



# SCIENTIST IN RESIDENCE PROGRAM™

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**Science Unit:** *Meet Me at the Beach!*  
**Lesson # 4** *Primary Intertidal Field Trip #2 - Zones*

**Summary:** Students visited the intertidal zone on the north shore of Stanley Park for a second time. During this visit, they observed and drew animals in quadrats distributed vertically in different habitat “zones” up the beach. Students then compared and contrasted animals living in the upper intertidal with those in the lower intertidal.

**School Year:** 2014/2015

**Developed for:** Elsie Roy Elementary School, Vancouver School District

**Developed by:** Jonathan Kellogg (scientist); Saira Devji and Carolyn Fanning (teachers)

**Grade level:** Presented to grade K; appropriate for grades K – 5 with age appropriate modifications

**Duration of lesson:** 4.5 hours

**Notes:**

- Field trip to north shore of Stanley Park, need parent volunteers for successful day
- Plan field trip for a day with a “low low” tide. Check tide tables - tides are usually best in May and June.
- Students must wear sturdy footwear for slippery, barnacle-covered rocks (no flip flops or sandals)
- Students must be dressed for the elements with appropriate hats and layers (sun, wind, rain)
- Bring first aid kit and fresh water
- Animal welfare is extremely important. Prepare students to handle animals with extreme care.
- Young children should not roll large rocks covered in animals. Adults can help lift rocks straight up and replace them gently exactly as they were found.

## **Objectives**

1. Explore the rocky intertidal areas of Stanley Park.
2. Observe live animals in their natural habitat.
3. Learn about the zones of the intertidal environment.
4. Discover the diversity of the intertidal environment.
5. Learn about adaptations that intertidal creatures have developed to survive their environment.

## **Background Information**

Building on the other lessons in this unit, students are returning back to the beach for a second chance to observe the seashore creatures in their natural environment.

After having lessons on barnacles and algae, students will again be on the beach to make observations about the animals that they will observe in their hula hoops, but with more emphasis during this trip on the vertical zonation that occurs in the intertidal environment.



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Most shorelines exhibit a gradient of species from those that are more tolerant of being exposed to dry conditions inhabiting the upper intertidal while those that are less tolerant of air exposure remaining in the lower intertidal. Most shorelines have barnacles in the upper intertidal, then mussels, snails, then clams and sea stars in the lower intertidal. By standing in the lower intertidal and looking towards shore, some of these zones may even be visible as distinct color bands.

## Vocabulary

Upper intertidal	Near the high tide mark, this is the zone that is infrequently underwater
Lower intertidal	Near mean lower low water, this is the zone that that is infrequently exposed to air except during some of the lowest tides of the year
Subtidal	Animals that remain submerged all the time
Vertical zonation	A community of species that is divided into distinct vertical bands of specific species progressing from the upper to lower intertidal

## Materials

- Clipboard
- Vertical zonation worksheet
- Larger intertidal field guide (Whelks to Whales or like)
- Laminated intertidal field guide
- Quadrat drawing worksheet
- String (to divide the hula hoop into 4)
- Sharpies
- Quadrats (or hula hoops)
- Rite in the Rain paper

## In the Classroom

### Introductory Discussion

1. Short description of 'hook' to capture student's attention.
  - What are you looking forward to seeing at the beach today?
  - What did you miss last time that one of your friends told you about?
  - Is there something that you wanted to take a closer look at today?
2. Short description of other items to discuss or review.
  - Briefly review some of the different types of animals that students will likely see at the beach. Remind students about the tidal cycle and explain that animals in the upper intertidal are infrequently covered with water while animals in the lower intertidal are infrequently out of the water and that all of those animals have special adaptations to survive in the environment where they have settled. When students get down to the beach, take the time to point out the colour bands that are present by the flora and fauna (brown *Fucus* (rockweed), green *Ulva*, white barnacles, black mussels, and large brown algae (kelp) nearer to the water).
3. Briefly describe science experiment/activity.
  - Arrive at the Stanley Park beach (We focused on the beach north of the Empress of Japan figurehead, parking for a bus is available just south of the spray park just to the west.)
  - Carefully make way down to the beach. Allow for some free exploration, and then make way to the rocky intertidal below the Empress of Japan figurehead.



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- For this lesson, the focus is on vertical zonation of the organisms so quadrats should be placed such that there is a line of them from the seawall down to the lower intertidal. Have the students rotate through the different quadrats so that they spend ~5 min in each of them and get a sense of the zonation of the species on the beach.
  - When the quadrat rotations are complete, have students focus on one of the quadrats (feel free to move quadrats on the beach if some are particularly uninteresting) and have students focus on drawing one organism in each section of the quadrat with enough detail so they can describe what it is.
  - Both the drawing and vertical zonation pages should be photocopied onto waterproof paper in the event of students dropping their clipboards onto the beach or into the water.
4. Briefly describe the processes of science that the students will focus on:
- This lesson focuses on the process of observations that scientists undertake when first arriving at a new beach and determining basic species diversity by looking at the presence or absence of key species.
5. Briefly describe safety guidelines.
- Review beach safety: No running, rocks are slippery, no flipping rocks because it may crush marine creatures, no throwing rocks, do not touch large crabs.
  - Review of safety is also important for crossing the road and staying together throughout Stanley Park and when riding the bus.
  - Bring a first aid kit to the beach to care for any cuts that may occur due to slips on the rocks and cuts by barnacles.

## Science Activity

The two main components of this activity are the drawing/observation quadrat phase and the vertical zonation phase.

1. Scientists regularly use quadrats, or square PVC piping that is 0.5 m on a side, as a unit of area to observe the species diversity in an area. If funds are not available to construct quadrats, hula hoops may be substituted if they are divided into quarters using yarn or string to make the area smaller.

To examine the vertical zonation, use ~5 quadrats and place them in a rough line with equal spacing from the seawall to near the water's edge (far enough back from the edge that the tide won't swamp it in the next 30 min).

Break the students into groups of four and have them take ~5 min to examine each quadrat to determine the presence or absence of the organisms on the worksheet.

Have them each rotate through the quadrats so that all groups get the opportunity to examine each of the locations. The layout of the worksheet should lead students to see the presence of more animals on the left side of the page in the upper intertidal (Hoop 1) while there should be more of the animals on the right side of the page in the lower intertidal (Hoop 5).

Not all of the animals should be found in each of the quadrats. If you have a larger class size or multiple classes, it may be reasonable to increase the number of quadrats between the shore and the water or make multiple parallel lines of quadrats so more students will be spread out. This activity is estimated to take 30-45 min.



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2. For the drawing/observation phase, accurate drawings of animals within each quarter would take considerably longer than the time permitted by the low tide, so students are asked to draw one animal in each quarter with at least 4-5 details so the organism could be recognized.

Upon arriving at their quadrat, students should look at the area as a whole, and then take turns focusing on an organism in each quarter of the whole system.

Allowing ~20-30 minutes for this activity allows students to focus on one of the quadrats and identify the flora and fauna that are present.

Both before and after these components, students are allowed to freely explore the beach and examine the diversity that is present.

We also used the large grassy area across from the spray park to allow the students to eat their lunch and to have a discussion with them about what they saw on the beach.

## Closure Discussion

1. What did you notice at the beach?
2. What did you wonder about that you observed?
3. Why do you think animals live in different zones of the beach?
4. What adaptations do the animals need to survive in the different zones?

## References (examples of the format to use for different types of references are below)

Species Identification Guide, *Seattle Aquarium*.

<http://www.seattleaquarium.org/document.doc?id=1960>. Accessed 1 May 2015. (Print in color and laminate both pages together to create field guides.)

## Extension of Lesson Plan

For older students, this lesson can be made more quantitative by asking students to estimate the numbers of each organism within the quadrant or each area of the quadrant. These data may then be used in the classroom to generate graphs of the total diversity present on the beach.