Experimental Design with Pill Bugs

Introduction

Pill bugs are odorless, easy to obtain, easy to maintain, and easy to handle. They are an ideal experimental organism. Design an experiment to learn more about the behavior of these isopods.

Concepts

- Experimental design
- Behavior

Background

Isopods are crustaceans just like lobsters, shrimp, and crabs. They are not insects but are classified along with insects in a larger group of organisms known as arthropods. Arthropods have exoskeletons (armor-like outer skeletons) and have jointed appendages. Crustaceans can be divided into smaller subgroups and one of these are known as isopods. There are more than 4,000 species of isopods. While most are marine forms, a few species live on land. Some land isopods roll up in a ball when disturbed, and are called pill bugs. Pill bugs are also known as rollers or roly polys. Sow bugs are similar to pill bugs but they simply move when disturbed and are often called hikers.

Pill bugs and sow bugs breathe through gill-like structures and must live in moist places. They are usually found in dimly-lit places and eat decaying wood, leaves, or vegetation. They are 5–15 mm long and have three body segments—head, thorax, and abdomen. The exoskeleton is made up of shield-like plates.

Either species are safe to handle. They do not bite, sting, or transmit diseases to humans. They play an important role in decomposing dead plant material.

Experimental Overview

In this activity, student groups will first observe and record the basic behavior of isopods. Based upon those observations, each group will generate a list of questions (problems) about isopod behavior or preferences to investigate and then write a hypothesis using one of those questions. As the instructor, your role will be to ensure that each experiment is designed correctly and each isopod is treated humanely.

Materials (per student group)

Pill bugs, 4
Petri dishes, 2
Paper towels
Ruler, plastic, 15 cm (6″)
Hand lens or dissecting microscope
Small brush
Extra materials as required for student-designed investigations

Safety Precautions

Wash hands thoroughly upon completion of any laboratory work. Always handle living organisms with care. Follow all standard laboratory safety guidelines.

Publication No. 10377
061616

Procedure

1. Form a research team as directed by your instructor. Become familiar with an isopods' basic behavior. Obtain two Petri dishes with lids and four isopods. Observe their behavior by answering questions *a–h*. A hand lens and/or dissecting microscope may be useful. Observe their behavior using a stereo microscope or hand lens and answer the following questions:
   a. Do you have pill bugs (rollers) or sow bugs (hikers)? (Touch them with a small brush to find out.)
   b. How long are they? Longest? Shortest? Average?
   c. How many legs? eyes? antennae?
   d. If they are on their backs, how do they turn over?
   e. Will they crawl over an edge and fall?
   f. Can they climb up smooth surfaces?
   g. What happens if they are placed in water for a few seconds?
   h. How fast can they move in cps (centimeters per second)?
2. Brainstorm some possible behaviors, preferred habitats, or food types that your research team would like to investigate. Write at least three different questions to investigate.
3. Select one question from your list and state the question clearly.
4. Write a hypothesis that relates to the question. Write the hypothesis in the form of an "If, then" statement. For example, "If isopods are placed in a box where they can choose between light and dark surfaces, then they will choose dark surfaces."
5. Make a list of the variables that might influence their behavior. Sort the variables by how they relate to your hypothesis—identify the variable that will be manipulated (independent variable), the variables that will be controlled, and the one variable that will be measured (dependent variable).
6. Design the experiment. Include the experimental question (problem), hypothesis, necessary materials, safety precautions, and details of the procedure. After designing the experiment, meet with your instructor for approval.
7. Obtain the materials and conduct the experiment.
8. Record data and summarize the results using data tables, drawings, graphs and other displays as appropriate.
9. Write up the experiment and results as directed by your instructor and/or participate in a discussion about your discoveries.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Living organisms that have been purchased and shipped from somewhere else should never be released to the environment without first consulting local authorities. Introducing exotic (non-native) species into the environment may result in irreparable damage to local ecosystems. Of course, if organisms have been collected locally, they may be returned to their place of origin.

Tips

- Pill bugs can be purchased from Flinn Scientific or collected locally. (Summer is a good time—look in a compost pile or damp areas that contain decomposing organic material.) A colony can be easily set up for maintaining isopods throughout the school year. A large plastic bucket with a cover can serve as the basic home. Drill small holes in the cover for air. Fill the container ½ full with compost or potting soil. Add enough water to moisten the soil. Place organic matter (leaf litter, dried grass, or sawdust) on the surface of the soil. Turn the isopods loose in their new home. Keep at room temperature and check occasionally to see if additional moisture or organic matter is needed.
- Examples of variables that students may use for their investigations are:
  Response to light, i.e., presence or absence, intensity, wavelengths—red, blue, etc.
  Response to temperature, i.e., warm vs cold
  Response to moisture, i.e., dry sawdust or grass vs wet/moist sawdust or grass
  Food preferences, i.e., leafy greens vs decaying fruits
  Color preferences, i.e., light colored substrate vs dark

Substrate preferences, i.e., sand vs clay

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard A: Science as Inquiry
Content Standard C: Life Science, regulation and behavior
Content Standards: Grades 9–12
Content Standard A: Science as Inquiry
Content Standard C: Life Science, behavior of organisms

Materials for *Experimental Design with Pillbugs* are available from Flinn Scientific, Inc.

Catalog No.	Description
LM1217	Pill Bugs, Pkg. of 30
LM1218	Pill Bugs, Pkg. of 100
FB1624	Experimental Design with Pill Bugs—Animal Study Kit

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.