

Activity 5 Predator/Prey Interaction Food Chains and Food Webs

Objectives

Students will investigate predator-prey interactions using a variety of small vertebrate predators. Students will examine prey behavior alone (zooplankton— *Daphnia* or *Agliodiptymus stagnalis*) and then after adding a predator (*A. opacum* [marbled salamander] larvae, mosquito fish, newts, or betta fish). After completing this activity students will understand adaptations used by predators and prey, as well as the terms producer, consumer, herbivore, and carnivore.

Terminology

Adaptation, camouflage, carnivore, comparison, consumers, classification, data, decomposer, detritivore, detritus, environment, experiment, food chain, food web, herbivore, hypothesis, independent variable, inference, insectivore, invertebrate, larva, mimicry, nutrients, observation, omnivore, predators, prediction, prey, producer, refuge, zooplankton

Grade Level: 3rd-6th

Ideal Class Size: 24 students divided into six groups of four

Subject Areas: Life Science, Inquiry Skills

Time

1 hour introduction and presentation
1 hour activity/experiment

Materials

- PowerPoint or Slide Projector w/slides
- Flip chart or writing board and erasable colored markers

Demonstration Equipment

- Living predators and prey such as: *Daphnia* or *Agliodiptymus stagnalis* or mosquito larvae, *A. opacum* larvae, mosquito fish, newts, or betta fish
- Containers for the predators and prey

Posters

- Methods of Science
- SAFE Rules
- A Simplified Food Web
- Data summary table for the predator-prey interactions activity
- Data summary table for the predator-prey game

Copies

- Predator/Prey Interactions data sheet (1/student)
- Predator/Prey Game Rules data sheet (1/student)
- Predator-Prey Interactions word search puzzle

Animal photo cards for predator game

- I am a Bobcat...I eat rabbits and mice
- I am a Hawk...I eat mice and snakes
- I am an Alligator...I eat fish and frogs
- I am a Kingsnake...I eat snakes and mice
- I am a Bullfrog...I eat fish, frogs, and insects
- I am a Praying Mantis...I eat insects

Activity equipment

- Observation chambers
- Black construction paper to cover the chambers
- Test tubes
- 2 blank sheets of white paper

Predator-Prey game supplies

- Animal Photo Cards
 - I am a Bobcat...I eat rabbits and mice
 - I am a Hawk...I eat mice and snakes
 - I am an Alligator...I eat fish and frogs
 - I am a Kingsnake...I eat snakes and mice
 - I am a Bullfrog...I eat fish, frogs, and insects
 - I am a Praying Mantis...I eat insects
- Post-It notes (small) for the Predator-Prey game
- Cut outs of prey templates using bright colored paper
- Cut outs of prey from photographs that were taken of objects in the room

ADVANCED PREPARATION

A) Demonstration

Set up camera/monitor for demonstration of predator-prey interactions

B) Predator-Prey Interaction Activity

- Collect zooplankton samples from a Carolina bay or other source.
- Collect predators from Carolina bay or from a local store (for betta fish).
- Make covers for predator-prey containers from black construction paper; ensure that the covers fit around the jars and can be slipped on and off easily.
- Label the jars based on the predator that will be used.
- Count an appropriate number of zooplankton into test tubes for each pair of students.
- Copy the Task List Objectives onto a classroom writing board or flip chart.

C) Predator-Prey Game

- Photograph objects in the room where the game will be played.
- Superimpose prey templates onto the photographs, copy these, and cut them out. You should now have camouflaged prey that exactly matches objects in the room. Make some prey items from brightly color paper to ensure that they are easy to find.

Safety Notes

Remind students that we are working with living organisms and that they should be treated gently and with respect.

Background Information

A predator is an animal that kills and eats other animals. The animal that is killed is the prey. The relationship between these two animals is known as predation. *For example:* owls eat rodents. The owl is the predator and the rodent is the prey. Most people only think of large land vertebrates as predators, but predators can be found in the water. Arthropods (which include insects) can be predators, too. Predatory arthropods can be as large, or larger, than their prey and are often fast moving and possess good searching capabilities. They use many different strategies than vertebrates for catching and subduing their prey, such as a web, raptorial legs, or paralytic saliva. Some predatory arthropods are predators in only one life stage, such as larval hover flies (Serphidae) or throughout all active stages, such as ladybugs.

In order to survive and reproduce, many prey have evolved cryptic coloration to escape predation. The colors that humans see are not always the same colors that all animals see. An animal's bright colors may not be visible to its primary predators. Camouflage, the ability to blend in with the surroundings, can determine whether a prey remains hidden or is identified by its predator. Some animals go through seasonal color changes to remain camouflaged, e.g., ptarmigans.

Other prey species, like the monarch butterfly, take in poisonous or distasteful plant toxins to avoid being eaten. Some prey species exhibit threatening or hiding behaviors that increase their chances of surviving and reproducing. Some prey behaviors include signaling to others, taking flight, posturing in a fighting position, scrambling for cover, or freezing on the spot. Freezing on the spot is an interesting behavior. Whether the prey uses this defense depends on how close the predator and prey are to each other. If the prey is far away, it will usually signal to other prey that a predator is in the area. If the predator is close by, the prey will freeze. Many times people think an animal is hurt or not afraid of them, but in reality the animal is very afraid and immobile.

Some common prey, such as aphids and rabbits, have amazing reproductive capacities whereby they produce large numbers of young in a short amount of time to ensure that at least a few will reach adulthood and reproduce.

Predators must face their own challenges in finding and catching prey. They have developed adaptations that can help them better find their prey such as echolocation in bats, signal detection in moths, and motion detectors that toads use as they sit and wait for their prey.

Other points to discuss:

- 1) **Predator and prey often benefit from their relationship.** Predators obtain food from their prey. Prey also benefit in that predators keep prey populations at a level that can be supported by the environment.
- 2) **What might happen if all the prey of a certain predator were destroyed?** The predators would either have to find a new food source or they would die, too.
- 3) **What might happen if all the predators of a particular organism were killed off?** The prey would first multiply, but after exhausting available food and shelter sources due to their increased numbers, the prey would soon begin to die as well because the ecosystem could no longer support the expanded prey population.

- 4) **Review the food web with students. Ask student what would happen if a predator fed on only one kind of prey?** Predator population levels would closely follow the prey population levels.

TASK LIST OBJECTIVES
Predator/Prey Interaction
Food Chains and Food Webs

LECTURE AND DEMONSTRATIONS (1 hour)

I. Introduction (10 minutes)

- A. Today's Topic - title
- B. Today's Task List
- C. Review SAFE Rules
- D. Review the Methods of Science

II. Power Point Presentation (15 minutes)

III. Demonstrations (35 minutes)

- A. Predator-prey interactions

TITLE ACTIVITY/EXPERIMENT (1 hour)

I. Introduction and classroom preparation (10 minutes)

II. Conduct the activity (30 minutes)

III. Science Seminar (10 minutes)

- A. Sharing the results
- B. Graphing and interpreting the data

IV. Close out (10 minutes)

- A. Wrap-up questions

LECTURE AND DEMONSTRATIONS (1 hour)

1. Introduction (10 minutes)

A. Today's Topic

Today's workshop highlights Dr. Whitfield Gibbons, a herpetologist who studies reptiles and amphibians. He studies the predator-prey interactions of reptiles, specifically snakes, turtles, and alligators in wetland habitats. One of his most interesting studies is entitled, "How Dangerous Are Venomous Snakes in America?"

We'll learn about predator-prey interactions using a variety of small vertebrate predators. Junior scientists will work in teams to perform experiments with actual vertebrate predators to determine which predator species found and consumed the most prey.

Junior scientists will also explore predator-prey interactions by playing the part of specific predator species. Students acting as predators will search for camouflaged prey species hidden in the classroom.

B. Today's Task List

C. Review SAFE Rules

D. Review the Methods of Science

Who remembers what we did last time we were here? Relate each step of the Methods of Science to some part of the activity from our last visit. Observation, hypotheses, and data collection were the steps that were most emphasized during the activity.

II. PowerPoint Presentation (15 minutes)

III. Demonstrations (35 minutes)

A. Predator-Prey Living Organisms Observations

[Use the camera/monitor set-up to show predator-prey interactions. Living organisms could include salamander eating termites, fish eating zooplankton, etc. Take a few minutes to show the students samples of live organisms, and then add a predator to the dish.]

- *Have the students review predator-prey concepts.*
- *Discuss why we should study predator-prey interactions.*

PREDATOR-PREY ACTIVITY (1 hour)

I. Introduction and classroom preparation (10 minutes)

I want all junior scientists to use their observation skills during the activity. I want you to be observant and take note of the behaviors you observe in the predator. We'll discuss them later on. Are you ready to be junior scientists? Let's get started!

II. Conduct the activity (30 minutes)

[After the materials have been passed out walk the students through their observation activity, having them record their results on the Predator-Prey Interactions data sheet.]

When all four students at one table are finished with their observations, have them discuss what they observed about their predator-prey interactions. Did their prey and predators behave similarly? Were there any differences? Instruct the students to work on their puzzle activities in their notebooks, if time permits.]

Note: *There will be a “wait period” during the observation activity. As soon as all tables are finished with the first part of the predator-prey interaction activity, proceed with the directions for the Predator-Prey game.*

I want you to use your observation skills to look at the predator and prey behaviors:

- Do prey look like they are searching for food?
- Are their antennae moving?
- Do the predators look like they are searching for food?
- Any other noticeable behaviors?
- Maybe with their mouthparts?
- Notice how the prey behave when a predator approaches.
- How does the predator capture and hold its prey?
- What body parts did the predator use to catch their prey?
- What features did the prey have that helped them escape?

III. Be a “predator for a day” and play the predator/prey game

Directions for the predator-prey game are on the back side of the game data sheet. Each student is assigned to be one of six predators (hawk, alligator, kingsnake, praying mantis, bobcat, bullfrog). Each predator can eat only certain prey items from the following list: insects, fish, frogs, snakes, mice, and rabbits. “Predators” are given 5 minutes to find suitable prey items and “kill” them (by marking it with a Post-It note). If a predator does not find and kill enough prey items to survive, it must go to the “Compost Pile.”

IV. Science Seminar (10 minutes)

A. Sharing the Results

This is the time to review the observations made and data collected.

B. Graphing and Interpreting the Data

V. Close out (10 minutes)

A. Wrap-Up Questions

Take a minute to answer questions the students may have come up with during the activity, and to assess their comprehension of the material covered.