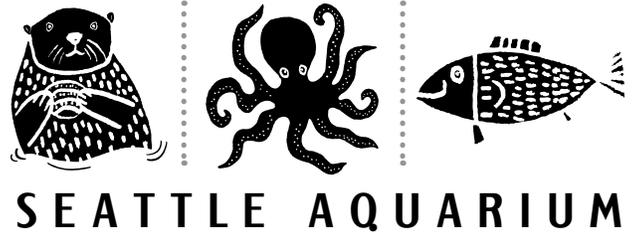


# Infection Detection— Sea Stars



## GRADES:

3–6

## DURATION:

30–45 minutes

## MATERIALS:

- 12 six-sided dice
- 12 sea star activity station labels
- Five colors of paper cut into small pieces—each student should have 20 pieces of one color
- Paper cups

## VOCABULARY:

- Sea star wasting disease
- Predator
- Tides
- Bacteria
- Virus
- Ecosystem
- Intertidal zone

## STANDARDS:

WA state:

- Inquiry
- Systems
- Life Science

Ocean Literacy

Principles:

5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.

## OVERVIEW:

*In this activity students will become sea stars going about a normal sea star day. Little do they know there is a virus spreading around the intertidal zone. Will they be infected? You'll have to play to find out.*

## GOALS AND OBJECTIVES:

- Students will learn that germs (viruses and bacteria) not only cause sickness in humans, but also in other animals.
- Students will discuss different ways that germs can be spread.
- Students will begin to understand the outcome of sea star wasting disease and other diseases with regards to population size and interactions.

## BACKGROUND:

Students may be familiar with the spread of germs from person to person but may not know that animals can also get sick from the spreading of germs. Both bacteria and viruses can make animals sick and can travel through air, water and by touch.

Many sea star species can be found in the intertidal ecosystem—that's the area between the highest high tide and the lowest low tide. They can be found on rocky coastlines and sandy shores.

A sea star uses its tube feet to handle prey and bring it to its mouth, which is located on the oral side (or underside) of its body. Sea stars have the ability to extrude their stomachs through their mouths and engulf their prey. Strong digestive juices liquefy the prey item and it is absorbed by the stomach. Once digestion is complete the sea star swallows its stomach back into its body. This adaptation allows the sea star to eat larger prey items that otherwise would not fit inside its flat bodies. Most sea stars in the Pacific Northwest are carnivores (and sometimes scavengers), preying on animals such as mussels, clams, snails and other sea stars.

The hard exterior of sea stars is a deterrent to many possible predators, but does not keep the animals safe from all predation. Gulls, crabs and other species of sea stars are common predators in the intertidal and subtidal zones. Some sea star adaptations for avoiding predation include: a calcareous skeleton, tube feet that can adhere firmly to a rocky sea floor, chemical defenses (foul tasting) and even slime.

Aside from predation, other factors can negatively affect sea star populations. Examples include but are not limited to:

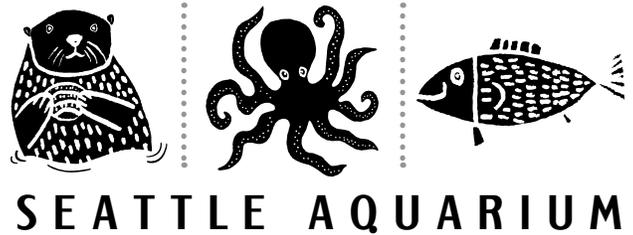
- Resource availability: variations in the resources that are available can occur due to natural occurrences in the ecosystem (examples: weather related, natural disasters), competition with other species and competition with humans.
- Human impacts: people can affect sea star populations through overuse of shared resources, destruction of habitats and pollution.
- Disease.

## 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.



# Infection Detection— Sea Stars



## ACTIVITY:

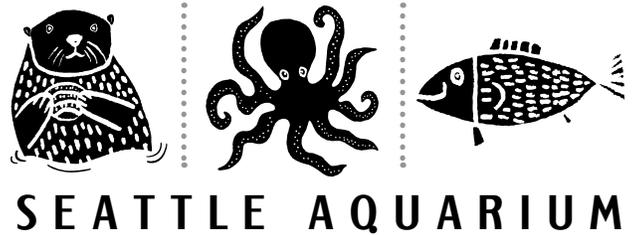
Setup for a class of 30 students (can be modified):

- Each student should have a cup with 20 pieces of paper in it (all one color).
- Tape the sea star activity station labels around the classroom.
- Put one die at each station.
- Display “health status” key on the board or somewhere students can see it.

## PROCEDURE:

1. Ask students to take one cup and assign each student to their first sea star activity station. Students should be evenly distributed among stations.
2. The students will shake hands with each of the students at their station. They will also trade one of their pieces of paper with each student they shake hands with. Students should only trade with their original color.
3. Each student will roll the die to determine their next station. Once all students have rolled, they will all walk to their next station. Note that there are two stations for each sea star activity. Students can choose either of those stations to go to next; it does not matter how many students are at each station.
4. Students should shake hands and trade their original colored papers with each other students at their station.
5. Repeat this process for five rounds.
6. Students should then sit at their desks and tally up the number of pieces of each color of paper they have in their cups.
7. Once all students have tallied their papers, reveal the health status key so they can find out if they have been infected or not.
8. Write on the board how many students fit into each health category. Follow this with a discussion using some of the discussion topics below.

# Infection Detection— Sea Stars



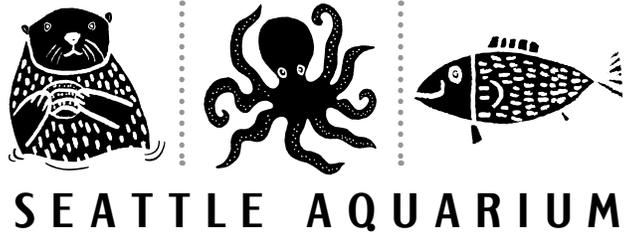
## DISCUSSION QUESTIONS:

1. How many sea stars remained healthy? How many were infected but could recover? How many were infected but could not recover? How many sea stars died?
2. During which daily activities could the sea stars be infected? (Anytime they came in direct contact with other sea stars, which could happen at any point during their day.)
3. Scientists don't know for sure if it is a virus that causes sea star wasting disease, but that's one possibility. What are some ways this virus could spread from one sea star to another? What are some ways that people can spread germs to each other?
4. Have students count up how many interactions they had with other students. This number will vary greatly between students, depending on how many other students were at the same stations during rotations. Why is it different? Talk about why sea stars that had more interactions are more likely to be infected than those that had fewer interactions.
5. Have the students create a memory map of where they traveled in their sea star day and who they interacted with. Because you have not identified which sea stars originally carried the virus, you will not be able to determine who infected them—but if that is of interest to you, try the modified version of this activity explained below.
6. If many of the sea stars in an area die, what will happen to other animals in the intertidal ecosystem (food web connection, disease spread to other species)?
7. How might catching a virus affect the life cycle of an individual sea star?

## MODIFICATIONS/EXTENSIONS:

Run the activity as it is written. Once the students have completed their tallies, reveal to them that the blue sea stars were the ones carrying the virus and that the red sea stars are immune to the virus. Use the health status key to determine if the stars have been infected. Red stars will not be infected regardless of how many blue papers they have collected.

Have the students create a memory map of where they traveled in their sea star day and who they interacted with. They should be able to trace where they were infected and possibly by whom! Follow this with a discussion using some of the discussion topics below.



### Sea star activity stations (print two copies)

|          |                                                                                                  |          |                                                                                                                                                           |
|----------|--------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | The tide is out! Use your hundreds of tube feet to cling to a rock until the tide comes back in. | <b>2</b> | You found a tasty mussel to eat. Use your tube feet to open its shell, then push your stomach outside of your body and into the shell to digest the meat. |
| <b>3</b> | Find a hiding spot to avoid predators like gulls and larger sea stars.                           | <b>4</b> | The tide is in. Creep higher on shore to snack on some gooseneck barnacles.                                                                               |
| <b>5</b> | Crawl over sand and rocks to explore some deeper water.                                          | <b>6</b> | You found a dead fish, an easy meal to share with other sea stars, snails and crabs.                                                                      |

#### Health status key:

| How many of your original color did you lose? | Health status                        |
|-----------------------------------------------|--------------------------------------|
| Five or less                                  | Healthy                              |
| Six or seven                                  | Slightly sick, will probably recover |
| Eight or nine                                 | Very sick, probably will not recover |
| 10 or more                                    | Dead                                 |

#### Health status key if blue stars are carriers:

| How many blue papers do you have? | Health status                        |
|-----------------------------------|--------------------------------------|
| Zero                              | Healthy                              |
| One or two                        | Slightly sick, will probably recover |
| Three or four                     | Very sick, probably will not recover |
| Five or more                      | Dead                                 |