

# SURVIVE THE SHORE

## Topic

Rocky Shore Crabs,  
Adaptations

## Duration

One session

## Vocabulary

adaptation  
Asian shore crab  
claws  
concealing camouflage  
exoskeleton  
green crab  
jonah crab  
northern hermit crab  
rock crab

## STANDARDS

### Practices

Constructing Explanations  
and Designing Solutions

### Core Ideas

Structure and Function

### Crosscutting Concepts

Structure and Function

## OCEAN LITERACY PRINCIPLE

OLP 5

## FOCUS QUESTION

How do a crab's adaptations help it survive?

## OVERVIEW

Students recall the term “adaptation.” Students make inferences of what challenges crabs face on the rocky shore. Students make inferences of what adaptations crabs have to overcome their challenges. Students will dramatize their knowledge of crab adaptations by participating in a physical education game.

## OBJECTIVES

*Students will be able to:*

- ★ Identify the term “adaptation”
- ★ Identify challenges and adaptations of rocky shore crabs
- ★ Dramatize their knowledge of crab adaptations through a physical education game

## MATERIALS NEEDED

- ★ Marine Crabs: True or False activity sheet for the teacher (page 138)
- ★ Plastic cones (same number as students is preferable)
- ★ Bean bags (same number as students)
- ★ Salad tongs (same number as students is preferable)
- ★ Pinnies (two sets of four pinnies—two different colors)

## TEACHER PREPARATION

1. Students need a large open space to play Survive the Shore—a gymnasium, field, or empty classroom.
2. Place traffic cones randomly throughout the large open space.
3. Place bean bags at the far end of the large open space.
4. Place salad tongs at the beginning of the large open space.

## BACKGROUND

Crabs are decapod crustaceans and are covered with a thick shell called an exoskeleton. Crabs are invertebrates (animals without a backbone). They have flattened bodies, two feeler antennae, and two eyes located on the end of stalks.





### Teacher Tips

- ★ Inform students they are going to be participating in a physical education game the day prior to this lesson so they have appropriate clothing.
- ★ Students with physical limitations can be given different roles in the “Survive the Shore” activity (i.e. the teacher’s role, a different predator, etc.)
- ★ Consider giving some students the role of hermit crabs in the “Survive the Shore” activity. Their goal can be to cross the tide pool to retrieve an empty shell. Make sure to designate a different object to represent a shell.

### BACKGROUND (CONTINUED)

Crabs are ten-legged animals that walk sideways. They have five pairs of legs and the first pair is known as the claws. There are over six thousand species of crab living around the world: marine crabs, freshwater crabs, and terrestrial crabs. Crabs can be as small as the pea crab (only a few millimeters wide) and as big as the Japanese spider crab (a leg span up to thirteen feet). Marine crabs breathe underwater using gills. Marine crabs are scavengers. Their diet primarily consists of worms, clams, mussels, other crabs, and other invertebrates.

A marine crab’s challenges include shorebirds, fish, other crabs, humans, and their harsh environment (power of the waves and currents, the fluctuation of temperature, the fluctuation of salinity and oxygen levels, and the openness to predators).

A marine crab’s adaptations include: their hard exoskeleton, their claws, and their concealing coloration—when an animal hides itself against a background of the same color.

### Five Rocky Shore Crab Facts

#### *Northern Hermit Crab*

The Northern Hermit Crab has a soft and long, spirally curved abdomen. The vulnerable abdomen can be protected from predators by an empty seashell found and carried by the hermit crab, into which its whole body can fit. Most often hermit crabs use the shells of sea snails. The tip of the hermit crab’s abdomen is adapted to clasp strongly onto the inside of the snail shell. These crabs spend most of their life underwater and they live in varying depths of saltwater from shallow shorelines to deep sea bottoms. They breathe through gills and can survive briefly out of water.

#### *Rock Crab (Cancer irroratus)*

The Rock Crab has nine small teeth on the front of the carapace beside each eye. The carapace reaches a width of up to five and one quarter inches. These crabs are similar in color to the Jonah crab. The two species can be identified by the purplish-brown spots on the Rock Crab which contrast the yellow spots of the Jonah Crab. Rock crabs can live from above the low tide line to as deep as 2,600 feet.

#### *Jonah Crab (Cancer borealis)*

Jonah crabs have a round, rough-edged carapace with small light spots. Their claws are large with dark brown-black tips. Jonah crabs can grow up to eight inches wide or more. Jonah crabs can live at depths of up to 750 meters. They are known to move around to areas in which the temperature is comfortable to them.





### Extension Suggestions

- ★ Have students participate in Otago University's rocky shore activity titled "Survivor Seashore" on page 18 of their *New Zealand Rocky Shore Activities* (found online).
- ★ Music lesson: Ask students to close their eyes and listen to "Carnival of the Animals: The Aquarium" by Camille Saint-Saens. Play the song several times, and ask students to come up with pictures in their minds of what the music might represent. After listening, inform students of the name of the song and the musician. Show students the work of art titled "Ocean Life" by Christian Schussele. Help students come up with their own choreography to move along to Saint-Saens' music, and to represent the different organisms in Schussele's work of art.

## BACKGROUND (CONTINUED)

### *Green Crab (Carcinus maenas)*

The green crab is a widespread invasive species, listed among the 100 "world's worst alien invasive species." It grows to a carapace width of three and a half inches. They feed on a variety of mollusks, worms and small crustaceans. Green crabs have traveled all around the world on ships' hulls and in packing materials. The color of the green crab can actually vary, from green, brown, red, or gray.

### *Asian Shore Crab (Hemigrapsus sanguineus)*

The Asian Shore Crab is a species of crab from East Asia. It is now an invasive species in North America and Europe. It has a squarish carapace which can be up to two inches in width, with three teeth along the sides. It is marked with alternating light and dark bands. The Asian Shore Crab is an "opportunistic omnivore" that prefers to eat other animals, especially mollusks, when possible.

## PROCEDURE

### Part One

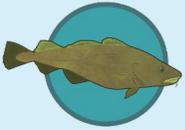
1. Read Suzanne Tate's *Crabby & Nabby: A Tale of Two Blue Crabs* (or another book about crabs) to the students.
1. Ask students to recall the definition of an adaptation.
2. Ask students if they know the names of different types of crabs. Ask them what information they know about these types of crabs.
3. Inform students that they are going to learn about crabs found at the rocky shore by participating in a "true or false" movement activity. Direct students to move to one side of the classroom if they think a statement you read is true, and direct students to move to another side of the classroom if they think a statement is false.
4. Inform students that the activity is not to test their knowledge, but to improve their knowledge of rocky shore crabs, and it is fine if they do not know the answers.
5. Encourage students to choose "true" or "false" based on their own thinking—not their friends' thinking.
6. Keep a tally of correct and incorrect answers on a whiteboard or SMART Board—based on the majority feedback.
7. Have students stand up while the teacher reads each true or false statement twice (from the *Marine Crabs: True or False* activity sheet), and allow time for students to make a decision and move to the designated "true" or "false" area. Inform students of the correct answer after the entire class has made their choice.





### Books

- ★ *Crabby & Nabby: A Tale of Two Blue Crabs* by Suzanne Tate
- ★ *A House for Hermit Crab* by Eric Carle



### Websites

- ★ Check out a video of a hermit crab shell exchange on the BBC Earth YouTube Channel titled “Amazing Crabs Shell Exchange—Life Story.”
- ★ Check out the Mocomi Kid’s YouTube Channel Episode titled “Why do crabs walk sideways?”



### Scientist Notebook

- ★ Students can record the dangers and adaptations of crabs living on the rocky shore. Students can paste their Marine Crabs: True or False activity sheet into their notebook.

## PROCEDURE (CONTINUED)

8. When all statements have been read and students have completed the activity, review all of the statements and the correct answers with the students.

### Part Two

9. Inform students that they are going to be participating in a physical education activity in which students are going to be crabs attempting to survive the rocky shore’s harsh environment.
10. Provide students with the instructions on page 136 before playing the game.

## WRAP-UP

- ★ Ask students to identify the term “adaptation.”
- ★ Ask students to recall the challenges crabs face and adaptations crabs need in order to survive.
- ★ Ask students to give feedback on the “Survive the Shore” activity. Ask them what they enjoyed about the activity and what was challenging. Ask students what decisions they made that enabled them to survive, and what decisions they made that were harmful to their survival.
- ★ Students may bring their Marine Crabs: True or False activity sheet home, or paste them into their science notebooks (if applicable).

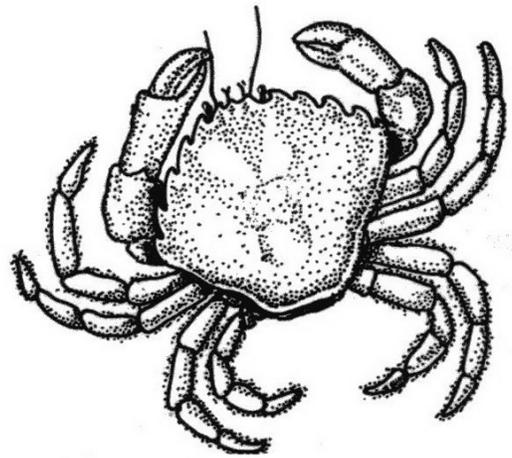


# SURVIVE THE SHORE GAME

## Instructions

### PURPOSE OF THE GAME

1. The purpose of the game is for students who represent crabs to crab-walk across the tide pool to get food, and to make it back safe to their shelter where they began their crab-walk.
2. Their large open space represents a tide pool.
3. The cones represent rocks or seaweed for the crabs to use to hide from predators or hold on to when big waves crash on the shore.
4. The bean bags represent food for the crabs.
5. The salad tongs represent the crabs' claws.



### ROLES OF THE STUDENTS & TEACHER

1. Most students are going to be crabs wearing a certain color pinny attempting to make it from one side of the tide pool to retrieve food and then back to the other side of the tide pool (their shelter).
2. At least four students (depending on class size) are going to be placed by the teacher on the perimeter of the tide pool. These students are going to alternate back and forth from being crabs to being gulls. When they are crabs they will wear a different color pinny than the crabs in the tide pool. When they are gulls, they will wear no pinnies.
3. The teacher's role is to shout out different warnings of crab attacks, gull attacks or crashing waves to the crabs in the tide pool.

### DIRECTIONS

1. Students who are crabs retrieving food line up at the end of the tide pool that is opposite the end of the tide pool where food (bean bags) have been placed.
2. Students who are crabs/gulls that are preying upon the crabs in the tide pool are placed in positions the teacher

assigns. These crabs/gulls may not move until the teacher shouts "Crab Attack!" or "Gull Attack!" Have these students begin as crabs with different-colored pinnies on.

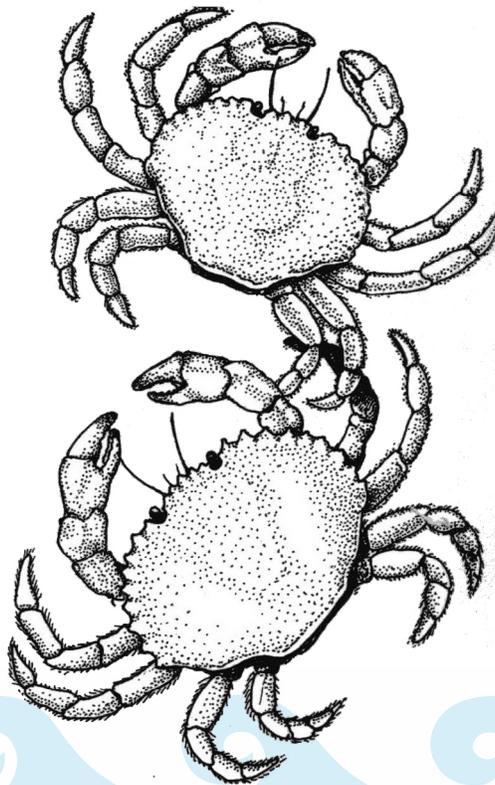
3. Students that are crabs retrieving food get in a crab-walk position (body facing up with hands and feet facing down) after having placed a salad tong (claw) on their stomach and under their pinny.
4. When the teacher shouts "Food!" the crabs retrieving food begin crab-walking. The crabs/gulls on the perimeter of the tide pool stay in place.
5. When the teacher shouts out "Crab Attack!" the crabs on the perimeter of the tide pool crab-walk toward the crabs in the tide pool. They are attempting to "eat" the crabs in the tide pool. If they touch a crab in the tide-pool that crab has been eaten and must start over where they began. Crabs in the tide pool may find safe spots by finding a cone (rock or seaweed) and touching it. If they are touching a cone they cannot be eaten because they are hidden from predators. When the teacher shouts "Crab Attack Back!" the crabs on the perimeter of the tide pool must return to their assigned positions and take off their pinnies so they can be gulls next.



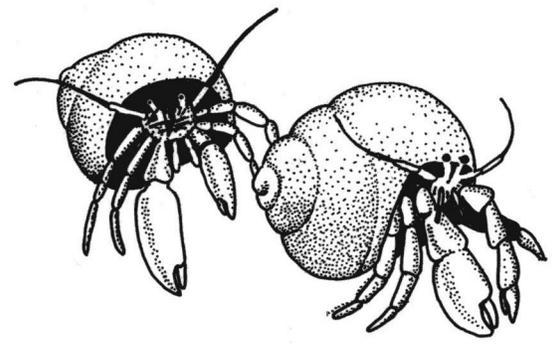
# SURVIVE THE SHORE GAME

*Instructions continued . . .*

6. When the teacher shouts out “Gull Attack!” the gulls on the perimeter of the tide pool can only walk (with arms outstretched) toward the crabs in the tide pool. They must attempt to tag the crabs in the tide pool. If they touch a crab in the tide-pool that crab has been eaten and must start over where they began. Again, crabs in the tide pool may find safe spots by finding a cone and touching it. When the teacher shouts “Gull Attack Back!” the gulls on the perimeter of the tide pool must return to their assigned positions and put on their pinnies so they can be crabs again.
7. When the teacher shouts out “Crashing Waves!” all of the crabs in the tide pool have seven seconds (depending on the size of the large area) to find a cone to touch (to hold onto for safety). There is not a maximum number of crabs that can touch one cone.
8. When seven seconds is up the teacher shouts “Crash!” and everyone must freeze. All the crabs who are not touching a cone must return to the beginning. When the teacher shouts out “Receding Waves!” crabs may begin to move around again.
9. When crabs in the tide pool reach food (the bean bags) they must pick the food up and place it on their stomachs using their salad tongs. Students may leave the salad tongs behind—but make clear to the students that crabs wouldn’t actually leave their claws behind! Crabs in the tide pool must return to the side of the tide pool they began (their shelter) and they are proclaimed to be “Survivors of the shore!”
10. The teacher may alternate shouting out “Crab Attack!” “Gull Attack!” and “Crashing Waves!” whenever he or she desires. This activity can last as long as the teacher deems it appropriate, but it is necessary to take breaks and switch tide pool crabs with preying crabs/gulls as well.



# MARINE CRABS: TRUE OR FALSE



Marine Crab Statements	Correct Answers
Most crabs have a hard shell called an exoskeleton.	True
Crabs are a type of echinoderm.	False, crabs are crustaceans. Echinoderms are organisms such as sea stars, sea urchins, and sand dollars.
Crabs have eight legs.	False, crabs have ten legs.
Marine crabs breathe underwater using gills.	True
Crabs do not eat other crabs.	False, crabs do eat other crabs. They are scavengers, and they also eat worms, clams, mussels, and other invertebrates (animals without backbones).
Another name for a crab's shell is carapace.	True
Hermit crabs grow their shells.	False, hermit crabs live inside shells of other organisms.
Shorebirds like to eat crabs.	True
Crabs have eyestalks	True.
All crabs walk sideways.	False, some crabs like the hermit crab walk forward and back. Most crabs do walk sideways because their legs are on the side of their body and their joints bend outward.

