

# Lesson 9: The Very Hungry Caterpillar

## Key Concepts:

- Monarch larvae consume large quantities of milkweed each day
- The amount of milkweed a larva consumes depends on its age and whether it is molting
- The amount of milkweed a larva consumes can be estimated in many ways

## Skills:

- Observation
- Prediction
- Measurement
- Data recording
- Data reporting
- Estimation
- Use of percent

## Materials:

- Monarch larvae
- 10+ oz. plastic cups (one for each larva)
- Milkweed (at least one large leaf per larva per day)
- Triple beam balances (or electronic scale, if you are lucky enough to have one)
- One Data Organizer: Hungry Caterpillars for each student, pair, or group (student handout page)
- Plastic wrap or petri dishes

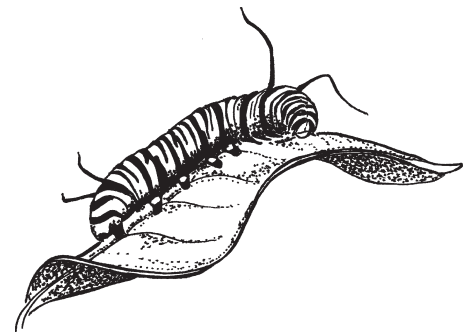
## Objective

Students will first predict, and then estimate, how much milkweed a larva consumes on a daily basis. If the research is carried over several days, they will learn how much milkweed consumption varies with larval age and size.

## Background

Before doing this lesson, be sure to read *Rearing Techniques* in the How-To's section. Start the lesson a day or so after you obtain the larvae. Part 1 should be done on the first day and part 2 starts the second day of the lesson and can be repeated daily until larvae pupate, if desired. You should use an individual container for each larva. Larvae can be kept in clear plastic cups with lids for several days without harm. If lids are tight, punch holes to allow airflow. This lesson will not work with late fifth instar larvae (i.e. those that are about to form a chrysalis), since they stop eating at that time. Also, when larvae are molting (shedding their skin) they often stop eating for a day. This will be interesting for students to observe. Modify this lesson if there is not one larva per pupil.

You can pick enough milkweed for several days, and keep the stems in jars of water or plastic bags in the refrigerator.



## Procedure

### Part 1—Planning and Setting Up the Experiment

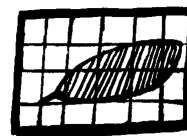
1. Ask students if they have read *The Very Hungry Caterpillar* by Eric Carle. You may wish to read it to them at this time, and ask the following questions:
  - *Why do you suppose Carle chose a caterpillar as his subject?*
  - *Would another animal subject have worked as well?*
  - *What do monarch larvae eat?*
  - *How can you tell how much they have eaten since the last time you observed them?*
2. Ask your students:
  - *How could you measure the amount of milkweed your caterpillar eats during a day?*

- During 24 hours?
  - During a week?
- List students' ideas for measuring how much a larva eats on the board. If it is suggested, you could use the method described here. You may also opt to use one of the other methods students suggest, or allow groups to pursue different methods.
  - Divide the class into small groups. Assign roles as in Focus on Features (lesson 1). Ask the Getters to come up and get the larvae for their group, one piece of milkweed for each larva, and a *Data Organizer: Hungry Caterpillars* for each student.
  - Each student should trace the milkweed leaf on the grid of the *Data Organizer: Hungry Caterpillars*. Count the number of squares within that leaf shape. Discuss strategies for counting partial squares. Place the milkweed and larva in the empty, clean container. Cover with a petri dish or plastic wrap. Assure the students that there will be enough oxygen for the larvae to breathe for one day.
  - Students should estimate how much their larva will eat (in squares or as a percent of the whole leaf). (i.e. *How many squares of leaf will your larva eat by \_\_\_\_ (time) tomorrow?*) Have students describe their testing procedure (what they will do to measure how much the larva will eat). Record the surface area of the leaf tracing in squares. Students may draw illustrations of their procedure.
  - Large larvae should get 2 leaves. Place the cups out of direct sunlight, or away from other heat sources. If the room is dry, add a damp piece of paper towel or filter paper. Be sure to replace it every couple of days to prevent mold.

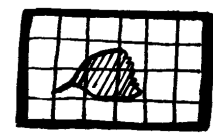


## Part 2—Doing the experiment and analyzing data

- Remind students what question they are trying to answer from the last lesson: *How much food does one monarch larva eat in a given period of time?* Have them look at their data sheets to see what predictions they made. Decide how you would like to have your students compare their predictions to their results.
- Ask Getters to get the larvae for their table. Instruct students to get their log books and the *Data Organizer: Hungry Caterpillars* sheet.
- Set the eaten leaf directly over its tracing on the *Data Organizer: Hungry Caterpillars*. Students should trace around the eaten portions of the milkweed leaf. If the leaf is wilted, this must be done with care and patience. When they are finished tracing, students need to count the number of squares that were eaten, using the same strategies they used in part 1.
- Have students compare their estimate with their actual square units of milkweed eaten. Then students can calculate the percentage of the total milkweed that the larva ate:



Day 1



Day 2

$$(\text{number squares eaten} \div \text{total number of squares in the leaf}) \times 100 = \% \text{ eaten}$$

- As a class, find the average amount of milkweed a monarch larva eats within the time frame you chose. You might average the number of squares or the percentages. Before doing this, list the data on the overhead and ask students to predict the average. Determine if this varies with larva size or other factors, such as whether they were molting.
- Assess student understanding by giving them a leaf tracing on graph paper, with an area outlined to represent the amount that a certain larva ate during a 24-hour period. Ask them to estimate the amount eaten, then count the actual amount eaten in square units. You might ask them to estimate percent eaten and calculate the percent eaten, if an understanding of percent is a desired outcome.

7. If desired, have students graph the results over several days as a class or in small groups. You can use averages, or make a separate graph for each larva.
8. Students often ask whether larvae eat at night. You may repeat this activity, measuring what was eaten during the day and night (from the time school ends to the next morning). Separately compare these amounts.
9. Modification: To make this lesson easier for young students, enlarge the graph paper on the student handout.

