

Changes in Materials for *Animal Studies*



Since publication of the *Animal Studies* Teacher’s Guide Third Edition, Carolina has discontinued dried plankton based on its increasing expense due to limited availability. Carolina’s Living Materials Department recommends “Frog Bites” food pellets as suitable replacements in the *Animal Studies* unit kit for both plankton (fiddler crab food) and brine shrimp flakes (dwarf frog food.) This change in materials requires revised instructions in the *Animals Studies* Teacher’s Guide and Student Investigations book for Lessons 3 and 5.

This errata set includes the following:

- For *Animal Studies* Teacher’s Guide Third Edition, Section 3: Materials Management and Safety—revised pages 5-7 and 9-11
- For *Animal Studies* Teacher’s Guide Third Edition, Section 4: Unit Investigations and Blackline Masters—revised pages 24-25, 27-28, 30-31, 55-56, and 60
- For *Animal Studies* Teacher’s Guide Third Edition, Section 5: Student Assessment, Formative Assessment—revised Question 2.1 and Question 2.4
- For *Animal Studies* Student Investigation book—revised pages 9 and 18

Photocopy and distribute these new instruction pages as needed.

If you have questions about these changes or about the module in general, call Carolina’s product information staff at 800-227-1150 (8 a.m.–5 p.m. ET, M–F), or email stc@carolina.com.

Before you place an order, remember to do the following:

- Choose your desired date of arrival. It should be a Wednesday or a Thursday because your live materials will be shipped on a Monday or a Tuesday.
- Indicate the requested date of arrival on each order sheet. Before these dates, prepare for the organisms' arrival as indicated in the **Care and Handling of Live Materials** section, pg. 9.
- Alert your school's front office to the expected arrival date. Arrange for the boxes to be brought to your room immediately upon delivery. Plan to teach the lesson the day after the animals arrive, if possible.
- Find out whether exterminators are scheduled to visit your school. If so, be sure they do not treat your classroom while you are teaching the unit.
- Open the carton and remove the live materials as soon as they arrive. See **Care and Handling of Live Materials** section, pg. 9, for guidance on how to maintain live materials.

If you are not using the *Animal Studies* unit kit from Carolina Biological Supply Company, be sure to contact your supplier to establish a delivery schedule.

Materials List

This Materials List chart is a cross-reference guide for the materials supplied in the *Animal Studies* unit kit (Item Number 97-2401U2). It gives the description of each item as it is listed in the lessons of the Teacher's Guide, and provides the cross-reference description of the item as it appears on the kit's packing list, which you will find in the *Animal Studies* unit kit box(es). Please note that the metric and English equivalent measurements in this unit are approximate. For additional information about the materials in this unit kit, please contact Carolina at 800-227-1150 or www.carolinacurriculum.com/STC/Elementary.

Item Description in Teacher's Guide	Description on Packing List	Lesson Number (Quantity Used)
Aquarium dip net, 5 cm (2 in)	Aquarium dip net	3 (2), 4 (2), 5 (2), 6 (2)
Aquarium thermometer	Aquarium thermometer	3 (1)
Bag of aqua gravel, 13.7 kg (30 lbs)	Box of 6 5-lb bags of aqua gravel	3 (3), 8 (3)
Black china marker	Pack of 8 black china markers	3 (8), 5 (8), 8 (8)
Black permanent marker	Fine-point black permanent marker	3 (1), 5 (1)
Bottle of tap water conditioner, 60 mL (2 oz)	2-oz bottle of tap water conditioner	3 (1), 5 (1)
Container of food pellets (1.2 oz)	Frog Bites , 1.2 oz	3 (1), 5 (1)
Flashlight with batteries	Standard 2 D-cell flashlight	10 (8)
	Pack of 16 D-cell batteries	10 (16)
Green permanent marker	Fine-point green permanent marker	3 (1), 4 (1)
Hand lens	Pack of 30 hand lenses	3 (30), 4 (30), 5 (0), 6 (30), 7 (30), 8 (30), 9 (30), 13 (30), 14 (30), 15 (30)
Humus, 1.6 liters (54 oz)	1.6-L bag of humus	5 (1)
Large plastic trash bag	30-gal trash bag	5 (1)

Item Description in Teacher's Guide	Description on Packing List	Lesson Number (Quantity Used)
Living Materials Order Form 1		
Dwarf African Frog	16 dwarf African frogs	3 (16), 4 (16)
Elodea Sprig	32 elodea sprigs	3 (32)
Living Materials Order Form 2		
Fiddler Crab	8 male and 8 female fiddler crabs	5 (16), 6 (16)
Living Materials Order Form 3		
Millipede	16 millipedes	8 (16), 9 (16)
Moss Mat	3 moss mats	8 (3)
Marine sand, 13.6 kg (30 lbs)	Box of 6 5-lb bags of marine sand	5 (5)
Metric ruler	Pack of 8 plastic metric (12 in) rulers	3 (8), 5 (8), 8 (8)
Model of hairgrass, 10 x 6 cm (4 x 2.4 in)	Models of hairgrass	5 (8)
Orange permanent marker	Fine-point orange permanent marker	5 (1), 6 (1)
Package of sea salt, 709 g (25 oz)	Package of sea salt	5 (1)
Pair of disposable gloves	Glove, disposable, small, pack of 100	8 (60), 9 (60), 10 (60) Use for live materials setup
Plastic cup, 270 mL (9 oz), and lid	Pack of 40, 9-oz. plastic cups with slotted lids	3 (9), 4 (16), 5 (14), 6 (16), 8 (8)
Plastic cup, 60 mL (2 oz), and lid	Pack of 16, 2 oz. plastic cups and lids	3 (8), 5 (8)
Plastic flex tank, 3.8 liters (1 gal) and lid	1-gal plastic tank; lid for 1-gal plastic tank	3 (8)
Plastic flex tank, 5.7 liters (1½ gal) and lid	1½-gal plastic tank; lid for 1½-gal plastic tank	5 (8), 8 (8)
Plastic pail, 1.9 liters (2 qt), and lid	2-qt plastic pail; lid for 2-qt plastic pail	3 (3), 5 (8) Use for live materials setup
Plastic pail, 2.8 liters (3 qt), and lid	3-qt plastic pail; lid for 3-qt plastic pail	3 (8), 5 (2) Use for live materials setup
Plastic spoon	Pack of 16 plastic teaspoons	3 (8), 4 (8), 5 (8), 6 (8)
Plastic water bowl	Plastic water bowls	5 (8)
Plastic water mister	Plant mister bottle; plant mister sprayer	8 (8), 9 (8), 14 (8)
Post-it notepad, 76 x 76 mm, (3 x 3 in)	3 x 3 in Post-it notes pad	4 (1), 5 (1), 6 (1), 7 (1), 8 (1), 9 (1)
Sheet of black construction paper, 24 x 30 cm (9½ x 12 in)	Pack of 50 9 x 12 in black construction paper	9 (8), 10 (24)

Item Description in Teacher's Guide	Description on Packing List	Lesson Number (Quantity Used)
Woodland terrarium soil, 7 liters (7.4 qt)	12-L bag of Carolina woodland terrarium soil	8 (1)

Needed But Not Supplied Materials

The following chart lists the materials that are needed for teaching *Animal Studies*, but are not supplied in the *Animal Studies* unit kit from Carolina Biological Supply Company. These items are commonly available in most schools or can be brought from home. Designed as a quick reference guide, the chart shows the materials that are needed for each of the 17 lessons. It will enable you to begin gathering the materials needed ahead of time.

Description in Teacher's Guide	Lessons																	Assm't 1	Assm't 4
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
Assorted markers	✓	✓	✓		✓		✓	✓			✓						✓		
Masking tape	✓	✓	✓	✓	✓		✓	✓	✓						✓		✓		
Newsprint pad, 61 x 91 mm (24 x 36 in)	✓	✓	✓	✓	✓		✓	✓			✓				✓		✓		
Pencil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓				
Science notebook	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
White drawing paper or poster board, 24 x 30 cm, (9½ x 12 in)	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓		✓			
Large bucket or other container			✓					✓											
Overhead projector			✓																
Paper towels			✓	✓	✓	✓		✓											
Sponges			✓		✓														
Box or other container					✓														
Leaf liter								✓											
Pieces of mushrooms, decaying wood and leaves, and fruit								✓	✓										
For live materials setup scissors																			

Care and Handling of Live Materials

This section is intended as a guide to the care, handling, and maintenance of the living organisms that will be needed during the *Animal Studies* unit. Dwarf African frogs, fiddler crabs, and millipedes will be studied during the *Animal Studies* unit. If you are using the *Animal Studies* unit kit from Carolina Biological Supply Company, you will need to order these living organisms separately by completing the prepaid living materials order forms that are included in the kit container or refurbishment set box. For specific information about ordering these living organisms, see pgs. 4–5 in the Unit Kit Materials List and Reordering Information section.

Why Use These Organisms?

The organisms in this unit were thoroughly researched before they were selected. The selection criteria for each organism included the following:

- The organism supports the goals of the unit.
- The organism is easy to use in the classroom.
- The organism is available year-round.
- The organism can be cultured, or raised under human care (often in a laboratory); therefore, the population of the organism in the wild will not be depleted.
- If the organism is not culturable, research has shown that collecting it from its natural environment will not affect its population or the existing food webs.
- The organism is unlikely to harm local ecosystems.

If you decide to substitute other organisms for those used in this unit, please keep these criteria in mind.

Note: For information on what to do with the organisms when the unit is over, see Advisory on Releasing the Organisms, pg. 12.

Tips on Receiving Live Materials

Dwarf African Frogs (*Hymenochirus boulengeri*)

Materials

- 2 holding pails with lids, three-fourths filled with conditioned water
- 1 bottle of tap water conditioner
- 1 holding pail (empty)
- 2 aquarium dip nets
- 1 aquarium thermometer
- 1 plastic cup, 270 mL (9 oz)
- Food pellets
- Elodea
- Scissors

Procedure

Before the frogs arrive, put water into two plastic holding pails until each is about three-fourths full. Add a drop of the tap water conditioner. Let the water sit to reach about room temperature. Generally, dwarf African frogs do best in a temperature of 22°C (72°F) or above.

When the frogs arrive, open the box immediately. The frogs will be in a plastic bag. Open the top of the bag and give it about 20 minutes to reach room temperature (the same as the water in the two pails). This will prevent shock from a change in water temperature. These frogs are especially sensitive to sudden temperature changes.

Elodea, a water plant, will be shipped with the frogs. Put half the plants in each holding pail of dechlorinated water. Now carefully pour all the frogs and the shipping water into the **empty** pail.

Note: If the weather is cold, the frogs may have slowed down their movement. Allow time for the frogs to warm up before assuming they are dead.

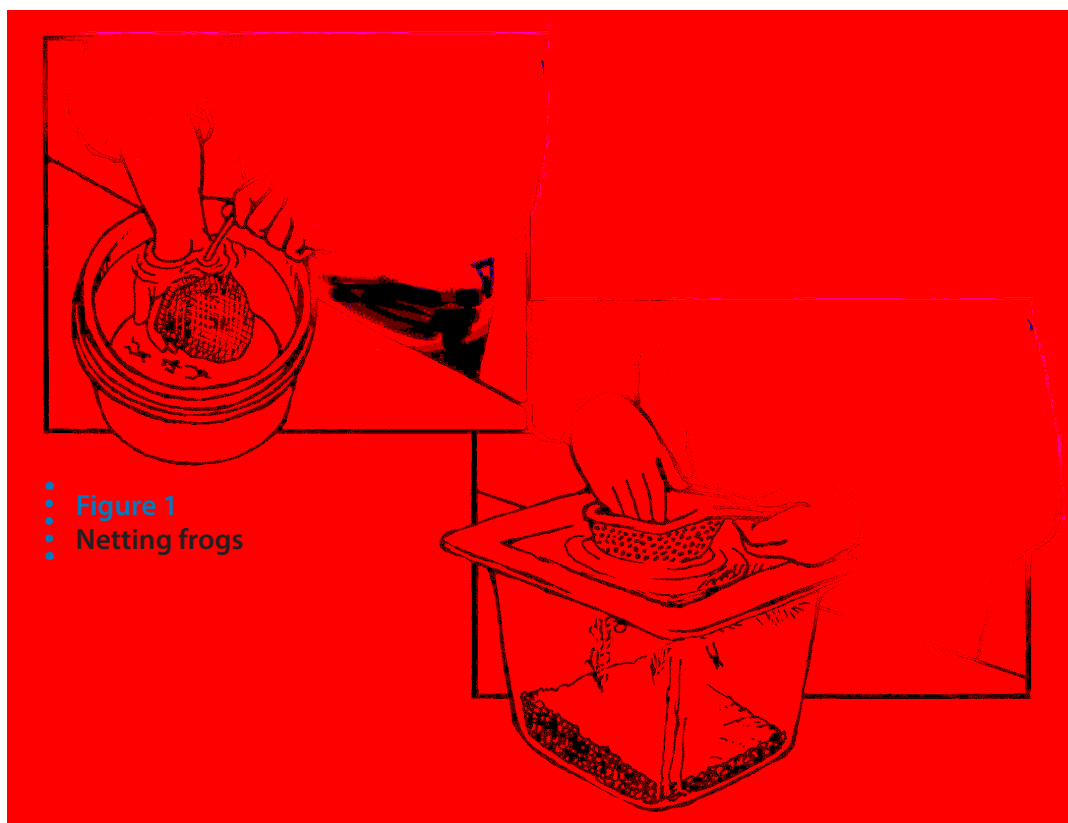
To help the frogs adjust to the pH in the holding pails, you need to gradually replace some of the shipping water with some water from the pails. Scoop out a cupful of the shipping water and discard it. Replace it with a cupful of the fresh water. After 15 minutes or so, replace another cupful and wait 15 minutes.

Then, with an aquarium net, transfer the frogs gently from the shipping water to the holding pails, placing half of the frogs in each pail (see figure). Always hold your hand over the netted frogs (remember, they can jump). Discard the shipping water. Use the scissors to punch air holes in the pail lids and cover the pails.

Until you are ready to use the frogs, store the holding pails in a safe place that is not too hot or cold, is in indirect light, and is out of the children's view.

Feed the frogs once each day by putting 1-2 food pellets per frog in each pail. Try to remove any uneaten food when possible.

If you must hold the frogs for more than a week before using them in Lesson 3, use a clean cup to scoop off one-fourth of the water a couple of times during the week. Replace it with an equal amount of room-temperature, dechlorinated water.



• Figure 1
• Netting frogs

Fiddler Crabs (*Uca minax*)

Materials

- 3 holding pails with lids
- 2 270-mL (9-oz) cups of sand
- 1 bottle of tap water conditioner
- 1 aquarium net
- Food pellets
- Instant Ocean®

Procedure

Before the crabs arrive, fill one holding pail halfway with tap water. Add a drop of tap water conditioner. Then add one teaspoon of Instant Ocean®, stirring to dissolve the powder. Let the water sit to reach room temperature.

Put one cup of sand in an empty pail so that the sand forms a gradual slope up to a small mound on one side of the pail (see **Student Instructions for Building a Fiddler Crab Habitat** in Lesson 5). Add one cup of the dechlorinated salt water to the side of the pail with no sand. Wait a few minutes. The sand will absorb some of the water. Add more water until it is about 1.5 cm ($\frac{3}{8}$ in) deep.

Repeat these steps for a second holding pail. In a few hours, check the water level in both pails. The sand may have absorbed more of the water and you may need to add more.

When the crabs arrive, open the box immediately. The crabs will be in one or two plastic bags. Open the bags slightly to pour out the shipping water. Then, carefully pour half the crabs into each pail.

Feed the crabs by putting 1-2 food pellets per crab in both the water and on the sand. Punch air holes in the pail lids and cover the pails.

Until you are ready to use the crabs, store the holding pails in a safe place that is not too hot or cold, is in indirect light, and is out of the children's view. Check the water level and food in each pail daily. When necessary, remove any old uneaten food and add fresh food.

Do not keep the crabs in the holding pails for more than a day or two. If necessary, skip ahead in the unit to Lesson 5 and create the crab habitats. Discard the wet sand from the holding pails.

Millipedes

Materials

- 1 holding pail and lid, with 5 cm (2 in) of damp soil
- Leaf litter
- 1 scissors
- 1 pair of disposable gloves
- Pieces of lettuce, mushrooms, vegetables, fruit, decaying wood, or decaying leaves

Procedure

Before you transfer the millipedes from the shipping container to the holding pail, use the scissors to punch a few air holes in the lid of the holding pail.

Put a 5-cm (2 in) layer of damp (not wet) soil on the bottom of the holding pail. Add 2 inches of leaf litter.

Open the shipping container and gently tip the millipedes into the pail. You can store them anywhere that is not too cold or too hot.

If you need to keep the millipedes in the pail for more than a day, give them a small handful of lettuce, mushrooms, vegetables, fruit, decaying wood, or decaying leaves to eat.

Maintaining the millipedes in the classroom

Add some decaying wood, bark, or more leaf litter to each terrarium. The millipedes will burrow into the soil or under the moss, seeking a dark, damp spot. Keep a supply of food for millipedes in the school's refrigerator. Feed the millipedes a few pieces every couple of days. Remove food beginning to mold.

Note: Whenever you or your students handle the millipedes, you will need to wear the disposable gloves provided in the kit. These gloves should be worn only one time. Always make sure students wash their hands when they are finished observing and handling the millipedes.

When taken out of the security of a terrarium or other container, millipedes may defecate. On occasion, they may also give off a secretion from their stink glands. The secreted substance can cause mild irritation to mucous membranes (such as the eyes) or open cuts. In this event, immediately flush the area with water.

The frog's toes are webbed, and the inner three toes of the hind limbs are clawed. The frog's eyes are small and without lids. Its nostrils are large, and its mouth is toothless. Frogs do not have external ear flaps as humans do, but, like humans, they hear through a tympanic membrane.

The dwarf African frog has a limited ability to lighten and darken its color to match its surroundings. This coloring acts as good camouflage when frogs hide among plants and rocks or search for food. Students may observe frogs shedding their skin. Frogs often eat the shed skin to get protein.

Feeding Behavior

Frogs feed mostly on aquatic invertebrates (crustaceans, worms, and insects) and mainly as a response to a visual stimulus such as movement. Because the frog's eyesight is better above than in front of its snout, it will feed on food that is not moving only if its snout has been touching the food for some time. Your class will feed the frogs food pellets, which are nonmoving.

Students will observe the frog snapping at food at the water's surface. The frog will also search for food along the bottom of the tank, where it will use its down-pointed snout and front feet to push stones aside to locate food. The frog lunges at its prey and sweeps it into its mouth with its front feet. With its back and front feet, the frog often tears larger food before swallowing it.

In the post-metamorphic stage, all frog species breathe through lungs that take oxygen from the air. Students will observe in the dwarf African frog an interesting behavior called **burbling**, the expiration and inspiration of air at the water's surface. In addition to taking in some oxygen from the water through its skin, the frog also can breathe atmospheric air through the lungs by surfacing to burble. The frog floats parallel to the surface, arms and legs extended and spread apart, snout protruding from the water, and rapidly and silently pulsates its throat. As the frog burbles quickly, it moves up and down in the water.

Note: Students will be creating their own animal drawings. It is recommended that you not show the animal illustrations in the Teacher's Guide until after completing Lesson 13.

Breeding Behavior

Many students will ask how to distinguish between male and female frogs. This is difficult. In general, female dwarf African frogs are larger and stouter than males. During breeding, males develop pinkish swollen glands behind their forelimbs. Successful breeding in captivity is rare, and it is highly unlikely to occur during the course of this unit. If the tank water in your classroom is warm (about 25°C, or 76°F), however, the frogs may try to breed after a few months. In nature, the male's vocalizations attract a female and stimulate her ovulation. As with other frogs, the male's call attracts only females of the same species and so helps prevent mating between species. During mating, the male clasps the female around the pelvis. The female lays eggs on the water's surface. After five days, larvae hatch, attach to the tank and plants, and swim freely to feed. If your frogs breed, you will need to move the eggs to another tank so that the adults do not eat them.

In this lesson the students review their frog habitat proposals from Lesson 2. This lesson's Materials section outlines the exact materials students will use to create the frog habitat. However, most elements the students included in their proposals can be equated with the ones on the list. They are as follows:

Elements of the Natural Habitat	Elements of the Classroom Habitat
Fresh water	Dechlorinated tap water
Space to live in	A tank that defines the space
Plants	Elodea
Food	Dried bloodworms and food pellets
Rocks, soil	Gravel
Light	Natural light through windows
Air	Dissolved oxygen in water and air in classroom

Students can best observe an animal's general behavior over a period of time. To help them in their efforts, students will establish an animal log in which to record daily observations. The checklist you create in this lesson will remind students of the most important behaviors to keep observing. Figure 3-2 (on pg. 26) shows one example of an animal log checklist.

It would be unrealistic to expect your students to observe and record all the animal characteristics discussed in the **Background** sections of this guide. Many characteristics are not obvious to children, for whom learning to observe and record is an ongoing process. Even if you are tempted to share with students information that may not be easily observable, instead encourage them to learn about each animal through their own experiences. In Lesson 14, the reading selection "Did You Discover . . .?" will give students information on the animals that they are unlikely to observe firsthand.

MANAGEMENT TIP

Studying live animals involves care and maintenance. With a little training, students are capable of handling most of the work. Some teachers schedule specific times during the day to tend to the animals. Establishing a routine and fostering students' independence can add greatly to their experiences in this unit. Caring for the animals will also help your students develop sensitivity to living things. To encourage sensitivity, discuss some guidelines for studying animals such as the following:

- Keep the covers on the habitats.
- Do not bang on the habitats or disturb the animals.
- Be gentle with the animals at all times.

Materials

For each student

- 1 pencil
- 1 science notebook
- 1 hand lens
- 1 copy of the **Animal Log Checklist** (blackline master at the end of this lesson)

For every two students

- 1 dwarf African frog

For every four students

- 1 green-dotted plastic cup, 270 ml (9 oz), and lid
- 1 green-dotted plastic flex tank, 3.8 liters (1 gal), and lid
- 4 elodea sprigs
- 1 black china marker
- 1 metric ruler
- 1 green-dotted plastic cup, 60 ml (2 oz), and lid
- 1 plastic teaspoon with green dot
- 1 piece of notebook paper
- 1 green-dotted pail of conditioned tap water

For the class

- 2 holding pails (each with half the elodea and half the frogs)
- 1 bucket for holding rinsed gravel
- 1 plastic cup, 270 ml (9 oz), for scooping gravel
- 3 2.3-kg (5-lb) bags of aqua gravel
- 1 bottle of tap water conditioner, 60 ml (2 oz)
- 8 plastic pails, 2.8 liters (3 qt)
- 2 green-dotted aquarium dip nets, 5 cm (2 in)
- 1 "Frogs" class list (from Lesson 1)
- 2 sheets of newsprint
- 1 container of food pellets, 1.2 oz
- 1 green permanent marker
- 1 black permanent marker
- 1 Post-it™ notepad, 51 × 76 mm (2 × 3 in)
- 1 aquarium thermometer
- Frog habitat proposals (from Lesson 2)
- Markers
- Paper towels
- Sponges
- Masking tape
- Overhead projector (optional)

Preparation

1. When the frogs and plants arrive, refer to Section 3 of this guide.
2. Have student helpers use the green permanent marker to mark dots either directly on the following materials or on masking tape labels for them: eight large plastic cups and lids, plastic tanks and lids, pails, plastic spoons (handles), aquarium dip nets (handles), and small cups and lids. The green dots will distinguish the frog-related materials from the crab-related materials, which will have orange dots.
3. Have student helpers
 - Rinse the gravel in a colander or pail with tap water until the water runs clear. Place the rinsed gravel in a container along with a plastic cup for scooping.
 - Rinse each plastic tank with warm water (students should not use soap).
4. Have student helpers fill eight pails three-fourths full with water, add a drop of tap water conditioner to each, and stir with a clean spoon.
5. Set up a distribution center for tanks and lids, rulers, china markers, pails of water, large cups with lids, small cups with lids, and paper towels (see Figure 3-3 on the following page). Keep the aquarium nets, food pellets, frogs, and water plants separate from the distribution center but easily accessible.
6. Label a newsprint sheet “What We Would Like to Know about Our Frogs.” Have this and the Post-it™ notes on hand.
7. Prepare and hang newsprint containing the first circle of an animal habitat Venn diagram. It will be used in Lesson 9 (see Figure 3-4 on the following page). Refer to Teaching Strategies in Section 2 of this guide for information on using Venn diagrams.
8. If your classroom has no water source, identify a nearby one. Or use a jug to bring water into the room.
9. Arrange students in their groups from Lesson 2.
10. For the completed frog habitats, choose a storage area in indirect light and away from heat and drafts. Make sure the habitats are accessible to students for daily observation.
11. Copy the **Animal Log Checklist** at the end of this lesson for each student. Make an overhead of it for class use.

MANAGEMENT TIP

You will need storage space for two more kinds of animal habitats. If your students’ desks are arranged in groups, try to keep one or more habitats in the center of these desks for ongoing observation.

Procedure

1. Focus students on their frog habitat proposals from Lesson 2. In a class discussion, ask students to review the important elements of the frog's home.
2. Explain that you have in the room materials for creating part of a water environment, called a habitat, in which the dwarf African frog can get what it needs to live. Show the class the tanks, gravel, plants, frog food, and pails of dechlorinated water. Challenge students to equate these materials with the elements in their frog habitat proposals.
3. Remind students that the frog must get the right amount of each material in its home. Review the **Student Instructions for Building a Dwarf African Frog Habitat**, later in this lesson (pgs. 12–14 in the Student Investigations book), with the class. Help each group decide who will assume the duties of moderator, recorder, investigator, and reporter. Remind them that the moderator's job is to make sure that each group member helps get materials and create the habitat.

MANAGEMENT TIP

Before starting to build the habitats, some groups have found it helpful for each member to record his or her name by each step of the instructions for which he or she is responsible.

4. Guide students through the process of getting the materials from the distribution center. Explain that moderators should let you know when the group is ready for the plants, which you will hand out on a paper towel. When the habitat is complete, you will give students their frogs.
5. Have the groups get their materials and begin. Let students know that when they need gravel, they will go to the distribution center to scoop two cups of gravel for the tank. As the groups create their frog habitats, be sure the recorders list the living and nonliving elements they place in each tank.
6. When the group moderators tell you their habitats are complete, carefully net two frogs and add the frogs to each habitat. Remind groups to begin their observation of the frogs while you distribute the rest.
7. Ask groups to set aside the small plastic cups, lids, and spoons, and return all other materials to the distribution center.
8. Ask students if they think the frogs have what they need to survive in the classroom. If food is not mentioned, ask the class what they think the frogs might eat. Then display the food pellets and talk about why it would be difficult to provide live food, such as insects and worms. Have each group fill a small cup halfway with food pellets. Assign each group a letter and have students use the black marker to code their habitats, cups, lids, and spoons by writing that letter on the green dots. Store the food near each group's frog habitat.

9. Using Figure 3-5 as a guide, demonstrate to groups how to feed the frogs. Refer students to Figure 3-2 in their books.

Note: Have students continue to feed the frogs this way. The frogs will eventually respond to the food without the spoon. Students will probably need to refill their food cups over the course of the unit.



10. Invite groups to share their observations of feeding the frogs. Ask questions such as the following:

- What happened when you put food in the tank?
- Did both frogs respond to the food? What happened when you moved the food with the spoon?
- How much food did the frogs eat?
- Did the frogs eat from the surface or bottom of the habitat?

Let students know that each time they feed the frogs over the next few weeks, they should observe the feeding carefully and discuss these questions again.

11. Now focus the class on the circle you have prepared for the Venn diagram. Remind students of their list of living and nonliving elements in the school. Explain that now you want to create a similar list for the frog habitats. Ask group reporters to share their lists, and record each element on the Venn circle. Save this for use in a later lesson.

Figure 3-5
How to feed
the frogs



Put 1-2 food pellets per frog on the water. Tap the food with the spoon until the frogs come over. Then sink some of the food with the spoon.

deposits a reddish brown egg mass under her abdomen. She carries these fertilized eggs until she immerses them in the water to hatch. The newly hatched babies are microscopic and undergo a series of molts before becoming pea-sized juveniles. When young, they molt about once every 10 days; as adults, once or twice a year. The life span of a fiddler is approximately two years. The fiddlers your class receives will have a range of sizes and ages.

The loss of an appendage also can stimulate molting, after which the appendage will regenerate. After a molt, the fiddler is soft-shelled for about 30 minutes, and it usually takes a day for the carapace to become as rigid as before. While it is rare to witness molting, you can let students know one clue to look for: before molting, the fiddler will appear very sluggish.

Crab Habitat Proposals from Lesson 2

Most of the elements students might include for the fiddler crab habitat are listed below, followed by the unit material that corresponds to each element (see **Procedure**, Step 3).

Elements of the Natural Habitat	Elements of the Classroom Habitat
Salt water	Dechlorinated tap water with Instant Ocean®
Space to live in	A tank that defines the space
Plants	Model of hairgrass (represents marsh grass)
Food	Food pellets, apples, lettuce, and bananas
Sand and mud	Sand-humus mixture
Light	Natural light through windows
Air	Dissolved oxygen in water and air in classroom

Note: Although fiddler crabs are hardy animals and can tolerate a range of temperatures, maintaining a marsh habitat will require more maintenance than an ordinary fish aquarium. Your students will assume complete responsibility for maintaining the crab habitats. This lesson contains illustrated instructions for doing so.

Key Scientific Terms

abdomen arthropods carapace crustaceans exoskeleton

Materials**For each student**

- 1 pencil
- 1 science notebook
- 1 hand lens

For every two students

- 1 fiddler crab

For every four students

- 1 orange-dotted plastic pail with lid, 1.9 liters (2 qt)
- 1 orange-dotted plastic cup with lid, 270 ml (9 oz)
- 1 orange-dotted plastic flex tank with lid, 5.7 liters (1½ gal)
- 1 black china marker
- 1 metric ruler
- 1 orange-dotted plastic cup with lid, 60 ml (2 oz)
- 1 plastic teaspoon with orange dot
- 1 plastic water bowl
- 1 model of hairgrass

For the class

- 2 holding pails of fiddler crabs
- 1 bottle of tap water conditioner, 60 ml (2 oz)
- 2 orange-dotted aquarium dip nets, 5 cm (2 in)
- 1 "Crabs" list (from Lesson 1)
- 4 sheets of newsprint
- 1 container of food pellets, 1.2 oz
- 1 orange permanent marker
- 1 black permanent marker
- 1 Post-it™ notepad, 76 x 76 mm (3 x 3 in)
- 1 package of sea salt, 709 g (25 oz)
- 4½ bags of marine sand, 2.25 kg (5 lb) each
- 4½ 270-ml (9-oz) cupfuls of humus
- 1 large plastic trash bag
- 1 large plastic cup, 270 ml (9 oz)
- 1 cardboard box or other container in which to mix sand and humus
- Student proposals for the crab habitat (from Lesson 2)
- Markers
- Paper towels
- Sponges
- Tape

6. Before the groups begin collecting their materials, remind the recorders to list every living and nonliving element they will place in each habitat. Then have the groups get their materials and begin.
7. When the group moderators tell you their habitats are complete, carefully net two crabs—one female and one male—to add to each habitat. Invite each group to observe these crabs while you distribute the rest.

Note: If you have extra crabs, put them in the student tanks. Emphasize that the crabs are not pets. It is very important that students never handle the crabs. Handling can cause the crabs to lose appendages, a protective response to danger.

8. Have students keep the habitats, small plastic cups, lids, pails, and spoons and return the other materials to the distribution center.
9. Ask students whether they think the crabs have what they need to survive in the classroom. If food is not mentioned, ask students what they think the crabs might eat. Then display the food pellets and talk about why it would be difficult to provide fresh fish or other foods found in a marsh. Have students use their small cups to take about a half cup of food. Pass around the black marker and ask each group to write its letter beside the orange dot on every item, including the habitat. Store these materials near each group's crab habitat.
10. Now have students feed the crabs. Have them put 1-2 food pellets per crab on the land and in the water of each habitat. Have groups share their observations of the crabs' feeding. Ask questions such as the following:
 - What happened when you put food in the tank?
 - Do the crabs respond to food the same way the frogs do?
 - How are the crabs' responses different?

Make sure students know that each time they feed the crabs over the next few weeks, they will observe the crabs' behavior, as they have been doing with the frogs.

11. Now focus the class on the crab habitat circle you have prepared. As the group reporters share lists of the living and nonliving elements in the crabs' habitats, record them. Save this for use in a later lesson.
12. Point out that students must monitor the tanks closely. Discuss the following:
 - **Feeding schedule.** Feed the crabs only once a day. To prevent mold and odor, use a spoon to remove old food from the land or water before every feeding. Then add fresh plankton to both the land and water. Let students know they can also put small pieces of apple, banana, or lettuce on the sand for the crabs.
 - **Water.** Each group should keep its orange-dotted water pail full of conditioned salt water. Ask student helpers who originally prepared the salt water to explain how it was done. Discuss where to store the water conditioner and Instant Ocean® and when to replenish pails during the week. Explain that groups will need to change the water once a week. Show students how to slowly lift the water bowl out of the habitat, dump the water, rinse the bowl, replace the bowl in the habitat, and refill it as directed in the Student Instructions for Building a Fiddler Crab Habitat. Emphasize that it is important not to spill water onto the sand-humus mixture.

Question 2.1

Name _____ Date _____

The environment in which each animal lives is made of both living and nonliving elements. The elements listed below are needed for the dwarf African frog’s classroom habitat. Identify which elements in the frog’s habitat are living and which are nonliving.

Write “L” in the space of something that is living **at this time** and place “N” in the space of something that is nonliving **at this time**.

Elements for the dwarf African frog’s classroom habitat:

- A. _____ Dechlorinated tap water
- B. _____ A tank that defines the space
- C. _____ Elodea
- D. _____ Dried bloodworms and food pellets
- E. _____ Gravel
- F. _____ Natural light through windows
- G. _____ Dissolved oxygen in water and air in classroom

The structures and behaviors of an organism determine how it adapts to its environment.

DISCUSSION		

Question 2.4

Name _____ Date _____

If a dwarf African frog were placed in a fiddler crab’s habitat, could it survive? Put an “X” next to the two elements of the fiddler crab habitat listed below that could possibly affect the dwarf African frog’s chances of survival.

Dwarf African frog classroom habitat

- A tank that defines the space
- Natural light through windows
- Dried bloodworms and food pellets
- Dissolved oxygen in water and air in classroom
- Dechlorinated tap water
- Elodea
- Gravel

Fiddler crab classroom habitat

- A. _____ Dechlorinated tap water with Instant Ocean®
- B. _____ A tank that defines the space
- C. _____ Model of hairgrass (represents marsh grass)
- D. _____ Food pellets, apples, lettuce, and bananas
- E. _____ Sand and humus mix
- F. _____ Natural light through windows
- G. _____ Dissolved oxygen in water and air in classroom

The structures and behaviors of an organism determine how it adapts to its environment.

DISCUSSION											

• **Figure 3-2**
• **How to feed**
• **the frogs**



10. Feed your frog. Talk about what you observed during the feeding.
 - What happened when you put food in the tank?
 - Did both frogs respond to the food? What happened when you moved the food with the spoon?
 - How much food was eaten?
 - Did the frogs eat from the surface or bottom of the habitat?

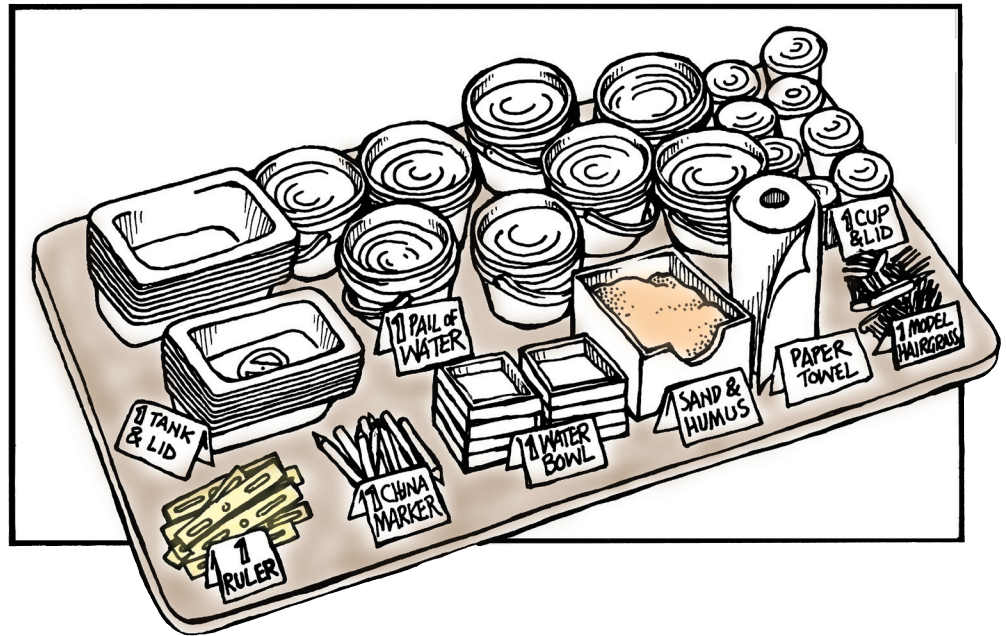
Think about these questions each time you feed your frog.
11. Remember your list of living and nonliving things in the school? Help the class make a similar list for the frog habitat.
12. Listen as your teacher talks to you about how to care for your frog.
 - **Feeding schedule.** The frogs should be fed once a day. If you see food in the tank, skip one of the feedings that day. If food is still in the tank the next day, you may be feeding your frog too much. Remove the extra food with a spoon so the food does not dirty, or contaminate, the water. Give your frog less food next time. If food sticks to the floating elodea, remove the elodea, rinse it with clean water, and put it back in the tank.



Find Out for Yourself

continued

Figure 5-1
Sample
distribution
center



6. Remember, the group recorder will list every living and nonliving thing that goes in the habitat. Now pick up your materials and begin working.
7. When your group is ready, have the moderator ask the teacher to net you two crabs. Observe them carefully.
8. For now, keep the small plastic cups, lids, pails, and spoons. Return the other materials to the distribution center.
9. Do the crabs have what they need to survive in the classroom? Share your thoughts with the class. Then follow these steps:
 - Pick up about half a small cup of crab food.
 - Write your group's letter beside the orange dot on the habitat and each item you have kept.
10. Feed the crabs. In your habitat, put 1-2 food pellets per crab both on the land and in the water. Then, discuss these questions with the class:
 - What happened when you put food in the tank?
 - Do the crabs respond to food the same way the frogs do?
 - How are the crabs' responses different?
11. Look at the circle your teacher has made. Listen as the group reporters talk about the elements in the crab habitats.