

Tracy Armand
Grolee Elementary
Opelousas, La.

Grade Level
Middle School (6-8)

Duration
Four to six weeks

Subject Area
Inquiry
Life Science

Materials List

- *Daphnia* spp.
- Computer with internet access and presentation capabilities
- BM #1-3

Grade/Benchmark/GLE Science
6,7,8/SI-M-A1/1,2
6,7,8/SI-M-A4/10-13
6,7,8/SI-M-B1/25,27
7/LS-M-D1/30
9/SI-H-A2/4

BM = Blackline Master

Pass the Water Fleas, Please



1 of 7

NOTE: This lesson should be used only after paddlefish have been eating food for a couple of weeks.

Focus/Overview:

Over the course of several weeks, students will be engaged in detailed observations of paddlefish during periods of feeding. They will record qualitative data of feeding behavior, physical descriptions of rostrum development, and infer the relationship between these components.

Background Information:

Paddlefish are filter feeders, having comb-like rakers that filter plankton from the water. They feed primarily on microscopic crustaceans including *Daphnia* spp., copepods and ostracods.

Daphnia spp., commonly known as water fleas, are small freshwater crustaceans. They are a major food source for young and adult freshwater fish. Copepods can be found in freshwater and saltwater. Ostracods are abundant in the marine environment and are also found in freshwater lakes and streams. Some species of ostracods are scavengers that feed on dead fish.

Additional background information on BM #1.

Learning Objectives:

Students will:

- Observe and infer sources of food for the paddlefish.
- Conduct Web searches to learn about *Daphnia* spp., copepods and ostracods as food for paddlefish.
- Create and share PowerPoint reports about one food source of paddlefish.



Procedure:

Preparation

Before starting this activity, make sure that you have a healthy *Daphnia* spp. colony. Information on how to feed and raise *Daphnia* spp. can be found in the *Native Fish Manual*.

Daphnia spp. can be purchased from several sources:

Carolina Biological, <http://www.carolina.com>

Science Stuff, <http://www.sciencestuff.com>

NASCO Science Catalog, <http://www.enasco.com/prod/Home>

WARD's Natural Science, <http://wardsci.com/Default.asp?>

Day 1

Show students a picture of an adult paddlefish, noting its large size. Ask the students what they think paddlefish feed on. Have them brainstorm ways in which they might discover what paddlefish eat. Record their ideas, and lead the discussion to include observations of eating preferences displayed by paddlefish in the recirculating tank in your classroom.

Tell students that they will be making observations of paddlefish feeding behaviors. Students split up into small groups; each group will get a chance to watch the fish feed. Students will record predictions and observations of each feeding, including information about the duration of feeding and type and number of behaviors observed. Use the feeding observation sheet (BM #2).

Some examples of feeding behaviors to look for:

- Movement: type, speed, length
- Level of fish in water column
- Interactions with other fish
- Physical description of fish

Each group of students will make five-minute observations of the behaviors of the fish without food in the tank and record their findings.

Days 2 to 7 (Time depends on number of groups.)

Each day, one group will make two five-minute observations.

The first five minutes, the groups will observe and record fish before food is introduced. Then, for the second five minutes, groups will observe the paddlefish when crumble food is introduced and record their findings. Students gather around the tank before the automatic timer releases the crumble, or one of the students will feed the fish 1/8 teaspoon of crumble by sprinkling it on the surface of the tank.



Week 2

Each day, one group will make two five-minute observations, one before feeding and one during feeding.

The groups will observe as paddlefish feed on *Daphnia* spp. Pick one student from the group to take a small fish net and dip it into the *Daphnia* spp. tank. With the *Daphnia* spp. in the net, the student then dips it into the recirculating tank to release the *Daphnia* spp. Remove the empty net and observe and record feeding behaviors.

If possible, repeat step 4, with ostracods and copepods. Then students will be able to see if there are any different feeding strategies or preferences between the different types of organisms. This would extend through the next week or two.

Week 3

Students write a paragraph summarizing their observations, findings and inferences of paddlefish feeding behavior.

Conduct a class discussion on students' observations, findings and inferences. Give students background information on the diet of paddlefish and the structure and function of their filter feeding systems (BM #1).

Divide the class into small groups and begin a Web search to learn more about paddlefish and their eating habits. Choose "expert groups" to focus on *Daphnia* spp., copepods, ostracods or other interesting food preferences or behaviors of paddlefish learned through this lesson and accompanying Web search. Students develop a PowerPoint report to show what they have learned. Provide sufficient time for researching and preparation of reports.

Week 4

Students give PowerPoint presentations to the class.

Assessment Strategies:

Students will be assessed on their observations (BM #2) paragraph and PowerPoint presentation (BM #3).



TEACHER REFERENCES:

Internet Sources

Dürbaum, Johannes and Thorsten-D. Künnemann. *Biology of Copepods: An Introduction*. Carl von Ossietzky University of Oldenburg.

<http://www.unioldenburg.de/zoomorphology/Biologyintro.html>.

Accessed January 5, 2004.

Images and descriptions of copepods.

Museum Victoria Australia. *Biology of Ostracods*. <http://www.museum.vic.gov.au/crust/ostbiol.html>.

Accessed January 5, 2004.

Information about the anatomy, ecology and distribution of ostracods with a link to the ostracod gallery of images.

Parmentier, Jan and Wim van Egmond. *Water Fleas*. Accessed January 5, 2004.

<http://www.microscopy-uk.org.uk/mag/artjun99/wflea.html>.

Images and descriptions of *Daphnia* spp.

Schumann, Kai. *Daphnia FAQ*. <http://www.ee.pdx.edu/~davidr/discus/articles/daphnia.html>.

Accessed January 5, 2004.

Comprehensive information for *Daphnia* spp. cultures.

Van Egmond, Wim. *Microscopic Fresh Water Crustaceans*. Microscopy-UK.

<http://www.microscopy-uk.org.uk/mag/wimsmall/crust.html>. Accessed January 5, 2004.

Images and descriptions of various freshwater crustaceans. Includes a labeled anatomy drawing of *Daphnia* spp.

Wilkins, Lon A. "Tuning Into Paddlefish," *Missouri Conservationist Online*. Conservation Commission of Missouri. <http://www.conservation.state.mo.us/conmag/2001/01/30.htm>.

Accessed January 5, 2004.

Information about the rostrum and feeding habits of the paddlefish.

Interview

Smith, Nicole. Louisiana State University Coastal Fisheries Institute: Baton Rouge, LA.

Email: nmille1@lsu.edu.

Thesis available at <http://etd.lsu.edu/docs/available/etd-11102004-154214/>



Blackline Master #1

Additional Background Information

Paddlefish are called filter feeders. They have comb-like gillrakers that strain plankton from the water. They swim with their mouths open wide so they can filter plankton from the water. Paddlefish feed primarily on microscopic and small crustaceans including *Daphnia* spp., copepods and ostracods.

At first, young paddlefish do not have gillrakers. They selectively feed by swallowing their food. Once fingerlings are about (5 in) in length, they will start to filter feed, but may still selectively feed up to one year or until they are 55 to 65 cm (22-26 in) in total length.

Research on paddlefish feeding behaviors shows that the fish use electroreceptors on their rostrum to find plankton swimming in the water. To find out what paddlefish feed on, scientists make observations of stomach contents.

Daphnia spp., commonly known as water fleas, are small freshwater crustaceans. They are a major food source for young and adult freshwater fish. Under a microscope, *Daphnia*'s heartbeat can be seen. *Daphnia* spp. can reproduce both sexually and asexually. Most of the time, the population consists of females that reproduce asexually. The population can increase quickly because a female may produce more than 100 eggs per brood every three days. *Daphnia* spp. feed on bacteria, yeast, micro algae, detritus and dissolved organic matter. For photographs and images of anatomy, visit <http://www.microscopy-uk.org.uk/mag/wimsmall/crust.html>.

Copepods can be found in fresh and salt water. Most of the 9,000 species of copepods crawl or swim, but at least one-third live as parasites on fish and invertebrates. Some species of copepods can be found in peat moss or in wet compost heaps. The body of the copepod is slender and segmented. Its antennae allow it to drift in the water. Males fertilize females during copulation by attaching a spermatophore to the genital field of the female. The female then forms egg sacs within a few hours to a few days after fertilization. The egg sacs are in pairs and are carried outside the body under the abdomen. They may produce several thousand eggs. Copepods feed on algae and microbes. For more information on habitat and photographs of copepods, visit <http://www.uni-oldenburg.de/zoomorphology/Biologyintro.html>.

Ostracods are abundant at sea, but some live in lakes and streams. In total, there are 8,000 different species. At sea, most are benthic, (live on the bottom) and move with their legs barely visible from between the shells of the carapace. Some species of ostracods are scavengers, feeding on dead fish. Others have strong claws for grabbing small live prey. The mating of the ostracods is unique. The males attract females using flashing lights to signal, like Morse code. The females brood eggs in a chamber of the carapace, then the males transfer sperm to the female before the eggs are laid. Ostracods can live for more than two years, but molt only four or five times during their lifetime. For more information on the habitat, anatomy and photographs of ostracods, visit <http://www.museum.vic.gov.au/crust/ostbiol.html>.



Blackline Master #2

Name _____

Feeding Observations

Physical description of fish (rostrum development)

Date	Time	Food Source	Observation Time	Behavior During Feeding	
				Type	Number of times
	11:03	crumble	5 minutes	Behavior Type	✓ ✓ ✓

Answer questions after recording all observations. Use back of page.

1. What was the most common feeding behavior?
2. Did you notice any changes in feeding behavior as the paddlefish developed?
3. How did the paddlefish act or move when feeding?
4. Where were the paddlefish in the water column when feeding?



PowerPoint Presentation Scoring Rubric

Successfully Accomplished 4	Mostly Accomplished 3	Partially Accomplished 2	Insufficient 1	No Effort 0
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Factual Information					
Information is accurate and is at an appropriate level for the audience.	4	3	2	1	0
Information is timely and is relevant to the presentation of the topic.	4	3	2	1	0
The significance of the topic is communicated to the audience	4	3	2	1	0
A list of resources is provided (Web sites, books, etc.).	4	3	2	1	0
Organization					
Presentation follows a clear, logical plan. The organization is obvious to the audience.	4	3	2	1	0
Visual aids are useful to the audience in furthering their understanding (readable, clear, logical).	4	3	2	1	0
Presentation					
Student worked well with others and shared in the actual presenting.	4	3	2	1	0
The presentation was clear and understandable to the audience.	4	3	2	1	0
Score					