LESSON 2 Awesome Adaptations

Lesson at a Glance
Students learn organisms of the shoreline ecosystem and their special adaptations. After being given an outline drawing of an organism, they label parts needed for survival with a brief description, then color and use various other arts and crafts items to depict a "realistic" form of the organism.

Lesson Duration
Two 45-minute periods

Essential Question(s)
What unique structural features or behaviors help organisms to survive in Hawai'i's shoreline habitats?

Key Concepts
- Shoreline organisms have evolved unique structures and/or behaviors that help them to survive in their habitats.
- Organisms can be described and compared by their structural features and behaviors

Instructional Objectives
- I can describe the structural features of an organism that lives in a shoreline habitat.
- I can describe how the structural features of an organism help it to survive in its shoreline habitat.
- I can compare different structural features, or behaviors of two organisms that are in the same or different shoreline habitats.
- I can make a realistic drawing or model showing the features of an organism and its habitat.

Related HCPSIII Benchmark(s):

Science SC.3.4.1
Compare distinct structures of living things that help them to survive.

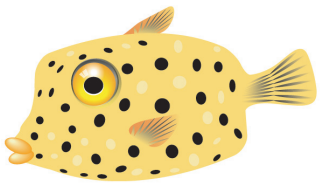
Science SC.3.5.1
Describe the relationship between structure and function in organisms.

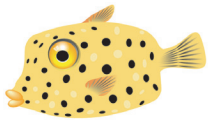
Visual Arts FA.3.1.1
Use the elements and principles of art and design, including value (i.e.; tint and shades, analogous colors)
line, rhythm, movement
proportion, and balance.

Visual Arts FA.3.1.2
Use a variety of art and technology media to create an original work of art.

Language Arts LA.3.5.1
Add details, descriptions, and information from different sources to elaborate meaning.

*Note: This benchmark may be met if additional sources for researching are used.





Assessment Tools

Benchmark Rubric:

Topic	Cells, Tissues, Organs, and Organ Systems		
Benchmark SC.3.4.1	Compare distinct structures of living things that help them to survive		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Group living things by the distinct structures that help them to survive and provide justification for the grouping	Compare distinct structures of living things that help them to survive	Describe a few ways in which distinct structures of living things help them to survive	Name distinct structures of living things that help them to survive

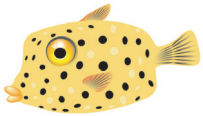
Topic	Unity and Diversity		
Benchmark SC.3.5.1	Describe the relationship between structure and function in organisms		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Classify the structures of organisms according to their function	Describe the relationship between structure and function in organisms	Identify the relationship between structure and function in an organism	Recall that structures in organisms are related to the functions they perform

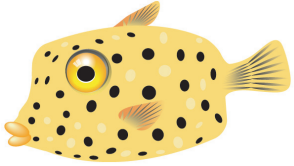
Topic	How the Arts are Organized		
BenchmarkFA.3.1.1	Use the elements and principles of art and design, including, value (i.e., tints and shades, analogous colors), line, rhythm, movement, proportion, and balance		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Consistently use the elements and principles of art and design, including, value, line, rhythm, movement, proportion, and balance	Usually use the elements and principles of art and design, including, value, line, rhythm, movement, proportion, and balance	Sometimes use the elements and principles of art and design, including, value, line, rhythm, movement, proportion, and balance	Rarely use the elements and principles of art and design, including, value, line, rhythm, movement, proportion, and balance

Topic	How the Arts are Organized		
Benchmark FA.3.1.2	Use a variety of art and technology media to create an original work of art		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Use an extensive variety of art and technology media to create an original work of art	Use a variety of art and technology media to create an original work of art	Use a few art and technology media to create an original work of art	Use one or two art and technology media to create an original work of art

*Note: This benchmark may be met if additional sources for researching are used. (e.g. internet, books, etc.)

Topic	Meaning		
Benchmark LA.3.5.1	Add details, descriptions, and information from different sources to elaborate meaning		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Add relevant details, descriptions, and information from different sources that insightfully elaborate meaning	Add relevant details, descriptions, and information from different sources that elaborate meaning	Add some trivial details, descriptions, and information from different sources that relate to but do not elaborate meaning	Add irrelevant or very few details, descriptions, and information from different sources that do not elaborate meaning



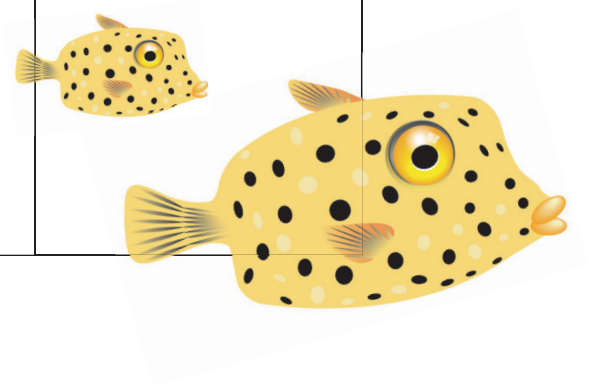


Assessment/Evidence Pieces

Lesson
- Student worksheet: *My Shoreline Organism*
- Assessment Tool: *Teacher Resource Checklist Awesome Adaptations*

Materials Needed

Teacher	Class	Group	Student
• Method to present PowerPoint • PowerPoint: *Awesome Adaptations* • Bulletin board paper optional: use the sketch that was created in Lesson 1	• Various arts and craft items (for mural) **SAFETY:** please provide items that will not pose any safety threats to the students. o Sand o Felt/fabric scraps o Construction paper scraps o Feathers o Toothpicks o Other items that students could use safely.	• Copy of *Shoreline Organism Outlines* • Materials for illustration • Scissors [Suggestion: May wish to remind students to observe safe use of scissors.]	• Worksheet: *My Shoreline Organism* • Glue



Instructional Resources

PowerPoint Presentation: *Awesome Adaptations*
Teacher Reading: *Awesome Adaptations Reference Table*
Teacher Answer Key: *Awesome Adaptations Shoreline Organism Outlines*
Student Worksheet*: Awesome Adaptations Shoreline Organism Images*
Student Worksheet: *My Shoreline Organism*
Assessment Tool: Teacher Resource Checklist *Awesome Adaptations*
Supplemental Resource: *Shoreline Habitats Interactive Game*

Student Vocabulary Words

adaptation: a feature of an organism that develops over time and allows it to survive in its environment.
anoxic: without oxygen.
ecosystem: a community of different living organisms and the physical environment in which they are found and interact with.
endemic species: a naturally occurring species that lives in a particular area and is found no where else in the world.
estuary: a partly enclosed bay where salty ocean water is mixed with freshwater from rivers or streams.
habitat: the environment in which an organism naturally lives and grows.
hydric soil: soil that is formed under saturated conditions where the top portion becomes anoxic. The water in the soil forces air out. This soil is found in wetlands.
hydrophyte: plants that have adapted to living in or on aquatic environments.
runoff: rainwater that flows over the land and into streams and lakes. It often picks up soil particles along the way and brings them into the streams and lakes.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview and the Teacher Reading *Awesome Adaptations Reference Table*.
- Preview the PowerPoint Presentation *Awesome Adaptations* and make arrangements to project it.
- Allot space on a bulletin board, or classroom wall to create a large shoreline habitat mural.
- Roughly sketch onto bulletin board paper the outline of contiguous Hawaiian shoreline areas, including wetland, sandy, and rocky shore. Or teacher may want to use the class sketch made in Lesson 1.
- If choosing to address benchmark FA 3.1.3, students must specifically be provided direction on the elements and principles of art.
- Choose one organism to use as an example. Locate the image of the organism both in the PowerPoint presentation, and its black and white outline image. Be prepared to show students how they can use crayon and other media to realistically depict structural features, and how these features help the organism survive in its shoreline habitat. If possible, prepare a complete example.
- Make copies of Student Worksheet *My Shoreline Organism*, one per student and make copies of *Awesome Adaptations Shoreline Organism Images* so that each student has just one image or creature.
- Arrange a way for students to see actual images of shoreline organisms as they make their own drawings. This might include access to the PowerPoint images, or to pictures in other sources like the *Awesome Adaptations Shoreline Organism Outlines*.
- Preview the interactive piece *Shoreline Habitats* to be completed at the end of Step II.

I. *A Shoreline Mural*

A. Explain to the students that they will be making a classroom mural depicting organisms that live in Hawaiian wetlands, sandy beach areas, and rocky shoreline areas.
[Suggestion: Teacher may want to use the sketch made in Lesson 1 and have the students "update" the sketch to create the finished mural.]

B. Remind students to use what they learned from Lesson 1 about the organisms that live in Hawaiian coastal areas and how they are exposed to the elements (heat/cold, wet/dry, salty, and wind).

C. Show the students the rough outline on the mural paper. Explain that this will serve as the "backdrop" for the mural, and that they need to think of ideas for drawing, and coloring in the different shoreline areas.

D. Teacher may want to assist students in developing criteria for the shoreline mural.

II. *Awesome Adaptations of a Shoreline Organism*

A. Present the *Awesome Adaptations* PowerPoint (23 slides). Discuss each of the images of shoreline organisms highlighting their unique adaptations.

B. The Teacher Reading *Awesome Adaptations Reference Table* provides a summary of the organisms in the PowerPoint presentation and their features. Use this as a tool in a follow-up discussion to check for student understanding of the concept of adaptations.

C. Distribute to each student one creature from the *Awesome Adaptations Shoreline Organism Images*. Have students use various media to illustrate the organisms, displaying their adaptations accurately. [Suggestion: Teacher may want students to draw the organism on their own without using the outlines.] [Note: Students may take a while to complete this task and may request to see the organisms while doing their drawings. Students may want to be "correct" and have difficulty trying to finish in a timely manner.]

D. Give students the *My Shoreline Organism* worksheet. Have them write down the name of the organism, and its adaptation(s).

E. Lastly, have students share their final product with the class, reporting the information they recorded on their worksheet. After they finish, the students must place their organism correctly onto the mural. Ideally, students should be able to do this with limited to no assistance.

F. If time permits, break the students into pairs and have them work together at a computer on the *Shoreline Habitats* interactive piece. In this interactive the students match the organism to their habitat based on the organisms adaptation.

III. *Shoreline Habitat Reflection*

A. Reflect back onto the original pieces of chart paper generated from the unit opener and first lesson. Ask students, these questions:

- What other organisms can we add to our list?
- What are some other ways you think organisms are adapted to these environments?

B. This last question becomes the "*hook*" for the next lesson. Tell students that their next lesson will be to create their own imaginary "*critter*" or organism with its own special and unique adaptation for the shoreline.

Extended Activities

Play the game: "*Bird Beak Buffet*.**"** **(**Education Task Force 2004 edition, P.O. Box 605, Larkspur, CA 94977.)

THE GAME: Each child will be a bird with a cup stomach. The birds will eat a variety of classroom objects, such as marbles, toothpicks, pennies, paperclips, and others. Each child will be given a "*beak*." Beaks will be items, such as clothespins, tweezers, forceps, and spoons.

RULES: Food must be picked up with the "*beak,*" and dropped into the "*stomach*" (cup). Food may not be scooped into the "*stomach.*" The cup must remain upright.

PROCEDURE:

The teacher scatters the "*food*" around the classroom, and gives a start and stop signal.

After each round, birds with like beaks get together and record onto post-it notes how many of each food they collected.

Post-it notes are placed on chart paper under the headings: "*Clothespin*," "*Tweezers/Forceps*," and "*Spoon*."

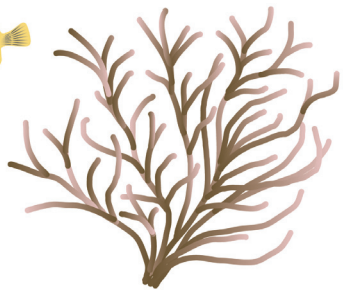
DISCUSSION:

Which bird got the most to eat? Why?

Was one bird better at getting any particular food? Why?

Does the type of beak affect what kind of food the bird can eat? How?

What kind of behavior did you observe in other birds?



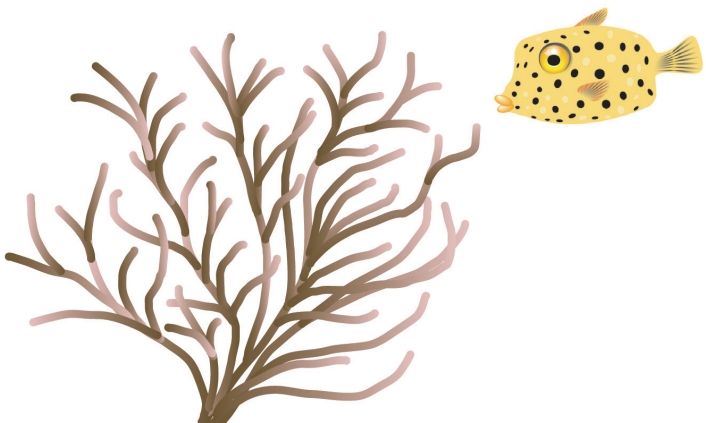
LESSON 2 Teacher Reading

Awesome Adaptations Reference Table

The following images and notes are presented in the PowerPoint presentation: *Awesome Adaptations*.

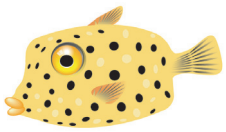
Organism	Notes
Beach Morning Glory	Buds are pointed and twisted (structure from wind). Closed flowers turn in upon themselves in a round shape for protection. Sends out long runners to help it keep rooted in sandy soil.
Beach Naupaka	Thick leaves prevent water loss. Shallow spreading root system. Pulpy coating on seeds protect the seeds from seawater, and helps them float.
Beach Heliotrope	Narrow silky leaves for sand and wind protection.
Pickleweed	Thick, succulent leaves retain moisture. Shallow, spreading root system. Able to withstand high salinity and little oxygen.
Black-necked stilt	Long, sharp beak for probing in mud. Very long legs for wading in water. Long toes to help them walk in mud. Dark feathers around the face for sun reflection. Hunt for small fish in shallow open water.
Periwinkle	Watertight shell to maintain moisture. Clustering behavior reduces heat and maintains moisture. Shell has a "trap door" (*operculum*) that closes to maintain moisture.
Nerite Snail	Watertight shell for moisture retention. Clustering behavior to reduce heating and retain moisture. Shell has trap door (*operculum*) that closes to retain moisture.
Rock Crab	Watertight external skeleton. Stores water in special gill chambers so it can leave the ocean. Agile and quick to avoid waves. Flattened body deflects waves. Strong legs to cling to rocks.
Fireworm	Flattened body can squeeze into small crevices. Venomous bristles for protection.
Brittlestar	Flattened body for hiding in crevices and rocks. Able to break off and re-grow arms.
Rock-boring sea urchin	Teeth scrape rocks for feeding on seaweed. Lives wedged into crevices, holes, and under rocks. Moveable spines for protection.
Goby	Camouflage color makes it hard to see it. Pelvic fins are fused to form a suction disc to cling to rocks as waves wash through.

Organism	Notes
Limpet (**ʻopihi**)	Low profile cap-shaped shell for wave resistance. Strong foot for clinging to rocks. Grooved shell for deflecting wave impact and water run off.
Sea Lettuce	Flattened blades attach to rocks in bunches. Soft and limp to move in surge of water.
Shingle urchin	Low profile body design is more resistant to waves. Many sucker-type tube feet for clinging to rocks. Flattened, tile-like spines to deflect force of waves.
Bermuda Grass	Spreading root system for clinging to sandy shore.
Batis or Akuli kuli kai	Succulent thick waxy leaves for moisture retention. Low growing, crawling root system for sandy soil and windy climate.



LESSON 2

My Shoreline Organism



Name:_____ **Date:**_____

DIRECTIONS:

Fill in each of the items about your Shoreline Organism.

PART A.

1. My shoreline organism is a(n) _____

2. It lives in the _____ shoreline habitat and its physical appearance is

_____

_____

_____

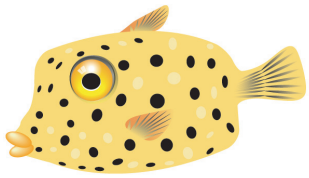
_____

3. The body parts (structural features) used for survival are

_____ and _____ .

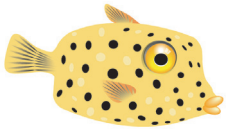
PART B.

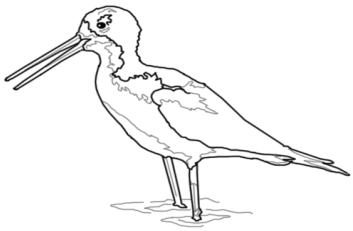
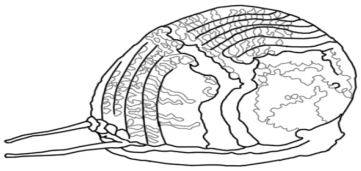
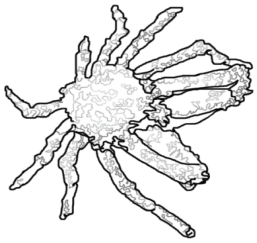
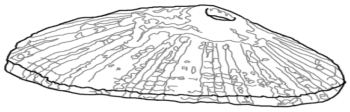
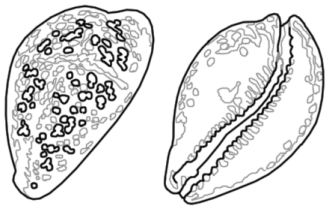
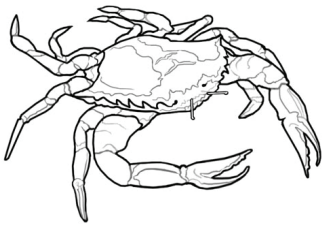
How does your organism use its body parts (structural features) to help it survive? Describe how the adaptations allow for survival in its particular habitat.



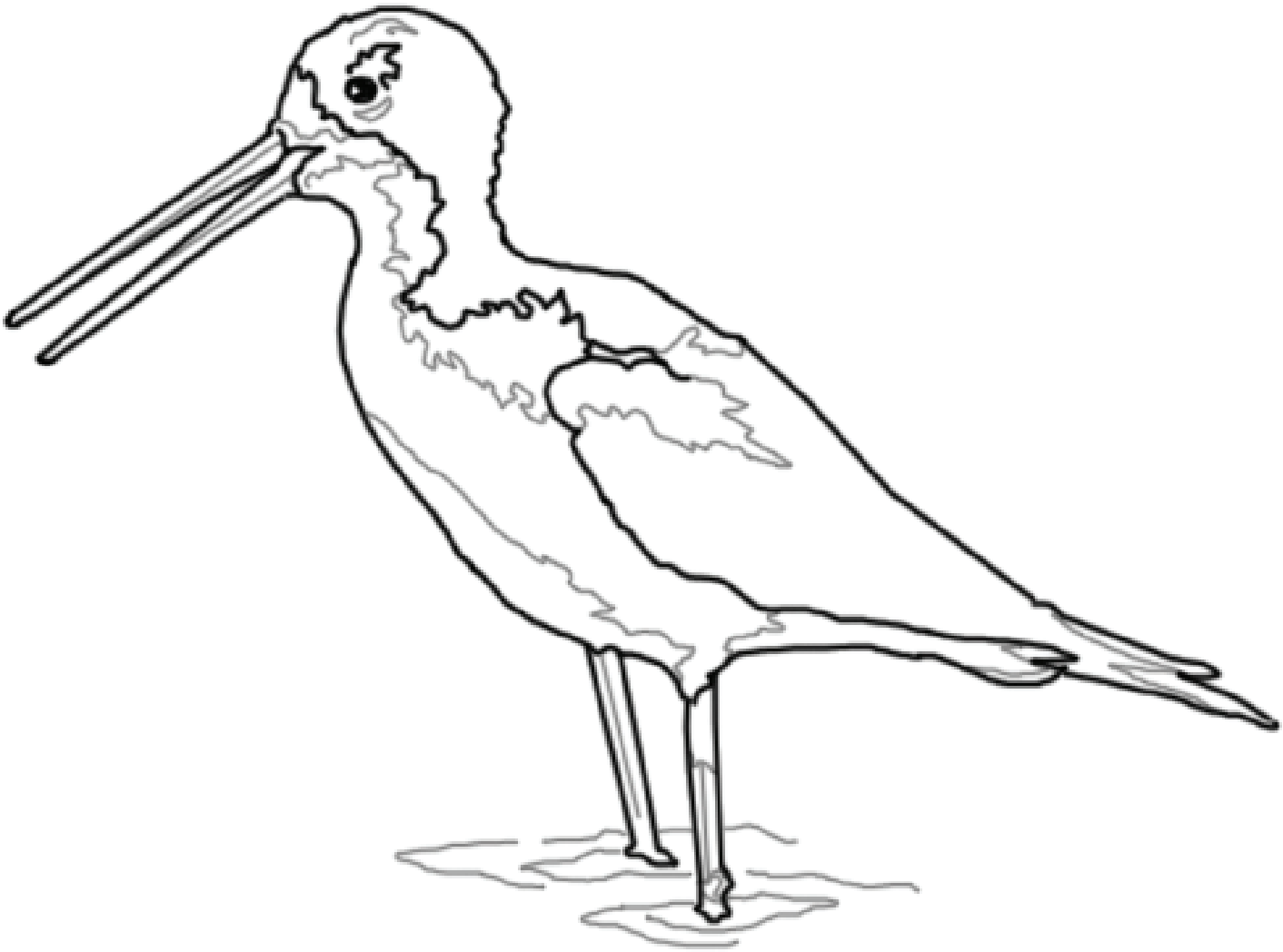
Awesome Adaptations Teacher Answer Key

Shoreline Organism Outlines

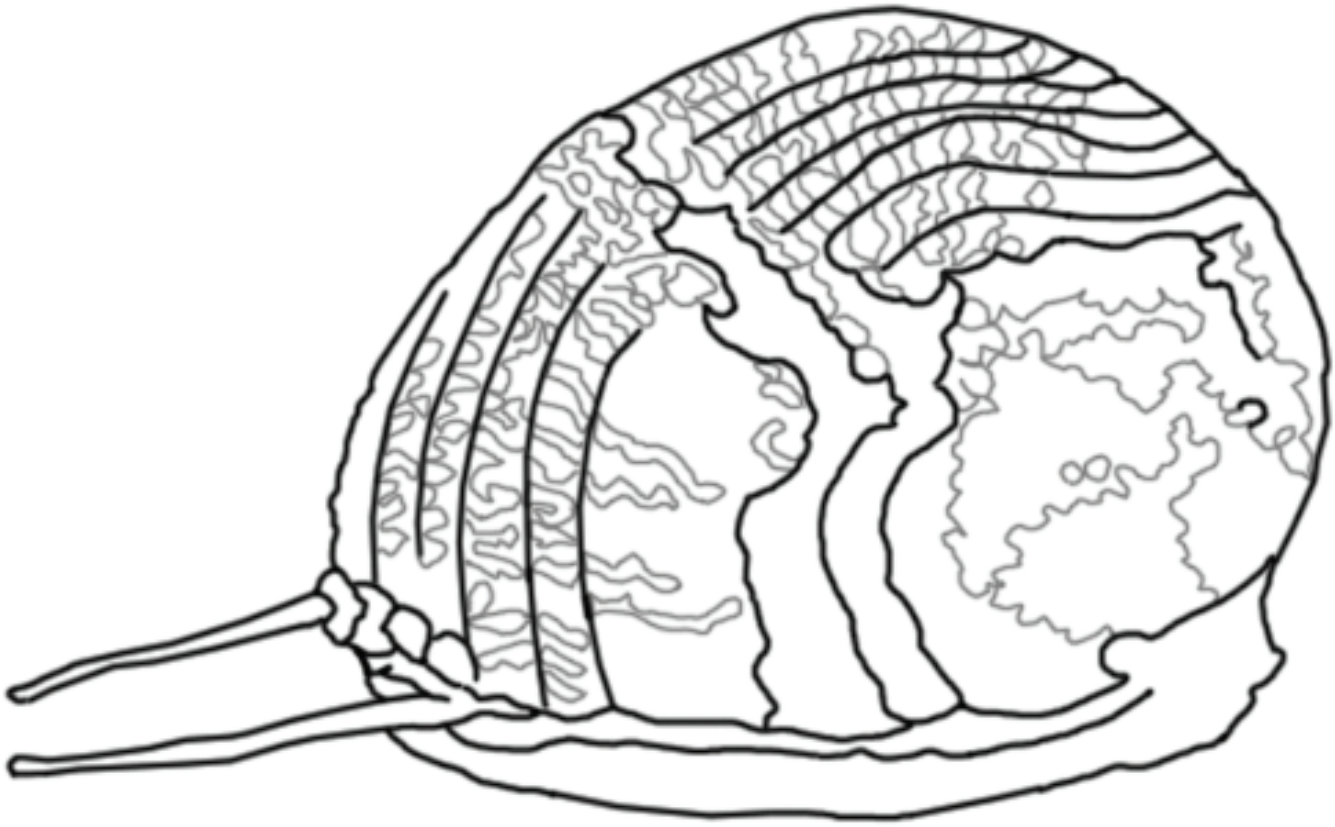


 *Hawaiian Stilt*	 *Nerite Snail*	 *Decorator Crab*
 *Hawaiian Coot*	 *Rock-Boring Sea Urchin*	 *Brittlestar*
 *Limpet (‘Opihi)*	 *Beach Morning Glory*	
 *Tiger Cowry*	 *Rock crab*	

LESSON 2 Awesome Adaptations Shoreline Organism Images



Hawaiian Stilt



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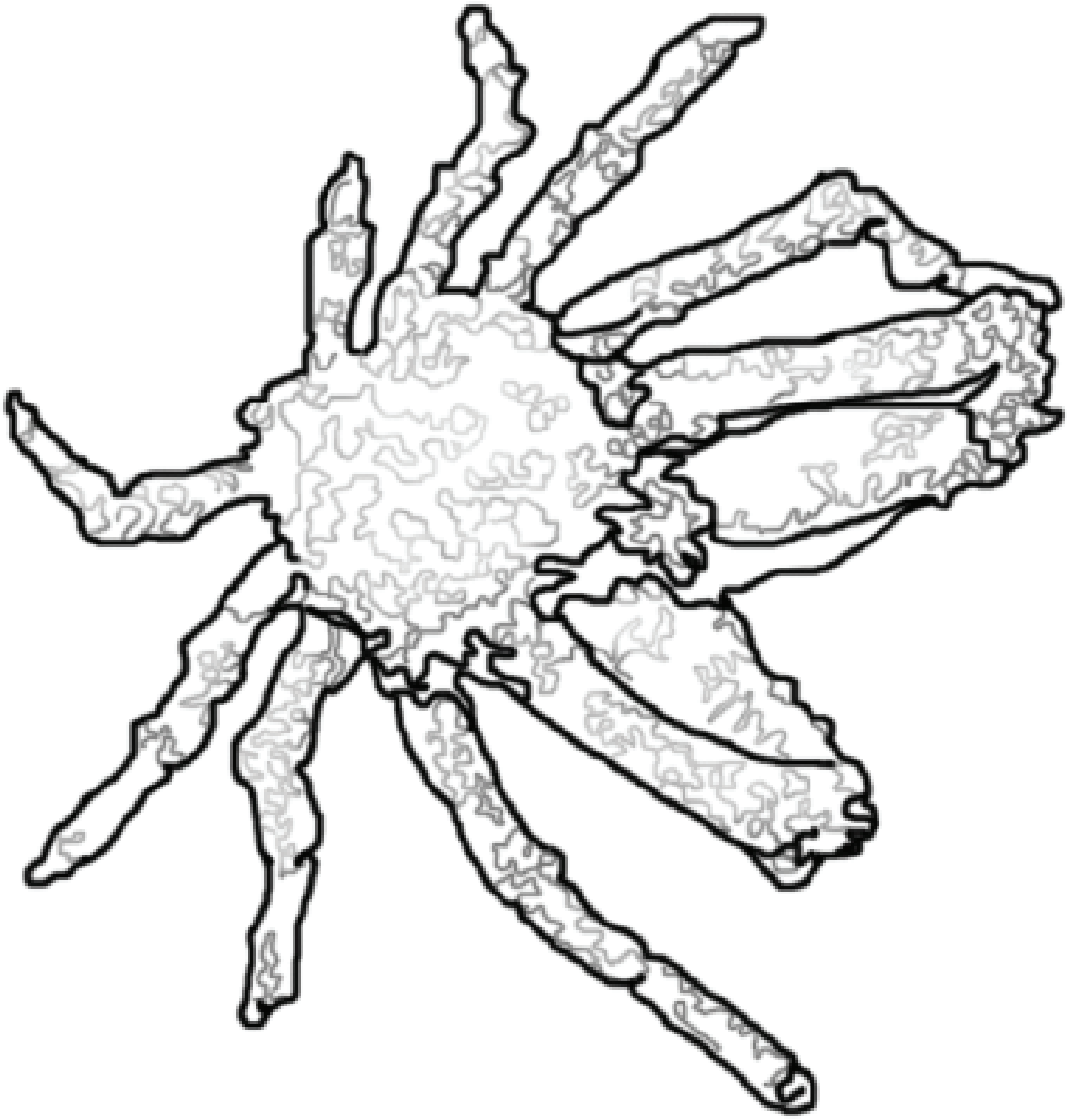
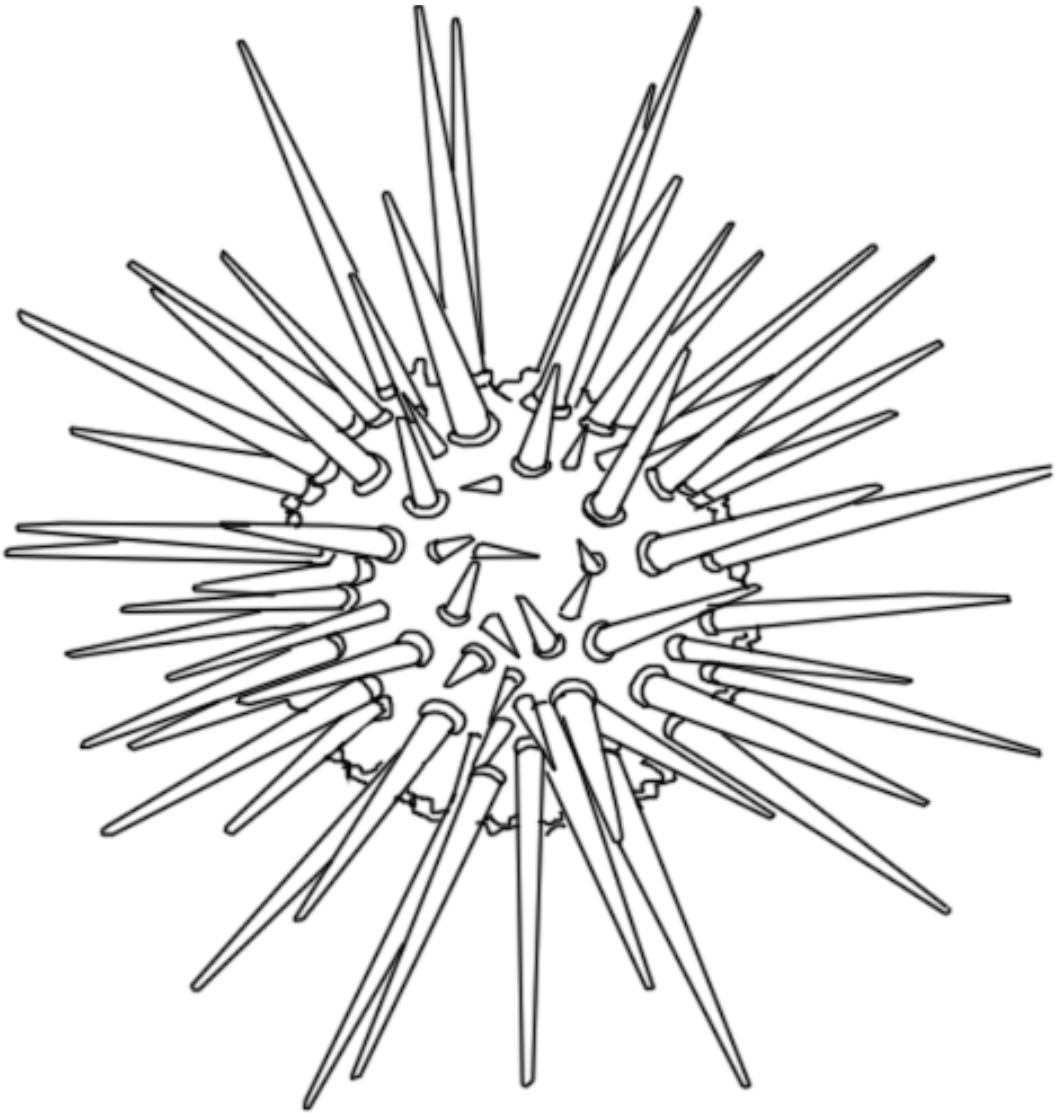


Decorator Crab

Hawaiian Coot

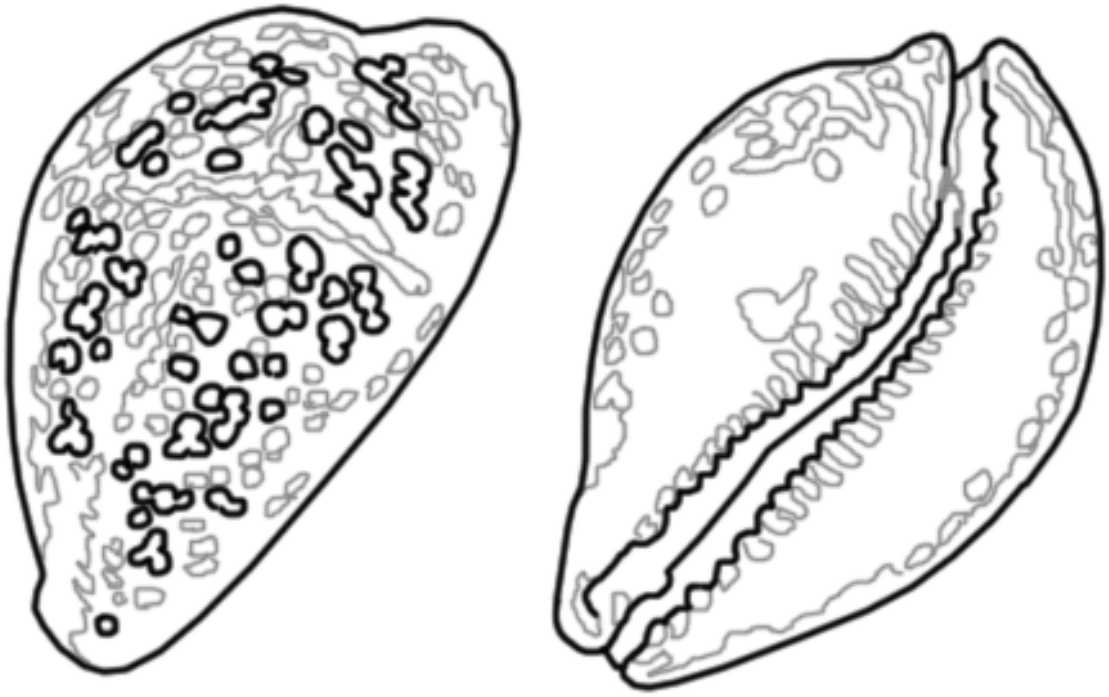


Rock-Boring Sea Urchin

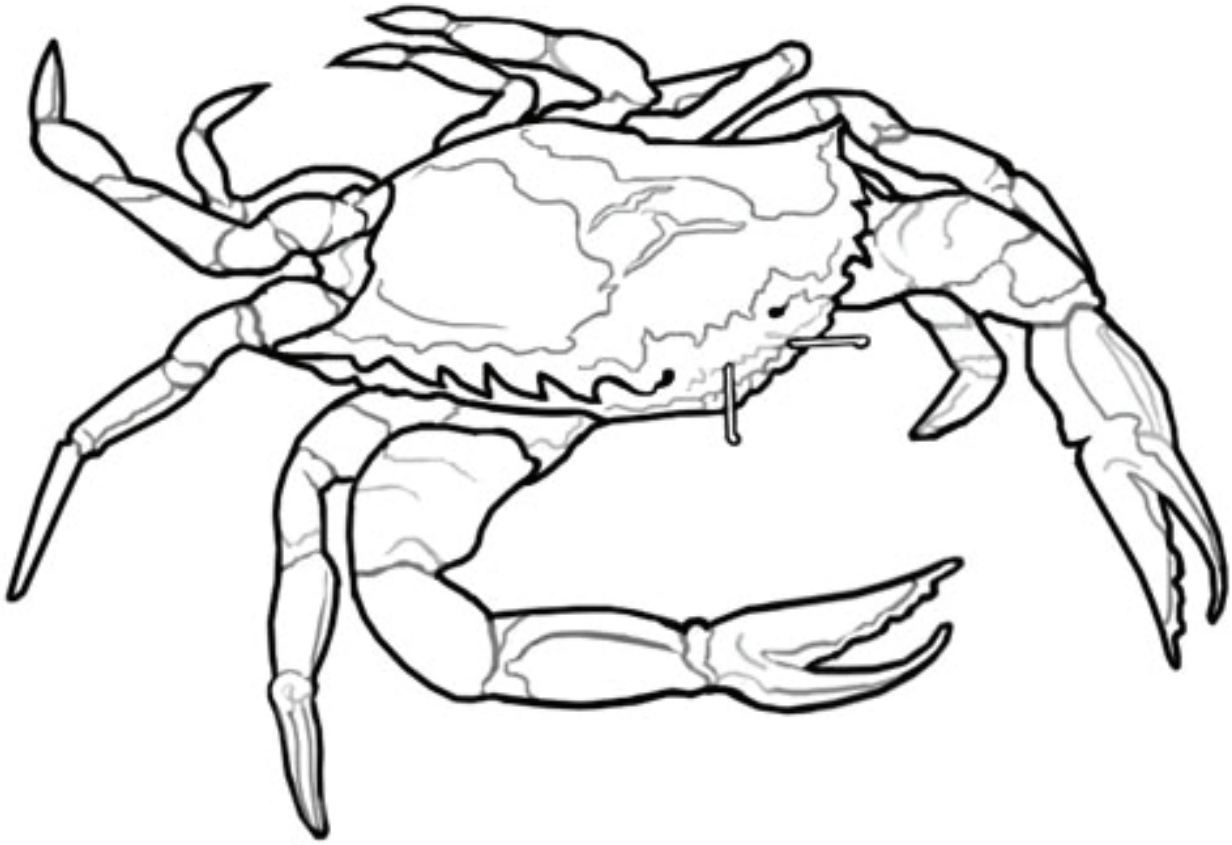
Brittlestar

Limpet

Beach Morning Glory



Tiger Cowry



Rock Crab

LESSON 2 Teacher Resource Checklist

Awesome Adaptations

Name	*SC 3.4.1 Organisms' structures and survival (worksheet Part A)*	*SC 3.5.1 Structure and function in organisms (worksheet Part B)*	*Fine Arts (shoreline organism artwork)*	
			3.1.1 Use elements and principals of art and design…	*3.1.2 Use a variety of art and technology media to create…*
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