

LESSON 1 Beach Habitat “Scene of the Crime”

Lesson at a Glance

Students will first be introduced to the concept of an ecosystem and a habitat and the differences between them. Students study the kinds of organisms that live on their local beaches or coastal areas, and describe how they fit into an ecosystem. Students research an organism and its habitat, and then place a drawing of that organism on a cross section of the beach in the appropriate habitat. Students will then be introduced to Claude the Crab and a pollution problem.

Lesson Duration

Two 45-minute periods

Essential Question(s)

How are ecosystems and habitats defined?

How is an organism’s behavior determined by its environment?

How do organisms survive in specific environmental conditions?

Key Concepts

- Organisms live in habitats, which determine their behavior.
- Different organisms need different environmental conditions in order to survive.
- An observation is the act of examining something carefully using one or more of your five senses.
- An inference is not an observation you actually make, but an explanation based on your observations and past experiences.

Related HCPSIII Benchmark(s):

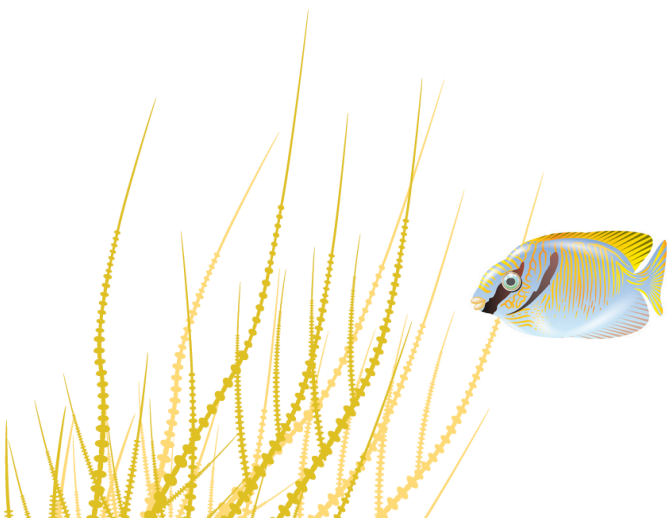
Science: SC 4.1.2
Differentiate between an observation and an inference

Science: SC 4.3.2
Describe how an organism’s behavior is determined by its environment.

Science: SC 4.5.3
Describe how different organisms need specific environmental conditions to survive

Instructional Objective

- I can explain and give examples of how different organisms’ behaviors are determined by their environments.
- I can describe how different organisms need different environmental conditions in order to survive.
- I can differentiate between an observation and an inference.



Assessment Tools

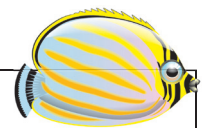
Benchmark Rubric:

Topic		Scientific Knowledge	
Benchmark SC.4.1.2		Differentiate between an observation and an inference	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain the difference between an observation and an inference and give examples	Differentiate between an observation and an inference	Provide examples of observations and inferences	Define an observation and an inference
Topic		Interdependence	
Benchmark SC.4.3.2		Describe how an organism’s behavior is determined by its environment	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give examples of how different organisms’ behaviors are determined by their environments	Describe how an organism’s behavior is determined by its environment	Identify a way that an organism’s behavior is influenced by its environment	Recognize that an organism’s behavior is influenced by its environment
Topic		Unity and Diversity	
Benchmark SC.4.5.3		Describe how different organisms need specific environmental conditions to survive	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain why different organisms need specific environmental conditions to survive	Describe how different organisms need specific environmental conditions to survive	List specific environmental conditions that organisms need to survive	Recall that organisms need specific environmental conditions to survive

Assessment/Evidence Pieces

Lesson

- *Beach Organism's* Student Worksheet
- Student Worksheet *Beach Organism's* questions 7 and 8



Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> • Image of Claude the Crab printed and made into a hat/crown • Simple drawing of a beach cross-section, preferably based on your field site. The cross section should be drawn on long paper to be hung on a wall in the classroom or on the board. • Teacher Reading: <i>The Case of Claude the Crab</i> • Method to project PowerPoint 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Student Worksheet <i>Beach Organism's</i> • Scissors • Tape

Instructional Resources

Image of Claude the Crab

Teacher Reading: *Beach Habitats*

Teacher Reading: *Example of Beach Habitats in a Cross Section*

Teacher Reading: *Beach Habitat Organisms Information Page*

Teacher Reading: *The Case of Claude the Crab*

Student Worksheet: *Beach Organism's*

Power Point: *Discovering Ecosystems and Habitats*

Student Vocabulary Words

ecosystem: all living and non-living things that interact with each other in an environment.

environment: surroundings and conditions in which an organism lives.

feral: not domesticated; wild.

habitat: the environment where an organism lives.

organism: a living thing.

Lesson Plan

Lesson Preparation

- Review the Science Background for Teachers provided in the Unit's Overview and Teacher Readings *Beach Habitats*, *Example of Beach Habitats in a Cross Section*, *Beach Habitat Organisms Information Page* and *The Case of Claude the Crab*.
- Optional: Print out image of Claude the Crab and create a hat/crown to wear as you read the story to the students.
- Create a generalized cross section of a beach for posting on wall. (An example of a beach cross-section can be found in this lesson.)
- Print out pictures of organisms from each of the three habitats being introduced. Make sure you have a photo, one per pair of students.
- Preview and make arrangements to project PowerPoint *Discovering Ecosystems and Habitats*.
- Preview and make copies of Student Worksheet *Beach Organism's*.
- Arrange access to a computer lab for the class to complete Student Worksheet: *Beach Habitat Organisms*, or prepare for students to complete their worksheet as homework.

I. *The Case of Claude the Crab*

- A. Read/role play *The Case of Claude the Crab* with the students. (Optional: Teacher can print out image of Claude the Crab and create a hat/crown to wear of Claude while reading the story.)
- B. Tell students that they will help Claude by being like detectives and scientists in a CSI (Crime Scene Investigation).

II. *Establishing Investigation Protocols: Differentiating Between Observation and Inference*

- A. State that making good observations are the basis for any investigation.
- B. Ask students what an observation is. "Something that they see" is a common response. Ask students if "seeing" is the only sense they can use when making observations. Through discussion and questioning, define an observation as the act of examining something carefully using one or more of your five senses. Clarify that you may not need to use all of your senses to make observations all the time. Provide practice by having students share observations of their classroom.
- C. Introduce the term inference. Explain that an inference is not an observation you actually make, but an explanation based on your observations and past experiences. For example, "the caterpillar is 3 centimeters long and 1 centimeter wide" is an observation. "The caterpillar is ready to form its chrysalis" is an inference.

- D. Provide students practice in differentiating between observations and inferences through the following activity:
- Give each pair of students two quarters so they may examine each side of the coin simultaneously.
 - Present students with the following and discuss which ones are observations (O) and which ones are inferences (I):
 - There is a representation of George Washington on one side of the coin. (O)
 - There are words printed on both sides of the coin. (O)
 - The coin is mostly made of silver. (I)
 - The eagle's wings are open to show that it is brave. (I)
 - Different coins have different dates printed on one side. (O)
 - The coin was made by people who are patriotic to our country. (I)

III. *Learning About the Scene of the Crime: What is an Ecosystem?*

(Teacher Note): The terms *ecosystem* and *habitat* are often used interchangeably. It is important for students to understand that within each *ecosystem*, there are several *habitats*. An *ecosystem* is, “all the living and non-living things that interact with each other in an environment” (ScienceSaurus, 2005), and a *habitat* refers to the place where a *particular organism* lives. The term *environment* refers to the surroundings in which an organism lives.

- Write the word *ecosystem* on the board. Ask students to Pair-Share to brainstorm what the word means. Have them consider the terms *ecology* and *system* in their discussion. Record their ideas on the board.
- Identify their school as an example of an ecosystem. Develop understanding of ecosystem characteristics by asking questions such as: What kinds of organisms live here? (us) What types of plants live here? (Answers will vary, depending on the school's landscaping.) What kinds of weather do we have? (Answers will vary, depending on the school's location.) What conditions do organisms in this ecosystem need to survive? (We need air, food, water, sunlight, shelter, and the right range of temperature).
- Lead students to develop a class definition of an ecosystem, which characterizes the interactions of living (i.e. animals, plants, bacteria) and non-living (i.e. air, water, soil, and sunlight) things in an environment.

IV. *Learning More About the Crime Scene: What is a Habitat?*

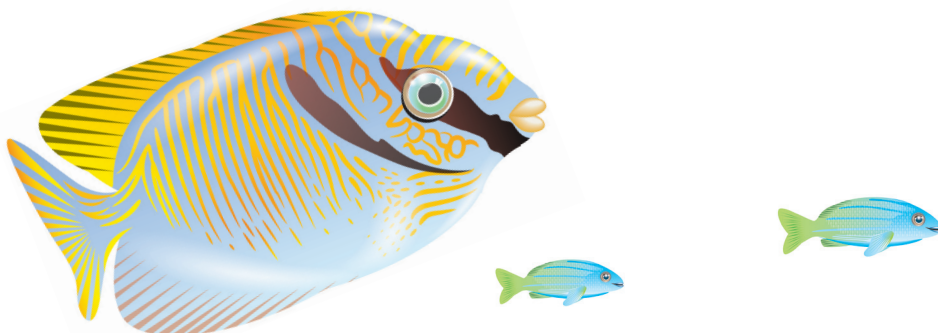
- Write the word *habitat* on the board. Ask students to brainstorm and record their ideas on the board.
- Make connections to previous discussion and ask the students: If our school is an ecosystem, what would our habitat be? (our classroom) Ask students to distinguish how a habitat is related to an ecosystem. Lead students to develop a class definition that captures the understanding of a habitat “as a specific environment that meets an organism's needs.” (ScienceSaurus, 2005)
- Display the cross section of the beach ecosystem so that all students can see it.
 - Explain each section of habitat to students by making these key points:
 - The **upper zone** lies above the high tide mark. In order to survive in this habitat, organisms need to be able to tolerate an environment that has little fresh water, strong winds, salt spray, and intense sun.
 - The **middle zone** is constantly changing because of tides coming in, and going out. Wave action moves the sand and does not allow much to live on the surface. In order to survive in this habitat, most organisms need to be mobile, be able to attach securely to the rocks, or bury themselves in the sand.
 - The **lower zone** is under water all the time. To survive in this habitat, organisms need to be able to breathe under water or come to the surface for air.
- View the PowerPoint *Discovering Ecosystems and Habitats* to reinforce these concepts.

V. *Learning More About the Crime Scene: Who Lives in Each Beach Habitat?*

- A. Ask students to help you identify an organism that might live in each zone, and discuss the conditions each organism needs to survive.
- B. Pair students and pass out a picture of a beach habitat organism to each pair. Examples of organisms include:
 1. Upper Zone: Laysan Albatross, Beach *Naupaka*, Mongoose, Wedge-Tailed Shearwater
 2. Middle Zone: Ghost crabs, Annelid worms, Nerites (*pipipi*), Periwinkles
 3. Lower Zone: Hermit crabs, sea cucumbers, gobies (*o'opu*), seastars, mullet (*'ama'ama*)
- C. Introduce the term hypothesis and define it as, “an idea that can be tested by an experiment or observation” (ScienceSaurus, 2005). Explain that hypotheses are based on the observations and questions leading up to an investigation, and may be stated in either of the following formats: “if... then...” or “if...then...because...”. As an example, show the students a picture of an opihi. Ask students to make observations of its adaptive structures/behaviors as well as the environmental conditions it needs to survive. Demonstrate to students that using the “if...then...” format, an example of a hypothesis could be: “If an opihi breathes air and needs moisture to survive, then it may live in the middle zone”.
- D. Ask student pairs to study their organism’s photo and make observations/inferences on the Student Worksheet *Beach Organism’s* based on the following questions:
 - a. What specific environmental conditions does this organism need to survive?
 - b. What behaviors might this organism have that might be determined by its environment?
- E. Using the “if...then...” format, assist student pairs to create a hypothesis for their organism. Ask the pairs to write their hypothesis on the Student Worksheet and then share their hypotheses with the class and place their organism where they hypothesize it exists within the beach habitats.
- F. Have students’ research their organism using the remaining questions on the Student Worksheet *Beach Organism’s* to guide them. As part of this task, ask the pairs to also create captions of their response to questions 7 and 8 then post them with their organism that is displayed in the beach habitats.
- G. As a class, ask student pairs to briefly share their research, stating whether their findings “support” or refute their hypothesis.

Extended Activities

1. Ask students to write a report on a coastal organism, including its habitat, and include illustrations.
2. Visit a beach or coastal area and take photographs of the animals and plants found there.
3. Make a food chain that shows the relationships of plants and animals on Hawaiian beaches and coasts.

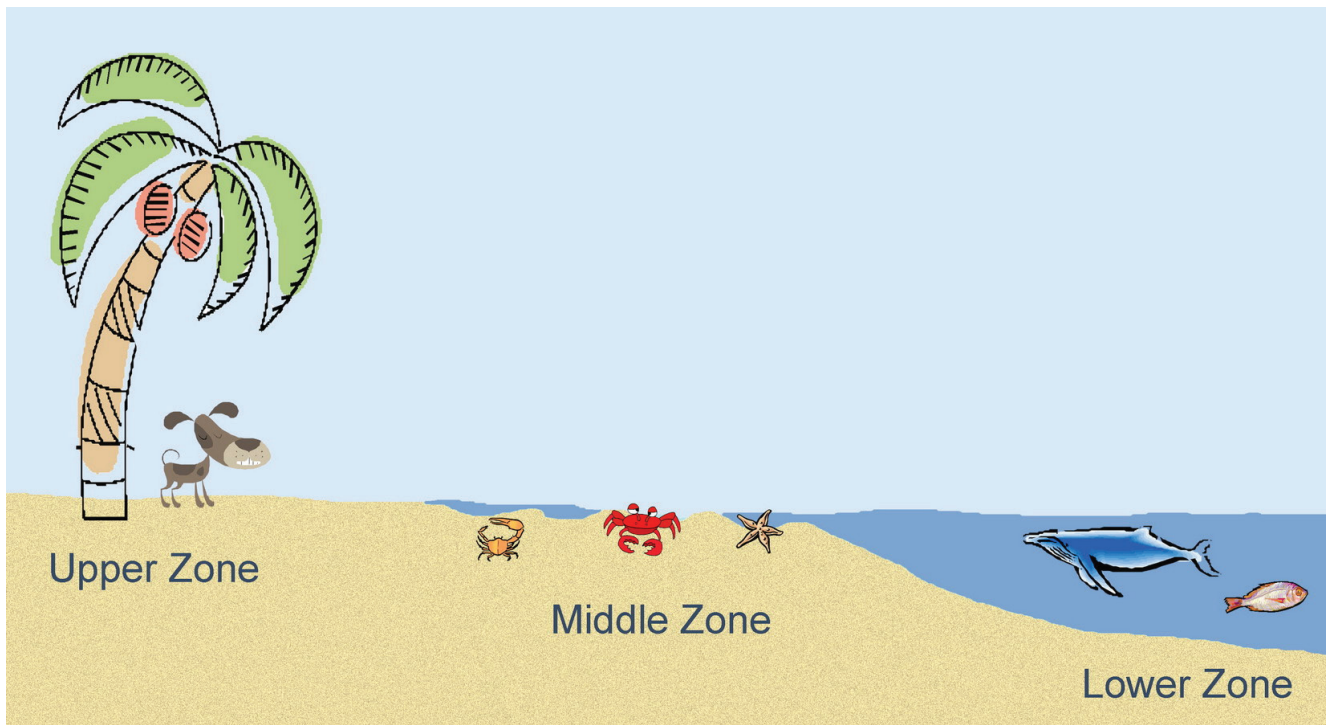


LESSON 1 Teacher Reading Beach Habitats

An ecosystem is all the organisms that live in an area together with the nonliving factors of the environment. Ecosystems are composed not only of animals and plants, but also bacteria and fungi, all of them living in complex relationships. The feeding relationships between organisms can be described as food chains. These food chains can be combined to make food webs to help describe the complex interactions of organisms living together in an ecosystem. A habitat describes where groups of organisms, or populations, naturally live.

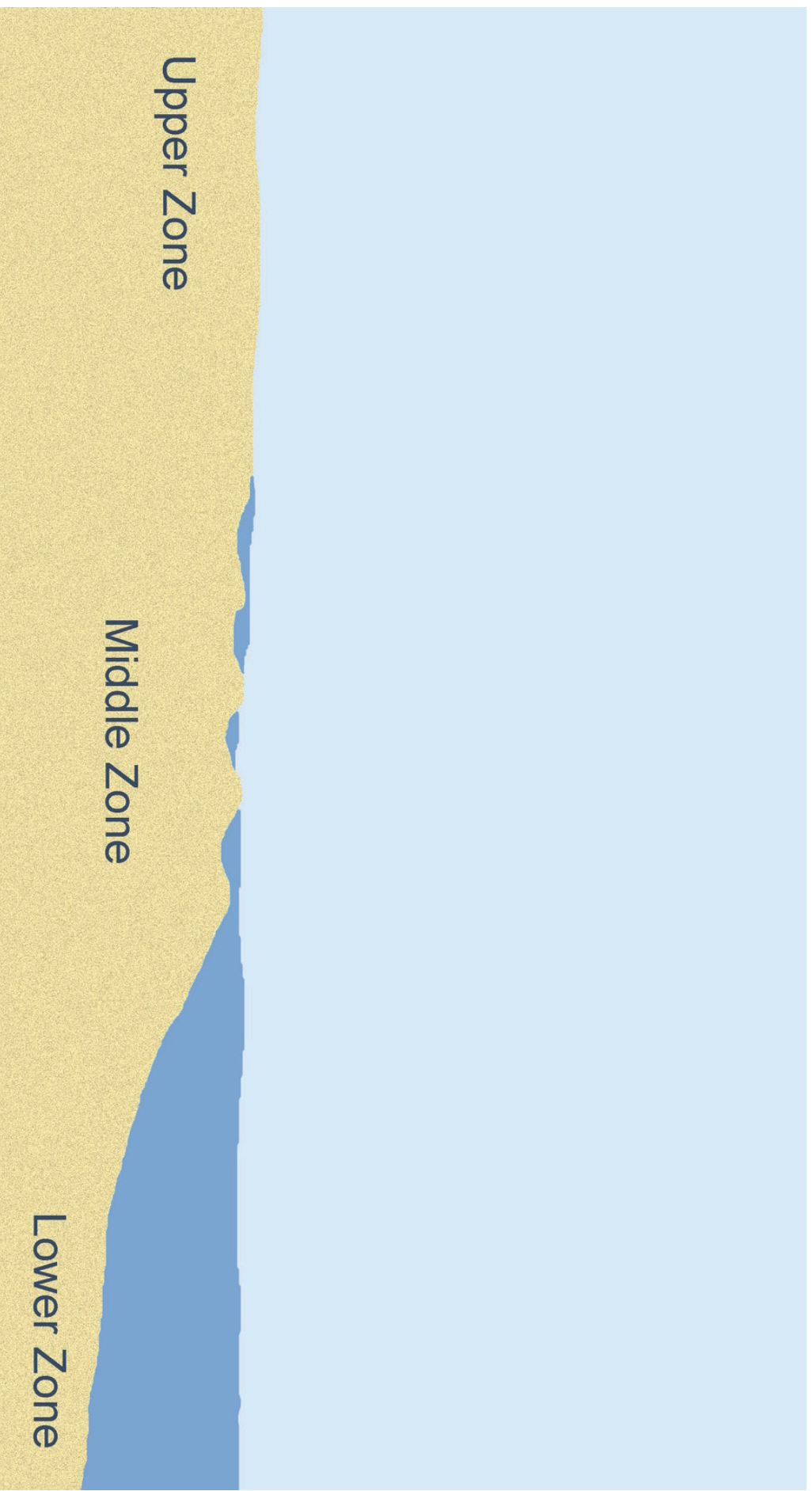
In a beach ecosystem, the habitats can be divided into the upper, middle, and lower zones. The upper zone is found above the high tide mark, and is often adjacent to more urban areas. This is the zone in which high winds create dunes. Common animals in the upper beach zone include feral cats, mongoose, and Laysan albatross. Common plants include beach morning glories, beach naupaka, nehe, and hinahina, all of which can withstand winds and salt water. The middle zone is between the low tide line and the high tide line, and constantly changes as the tides move in and out. Most organisms live in the sand. Common animals include ghost crabs, mole crabs, clams, and annelid worms. The lower zone is submerged under water. Organisms include schooling fish such as mullet, goatfish, and flagtails.

It is important to keep in mind that beaches are constantly changing ecosystems, and the presence of organisms is also changing.





(Teacher Reading) Example of Beach Habitats in a Cross-Section:



LESSON 1 Teacher Reading Beach Habitat Organisms Information Page

Lower Zone (This is the shallow coastal water)

Goat Fish:

<http://www.photolib.noaa.gov/htmls/reef0031.htm>

Green sea turtle:

<http://www.photolib.noaa.gov/htmls/reef0723.htm>

Sea urchin:

<http://www.photolib.noaa.gov/htmls/fish1816.htm>

Middle Zone (This is the beach foreshore)

Ghost crabs:

<http://www.photolib.noaa.gov/htmls/line0942.htm>

Mole crabs (sand turtles, *'ala'eke*):

<http://www.marinelifephotography.com/marine/arthropods/crabs/crabs.htm>

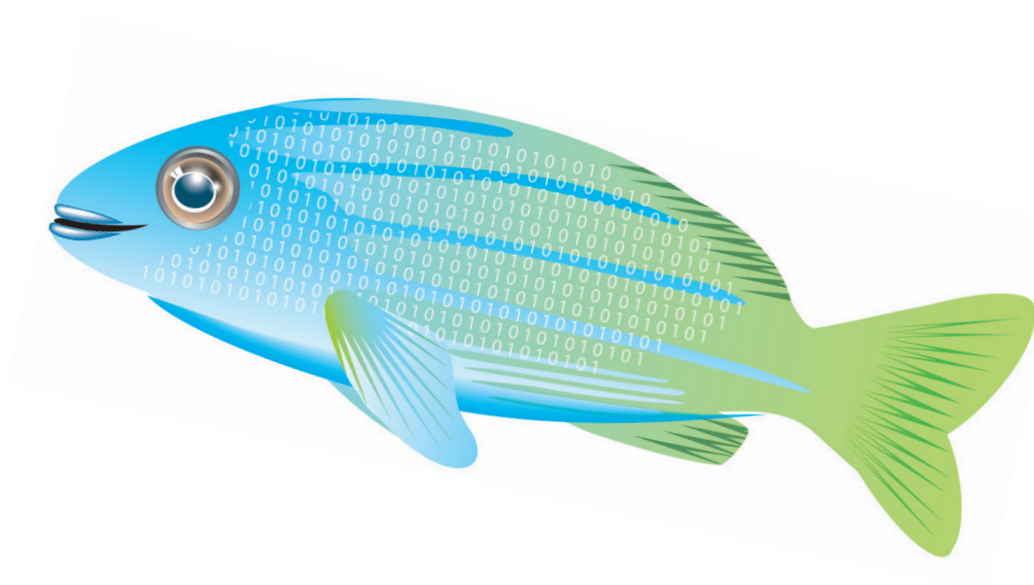
Shorebirds (possibilities include *'Akekeke* (Ruddy Turnstone); or *Hunakai* (Sanderling), *'Ulili* (Wandering Tattler; all three spend winters in Hawai'i)

<http://www.HawaiiAudubon.com/gallery/shorebirds.html>

Upper Zone (This is the beach backshore)

Mongoose:

<http://www.instantHawaii.com/cgi-bin/Hawaii?Animals.mongoose>



LESSON 1 Teacher Reading

The Case of Claude the Crab

It was a hot, muggy day, and I was sitting sleepily at my desk when in rushed the largest crab I had ever seen. He introduced himself quickly as Claude Crab, and told me he desperately needed to hire a private detective. Of course, my first question was what crime he needed investigated. Immediately, he started talking very fast and clicking his claws together in obvious panic. When I could finally get him calmed down so I could understand him, I started to get the picture...

The crime was attempted murder. This poor crab's home was being destroyed, and he was in grave danger of being killed! He did not have any idea what was going on, or why someone would want to kill him. Claude was sure that he had no personal enemies, and certainly none capable of the magnitude of destruction he was describing.

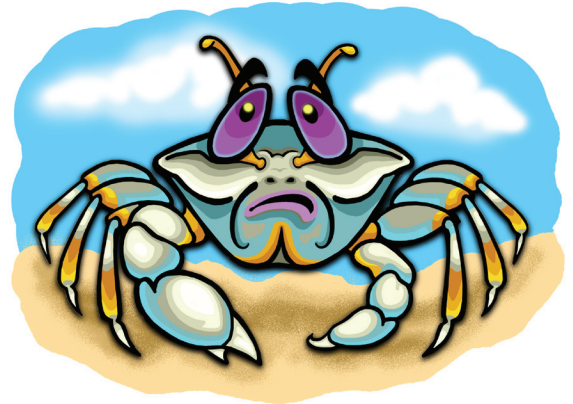
Then, he gave me the first clue. He said that every day, the beaches and ocean waters became more crowded with dead objects that he did not recognize. He described many shapes, colors, and textures: He said that none of the objects were good to eat, and all they did was clutter up the beach. But, the most dangerous, by far, were these funny loops of some strange, thin stuff that was almost invisible. Once you had gotten caught in it, it was almost impossible to get free. He was sure that someone was laying traps for him!

The second clue was his story of how some days the very ocean waters turned poisonous with strange colors and disgusting flavors. He said that on those days, he had no choice but to stay out of the water and go hungry until the poisons had dissipated. The water burned his gills too much to go in.

Furthermore, he said that he was not the only one in danger from these criminals. All his friends in the ocean were in danger. The fish, the seals, the dolphins, and the birds were all fighting for their lives against an enemy that they did not understand. He made a rather eloquent plea for my help.

After making suitable arrangements for payment and travel expenses (of course), I thanked Claude and assured him that I would get to work on his investigation first thing in the morning. I would find the villain and save him and his friends!

As soon as he left, I began to regret my bold promises. This was obviously far too big a job for me to handle alone...



LESSON 1 Beach Organism's

Name: _____ Date: _____

Directions: Answer the following questions in complete sentences.

1. Looking at the photo of the beach organism give one observation.
2. Looking at the photo of the beach organism provide an inference.
3. Create a hypothesis telling what part of the coastal ecosystem you think the beach organism lives.
(write “if.....then” statement)
4. What is the organism's name?



5. What ecosystem is the organism a part of?
6. Describe the organism's habitat.
7. What behaviors of the organism are determined by the habitat in which it lives?
8. What environmental conditions does the organism need to survive?
9. Did the research answers support your hypothesis? Why or why not?