Crayfish Capers

Overview

One of the most successful groups of animals in the world includes the members of the phylum Arthropoda, which means "jointed legs." There are three times more species of arthropods than all other animal species combined. This group of invertebrates (animals without backbones) includes the insects, spiders, mites, and the crustaceans such as the crayfish, lobster, crab, barnacle, and shrimp. The crustaceans are almost entirely marine (living in salt water) and many live at the rocky seashore. One of the freshwater exceptions is the incredibly successful crayfish.

This activity begins as students look at pictures or real representatives of the crustaceans to determine their similarities and differences. Session 1 ends with the students asking questions that they think they could answer by closely watching a living crustacean– the crayfish.

In Session 2, students work in small groups to create a habitat for live crayfish. They then observe the crayfish's external anatomy and behavior to discover the ways a crayfish is adapted to live in a water home. The students ask more questions, take "mind photographs" to look for similarities and differences between the crayfish, learn how to hold them and help complete the class crayfish illustration. Session 3 provides further opportunities for observations of the crayfish behavior and students make individual labeled drawings of their crayfish. Students discover that crayfish have special adaptations to survive in their freshwater habitat. They also find that although crayfish have many parts and behaviors in common with other crustaceans, they are also very different.

What You Need

For Session 1

For the class

- 5-10 photos or drawings of different kinds of crustaceans (shrimp, lobster, crab, crayfish), or bring in live or fresh crustaceans from a fish or Asian market
- two large sheets of chart paper or the chalk board
- tape
- colored markers

For each group
- 1-2 sheets drawing paper,
- 4 pencils
- crayons

For Session 2

For each group of 4 students:
- one live medium-sized crayfish (See Getting Ready)
- one clear plastic shoe box or flat container filled with about 3" of water
- dechlorinating liquid (from an aquarium store)
- small plastic cup
- small fish net

For the class:
- 3 sheets chart paper
- colored markers
- tape
- rocks/gravel in tub
- broken clay flower pots—enough for 1 piece per group
- Elodea sprigs—enough for 4 or 5 per group (these plants are available from an aquarium store)
- paper towels
- large fish net (to drain water from gravel)
- 5-10 gallon holding tank for the crayfish
- coffee mugs or clean clay flower pots (for the crayfish to use as hiding places in the holding tank)
- Key Concept written in large letters on butcher or chart paper (see Getting Ready)

optional
- "sinking" goldfish food, tubifex worms, fresh or frozen fish

For Session 3

For each student:
- drawing paper
- pencil
- crayons to share

For each small group:
- crayfish and habitat set up in Session 2

Getting Ready

Ordering Crayfish

Crayfish can be ordered from scientific supply houses such as Niles or Carolina Biological (800) 547-1733. Order a few extra crayfish in case some die or are reluctant to move around. You can even collect your own if there is an appropriate freshwater wetland, lake, stream or pond nearby. In some areas crayfish can be bought from bait shops. Remember to change the water frequently and to add dechlorinating drops, which can be obtained from aquarium stores.

Most supply houses also provide several other preserved or live crustaceans for comparison, such as hermit crabs, brine shrimp, barnacles, crabs, etc. as well as Elodea or pond weed. Usually the plants can also be obtained locally from aquarium stores.

Key Concepts:
Write out the key concepts using colored markers on a large sheet of chart paper.

> **Crayfish have special adaptations to survive in their freshwater habitat.**
>
> **Crayfish have many parts and behaviors in common with other crustaceans, but they are also very different.**

(Into the Activity)

Session 1

My Buddy Says

1. Group students in pairs at their seats or on the rug and assign each student to be either #1 or #2. Remind them that a habitat is a home and includes everything an animal needs to survive.

2. Tell the students that each of them will have their turn to share their ideas about a question you will ask them, but first Buddy #1 will be given a question and Buddy #2 will just listen to their ideas. Then Buddy #2 will share what Buddy #1 said with the whole class.

3. Ask Buddy #1 the following question:

- **What are two things animals need to have in their habitat so they can survive?** ***(food, water, shelter, mate, plants, air)***

4. Give Buddy #1 30 - 60 seconds to talk about their ideas to Buddy #2 (who listens only).

5. Ask several Buddy #2's what their Buddy #1 said about the question. Buddy #1 may correct misstatements by the reporting buddy, but cannot add new information. As they share, list their responses in words or pictures on a chart labeled My Buddy Says.

6. Switch roles for question #2 and remind the students that only one person in each pair is talking at a time - the other person is actively listening. Pose the following question for Buddy #2 to answer:

- **Can you think of two more things animals might need to live?**

7. Ask several Buddy #1's what their Buddy #2 said about the question. As they share, list their responses in words or pictures on the board.

8. Repeat #3 - #7 with the following two questions:

- **Imagine you are a crab living in the ocean. Describe what your home or habitat would look like.**

- **As a crab, what do you use to protect yourself?**

Animal Drawings

1. Have students sit in a circle. Show them the crustacean photos and drawings one by one, or the actual organisms if you were able to obtain them. Tell the students that all of these organisms have some things in common with each other. They all belong to a group of animals called **Crustaceans**. Ask the students what they can see that is the same in all the organisms. Have the students share their ideas and then ask what they can see that is different about the animals. After a few minutes of sharing, tell them that they will work with their small group to become the expert on one of these kinds of crustaceans.

2. Have students return to their tables. Distribute a large sheet of drawing paper, pencils, and crayons to each small group of students. Also distribute a different crustacean (photo/illustration or the "real thing") to each group.

3. Have students work together in their small group and make a drawing of their animal. Tell them to draw it BIG– so big that it fills up most of the paper. As you walk around, encourage them to add as many details to their drawing as they can.

Sidebar: Help the students to focus their observations by using some of the following prompts: tell me about this part of your drawing; show me where you saw this structure; what do you think the organism might use this part for?

4. Show the students how to label each of the structures or parts they included on their illustration. If the students don't know the name of a structure, have them make one up that is descriptive of what they think that structure is used for. Students can then label all the parts of their illustration (or have them dictate the names to older student helpers.)

5. After each group has completed their illustration, ask them to imagine where they think this organism would live. Have them add details of their organism's habitat to their drawing.

6. Display the drawings around the room and have each group present their drawing and describe the labeled parts of their animal and its habitat. As the students make their presentations, list the structure or parts and attributes they mention on a large chart (sample below) with one side labeled *All Crustaceans Have* and the other side labeled *Only Some Crustaceans Have.*

All Crustaceans Have	**Only Some Crustaceans Have**
legs	antennae
A shell (exoskeleton)	Bright colors
mouth	Long tail
	pinchers

What We Want to Know

Have each group make up two questions about their animal that they might be able to answer if the animal was alive so they could watch it. List these questions on a chart labeled *What We Want To Know about Crustaceans.*

(Through the Activity)

Session 2: Crayfish in the Classroom

Crayfish Brainstorm

1. Tell the students that they will now have the chance to see if some of their questions can be answered as they carefully watch a real, living crustacean called a crayfish.

2. Hold up one crayfish (pick it up behind the pincers or use a net to put one in a small tray) so everyone can see it. Walk with it rather quickly around the room so that everyone gets a chance to take a peek at it. Tell them that each small group will get a living crayfish at their table so that they can make their own discoveries about this incredible animal.

3. Tell the students that the crayfish need to be treated very gently and only those students who treat them with respect will be allowed to pick them up at the very end of the class (and then only with supervision.) Tell them that they can touch the crayfish gently before then, but the pinchers can hurt if they grab skin, so everyone needs to be careful.

4. Have students brainstorm a list of all the external parts they could see (or would expect to see) on the crayfish as you walked around holding it. Record their ideas on chart paper with the words *Animal Parts* written across the top. Their list might include legs, eyes, antennae, pincers, shell or exoskeleton, hair or bristles, and mouth parts. Tell them that they will probably want to refer back to this list as they discover things about their crayfish.

Designing the Crayfish Habitat

1. Tell the students that before they can get a crayfish, they will need to create a suitable habitat for it. What might a crayfish need in its habitat? As students suggest ideas, write them down and discuss why each would be important to a crayfish. *(water, plants, food, shelter)*

Students may not know that crayfish are freshwater creatures and could not survive in saltwater. Be sure to tell them that although crayfish can't live at the rocky seashore, they are still excellent creatures to study because they have a lot of things in common with crustaceans that do live at the seashore. In fact, they look like little lobsters.

2. Arrange students into cooperative groups of about four and assign each student in the group a number from 1-4. Tell them that their group will work together to design a habitat for their crayfish. Pass out the plastic shoe box with about three inches of dechlorinated water to each of the groups. Tell them this will be the start of the habitat.

3. Show them where the other materials (plastic cups, fish nets, gravel, plants and broken flower pot pieces) are located and describe how they will take turns coming up and getting materials for their group. Assign #1's to be in charge of getting the gravel, #2's the plants, #3's the crayfish, and #4's the piece of clay flower pot (the "home" for the group's crayfish).

4. Call up the #1's to get the gravel. Have them scoop 1 cup of gravel and take it back to put in the aquarium. Tell the students the crayfish might crawl out if the gravel is piled too high on the sides.

5. Next call up the #2's to get the plants. Remind them that they should all agree where to "plant" the pond weed.

6. Then call on the #3's to get the crayfish. Have them bring the empty gravel cup with them to receive their crayfish. The teacher can put the crayfish in the fish net and the student can hold the plastic cup under the net to catch drips.

7. Add the flower pot piece to the habitat. The crayfish will probably need some uninterrupted time to locate the home and go underneath it. Most will go in within a few minutes if they are left undisturbed. Have the students predict which way they will go into the home—backing in or walking forward. Sometimes if the crayfish discovers the shelter too quickly, the students won't be able to see much of the crayfish as it will hide out. If this happens, just remove the shelter for a time so the students can make their observations.

Live Crayfish Discoveries

Free Exploration

1. Give the groups about 10 minutes to discover things about their crayfish on their own. Remind them to look, listen, and smell, but not to touch quite yet. Have each group decide on one observation about their crayfish they would like to present to the class.

2. After this initial observation period, refer back to the *Animal Parts* and *What We Want to Know* charts. Were the students able to find all the parts listed on the chart on their own crayfish? What additional parts did they find? Which questions are they now able to answer based on their observations of the live crayfish?

Class Drawing

1. Draw an outline of the crayfish on a large sheet of chart paper or the white board. Ask students to help you complete the drawing by adding the parts they see on their crayfish.

2. Call on a volunteer and ask them to come up and add a part to the drawing. Be sure that they also label the part they add. Keep calling on volunteers until all of the parts have been added to the drawing.

More Questions

1. Have the students brainstorm any additional questions they would like to add to the *What We Want to Know* chart. Although it is unlikely that the students will be able to answer all of their questions, leading a discussion about how they might try to answer some of them is usually very interesting. Here are some representative questions which students usually ask:

- how many legs does it have
- how does it protect itself
- what do they use all the different legs for
- what does it do when you touch its head
- does it blink its eyes
- does it prefer land or water
- what does it like to eat
- how does it find food
- how does it eat
- how hard can it pinch
- can you sneak up behind it
- what do they use their antennas for
- is it a boy or a girl

You may hear a lot of different answers from your students about how many legs the crayfish have. Some might count the pincers, some might not and some may count all the abdominal legs and others won't. In addition, some may have lost a leg during capture or confinement; if so, it will eventually grow back after several molts.

2. Have some food available if the students would like to try to feed the crayfish, although they may not be comfortable enough yet in their new home to start to eat. You might want to leave the crayfish undisturbed for a while so they can check out their new habitat.

Mind Photographs

1. Have the students take a picture in their mind of their crayfish by looking at the crayfish and then closing their eyes and picturing what it looks like. Have them do this two more times so they have a very clear picture of their crayfish. Then have each student close their eyes as you move the crayfish around so that each group has a new crayfish to observe.

2. Have them compare this "new" crayfish with their "old" one by closing their eyes and visualizing their original crayfish. Have each group say one way the crayfish are different and one way they are the same. Make a large T-Chart on the board with one side labeled *All Crayfish Have* and the other side labeled *Only Some Crayfish Have.* (Students will notice differences in size, color, and number of pincers, legs, and antennae.)

3. You will want to return the crayfish back to their original group since by this time the students will usually be clamoring to have "their" crayfish back.

Categorizing and Sequencing

Have the students work together to agree on and arrange the trays of crayfish in a sequence from largest to smallest. They might also sequence or categorize them based on color, markings, or size of pincers.

Time to Hold the Crayfish

1. Tell the students that you will now come around and show them how to tell if their crayfish is a male or a female. [Look on the underside of the abdomen on the crayfish. Females have swimmerettes (small abdominal legs) which all look identical in color, size and orientation. In males, the first set of swimmerettes is white-tipped, face towards the

head and appear heavier. In females the swimmerettes are used to hold the eggs and keep them well aerated.]

2. Travel to all the groups, showing them the swimmerettes and the mouth parts. This is also a good time to show the students the intestine and where the "poop" comes out.

3. As you move to the different groups, also take the time to show them how to carefully pick up the crayfish. Of course nobody has to pick up the crayfish unless they want to. Remind them that they must be gentle, watch out for the pinchers, and only hold it 1-2" above the water in case they get nervous and need to return it to the water very quickly.

Wrapping it Up for the Day

1. Return the crayfish and plants to the holding tank, and the small aquaria to the side of the room.

2. Ask the students what they learned today by using a live crayfish that they probably couldn't have learned if they had just used pictures or a model of a crayfish.

3. Tell them that they will be able to observe the crayfish again in the next session.

Session 3: Further Observations and Illustrations

1. Have the students help you place each group's crayfish back in their small aquaria.

2. Allow the students to freely observe the crayfish for 5 or more minutes (remind them to not pick them up unless an adult is supervising).

3. Distribute a sheet of drawing paper (or their journal), a pencil and crayons to each student and have them create his or her own illustration of the crayfish. Remind them to label the parts and to use colors that accurately reflect what the crayfish really looks like.

4. You might also have the students turn their illustration over and draw the underside of the crayfish on the back of the sheet. Display the completed drawings around the room.

Key Concept

Hold up the key concept and have one or two students read it aloud. Post it near other work from this activity.

(Beyond The Activity)

Going Further

What's in a Name

Of course the crayfish is not a fish at all. In some areas they are called crawfish or crawdads. Have the students participate in a contest to give the crayfish a more appropriate name. The students can make posters and slogans in support of their choice and then vote on the winning name. You might want to extend this to include new names for other rocky seashore creatures such as starfish, barnacle, mussel, and sea anemone.

Field Trip

Take a field trip to a pond or marsh to observe crayfish in their natural habitat. Use a baited minnow trap to capture some crayfish and compare them to the ones you had in your classroom. Remember there are over 500 species of crayfish! You can also take a field trip to a seafood market where many different species of crustaceans can be observed.

Live Animal Comparison

Bring live shrimp, crabs, or lobsters into the classroom to observe their behavior and compare to the crayfish. Compare crustaceans to a live goldfish. List all of the ways that fish and crustaceans are different.

What If

Write a story about a crayfish that somehow ended up at the rocky seashore. Remind the students that it really can't live in saltwater. What sort of adventures might it encounter? What strange rocky seashore creatures might it encounter? What would it think of the crashing waves and changing tides? Would it get along with the crabs?

Library Research

Visit the library and learn about the freshwater habitat of the crayfish. Learn who its enemies are and about other animals living with the crayfish. Have the students draw a picture of the crayfish in its natural habitat.

Crayfish Capers Home Activities

FAMILY OUTINGS

• Ask your parents to take you to a seafood market or the seafood section of your local grocery store. Look at all the kinds of crustaceans they have. Do they keep any of them alive? Sketch one of the crustaceans you see. What do they all have in common and how do they differ from one another? Did you see anyone buying crustaceans? Ask them how they plan to cook them.

• Ask your family to visit a local creek, lake, pond, or wetland to look for crayfish. Encourage your family to help you watch the behavior of the living crayfish and write down any questions you or your family have about what you see. Can you answer some of their questions? Teach them what you know about crayfish adaptations and behavior. Try to catch some of the crayfish to look at them more closely. How do they differ from the crayfish you investigated in class? Write down your observations and make a detailed, labeled sketch of the crayfish in its habitat. Bring your sketch to class to share with your classmates.

CRUSTACEANS IN YOUR BACKYARD?

Did you know that rolly-pollys or pill bugs and sow bugs are crustaceans? Tell your family all of the things that crustaceans have in common with one another. Challenge them to think of a crustacean that lives in your backyard. Go on a rolly-polly hunt to see if you can dicover where they like to live. What structures or parts do they have in common with other crustaceans? How are they different?

Background

One of the most successful groups of animals in the world includes the members of the phylum Arthropoda, which means "jointed legs." There are three times more species of arthropods than all other animal species combined. This group of invertebrates (animals without backbones) includes the insects, spiders, mites, and the crustaceans such as the crayfish, lobster, crab, barnacle, and shrimp. The crustaceans are almost entirely marine (living in salt water) and many live at the rocky seashore. One of the freshwater exceptions is the incredibly successful crayfish.

There are more than 500 species of crayfish and they are found throughout the world in swamps, marshes, ponds, streams, and even cold lakes and fast-running rivers. They are found in all coastal areas of the United States, including Hawaii, and have been introduced in Costa Rica, Spain, France, Africa and Japan. Although they live only in brackish or freshwater, crayfish are ideal to represent the crustaceans living at the rocky seashore because they have so much in common with their marine relatives and yet are much easier to obtain and keep alive in the classroom.

All arthropods, which includes crustaceans, have several features in common. They are all covered with a hard external skeleton (exoskeleton) that is segmented so they can move. Arthropods must shed or molt the exoskeleton in order to grow because it cannot grow as the inner body does. By the time a crustacean molts, a new, soft exoskeleton has already started to form underneath the old one. As soon as it molts, the animal inflates its new exoskeleton to a larger size by swelling itself with water. This allows for some growing room before the next molt is necessary.

Crustaceans are very successful living between the rise and fall of the tides in the wetlands and these same adaptations allow the crayfish to live in very diverse freshwater systems. All crustaceans have gills covered by a carapace—the shield-like part of the exoskeleton that covers the head and most of the back, and wraps around the sides of the body above the walking legs. In shrimp, lobsters, and crayfish, the tail section, or abdomen, extends back past the carapace and ends in the telson or fanlike tail. Crustaceans can stay out of water for varying lengths of time, but must always keep their gills moist so they can breathe. **Most crayfish can remain out of water for only about 10 minutes at a time.**

Crayfish, crabs, and lobsters are called decapod crustaceans because they have ten large legs. The first pair of legs are modified into pincers, which are used to defend

against predators, help in competition with other crustaceans, and catch and tear food into smaller pieces. Actually, even the mouth parts of decapods are modified legs (not counted among its ten) and are used to sort and manipulate food after the pincers bring it to the mouth.

The next four pairs of legs are used primarily for walking, but also for handling food and cleaning itself. In crayfish, the legs on the abdomen or tail section are used in reproduction to hold masses of dark, spherical eggs until they hatch. They also are used as fans to keep the eggs oxygenated. These abdominal legs are called swimmerets because they help the crayfish to swim, although they are weak swimmers and cannot float. The crayfish uses its strong tail to dart backwards rapidly by flexing it towards the belly. This allows them to escape predators and to right themselves when they end up on their back. In crabs, the tail and abdomen are very much reduced and are wrapped tightly underneath the carapace. Female crabs have a wide rounded abdomen used as a shelf to hold their eggs. Males have a narrow, triangular abdomen.

Crayfish can be very aggressive towards one another. It is important, if you are keeping them for any length of time, that each crayfish be given a place to hide. Crayfish will eat almost any kind of fresh or frozen fish and can actually live for over a month without being fed. They will also eat live food such as goldfish and water plants.

Crayfish have to contend with fast moving rivers, whereas its seashore relatives, crabs and shrimp, have the changing tides and crashing waves to deal with. Crayfish have pincers like crabs and walking legs like shrimp. Also, like crabs, they can hang onto rocks and water plants so it isn't dislodged with strong water movement. By observing crayfish that live in streams and ponds, we can begin to understand how their ocean relatives live as well.

Who Am I?

Overview

Rocky seashore seaweed and animals are a hardy bunch. Whether living on exposed rocks or in tidepools, each has special adaptations for living there and interacting with the other seaweed and animals around it.

In Session 1, students watch a video to observe rocky seashore creatures in action. As they watch, they look specifically for details about the *one* creature for which they are responsible to observe closely. After the video, they "write" down their observations on sentence strips in words or pictures, post them on the wall and present their observations to the class. They then participate in a Carousel and rotate as a group to posters representing each of the five or six animals focused on in this activity. On each of the posters they add information they learned about the creature from the previous activities, the video or any of the other information displayed around the room. Finally, they do Animal Corners as a way to form new heterogeneous groups for the upcoming Game Show.

In Session 2, students work in small cooperative groups to teach each other about specific rocky seashore creatures. Then students participate in a "game show" and a 20-questions guessing game to check for understanding. Students discover that the rocky seashore is a habitat with many very different creatures and encouraging others helps everyone to be a winner!

What You Need

For Session 1:
For the class

- colored markers (various colors)
- video about the rocky seashore (See Sources)
- VCR and monitor
- tape
- 1 copy of each large Tidepool Animal picture to display on wall (See Getting Ready)
- 1 small slip of paper for each student
- 1 pencil for each student
- 1 sheet chart paper for bar graph
- 5 markers or beans for each student
- 5 small cups (or other small container)

Optional
- books about the rocky seashore (See Resources)
- tape player
- audio tape of ocean sounds or other music (See Resources)

For each of 5 small groups
- 1 colored marker (different than other groups)
- 1 large Tidepool Animal picture
- 1 sheet chart paper for Creature Poster (See Getting Ready)

For each pair of students
- 1 small Tidepool Animal picture
- 3 sentence strips
- 2-3 colored markers

Session 2:
For the class
- glue
- one package 3" x 5" index cards
- 1-2 sheets chart paper for Scoreboard
- colored markers (various colors)
- Questions for Game Show
- Who Am I? Questions

For each group of 4-5 students
- 4-5 slips of paper (for numbering students)
- one set of Tidepool Animal Fact Cards (See Getting Ready)
- 4-5 pencils
- 1 Creature Poster (from Session 1)

Getting Ready

1. Decide which five of the Tidepool Animals (out of a possible six) you will focus on for this activity. (For a class of 30, use all six animals.) Session 1 includes an activity where the class makes a bar graph to choose their five favorite creatures. If you would rather make the cards before then, choose your own five favorite or make all six sets just to be prepared for whatever the students decide.

2. Assemble the Tidepool Animal card sets as follows: (See Sample)

   Duplicate five copies of each one of five tidepool animals (barnacle, sea star, hermit crab, mussel, chiton, or sea anemone). Glue each picture on one side of a 3" x 5" index card. This will give you 25 pictures, five of each animal or five sets.

Duplicate one copy of the five fact sentences associated with each animal and cut each of the sentences apart from the others, making five slips of information about one creature. Glue just **one** of the five fact sentences about the animal on the opposite side of one of the corresponding picture cards. Repeat with the other four sentences to create five cards about one animal, each with a different sentence on the back. Repeat the process with the other picture cards and their associated sentences. This will make five barnacle cards, five sea star cards, and so forth.

3. Prepare five large Creature Posters as follows: duplicate each of five large Tidepool Animal pictures and glue or tape each one to the center of a large sheet of chart paper. Label the poster with the name of the animal pictured: barnacle, sea star, hermit crab, mussel, chiton, or sea anemone.

4. Duplicate one additional copy of the five large Tidepool Animal pictures. Display each animal on the wall with enough room around it to add sentence strips.

5. Duplicate two copies of each of the small Tidepool Animal pictures to make 10 pictures in all. One picture will be distributed to each of 10 pairs of students during the video.

6. Cue up the rocky seashore video to a spot that shows all five of the creatures in about 10 minutes of tape, or be prepared to fast forward it to show the animals in action.

7. Make the Scoreboard chart for the Game Show by making five columns on a large sheet of chart paper and labeling each column with the name (optional, add a small picture) of one of the Tidepool Animals as follows:

Barnacle	Sea Star	Hermit Crab	Mussel	Chiton (or Sea Anemone)

Tidepool Animal Fact Cards

—Sample—

FRONT

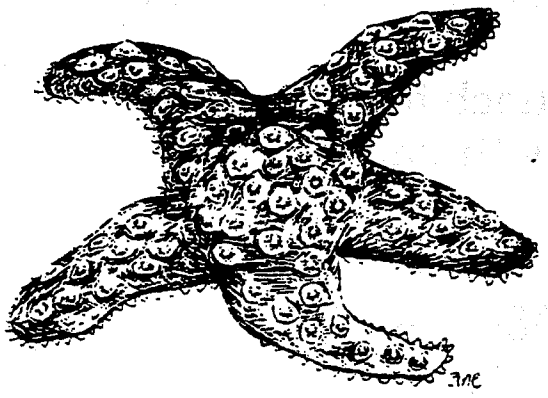
BARNACLE

BACK

- It is hard to believe, but I am related to the crab.

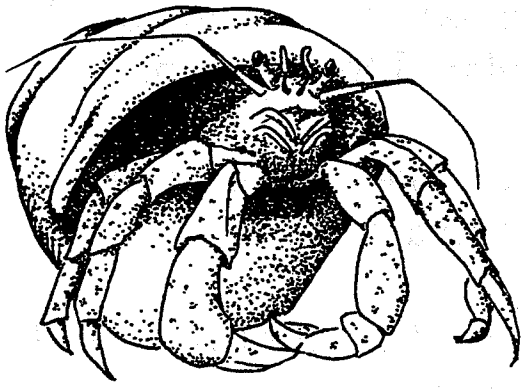
BARNACLE

- It is hard to believe, but I am related to the crab.
- I look like a little volcano glued to a rock.
- I only stick out my legs at high tide.
- I kick food into my mouth with my legs.
- I use my feathery legs to catch tiny plankton to eat.



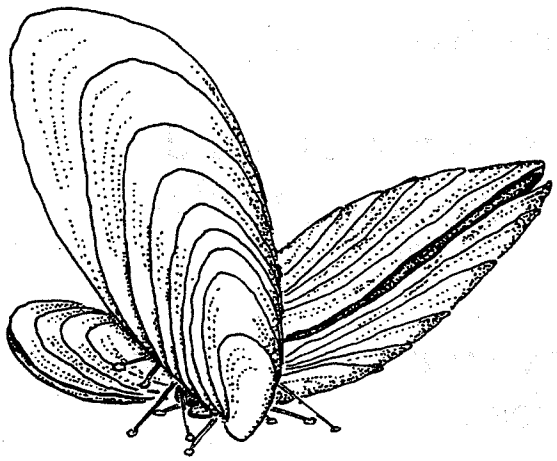
SEA STAR

- I have five arms.
- My skin is rough and colored orange, purple, brown or red.
- I have hundreds of tiny tube feet.
- I love to eat mussels.
- My stomach comes out of my mouth when I eat.



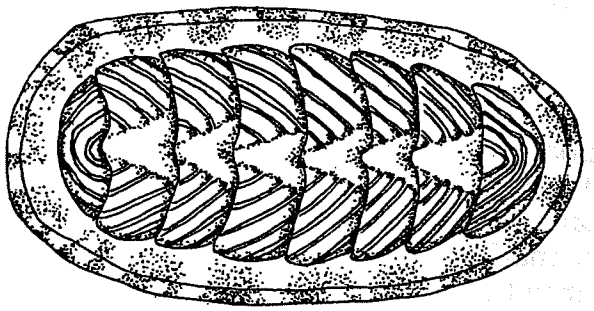
HERMIT CRAB

- I live inside empty snail shells.
- I fight a lot with my buddies.
- I am a scavenger. I eat dead things.
- As I grow, I have to move into a new shell.
- I have antennae to help me learn about my habitat.



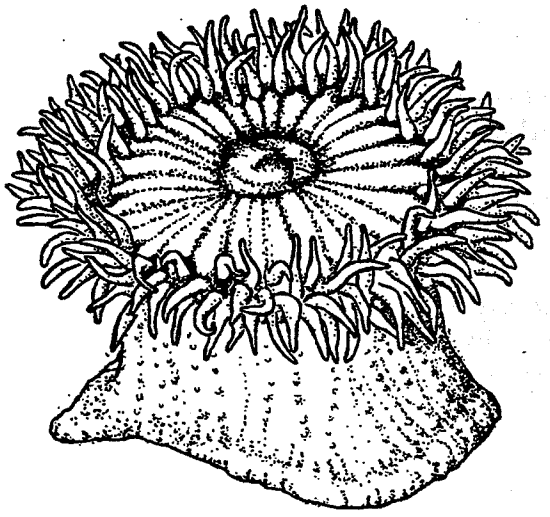
MUSSEL

- I have two blue shells.
- I attach to a rock with sticky threads.
- My name sounds **very strong**, and I am.
- I catch and eat tiny plants and animals from the water.
- Some sea stars love to eat me.



CHITON
(Ki-ton)

- My shell has eight parts.
- I scrape algae off rocks with my scratchy tongue.
- I move very slowly and can roll up into a ball for protection.
- I have one large foot like a snail.
- I move around at high tide, but stick tight at low tide.



SEA ANEMONE

- I am an animal that looks like a flower.
- I have tentacles all around my mouth.
- I grab and sting my food with my tentacles.
- I live stuck to a rock.
- I eat small fish, crabs, and shrimp.

(Into the Activity)

Session 1: Who Lives At The Rocky Seashore?

Our Five Favorite Tidepool Animals

1. Have the students decide which of the five tidepool animals (out of a possible six) focused on in this activity are their favorites. Display all six pictures and set a small cup in front of each picture. Give each of the students five markers and have them file by the pictures, placing a marker in the cup of each of the five creatures that they like the most.

2. Count up the markers in each of the cups and create a bar graph to determine which creature got the fewest votes. That will be the creature you will eliminate.

Observing Tidepool Animals in Action

1. Distribute one of the small Tidepool Animal pictures to each pair of students. Tell the students that they are going to watch a video about tidepool creatures and they need to pay very close attention and keep a sharp lookout for the creature shown on their card. They are responsible for observing as many details about their animal as they can.

Sidebar: Depending on the experience of your students you may need to lead a discussion about how to observe and what it means to observe very carefully.

2. Tell them that when they see "their" animal, they should call out its name and hold up the picture. After the video, they should be able to share with the rest of the class what they noticed about its color, how it was moving and what it seemed to be doing.

3. Start the video (with the sound off) and turn on the tape player with ocean sounds (or other classical music.) During the video, walk around and help the students to observe their creature when it appears on the video.

4. Distribute two or three sentence strips and a colored marker to each pair and have them write (in words or drawings) what they saw their creature doing or how it was moving or describe some of its features.

Sidebar: Helpers or older students can write on the sentence strips as the students narrate.

5. Then have two pairs of students with the same creature picture join together at one table and share what they wrote on their sentence strips with each other. If they don't agree on one of their observations, perhaps they can watch that part of the video again. Have them decide on which of the sentence strips they can all agree on and then help them tape their sentence strips to the wall under a picture of their animal. Have them use their sentence strips to present their observations to the class.

Carousel

1. Place the five Creature Posters and crayons around the room on five different tables. Divide the class into five groups and give each group a different color pen.

2. Have the groups rotate to each of the posters, writing down or drawing and coloring what they know about that creature or something about the way it looks. If it is shown at high tide, they can add a picture of how it looks at low tide. They can add anything they know about it, and can use any of the information about the creature already up around the room.

It is really great if you can manage to have older student helpers or parents to help students write down their observations on the Creature Posters.

3. Tell them that when you say **ROTATE**, they will travel with their group and their pen to the next poster. When they get there, have them read what the other groups wrote and if they agree with them put a circle next to it. If they don' t agree, put an X next to it.

4. After every group has visited each of the posters, display the posters up on the walls, maintaining some distance between each. Have the last group to visit each poster present the poster to the class.

5. If there are statements that have been questioned by the students look them up in a book and correct any dubious information that you see. Model how to look up information in a book, or if you have access in the classroom, the Internet.

Animal Corners

1. Have the students sit back down and then distribute a small slip of paper to each of them. Ask them to write down which of the animals pictured on the Creature Posters they would like to be, or which they would like to know more

about or which animal they are most like. Tell them it is very important to keep their choice a secret.

2. Once all the class members have decided, have them take their slip of paper and stand under the poster of their choice. Once they congregate under their poster, have the group members share with each other why they selected that animal. Then as a group, have them decide on several characteristics they share in common with the animal and/or why they chose this animal.

3. Have a spokesperson for each group present their ideas to the rest of the class.

4. Tell the class that this will be their group for the upcoming Game Show to be played in the next session.

Sidebar: You may want to move some of the students around to even out the groups if they are not evenly matched for numbers, and/or abilities. Try to pair confident readers with those that can use some extra help. Usually however, the groups self-select pretty evenly since it is a secret "ballot" and they don't know which group their friends chose.

(Through the Activity)

Session 2: Sharing Information and the Tidepool Game Show

Getting the Facts

1. Announce to the students "Welcome to Who Am I!" "The game show where cooperation, encouraging others and using your notes is rewarded."

Sidebar: The game show is played in a way which insures that every student will be successful, even those that are loath to speak out in class for fear of being wrong. Students are highly motivated to work together and encourage each other to make sure that everyone knows the answers. Besides all of that, it is a lot of fun! Teachers have told us that they are amazed at how well this structure works on a number of different levels.

2. Have your students work with their Animal Corners group from Session 1. Distribute the appropriate Creature Poster created in the last session to each of the groups and have them place it in the middle of their table.

3. Distribute one set of five Tidepool Animal Fact Cards that corresponds to their Creature Poster to each group of students. Have them divide the cards up among themselves so that each student has one (or two depending on whether you have four or five in a group.)

4. Have students learn the information on their card. If necessary, other members of their group, adults or student helpers can help them read and understand them.

5. When everyone in the group is sure about their own fact, give the groups 10-15 minutes to teach their fact to the rest of their group. Have students check for understanding by taking turns "quizzing" each other.

6. Emphasize how important it is for everyone to learn the information on all of the cards in their group. During the upcoming Game Show you will be calling on them to answer a question --maybe the answer is on their card, but maybe it is on the card of someone else in their group. And since they won't be able to use their cards during the Game Show, they should take the opportunity to learn it now.

7. Tell the students that as they are teaching each other, you will be walking around and making notes about which teams are really cooperating with one another, showing consideration and practicing great listening skills. Those teams will get extra points during the Game Show.

8. After everyone has taught their fact to their team members, have them add any new information they learned about their animal to their Creature Poster. Tell them that although they won't be able to use their Tidepool Animals Fact card during the Game Show, they can use any of the notes they make on their poster, or any of the other information up around the room.

Sidebar: Remember the goal of this activity is not memorization and recitation of the facts on the Who Am I? cards, but rather on cooperation, encouraging others, and as the students find necessary, revisiting their notes, drawings and other information posted around the room from the previous sessions and activities.

The Tidepool Game Show

This activity is really fun to do with flair in your role as game show host. Tell students that you get to be the final decision-maker and judge. In this role it is up to you to decide if an answer is complete and which teams earn the extra points for cooperation and encouraging others. You should feel free to orchestrate a tie or otherwise make it so that no team is the "winner," but that everyone wins.

1. Have students stop sharing information for the moment and pass in their cards.

2. Have each member of a group number off from 1 - 4 or 5, or give them a numbered card (1-- 4 or 5), so that every student in the class has one.

3. Display the Scoreboard chart with five columns labeled with the names of the animals (and a simple picture) for each team. As answers are given, write down each team's accumulated points in the correct column.

4. Pose a question to one group (use the suggested questions that follow or prepare others ahead of time) and ask the group to put their heads (literally) together to answer the question. Encourage each group to share with their team members whatever they know about the animal that might be of help in answering the question. Also remind them to look at their poster and the notes they made, especially if they are having trouble remembering the answer.

5. After allowing 1–2 minutes for a group discussion, repeat the question and then call out a number (pick a number out of a hat, pick a name stick or see sidebar for another technique.) The student with that number will stand and give the answer the group has agreed upon.

While picking the student to answer a question may look like a random process, it actually allows you to have some control over the questions that you ask students. If you have students with special needs you can help to ensure their success during the game show by noting their number and making sure that you ask them a question that you think they will be able to answer. You may want to call on that usually unsuccessful student who you know has the right answer this time. In this way every student can be a winner.

6. Remind the students that you will be giving points for encouraging others (in their own group and other groups) and cooperation, as well as points for the correct answers. Ask them how you would know if they were encouraging others and cooperating. (They might say, "You can do it!" and so forth.) Make a really big deal about working together as a whole class team so that everyone can be a winner. Remind them however, about when the best time to encourage others might be - it probably isn't a good idea to yell loud remarks when the person is trying to think. Suggest other opportunities and ways to encourage.

Sidebar: The points for social skills and the opportunity to steal, and that they will need to know all the answers for the 20 Questions Game later, keeps all the teams engaged in the game even when it isn't their turn.

"SCORING"

1. If the student called on can answer the question completely, that group gets five points. If other teams are encouraging them, give the encouraging teams a point as well.

2. If the student gives a partial (or incorrect) answer, remind them in a positive tone (modeling encouragement) to look at their poster again because "you know they know the answer."

3. If they still don't have the answer, give the whole team one-minute to discuss it again. Choose a second number from that team and give that person a chance to answer. If that answer is complete, give the team five points.

*Sidebar: Remind students that they **ALL** need to listen to **ALL** of the answers because they will need the information to play the next part of the game.*

4. If their answer still isn't complete or if it is wrong, ask the rest of the class if they think the group deserves a hint. Since other groups are getting points for encouraging and cooperation, they are usually eager to say, "Give them a hint!" At first the encouraging may be a little faked, but it quickly becomes infectious and you will be incredibly gratified at how your whole class is working together as a team.

5. If all fails (very rarely) and the team still cannot complete the answer in two tries, plus a hint, ask for volunteers from another team to answer. If the volunteer gives a complete answer, that team gets one bonus point.

6. Repeat steps 1 - 5 with the next team and a new question. Continue until each team has had several turns.

7. A tie is very easily orchestrated if it is important to you and your students that no *one* team comes out the winner. Remind them that you are the judge and host, and in that role you are free to add points to those groups that you thought were really working well together and encouraging others.

Sidebar: Many teachers have told us that they love this activity because they have never seen all their students so fully engaged and positive about sharing and helping others to shine. The students can't fail to learn in this atmosphere.

Sidebar: Some teachers have decided to not orchestrate a tie because they often have competitions in their class and their students expect it. Other teachers have said that by

not forcing a tie, it makes the point that helping others and working together really does make a difference, but each student still has the responsibility for their own learning. Use your own judgment, either way it can't hurt to feel like a winner!

Suggested Questions and Possible Answers for the Tidepool Game Show

Sidebar: You might want to record the correct answers on the board to be used later as a review before playing "Who Am I?" which follows.

- BARNACLE group
  What do barnacles eat and how do they capture their food?
  (kick food into their mouth, filter plankton out of the water, use feathery legs to grab tiny plants and animals)
  What do barnacles look like?
  (little volcanoes, feathery legs, stuck to rocks)

- SEA STAR group
  How and what do sea stars eat?
  (mussels, snails, other shellfish, and some eat algae; to eat it pries open shells, inserts stomach into shell of prey)
  Describe a sea star.
  (five or more arms, usually rough skin, tube feet, orange, purple, brown or red)

- HERMIT CRAB group
  What does a hermit crab look like?
  (soft rear, and belly not covered with armor, lives inside a snail shell for protection, has antennae, eyes, claws)
  When does a hermit crab need to find a larger shell, where might it find one and how does it get it?
  (they need to find larger shells as they grow, they find empty snail shells or fight for shells with other hermit crabs)

- MUSSEL group
  Describe what a mussel looks like.
  (two shells, black or dark blue, stuck to a rock with threads, has a thick end and a thin end)
  What does a mussel eat and what eats it?
  (eats plankton, eaten by sea stars, oystercatchers, gulls and probably fish)

- CHITON group
  How does a chiton eat?
  (scrapes algae off rocks with its scratchy tongue)
  Describe a chiton.
  (eight parts to its shell, one muscular foot, can roll up into a ball, very flat, oval, girdle of flesh around the shells)

- SEA ANEMONE group
  How does a sea anemone get its food?
  (water/waves bring food, stinging cells, sticky tentacles grab food and pull into its mouth)
  What do sea anemones eat?
  (fish, crabs, shrimp, plankton, mussels, bits of flesh floating around)

Who Am I?

This is the final round of the "Tidepool Game Show."

1. Use the following questions, plus your own if you wish, and ask students (in a 20-questions style) about animals featured in the game, as well as some others they may have encountered elsewhere in their rocky seashore study.

2. Have the students put their finger on their nose when they think they know the answer. Once everyone or nearly all have their fingers on their nose, call on one student to give the answer. Have each student informally, keep track of their own points. Everyone is a winner!

Suggested Questions

- You have two arms and two feet, but I have five arms and hundreds of tube feet. Who am I?
  (sea star)
- I have big claws that I use to hunt for food. Who am I?
  (hermit crab, crab, lobster)
- I scrape algae off rocks with my tongue. Who am I?
  (chiton, limpet, or other snail)
- My armor doesn't cover my whole body, so I wear an empty snail shell to protect my soft abdomen. Who am I?
  (hermit crab)
- I am as hard as a rock and glued to a rock. I stick my feathery legs outside my shell to feed. Who am I?
  (barnacle)
- I stick my stomach into a mussel shell to eat. Who am I?
  (sea star)
- At low tide I pull my legs in and close my shell up tight. Who am I?
  (barnacle)

- I have eight shells in a row and one strong foot. Who am I?
  (chiton)
- I look like a beautiful flower stuck to a rock, but I am an animal with stinging tentacles! Who am I?
  (sea anemone)
- My name makes me sound very strong, and I am! Who am I?
  (mussel)

Extra Hard (not studied in this activity)

- I have a door that I can shut tight against predators. Who am I?
  (snail or barnacle)
- My purple spines make me look like a pin cushion. Who am I?
  (sea urchin)
- I can change color in the wink of an eye. Who am I?
  (octopus)

3. Hold up the key concept and have one or more students read it aloud. Post it near your rocky seashore work.

> **The rocky seashore is a habitat with many very different creatures.**
>
> **Encouraging others helps everyone to be a winner!**

(Beyond the Activity)

Going Further

20 Questions
Have students make up some of their own "Who Am I?" questions to share with the class.

Library Research
Go to the library to learn more about each of the animals featured in the Tidepool Animal Fact Cards. Have students choose one of them to investigate more closely. Have them make a sketch of their animal, color it appropriately, and label its parts.

Class Quilt
Have students illustrate the facts they learned on a square piece of construction paper. Tape pieces together from the back to make a class quilt. Use colored library tape as seams on the front for a finished look.

Field Trip
Visit the rocky seashore or an aquarium to observe the different kinds of animals that live there. How many of the animals learned about in this game can you find? Of the animals found, how many of their adaptations can you observe?

Literature/Literacy Connections
• Read the story *A House For Hermit Crab* by Eric Carle or other books about hermit crabs (see Literature Connections). Lead a class discussion about how a hermit crab depends on other animals at the rocky seashore.

• Read a book about the rocky seashore and whenever the students hear new information, have them write it on sentence strips and add it to the Creature Posters.

• Have students use the information they have learned about a particular animal to write their own fictional story about it.

• Read *Animals Should Definitely Not Wear Clothing* by Judith Barrett. Have students think of situations involving animals in the wrong kind of habitat. Have students draw and label pictures of their ideas.

Everything's Connected
Have students brainstorm all the things they need to survive. (*food, water, shelter, and a home*). Then ask them what kinds of living or non-living things would be important for animals to have to successfully live in the rocky seashore habitat? *(water, waves, wind, sand, rocks, sun, plants, etc.)* . Challenge your students to think of some ways that different kinds of animals might be connected to one another or to one of the other non-living things. *(Sea stars eat mussels, mussels get their food out of the water, hermit crabs use snail shells for protection, sea anemones are attached to rocks in the tidepools, etc.)* See how many connections the class can make until everyone runs out of ideas.

Who Am I? Home Activities

MAKE YOUR OWN ROCKY SEASHORE BOOK

Ask your parents and neighbors if you could search through their old nature magazines to find and cut out pictures of rocky seashore animals. Glue the pictures onto a sheet of paper and make your own Rocky Seashore Book by adding drawings and facts about the animals. If you can't find the pictures you want, use books from the library for reference and make your own colorful drawings. Bring your book to class to share with your classmates.

ROCKY SEASHORE SURVIVAL SUIT

Hey, lucky you! You have been chosen to live at the rocky seashore for a week. Not really, but look around your house to find things you can use to make a rocky seashore survival suit. What might you use to make adaptations for feeding, moving, and surviving the crashing waves, changing tides and predators who would like to eat you. Hints: if you are a filter -feeder like mussels or barnacles, what might you use to strain the water? What will you use to hang on when the waves are crashing?

WHO AM I?

Ask your family to take you to the video store or your library and rent a nature video about the rocky seashore. If you can't find a video, check out a book about the rocky seashore and read it to your family or have them read it to you. Teach your family what you learned about this habitat and then challenge them to a game of Who Am I? Take turns making up riddles about rocky seashore animals. Remember to encourage each other!

Background

Rocky seashore seaweed and animals are a hardy bunch. Whether living on exposed rocks or in tidepools, each has special adaptations for living there and interacting with the other seaweed and animals around it.

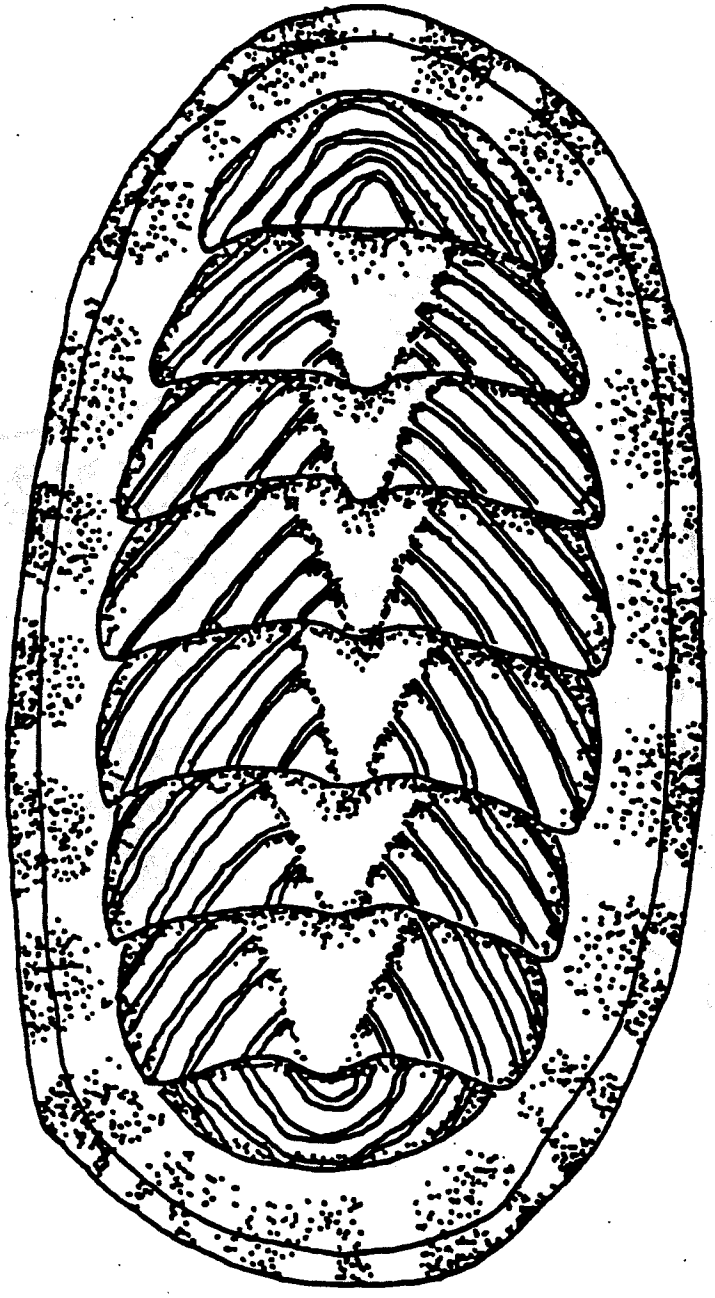
Barnacles live their entire adult life inside a volcano-shaped shell glued to a rock. They have feathery legs that grab plankton from the water at high tide. Knobby-skinned **sea stars** have hundreds of little "tube feet" on their underside that are useful not only for hanging on tightly to a rock, but also for walking and for prying open some of their favorite food, the mussel. Most sea stars have five arms or "rays," but some kinds can have more than 20.

Mussels, which are soft-bodied mollusks (protected by two shells) that grow larger as the animal grows. Adult mussels attach themselves to the rocks by strong filaments called byssal threads and live in huge groups called "beds."

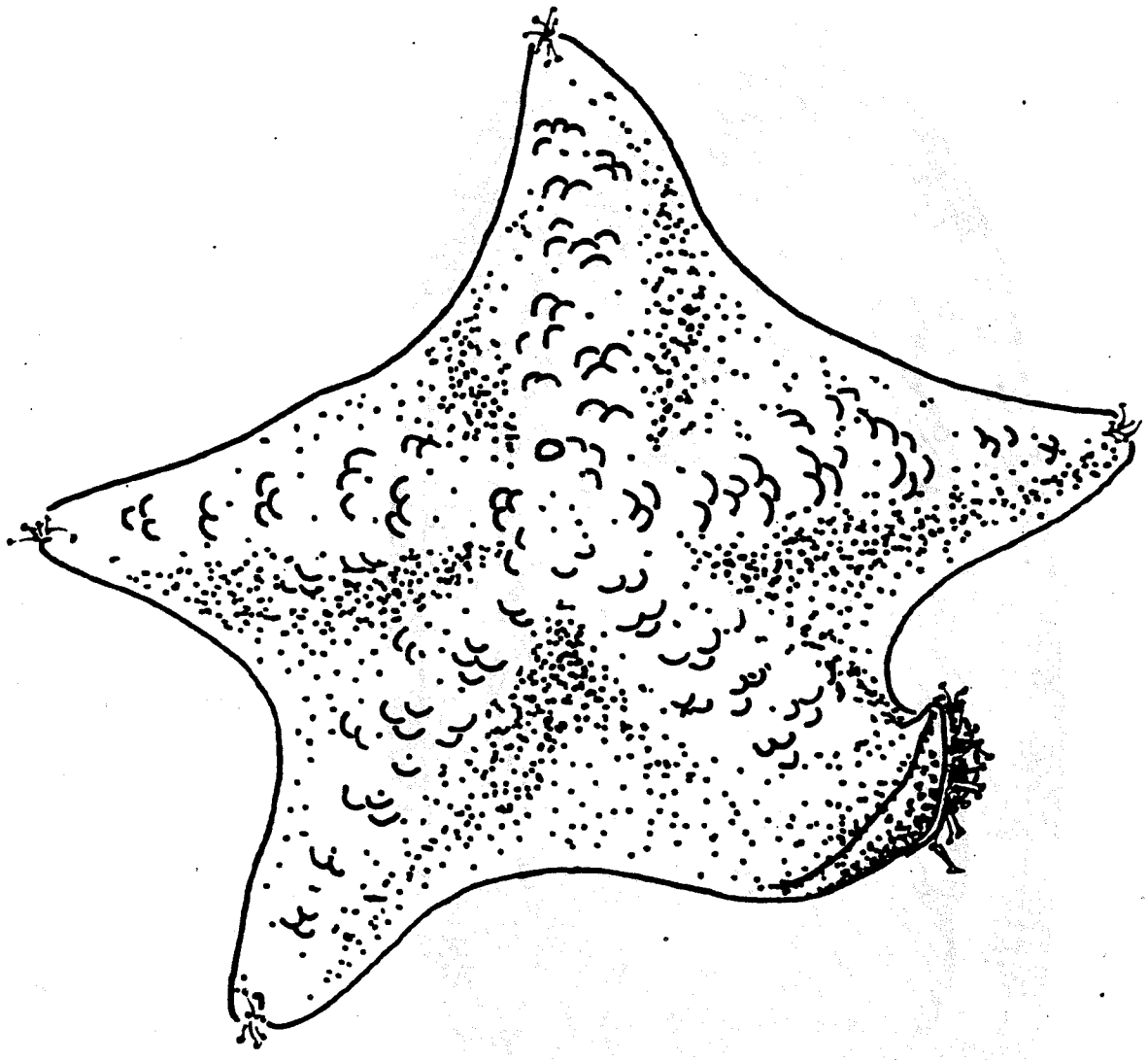
Another mollusk, the **Chiton,** has eight butterfly-shaped shells covering its body, and attaches to rocks with a big muscular foot. Chitons make a living by scraping algae off rocks with their hard, rasp-like tongue, called a radula. The shells of many other 1-shelled snails are important homes to another common tidepool resident, the hermit crab.

Hermit crabs are related to other crabs, shrimp, and even barnacles. Unlike their relatives with entirely hard exoskeletons, hermit crabs have partly soft bodies and use the shells of dead snails for protection. As they outgrow their shells, they often fight with each other over new shells. They are scavengers, keeping things tidy by eating the remains of dead organisms.

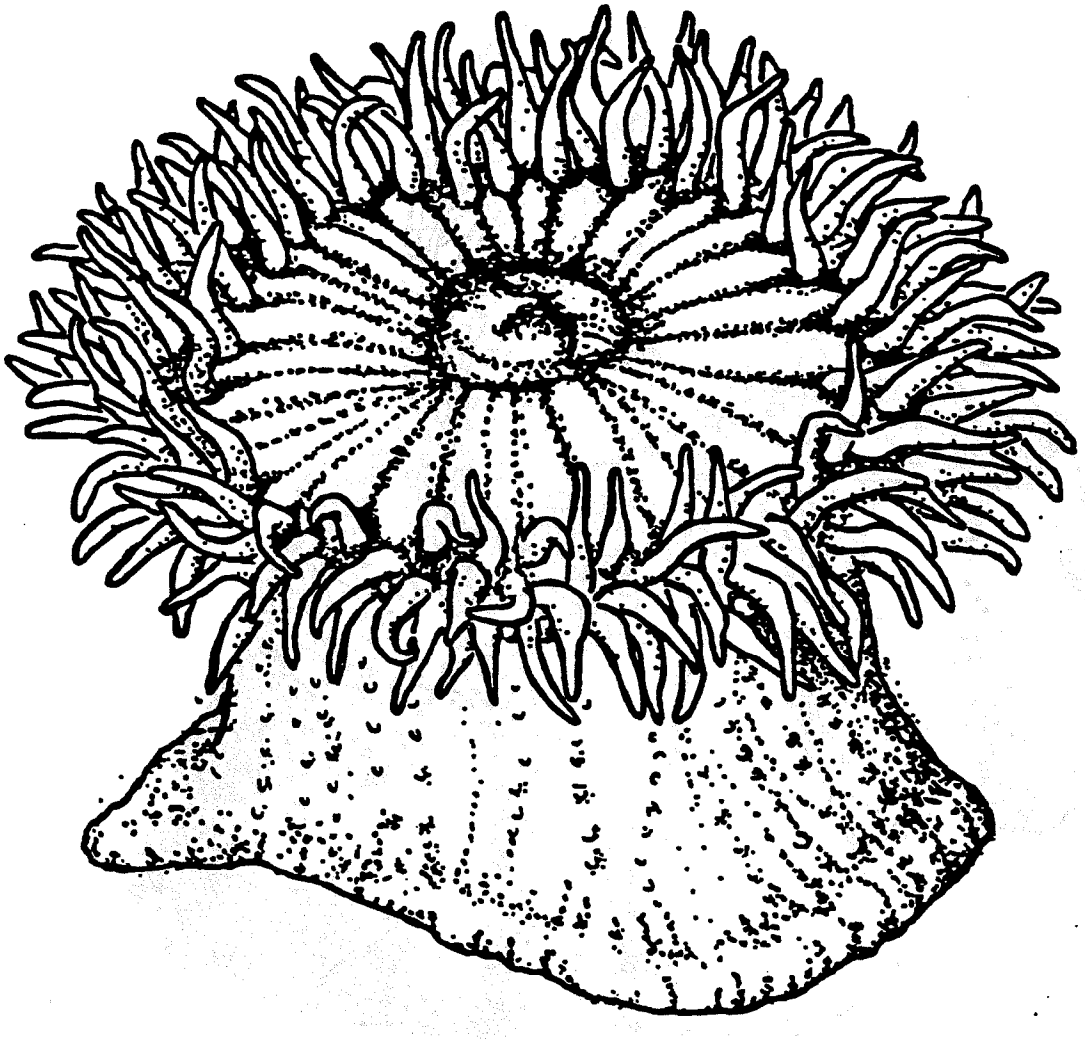
The soft **sea anemone** lives attached to a rock, waiting for the wash of the tides and waves to bring it food. Equipped with petal-like, stinging tentacles, it quickly pulls an unlucky fish, shrimp, or crab that gets too close into its mouth.



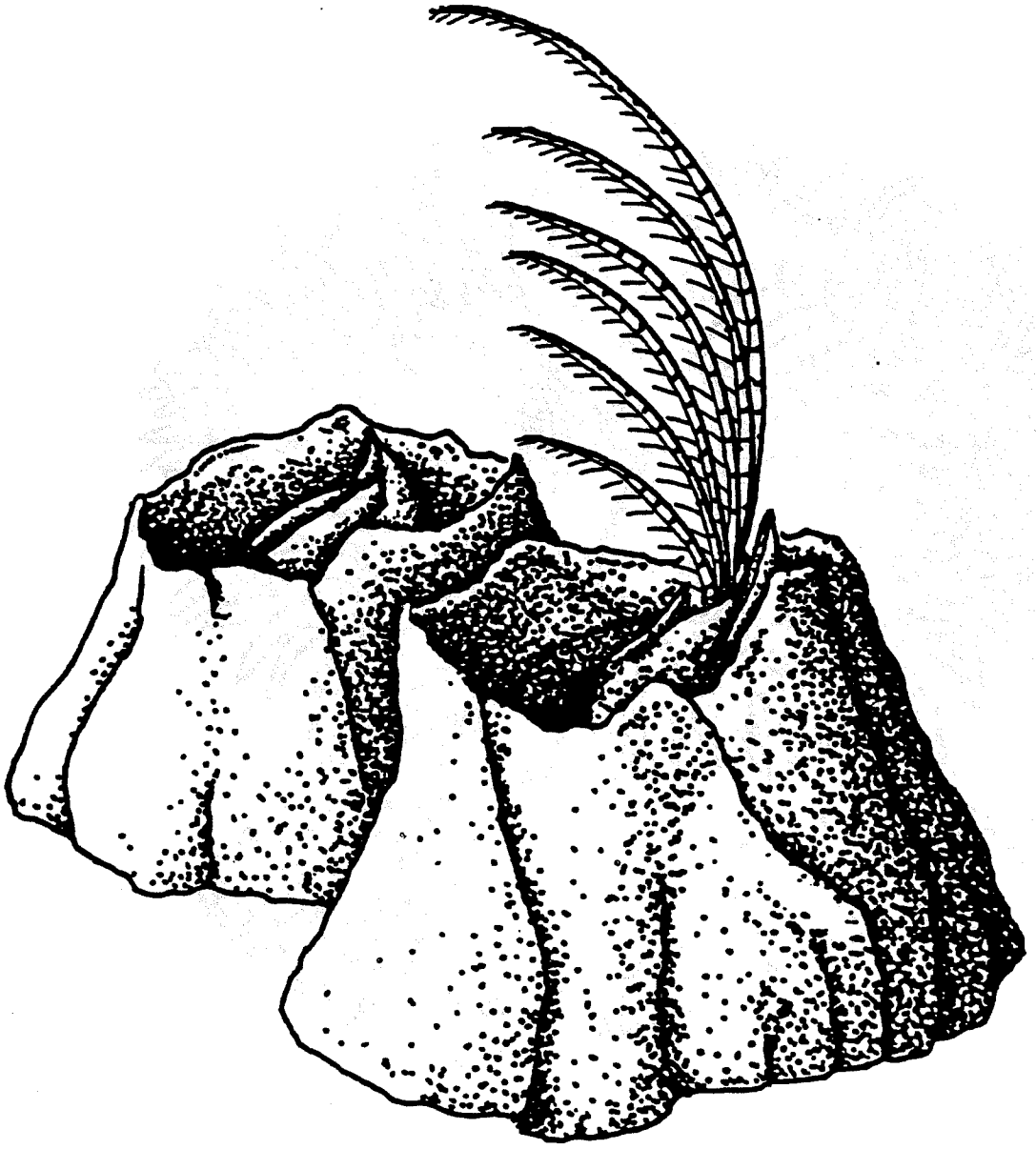
CHITON



BAT STAR

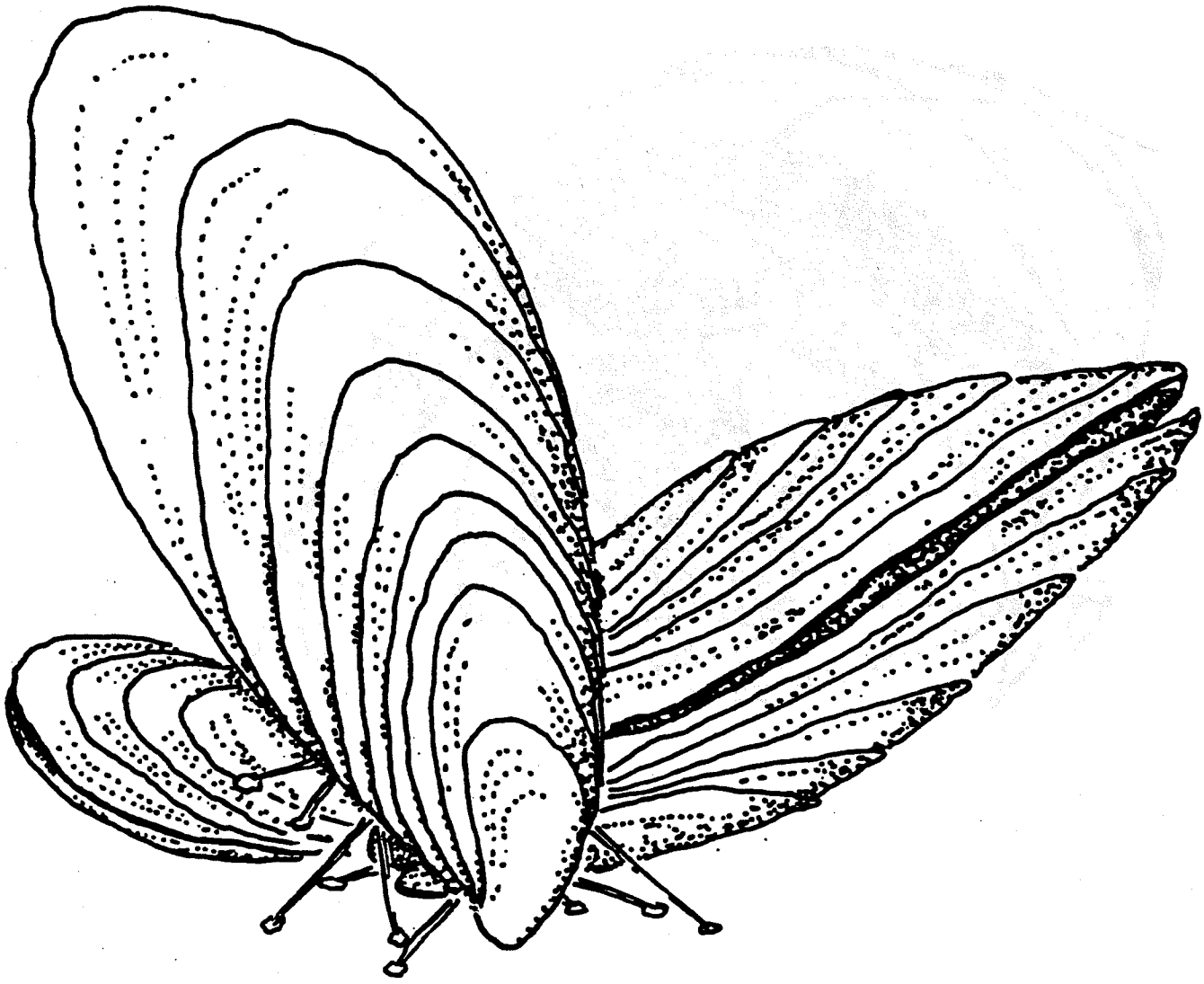


SEA ANEMONE



BARNACLES

HERMIT CRAB



MUSSELS