

# Ocean Sense Program



## Lesson 2

Module:

Nuċamat

Time:

75 minutes

### Learning pillars:

- Indigenous knowledge
- Ocean science
- Data exploration

### Grade & curriculum connection:

#### • BC Science 9

*"The biosphere, geosphere, hydrosphere, & atmosphere are interconnected, as matter cycles and energy flows through them."*

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## "Tiny Food"

Examine how **syu'ilhtuns (plankton)**, some of the oceans' smallest creatures, sustain many of the marine food webs, including species introduced in the **Our Relatives at the Beach** activity. Plankton demonstrate an amazing connection between the biosphere, geosphere, hydrosphere, and atmosphere.

There are many connections between sea creatures in their ocean home, and often these connections link back to the **food web**. Plankton, or "tiny food" play a very important role at the base of many marine food webs. There are two types of plankton: **zooplankton** and **phytoplankton**. The process called **photosynthesis**, which occurs in the **chlorophyll** inside phytoplanktons' cells, takes **solar radiation** and transforms it into energy and oxygen, the latter of which cycles back into the atmosphere. Ocean Networks Canada measures the amount of chlorophyll in the ocean with an instrument called a **fluorometer**, thereby showing the **seasonal cycling** of phytoplankton. Zooplankton follow an amazing **diel vertical migration** pattern that is signalled by solar radiation. Ocean Networks Canada measures this migration with an instrument called a **zooplankton acoustic profiler** (ZAP).

### Learning objectives

- Examine the connection between the biosphere, geosphere, hydrosphere, and atmosphere
- Explore seasonal energy cycles
- Examine daily migration patterns
- Explore how data allows us to observe marine phenomena

### Materials

- Computer with internet connection
- Projector and screen
- Slidedeck: **Nuċamat**

- *Plankton: Choose your own Adventure* activity

## Teacher preparation

- Gather the materials for the activity, *Plankton: Choose your own Adventure*.

## Classroom instructions

### Hook

1. Share the images of plankton on slide 15 and tell the students that there are two major types of plankton. Ask them to guess at the two distinct types of plankton before making any clicks! Test their guess by clicking two more times!
  - *Phytoplankton will be highlighted with the first click, outlined in green.*
  - *Zooplankton will be highlighted with the second click, outlined in red.*
2. In a manner that works best for the students, ask them to compare and contrast the images of the two types of plankton. Some potential responses include:
  - *Size: phytoplankton are orders of magnitude smaller than zooplankton*
  - *Shape: zooplankton take many different shapes*
  - *Features: some zooplankton have recognizable features, like eye spots*

### Step-by-step process

3. In a manner that works best for students, define phytoplankton and zooplankton.
  - a. Phytoplankton: tiny plant-like organisms that take the energy of the sun and change it into energy and oxygen, a process called photosynthesis.
  - b. Zooplankton: tiny animals, young larvae of larger animals, and weak swimmers.
4. Play the video of a zooplankton on slide 16.
5. Squṭxulenuhw (George Seymour) shared that one Hulḡumíñuḡ term for plankton, syu'ilhtuns, translates to "tiny food" (slide 17).
  - a. Show the relative size of a copepod (zooplankton) to a pen, a phytoplankton to a copepod on slide 17.
  - b. Show the food pyramid on slide 18.
6. Invite the students to discuss how the Hulḡumíñuḡ translation of "tiny food" matches what they've learned about plankton so far. Some discussion points might include:
  - a. Plankton (both types) are very small.
  - b. Phytoplankton make the base of the pyramid, and they are considered primary producers.
  - c. Zooplankton eat the phytoplankton, and they are considered first order consumers.
  - d. The pyramid shape has to do with the mass of organisms at each level, therefore phytoplankton contribute the most, by mass, to a food source.
  - e. All consumers rely on the level below them as a source of food.
7. In a manner that works best for students, discuss how photosynthesis, which occurs in the chlorophyll inside phytoplanktons' cells, takes solar radiation and transforms it into energy and oxygen, the latter of which cycles back into the atmosphere.
8. Explain that Ocean Networks Canada collects data about phytoplankton biomass using an instrument called a fluorometer. Invite the students to examine slides 19-22 and try to explain the mysterious difference in the amount of phytoplankton in January compared to March. The explanation (also found in the Speakers' Notes in the slidedeck):
  - a. Every spring, phytoplankton grow rapidly.
  - b. The water colour can become visibly green.
  - c. This annual burst in productivity is referred to as the spring phytoplankton bloom.
9. Display slide 23 and invite the students to describe what they see. Provide them with the following hints to see if they can add more detail to their explanation:
  - a. The lighter colours (red, orange, yellow, green, teal) show greater amounts of what is being measured.
  - b. The scale on the y-axis is depth (in meters) below the ocean surface.

- c. The image shows data from June 26 to June 27, 2011. Day and night time are shown along the bottom of the image.
  - d. Night time corresponds to greater amounts of what's being measured at the ocean surface.
10. In a manner that works best for students, discuss how zooplankton are also signaled by solar radiation to make a daily journey called diel vertical migration.
  - a. Zooplankton spend the day in deep dark water.
  - b. They use the darkness to protect themselves from predators.
  - c. At night, they travel to the water surface to feed on tiny plants called phytoplankton.
  - d. Because of their tiny size, zooplankton make the longest migration of any animal relative to their body size, every night and day.
11. Complete the activity, *Plankton: Choose Your Own Adventure*, which reviews what's been learned so far about plankton.
12. Conclude by discussing why data about plankton is important to gather. Some potential responses are:
  - a. Plankton are an important source of food for many species in the ocean.
  - b. Phytoplankton are responsible for producing approximately 50% of our oxygen on Earth.
  - c. Plankton growth can point to seasonal changes.

### Modifications and adaptations

- Turn the *Plankton: Choose Your Own Adventure* computer based activity into an active game when students travel from station to station.

### Final remarks

Since 2012, ONC and BC Ferries have partnered on outfitting vessels servicing the west coast of Canada to support long-time series data collection. As passenger ferries make repeat daily transits through the Strait of Georgia, ONC's innovative sensor system is collecting high-quality measurements on ocean temperature, salinity, oxygen, turbidity, and chlorophyll concentration. Every time you travel on a BC Ferries vessel, your journey is helping collect oceanographic data! You can [view the data dashboard](#).

### Assessment

- How are plankton related to the story told by Squxulenuhw, George Seymour?
- Describe how plankton show a connection between the biosphere, geosphere, hydrosphere, and atmosphere.
- Explain the seasonal energy cycle of plankton.
- Explain the daily migration pattern of plankton.
- How do data allow us to observe marine phenomena?
- Describe the importance of data collection in one place over a long period of time.

### Extensions

- Examine additional ZAP images of zooplankton on slide 22 and discuss what could create the different scenarios.

## Glossary

**Chlorophyll:** The most abundant photosynthetic pigments in phytoplankton.

**Diel vertical migration:** The daily vertical (up and down) movement of an organism from one area to another.

**Fluorometer:** Used to identify the presence and amount of chlorophyll in seawater. A fluorometer detects electromagnetic waves (e.g. light) which at depth usually is a measure of the fluorescence of a substance. Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation.

**Food web:** The energy cycle of organisms in a particular ecosystem; made up of more than one food chain.

**Photosynthesis:** Converting solar energy into chemical energy.

**Phytoplankton:** Tiny plants in the water that photosynthesize.

**Plankton:** Small plants and organisms that make the base of many marine food webs. The word plankton comes from the Greek word “planktos” meaning wanderer.

**Seasonal cycling:** The seasonal effect of Earth’s orbit around the Sun. In the Pacific Ocean off the coast of Canada, the weather and climate conditions during fall, winter, spring and summer have impacts on marine habitats and organisms.

**Solar radiation:** Energy from the sun.

**syu’ilhtuns:** Hulġumíñuṃ for “tiny food” which is used as a term for plankton.

**Zooplankton:** Tiny animals, young larvae of larger animals, and weak swimmers in the ocean.

**Zooplankton Acoustic Profiler (ZAP):** A type of echosounder that uses sound to measure the abundance of zooplankton.

# Ocean Sense Program



## Activity 3

### Module:

**Nuɫaɲat**

### Lesson:

**"Tiny Food"**

### Time:

30 minutes

### Learning pillars:

- Indigenous knowledge
- Ocean science

### Grade & curriculum connection:

- **BC Science 9**

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## Plankton: Choose your own Adventure!

### Materials

- Internet connected devices for each student or small groups of students
- Google Form, [Plankton: Choose Your Own Adventure](#)

### Teacher preparation

- As this game requires reading, consider the students' reading levels and allow them to work individually or in small groups.

### Procedure

1. Allow the students to play *Plankton: Choose Your Own Adventure*.
2. In a manner that works best for students, discuss the various outcomes of their journey as plankton.

### Conclusion

Review the following concepts reinforced and learned through playing the game:

- Seasonal cycles impact plankton growth
- Plankton, both phytoplankton and zooplankton, demonstrate the interconnectedness of the marine ecosystem
- Data collection allows us to observe marine phenomena