OCEAN NETWORKS CANADA

Ocean Sense
Program

Lesson

Module:

Loxiwey

Time:

45 minutes (inclusive of activity)

Learning pillars:

- Indigenous knowledge

Grade & curriculum connection:

- **BC Science 5**
  "First Peoples concepts of interconnections in the environment."

Created in partnership with:

A-Tlegay Fisheries Society

Local knowledge holders of the Discovery Passage area.

A UNIVERSITY OF VICTORIA INITIATIVE

What are Clam Gardens?

Learn what a clam garden is by observing photographs and participating in a hands-on activity that examines the difference between a modified and unmodified beach. Explore how loxiwey, the term for clam garden in the Kwak̓wala language of the Liǧʷiɬdaxʷ (also spelled Laich-kwil-tach) people, creates an ideal habitat for clams to grow and mature.

Clam gardens are not naturally occurring features; they are beaches specifically shaped by coastal peoples to create the most **productive** environment for clam growth in the **intertidal zone**. This type of **aquaculture** can produce twice the biomass and density of butter clams than unmodified beaches (Groesbeck et al., 2015; Jackley et al., 2016). This takes careful observation, skilled work and in-depth knowledge of the local environment to succeed. Clams are a key food source for many coastal Indigenous communities. In the activity Cookie "Clam" Digging, students will see how collecting clams is a lot like **tilling** soil; in places where it hasn't been done, clams do not grow very well. For an extension, explore current **clam garden revitalization** projects.

Learning objectives

- Students can demonstrate an understanding that aquaculture has been around since time immemorial.

Materials

- Computer with internet connection
- Projector and screen
- Slide deck: Loxiwey (Clam Gardens)
- Activity: *Cookie "Clam" Digging* materials

Teacher preparation

- Preload slide deck: Loxiwey (Clam Gardens)

Classroom instructions

Hook

1. Share slides 1-5 and leave out the name of this lesson to create a mystery.
2. Ask the students to Think-Pair-Share what they notice in each beach. If they haven't noticed the following, be sure to mention that:
   a. Rocks are placed near the tide line
   b. Each beach has a sandy patch above the rock area
3. Share slide 6, explaining that all the photos show historic clam gardens, also known as loxiwey, which are intertidal rock and sediment features constructed by the Indigenous peoples of the Pacific Northwest Coast, including the Kwakwa̱ka̱'wakw (pronounced Kwak-wak-ya-wak) and Coast Salish, to enhance and expand shellfish habitat.

Step-by-step process

4. Share slides 7 & 8 to introduce where the Indigenous knowledge in this lesson comes from.
5. Share slide 9 and explore with students what they think is meant by the term "garden?"
6. Share that Homalco First Nation Knowledge holder Chief Darren Blaney refers to barnacle shells as being "soil" in the clam garden.
7. Share slides 10-12 to define loxiwey, learn about the practice on the Pacific coast, and learn how it's a sustainable practice.
8. Complete activity Cookie "Clam" Digging.
9. Share slides 14 & 15 to discuss the traditional knowledge about clam harvesting and seasonal cycles.

Modifications and adaptations

- Visual learners may benefit from having the beach photos printed out rather than displayed.

Final remarks to the educator

Currently within Liǧʷiɬdaxʷ (also spelled Laich-kwil-tach) Territory, revitalization of the clam gardens is in its initial stages; however, in other areas significant revitalization work has begun. Nicole Smith, an archaeologist with the Clam Garden Network mentions: "we try to keep the construction and maintenance of clam gardens in the present tense so that people don't get the impression that the practice has stopped." (N. Smith, personal communication, March, 2018).

Assessment

- What are some observable features of clam gardens?
- What kinds of impacts do clam gardens have on the intertidal zone?

Extensions

- Connect this exploration of clam gardens to:
  - Other hunting and gathering practices of Indigenous peoples
  - Red tide events
- Explore the Clam Garden Network revitalization project at **https://clamgarden.com/**

Glossary

Aquaculture: The practice of rearing and farming aquatic organisms.

Clam garden: A modified beach that creates the most productive environment for clam growth in the intertidal zone.

Clam garden revitalization: Traditional teachings of building and maintaining clam gardens that are being reshared in hopes that clams will return to the beaches where they have been cultivated for thousands of years.

Intertidal zone: The area of a beach between high tide and low tide.

Loxiwey: The Kwak̓wala word for clam garden meaning "to roll."

Productive: The ability of a clams to grow plentifully and to a harvestable size at a particular beach.

Tilling: The act of digging, stirring, and overturning sediment with the purpose to create a more productive habitat for growing.

References

Blaney, D. Homalco Nation. Homalco Treaty. Oral teaching. personal communication. 2018.

Clam Garden Network. (n.d.).
https://clamgarden.com/

Cullon, D. (n.d.). [Photograph]. Personal collection.

Deur, D., Dick, A., Recalma-Clutesi, K., & Turner, N. (2015). Kwakwaka'wakw "clam gardens": Motive and agency in traditional Northwest coast mariculture. *Human Ecology*, 43(2), 201–212. doi:10.1007/s10745-015-9743-3

Groesbeck, A. S., Rowell, K., Lepofsky, D., & Salomon, A. K. (2014). Ancient clam gardens increased shellfish production: Adaptive strategies from the past can inform food security today. *PLoS ONE*, 9(3). doi:10.1371 journal.pone.0091235

Homalco First Nation. (2021). Homalco culture and language.
https://www.homalco.com/who-we-are/culture-language/

Jackley, J., Gardner, L., Djunaedi, A., & Salomon, A.K. (2016). Ancient clam gardens, traditional management portfolios, and the resilience of coupled human-ocean systems. *Ecology and Society*, 21(4). doi:10.5751/ES-08747-210420

McCharles, R. (2012). Paralytic shellfish poisoning risk - Nel's Bight, Cape Scott Trail, BC [Photograph].
https://www.flickr.com/photos/rickmccharles/7966826904

Morris, M. (n.d.). [Photograph]. Personal collection.

Quatell, J. Wei Wai Kum Nation. Oral teaching. personal communication. 2018.

Smith, N. (n.d.). [Photograph]. Personal collection.

Wei Wai Kum First Nation. (2009-2025). Our culture.
https://weiwaikum.ca/about/our-culture/

West, L. (2017). Dogwood flowers [Photograph].
https://www.flickr.com/photos/calliope/34612579626

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Cookie "Clam" Digging

Students will use soft cookies to model clam gardens as modified beaches and hard cookies to model unmodified beaches, with the "clams" represented by the chocolate chips. A toothpick helps students dig "clams" from these beaches and compare the beaches.

Materials

- 1 soft chocolate chip cookie/group (e.g. Chips Ahoy)
- 1 hard chocolate chip cookie/group (e.g. Breaktime)
- 1 paper towel/napkin/group
- 1 toothpick/student
- Timer

Teacher preparation

- Place one soft and one hard chocolate chip cookie on each paper towel/napkin for each group

Procedure

1. Group students into pairs or groups of four.
2. Give each student a toothpick. This is the "clam-digging stick."
3. Distribute a hard and a soft cookie on the paper towel/napkin to each group of students, explaining that the chocolate chips are the "clams" they wish to harvest and the cookies are the "beach".
4. Ask the students to observe if the "beach" is soft, hard, crumbly etc., and how many "clams" they can spot without moving anything.
5. Distribute one toothpick per student. Explain that they can only use their "digging sticks" to get the "clams" out. Forceful crushing or breaking the cookie with their hands is not permitted.

6. Start the clock and let the students dig “clams” for 1 minute on each “beach”.
    a. Remind them that clams can only be dug when the tide is low so the time limit emulates actual harvesting practices.
7. After the time is up, ask each group to record the number of “clams” dug up for each type of “beach”.
8. Discuss:
    a. Which “beach” had the easiest “clams” to remove?
    b. Which “beach” had the hardest “clams” to remove?
    c. Which “beach” had the biggest “clams”?
    d. Which “beach” had the smallest “clams”?
    e. How do they think the substrate might impact the growth of the clams?
9. Explain to the students that digging clams helped aerate the sediments (like tilling soil). Beaches that are regularly dug have better productivity for clams. Smaller clams are better able to settle, dig into the sediments, and get the nutrients they need. Clam gardens are beaches that are regularly dug.
    a. The hard cookie represents a natural, unmodified beach.
    b. The soft cookie represents a clam garden, modified beach.

Conclusion

Knowledge holders shared that digging clams was done with an aptly named “clam digging stick”. This hardened stick was used to dig up clams in the gardens when it was time to harvest them. Homalco First Nation Knowledge Holder Darren Blaney shared that active harvesting of clams in clam gardens helps keep beaches healthy and productive. Collecting clams is a lot like tilling soil; in areas where it hasn’t been done consistently, clams do not grow very well.