OCEAN NETWORKS CANADA

# Ocean Sense
## Program

Lesson 2

### Module:
**Science and Fishing**

### Time:
45 minutes

### Learning pillars:
- Indigenous knowledge
- Ocean science

### Grade & curriculum connection:
- **BC Science 9**
  *"The biosphere, geosphere, hydrosphere, & atmosphere are interconnected, as matter cycles and energy flows through them."*

Created in partnership with:

Wap Sigatgyet
House of Building Strength

Aboriginal Education School District 52
Prince Rupert, Wap Sigatgyet

A UNIVERSITY OF VICTORIA INITIATIVE

# Boats at Sea

**Key observations from time immemorial have helped the Ts'msyen people thrive for thousands of years while living off the land and fishing. Explore how Ts'msyen people have always understood the application of buoyancy by building and testing tin foil boats in different densities of water.**

Ts'msyen people traveled the Skeena **estuary** to the sea in their canoes to harvest a wide variety of fish from the ocean, including salmon, cod, and halibut. Traditional fishing practices demonstrate a deep understanding of water density changes as fresh water meets ocean water. Water **density** is influenced as well by time of year and temperature, resulting in the **buoyancy** of a fishing vessel varying in different aquatic environments.

## Learning objectives
- Systematically and accurately collect and record data
- Express and reflect on a variety of experiences, perspectives, and worldviews through place

## Materials
- Slide deck: **Science and Fishing**
- Activity 2: *Boat Captain* and all materials listed therein

## Teacher preparation
- Prepare the materials to distribute to students
- Make the salt solutions listed - note, water temperature is very important to this and can change the results of the demonstration

## Classroom instructions

### Hook

1. Prior to colonization and into the early 1900's, Ts'msyen people used canoes as their primary method of transportation on rivers, tributaries, and at sea. This enabled them to harvest a wide variety of fish from the ocean, including salmon, cod, and halibut. Fish were caught and processed in parallel with the Ts'msyen seasons and seasonal indicators; for example, some tribes would use the blooming of salmonberry flowers, while others used the migration patterns of other species.
2. Share slide 14 and read out the example of a seasonal indicator that was shared by Alex Campbell of Lax Kw'aalaams.

### Step-by-step process

3. Complete the activity *Boat Captain* using slides 15-18.
4. Have the students make observations about the buoyancy of the different solutions (i.e. observe the distance between the waterline and the edge of the boat, or, if any parts of the vessel are lower than others in the water).

a. During the observations, challenge the students to get as much "catch" as possible.

5. Encourage the students to make changes to their design and to make as many observations as they can.

### Modifications and adaptations

- Have the students work collaboratively on their boats.
- Allow for more than one iteration of each boat.

## Final remarks to the educator

Observations of the natural environment long predate the term "science" and were used extensively by people to understand and interact with their environment. Remind students there are many ways to "know."

The students should have observed that salt water has a higher density than freshwater, and thus is able to provide more lift for the boats. This means it's possible to take in more catch than may be advisable for the vessel travelling in fresh water.

## Assessment

- Have the students reflect on their experience building boats and trying them in different solutions. What did they notice as being the most meaningful for them?

## Extensions

- Connect with local knowledge holders where you are to further explore how people discussed and shared information about their environment.
- Calculate the density of water from each basin using the formula density = mass/volume.
- Incorporate a study of how surface area impacts buoyancy by comparing flat, barge boat designs to narrow-hulled boat designs in the activity *Boat Captain.*

## Glossary

**Buoyancy:** The ability to float in water or in a liquid of higher density.

**Estuary:** A geographical area where a freshwater river or stream meets the ocean, resulting in water mixing and a distinct ecosystem.

**Density:** How closely packed molecules are in a given subject. This can be given a numeric value by dividing the mass of the object by the volume of the object.

**Seasonal indicators:** Occurrences in the natural environment, such as the blooming of particular flowers or the sighting of particular animals that indicate a seasonal change has occurred.

## References

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# Ocean Sense
## Program

Activity 2

# Boat Captain

**Observation of your environment is key to understanding how to live and survive in the natural world. Key observations from time immemorial have helped Indigenous people thrive for thousands of years while living off the land and fishing. In this activity, students explore how the density of water can impact fishing practices. Influenced by time of year and temperature, students may be surprised at how much buoyancy varies in different aquatic environments.**

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## Materials
- Aluminum foil in ~35 cm x 26 cm sheets, 1 sheet/student
- Marbles or small glass beads
- 2 clear basins *(a plastic wash basin 40 cm x 31.8 cm x 15.2 cm with a 11.4L capacity works well)*
- Water
- Salt *(Tip: the results of this experiment can be exaggerated for effect by providing the students with supersaturated salt solutions rather than near sea water)*
- Tablespoon
- Measuring cup
- Towels

## Teacher preparation
- Prepare the two water basins, one saltwater, one freshwater with at least 6 cm depth of water *(74 mL (5 Tbsp) in 5 L (20 cups) water should be sufficient)*
- Cut or portion the tinfoil
- Have towels ready for mopping up

## Procedure

1. Introduce the activity with the scenario on slide 16 and share the instructions on slide 17.
2. Give one sheet of foil to each student and ask them to shape it into boats as they see fit.
    a. Encourage students to create a boat shape, as seen on slide 2 and 16, with foil so as to avoid introducing surface area into this activity.
3. Have the students place their boat in one of the water basins.
4. Have the students add as many marbles or small glass beads to their boat, counting as they add, before the boat sinks.
    a. These items added to the boat represent a catch of fish.
5. Have the students observe their vessel in the basins, noting the waterline in relation to the edge of their boat.
6. Once the students are happy with their catch numbers, have them remove the “fish” and then move their boat to the other basin.
    a. Have the students maintain the integrity of their boat as much as possible and try not to let them make changes to the vessel between basins.
7. Add the “fish” back into their boat. If the boat continues to float, have the students observe the new waterline in relation to the edge of their boat. If the boat sinks, have the students consider why this might have occurred.
    a. When moving from freshwater to saltwater, it is expected that their boat should be able to catch more “fish”.
    b. When moving from saltwater to freshwater, it is expected that their boat will sink and not be able to carry as many “fish”.
8. Discuss why they think this is an important observation.

## Conclusion

9. Share slide 18 featuring how in depth knowledge of water properties allowed Ts’mysen people to transport fish from saltwater through the estuaries to freshwater without waste.