Seashells and Scientific Names

Background

Seashells have always been admired and sought for their beauty, their variety and the mystery of their appearance on our shores. They exemplify art in nature—the exquisite delicacy and pattern that man can never truly duplicate. Because of their attraction, seashells are excellent for teaching classification. Students enjoy handling them and examining their differences and similarities.

Seashells are common and readily available. Most students have probably picked one up at some time. This set of materials should stimulate their interest in knowing the actual names of shells and demonstrate the importance and utility of a good classification system. Plus, students should emerge with a sound understanding of the phylum, Mollusca.

Teacher Notes

Students may want to use words such as clam or snail in their keys. Be sure to make it clear that this assumes prior knowledge on their part and shouldn't be used.

Remember, don't let your students look at the pictures in the field guide until they have decided on a possible identification. You want them to try to take each shell through the key at least once.

A Description of the Mollusk Phylum

Common features of all mollusks:
- soft-bodied
- body includes: a muscular foot or arms
  a visceral mass (guts) and gills
  a mantle
  a shell
  a trochophore larva

The Four Major Classes of Mollusks:

Class Polyplacophora: many shell bearers

- common name: chitons
- common features: eight internal shell plates; a radula, or row of teeth, for scraping algae off rocks

Chitons are slow, usually small, brownish creatures that live on rocks at the seashore. When disturbed, they clamp down powerfully and are difficult to pry off. In California, you can find cryptochitons as large as footballs.

Class Gastropoda: belly-foot

- also known as: univalves—one shell
- common names: snails, slugs, limpets, whelks, etc.
- common features: a radula for scraping algae off rocks; one coiled, external shell; well-developed head and eyes; an asymmetrical visceral mass

Gastropods live in a coiled shell. They move on a muscular foot that they can draw back into their shell when danger threatens. Some gastropods have lungs and can live on land. But most live underwater. Slugs are gastropods without shells. In the tropics, there are gastropods called cone shells that can shoot a poison dart lethal enough to kill a man.

Class Pelecypoda: hatchet-foot

- also known as: bivalves—two shells
- common names: clams, scallops, mussels, oysters, etc.
- common features: no radula, uses gills to filter food; two external shells attached by a hinge; no head, primitive eyes; two siphons: one pumps water in, the other out

Pelecypods move rapidly by digging with their muscular, hatchet-shaped foot. Almost all of them live buried in the sea floor. There are giant clams in the tropics, but they close their shells very slowly. Pelecypods are eaten all over the world, and some are harvested for pearls.

Class Cephalopoda: head-foot

- common names: squids, octopus, chambered nautilus
- common features: no radula, captures food with tentacles and arms; well-developed head and eyes; muscular foot has become arms and tentacles; uses ink as an escape mechanism

Cephalopods are some of the fastest moving and most intelligent animals in the ocean. An octopus has no shell, but it has a beak that it uses to bite and eat its prey. Squid have an internal shell called the gladius, or pen. The chambered nautilus has a beautiful external shell with internal chambers filled with gas to help them float and swim. Unlike gastropods, the nautilus is not coiled up into the shell. It lives only in the last chamber.

Believe-It-Or-Not Mollusk Facts

- There are over 100,000 species of mollusks. That makes it the second largest phylum on earth. Arthropoda, the phylum containing insects, has the most species.
- The radula and mantle are found in no other phylum.
- Slugs can crawl over the edge of a razor without being cut. This is because their foot is protected by special slime.
- Giant clams may be five feet long and weigh 500 pounds.
- Only one in 1,000 wild oysters contain a pearl.
- In 1860, a giant squid was found whose body, not including the arms, was 50 feet long and 20 feet in diameter. It was estimated to weight two tons.
- The Indians of New England used whelk shells for beads and clam shells for money. It was called "wampum."
- Until plastic was invented, many buttons were made of shell.

ACTIVITY 1

Designing a Dichotomous Key

Purpose

To teach students how to set up and use a dichotomous key.

Student Background

When you want to organize your record albums at home, you have to develop a system of classification. This system must be consistent, easy to use and based on important common characteristics. You could, for example, arrange your records according to the color of the cover. If you tried it this way, you would run into some problems. First, most album covers are many different colors. How are you going to decide which color to file the album under? And does the color of the cover really make a difference to you when you're looking for music to play? A better way might be to organize the albums according to the type of music: country, jazz, rock, etc.

Biologists need a system to organize living things. When you go to the zoo, you don't find birds on display with monkeys or snakes slithering around with lions. The animals are arranged in a particular way. When you open a biology book, the chapters on plants and animals are arranged in a certain order. That's because scientists use the Linnaean System of Classification. This system has seven categories: kingdom, phylum, class, order, family, genus and species.

Originally, organisms were classified and organized to make them easier to study and to simplify communication with scientists worldwide. It was an attempt to create order out of chaos and to develop an understanding of relationships.

With our understanding of evolution, genetics and biochemistry, many other characteristics are considered when placing an organism in a group with similar organisms. Several changes in the placement of organisms have occurred since researchers discovered new ways of assessing similarities, differences and relationships. Currently, the classification system represents evolutionary relationships and can give us information about the changes that have occurred over time. Classification is not a fixed absolute, but rather a dynamic system that can change with new knowledge or with the changes that occur in organisms over time.

You may have learned about Linnaeus's system before today. Even if you haven't, you've probably seen a product of it—the scientific name. Scientific names come from the last two categories: genus and species. *Homo sapiens* is made up of the genus name and species name of human beings. Lions are in the genus *Felis* and the species *leo*, so their scientific name is *Felis leo*. Notice how the name is written. The genus is capitalized; the species is not. The entire name should always be italicized or underlined. All organisms have scientific names.

Scientists called taxonomists put living things into a system of classification and give them names based on important characteristics. They place organisms into groups that have clear-cut similarities. Think about the class, mammals. You should be able to point out the important characteristics that all mammals share. And you should be able to point out why something like a toad is not a mammal.

Naming a creature is one thing, but figuring out what that name is when you're not a taxonomist requires a key. A key allows you to retrace the steps that a taxonomist took to classify an organism. It leads you through a series of choices until you get to a final choice that points to the scientific name of the organism you wanted to identify. Because there are at least two choices at every step, these devices are called dichotomous keys (di- means two, -chotomous means branched) (see Figure 1).

Materials/Equipment

an assortment of seashells (Use whatever shells are available, such as scallops, mussels, cockles, whelks, periwinkles, clams, oysters, limpets, moon snails or slipper shells.)
rulers
string
balance
hand lens

Procedure

Part 1

Your class should divide itself into groups of four. Each group should have a number. Your teacher will give each group a collection of different seashells plus some work sheets.

1. Separate your shells into two distinct groups. To do this, pick a characteristic that looks important. Look at the color, size and shape. Use a ruler and string, scale or hand lens to identify significant differences between the shells. You want to find one characteristic that will divide all your shells into two categories. (For example, shells with hinges and shells without hinges [typically snails]) NOTE: Be sure not to use words such as clam and snail. These words assume too much.

2. Separate each of your large categories into smaller ones, using dividing characteristics. (For example, hinge at center of top and hinge off to one side.) Remember you are dividing two already separate groups. Do not recombine any of the shells you divided in step 1.

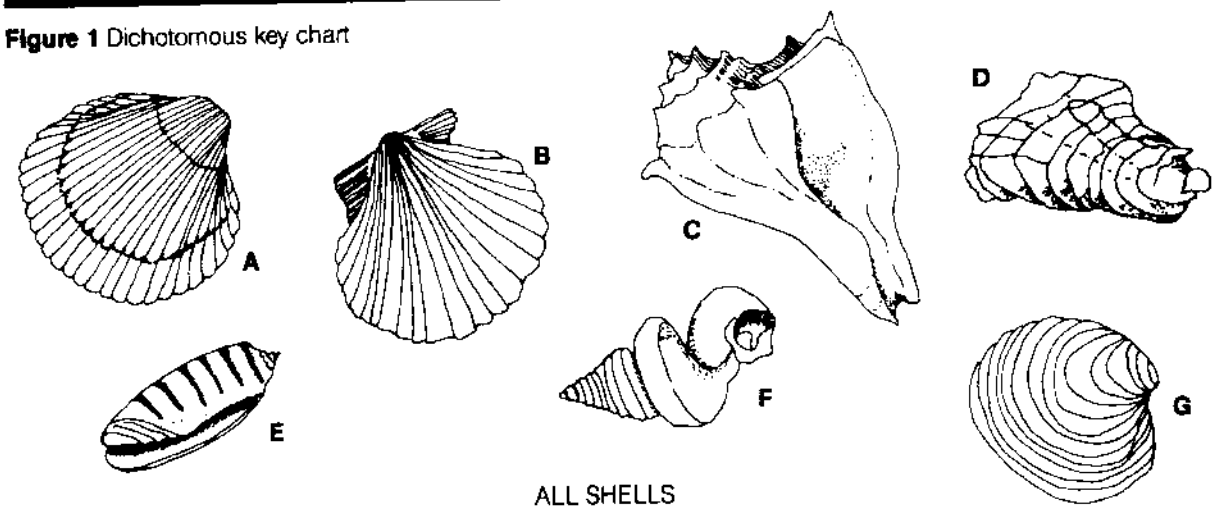
3. Once again, divide the shells in each remaining group. By now you may have categories with only one shell. When this happens, you are ready to name that shell. This could be its common name (coquina, disk clam) or a made-up name (George, Sue).

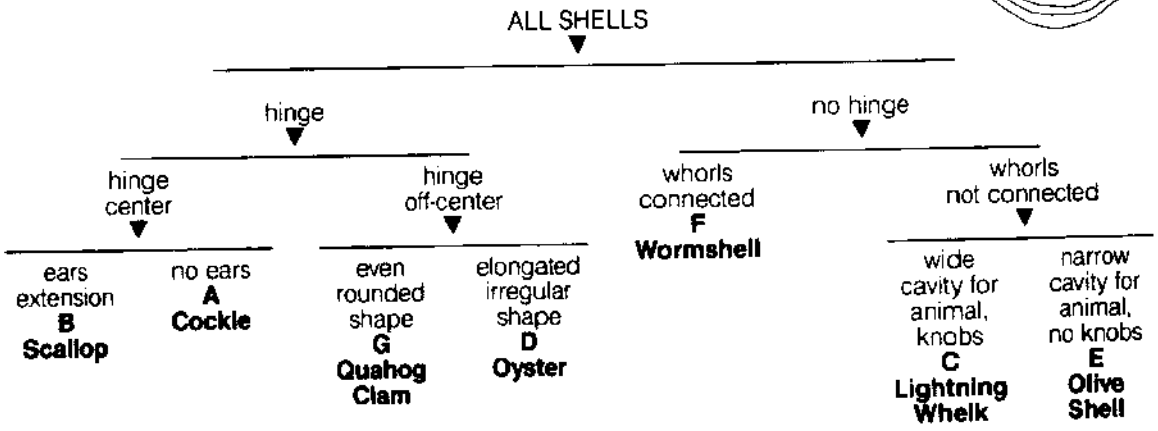
4. Any categories that still have more than one shell can be divided, named and listed. By now each shell should have its own category and name.

Your chart represents one form of a dichotomous key. At each step, there are two choices. You could have easily created a different form by making different choices. Therefore, taxonomic keys are reflections of individual choices that are arbitrary in nature.

When the class has completed their charts, switch charts and shells with another group. Using a stopwatch, your teacher will then time how long it takes for each group to correctly identify the shells using your chart. The group that is fastest has the best key. To be sure, switch again.

Figure 1 Dichotomous key chart





ACTIVITY 2

Using a Dichotomous Key

Purpose

To teach students how to use a dichotomous key

Materials

an assortment of shells
copy of the dichotomous key chart (Figure 1)

Procedure

Divide students into groups of four or five. The teacher will give each student a collection of shells and a dichotomous key of seashells.

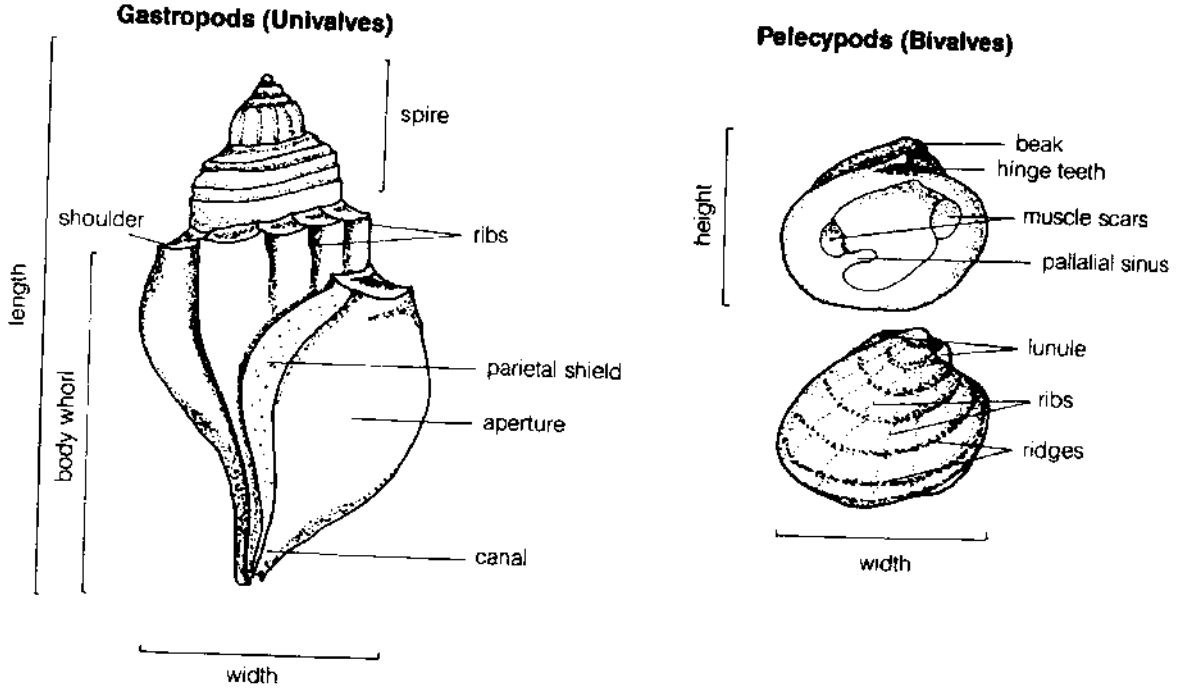
Examine the key and notice how it differs from the one you made in Part 1. It has no boxes, but the categories are arranged in sequence on each page. See how each number has at least two choices. Pick up one of your shells and try to work through the key until you get to its scientific name. Be sure to read all the choices before picking one that seems closest to your shell. When you select a description, follow the dotted line to see where you should go next.

If you're not sure about some of the words used in the choices, use the glossary and Figure 2. Occasionally, none of the choices seem right. In this case, either start over or pick a choice to see if it leads you to a description that sounds like your shell. You must be patient.

Once you reach a scientific name for your shell, check it by looking it up in a field guide with photographs or drawings. Your teacher will only allow you to check your shell when you have a possible name. And, it's not fair to leaf through the guide to find the right picture and then look for the name.

Try to properly identify all the shells given to your group. When you're finished, test each other on the common and scientific names. Next time you go to the beach, you'll be a real expert.

Figure 2 Parts of shells



Glossary

Aperture: in gastropods, the major opening of the shell.

Beaded: sculptured so as to resemble beads or strings of beads.

Beak: small tip of a pelecypod (bivalve) shell, near the hinge. Also called the "umbo."

Canal: in gastropods, a narrow notch or tubular extension of the aperture.

Crenulations: regular notches on the edge of a shell.

Height: see Figure 2.

Hinge: all the structures at the dorsal region of pelecypod (bivalve) shells that function in opening and closing the shells.

Length: see Figure 2.

Lunule: heart shaped area on the dorsal margin of pelecypods. (see Figure 2).

Pallial Sinus: an inward curve of a faint line on the inside of pelecypod shells.

Parietal Shield: a covering on the inner lip of a gastropod (see Figure 2).

Ribs: an external, raised structure on gastropods and pelecypods, running vertically (lengthwise) on bivalves and in all directions on univalves.

Ridges: an external, raised structure on pelecypods, running horizontally.

Spire: the upper whorls from the top of the shell to the body whorl.

Whorl: in spiral gastropods, one full turn of the shell. The body whorl is the whorl that occupies the largest area of the body (see Figure 2).

List of Common North Carolina Shells

These are the shells that can be found in the dichotomous key

Pelecypods:
Anadora ovalis Ark Shell
Anomia emphippium Atlantic Jingle Shell
Arca zebra Zebra Ark
Argopecten gibbus Calico Scallop
Argopecten irradians Atlantic Bay Scallop
Atrina serrata Pen Shell
Chione cancellata Dog Clam
Crassostrea virginica Eastern Oyster
Dinocardium robustum Great Heart Cockle
Divalinga quadrisulecata Cross-Hatched Lucine
Donax variabilis Coquina Clam
Dosinia discus Disk Shell
Macrocallista nimbosa Venus Sunray Clam
Mercenaria mercenaria Northern Quahog
Modiolus demissus Ribbed Mussel
Mytilus edulis Common Blue Mussel
Placopecten magellanicus Deep Sea Scallop
Pteria colymbus Wing Oyster
Spisula solidissima Surf Clam
Tagelus divisus False Razor Clam
Trachycardium egmontianum Prickly Cockle

Gastropods:
Busycon carica Knobbed Whelk
Busycon canaliculata Channeled Whelk
Busycon contrarium Lightning Whelk
Crepidula fornicata Slipper Shell
Cypraea cervus Atlantic Deer Cowrie
Diodora cayenensis Keyhole Limpet
Epitonium spp. Wentletrap
Fasciolaria hunteria Banded Tulip Shell
Ilyanassa obsoleta Mud Snail
Littorina irrorata Marsh Periwinkle
Nassarius vibex Mottled Dog Whelk
Oliva sayana Olive Shell
Phalium granulatum Scotch Bonnet
Polinices duplicatus Moon Snail
Sinum perspectivum Baby's Ear
Terebra dislocata Atlantic Augur Shell
Turbo castanea Chestnut Turban

Questions

1. Place the correct letters next to the following items. In some cases more than one letter may be right.

Polyplacophora = P
Gastropod = G
Pelecypoda = B (bivalve)
Cephalopoda = C

a) radula _____
b) pearls _____
c) ink _____
d) trochophore larva _____
e) tentacles _____
f) slugs _____
g) scallops _____
h) chiton _____
i) belly-foot _____
j) two siphons _____
k) internal shell(s) _____
l) hatchet-foot _____
m) no head _____
n) two shells _____
o) head-foot _____

2. Describe what you think is the best way to arrange books in your locker or on a shelf at home. Why do you prefer this way to any other?

3. What do we call the system that biologists use to arrange living things?

4. What do we call scientists who classify living things?

5. What is a dichotomous key?

6. What are the common features of all mollusks?

7. What are the four major classes of mollusks?

8. In which class is a snail? Describe the main features of this class.

9. In which class is a squid? What does the class name mean? Does a squid have a shell?

10. What kind of mollusks are in the class polyplacophora? Do they have a shell?

11. In which class would you find bivalves? How would you distinguish between a bivalve and a univalve? Make a list of the differences between the two.

12. What's different about the lifestyle of a snail and a clam?

13. How do you explain the fact that a chambered nautilus is not in the same class as a moon snail?

14. Describe two major differences between a scientific name and a common name.

15. What do clams eat?

16. Where are chitons found?

17. The Linnaeus Classification has seven divisions. In order, they are:

18. Name several ways in which humans use (or have used) mollusks.

19. Tell the scientific name and common name of one mollusk that you identified using the professional dichotomous key.

20. Why do you think it's alright for gastropods to move slowly? How do they protect themselves from danger if they can't run away?

21. Explain why you think it is important for scientists to have a way of organizing living things. Give at least three reasons. Then tell why it's important for you to know about this system.

Competency Factors/References

Competency Indicators

Biology—

3.4 know about the diversity of living things;

3.4.2 design a dichotomous key for a group of objects;

3.4.3 devise several classification systems based on similar characteristics;

4.2 know the major representatives of kingdoms of living things;

4.2.1 use a given classification system to find the organism's species name when given sufficient features of the organism;

4.2.2 describe the binomial system of nomenclature; and

4.2.4 state the advantage of a biological classification system.

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