

## STATION 2

# marine microbes

**Crabbins** contacts **Dr. Seeksalot** at Oregon State University expressing his concern about the unpredictability of crabbing season in the past 20 years. Dr. Seeksalot studies how microbes react to changing ocean conditions, such as ocean acidification, warming, wind patterns, deoxygenation, overfishing, + more.

Invisible to the naked eye, there are a bunch of microbes living in the ocean. They include bacteria, viruses, archaea, protists, and fungi. If you weighed ALL the living organisms in the ocean, 90 percent of that weight would be from microbes! Just because these microbes can't be seen doesn't mean they aren't important.

Microbes are often the engines of ecosystems that otherwise would not have access to the food and nutrients they need. Many are also the keepers of healthy ecosystems, cleaning the ocean of waste and often defending against disease rather than spreading it. Microbes live in some of the most extreme environments, from boiling hydrothermal vents to underground glacial lakes in the Antarctic. They were even the first life on the planet, living without oxygen in an ancient ocean. Microbes are essential for a thriving ocean ecosystem. Without them, the world we know would not exist.

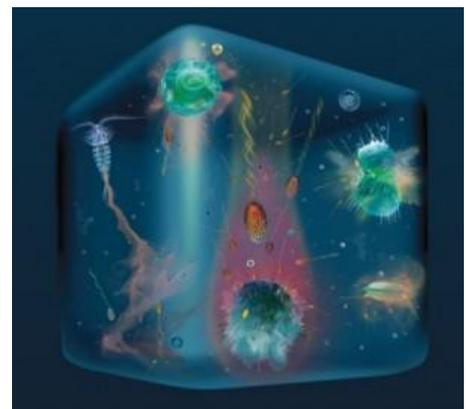
It's time to learn about microbes and how Dr. Seeksalot's expertise in microbiology may help us form hypotheses about the crab problem. Our approach is to start small and work our way up to bigger processes in the ocean.

### DID YOU KNOW?

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#### In a single drop of seawater, you can find:

- 1,000 small protozoans and algae
  - 1 million bacteria
  - 10 million viruses
- 



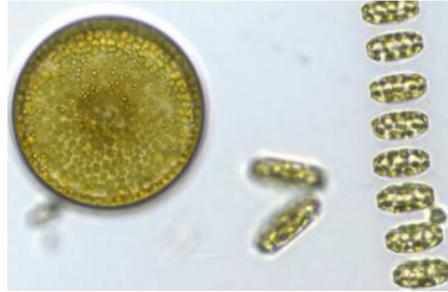
Microbes are often referred to as **plankton**. The word plankton comes from the Greek word, *planktos*, meaning drifter or wanderer.

### Below are the different types of microscopic plankton:



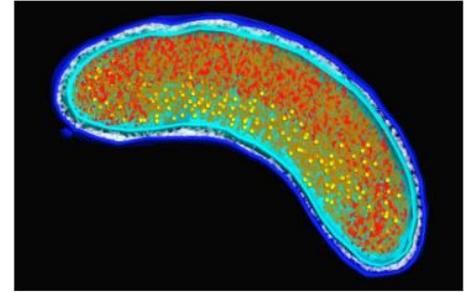
#### Zooplankton

"Zoo" means animal. Zooplankton are plankton consisting of small animals and the immature stages of larger animals.



#### Phytoplankton

"Phyto" means plant. Phytoplankton are plankton consisting of microscopic plants



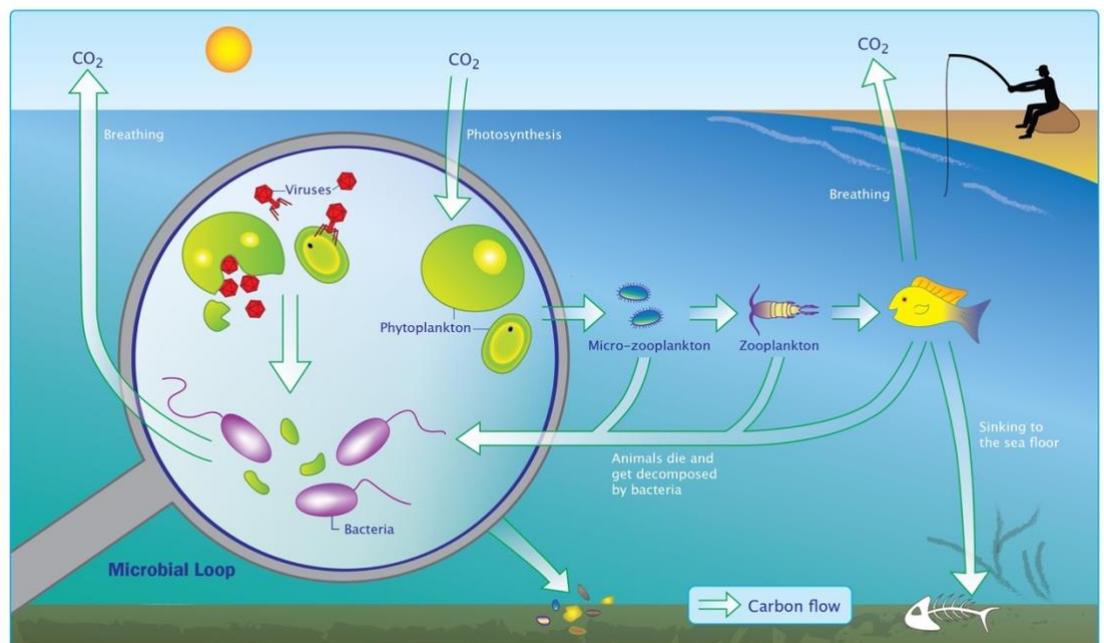
#### Bacterioplankton

"Bacteria" is latin for staff or cane. The first bacteria to be discovered were rod-shaped but microbes come in different shapes (circles, spirals, etc.) Bacterioplankton are the bacteria drifting in the water.

### How do zooplankton, phytoplankton and bacterioplankton interact?

You've probably seen an image of a food chain where the big animals eat the smaller animals. Microbes play a huge role in the ocean food web. Watch the video below to learn about how zooplankton (or "grazers") feed on a phytoplankton while bacterioplankton transform nutrients.

#### Video: The Microbial Loop





## If you are unable to see these organisms without a microscope, how do scientists study them?

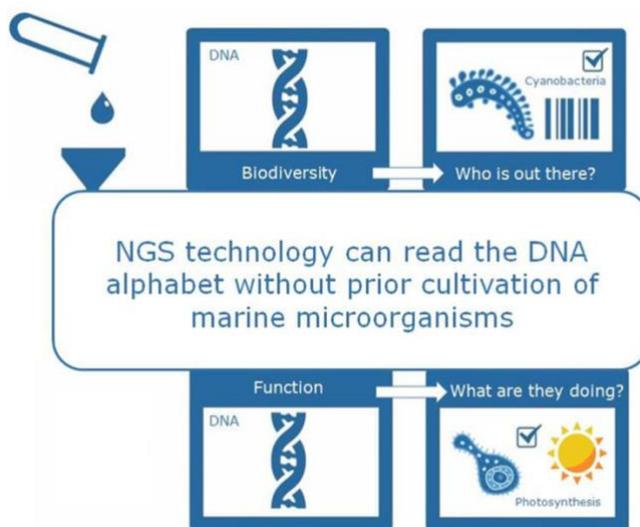
There are a few approaches to studying microbes. We can study them in the lab through "culturing" where we actually grow the bacteria on a petri plate. Or we can study them on the computer where we analyze their genetic code.

All the information about a microbe, or any kind of cell, exists in the cell's DNA. DNA is the molecule that contains the genetic code of organisms and is akin to the "blueprint" of the cell, since it tells the cell what to do and when to do it.

DNA is the building plan of an organism and includes instructions for all that organism's features and functions. If scientists can "read" the data coded in the DNA, they can obtain a great deal of knowledge about that organism.

This can be challenging but combining our findings from both genomic research and laboratory culture studies provides us with a great deal of information about how bacteria function.

Read the article, "**Understanding Marine Microbes: The Driving Engines of the Ocean**", to learn more about the methods marine microbiologists use to make new discoveries.



*NGS = Next Generation Sequencing*

## Test your knowledge!

- Rank the following organisms below: phytoplankton, bacterioplankton, zooplankton
  - Smallest: \_\_\_\_\_
  - \_\_\_\_\_
  - Largest: \_\_\_\_\_
- What does the word plankton mean?
  - Plant
  - Wanderer
  - Snow
  - Soup
- What forms the basis (bottom) of the ocean food web?
  - Small fish
  - Worms
  - Phytoplankton
  - Zooplankton
- Where does the majority of the oxygen on earth come from?
  - Marine plants (phytoplankton)
  - The Amazon Rainforest
  - The Redwoods
- What does Next Generation Sequencing tell us about a community of marine microbes?
  - Who's there – what species of microbes are present
  - What they need to grow in lab (culturing)
  - None of the above
- What percentage of the human population lives within 200km (~125 miles) of a coastline worldwide?
  - 100%
  - 75%
  - 50%
  - 25%