Name: _____
Lab day of week: _____

Microevolution through Natural Selection

Adapted from Mark Smith, Division of Natural Sciences, Fullerton College, CA

Objectives

Observe how predator-prey interactions can change prey populations over time.
Be able to predict how an environment will affect an organism.

Instructions

1. Form groups of four people.
2. Each person will be a predator. Have each person in the group choose a mouthpart, and each get a small cup to represent their stomach.
3. Count out beans for your group. (If you have three predators, start with 10 of each bean. If four predators or more, start with 13 of each bean.) These beans are the prey species, with varying color and size.
4. Select an ecosystem type, represented by a fabric piece. Drape the fabric over some objects to give it interesting topography.
5. Fill in the data below:

   Ecosystem name: _____

   Ecosystem description: _____

   Your predator description: _____

   Hypothesis of most successful predator: _____

   Hypothesis of most successful prey: _____

6. The predators must carry their "stomach" (small cup) with them (in their hand) at all times during the 'capture' period.
7. With the predators' backs turned to the ecosystem, the timer will randomly scatter the initial prey populations over the entire ecosystem. The predators cannot look until the timekeeper is finished.
8. At the timer's signal, the predators will have 15 seconds to hunt and capture prey. You must capture and deposit the prey in your stomach. Any prey that might drop out of your stomach or the ecosystem will be lost. A predator may attempt to 'steal' prey from other predators, but not from their stomachs; you are not parasites.
9. The predators will count the number of each prey type in their stomachs and record it in data table 1. Share your results with the rest of the table.
10. Calculate the number of surviving prey for each type. Also calculate the prey's reproductive success by adding 1 offspring for each survivor. Add the offspring to the surviving populations of prey species for a new population in the next generation.
11. Add the offspring to the surviving populations and mix in the ecosystem.
12. Repeat steps 7-11 for each new generation, and fill in Data Tables 2 and 3.
13. Once you have completed three feeding cycles, you can return all equipment.

Results

Complete your data tables.
Summarize your data in table 4.
Graph your data from table 4.

Data Table 1

	Black	Brown	Red	Lg. white	Sm. white
Initial prey					
Straw kills					
Forceps kills					
Spoon kills					
Dropper kills					
Total kills					
Survivors (10 - # killed)					
Offspring (= # survivors)					
Next population total					

Data Table 2

	Black	Brown	Red	Lg. white	Sm. white
Prey from end of table 1					
Straw kills					
Forceps kills					
Spoon kills					
Dropper kills					
Total kills					
Survivors					
Offspring (= # survivors)					
Next population total					

Data Table 3

	Black	Brown	Red	Lg. white	Sm. white
Prey from end of table 2					
Straw kills					
Forceps kills					
Spoon kills					
Dropper kills					
Total kills					
Survivors					
Offspring (= # survivors)					
Next population total					

Data table 4

Next population total	Black	Brown	Red	Lg. white	Sm. white
Start	10	10	10	10	10
End of round 1					
End of round 2					
End of round 3					

Food Webs

Adapted from Schmidt, et al. 2006. Life All Around Us.

Objectives

Be able to represent basic ecological relationships with a food web.
Be able to predict how a food web might adjust in response to changes.

Introduction

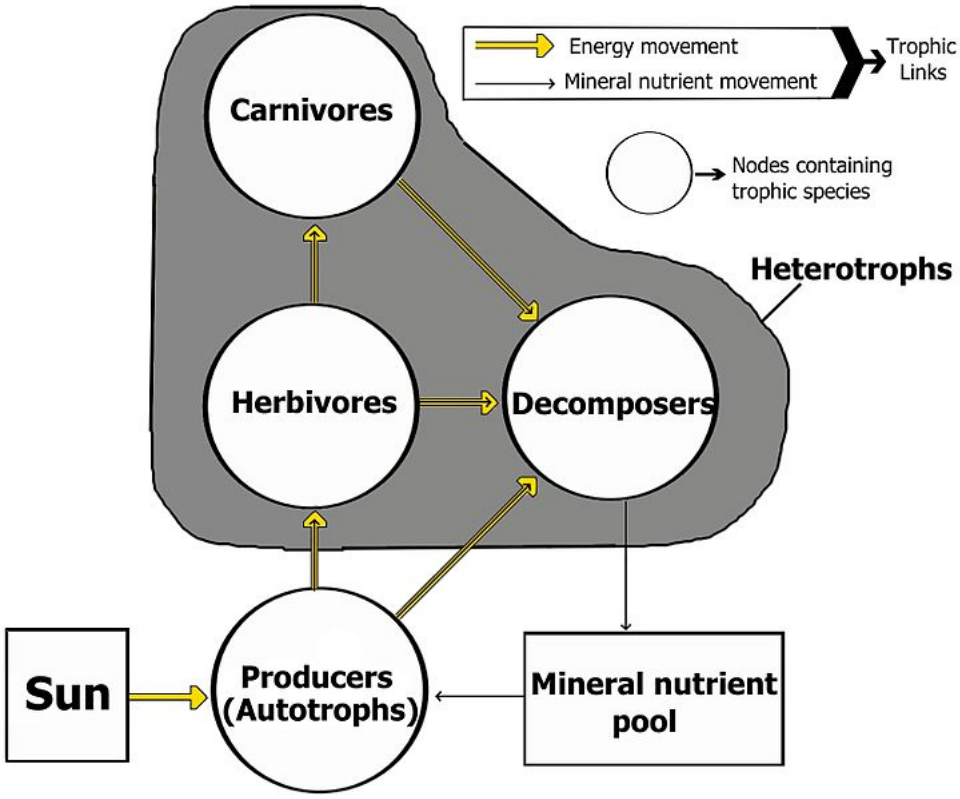

Image from commons.wikimedia.org

The Mole's Food Web

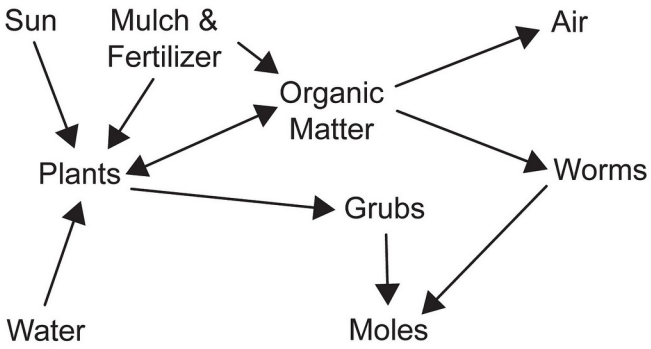

Image from www.flickr.com/photos/dwblakey/

Practice

Aleutian Islands in the 1970s:

The waters of the Pacific Ocean off of the Aleutian Islands in Alaska supported abundant wildlife until the 1970s. There are two main groups of photosynthetic organisms in these waters: kelp (seaweed), and phytoplankton. Kelp forests off the coast were rich in large marine mammal species due to an abundant food supply associated with a cold marine current. **Phytoplankton** (microscopic algae) perform photosynthesis. Microscopic animals called **zooplankton** ate the phytoplankton. **Small fish** ate the zooplankton. **Larger fish** ate smaller fishes. **Seals** and **sea lions** ate large fish. **Killer whales** ate both seals and sea lions.

Seals and sea lions store fat as blubber, which insulates them from the cold water of the Northern Pacific Ocean. Those seals and sea lions are an energy-rich food source for killer whales. **Sea otters** also inhabited the waters around the islands. They can be eaten by killer whales but are not their preferred food source. They are much smaller than seals and sea lions and do not store fat for insulation. Instead, sea otters have an incredibly thick pelt with his many is 1 million hairs per square inch. They use their pelts for insulation.

Sea otters are a keystone species in kelp bed communities. Keystone species have many other species depend upon them. Sea otters are predators of **sea urchins** and help keep sea urchin populations limited. Sea urchins are herbivores that graze on **kelp**.

- Draw a food web representing these relationships as they existed in the 1970s.

Aleutian Islands today:

The waters in this area are much warmer today than they were in the early 1970s. This may be due to natural climatic fluctuations and or global climate change. The phytoplankton does not grow as well in warm water. Scientists began to notice a rapid decline of seal and sea lion populations.

- Draw the food web that could occur today assuming the total collapse of the phytoplankton population.

Lab 11 Assignment

Regarding Lab 11:

1. Turn in this completed lab, and attach your responses to the items below.
2. Attach your graph showing the results of the predator-prey simulation.
3. Compose a paragraph describing what you observed in the predator-prey simulation. Consider discussing changes you saw over several generations, the influence of environment, potential impacts on predators, and implications for resource management.
4. If we saw a video, attach the food webs you drew from that material.