this representative of the concerns raised by the use of biological control?
(Both were used to find out if snails might also eat the "good plants" as well as algae. Although it is preferable to have them graze on the unwelcome algae, they can easily destroy *Elodea* **and other desired plants. This is a common concern when introducing biological control mechanisms to an invaded region.)**