



## LESSON 4

### Kelp Forest

#### Grades 4 to 7

### Objectives

- To learn about the kelp forests and the creatures that live in them.
- To understand the connections between sea otters, kelp, abalone and sea urchins.
- To explain the difference between sea otters and river otters.
- To learn the parts of seaweed and what they are used for.
- To name some common foods that contain seaweed and seaweed extracts.

### Materials

**Video:** *Haida Gwaii Abalone Stewardship* produced by the Haida Fisheries Program of the Council of the Haida Nation.

**Video:** *Gwaii Haanas: From Earth to Ocean* produced by Gwaii Haanas National Park Reserve and Haida Heritage Site.

**Book:** *Kelp Forests* by Judith Connor and Charles Baxter, Monterey Bay Aquarium Foundation, 1989.

**Book:** *Sea Otter Inlet* by Celia Godkin, Fitzhenry & Whiteside, 1997.

**Publication:** *Ocean News Issue 3: Marine Mammals*, Bamfield Marine Station, Bamfield, BC VOR 1B0 (*Ocean News* can be ordered from the above address.)

**Station 1:** Piece of bull kelp, holdfast attached to a rock, limpet shell, sandpaper, photos or picture of bull kelp with parts labelled. Abalone shell, sea urchin test, photo or specimen of urchin mouth, photo of kelp with star shaped bite marks in it.

**Station 2:** Food product packages that contain carageenan or algin or other seaweed (eg: ice cream, icing, pudding, nori, soap, shampoo, pie filling, chocolate milk, egg nog). Tape measure.

**Station 3:** Skate egg case, drawing or photo of skate and egg case attached to seaweed.

**Station 4:** Wooden blocks to make an archway. Photos of sea otters and river otters, “*You Otter Know the Difference*” article from *Ocean News*, drawing of sea otter food chain.

**Station 5:** Shells or pictures of decorator crab, Dungeness crab, shrimp, rockfish, turban snail or whelk, barnacle. Book: *Welcome to the World of Octopuses* by Diane Swanson, Whitecap Books, 2000.

### Concepts

- Kelp forests are nurseries, food and shelter for animals, reduce erosion and protect beaches.
- Keystone species are important for balance in an ecosystem.
- When a keystone species is gone, other animals are affected.
- Humans use products that contain seaweeds (kelp) every day.

### Activities

#### 1. Kelp Forests Inhabitants

Read *Sea Otter Inlet* by Celia Godkin. Talk about what happened around Haida Gwaii. In the early 1900s, the sea otters disappeared because they were killed for their fur. Without sea otters to eat the sea urchins, the urchins were able to eat a lot of kelp, which created urchin barrens.

Watch the *Haida Gwaii Abalone Stewardship* video and the kelp forest section of the *Gwaii Haanas: From Earth to Ocean* video.

Ask students to compare the kelp forest and urchin barren in the *Abalone Stewardship* video.

Talk about the animals they saw in the kelp forest. How is the kelp forest like a forest on land?

*A: It provides the same things (habitat, food shelter, etc.) as a land (terrestrial) forest does. It also has a canopy.*



## 2. Terms and Concepts

Ask students if they know what these vocabulary words mean: extirpated, threatened, endangered, extinct, urchin barrens, keystone species.

- Extirpated – extinct in a specific area
- Threatened – the step before endangered.
- Endangered – this is more serious because the next step is extinction.
- Extinct – The species no longer exists.
- Urchin barrens – areas where urchins have eaten all the available kelp.
- Keystone species – A species that many other species rely on. When it is gone the habitat and other species are affected.
- Conservation – Conservation means to protect or be careful with something.

Abalone is a threatened species. If the species continues to decline, what is the next stage?  
*A: Endangered. After that, the next stage is extinction if the species continues to decline until there are none of that species left in the world. Extirpation is a term used to describe a species that used to live in a local area but is no longer there – like the sea otter around Haida Gwaii.*

Draw a picture of an archway made of blocks. Use the archway to discuss what a keystone is. Explain keystone species (defined above).

How are kelp forests affected when there are no sea otters in them?

*A. Without sea otters, abalone and sea urchins do not have many predators. They eat more kelp and there are less kelp forests.*

Discuss conservation. What does it mean to conserve something? What can you do to conserve water or electricity? If you conserve something you want to protect it.

## Station Activities

Set up the 5 activity stations. Split the class into 5 groups and rotate through the stations.

Stations cards with answers on the back are in an accompanying document. Cards are to be placed with materials for each Station (listed in Materials section above).

## Conclusion

- Go over what students have learned at each station.
- Review the importance of kelp forests and what animals live there.

## Extension

- Make a three-dimensional model of a kelp forest using construction paper, craft supplies and found objects.
- Research one of the animals that lives in a Haida Gwaii kelp forest.
- Find out how seaweed is used as a thickener in food and other products.
- Do a survey to find out how many foods we eat contain seaweed or seaweed extracts.



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**Lesson 4 • Kelp Forests • Grades 4 – 7**

**Activity Station Cards**

*Print these pages double sided for activity cards with answer on the back.*

**Station 1. Parts of Kelp**

*Look at the piece of bull kelp and other kelp parts.*

1. Find the air bladder that helps the kelp to float so the blades (like leaves) can reach the sun to make food.
2. Find a holdfast (like roots) of the kelp. It is the part that attaches the kelp to a rock. Many animals like to live in holdfasts because they provide shelter.
3. Look at the stipe of the kelp. It is like the stem of a plant but much more flexible. Notice the small round shapes on the stipe made by limpets. Limpets are a kind of snail that eat kelp with their sandpaper tongues. They also make a place for themselves to live on the stipe. They always return to their home. Feel the sandpaper and look at the limpet shell. Abalone are snails that eat kelp too. Look at the abalone shell.
4. Sea Urchins eat kelp. Look at the sea urchin test. They take star shaped bites out of the kelp with a mouth that is on the bottom of the urchin. Look at the picture of the kelp that a sea urchin ate.

**Station 2. Seaweed in your Cupboard**

1. Did you know that humans are seaweed eaters too? Look at the variety of food here. Read the ingredients. Do you see carageenan or algin? Then it was made with seaweed! Seaweed extracts are used to thicken food.
2. A kelp forest is the fastest growing forest in North America. It can grow as tall as a ten-story building. Kelp can grow up to 15 cm per day! Use the measuring tape to see how much that is. How much can it grow in 4 days? How many days would it take to grow as tall as you?

2 days to 30 cm	5 days to 75 cm
3 days to 45 cm	10 days to 150 cm
4 days to 60 cm	20 days to 300 cm
3. Why do you think humans use seaweed in so many different foods?



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**Activity Station Cards**

***Station 2 Answer:***

*3. It grows quickly, it has lots of vitamins and minerals and it thickens liquids.*



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**Activity Station Cards**

**Station 3. Egg Cases**

1. Look at the skate egg case. Some other fish have similar cases. They are called a mermaid's purse. Why do you think it is called that?
2. How is the egg case attached to the kelp?

**Station 4. Keystone Species**

Build an arch with the blocks. The keystone is the block at the top in the middle. What happens when you pull it out?

In nature, a keystone species like the sea otter affects everything else in the kelp forest habitat. What happens when a keystone species is gone?

**Station 5. Sea Otters**

1. Sea Otters like to eat sea urchins, abalone, crabs, octopus, sea stars, clams and other invertebrates. They live mostly in the kelp canopy but dive to the bottom for food. If there are no sea otters, sea urchins can eat up all the kelp. Look at the sea otter food chain diagram.
2. Compare river otters and sea otters. How are they different?



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**Lesson 4 • Kelp Forests • Grades 4 – 7**

**Activity Station Cards**

***Station 3 Answers:***

- 1. It looks a bit like a bag or purse and it washes up on beaches like it came from a mermaid in the ocean!*
- 2. The egg case is attached by hooks or threads that wrap around stipe of kelp on the ocean floor.*

***Station 4 Answer:***

*In architecture, the keystone is the top stone in the arch. All the blocks depend on the stone to stay in place. When you pull out the keystone, all the blocks fall down. Everything else is affected. The same can be said for keystone species in the ecosystem. If there are no sea otters to eat the sea urchins then the sea urchins keep eating the kelp, but nothing eats the sea urchin. Urchin barrens that are areas devoid of kelp develop when urchins eat all the kelp.*

***Station 5 Answer:***

*River otters move easily on land. Sea otters rarely leave the ocean and are clumsy on land if they do venture there. River otters swim belly down while sea otters swim on their backs. Sea otter feet are more webbed than river otters' feet.*



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**Activity Station Cards**

**Station 6. Octopus**

Octopus live under rocks or in crevices and caves in the kelp forest. There is a lot of food for them to eat. Guess what they eat by solving the “Who Am I?” riddles. Identify these octopus food items: Barnacle, Snail, Dungeness crab, Decorator crab, Rockfish, Shrimp

1. I’m often seen in dips and scampi dishes.  
I’m also a favourite food of bottom fishes.  
A lobster looks a lot like me,  
When it’s still a baby floating free.
2. I’m white below and red above.  
My shell fits me like a glove.  
I have 8 walking legs and 2 strong claws.  
But you’d never have to worry about my puny jaws.
3. My shell is bumpy and I’m in disguise.  
Hiding with seaweed fools your eyes.  
Call us farmers because we grow snacks,  
Right up there upon our backs.
4. I cement my head to rocks and stuff.  
It’s hard to pull me off, my shell is tough.  
I kick food like plankton into my mouth.  
When I was young I could move north or south.
5. I have a spiral house. They say I’m slow.  
People hate my relatives on land you know.  
I drill a hole to eat my food.  
I wish octopus didn’t think I tasted good.
6. I can live deep in the sea  
And I can live to be 150.  
People like to eat me and the octopus too  
Too bad I’m so tasty, what can I do?



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**Activity Station Cards**

***Station 6 Answers:***

*(1) Shrimp, (2) Dungeness Crab, (3) Decorator Crab, (4) Barnacle, (5) Snail, (6) Rockfish*