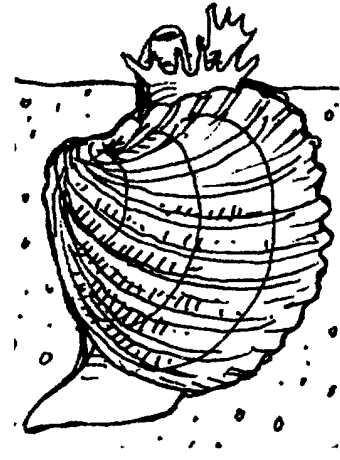


More Than a Few Clams

Key Concepts

1. There are many species of clams that live in estuaries and the ocean.
2. Clams have unique structural and behavioral adaptations.
3. Estuaries provide a large concentration of edible resources, including clams, utilized by aboriginal people to the present.
4. Humans use a variety of techniques for harvesting clams from the estuary and oceans.



Background

Worldwide, about 20,000 different kinds of clams are found in shallow waters. All of them may be eaten and people have used clams for food for thousands of years. Most clams live in sandy or muddy beach habitats. As adults, clams are relatively stationary, burrowing down into the sand or mud for protection. A look at clams and clam harvesting provides an intersection for a study of how humans make a living along our coasts and how marine animals are adapted to their environments.

Materials

For each student or pair of students:

- “More Than a Few Clams” student pages

Teaching Hints

The next several lessons, also focusing on clams, require some advance planning. It is highly recommended you locate a source for fresh clams. If you are not able to dig your own, try one of the large, chain grocery stores or a local fish market. Avoid the temptation to skip the hands-on activities like “Open Sesame”. These activities provide valuable teaching moments that are well worth the advanced planning required.

“More Than a Few Clams” introduces clams with a student reading. Clams found on the coast of the northwestern U.S. are highlighted. Contact your state Department of Fisheries or similar agency for information specific to your area of study.

Key Words

cannery - a factory for the canning of foods

dredge - an apparatus usually in the form of an oblong iron frame with an attached bag net used especially for gathering fish and shellfish

midden - a refuse heap or pile of discarded garbage which, if old and from a special culture, can have archeological value; often composed of assorted shells from common food sources like clams

siphon - a tube-like structure in certain marine animals, like clams, allowing the passage of seawater

Extensions

1. Have students draw any available clam shells as they look closed. Encourage students to draw the shells their actual sizes and include the patterns and colors found on the shells. Challenge students to record one interesting or unusual fact about each clam.
2. Take a field trip to the beach at low tide and dig for clams.
3. Have students make a model of a clam dredge.
4. Challenge students to invent another way clams might be harvested. Does your new method harm other marine animals or plants?
5. Have students make their own crossword puzzles, using the vocabulary presented in the reading.
6. Have students complete the crossword puzzle, "Keep Clam." A completed puzzle is found at the end of the "Answer Key" section.

Answer Key

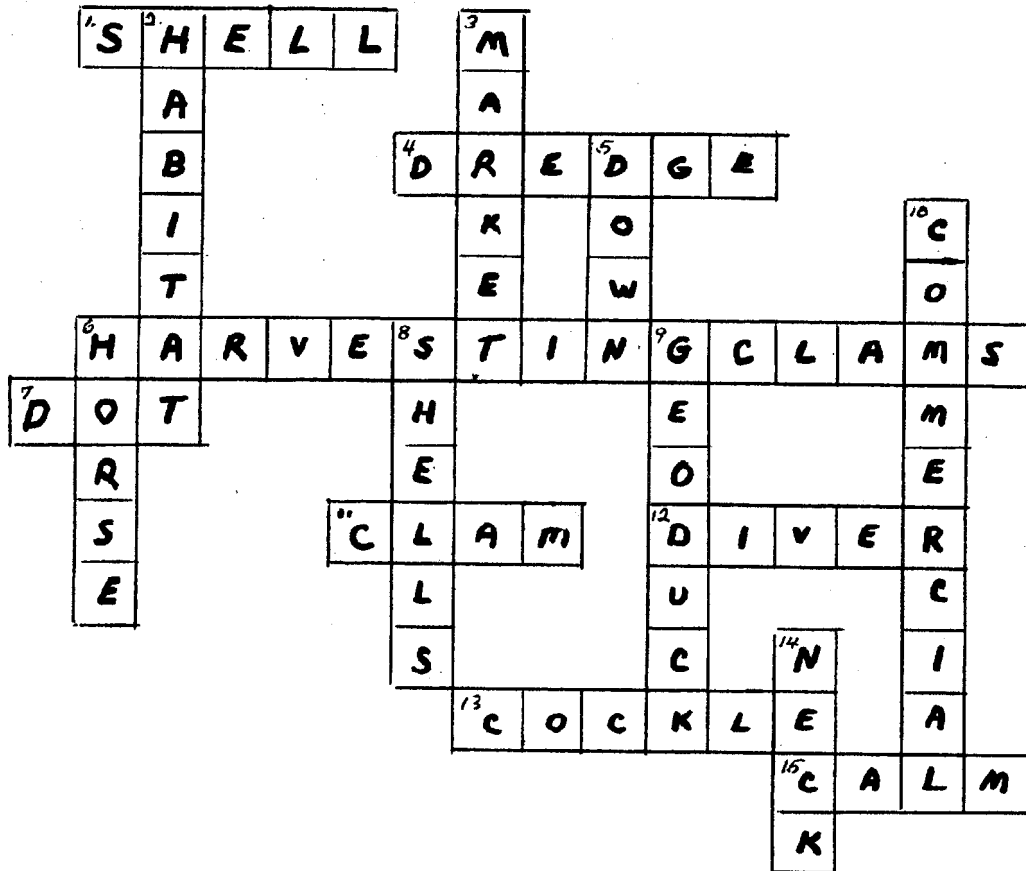
1. Two ways in which clams protect themselves: they quickly dig to move away from danger, and they live below the surface. Your students may have other suggestions such as hard shells or the ability to hold shells together tightly. Use this question to assess students prior knowledge.
2. "Speed" could dig 72" (six feet!) in one minute (i.e. 12 inches/10 seconds x 60 seconds/minute).

3. Digging rapidly helps razor clams survive because it enables them to get away from damaging wave action and any predators which might see or reach them near the surface.
4. The geoduck appears to be a fast digger, because it quickly contracts its siphon.
5. Habitat is the place where an animal lives. An organism's habitat is generally considered to be the total of living and non-living factors which act upon that organism.
6. While advice to Ms. Taken will vary, geoducks are found on muddy, sand beaches (below the tide line) indicating that she should move from the cobble beach to a sandy one.
7. Wading birds probably look for clam holes, as well as siphons which extend above the surface.
8. Since this question asks for an opinion, answers may vary. Both dredge and bucket harvesting can destroy sea pens. If the mesh on the bucket is large enough to allow the sea pens to pass through, the bucket technique may be less harmful. Accept any reasonable answers and use them as a springboard for a discussion about the unintended impacts of harvesting animals on marine habitats.
9.
 - a. In three hours a diver could harvest 360 geoducks (i.e. $2 \text{ geoducks/minute} \times 60 \text{ minutes/hour} \times 3 \text{ hours}$).
 - b. In three hours, 50 boats could harvest 18,000 geoducks (i.e. $50 \text{ single diver boats} \times 360 \text{ geoducks/diver}$).
 - c. Since this question asks for an opinion, answers may vary. Overharvesting is likely to be correctly advanced as a prime reason for regulations.
10. Geoducks are not harvested by dredge because they lie very far below the surface of the water and deep in the sand. The size and power of the dredge necessary to dislodge geoducks makes the technique impractical.
11. Since this question asks for an opinion, answers may vary. Restaurants and supermarkets are the primary purchasers of clams in the shell.
12. Lots of choices are available for the five kinds of workers that help get the clam to the plate including, but not limited to: clam digger/diver, canner, cleaner, cooker, meat remover, labeler, truck driver, warehouse person,

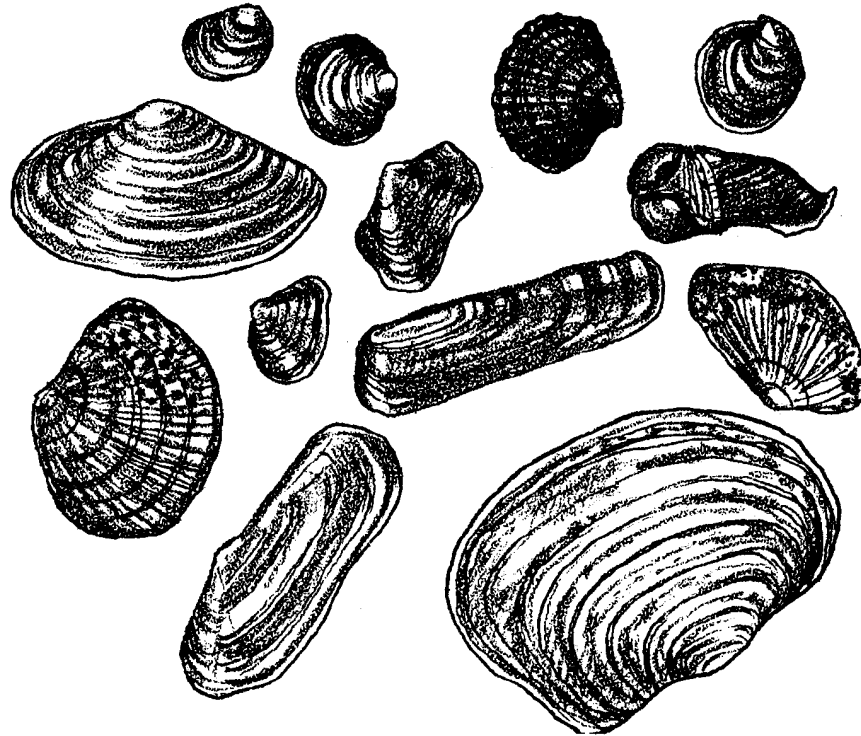
boat/train workers, grocer, restaurateur, cook, waiter, etc. Use this question to underscore the diversity of workers that depend on estuaries and the coastal zone and the interrelationship of their jobs and the environment.

Keep Clam—Crossword Puzzle Key

This crossword puzzle is a vocabulary building activity. The words used are found in the text of the section and are, for the most part, key words. Again, this assignment may be completed by individual action or through small group consultation. Both approaches have their advantages.



More Than a Few Clams

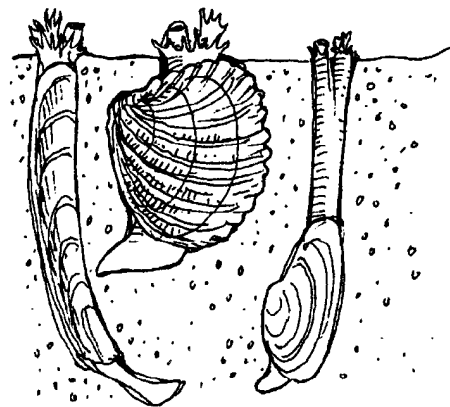


Clams are found in both fresh and saltwater all over the world. There are about 20,000 kinds of clams. All of them may be eaten. People have eaten clams for thousands of years. Their shells are many sizes. They are different colors and patterns. Clam shells may be round, oval, or almost square.

Indian people living near shorelines ate clams. They used simple sticks to dig up a seemingly unending supply. The shells from clam feasts were buried near the villages. They have stayed buried much as they were left. These old garbage piles are called middens. You can sometimes see shell middens in soil that has been cut away.

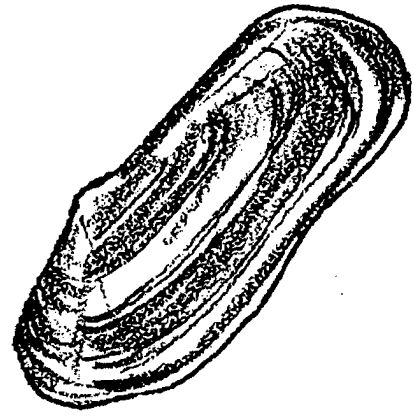
Most clams live in sand or mud on shallow beaches. Most clams live below the surface. There they hide from animals that would like to eat them. An animal that captures its food is called a predator. Some clams escape from predators by quickly digging.

1. What are two ways that clams avoid predators?



The razor clam can move quickly. Razor clams live on the ocean beaches. They are found from Alaska to California. They are shaped like an old-fashioned straight razor. Razor clams can be as large as eight inches (20 cm).

Some people think it is the best clam for eating. Razor clams are not easy to catch. They can dig speedily down through the sand. They can dig twice their length in 10 seconds.



RAZOR CLAM

2. “Speed” Razor Clam feels the footsteps of a clam digger. “Speed” has only one minute to escape. How far could “Speed” dig in one minute?

How do they move so quickly? Although clams don’t have hands for digging, they do have a “foot.” A clam’s foot is pointed and muscular. To dig, the razor clam points its foot down into the sand. It may point it as far as half of the length of the clam.

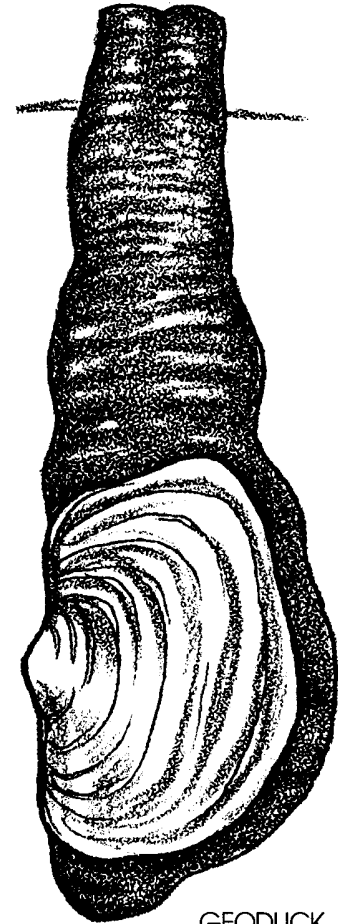
The clam then makes the tip of the foot larger. This forms an anchor. The muscle in the foot gets smaller. This pulls the clam downward. Razor clams can “point and pull” very rapidly, again, and again, and again.

3. Razor clams live in the pounding waves on a sandy beach. They feed near the surface of the sand. How might digging rapidly help razor clams survive?

Geoducks (pronounced GOOEY ducks) are very large clams. They can weigh up to 13 pounds. A geoduck's siphon (neck) is so large that it does not fit in its shell.

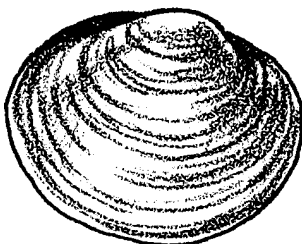
Geoducks live in muddy sand. They are found from 2-6 feet below the surface. A geoduck's long siphon reaches up through the sand to the water. When the geoduck senses danger, it quickly pulls down its siphon. Geoducks live in the sand under water 10 to 120 feet deep. People on the beach only see them during very low tides.

4. Many clam diggers think the geoduck can dig rapidly. In truth, it is not a very fast digger. What is the geoduck doing that makes clam diggers think it is a fast digger?

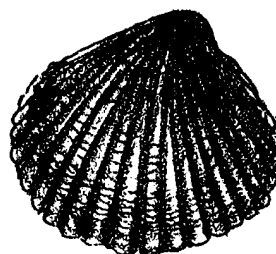


GEODUCK

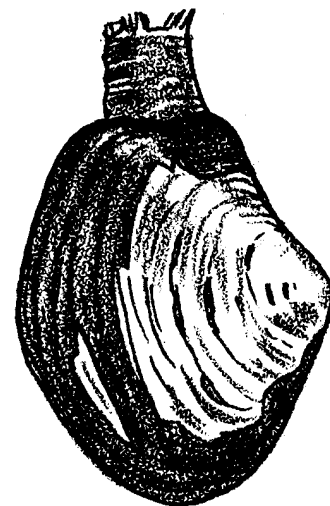
It is easiest to see clams at low tide. Clams are often found in clusters or groups scattered along the beach. Not all beaches are the same. Differences in beaches provide homes for different kinds of clams. These homes are called habitats. Butter clams and little neck clams are usually found in gravel and cobble (round stone) beaches. Sand and mud beaches are the usual habitats for geoducks, horse clams and cockles. All of these beaches may be found in an estuary.



BUTTER CLAM

LITTLE NECK
CLAM

COCKLE



HORSE CLAM

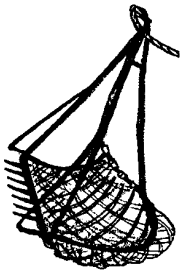
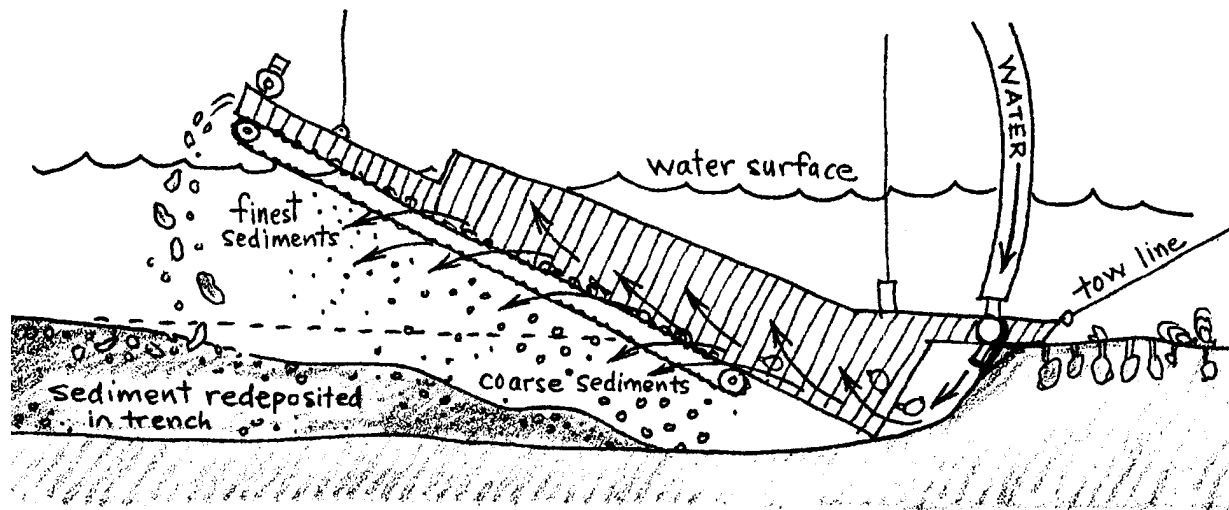
5. What is an animal's habitat?
6. Ms. Taken is searching up and down a cobble beach. She is looking for geoduck holes. She's not having much luck. What information might you give to help in her search?

Harvesting Clams

People still dig clams for food. Some clams live very near the surface of the sand. These clams can be dug with a shovel at low tide. Other clams may lie in the sand as deep as three feet or more. Clam diggers look for holes in the beach. A hole can be left when the clam pulls its siphon down to its shell. Have you ever dug for clams? If you have, you know that clams can be hard to catch. Many more clams get away than you catch. This is because some clams can dig rapidly. Others quickly pull their siphon down to meet the shell. The digger often loses sight of the clam.

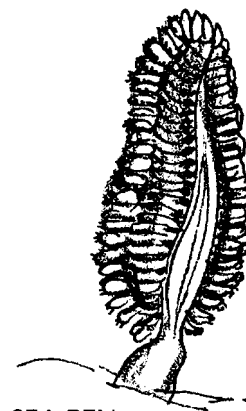
7. People aren't the only animals that dig clams for food. Some wading birds with long bills eat clams. These birds walk along the beach in search of food. What might they be looking for?

Most clam diggers eat all of their own harvest. Yet, some people dig clams to sell. Collecting clams for sale is called commercial harvesting. About 50 different kinds of clams are harvested for sale. Some harvesting is done from a boat with a dredge. A dredge makes strong jets of water. The jets wash the clams from the bottom. The clams are carried onto a conveyor belt. The belt brings them to the surface. People sort out the clams they want. The rest are returned to the water. The dredge disrupts the sea floor. It also disrupts the plants and animals that live there. Burrowing anemones, nudibranchs, sea pens, and other bottom dwellers are sent into the water. They tumble until they can come to rest on the sea floor again. This disruption is hard on the bottom dwellers.



There is another way clams are harvested by boat. A large wire bucket is dropped overboard. It may be six feet or more across. The bucket is dragged along the bottom. The bucket digs into the sand as it moves along. The sand flows through the wires. The clams stay inside the bucket. The bucket is then brought into the boat. The clams are sorted.

8. Many other animals live on the sea bottom. Sea pens look like bushy, old-time feather pens. They live on sandy sea floors. Sea pens can be harvested along with the clams. Do you think dredge or mesh bucket harvesting is most harmful to sea pens? Why?



SEA PEN

Geoducks are also harvested to be sold. They are usually harvested by teams of divers. The divers look for geoduck siphons. The siphons stick above the surface. The divers shoot water jets into the sand or mud bottom. Then they pull the geoducks out of the sand by the siphon.

9. Challenge: Divers can collect over two geoducks per minute. They can stay underwater from one to three hours at a time.

a. How many geoducks could a diver harvest in three hours?

b. At one time, many people collected geoducks for sale. At one spot, fifty boats with divers, were seen at the same time. If each boat had one diver, how many geoducks could be harvested in three hours?

c. Why do you think laws were passed to limit geoduck harvesting?

10. Why do you think geoducks are not harvested using a dredge?

Marketing Clams

Harvesting the clams is only the beginning for those who sell clams. They must find a way to prepare the clams. They also must get them to you. After the clams are harvested, some are taken to a cannery. Others are sold directly to markets.

Men and women work at many different jobs in the cannery. The first job is to sort the clams. The clams are then cleaned. Some of the clams are now ready to be sold in their shells. The rest of the clams are cooked. They are dipped in boiling water. The boiling water makes the clams open. After they cool, the meat is removed from the shells.

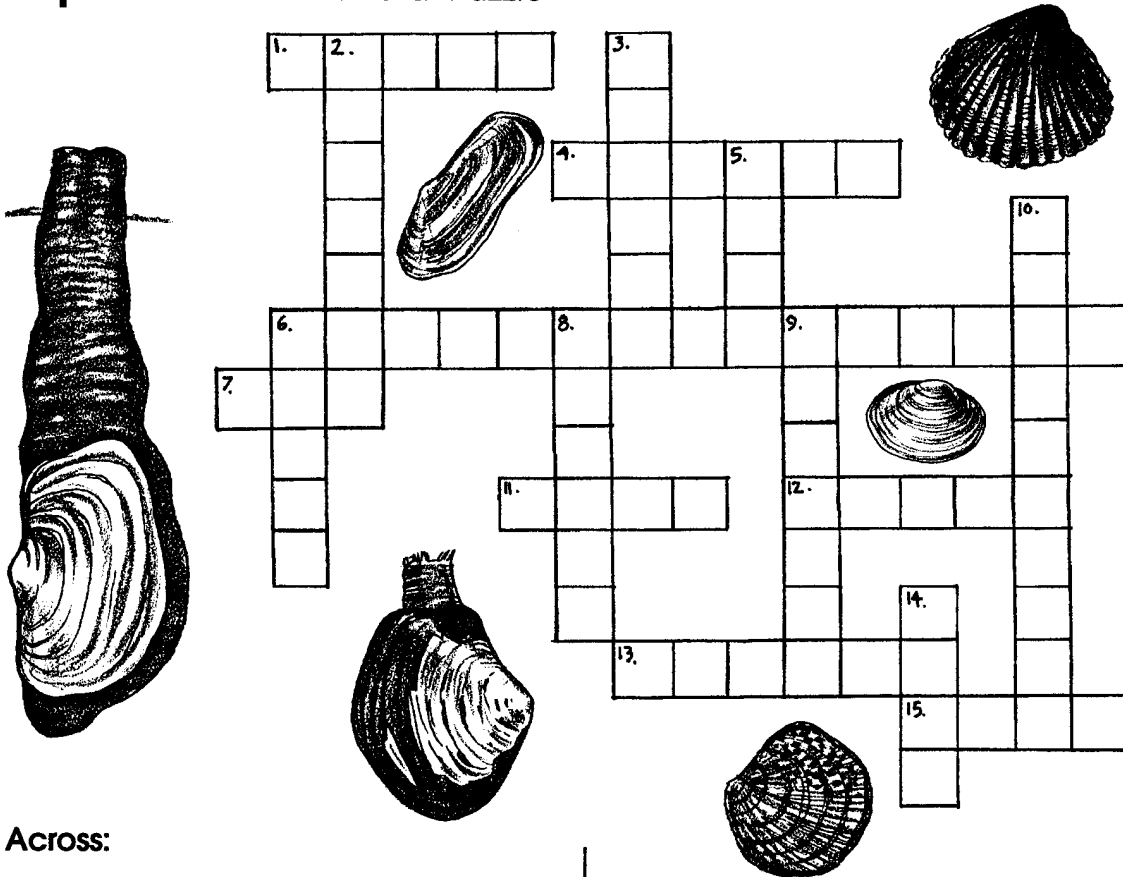
11. Who do you think buys clams sold in their shells?

Cannery workers freeze or can the clams. Others label the clams for market. The clams are then loaded onto trucks. The truck drivers take some to small seafood markets. They take some to big seafood distribution plants. There the clams are readied for shipment. They are shipped by truck, boat, air or train to places all over the world.

The next time you are in the grocery store, look for clams for sale. You might find them in several places. Look in the meat or seafood department for fresh clams. Look in the canned food section for canned clams. Look in the frozen food section for prepared clams. What kinds of clams can you find? Where did the clams come from?

12. Lots of things happen from the time a clam is at the beach until it is on your dinner plate. List five kinds of workers that help get the clam to your plate.

Keep Clam Crossword Puzzle



Across:

- 1. The hard outer covering of a clam.
- 4. This washes clams from the bottom with strong jets of water.
- 6. Collecting clams for sale is called (two words)
- 7. A small round spot.
- 11. People often eat the Little Neck _____ whole.
- 12. Geoducks are harvested by this person who wears a wet suit.
- 13. A kind of clam made famous in a song "...singing' _____s and mussels, alive, alive-Oh!"
- 15. People like to go clamming when the water is _____and not rough.

Down:

- 2. The place where the clam lives.
- 3. Many clams after they are harvested are taken directly to a_____.
- 5. The opposite of up is_____.
- 6. This large animal, ridden by jockeys in races, gives its name to a large clam.
- 8. Clams have two hard_____ .
- 9. These very large clams are harvested by divers.
- 10. _____clam diggers sell their catch.
- 14. This part of the clam contains the siphons.