

Designing Investigations with Pillbugs

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I. Pillbug Facts

1. Many people mistakenly think that pillbugs are insects but in fact, pillbugs are crustaceans as are lobsters, shrimp, and crabs. Both insects and crustaceans are classified in a larger group known as the arthropods. Arthropods are animals with exoskeletons and jointed appendages.
2. Pillbugs are classified in a group of crustaceans known as isopods. There are about 4000 species of identified isopods. Most isopods live in marine habitats, some live in fresh water, and a few like pillbugs live on land.
3. Some land isopods roll up in a ball or pill when disturbed, hence the term pillbug. Other names for pillbugs are sow bugs, wood lice, potato bugs, and roly-pollies. Roller is a term used to describe a pillbug that rolls up in a ball. Hiker is a term used to describe a pillbug that runs when disturbed.
4. Because pillbugs breathe through gill-like structures, they must live in moist places. They prefer dimly lighted or dark habitats and live underneath rocks, logs, boards, leaves, etc. They eat decaying wood, leaves, and other vegetation.
5. Pillbugs are 5 to 15 mm long and have three body regions; head, thorax, and abdomen. Most of the pillbug's exoskeleton consists of shield-like plates. The body is flattened laterally. Each of the seven pairs of legs is identical. There is one pair of antenna and one pair of compound eyes.
6. The young hatch from eggs that are carried in a brood pouch under the thorax of the female. The young are self-sufficient after hatching.
7. Pillbugs grow by molting. They shed their exoskeleton and grow a new one. During molting pillbugs crawl out of the back half of the old exoskeleton first, and a few days later crawl out of the front half.
8. Pill bugs are safe to handle. They do not bite, sting, or transmit diseases to humans. They do not harm other plants or

animals. They are not economically important, but they play an important role in decomposing dead plant material.

II. Introduction to Pillbugs

In this introductory activity, you will learn some important things about pillbug anatomy and behavior. You will also learn how to handle pillbugs and that they will not harm you. The knowledge and skills you acquire in this activity will be of help to you when you design and conduct your pillbug investigation.

Materials

Petri dish with wet paper in bottom
6 pillbugs

small beaker with water
spoon and small paintbrush

1 piece copy paper
stereomicroscope or hand lens

Procedure:

Using the spoon and brush, place six pillbugs in the Petri dish. Work with these 6 pillbugs in answering the following questions.

1. Are your pillbugs hikers or rollers? These two respond differently when disturbed. If you touch a hiker with the brush it will start moving faster. Rollers roll up into a ball when touched. How many hikers do you have? How many rollers?
2. What is the length in millimeters of your shortest pillbug? How long is your longest pillbug?
3. How many pairs of legs does a pillbug have? Do all of your pillbugs have the same number of legs?
4. How many antennae does a pillbug have? What do you think are the functions of the antennae?
5. How many eyes does a pillbug have? Are the eyes compound or simple?

6. Does a pillbug have an endoskeleton or an exoskeleton? Touch the plates on the outside of the body. If the plates feel hard, the pillbug has an exoskeleton.
7. Place a pillbug upside down on a piece of paper. Describe how it turns over.
8. What does a pillbug do when it comes to an edge where there is a drop off?
9. Can pillbugs climb on steep smooth surfaces like the edges of the Petri dish? Can pillbugs climb on rough smooth surfaces like your arm?
10. Put a pillbug in a beaker of water for a few seconds. Take it out of the water and place it on the piece of paper. Observe it carefully and describe its behavior.
11. How fast can a pillbug run? Make an X in the center of the copy paper. Place the pillbug on the center of the X. Let it go and record the time in seconds that it takes the pillbug to run off the paper. Place another X where it left the paper. Measure the distance between the 2 Xs in centimeters. Calculate the speed of the pillbug in cm/sec.

III. Designing and Reporting an Investigation using Pillbugs

1. Brainstorm with your partner about possible pillbug behavior problems you would like to investigate. List at least three such problems.
2. Select one problem you would like to investigate and state the problem.
3. Write a hypothesis that relates to your problem. Write your hypothesis in the form of an "if, then" statement. For example, "If pillbugs are placed in a box where they can chose between light and dark surfaces, they will chose dark surfaces."
4. Give your project an appropriate title.
5. Brainstorm and make a list of the all of the variables of influencing factors (see p. 33-34 of the student manual).
6. Sort the variables by how they relate to your hypothesis by identifying the variable you will manipulate (independent variable), the variables that will be controlled or stay the same (controlled variables), and one variable will be the one that you will measure (dependent variable).

7. Design the investigation and write it up, answering the following questions in the process.
 - How will the variables be controlled?
 - How will variables be measured?
 - How will variables be manipulated?
 - What equipment and supplies do I need?
 - Does my experimental design really do what it is supposed to do?
 - Will my experiment answer my question?
 - Have I identified all of the variables?
 - How many pillbugs will I use in the investigation?
 - How many times will I repeat the investigation?
 - Have I accounted for possible sources of error?
 - How might the pillbug behavior I am investigating affect the ability of pillbugs to survive in their natural environment?
8. Make a drawing to illustrate the design of your investigation.
9. Conduct the investigation.
10. Record your data and summarize the results in data table(s). Determine if a line graph or bar graph is necessary, and make sure to title the graph and label each axis.
 11. Write your conclusions. Explain whether or not you confirmed your hypothesis and explain why.