



**Science Unit:** *Beluga Whale*

**Lesson 4:** *Beluga Adaptations (Blubber Gloves)*

School Year: 2015/2016

Developed for: Champlain Heights Annex, Vancouver School District

Developed by: Dr Dom Tollit (scientist); Wendy Russo, Ramona Smith, Sabrina Luk (teachers)

Grade level: Presented to grades 1-2; appropriate for grades 1-4 with age appropriate modifications

Duration of lesson: 1 hour and 20 minutes

Notes: Floor will get wet!

**Objectives** (Objectives refer to the science topic and/or the process of science.)

1. Learn about aboriginal understanding of marine animal life cycles and the importance of sustainability.
2. Learn about adaptations of beluga to live in their environment.
3. Learn about how belugas and most marine mammals use blubber to insulate themselves from cold water.

## **Background Information**

Marine mammals are warm-blooded and will die (like humans) if they get too cold. Some marine mammals spend their entire lives in the Polar Regions. Blubber is a thick layer (can be at least a foot) of vascularized adipose tissue (fatty acids) found under the skin of whales, dolphins, porpoises, seals and sea lions. It covers the whole body except parts of appendages. It is the primary storage location of fat (food reserves) and especially useful for species that feed and breed in different parts of the ocean. It can form 50% of the mass. It is also mobilized when mothers need to produce large quantities of milk during lactation. During this process fat soluble contaminants (like DDT) that are stored within the blubber tissue can be passed to the calf or pup. It also adds buoyancy while swimming so may save energy. It can also help streamline the body. It is a good insulator as unlike fur it does not compress and allows marine mammals to use Polar Regions. Penguins also use a blubber layer to stay warm.

Whaling was practiced by 3000 BC. For a family or community living in an impoverished environment, a caught whale meant ample food over a long period. Whale blubber also provided communities with fuel for light, heat and cooking. In 1868 Svend Foyn, a Norwegian, revolutionized the whaling industry forever with the invention of the exploding harpoon, and by using fast steam powered catcher boats. A single 90-foot blue whale could yield up to 120 barrels of oil, and blue whales were killed by the thousands from about 1900 onwards – clearly non-sustainable. The slaughter peaked in 1931 when over 29,000 were killed in one season. Belatedly, the International Whaling Commission (IWC) banned all hunting of blue whales in 1966 and gave them worldwide protection. By this time their numbers had fallen from about 200,000 / 300,000 in pre-whaling days to 1-2000. The whaling industry is estimated to have accounted for 1.25 million whales weighing a total of 64 million tons.



## What were the whales used for?

One of the main uses of whale oil (from reduced whale blubber) were oil for lighting, including the streets of London UK: Sperm whale oil burned slowly, without an offensive odor. It was considered one of the finest oils for illumination used in an oil lamp. Spermaceti was used to make the finest quality clean and odorless candles. For lubricating: Whale-oil was processed into fine lubricating oils for industries such as clock making. The oil of the blackfish, a small, toothed whale, was prized for lubricating delicate machinery, such as chronometers on whale ships. The oil remained fluid even at very cold temperatures. Other uses: Although it was most prized for lighting and lubricating, whale oil was also used to manufacture soaps, varnish, cosmetics ("imparts a rich glossy sheen"), paint, glaze (on photographs), to process textiles and rope and burnt to provide heat.

Whale bone – Baleen. Buggy whips, Carriage springs, Corset stays, Fishing rods, Hoops for women's skirts, Umbrella ribs and many other applications where nowadays plastic or steel would be used.

## Vocabulary

Conservation:	The act of preserving, guarding or protecting; wise use.
Sustainability:	To use natural resources at a rate that the Earth can renew them
Blubber:	The fat of marine mammals – found between the skin and muscle
Insulate:	To cover something to prevent the loss of heat
Adaption:	The process of making suitable to a condition (i.e., to an environment)

## Materials

- 5 Blubber gloves (available from SRP)
- Big bag of ice
- Large Rubbermaid plastic box
- Colored pens
- Paper
- Extra towels and a mop

## In the Classroom

### Introductory Discussion

1. Short description of 'hook' to capture student's attention.
  - Ask how humans stay warm (clothes, live inside buildings, shiver)? Remind them marine mammals are also warm blooded and will die if they get cold. Ask how marine mammals stay warm (blubber/fat layer and fur, keeping active)?
  - Ask how a layer of blubber actually keeps an animal warm (insulation of body from cold water – fat does not transmit heat well)? Introduce the word insulate. Tell the class we are going to prove that a layer of blubber helps protect from the cold. Talk about the other uses of blubber (food reserve, buoyancy, stream lining) Ask the students to suggest other body adaptations a beluga has that help it survive in the Arctic (no dorsal fin to scrape on ice, white to camouflage them from predators, body parts to swim).
  - Read the short (5 minute read) book – "Salmon Boy - a legend of the Sechelt people" by Donna Joe. Use the book to introduce sustainable use and a conservation message. Discuss whaling by humans, focusing on the unsustainable nature of industrial whaling in the 19<sup>th</sup> and 20<sup>th</sup> Centuries. Discuss what whales were hunted for and human's incorrect belief that the ocean's resources were limitless. We nearly drove large whales extinct and we have been overfishing many other species, including cod and tuna. Discuss the need for sustainable use and conservation of all endangered species, including whales.



2. Briefly describe science experiment/activity:

- Observe how blubber insulates or protects from the effects of cold water by using “Blubber Gloves”
- Learn how the body of a beluga is well adapted to living and finding food in the Arctic (linking form with function)

3. Briefly describe the processes of science that the students will focus on:

The students will predict if using the “Blubber Gloves” will protect their hand from the cold water. They will then observe the effects of using or not using the “Blubber Gloves”, record the results and make a summary conclusion. The students will also draw and label a beluga and then undertake a ‘word cross’ exercise that helps them think how Beluga’s bodies are adapted to living and hunting in the Arctic i.e., linking body form with function.

4. Briefly describe safety guidelines.

- Walk carefully - slippery floors!

## Science Activity/Experiment

This lesson is best undertaken by splitting the class into five small groups of four students. The scientist runs the “Blubber Glove” station with one of the small groups at a time. The other students undertake the adaptations to life in the Arctic activity.

### Activity Title 1:

Blubber – keeping warm in cold water

### Purpose of Activity:

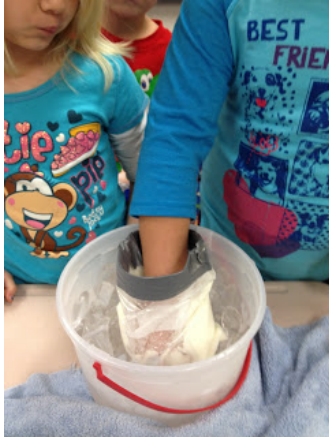
Predict then observe how blubber insulates or protects from the effects of cold water by using “Blubber Gloves”

### Experimental Observations:

The students will predict if using the “Blubber Gloves” will protect their hand from the cold water. They will then observe the effects of using or not using the “Blubber Gloves”, record the results and make a summary conclusion.

### Methods and Instructions:

Fill the plastic box half full of cold water and add the bag of ice. Ask the students to predict whether they think their hands will be cold or stay warm when in the blubber gloves. Ask all four students to put their bare hands into the ice water (5-10 seconds is enough). Then ask them to put their hands deep inside the blubber gloves. Wrap the gloves around their hands. Ask them to hold the grey top of the blubber gloves and put their hands in the ice water (making sure they don’t put them in so deep as to flood the blubber gloves). Let them feel that their hands don’t get hold (15-20 seconds). Ask them to record their results and draw a conclusion (e.g. the blubber gloves insulated or protected my hand from the cold). Help with the conclusion as necessary.



## Activity Title 2:

Beluga – adaptations to life in the Arctic

## Purpose of Activity:

The students will draw and label a beluga and then undertake a 'word cross' exercise that helps them think how Beluga's bodies are very well adapted to the Arctic.

Experimental Observations: Students will use their common sense to link different body parts with their function and use.

## Methods and Instructions:

A picture of a beluga whale with blank arrows is projected onto the white screen together with a list of "labels" using the red words on the word cross data sheet below. Ask the students to carefully draw a beluga and then label the beluga. Once they have completed the picture ask them to complete the word cross – drawing arrows from the red 'body' labels with black 'function' labels. Check that they are getting them right and help as necessary. Ask those that finish early to color in the beluga and add fish, echolocation clicks and other marine life. The correct answers of the word search are as follows.

TAIL - SWIMMING

PECTORAL FIN - MANOURVERING

NO DORSAL FIN - LIVING UNDER ICE

LOTS OF BLUBBER (FAT) - STAYING WARM (INSULATION)

TEETH - EATING FISH

BLOWHOLE - BREATHING

MELON - SENDING OUT CLICKS

WHITE BODY - HIDING FROM POLAR BEARS and KILLER WHALES (i.e., camouflage)

EYES - SEEING



## Closure Discussion

1. Ask if the blubber gloves worked and protected the student's hands from the cold. Discuss why they work. Fat does not transfer heat very well and so the cold does not transfer from the ice water to their hands.
2. Talk about when whales get stranded we have to keep them cool with wet blankets because the blubber keeps them so warm that on land they overheat.
3. Go through each of the beluga body parts and explain the function of each. Highlight that all animals are very well adapted to their environment. Get the students to give suggestions of great animal body adaptations (e.g., giraffes have long necks to reach high leaves during droughts).
4. While animals are well adapted to life, they can be over-exploited by humans. Scientists need understand how many animals of each species exist and what they need to survive to be able to protect them.

## Extension of Lesson Plan

1. Test the gloves in hot water.
2. Repeat the blubber glove experiment testing different materials as insulators. Try using packing peanuts, rubber bands, cotton wools, wool, sand and feathers.
3. Set out two beakers of hot water each with a thermometer in. Wrap one beaker with insulating material. Record the temperature of each beaker every one minute and plot the temperature drop of the insulated and non-insulated beaker.

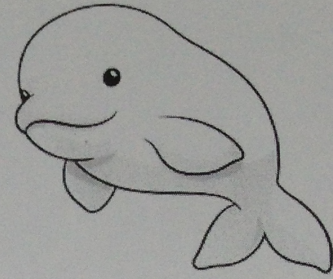







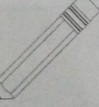
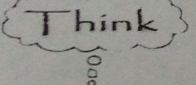
## Blubber Experiment

Scientist's Name:

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### Scientific Method

<p>Ask a Question</p> 	<p>Will my hand be cold or warm in the blubber?</p>
<p>Make a Prediction</p> 	<p>I think my hand will feel _____ in the blubber glove.</p>
<p>Make a Plan and Follow it</p> 	<ol style="list-style-type: none"><li>1. Put your hand in the ice water without blubber.</li><li>2. Stick your hand in the water for 5 seconds.</li><li>3. Do the same with the "blubber glove".</li><li>4. Observe. How did your hand feel?</li></ol>
<p>Record the Results</p> 	<p>How did your hand feel <b>without</b> the blubber?</p> <p>_____</p> <p>How did your hand feel <b>with</b> the blubber?</p> <p>_____</p>
<p>Draw a conclusion</p> 	<p>Write in a complete sentence what you learned about blubber.</p> <p>_____</p> <p>_____</p>



NAME:

DATE:

## BELUGA ADAPTIONS to LIFE

(Link the **red** words to the right **black** words)

TAIL

BREATHING

PECTORAL FIN

SENDING OUT CLICKS

NO DORSAL FIN

SWIMMING

LOTS OF BLUBBER (FAT)

EATING FISH

TEETH

HIDING FROM POLAR BEARS

BLOWHOLE

LIVING UNDER ICE

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STAYING WARM (INSULATION)

WHITE BODY

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EYES

MANOURVERING

