

MATERIAL

set of or photographs
of limpet shells

PROCESS SKILLS

- **Observing**
- **Identifying**
- **Classifying**

Creating a Dichotomous Key for Limpet Shells

Limpets are marine invertebrates found along rocky shorelines around the world. The flattened shape of a limpet's shell allows it to withstand the impact of waves, and its muscular foot allows it to cling tightly to rocks. Although biologists today classify limpets by using traits of the entire organism, for this activity you will construct a dichotomous key based on shell characteristics.

Dichotomous keys are used to identify objects or organisms that have already been described by another scientist. As its name implies (*di-* means “two”), a dichotomous key is made up of paired statements. Each pair of statements divides the objects to be classified into two categories. This means that each object must fit into one category or the other, but not both. At the right is a simple example of a dichotomous key that identifies five common beans. As you proceed from step to step, the classification is narrowed down until all five beans are identified.

SAMPLE DICHOTOMOUS KEY FOR BEANS

- | |
|--|
| 1.a. If the bean is round it is a garbanzo bean. |
| 1.b. If the bean is oblong go to step 2. |
| 2.a. If the bean is white it is a white northern bean. |
| 2.b. If the bean is dark-colored go to step 3. |
| 3.a. If the bean is a solid color go to step 4. |
| 3.b. If the bean is speckled it is a pinto bean. |
| 4.a. If the bean is black it is a black bean. |
| 4.b. If the bean is reddish-brown it is a kidney bean. |

PROBLEM What characteristics can you use to make a dichotomous key for limpet shells?

PROCEDURE

1. Identify some characteristics of each limpet shell. Characteristics may include margin (edge) variation, shape, color, and features on the shell.
2. Construct a dichotomous key, using the above sample for beans as a guide. Start with a general characteristic that separates your limpets into two groups. (**Example:** Keyhole limpets have a hole at the highest point of their shell; true limpets do not.)
3. Continue making paired statements that become more detailed.
 - Each pair of statements must contain only two choices, and these choices must refer to the same characteristic. (**Example:** Do not compare size and color in the same pair of statements.) Every limpet that has not yet been identified must fit one of the two choices.
 - Do not use vague terms such as *big* and *little*. Be as specific as possible.
 - Each statement must either identify a limpet or lead to another step in the key.
4. Trade dichotomous keys with another student or group in your class. Check to make sure you can identify each limpet using your classmates' key.



Cellana testudinaria
Common turtle limpet



Collisella striata
Striate limpet



Patelloida saccharina
Sugar limpet



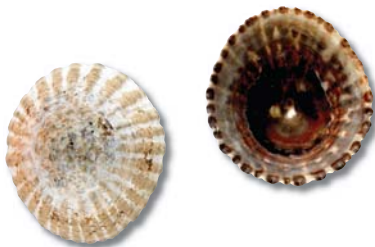
Fissurella nodosa
Knobbed keyhole limpet



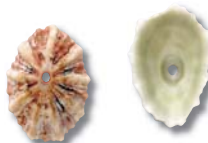
Fissurella maxima
Giant keyhole limpet



Cellana radiata
Rayed limpet



Nacella deaurata
Patagonian copper limpet



Fissurella barbadensis
Barbados keyhole limpet



Megathura crenulata
Great keyhole limpet

ANALYZE AND CONCLUDE

1. **Summarize** How did you organize the limpet shells?
2. **Analyze** What different categories did other groups use to organize the shells?
3. **Identify Problems** What problems arose as you constructed your key?
4. **Infer** If you were given the actual shells, what additional characteristics could you have used to make your key?
5. **Apply** Two outcomes are said to be mutually exclusive if they cannot both occur at the same time. For example, heads and tails are mutually exclusive outcomes of flipping a coin. Why is it important that the paired statements in a dichotomous key describe mutually exclusive characteristics?