

## Lesson 3: Antarctic Oceanography- Animals: Penguins, Seals and Whales

### Lesson Objectives:

- Students will be introduced to the Marine animals that live on the ice sheets of Antarctica.
- Our main focus will be seals, whales and penguins.
- We will discuss adaptation, survival, and their place in the food chain.

*Very few animals are permanent residents on Antarctica's landmass; mostly worms, insects and mites are found there. No vertebrates, or backboned animals, of any kind are naturally found in Antarctica.*

## Penguins

Penguins are flightless birds found only in the Southern Hemisphere. They are clumsy on land but very agile in the water. Their wing like flippers helps them dive and swim through the icy waters. There are several penguin species found in



Emperor penguins off shore of Wilkes 1982  
Acquired by the Division of Antarctic Research  
© Commonwealth of Australia

Antarctica (see table), but only the Emperor lives on the ice shelf.

In March, female Emperor penguins come

ashore to claim their breeding ground and mate. In May or June, she lays her egg.



The female goes to sea to feed and leaves the egg with the Emperor male, who holds the egg on his feet and warms it with folds of loose skin. This **incubation** lasts for two months. The males must survive on stored body fat for that duration. After feeding for several weeks, the females return and the male must then make the trek back to the sea to feed, which often can be several miles from the nest site. He needs to renourish himself and bring back food for the female and the baby. The baby



is cared for by its parents until it is able

to care for itself, usually at about 5 months of age.

- Seals and whales are predators of penguins.

## Penguins of Antarctica

NAME	POPULATION	SIZE	DIET
EMPEROR	Under 200,000 breeding pairs.	Height - 36"-42" Weight - 66-88 pounds.	Krill, squid and fish.
KING	1 to 1.5 million pairs.	Height - 37" Weight - 30 lbs.	Fish and squid
ADELIE	2.5 million breeding pairs.	Height - approx. 30" Weight - 11 lbs.	Antarctic and ice krill.
CHINSTRAP	7.5 million pairs.	Height - 27" Weight - 9 lbs.	Almost exclusively krill.
ROCK-HOPPER	Estimated to be near 3.7 million pairs.	Height - 21" Weight - 5-6 lbs.	Lantern fish and euphausiid crustaceans
GENTOO	Estimated 300,000 breeding pairs.	Height - 23" Weight - 12 lbs.	Crustaceans, fish and squid
MACARONI	11.8 million pairs.	Height - 27" Weight - 9 lbs.	Lantern fish and euphausiid crustaceans.

## Seals



The common seals found in Antarctica are the Weddell, Ross, Crabeater, Leopard, Southern Elephant and Antarctic Fur Seal. Other than the Fur

seal, they are all "earless" seals, meaning they have no external ear structures, but they have excellent hearing both on land and in the sea. Like penguins, the earless seals move awkwardly on land but are quite agile in the water. The Fur seal has longer flippers than the others, so it moves well on land as well.

Weddell seals can dive down 2000 feet in search of fish, using sonar to locate their food. Since they require air to breathe, they can cut holes in the ice for air holes using their sawlike teeth. The Weddell seal can stay underwater for up to an hour at a time



Ross seals are the smallest and least plentiful of the Antarctic seals. They live on thickest areas of **pack ice**.

Leopard seals are fierce predators. They are found in the sea near areas where penguins breed, so they can

feed on the flightless birds. The females are ten percent larger than the male.

Crabeater seals are the most common large seal on earth, numbering around 40 million. Despite their name, they do not feed on crabs; they feed on krill. The females are slightly larger than males.

The largest seal is the Elephant Seal, which gets its name from a large proboscis, or trunk. The males can inflate this trunk to attract females and scare off other males. The male, which can weigh up to four tons, is much larger than female, which weighs about one ton.

The Antarctic Fur seal is an eared seal, meaning it has visible ear structures. Its fur has two layers – an outer layer of coarse hair and a thick velvet-like inner layer. Because of their beautiful fur, these seals have been hunted almost to the point of extinction. The populations of the Fur seal are once again increasing thanks to international laws banning the hunting of them



All seals have fish in their diet, while some species also eat krill, squid, penguins, octopus and/or crustaceans.

## Whales

There are two types of whales found in Antarctic waters, Southern baleen whales and toothed whales. They are so categorized by the structures found in their mouths to feed. The baleen whales have a bristly substance (**baleen**) in their mouths. This baleen is attached to plates on the whale's gums, and it serves as a filter by which the whale can strain krill, its main food source. The toothed whales have teeth, and therefore can eat much larger animals.

The major species of baleen whales found at least part of the year in Antarctic seas are: Blue, Fin, Sei, Minke, Humpback and Southern Right whales. Humpback whales have been observed herding krill into a circle, causing the krill to swarm into a more compact group. The whale then dives and rises up beneath the concentrated krill with its mouth open, ending up with a mouthful of food.

The Blue whale is not only the largest of the baleen whales, but also largest creature that has ever lived on the earth (the largest one measured 124 feet in length). Before hunting whales for blubber and oil became popular, there were 200,000 Blue whales; now there are only approximately 1000 left in existence. All whales are now protected by international agreement, but there are still countries that ignore the treaty and hunt the whales for precious food and oil.



The two most common toothed whales found in the Antarctic are the Sperm Whale and the Orca, the killer whale. The sperm whale is the largest of the toothed whales, measuring approximately 60 feet in length and weighing 70 tons. The toothed whales' diet consists of fish, squid, birds, penguins and seals.

## What to do if you come across a stranded whale

Source: <http://www.clearlight.com/~kid/whales/hbwhales.html>

A stranded whale is one that has beached itself ashore for some reason. They can be found anywhere throughout the world. If you are the first to come upon such an unfortunate creature, there are a number of things you can do to help its rescue:

The first thing you should do is contact the nearest office of the national parks or wildlife department to summon help from experienced persons. You will need to tell them the exact location of the stranded whale and give an accurate description of its type, condition and health. If you are unsure of the type you should take notes as to its size, body shape, color, the size and positions of its fins, the location and number of blow holes, and whether or not the stranded whale has throat grooves.

Out of the water, stranded whales will find it very difficult to maintain correct body temperature. A rapid rise in body temperature will result in death in a few hours. Pouring buckets of seawater over the skin will ensure it stays cool and wet.

**Never pour water in the blowhole!**

These mammals breathe air through their blowhole and pouring water in there will cause them to drown.

Covering exposed areas of the skin with water-soaked hessian bags or something similar will help with cooling and also help prevent sunburn. Once again, **do not cover the stranded whale's blowhole!** Also, do not cover the fins, as these areas are used to lose heat from the body.

When the wildlife officers arrive, follow their instructions exactly. They know best what to do for beached whales



## Fun Facts

- Antarctica is the highest continent on earth. Winds flow down the coastal slopes under the influence of gravity. Speeds of these katabatic winds have been recorded up to 320 kilometers per hour.
- Antarctica is the driest continent on earth.
- Adelie penguins walk up to 50 kilometers across the sea ice to reach their nesting grounds, returning to the same nest site and to the same mate in often-crowded colonies containing many thousands of birds.
- Did you know: Dolphins and porpoises are related to toothed whales?
- Did you know the Orca is the most intelligent whale, often trained for entertainment purposes at Marine Parks?

## Activity 3-1. Classroom Discussion

1. How does the increase or decrease of whaling over the centuries affect the food chain?
2. What adaptations enable sea animals to live in such a frigid climate? Whales: Extra layers of fat to protect from cold, Baleen is attached to plates on the whale's gums, and it serves as a filter by which the whale can strain krill, its main food source. Penguins: males store body fat to survive during incubation. The Fur seal has longer flippers than the others, so it moves well on land as well. Weddell seals can dive down 2000 feet in search of fish, using sonar to locate their food. Since they require air to breathe, they can cut holes in the ice for air holes using their sawlike teeth.
3. What types of marine animals would be affected by over-harvestation of Krill (whales, seals, penguins)
4. What are the two types of whales found in Antarctic waters? (Southern baleen whales and toothed whales)

## Activity 3-2. Antarctic Features

[http://quest.arc.nasa.gov/antarctica2/main/t\\_guide/blackline\\_2.html](http://quest.arc.nasa.gov/antarctica2/main/t_guide/blackline_2.html)

Locate as many of these *creatures* and *geographic features* on an Antarctic map as you can. Watch out - some of the creatures *do not belong* in the Antarctic!



### Geographic Features

Amundsen-Scott South Pole Station  
 Antarctic Circle  
 Antarctic Convergence  
 Antarctic Ocean  
 Antarctic Peninsula  
 Anvers Island  
 Balleny Island  
 Beardmore Glacier  
 Bouvet Island  
 East Antarctic Ice Sheet  
 Ellsworth Mountains  
 Geographic South Poles  
 Geomagnetic South Pole  
 Gerlache Strait  
 Heard Island  
 Indian Ocean  
 King George Island  
 Magnetic South Pole  
 Marie Byrd Land  
 McMurdo Dry Valleys  
 McMurdo Station  
 Mount Erebus  
 Palmer Station  
 Ronne-Filchner Ice Shelf  
 Ross Ice Shelf  
 Ross Island  
 Rothera  
 Scott Base  
 Sentinel Range  
 South Atlantic Island  
 South Georgia Island  
 South Orkney Island  
 South Pacific Ocean  
 South Sandwich Island  
 South Shetland Islands  
 Transantarctic Mountains  
 Vostok  
 Victoria Land  
 Weddell Sea

### Creatures

Adelie penguins  
 Antarctic hairgrass  
 Beluga whales  
 blue whales  
 dinosaur fossils  
 elephant seals  
 Emperor penguins  
 endolithic organisms  
 finback whales  
 indigenous peoples, such as Eskimos  
 international research stations  
 kraken  
 leopard seals  
 lichens  
 Macaroni penguins  
 ostriches  
 pearlwort  
 polar bears  
 sei whales  
 skuas  
 USAP field teams  
 USAP research stations  
 walruses  
 Weddell seals



For more activities like this one please visit NASA Passport to Knowledge, Live from Antarctica 2

<http://passport.ivv.nasa.gov/antarctica/teacherguide.html>

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## Activity 3-3. Penguin Adaptation

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Source: NASA Passport to Knowledge, Live from Antarctica 2

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**Objectives:** Students will investigate animal adaptations to a cold environment and incorporate key findings by designing an organism well-adapted to this environment.

Students will demonstrate the ability to predict animal behavior patterns by simulating penguin foraging activity.

**Engage:** Brainstorm ways in which penguins are well adapted to cold water and icy environments. Then complete the following demonstrations:

1. Flying birds need large wingspans to hold themselves up in the air, but small wings work best for birds swimming through water. Demonstrate this with two pieces of flexible card. Try to push one, flat, through a pan of water. It's hard. Fold another piece five or six times and try pushing that through the water. The smaller, stiffer card, like a penguin's wing, works better.
2. Most birds have hollow bones to make their bodies light enough to become air-borne. But the penguins' heavy, solid bones help them float lower in the water. With the help of two student volunteers, demonstrate the difference between hollow bones and solid bones using two toilet paper rolls, one empty the other stuffed with tissue paper.
3. Float an empty can in a bucket of water open end up. It floats high in the water like flying aquatic birds (ducks, for example). Add sand to another can until it sinks slightly. Now push down on both cans. The sand-filled container is easier to push down into the water. In this way, it's easier for penguins to dive into water.

## Activity 3-4. Antarctic True or False

Source: [http://quest.arc.nasa.gov/antarctica2/main/t\\_guide/activity\\_A1.html](http://quest.arc.nasa.gov/antarctica2/main/t_guide/activity_A1.html)

1. Antarctica is the largest continent.
2. There are cities in Antarctica.
3. You will find polar bears in Antarctica.
4. Antarctica doubles in size and shrinks each year. True or False, and Why?
5. Antarctica is a continent covered by ice and snow, just like the Arctic.
6. Daylight lasts for six months at the South Pole.
7. There are rivers and volcanoes in Antarctica.
8. There is water under nearly all the ice.
9. Penguins live only in Antarctica
10. Antarctica is a territory of the United States.

## Activity 3-4a. Antarctic True or False Teacher's Key

Source: [http://quest.arc.nasa.gov/antarctica2/main/t\\_guide/activity\\_A1.html](http://quest.arc.nasa.gov/antarctica2/main/t_guide/activity_A1.html)

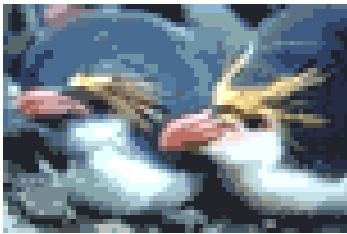
1. Antarctica is the largest continent. (F)
2. There are cities in Antarctica. (T: McMurdo in summer swells to over 1,500 people)
3. You will find polar bears in Antarctica. (F)
4. Antarctica doubles in size and shrinks each year. True or False, and Why? (T: The ice sheet grows and melts from winter to summer.)
5. Antarctica is a continent covered by ice and snow, just like the Arctic.  
(T: for Antarctica. F: for the Arctic, which is ice over water, and is not a continent)
6. Daylight lasts for six months at the South Pole. (T)
7. There are rivers and volcanoes in Antarctica. (T)
8. There is water under nearly all the ice. (F)
9. Penguins live only in Antarctica. (F: Penguins live elsewhere south of the equator, including coasts of South America, Southern Africa, and islands north of Antarctica.)
10. Antarctica is a territory of the United States. (F)

## Student Information Sheet 3. Antarctica III: Animals: Penguins, Seals and Whales

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*found there. No vertebrates, or backboneed animals, of any kind are naturally found in Antarctica.*

### Penguins



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water. Their wing like flippers helps them dive and swim through the icy waters. There are several penguin species found in Antarctica, but only the Emperor lives on the ice shelf.



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