Get A Grip

OREGON COAST
AQUARIUM
N E W P O R T

Teacher's Guide

Topic: Tidepools

Grade level: 1

Aligned Standards:

Next Generation Science Standards (NGSS) Performance Expectations:

1-LS-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

K-LS1-1. Use observations to describe patterns of what plants and animals need to survive.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

NGSS Science and Engineering Practices:

Asking questions and defining problems

Obtaining, evaluating, and communicating information

Ocean Literacy Principles:

Principle #5. The ocean supports a great diversity of life and ecosystems.

   d. Ocean biology provides many examples of life cycles, adaptations, and relationships among organisms that do not occur on land.

How do tidepool animals thrive in Oregon's wild waves? Discover how through a hands-on investigation of these creatures and their amazing features which help them survive. Compare and contrast these features with familiar objects to learn how nature inspires human inventions!

Activity at a glance

Students will learn how animals that live in tidepools survive the crashing waves.

Objectives

Students will be able to:

- Communicate how waves affect tidepool habitats
- Describe how tidepool animals survive in a rocky shore environment
- Identify human inventions that mimic tidepool animal adaptations
- Express excitement and appreciation for tidepool animals

Skills

Students will gain expertise in:

- Identifying specific adaptions and how they are used for survival
- Critical observation of natural phenomena and organisms
- Understanding how natural phenomena such as waves impact living things
- Making connections between humans and nature
- Proper techniques for interacting with live tidepool animals

Program features:

- Visit the Wave Crash exhibits with Aquarium staff
- Facilitated educational experience in our Classroom
- Opportunity to interact with live animals
- Time for self-guided exploration of the Aquarium

Extension activities

Use these prompts to facilitate further discovery before, during, or after your field trip to Oregon Coast Aquarium.

In the Classroom

- Before your field trip, have students watch this video of waves crashing into tidepools. What do they notice? What are some words to describe what the water is doing?
- Before or after your field trip, have students hold out their hand flat, palm-up, over a sink directly under the tap. Place in their hand a small object: a bean, a button, etc. Turn on the sink at full-blast and observe what happens to the object. Was it washed away? Why? Experiment with objects of different sizes and shapes and compare and contrast what happens. Relate this to how waves might impact tidepool animals and how these animals need to find ways to avoid being washed away.
- After your field trip, conduct the provided Post Visit Activity with your students (see pages 4-6 for complete lesson plan).

At Oregon Coast Aquarium

- Have students complete the included Investigation Worksheet (page 3) to observe a rocky shore animal, describe its habitat, and create a sketch.
- While exploring the Aquarium, ask students to look for body features on animals that might have inspired human inventions. Examples include: bird wings and airplanes, sea lion flippers and swim fins, crab claws and kitchen tongs, etc.
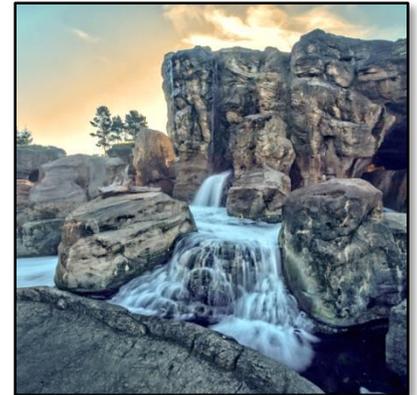
Get Outside

- The Central Oregon Coast has a number of great tidepooling sites. Near Oregon Coast Aquarium, check out Seal Rock State Recreation Area or Yaquina Head Outstanding Natural Area. Both sites have restrooms and picnic facilities. Yaquina Head also has an Interpretive Center, a great indoor alternative for poor weather.

- Check out our Oceanscape Network tidepooling page for field trip tips, a map of tidepooling sites across Oregon, tide schedules, and a field guide to common tidepool creatures. Oregontidepools.org also has many additional great resources.

- No time for tidepooling, or are the tides not right during your visit? Simply stopping at a beach or overlook and having students watch the waves can impress upon them the power of water. Ask students to share what they see, smell, hear, etc.

- If you are unable to visit a tidepool or beach, connections to this program can also be made with nearby nature. With your students, explore your school grounds or a local park and look for plants or animals that may have inspired human inventions.

OREGON COAST AQUARIUM NEWPORT

Name: _____

Aquarium Animal Investigation

Choose an animal somewhere in the Rocky Shores Gallery.
Then, use the information posted next to its exhibit or ask a Chaperone or
Aquarium Volunteer to help you answer the questions below.

Type of animal: _____

Describe its habitat (where it lives):

_____

Does your animal (circle all that you can see)…

Stick to the rocks?   Have a hard shell?

Bend with the water?   Have a rounded body?

Draw your animal in the box below!

Get a Grip – Post Visit Activity

At a glance: Students will design an object that can withstand waves inspired by the tidepool animals they learned about at the Oregon Coast Aquarium.

Objectives

Students will be able to:

- Apply prior knowledge gained at the Aquarium to create original object designs.
- Rebuild and improve their designs based on tests using miniature waves.
- Describe ways their design reflects how tidepool animals survive the waves.

Next Generation Science Standards

Performance Expectations

- 1-LS-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices

- Developing and using models
- Planning and carrying out investigations
- Defining problems and designing solutions

Ocean Literacy Principles

- 5. The ocean supports a great diversity of life and ecosystems.

Time: Approximately 30 minutes (NOTE: If your time or resources are limited, students can simply sketch their designs instead of building them.)

Materials:

- Photos or artifacts of tidepool animals (sea stars, urchins, anemones, barnacles, mussels, etc.)
- Design materials:
  - **Sticky**
    - Suction cups
    - Play dough
    - Sticky tac
    - Tape or glue
    - Velcro
  - **Hard shell**
    - Cardboard or cardstock
    - Yogurt cups or similar
  - **Bend/Flexible**
    - Hot glue sticks
    - Glow sticks
    - Pipe cleaners
  - **Rounded body shape**
    - Foam blocks that can be shaped
    - Plastic eggs
  - **Other**
    - Popsicle sticks
    - Toothpicks
    - Modeling clay
    - Felt or other fabric
    - Any other sort of crafty material you have on hand

Tips on collecting materials
- Start early! Ask other teachers and/or students to bring in recyclables from home.
- Ask the cafeteria if they have any materials they can save.
- Raid the recycle bins at school.

Background Information

Waves bring both vital resources (food, water, oxygen, cool temperatures) and challenges (big crashing waves, driftwood and other debris, predators) to animals living in rocky shore environments. Tidepool animals use a variety of physical features and behaviors to help them thrive in this habitat. The ability to **stick** with a muscular foot, byssal threads, or tube feet helps them hold on to the rocks and not get swept away. A **hard shell** provides protection from big crashing waves and any debris that might be in the water. The ability to **bend** helps them have a better grip on curved and bumpy rocks, and to flex with the waves. A **rounded body shape** allows water to easily flow over and around them. Most rocky shores animals use a combination of these abilities to survive.

Examples of animals in each category:

- **Stick**: Chitons, sea stars, urchins, turban snails, anemones, sea cucumbers, limpets
- **Hard shell**: Barnacles, mussels, hermit crabs, urchins, chitons, tube worms, turban snails, limpets
- **Bend** (flexible): Chitons, anemones, sea cucumbers
- **Rounded body shape**: Chitons, barnacles, urchins, mussels, sea stars, limpets

Procedures

Engage (about 5 minutes):

- With your students, watch the following tidepool video: https://youtu.be/Az2Ct1tUAEM
- Ask students what they learned about tidepool animals during their classroom program at the Aquarium. Write down what they remember about how these animals survive in the tidepools on the white board. Solicit responses from students that describe *how* these animals withstand the waves in their environment (encourage descriptions such as sticking, hard shell, bending/flexible, rounded body shape).

Explore (about 15-20 minutes):

- Tell students they are going to design an object they think could survive crashing waves without falling apart or being washed away. (You can choose to have students work individually or in small groups.) Distribute the materials or give instructions for collecting them.
- They should use tidepool animals for inspiration, so remind them that they can refer to the whiteboard list you created as a class, and the pictures of tidepool animals.
- Give ample time for students to create their objects, encouraging them to think creatively and to make predictions about what might happen to their object if a big wave hit it.
- Allow students to test their creations by placing them in a tub or sink filled with 1-2 inches of water. Use a dustpan or their hands to create "waves" and see how their design holds up. If it falls apart, have students think about why it didn't work and what they could do to improve the design.
- Build, test, and rebuild designs for as long as time allows!

Explain and Expand (about 5 minutes):

- Have students demonstrate their designs to their classmates, highlighting the ways their creation stands up to waves.
- Discuss how their designs stood up to the tub "waves" test and if they used what they learned to rebuild their objects.
- Ask students to compare these structural characteristics to specific tidepool animal adaptations.
- Ask students to think about things buildings have to withstand (wind, rain, fire, etc.) so that humans can live, go to school, and work safely inside. What are some ways people build buildings to be strong and stable?

Evaluate:

- Judge your students' achievement of the Objectives based on their answers and language during the *Explain and Expand* segment. Pay close attention to:
  - Whether students reference prior knowledge/vocabulary gained at the Aquarium
  - If they are able to describe what they learned from tub tests and how that was applied to changes they made to their designs
  - How well students describe ways their design reflects how tidepool animals survive the waves
- Ask students: What was the most challenging part of this activity? What was your favorite part?

Extension activity (if time allows)*:*

- Discuss how, like animals, people have to be able to survive challenges in their own "habitats" such as fire, rain, wind, cold, etc.
- Take a tour of the school and look for safety features such as fire sprinklers and fire extinguisher cubbies, explore windows and doors to see how rain and cold is kept out, look for rain gutters and drains, etc.
- Compare the structures you see to any similar animal features you have discussed, or the ways that students designed their own objects.

Additional resources:

Monterey Bay National Marine Sanctuary: Tide Pool Species and Adaptations

Oregon Coast Aquarium: Rocky Shores

NOAA Ocean Explorer: Virtual Tide Pool
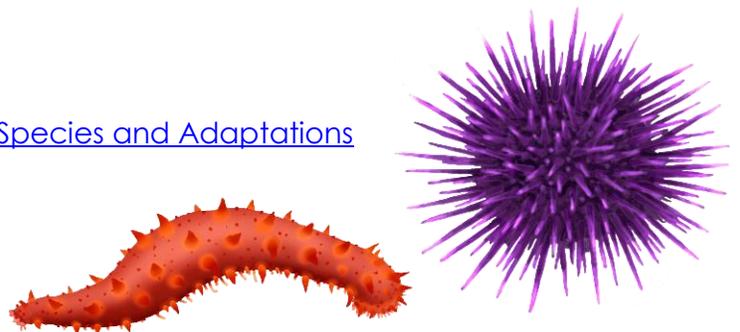
Oregon Coast Aquarium would love to see your students' creations!

Send photos of student designs to education@aquarium.org with the title "Tidepool Design".

Your class may get featured on our website or be eligible to win a FREE on-site program!