

Ecosystems

SESSION 8: HYDRA VS. DAPHNIA

Note: Sessions 3 through 13 present key ideas related to ecosystems in a variety of exploratory activities. Depending on your students' needs as assessed during Sessions 1 and 2, you may choose to eliminate some, expand others or include sessions that deal with other life science concepts and skills.

Getting Organized

Materials

For the class experiments:

Have necessary measuring tools such as a triple-beam balances and rulers as well as observation tools such as microscopes and hand lenses available for students to collect experiment data.

For the teacher:

Chart paper, dry-erase board, or chalkboard and writing implements
Clipboard for keeping assessment notes

For the entire class:

Enough cultures of hydra and daphnia – Order one class set for 30 of each organism for every 15 students.
Small containers for distributing cultures

Note: Do not mix the cultures before distributing them to students. Hydra will rapidly consume daphnia!

For each student:

Handout 10: Food Chain and *Handout 11: Hydra and Daphnia*
Journal notebook

For each pair of students:

1 compound or dissecting microscope
Hand lens
Several well slides and cover slips if using a compound microscope
Droppers or pipettes
Flashlight
Toothpick

Advance Preparation

1. Photocopy *Handouts 10* and *11*.
2. Check hydra and daphnia cultures.

3. Be sure that your living specimens for the next session are available: about 80 planarians for 15 students.
4. Place materials in the materials station.
5. Read over students' aquatic experiment plans. Are the plans complete? Are they clear? Be prepared to return them to students during this session.

Tips for care of organisms:

Hydra will most likely arrive in a small jar. Use any large container at least one quart in size to hold them. To keep a culture of them alive, order daphnia to feed them. Hydras are sensitive to environmental changes, so move them with a large pipette taking care not to injure them.

Daphnia will most likely arrive in a small plastic jar, but need a larger container to grow in. A 1-gallon tank would be ideal. Add two to three pea-sized bits of hard-boiled egg yolk to the gallon-tank. When adding daphnia to a tank, submerge them along with the jar that they come in. If you pour them with the contents of the jar, air bubbles can get trapped under their shells and kill them.

Guiding the Learning

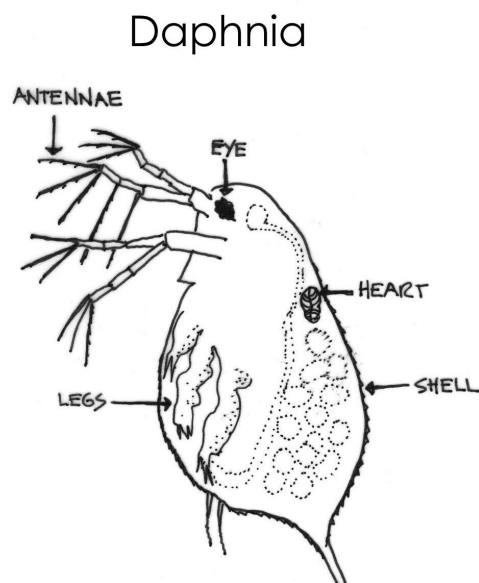
Content Background

Here is background information on the two organisms students will be studying during this session.

Daphnia (water flea)

Kingdom: Animal

- These small animals can be found in many fresh water ponds and lakes.
- Daphnia are *crustaceans* like crabs and lobsters.
- Daphnia eat algae, bacteria and dead plant parts.
- Daphnia can swim with the use of two large antennae. Daphnia also have eyes and a mouth, along with a heart and other organs that can be seen through the hard, clear outer shell.
- Middle school students are capable of observing changes in daphnia heart rate when chemicals or temperatures are manipulated.
- These small animals lay eggs in the sediment at the bottom of their pond. The eggs quickly hatch into young daphnia that grow to full size in a few days.

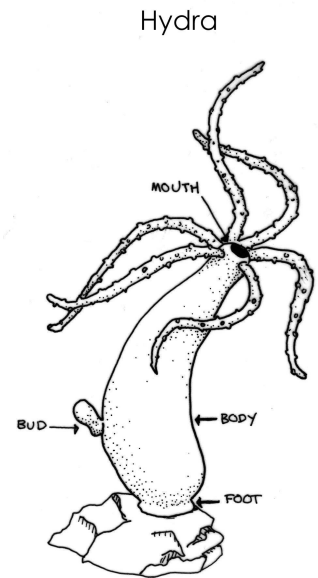


- Many animals including fish, insects, and hydra eat daphnia. Because they eat plants and smaller organisms, daphnia are *consumers*.

Hydra

Kingdom: Animal

- Hydras are a type of fresh-water animal that use tentacles to catch food.
- Hydras eat small fresh water animals including daphnia.
- A hydra has a ring of tentacles around its mouth that leads into a tube-like body. At the base of the body, there is a round foot that helps this animal attach to plants and rocks. Though usually attached to a rock or other object, a hydra can slide like a snail and even tip over to move around.
- Like jellyfish, hydras have stinging tentacles. Small stinging cells on the tentacles stick into the prey and stun it with poison. These tentacles then guide the prey into the mouth.
- Hydra can reproduce sexually – the eggs are dropped into the sediment. They can also reproduce by *budding*. When a hydra makes a bud, it grows a smaller hydra out of one side of its body tube, like an arm. Once this new hydra animal is big enough, it falls off to become a separate animal.



What's the Science?

- ❑ An ecosystem involves a system of relationships.
- ❑ One way to understand these relationships is to look for food chains.
- ❑ All food chains start with the sun and plants.
- ❑ Plants play the role of a producer in an ecosystem – because they create their own food.
- ❑ An organism that eats plants is called a primary consumer.
- ❑ An organism that eats a primary consumer is called a secondary consumer.

Process Skills and Objectives

Students will:

- ❑ use a microscope and a hand lens to observe hydra and daphnia.
- ❑ identify and diagram a food chain.
- ❑ read to learn about hydra and daphnia.

Daily Routine

Allow students five minutes to collect their experiment data.

Setting up the Problem

Can students recall the organisms that they have considered for inclusion in their mini-ecosystems thus far? (Elodea and/or duckweed, paramecia, and euglena) Share some of their initial thinking about whether or not they will include them. Then introduce them to the names of the two new organisms that they will consider: *hydra* and *daphnia*. Display a photocopy of each organism. (Photocopy pictures from *Handout 9*.)

Note: Do not give students the handout yet. Instead, allow them to explore and answer their “what-if” questions before distributing it.

Point out the list of questions that they generated during Session 7.

Possible chart:

<p><i>What does this organism eat?</i></p> <p><i>What eats this organism?</i></p> <p><i>Where can this organism be found in the natural environment?</i></p> <p><i>Is its habitat similar to the mini-ecosystem?</i></p> <p><i>How will the size of the ecosystem affect this organism?</i></p> <p><i>What is the life cycle of this organism like?</i></p> <p><i>Does it reproduce quickly?</i></p>
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Mini-Lesson: Food Chain

Remind students that they will be observing two organisms -- *hydra* and *daphnia*. Add these names to the word wall. Explain that these two organisms are part of a food chain. Distribute *Handout 10: Food Chain*. Give students an opportunity to read about the food chain. Then ask them to discuss and summarize what they learned. Share a few summaries. Add the term *food chain* and its definition to the word wall. Then send students off to work.

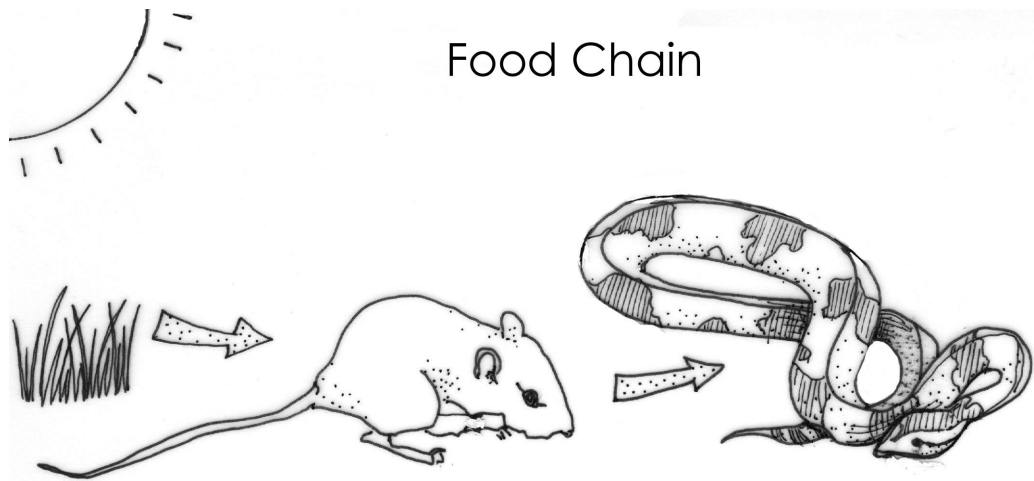
Name _____

Date _____

Handout 10: A Food Chain

All living things need food for energy. That's what keeps them alive and growing. Knowing where organisms get their energy in an ecosystem is important. That will help you plan your ecosystem.

This diagram shows a food chain that exists in a grassland ecosystem. A food chain shows one feeding relationship. It shows how energy flows from one organism to another.



Notice that the food chain begins with the sun and a plant. That is because the plant absorbs the sun's energy and uses it to transform carbon dioxide and water into a source of energy for the plant -- sugar. This process is called *photosynthesis*. (The focus of this article is on food. But, don't forget that oxygen is released back into the air during photosynthesis.)

Because plants can use these chemicals to make food – they are important in an ecosystem. They are called *producers*. They produce the food and energy for all other living organisms. All animals either eat plants, eat animals that eat plants, or eat animal eaters. Some animals, like humans, eat all three.

The mouse in the chain is a *consumer*. The mouse eats the plant to get the food and energy to live. It is called the *primary consumer* because it is *one* link away from plants in the chain.

Look at the food chain diagram again. Notice that the arrow is pointing to the snake. That shows that another consumer -- the snake, eats the mouse.

The snake is a *secondary consumer*. Can you think of a tertiary consumer -- the missing link in this food chain -- that might eat a snake? Write its name on this line: _____.

(By the way, you can also use the terms *predator* - *prey* to describe the snake and the mouse. The predator is the hunter--in this case the snake. The prey is the hunted--in this case the mouse.)

Your Task:

Draw a diagram of one food chain that might exist in an aquatic ecosystem with the following organisms:

paramecia, euglena, duckweed, hydra, daphnia, elodea

First observe daphnia and hydra to help you. Then draw the diagram on the back of this sheet or in your journal. Use the words *producer* and *consumer* in your diagram.

Tape this handout in your science log or journal.

Independent Work Time

Note: If distribution and clean-up have gone smoothly, you may wish to add an extra five minutes to this part of the session.

Follow the materials distribution system that you developed with students during Session 6. Ask students to spend 20 to 25 minutes observing these organisms. First ask them to use hand lenses, or dissecting microscopes, in order to observe several animals at once.

Then using a pipette, tell them to move the organisms to deep well slides for viewing with the compound microscope. Recommend that they use the low magnifications, as these organisms are relatively large. You may wish to chart their assignment to help them stay on task.

*Use a hand lens to look at the hydra and daphnia.
Use a pipette or dropper to place them in a well slide.
View them using the microscope at low magnifications.
You may put organisms together to see what, if any, feeding relationship you discover.
Draw and write about what you observe.*

After 20 to 25 minutes, direct students how to clean up. During the clean-up process, suggest that students with no clean-up responsibility complete their journal entries.

Note: This is a period for students to explore these organisms and for you to make note of their understanding of the concepts. And, too, it is an opportunity for you to evaluate their ability to use a microscope and write about their observations. Content information will be discussed during the share.

Assessment

Note whether or not students can prepare a slide, focus a microscope and can draw a diagram. Also determine how well they can describe their observations. And, finally, determine if students understand what some of the feeding relationships in an environment are. Use what you learn about their needs to help you plan future whole-class or small group mini-lessons.

Share

Have each student share one statement about what he or she learned about these organisms from their observations. Then distribute *Handout 11: Hydra vs. Daphnia* to students. Read it together, discussing any terms with which students have difficulty. Have students draw the food chain illustrating their relationship to complete *Handout 10*.

Extension or Homework

Have students research more information about daphnia and hydra.

Ask students to write their initial ideas about whether or not they would add these two organisms to their ecosystems.

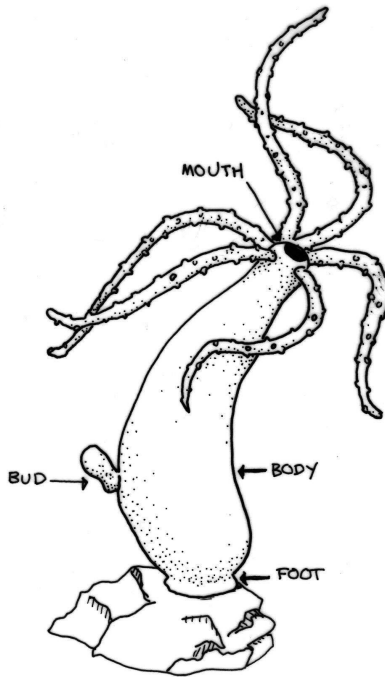
If necessary, have students make final revisions to their aquatic plant experiment plans.

Name _____

Date _____

Handout 11: Hydra and Daphnia

Hydra

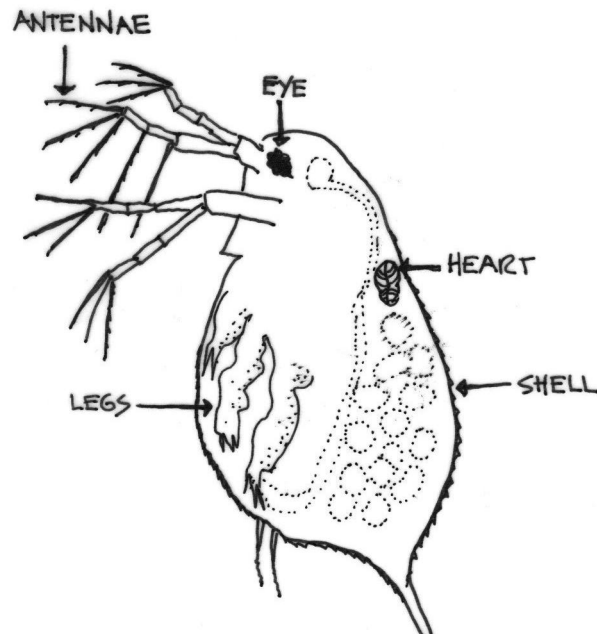


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