



Sea Ghosts Viewing Guide

"If we're going to maintain the balance of our world's ecosystems, if we're going to protect what we love, we cannot afford to be ignorant to what is going on around us—everywhere on the planet. Belugas seem remote, far from our influence. But they are not ... we are very, very connected." —Jean-Michel Cousteau

VIEWING TIME

One hour total; viewing it in shorter segments is recommended.

OBJECTIVES

Students will be able to

- locate the Arctic Circle and Arctic Ocean on a map.
- identify adaptations of marine mammals, including special adaptations of beluga whales.
- identify anthropogenic and environmental hazards that have affected and will potentially affect beluga whale populations.

MATERIALS

- Copy of the *Sea Ghosts* episode from the *Jean-Michel Cousteau: Ocean Adventures* series
- *Sea Ghosts* Viewing Questions teacher sheet
- *Sea Ghosts* Viewing Questions student sheet
- *Sea Ghosts* Glossary
- Paper
- Pencil
- A map of the world

SYNOPSIS

In this one-hour program, Jean-Michel Cousteau travels with his team to the Arctic and sub-Arctic to discover why some beluga groups are thriving and others are disappearing. The relationship between people and belugas is ancient. For more than 4,000 years, hunters of the north have depended on these whales for their own survival in a land with little to offer. These traditional cultures have now partnered with scientists and modern technology to protect the beluga, which, in turn, ensures their own future. Yet these efforts are only a small part of the story as new discoveries have raised troubling questions about the health of belugas and their long-term survival.

PRE-VIEWING ACTIVITIES

- Look at a map and do research to answer the following:
 - Where is the Arctic? What countries lie within or partially within the Arctic Circle?
 - Choose two different locations in the Arctic. What are their average monthly temperatures? Compare these with the average monthly temperatures where you live.
 - How does the environment in the Arctic change from summer to winter? What are the most drastic changes?
 - What is the average temperature of the Arctic Ocean?
 - Name five animals that live in the Arctic Ocean.
 - What is the Arctic ice pack? How large is it? Does it change size? Why are scientists concerned about the Arctic ice pack?
- Study characteristics and adaptations of marine mammals.
- Complete the "Whale Adaptations" lesson on the Ocean Adventures Web site.
<http://www.pbs.org/kqed/oceanadventures/educators>
- Read the *Sea Ghosts* Glossary sheet and write down any unfamiliar words.

WEB LINKS

Sea Ghosts

[www.pbs.org/kqed/
oceanadventures/episodes/
seaghosts/](http://www.pbs.org/kqed/oceanadventures/episodes/seaghosts/)

"A Warmer World for Arctic
Animals" video

[www.pbs.org/kqed/
oceanadventures/video/
arcticanimals](http://www.pbs.org/kqed/oceanadventures/video/arcticanimals)

"Beluga Whales" video

[http://www.pbs.org/kqed/
oceanadventures/video/belugas](http://www.pbs.org/kqed/oceanadventures/video/belugas)

"Beluga Whales Under Threat"
article

[http://www.pbs.org/kqed/
oceanadventures/episodes/
seaghosts/indepth-belugas.html](http://www.pbs.org/kqed/oceanadventures/episodes/seaghosts/indepth-belugas.html)

FOCUS FOR VIEWING

- Refer to the viewing questions that go with each segment of *Sea Ghosts*. 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.

FOLLOW-UP ACTIVITIES

- Review the *Sea Ghosts* Glossary sheet and any new vocabulary words learned.
- Look at a map of the belugas' range. Discuss how this might change due to climate change. (A map can be found at <http://www.seaworld.org/animal-info/info-books/beluga/habitat-&-distribution.htm>.)
- Write a summary of the issue facing belugas that you feel is most important. Describe the problem, who is involved, what is being done about it and what you think is the best solution.
- Research the revenue from whale watching in different areas. Would a loss of a whale species impact the economies of cities, states and countries?
- Create a PSA about beluga whales in the lesson "Beluga Balancing Act."
[http://www.pbs.org/kqed/oceanadventures/educators/seaghosts/
belugabalance.html](http://www.pbs.org/kqed/oceanadventures/educators/seaghosts/belugabalance.html)
- Watch the Web-only video "A Warmer World for Arctic Animals" and complete the accompanying activities in "Arctic Animals and a Changing Climate."
<http://www.pbs.org/kqed/oceanadventures/video/arcticanimals>
<http://www.pbs.org/kqed/oceanadventures/educators/arctic/>

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
The Interdependence of Organisms
The 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/](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.

SEA GHOSTS 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.

Introduction (2:46-5:31)

- G 1. Belugas are named from the Russian word for what? *"white one"*
- A 2. Belugas use one of the most *complex sonars* of any animal.
- E 3. Where in the world are belugas found? *in the Arctic (and sub-Arctic)*
- HI 4. The challenges belugas face are different depending on what? *where they live*

Tracking Belugas/Cook Inlet, Alaska (5:32-9:27)

- A 1. What adaptation do belugas have for living under the ice? *no dorsal fin*
- G 2. How long do belugas in a group stay together? *their whole lives*
- A 3. Why do belugas have flexible necks? *to better investigate their surroundings*
- G 4. Why does Dr. Michaud photograph belugas? *to identify them in order to study their social structure and habitat use*
- G 5. How long have some belugas been tracked through photo identification? *more than 20 years*
- A 6. Why are belugas difficult to identify? *they are completely white and have no dorsal fin (they have few distinct markings, unlike humpback whales and killer whales)*
- G 7. How long do belugas live? *60 to 80 years*

Somerset Island, Canada (9:28-13:57)

- A 1. Why do belugas visit the Cunningham Inlet? *to shed their skin*
- E 2. Why is the river beneficial to the belugas? *the water is rich in food*
- G 3. How often can a female in her prime give birth? *once every three years*
- G 4. How large can belugas grow? *up to 16 feet and 3,000 pounds*
- A 5. What distinguishes older males from other belugas? *they have an upward curve at the tip of their flippers*
- A 6. How many beluga "calls" have scientists identified? *at least 50*
- A 7. How is a beluga well-adapted to living in cold water? *it has thick skin, and up to 50 percent of its body weight is blubber*
- E 8. List some other animals the Ocean Adventures team sees. *a bird (parasitic jaeger), foxes, polar bear*
- E 9. The balance of life in the Arctic is, "at best, *precarious.*"

Subsistence Hunting/Point Lay, Alaska (13:58-24:23)

- HI 1. Why are belugas so important to the people of Point Lay? *the belugas provide food, and hunting is part of the native culture*
- G 2. How long has the Point Lay beluga population been studied? *more than 25 years*
- HI 3. Why did the village want to hold a meeting with the Ocean Adventures team? *they were concerned that the team's filming might interfere or create controversy*
- G 4. What did scientists attach to live belugas that were captured? *satellite transmitters*
- G 5. What information is collected from the items attached to the belugas? *information about where the belugas go*
- HI 6. How do the hunters move the belugas in a certain direction? *they use a "curtain of sound" from their boat engines*
- G 7. What do belugas do under the ice? *it is a mystery*
- E 8. What is occurring sooner and faster every year? *the summer ice melt*
- E 9. Ice may provide belugas protection from *killer whales*.
- A 10. Where do belugas feed? *on the ocean floor, throughout 3,000 feet of the water column and on the underside of the ice*

Commercial Hunting/Baffin Island, Canada (24:24-27:53)

- HI 1. How many belugas were killed by the Hudson Bay Company each year? *200 to 300 belugas, sometimes more*
- HI 2. What was done with any excess whales that were killed? *nothing; they were left to rot*
- HI 3. How did the native community suffer? *too many whales were killed commercially; there were not enough left for native subsistence*
- HI 4. The Baffin Island beluga population is classified as *threatened*.

Cook Inlet, Alaska (27:54-35:00)

- HI 1. When was commercial hunting of belugas banned in the United States? *1972*
- HI 2. Why did the natives decide to cease traditional hunting? *the beluga population was declining*
- G 3. How big is the Cook Inlet beluga population currently? *about 300 individuals*
- HI 4. What was one reason the population declined? *there were too many belugas hunted by native groups (each group didn't know how many belugas were being taken by the other groups)*
- HI 5. What has happened to the beluga population since the subsistence hunting stopped? *it is still declining*
- HI 6. Name another likely factor affecting the Cook Inlet belugas. *seismic oil and gas exploration, shipping and drilling noise, toxic pollution, and sewage pollution*

- G 7. How much of Alaska's revenue comes from oil and gas?
90 percent
- G 8. Why do opponents of listing the Cook Inlet belugas as endangered say it will make it harder for them to recover? *there will be more litigation*
- G 9. What does Mayor Begich want in order to place the belugas on the endangered species list? *strong scientific evidence of the cause of the population decline and a plan to keep the population healthy and growing*
- HI 10. Were the Cook Inlet belugas placed on the endangered species list? *yes*

Cancer in Belugas/St. Lawrence and Saguenay Rivers, Canada

(35:01-44:21)

- HI 1. How long was the St. Lawrence beluga population hunted? *more than 200 years*
- E 2. How many species of marine mammals are found here?
one dozen
- E 3. Why are phytoplankton important? *they are the base of the oceanic food web*
- HI 4. Why was the Saguenay–St. Lawrence Marine Park established? *concern for protecting the beluga whale*
- HI 5. How large is the St. Lawrence beluga population? *about 1,000 individuals*
- HI 6. Why hasn't the beluga population been showing normal signs of increase? *young animals are dying of infectious diseases from parasites and bacteria; older animals are dying of cancer*
- HI 7. Why are belugas getting cancer? *exposure to contaminants*
- HI 8. Where do contaminants in the belugas originate? *from industry in the Great Lakes region and aluminum smelters*
- HI 9. How do belugas absorb these contaminants? *through the food chain and also by feeding in the sediment; mothers pass contaminants to their calves*
- HI 10. What percentage of belugas found dead have cancer?
25 percent
- HI 11. Myrex is a contaminant that was used in *insecticides* and was *banned* in the early 1970s.
- HI 12. Myrex is still found in belugas and leads to *reproductive failure*.

Beluga DNA/Yakutat, Alaska (44:22-48:50)

- G 1. What kind of survey is done to find out where belugas spend their time? *aerial surveys*
- G 2. What do scientists study using the tissue samples that are taken from belugas? *genetics*
- A 3. What have scientists discovered about belugas in these studies? *that the beluga groups contain large extended families; they've also been able to map migration routes and look at their level of fitness, adaptations and evolution*
- HI 4. What big question is Dr. O'Corry-Crowe looking to answer? *how we can better predict how belugas will be able to deal with changes in the environment*

Climate Change (48:51-54:07)

- HI 1. What do seals caught by the hunters have less of than they used to? *blubber*
- HI 2. Why are the seals "skinnier" now? *young seals feed from their mothers on top of the ice, and when the ice melts earlier than normal, the young seals aren't able to feed as long*
- HI 3. One NASA study warns that the Arctic Ocean could be nearly ice free by when? *the fall of 2012*
- HI 4. How would walrus be affected by less ice? *they recover from deep dives on ice floes, so they'd have to swim to shore, far from the food that they need*
- HI 5. How would an Arctic without ice impact polar bears? *they could be confined to shore, isolated from their sea-bound prey*
- HI 6. What are some other possible changes resulting from less ice cover in the Arctic? *more shipping, fishing, oil exploration, noise and pollution; it could also mean more algae and small animals for belugas to eat*
- HI 7. "We are all connected, so what happens to belugas today happens to us *tomorrow.*"

SEA GHOSTS VIEWING QUESTIONS

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.

Introduction (2:46-5:31)

- G 1. Belugas are named from the Russian word for what?
- A 2. Belugas use one of the most _____ of any animal.
- E 3. Where in the world are belugas found?
- HI 4. The challenges belugas face are different depending on what?

Tracking Belugas/Cook Inlet, Alaska (5:32-9:27)

- A 1. What adaptation do belugas have for living under the ice?
- G 2. How long do belugas in a group stay together?
- A 3. Why do belugas have flexible necks?
- G 4. Why does Dr. Michaud photograph belugas?
- G 5. How long have some belugas been tracked through photo identification?
- A 6. Why are belugas difficult to identify?
- G 7. How long do belugas live?

Somerset Island, Canada (9:28-13:57)

- A 1. Why do belugas visit the Cunningham Inlet?
- E 2. Why is the river beneficial to the belugas?
- G 3. How often can a female in her prime give birth?
- G 4. How large can belugas grow?
- A 5. What distinguishes older males from other belugas?
- A 6. How many beluga "calls" have scientists identified?
- A 7. How is a beluga well-adapted to living in cold water?
- E 8. List some other animals the Ocean Adventures team sees.
- E 9. The balance of life in the Arctic is, "at best, _____."

Subsistence Hunting/Point Lay, Alaska (13:58-24:23)

- HI 1. Why are belugas so important to the people of Point Lay?
- G 2. How long has the Point Lay beluga population been studied?
- HI 3. Why did the village want to hold a meeting with the Ocean Adventures team?
- G 4. What did scientists attach to live belugas that were captured?
- G 5. What information is collected from the items attached to the belugas?
- HI 6. How do the hunters move the belugas in a certain direction?
- G 7. What do belugas do under the ice?
- E 8. What is occurring sooner and faster every year?
- E 9. Ice may provide belugas protection from _____.
- A 10. Where do belugas feed?

Commercial Hunting/Baffin Island, Canada (24:24-27:53)

- HI 1. How many belugas were killed by the Hudson Bay Company each year?
- HI 2. What was done with any excess whales that were killed?
- HI 3. How did the native community suffer?
- HI 4. The Baffin Island beluga population is classified as _____.

Cook Inlet, Alaska (27:54-35:00)

- HI 1. When was commercial hunting of belugas banned in the United States?
- HI 2. Why did the natives decide to cease traditional hunting?
- G 3. How big is the Cook Inlet beluga population currently?
- HI 4. What was one reason the population declined?
- HI 5. What has happened to the beluga population since the subsistence hunting stopped?
- HI 6. Name another likely factor affecting the Cook Inlet belugas.
- G 7. How much of Alaska's revenue comes from oil and gas?
- G 8. Why do opponents of listing the Cook Inlet belugas as endangered say it will make it harder for them to recover?
- G 9. What does Mayor Begich want in order to place the belugas on the endangered species list?
- HI 10. Were the Cook Inlet belugas placed on the endangered species list?

Cancer in Belugas/St. Lawrence and Saguenay Rivers, Canada
(35:01-44:21)

- HI 1. How long was the St. Lawrence beluga population hunted?
- E 2. How many species of marine mammals are found here?
- E 3. Why are phytoplankton important?
- HI 4. Why was the Saguenay–St. Lawrence Marine Park established?
- HI 5. How large is the St. Lawrence beluga population?
- HI 6. Why hasn't the beluga population been showing normal signs of increase?
- HI 7. Why are belugas getting cancer?
- HI 8. Where do contaminants in the belugas originate?
- HI 9. How do belugas absorb these contaminants?
- HI 10. What percentage of belugas found dead have cancer?
- HI 11. Myrex is a contaminant that was used in _____ and was _____ in the early 1970s.
- HI 12. Myrex is still found in belugas and leads to _____.

Beluga DNA/Yakutat, Alaska (44:22-48:50)

- G 1. What kind of survey is done to find out where belugas spend their time?
- G 2. What do scientists study using the tissue samples that are taken from belugas?
- A 3. What have scientists discovered about belugas in these studies?
- HI 4. What big question is Dr. O'Corry-Crowe looking to answer?

Climate Change (48:51-54:07)

- HI 1. What do seals caught by the hunters have less of than they used to?
- HI 2. Why are the seals "skinnier" now?
- HI 3. One NASA study warns that the Arctic Ocean could be nearly ice free by when?
- HI 4. How would walrus be affected by less ice?
- HI 5. How would an Arctic without ice impact polar bears?
- HI 6. What are some other possible changes resulting from less ice cover in the Arctic?
- HI 7. "We are all connected, so what happens to belugas today happens to us _____."

Sea Ghosts Glossary

adaptation: a characteristic that allows an organism to live successfully in a particular environment

algae: simple aquatic organisms that carry out photosynthesis; seaweeds are marine algae

aluminum smelter: a factory where aluminum is extracted from aluminum ore

Arctic Ocean: the smallest ocean in the world; its waters surround the North Pole and are covered in sea ice throughout most of the year

beluga whale: a species of cetacean that lives in Arctic and sub-Arctic waters; it is also called the “white whale” and is known for its vocalizations

bioaccumulation: the accumulation of a substance, such as a pesticide or toxic chemical, in an organism

cetacean: a whale, dolphin or porpoise

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

endangered species: a species that is in danger of becoming extinct

Endangered Species Act: a U.S. law passed in 1973 in order to protect plant and animal species that are at risk of becoming extinct

genetics: the science of heredity, or how the characteristics of living things are passed from one generation to the next

ice floe: a large, flat piece of floating ice

industrial pollution: pollution that can be directly linked to industry such as manufacturing and farming, often occurring as water, air or soil pollution

litigation: a lawsuit

polychlorinated biphenyls (PCBs): a group of toxic manmade chemicals that are known to bioaccumulate in animals and were banned in the U.S. in 1979

plankton: microscopic plantlike (phytoplankton) or animal (zooplankton) organisms that drift in the water

population: a group of organisms of the same species living in a particular area

sonar: also called echolocation, a method for locating objects underwater

Species at Risk Act: a Canadian law passed in 2003 in order to protect plant and animal species that are at risk of becoming extinct

subsistence hunting: hunting for the sake of survival rather than entertainment

threatened species: a species that is likely to become endangered in the near future

veterinary pathologist: a medical specialist that studies diseases in animals

watershed: the area of land where water from rain or melting snow drains downhill into a river, lake or other body of water