

Date: _____

Your Name: _____



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

Released Science Inquiry Task

The Rocky Intertidal Zone Ecosystem

2014

Grade 8

Science

Directions:

You will be analyzing data from research described in a short story called “The Rocky Intertidal Zone Ecosystem.” You will use information provided in the story to answer a set of questions. Explain the reasons for all of your answers. You may include a drawing or labeled diagram to help explain your answers.

This Word Bank defines terms you will need to understand throughout this task. You may refer back to the Word Bank throughout this session.

Word Bank

Biodiversity	the number and variety of organisms found within a specified geographic region
Ecosystem	a biological community of interacting organisms and their physical environment
Food web	a system of connected and related food chains in an ecosystem
High tide	the highest water level during a tide cycle
Invasive species	a new or non-native species that is introduced into an area and quickly reproduces and spreads out, affecting the organisms that were already in the area
Low tide	the lowest water level during a tide cycle
Population survey	a count of the number of organisms of each species in a specific area of an ecosystem
Stability	the ability of an ecosystem to remain stable (or not fail) if a change occurs in the ecosystem
Tide pool	the amount of water that remains after a tide has retreated
Zones	areas in an intertidal ecosystem distinguished by their location and amount of exposure to water Spray zone: the area of the shoreline that is frequently splashed by water but not covered by water at all times Intertidal zone: the area of the shoreline covered by water at high tide and uncovered at low tide Low tide zone: the area of the shoreline that is mostly covered by water

The Rocky Intertidal Zone Ecosystem

Ms. Fletcher's class took a field trip last March to investigate a rocky intertidal zone shoreline at low tide. At the shoreline of Coastal Park, the students took pictures of different plants and animals in the tide pools and on the rocks above the tide pools. They also took population surveys of sea stars, blue mussels, and green crabs and collected some samples of seawater.

Back at school, the students did some research to identify some of the species they found in the intertidal zone. With the help of microscopes, the students observed plankton and algae in the samples of seawater they had brought back to school.

The class then watched a video about the rocky intertidal zone. The video showed that many organisms have adapted to the changing environment. For example, when blue mussels are underwater during high tide, they open their shells and feed on plankton. At low tide, however, blue mussels close their shells to keep from drying out. Also at low tide, sea stars retreat to tide pools or cracks between rocks to stay wet.

Ms. Fletcher asked the class to describe the biodiversity they saw in the intertidal zone.

"There were so many species!" Maria exclaimed. "And so much food for every animal to eat."

"There is plenty of sunlight and water there. The food web is large because there are plenty of resources," Calvin added.

"What might make it hard for the intertidal zone ecosystem to stay stable?" Ms. Fletcher asked.

"The video showed that the ocean is becoming warmer," Calvin said.

"How did it show some of the organisms living in the intertidal zone responding to increasing temperatures?" Ms. Fletcher asked.

"The barnacles and blue mussels were hurt the most," said Maria. "They couldn't build shells, so there were fewer of them."

"But, the algae and sea grass grew a lot faster," Calvin added.

Ms. Fletcher concluded, "So, we can see that some organisms are harmed but some organisms benefit by changes in an ecosystem."

The class decided to do more research on the organisms they found. Using the information they gathered from their field trip and research, the students made Figure 1 and Table 1 shown on the next page.

Figure 1. Rocky Intertidal Zone

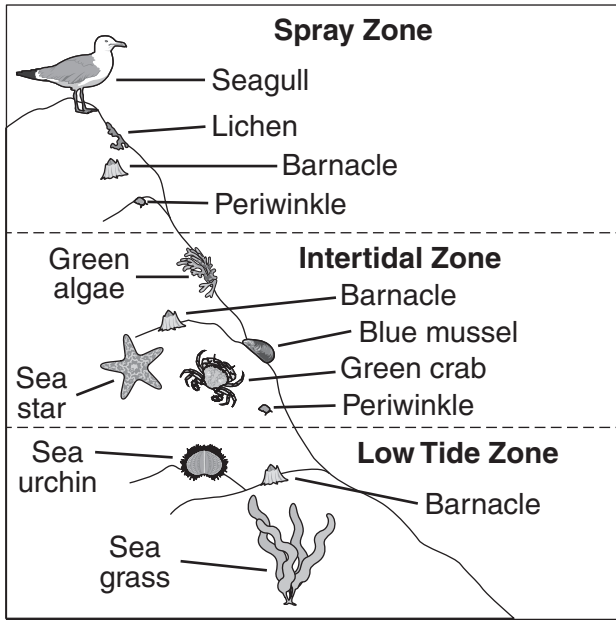


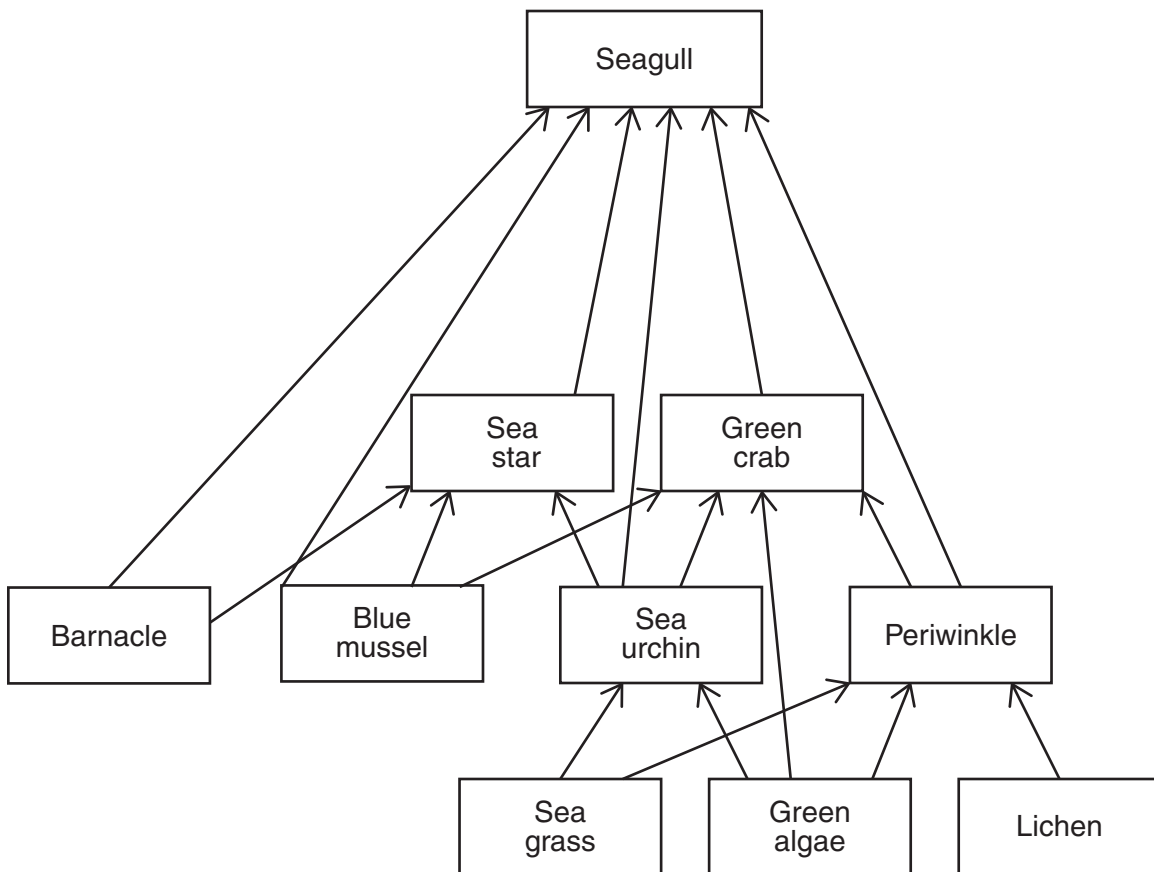
Table 1. Intertidal Zone Organisms

Organism	Food Source	Eaten By
Barnacle	Plankton (tiny organisms)	Sea stars, seagulls
Blue mussel	Plankton (tiny organisms)	Sea stars, green crabs, seagulls
Green algae	Makes its own food	Periwinkles, green crabs, sea urchins
Green crab	Periwinkles, green algae, blue mussels, sea urchins	Seagulls
Lichen	Makes its own food	Periwinkles
Periwinkle (snail)	Green algae, lichens, sea grass	Seagulls, green crabs
Seagull	Periwinkles, green crabs, barnacles, blue mussels, sea stars, sea urchins	Land predators
Sea grass	Makes its own food	Periwinkles, sea urchins
Sea star	Barnacles, blue mussels, sea urchins	Seagulls
Sea urchin	Sea grass, green algae	Seagulls, green crabs, sea stars

During their research, the students learned that green crabs are an invasive species in clam beds found in mudflats in Maine. They read an article about how warming temperatures caused an increase in the number of green crabs in these clam beds. The students learned that the green crabs are reducing the number of clams in Maine.

The students decided to investigate how an increase in the number of green crabs might affect other species in the rocky intertidal zone they visited. First, the students used the information from Table 1 to draw a food web that included the green crabs. The students' food web is shown below.

Figure 2. Partial Rocky Intertidal Zone Food Web



Answer question 1 on page 1 in your Student Answer Booklet.

- 1 Explain why drawing a food web is a useful way to help the students predict how organisms in an ecosystem might be affected by changes to a specific population.

The article the students read about warming temperatures also discussed ways that people are trying to remove the green crabs because of the harm they cause to clam beds. Based on the food web, Calvin predicted that if green crabs were removed from the ecosystem, the seagull population would significantly decrease.

Answer question 2 on page 1 in your Student Answer Booklet.

- 2 Identify whether Calvin’s prediction that the seagull population would **significantly** decrease is supported by the food web in Figure 2. Use evidence from the food web to explain your answer.

Answer question 3 on page 2 in your Student Answer Booklet.

- 3 Predict how the populations of blue mussels and sea stars would **most likely** change if the population of green crabs increased. Use evidence from the food web to support your prediction.

When the students conducted population surveys during their March trip to the rocky intertidal zone at Coastal Park, they followed the procedure listed below.

1. Divide a portion of the rocky intertidal zone into three sections.
2. In each section, lay down a 1 m × 1 m square frame made of plastic.
3. Count the population of blue mussels, sea stars, and green crabs in each frame.

Table 2 below shows the students’ data.

**Table 2. Population Survey Data from March Field Trip
(1 m² frames)**

Frame	Number of Blue Mussels	Number of Sea Stars	Number of Green Crabs
1	36	3	2
2	62	8	4
3	33	5	2

Answer question 4 on page 2 in your Student Answer Booklet.

- 4 Describe **two** pieces of equipment or tools—in addition to the plastic frames—the students **most likely** used to help them collect data for the population surveys. Explain why each piece of equipment or tool was appropriate for collecting data.

Answer question 5 on page 3 in your Student Answer Booklet.

- 5 Use the data from Table 2 to draw a graph that shows the populations of each species found in the three frames. Construct your graph on the grid in your Student Answer Booklet.

The students agree that the population survey from their March field trip is one way to begin to test predictions based on the food web. The students decided to return to Coastal Park to collect more population survey data. They plan to take three more field trips to Coastal Park over the next two months.

Answer questions 6 and 7 on page 4 in your Student Answer Booklet.

- 6 Read the prediction you made in response to question 3. Use Table 2 and information from the story to explain whether the students collected enough data on their field trip for you to determine if your prediction about the change in population in response to question 3 is supported. Explain your answer.
- 7 Describe how data from an ongoing population survey (repeated visits to Coastal Park) could be used to help test your prediction.

Answer question 8 on page 5 in your Student Answer Booklet.

- 8 Describe how the students can make sure that the information they collect from future population surveys will provide the information they need to help them test their predictions. Explain your answer. (Hint: Think about good experimental techniques.)

