Jean-Michel Cousteau OCEAN ADVENTURES

PBS

Call of the Killer Whale Viewing Guide

"Everywhere on the planet, we are connected to the ocean. We have the opportunity to do what needs to be done to protect our life support system and improve the quality of life, not just for the marine environment, the marine mammals, the orcas, but for ourselves. This is a choice we have. If we protect the ocean, we protect ourselves." –Jean-Michel Cousteau

VIEWING TIME

Two hours total; viewing it in shorter segments is recommended.

OBJECTIVES

Students will be able to

- identify adaptations of marine mammals.
- compare and contrast the behavioral adaptations of different groups of orcas.
- explain the social structure of orca groups.
- make connections between changes in the behavior of orcas and a decline in their prey.
- identify environmental hazards that have affected orcas and their ecosystems.

MATERIALS

- Copy of the *Call of the Killer Whale* episode from the ***Jean-Michel Cousteau: Ocean Adventures*** series
- *Call of the Killer Whale* Viewing Questions teacher sheet
- *Call of the Killer Whale* Viewing Questions student sheet
- *Call of the Killer Whale* Glossary
- Paper
- Pencil

SYNOPSIS

In this two-hour program, Jean-Michel Cousteau and his team of explorers travel to both the Northern and Southern hemispheres as they seek out killer whales in the Atlantic and Pacific oceans. They discover that people and orcas share surprising similarities, even similar needs, and they relate their findings to the captivity and release of Keiko, from *Free Willy* fame, who captured the world's imagination and whose survival depended on pioneering efforts to reintroduce Keiko into the wild. The team also learns how some of the threats to killer whales now intersect with human lives. During the expedition, intriguing detours arise, leading to critical examinations of our environment, of the food on our dinner tables, even of our own health.

PRE-VIEWING ACTIVITIES

- Study the characteristics and adaptations of marine mammals. What special adaptations do they have for living in the ocean? How are they similar to humans and how are they different?
- The orca is well-known by the name "killer whale." Research how this name originated.
- Look up the definition of "culture" from three or four different sources. Discuss what it means and list some examples of culture.
- Read the *Call of the Killer Whale* Glossary sheet and write down any unfamiliar words.

FOCUS FOR VIEWING

- Refer to the viewing questions that go with each segment of *Call of the Killer Whale*. Each question is labeled with a theme: Adaptations, Ecosystems, Human Impact or General. A segment can be viewed alone or combined with other segments.
- Listen for the vocabulary words you wrote down and try to discover their meaning.

WEB LINKS

Call of the Killer Whale
www.pbs.org/kqed/oceanadventures/episodes/killerwhale/

"Orcas Hunting" video
www.pbs.org/kqed/oceanadventures/video/orcas

"Same Species, Different Habits"
www.pbs.org/kqed/oceanadventures/episodes/killerwhale/indepth-orcas.html

FOLLOW-UP ACTIVITIES

- Review the Call of the Killer Whale Glossary sheet and any new vocabulary words learned.
- Draw a family tree of your family as if you were an orca pod from the Pacific Northwest. (Remember, children remain in pods with their mothers.) Who is the matriarch? How is this family tree different? Which family members would be living with a different pod?
- Pretend you are an orca and write a journal entry about your day. What did you do? What do you communicate about with the other members of your pod? What do you notice about your environment?
- Listen to calls of orcas in the Pacific Northwest. What do you think they are communicating? You can listen to orca calls on the following websites:
  http://www.orca-live.net/
  http://orcasound.net/
- Discuss with friends or family your thoughts about keeping orcas in captivity.
- Next time you visit the grocery store or eat at a restaurant, see if they have salmon for sale. Are you able to find out what kind of salmon it is? Where it came from? If it is wild or farmed?
- Complete the activities "Parasite Perils" and "Orca United Nations."
  http://www.pbs.org/kqed/oceanadventures/educators/killerwhale/parasite.html
  http://www.pbs.org/kqed/oceanadventures/educators/killerwhale/orca-un.html

STANDARDS

National Science Education Standards, Science Content Standards
http://www.nap.edu

Grades 5–8
Life Science - Content Standard C:
Populations and Ecosystems
Diversity and Adaptations of Organisms

Science in Personal and Social Perspectives - Content Standard F:
Populations, Resources and Environments
Natural Hazards
Science and Technology in Society

Grades 9–12
Life Science - Content Standard C:
Biological Evolution
Interdependence of Organisms
Behavior of Organisms

Science in Personal and Social Perspectives - Content Standard F:
Environmental Quality
Natural and Human-Induced Hazards
Science and Technology in Local, National and Global Challenges

Ocean Literacy: Essential Principles and Fundamental Concepts
http://coexploration.org/oceanliteracy/

Essential Principle #5:
The ocean supports a great diversity of life and ecosystems.

Essential Principle #6:
The ocean and humans are inextricably connected.

ABOUT THE AUTHOR

Andrea Swensrud is the KQED Education Network Project Supervisor for ***Jean-Michel Cousteau: Ocean Adventures.*** She has a master of arts in teaching and has taught and managed marine science education programs. KQED Education Network uses the power of KQED Public Broadcasting to inspire learning by providing projects for youth and curriculum materials and professional development for teachers, child-care providers and families.

CREDITS

Jean-Michel Cousteau: Ocean Adventures is produced by KQED Public Broadcasting and the Ocean Futures Society. The corporate sponsor is the Dow Chemical Company. Additional major support comes from the Richard and Rhoda Goldman Foundation, KQED Campaign for the Future and the Corporation for Public Broadcasting.

Call of the Killer Whale Viewing Questions with Answers

Note: The timing listed below is approximate and is based on the PBS broadcast.

The following questions are coded based on theme:
A = Adaptations, E = Ecosystems, HI = Human Impact and G = General. Use these codes to help you choose which questions or segments to focus on.

HOUR 1

Introduction (2:25-5:30)

G 1. What is the maximum length of male orcas? *32 feet*
A 2. Who rules orca pods? *females*
E 3. Where do orcas live? *from the Arctic to the Antarctic*
G 4. How many orcas are there worldwide? *fewer than 100,000*

Orcas in Captivity (5:31-11:25)

HI 1. Why were orcas captured in the mid-1960s to mid-1970s? *to be sent to aquariums*
HI 2. What is one reason that keeping orcas in captivity is controversial? *because they have very elaborate social relationships*
HI 3. Where was Keiko captured and where was he taken? *he was captured in Iceland and taken to Mexico City*
HI 4. How many orcas remain in captivity today? *42*
HI 5. Keiko became famous because of which movie? *Free Willy*

Orca Society and Culture (11:26-13:29)

A 1. What defines a matrilineal society? *everyone in the group is related to a female ancestor*
G 2. When do large adult males leave their group? *never*
G 3. What are the names of the four groups of orcas that live in the Pacific Northwest? *northern residents, southern residents, transients and offshores*
G 4. Do these groups mix? *no*
A 5. What do humans and orcas pass on from generation to generation? *languages and behaviors*
A 6. "For both humans and orcas, different *cultures* exist among the same species."

New Zealand Orcas (13:30-17:35)

G 1. What percentage of the world's whale, dolphin and porpoise species live in the waters around New Zealand? *50 percent*
G 2. How many orcas live around New Zealand? *about 200*
E 3. What are some of the things that New Zealand orcas feed on? *fish, sharks, rays and marine mammals*
A 4. What are some of the differences between orcas in New Zealand and orcas in the Pacific Northwest? *what they prey on, their social structure, their language and how much they travel*
A 5. Even though orcas around the world live in similar *habitats*, they have different *cultures*.

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Call of the Killer Whale
Teacher Sheet

1 B

Echolocation/Keiko's Rehabilitation - Part I (17:46-21:35)

HI 1. Why did Keiko gnaw on the rock in his tank? *he was stressed*

HI 2. What important task did Keiko have to learn to do in order to be released and survive in the wild? *echolocate and catch live fish*

A 3. Why do whales echolocate? *to "see" with sound in order to find food*

Hunting Strategies of Orcas (21:36-27:19)

A 1. The orcas in New Zealand are opportunistic in their feeding, but are also very *specialized*.

A 2. How do orcas catch rays along the rocky coast of New Zealand? *one orca grabs the ray by the tail and another one bites it*

A 3. Why do the orcas carry the rays around? *to train the younger orcas how to eat them*

A 4. What do orcas that aren't good at catching rays do when they find a ray? *call in another orca that's better at catching rays*

A 5. What have the orcas learned to do to keep rays immobilized? *flip them over*

A 6. How do orcas in Antarctica catch crabeater seals? *they work together to create a wave of water that washes the seal off the ice floe*

A 7. How do orcas in Argentina catch sea lion pups? *the orcas swim up on the shore*

A 8. How do transient orcas off the coast of California hunt gray whale calves? *they work together in packs to isolate and overpower the calves*

A 9. If there is a change in the orca's environment so that their prey is no longer available, it is difficult for orcas to *adapt*.

Orca Vocalization/Keiko's Rehabilitation - Part II (27:20-33:22)

A 1. For how long did Keiko learn to hold his breath (which is normal for wild orcas)? *almost 18 minutes*

HI 2. What did Keiko do before sleeping that was different than a wild whale? *he gathered his toys around him*

HI 3. How long had it been since Keiko communicated with another orca? *more than two decades (20 years)*

G 4. How do Dr. Spong and the researchers at OrcaLab listen to the orcas? *through a network of hydrophones*

A 5. How can the researchers tell if the orcas are hunting? *they hear them echolocating*

A 6. What do the orcas' calls sound like when they are resting? *they are low-energy sounding*

A 7. On average, how many distinct calls does a pod make? *a dozen*

A 8. Which mammals are known to have dialects at the family level? *humans, dolphins and some primates*

Keiko's Return to the Wild (33:23-38:27) and (41:15-43:46)

G 1. From how far away can orcas' calls be heard? *10 miles*
HI 2. How did Keiko travel to Iceland? *on an airplane*
HI 3. Where was Keiko kept while he acclimated to his old home? *first in a pen, then in the bay*
HI 4. How long had Keiko been in captivity? *23 years*
HI 5. Did Keiko join a group of orcas in Iceland? *at first, but then he followed a fishing boat into a fjord in Norway*
HI 6. Why was the decision made to again feed Keiko by hand? *there weren't fish in the fjord for him to eat*
G 7. How did Keiko die? *from a pneumonia-like virus*

Orca Stranding (44:55-53:45)

HI 1. How does the team first help the stranded young orca? *digging holes in the sand for her flukes and flippers, keeping her skin moist, and keeping her hydrated*
G 2. Why did the young orca have marks on her tail stalk? *probably from another orca trying to drag her back into the water*
G 3. It is believed that orcas can survive out of water for how long? *24 hours*
G 4. Why was Rakey moved to the eastern coast of the island for release? *there was a better chance that her pod would hear her calls*

HOUR 2

Norway (2:23-7:38)

A 1. Do the orcas in Norway have the same matrilineal system as those in the Pacific Northwest? *yes, but the groups are not as permanent*
A 2. Why do the orcas travel into the fjords in the winter? *to feed on herring*
A 3. What is the name of the unique technique that the orcas use to hunt herring? *carousel feeding*
E 4. After 20 years of coming into the fjords, why did the herring and the orcas stay offshore this year? *scientists aren't sure*
HI 5. What happened to the orcas when the herring population was overfished in the late 1960s? *hundreds of orcas were harvested for animal feed*
HI 6. What is one possible reason that the orcas' social structure is so fluid? *the harvesting of so many orcas in the 1970s*
G 7. What animal did the team unexpectedly find swimming in the ocean in Norway? *a reindeer*

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Call of the Killer Whale
Teacher Sheet

1 D

Hunting Gray Whales (7:39-12:19)

G 1. Where does the ***Ocean Adventures*** team travel to look for orcas hunting gray whales? *Monterey Bay, California*

A 2. Why do the transient orcas focus on hunting gray whales versus other whales? *there are more of them, and they are easier to find*

A 3. How do the orcas kill the gray whale calf? *by drowning it*

A 4. Why do the orcas eat the tongue of the gray whale first? *the tongue is easy to get to; they pick the "best" parts to eat first before the whale carcass begins sinking*

Contaminants - Part I (12:20-18:11)

HI 1. Why can't the ***Ocean Adventures*** team approach the orcas in British Columbia? *the orcas are protected by law*

HI 2. Which group of orcas are the most contaminated marine mammals on the planet? *the transients*

HI 3. How does Dr. Ross study the contaminants in orcas even though he can't take samples from them? *he studies and samples harbor seals*

HI 4. How do chemicals enter the marine environment? *through sewage effluent and the atmosphere*

HI 5. How do chemicals like PCBs and PBDEs impact orcas and harbor seals? *they lead to reduced reproduction, increased mortality and an increase in the incidence of disease*

HI 6. What is the relationship between high contaminant levels in marine mammals and humans? *we share the same environment and rely on the same food webs*

Salmon - Part I (19:47-27:57)

E 1. Who depends on salmon for survival in the Pacific Northwest (there are several answers)? *the First Nations people, orcas, bears, eagles*

E 2. How do orcas "manage" the population of their food, the salmon? *they feed in one place for a short while, then move on*

HI 3. What are two probable reasons that the wild salmon populations have declined in British Columbia? *logging and salmon farming*

HI 4. What species of salmon are farmed in British Columbia? *Atlantic salmon*

HI 5. How many pounds of fish (used as food for farmed fish) does it take to grow one pound of farmed fish? *2.2 pounds*

HI 6. How many times higher are the levels of PCBs and PBDEs in farmed salmon than in wild salmon? *10 to 15 times higher*

HI 7. What is the health concern around PCBs and PBDEs? *they are linked to cancer in humans*

Contaminants - Part II (27:57-33:46)

HI 1. When were PCBs banned in the United States? *the 1970s*
HI 2. In what kinds of foods are PCBs found? *fatty fish, meats and dairy fats*
HI 3. What are PBDEs and where are they found? *flame retardants; they are found in electronic equipment, home furnishings and dust*
HI 4. Why do children have higher levels of PBDEs than adults? *they spend more time on the floor*

Salmon - Part II (33:47-45:51)

HI 1. Why are the orcas in the Pacific Northwest traveling farther each day than they used to? *they are looking for food*
E 2. What do orcas eat? *Chinook salmon*
G 3. By what year are wild Chinook salmon predicted to be extinct? *2100*
E 4. What do Chinook salmon eat when they are young? *pink salmon*
G 5. What are salmon born without? *scales*
G 6. How do sea lice affect baby salmon? *they eat into the salmon's skin, causing the salmon to die*
HI 7. What is the relationship between sea lice infecting baby salmon and fish farms? *the fish farms contain a lot of salmon, which host sea lice; the young salmon swim along the coast by the fish farms and the sea lice latch on*
HI 8. What is slice? *a treatment fed to farmed salmon that kills sea lice*
HI 9. What is one solution to the open-net salmon farms? *closed containment (pens with walls instead of nets)*

Robson Bight (45:52-50:13)

E 1. Why is Robson Bight an important area for orcas? *they go there to rub on the beach and feed*
HI 2. What was lost on the bottom of the ocean in Robson Bight? *logging equipment that fell off of a barge*
HI 3. What are the concerns about having the wreckage at the bottom? *fuel and oils will leak out over time; the environment is not like it used to be*
HI 4. When will some pieces of the wreckage be removed? *May 2009*

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HI 3. Where was Keiko captured and where was he taken?
HI 4. How many orcas remain in captivity today?
HI 5. Keiko became famous because of which movie?

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G 2. When do large adult males leave their group?
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G 4. Do these groups mix?
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New Zealand Orcas (13:30-17:35)

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G 2. How many orcas live around New Zealand?
E 3. What are some of the things that New Zealand orcas feed on?
A 4. What are some of the differences between orcas in New Zealand and orcas in the Pacific Northwest?
A 5. Even though orcas around the world live in similar _____, they have different _____.

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A 5. What have the orcas learned to do to keep rays immobilized?
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G 2. Why did the young orca have marks on her tail stalk?
G 3. It is believed that orcas can survive out of water for how long?
G 4. Why was Rakey moved to the eastern coast of the island for release?

HOUR 2

Norway (2:23-7:38)

A 1. Do the orcas in Norway have the same matrilineal system as those in the Pacific Northwest?
A 2. Why do the orcas travel into the fjords in the winter?
A 3. What is the name of the unique technique that the orcas use to hunt herring?
E 4. After 20 years of coming into the fjords, why did the herring and the orcas stay offshore this year?
HI 5. What happened to the orcas when the herring population was overfished in the late 1960s?
HI 6. What is one possible reason that the orcas' social structure is so fluid?
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HI 5. How do chemicals like PCBs and PBDEs impact orcas and harbor seals?
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Call of the Killer Whale
Student Sheet

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HI 7. What is the health concern around PCBs and PBDEs?

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HI 3. What are PBDEs and where are they found?
HI 4. Why do children have higher levels of PBDEs than adults?

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HI 2. What was lost on the bottom of the ocean in Robson Bight?
HI 3. What are the concerns about having the wreckage at the bottom?
HI 4. When will some pieces of the wreckage be removed?

Call of the Killer Whale Glossary

apex predator: a species that kills and eats other animals, but has virtually no predators of its own

clan: related orca pods using the same or similar calls

closed containment: a system of fish farming where there is a solid barrier between the farmed fish and the marine environment

dialect: a unique set of calls made by a pod of orcas

dorsal fin: the fin located on the center part of the backs of fish and some marine mammals, such as killer whales and dolphins

dorsal saddle: the gray pigmented area found directly behind the dorsal fin of an orca

echolocation: the use of echoes from sound waves to create a sensory map of an area and to
detect prey

fjord: a long, narrow inlet of the sea between steep slopes

hydrophone: a device used for listening to underwater sounds

matrilineal: descended from a female ancestor

sea louse: a type of crustacean that parasitizes marine organisms; one species lives exclusively off the skin, blood and mucus of salmon