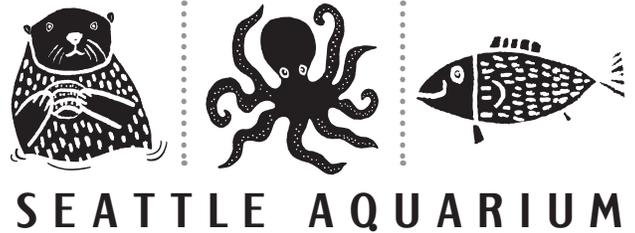


# Counting Sea Stars



## GRADES:

3–5

## DURATION:

30 minutes

## MATERIALS:

- Hula hoop, string or tape
- Worksheets
- Pencils
- Appropriate candy (this can be substituted with non-food items)

## VOCABULARY:

- Quadrat
- Ecological diversity
- Population
- Sampling

## STANDARDS:

WA state:

- Life Science
- Systems
- Inquiry

Ocean Literacy

Principles:

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

## OVERVIEW:

*In order to learn more about sea stars and how an outbreak of sea star wasting disease could affect the population, scientists need a method to count sea stars and other animals without having to count every single animal in the area.*

*To get a good understanding of the living things present in an area, they count organisms in part of an area. This is called sampling. One tool used to sample is called a quadrat. A quadrat is a small sample of what the tide pools look like. You can use a quadrat to estimate the number of animals in the entire area.*

## GOALS AND OBJECTIVES:

- Students will be introduced to data sampling techniques and have a chance to try the quadrat data collection method in the classroom.
- Using data collected in the classroom, students will be able to answer questions about diversity in an ecosystem.
- Students will be able to predict observable changes within the sea star population due to sea star wasting disease.

## BACKGROUND:

- Introduce students to the topic of Sea Star Wasting Disease by using one of the available resources.
  - Short videos on the issue such as KCTS's *A Sea Without Stars* (seven-minute video): <https://ww2.kqed.org/quest/2014/11/18/a-sea-without-stars/>.
  - Sea star fact sheets on the Seattle Aquarium website.
- Students will need a basic understanding of tide pool zonation to engage in activity.

### Rocky high zone:

- Only underwater during high tide so animals spend a lot of time exposed to air.
- Temperature and salinity can change greatly.
- Lots of terrestrial predators such as birds, raccoons and people.
- Food is hard to find and is mostly algae.
- Animals: acorn barnacles, limpets, small snails, aggregating anemones, shore crabs and small hermit crabs.

### Rocky mid zone:

- Animals that live here spend half their time underwater and half their time exposed to air.
- Wave action is extreme.
- Lots of competition for living space.
- Predation from both terrestrial and marine animals such as birds, river otters, sea stars and fish.
- Animals: mussels, chitons, larger predatory snails, hermit crabs, pygmy rock crabs, ochre stars and mottled stars.

### Rocky low zone:

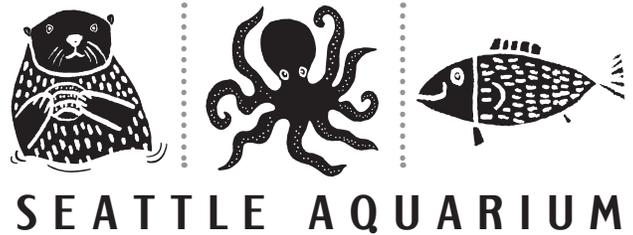
- Animals are underwater most of the time except for days with very low tides.
- Lots of different types of food available.
- Lots of marine predators such as sea stars, anemones, crabs and fish.
- Many different types of seaweed.
- Animals: sunflower stars, blue-striped sun stars, leather stars, sharpnose crabs, graceful kelp crabs, urchins, anemones and sea cucumbers.

## RESOURCES:

- <https://ww2.kqed.org/quest/2014/11/18/a-sea-without-stars/>.
- Sea star fact sheets on the Seattle Aquarium website.



# Counting Sea Stars



## ACTIVITY:

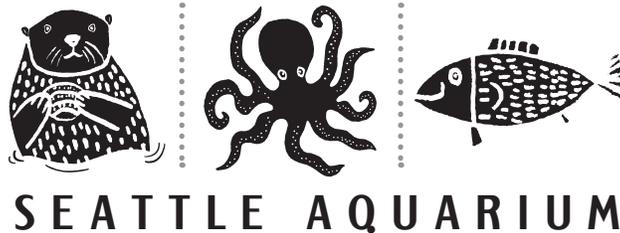
1. Set up the room with at least three quadrats (small circles or squares), designating each one high, mid or low tide to mimic a beach (two or even three sets of the quadrats can be set up to accommodate larger numbers of students). Place the corresponding type of candy, representing an animal species, in the appropriate quadrat according to the chart provided.
2. **Think, pair, share:** What animals live in a tide pool OR where in the tide pool do sea stars live?
3. **Collaborative board work:** Prompt, *"How could you answer this question?"* Teacher-led brainstorm on board. Common examples might include: looking it up online, counting the animals at the beach, going out at different times, video recordings of tides etc. Once all ideas have been exhausted, begin to discuss feasibility/accuracy/conservation impacts of many of the suggestions to help narrow down ideas and promote further conversation. *"Today we will be using a tool called a quadrat to sample the number and diversity of organisms in the tide pools (including sea stars)."*
4. Instruct students to work in pairs or individually. Provide students with worksheets and pencils, and give them time to rotate around the "tide pool quadrats" and record their findings.
5. **Collaborative board work:**
  - a. Which tidal zone had the **largest number of animals**?  
What can you infer about the tidal zone and number of animals found?
  - b. Which tidal zone had the **highest diversity**? The lowest?  
What can you infer about the tidal zone and diversity?
  - c. Based on the data collected today, where would we see a change if sea stars started getting sick in this area?



## Counting sea stars quadrat activity WORKSHEET KEY

Quadrat count			
Species	High tide	Mid tide	Low tide
Acorn barnacle (silver kiss)	20	8	3
Sunflower star (pink starburst)	0	0	4
Blue mussel (purple kiss)	12	8	2
Shore crab (gold kiss)	10	1	0
Blue striped sun star (mint)	0	0	6
Anemone (mini chocolate bar)	2	9	8
Leather star (peanut butter cup)	0	1	5
Ochre sea star (yellow starburst)	0	7	2
Periwinkle (lollypop)	18	0	0
Mottled star (red starburst)	0	6	1
<b>Total number of organisms</b>	<b>62</b>	<b>49</b>	<b>31</b>

Three most dominant species at each tide level		
High tide	Mid tide	Low tide
Acorn barnacle	Anemone	Anemone
Periwinkle	Acorn barnacle	Blue striped sun star
Blue mussel	Blue mussel	Leather star



## Counting sea stars quadrat activity

A quadrat is a tool used to sample the number of organisms in an ecosystem. Compare animal populations at high, mid, and low tide zones. Use the tally method to count the number of animals found at each tide level.

Quadrat count			
Species	High tide	Mid tide	Low tide
Acorn barnacle (silver kiss)			
Sunflower star (pink starburst)			
Blue mussel (purple kiss)			
Shore crab (gold kiss)			
Blue striped sun star (mint)			
Anemone (mini chocolate bar)			
Leather star (peanut butter cup)			
Ochre sea star (yellow starburst)			
Periwinkle (lollypop)			
Mottled star (red starburst)			
<b>Total number of organisms</b>			

Three most dominant species at each tide level		
High tide	Mid tide	Low tide