Poles Apart - A Pictorial Visit to the Arctic and Antarctic

The NCSR Pictorial Series of modules are designed to provide faculty, teachers and other natural resource professionals an informal *PowerPoint* presentation on selected environmental settings. The presentations consist of pictures of the natural environment and feature plants, animals and landscapes of the area. The modules intended theme is to show diverse audiences interesting aspects of various environments. As a result, the presentations can stimulate learning more about the features of various natural settings and why they are both different and changing.

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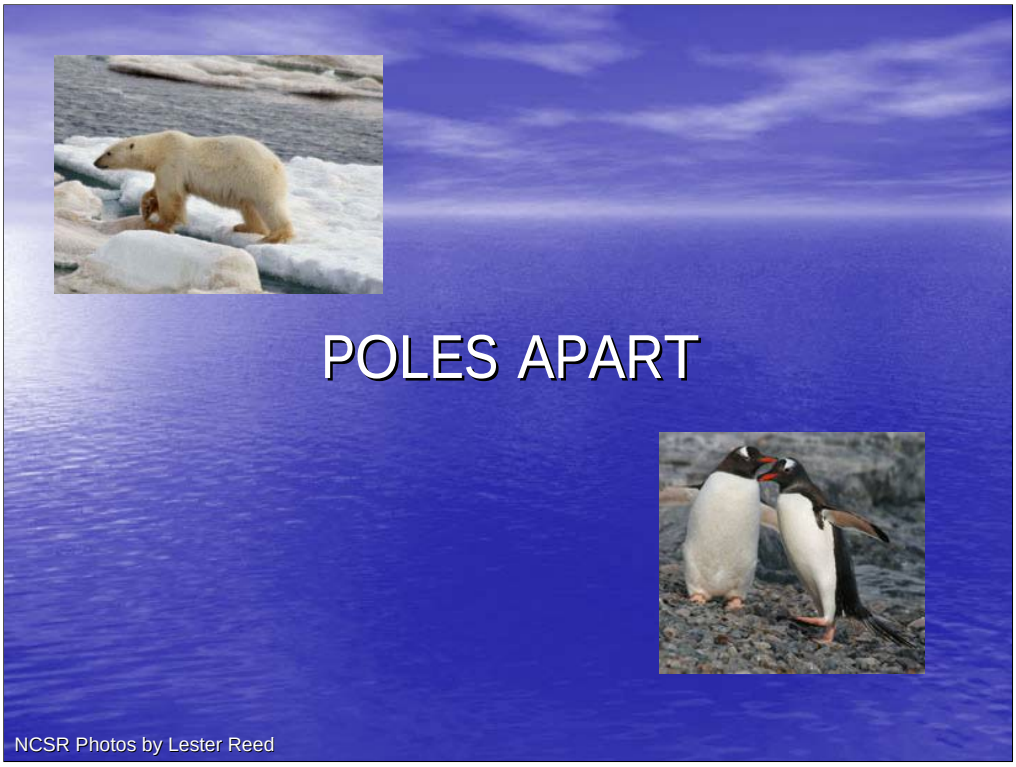
Introduction

Poles Apart - A Pictorial Visit to the Arctic and Antarctic is part of the NCSR Pictorial Series designed for presentation to general audiences. It is comprised of images made from photographs of the Arctic and Antarctic regions presented in a *PowerPoint* format supported by Instructor Notes. The purpose of the presentation is to explain and illustrate the reason for the differences between these two regions. The information in the *PowerPoint* is provided in an informal manner and geared to audiences with a wide range of ages and natural resource backgrounds. The presentation's purpose is to stimulate interest in the natural environment and factors that affect the environment.

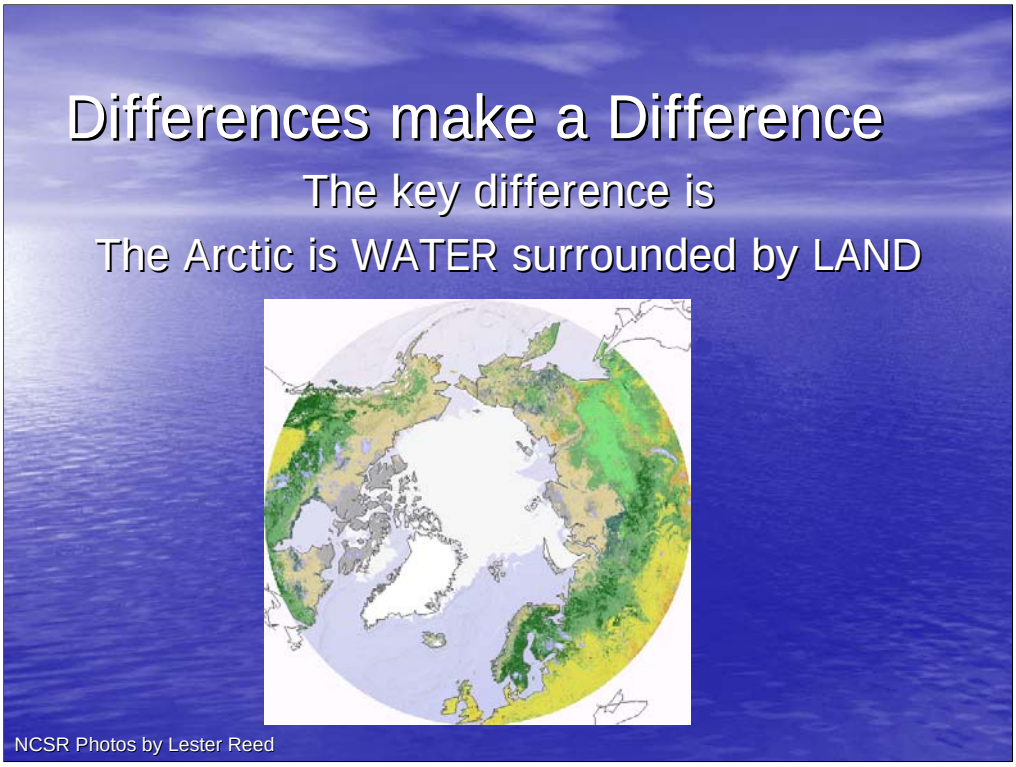
Presentation

The presentation is designed to show the slides accompanied by comments by a "presenter". Modifying the *PowerPoint* slides as an automated slide show including dubbing of narrative or music is an alternative.

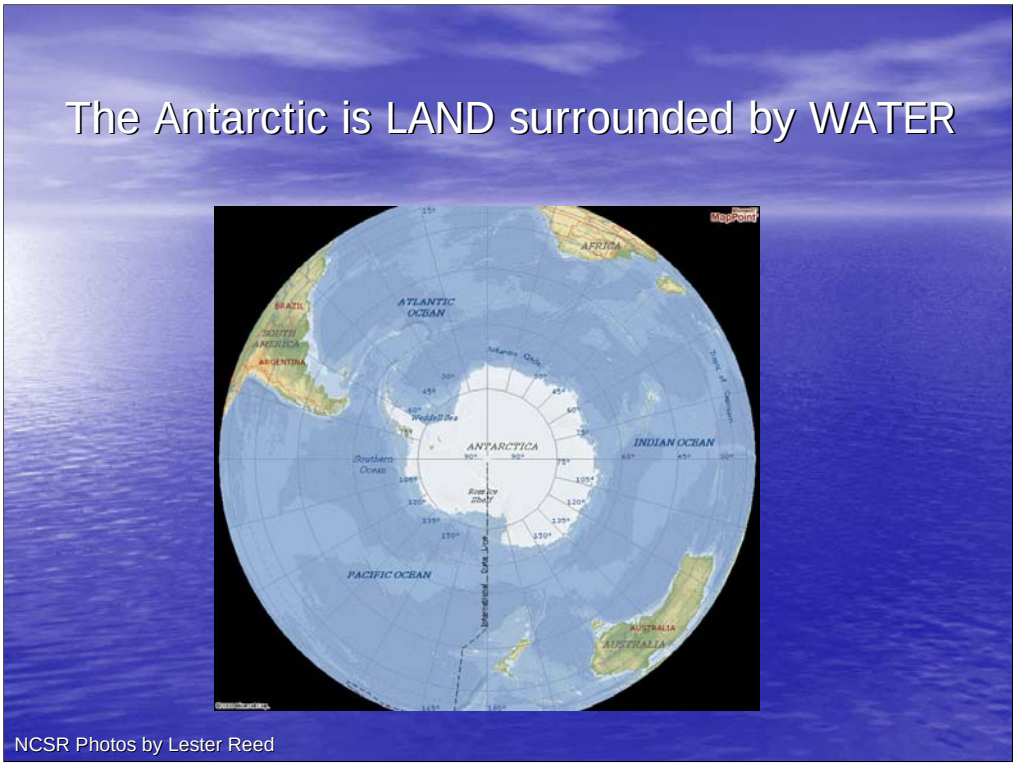
PowerPoint Slide with Instructor's Notes



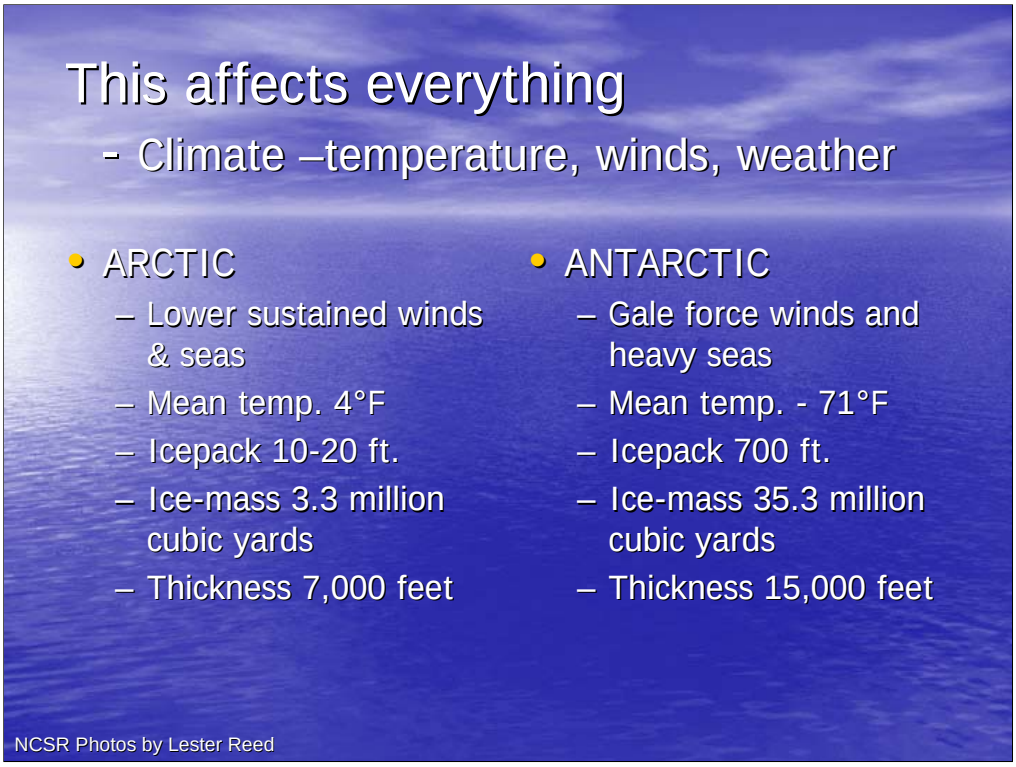
Although both Geographic Poles are subject to the same sun-induced seasonal variations, there are major differences in their climate, animals and vegetation. This presentation is designed to highlight these differences for general audiences and give them some insight into why they exist.



The map projection for the Arctic illustrates the fact that the Geographic North Pole area is in a water environment. Although the Polar region is a frozen sea ice cap, it is surrounded by land masses. That factor has a significant influence on what can live and grow in the greater Arctic region.



The Antarctic Geographic South Pole, on the other hand, is on a land continent covering 5.4 million square miles (about 1.4 times the size of the continental United States). The continent is surrounded by an unbroken polar sea now referred to as the Southern Ocean. The open circumpolar ocean (an unbroken ocean surrounding the South Pole continent) keeps the continent nearly permanently covered in ice (less than 3% of the continent is free of the permanent unbroken South Polar ice sheet) preventing habitation by either plants or animals.



The physical settings of the Poles cause major differences. A few examples are provided below:

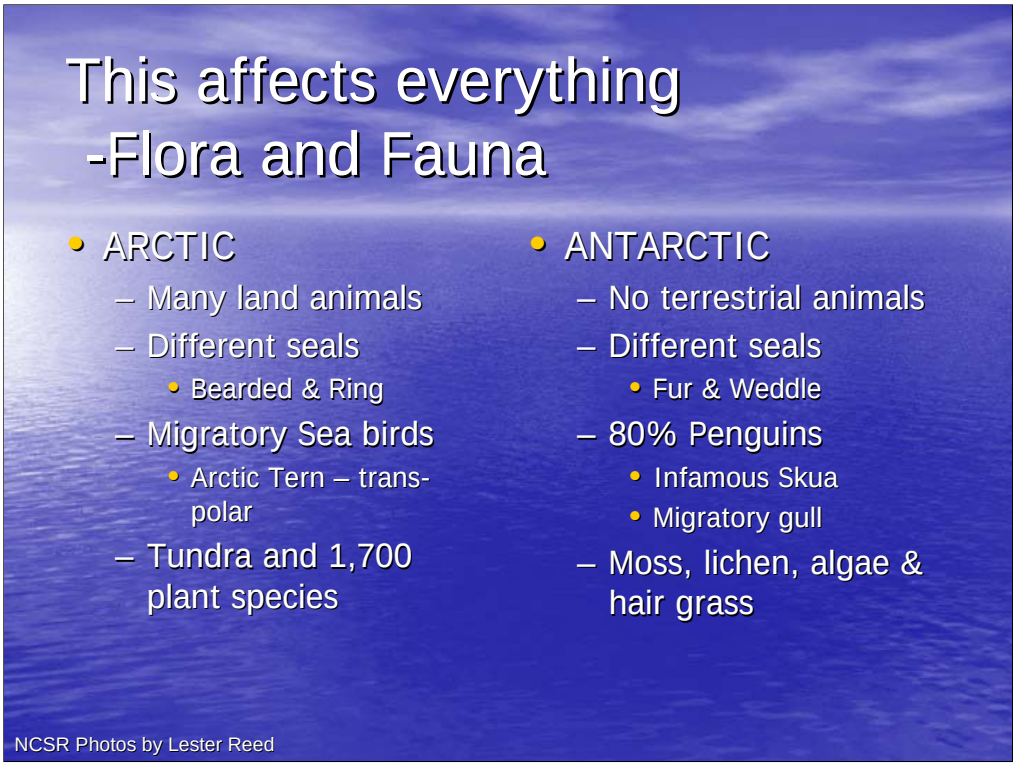
Climate:

The open circumpolar setting of the Antarctic region prevents warming currents from entering the region by forming a convergence where colder southern waters collide with warmer northern waters essentially blocking those from the north. In the Arctic, warmer waters from the south penetrate deep into the region creating a more hospitable climate for animals and plants. The encroachment of the Gulf Stream flow on the west side of Greenland is an example of this phenomenon.

The open Southern Ocean generates high winds and seas exceeding those in the Arctic.

The annual mean temperature in the Arctic is 4° F (-20°C) and minus 71° F (-57° C) in Antarctica.

Average thickness of the icepack in the Arctic is 10-20ft and 700ft in Antarctica.



The physical settings of the Poles cause major differences. A few examples are provided below:

Flora and Fauna:

There are no terrestrial animals in Antarctica but the Arctic has a relatively large number of animals including polar and brown bears, fox, reindeer, ground squirrels and muskoxen. Both regions have numerous sea mammals such as seals and whales. Seals are different in each region.

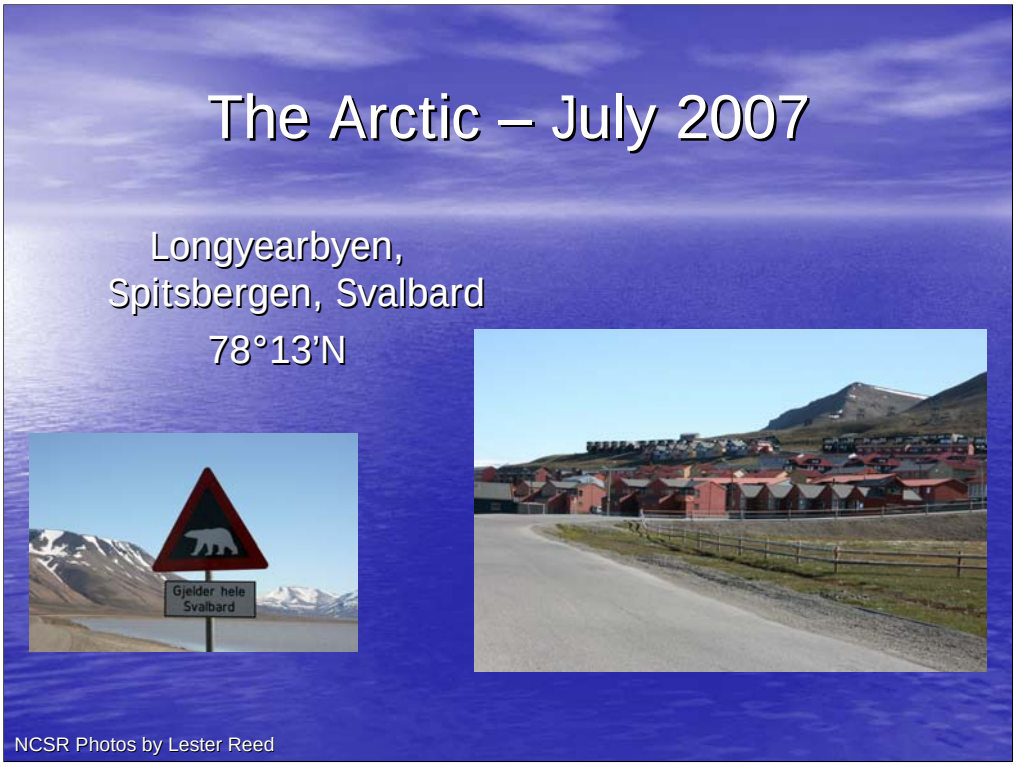
Bird populations are present in both regions however the penguins makeup about 80% of the birds in Antarctica. No penguins are found in the Arctic. The Arctic Tern is the only bird common to both regions making an annual trans-pole migration.

Vegetation is prolific (1,700 kinds of plants) in the Arctic as are tundra plains which support many types of plants adapted to short growing seasons. In the Antarctic, only moss, lichen, algae and recently Antarctic hair grass are found (Some scientists suggest the appearance of grass is due to climate warming).

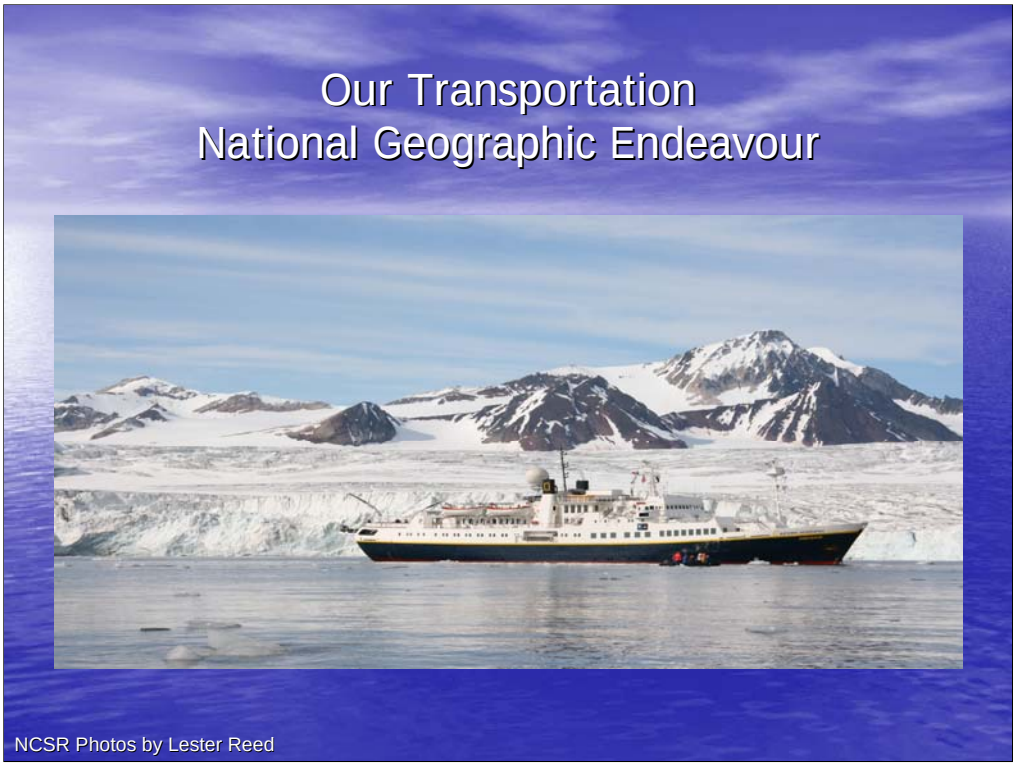
Human activities.

- There are no aboriginal people in the Antarctic nor are there any fossil records of human habitation. In the Arctic there are indigenous people with a long record of existence in the region.
- Today only research teams reside in Antarctica varying from 2,500 over wintering and up to 30,000 in summer. There over 15 million people residing in the Arctic region.

The above factors make the Polar Regions significantly different as the following pictures will illustrate.



The Arctic journey starts 700 miles from the north geographic pole in a Norwegian town of 1,200 people (pronounced *long-year-ben*. *spits-bergen & salv- bard*) It is the largest town above the Arctic Circle and originally was founded to support coal mining. Now it is mainly a departure point for tourist activity in the region. Longyearbyen is the start of the Arctic voyage shown in the following slides.

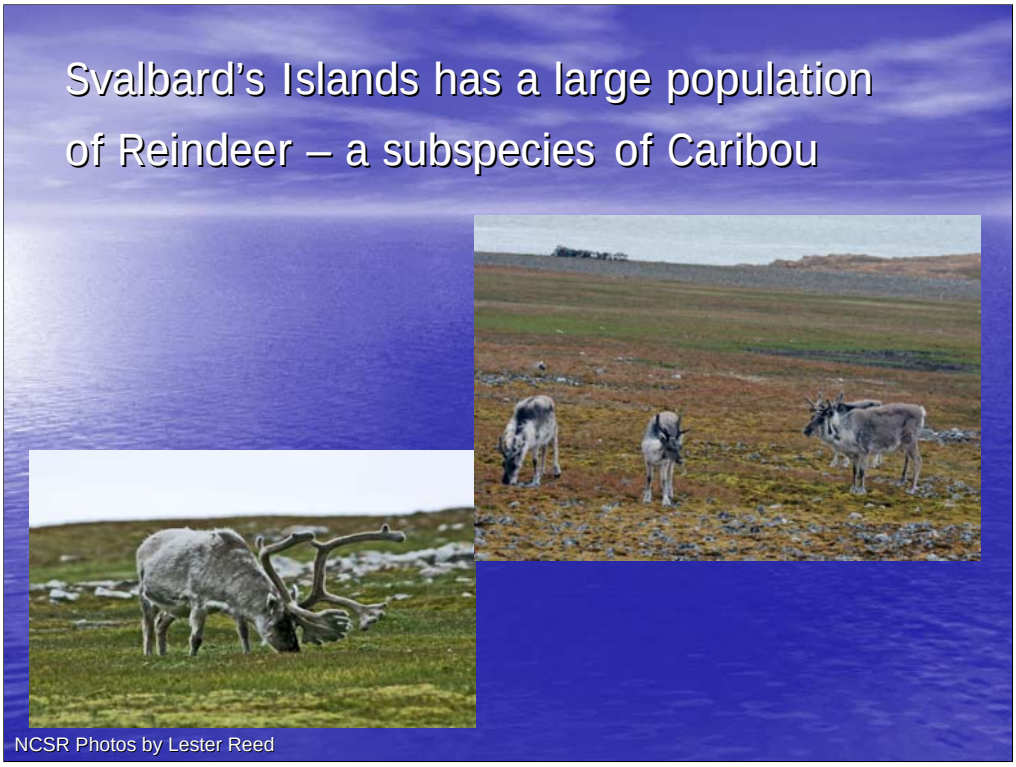


This particular cruise is by a consortium of the National Geographic and Lindblad Explorations. It has 100 passengers and is oriented toward presenting the Arctic up close and personal. The expedition staff consists of expert naturalists who accompany the passengers on land excursions and provide detailed presentations about the area visited.

Except when in the ice pack area, there were two trips a day to shore. The first stop was at a remote island, which proved typical of the conditions encountered in the summer, south of the polar ice cap.

The flat plains areas are Arctic tundra, a boggy biome consisting of low growing plants during its short summer season. The surface during the summer is supported by permafrost that does not melt. This creates marshy areas with large amounts of surface water. Until recently the tundra was one of Earth's three major carbon dioxide sinks, taking in more carbon dioxide than it releases. Recently, as a result of global climate change, there are warmer temperatures with longer growing periods and the permafrost areas are further from the surface. This has resulted in an increased amount of decomposing materials which are giving off carbon dioxide. If this trend continues, the tundra areas may end in a “feedback loop” where they produce more carbon dioxide than they absorb and retain, contributing to an increased greenhouse effect.

Tundra supports abundant life in the Arctic. It provides an environment favorable for insects, some bird species, and grazing animals such as reindeer and muskoxen.



Svalbard reindeer are not like the domesticated Lapland animals, but more like caribou and most likely migrated to the area from Siberia across Alaska and Canada.

During the short growing seasons, flowers are abundant in small clumps in the drier parts of the tundra. Pictured here are purple saxifrage (upper left), artic poppy (upper right and lower left) and small willow trees (lower right).

Unlike the mega-cruise ships, the small cruise ship is ideal for moving about the area and providing maximum opportunities in different sights and experiences.

The transportation from ship to shore or for viewing from the water is by Zodiac. This reliable craft, used initially by Jacques-Yves Cousteau in his ocean research, is well adapted for providing transportation on exploration cruising.

There are a great variety of birds in the Arctic. Those in the Svalbard archipelago are primarily sea birds that arrive for breeding in the spring, and migrate south as winter approaches. Pictured here are Guillemots (lower left) and Kittiwakes (upper right).

Large flocks of birds gather when there are abundant schools of fish and copepod. The flocks include Glaucous Gull, Arctic Terns, Kittiwakes and Guillemots.

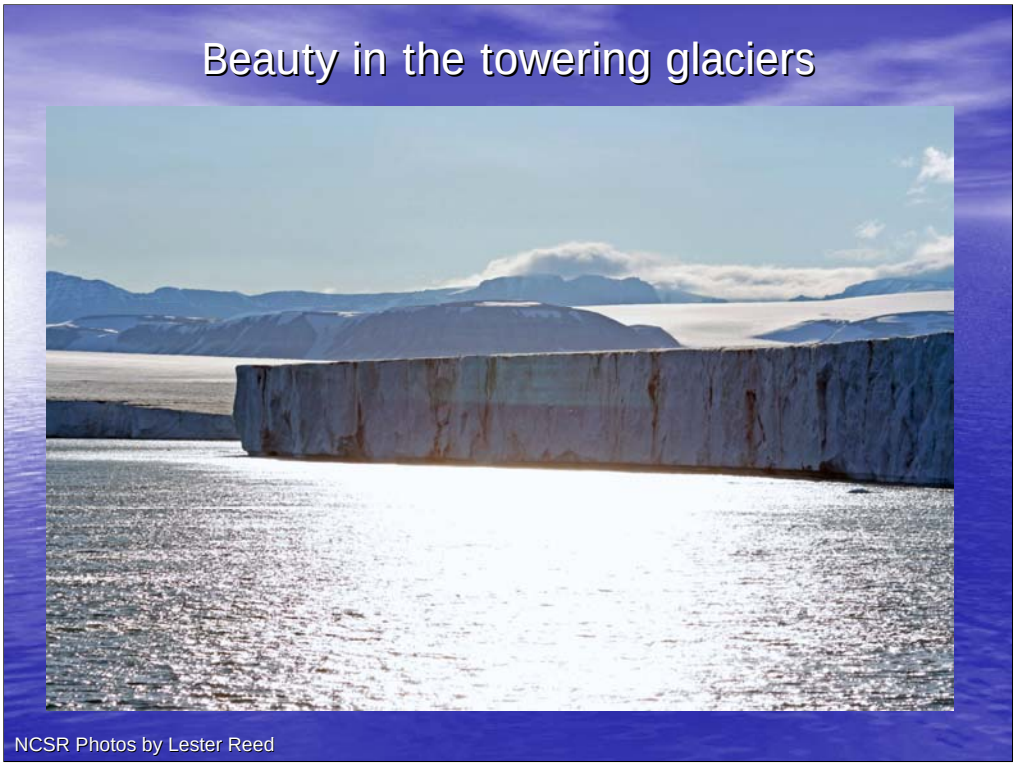
Using glacier fronts to create feeding opportunities

NCSR Photos by Lester Reed

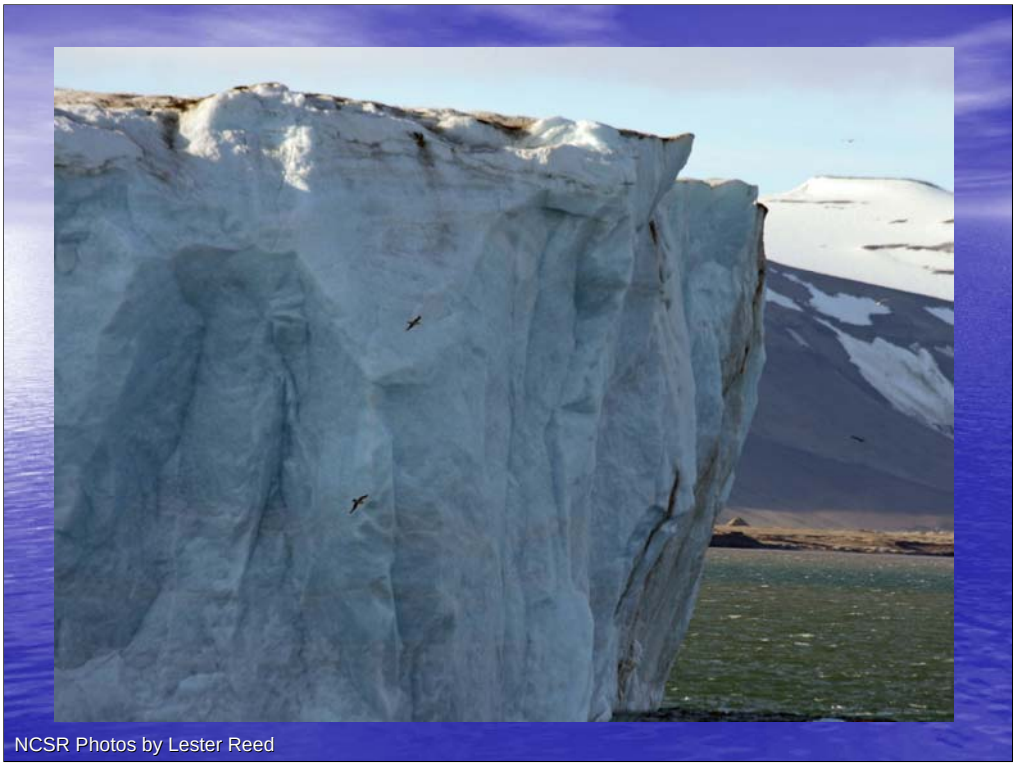
Glacier fronts, particularly areas of fresh water runoff, create areas of “upwelling” of the seawater and bring fish to the surface where they make easy pickings for the sea birds.

The birds present an unforgettable sight as they use the ice as landing sites.

The sea ice provides resting spots for the various Arctic sea birds.



As the glaciers move toward the sea, they erode, are under cut and calving occurs (breaking off the front parts of the glacier to form icebergs). This results in the glacier front resting on land until it again slowly slips out to sea.



The fronts vary in size and shape depending on the results of the wind and sea conditions.

The black areas are known as “dirty ice”. The dirt usually consists of particles of rock hewed off cliffs and the substrata as the glacier moves toward the sea.

The low area is where glacier melts flow as they run to the sea.

One of the highlights of any Arctic trip is seeing polar bears. As “sea mammals” the bears spend as much time as possible on the ice hunting for seals, their primary food source. Only when the ice melts are they forced on shore.

Polar bears have become the poster child of the global climate change/warming movement. The projected loss of these animals during this century has been presented in newscasts, a feature film and articles in numerous publications. Below are some data that presenters may wish to use to inform viewers about these animals.

Size: Polar bears are the largest land predator in the world.

Males 8 to 10 feet tall and 1,200 to 1,400 lbs

Females 6 to 8 feet tall and 600 to 800 lbs

Numbers: There are thought to be between 20,000 and 25,000 bears in the wild.

Range: Circumpolar with the largest population in Canada. Although distributed across the Arctic, they do have distinct populations and do not intermingle.

Reproduction: Females conceive and den in November or December for the impending birth. Normally, two cubs are born weighing 1-1/2 pounds each. The cubs are nursed by the female for five months and emerge weighing about 35 lbs in March or April. The female does not eat during her stay in the den and survives on fat reserves.

Breeding: Females first breed at four to five years of age. They will rebreed approximately every three years, one of the lowest rates of reproduction among land mammals.

Early life: Cubs remain with their mothers approximately 2 years and then are turned out to survive on their own. Some estimates put survival up to the age of five years at 50% or below.

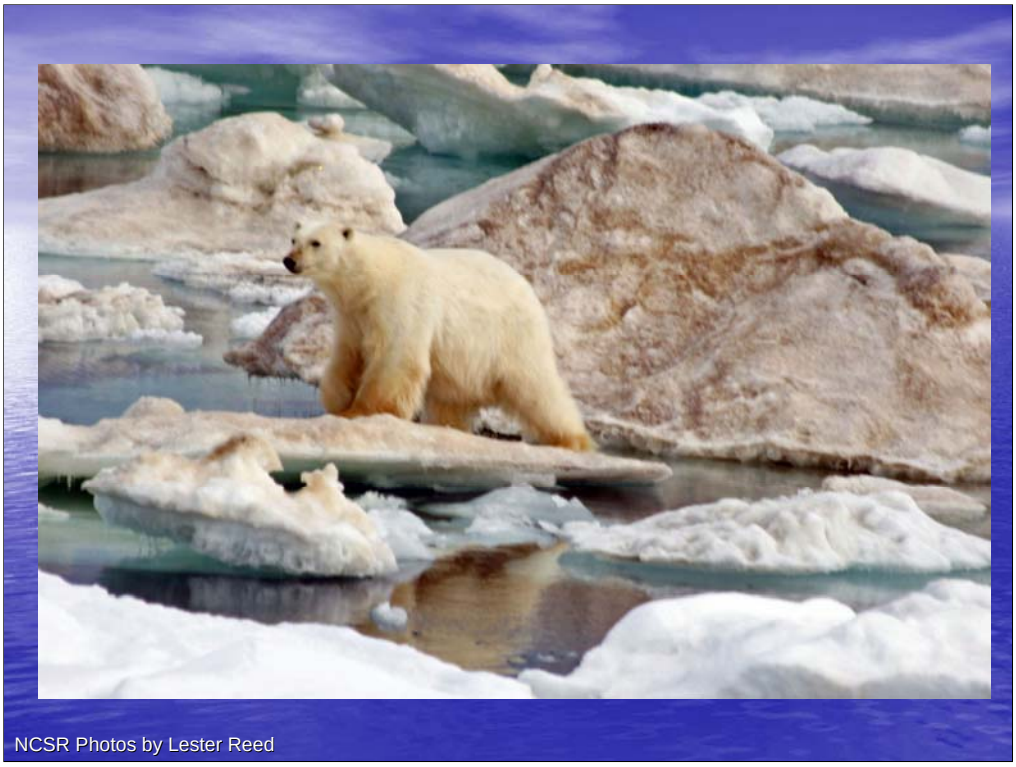
Age: After reaching five years, adult bears live 15 to 18 years. On occasion, scientists have tagged and followed bears to 30 years.

Diet: Seals, particularly the ring seal, is the primary food. However, bears will eat any readily available animals including dead whales or walrus. Male bears will kill and eat young cubs and the mother must be vigilant to prevent that unfortunate event.

Travel: Bears walk and seldom run as it consumes too much energy and overheats them (they have limited ability to lose temperature due to their unique fur layers). They are also great swimmers and can stay in the water in excess of 24 hours.

Threat of Global Warming: The diminishing amount and availability of sea ice has impacted the ability of bears to hunt and gain sufficient fat reserves to survive their long summer fast. Anecdotal evidence of increased drowning and data shows that bear weights seem to be in decline. This is especially critical for females who may soon lose the ability to adequately nourish their cubs, resulting in a rapid disappearance of young bears needed to replenish the population.

These bears are evidently quite at home on the ice.



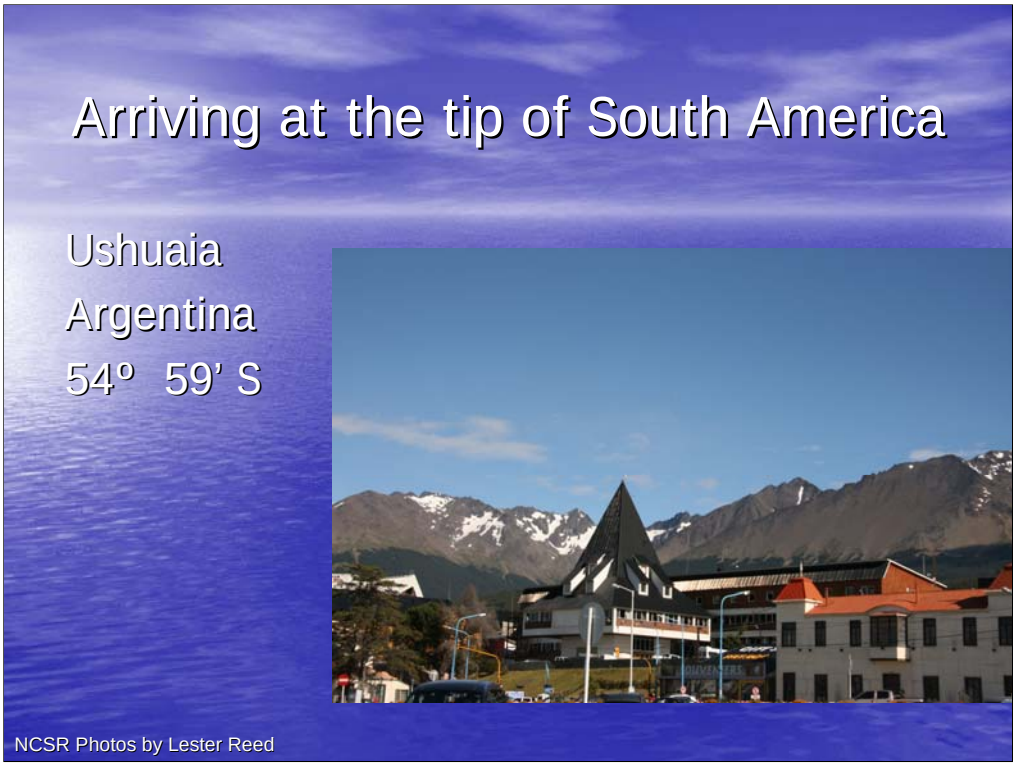
This mature male presented a great “photo op”

The bear’s ability to leap from flow to flow is phenomenal.

This guy sure looks like he is comfortable and relaxed.

With a striking display of light and colors, our expedition departs the Arctic.

Reaching Antarctica requires a 2-day sea voyage across the Drake Passage. The Drake can be one of the roughest pieces of ocean in the world. On our southerly passage, we encountered 45-foot seas that took its toll on many of the passengers. Unlike the Arctic, which has commercial and charter service by air to airports well above the Arctic Circle, only military or other government aircraft fly into some of the Antarctic's major research stations. Tourists and researchers alike get to their destinations by ship.

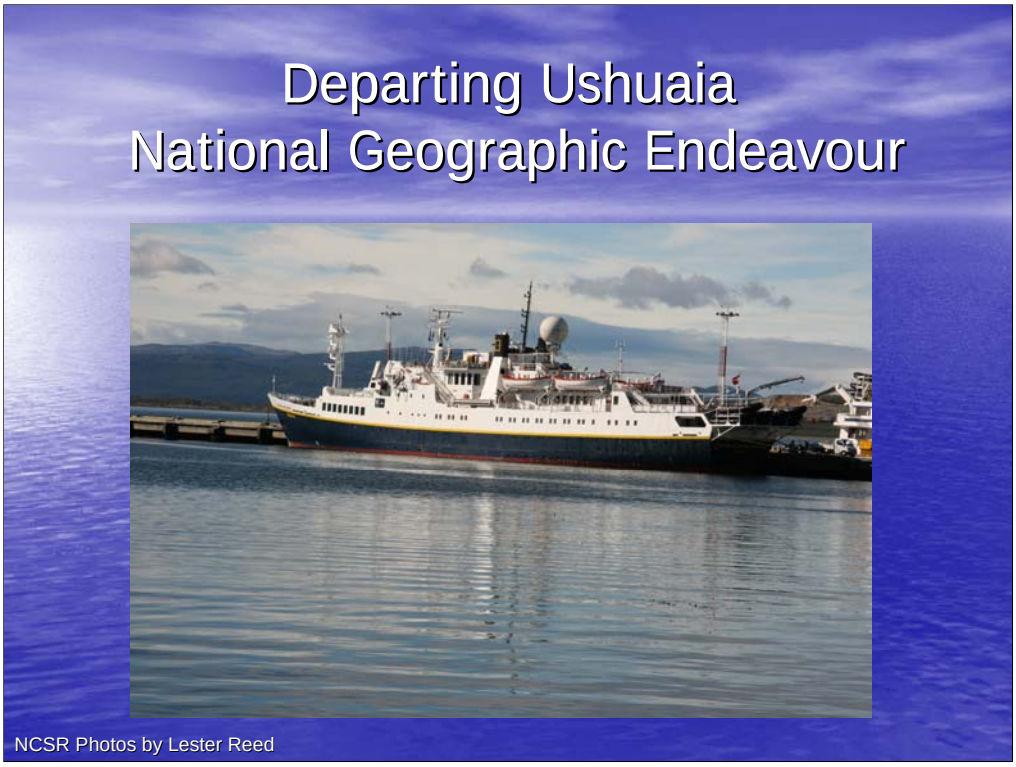


The departure point for many ships headed to the Antarctic, particularly eco-tours, is from Ushuaia (oho shia). The city is the southern terminus of the Pan-American Highway.

The city prides itself as “the end of the world” because of the highways terminating there. The high population is due to the Argentine government’s program to provide tax breaks and subsidies to foreign companies to locate light manufacturing and assembly operations there. As a result, there has been a dramatic increase in population over the past 15 years. The area has shallow top soil and extremely cold winters resulting in slow growing trees and limited vegetation.

There are abundant populations of sea birds.

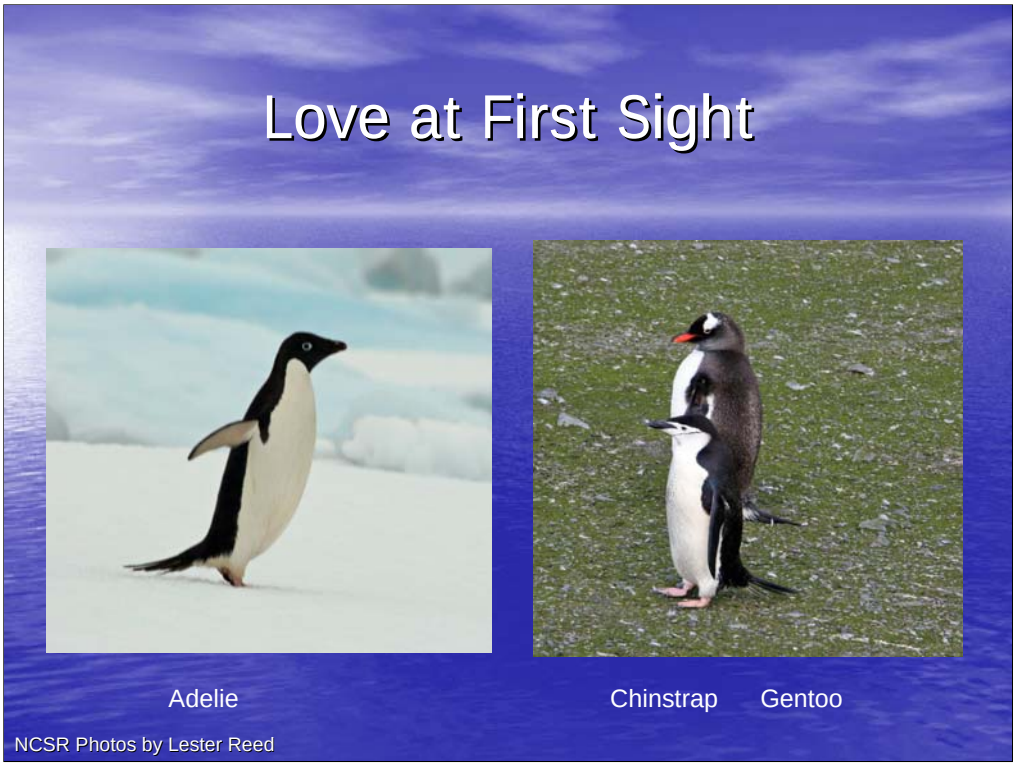
Sea mammals such as sea lions are plentiful as are colonies of Rockhopper Penguins.



Again, using the National Geographic Endeavour for home during the Antarctic cruise, the group of tourist adventurers set sail.

Accompanied during the two-day sail by a variety of albatross and petrels, most passengers were overjoyed to reach land as motion sickness had taken its toll during the rough passage south.

Our first stop was late the second day at a small island with large colonies of Chinstrap and Gentoo penguins. The chicks were up and around and beginning to develop feathers. Also, many adults were starting their molt which is a very stressful time. The enforced fast (they can not enter the water to feed) and high energy requirement needed for forming new feathers simply has to be stoically endured each year. Everyone from the ship was very careful not to disturb these molting penguins.



The three main penguins that nest on shore in the Antarctic are in the “brush tail family” (Clearly seen in these photos.)

Adelie: The penguin on the left is the smallest of this group measuring 25 inches and weighing 9 pounds. There are an estimated 2.5 million pairs of Adelies.

Chinstrap: The penguin on the right forefront is easily identified by the black chinstrap. They are 29 inches tall and weigh 10 pounds. There are an estimated 7.5 million breeding pairs.

Gentoo: The penguin in the background walking with the Chinstrap is a Gentoo, clearly distinguishable by the bright bill and white head spot. They are among the largest of the penguins with males reaching 36 inches and 18 pounds, females are somewhat smaller. There are an estimated 300 thousand breeding pairs.

In this slide are:

Upper left – a parent (both parents care for the chicks) regurgitates food for the chick to eat.

Right – a chick in transition from down to feathers. As soon as the feathers are grown in, the chicks are "*on their own*" and must go to sea and catch their own food. A very difficult transition as far as the young chick is concerned, but a welcome relief to the parents.

Lower left – Although they spend most of their time swimming under water with quick pop-ups to breathe, they are quite adept at swimming on the surface. Underwater, penguins can reach swimming speeds of 30 miles per hour.

Penguins are often thought of in anthropomorphic terms. Here is a series of photos for enjoyment and to illustrate why penguins are popular and easily interpreted to be “human-like” (slides 43-46).


Well wading in is a better idea
Boy this is getting deep
NCSR Photos by Lester Reed

See above


Here Goes!
Ever see a Penguin do the backstroke?
NCSR Photos by Lester Reed

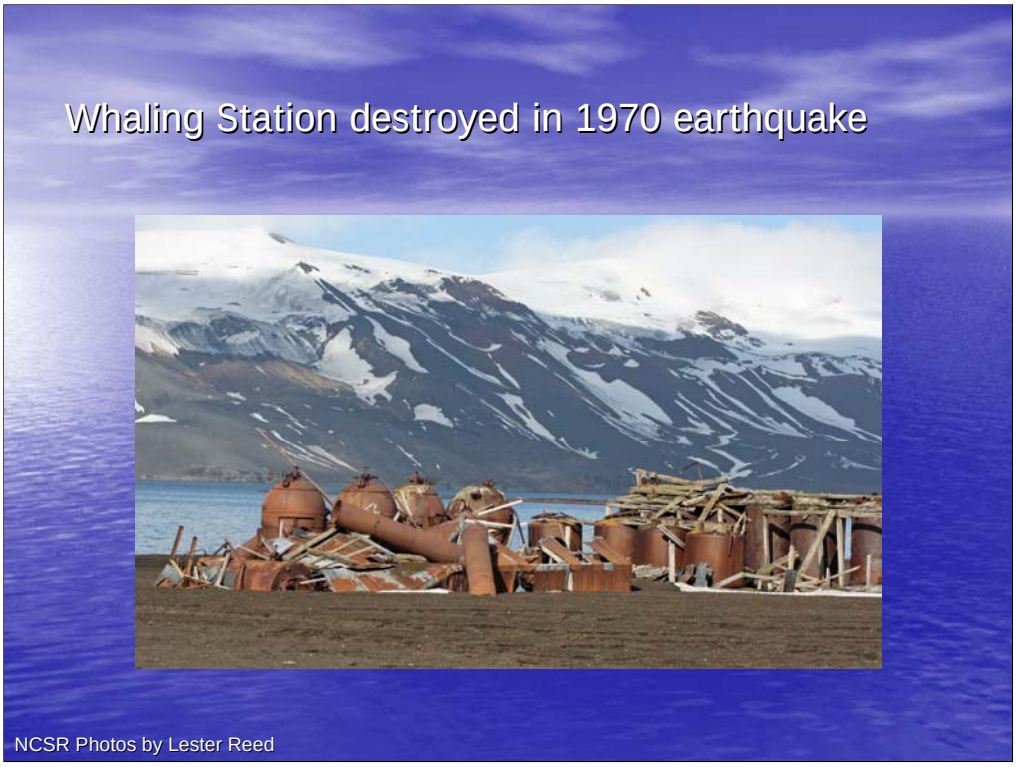
See above

See above

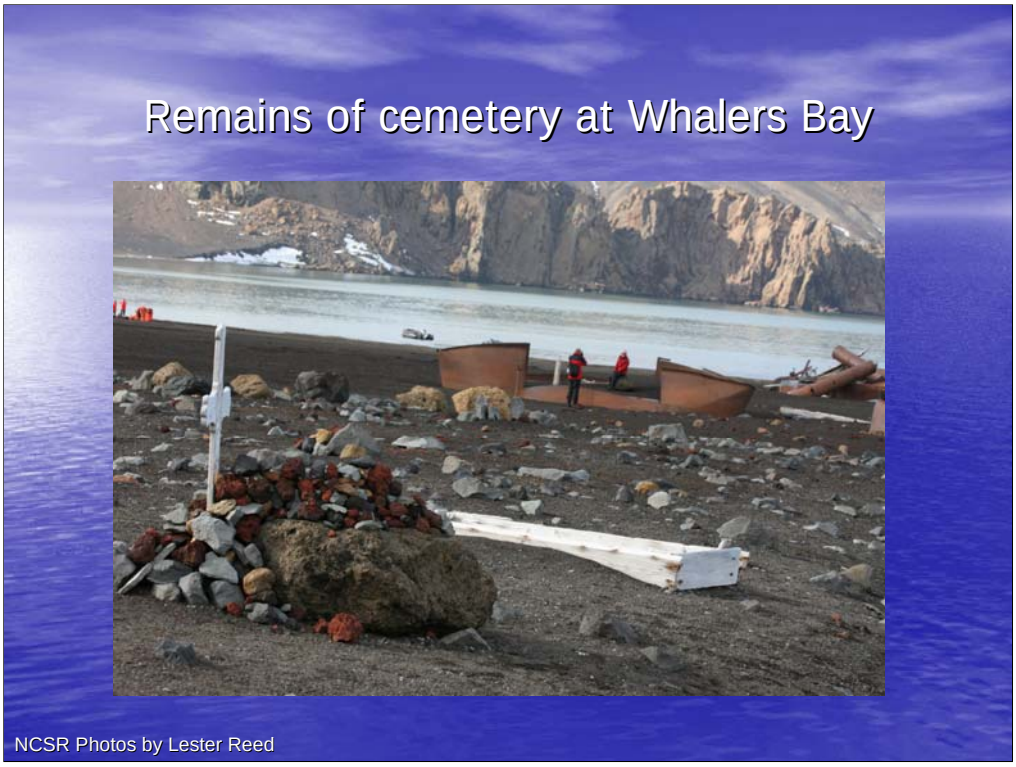
These Chinstraps are passing to and from the water. However, in the photo they can be easily interpreted as “dancing”.

These young penguins are all clumped together gathering up their nerve to dive in and become "birds who fly under water". It takes a bit of courage to start their new lives.

Deception Island, so called by early seamen since the small entrance, named Neptune's Bellows, to the protected harbor was easily missed. It was a major whaling site until 1931 when improvements to on-board ship processing of whales made the station uneconomical to operate. Over the years, Great Britain, Argentina and Chile have contested control over the island. Although the Antarctica Treaty has put land claims in abeyance, it does not require countries renounce those claims. However, seismic activity has put an end to active use of the island. Eruptions in late 1960s and early 1970s destroyed most of the buildings and equipment. The island is now considered a restless caldera with a significant volcanic risk. Today, it is a frequent stop for tour ships.



The whale processing operation was conducted both on factory ships and on shore. These are the remains of the rendering tanks that produced oil and other materials from whale carcass. Abandoned prior to the international agreement that requires dismantling of any abandoned site, these ruins remain.



Forty five (45) men were buried in the station's cemetery, but the cemetery was destroyed in a 1969 eruption. A few crosses have been re-erected as a memorial to those whose remains had rested in the cemetery.

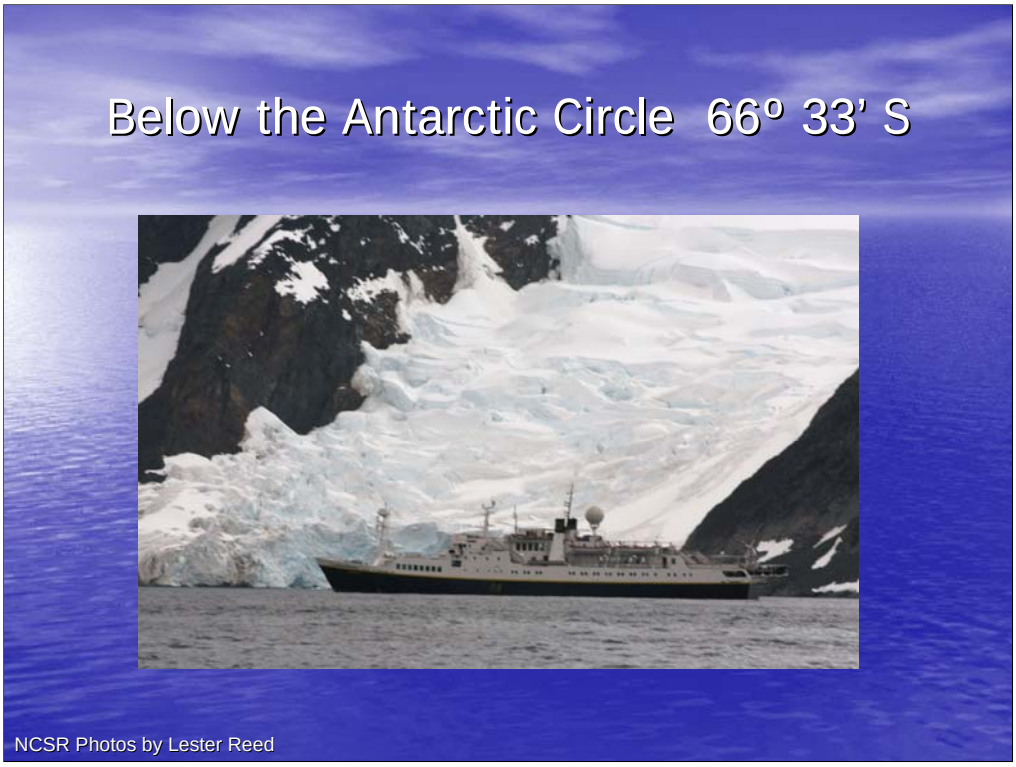
A walk on the beach at Deception Island is contested by a fur seal.

Once out of sight, the seal feels free to relax. These seals are fast and can run down a person if they are too close. Visitors are instructed to give them a wide berth and never get between them and the water.

A cut in the wall, called Neptune’s Window, provides an opportunity to get a view of the sea surrounding Deception Island. It is a bit of a climb but well worth it.

It also provides a view of the steep interior walls. The stark nature of the landscape holds a special kind of magnificence.

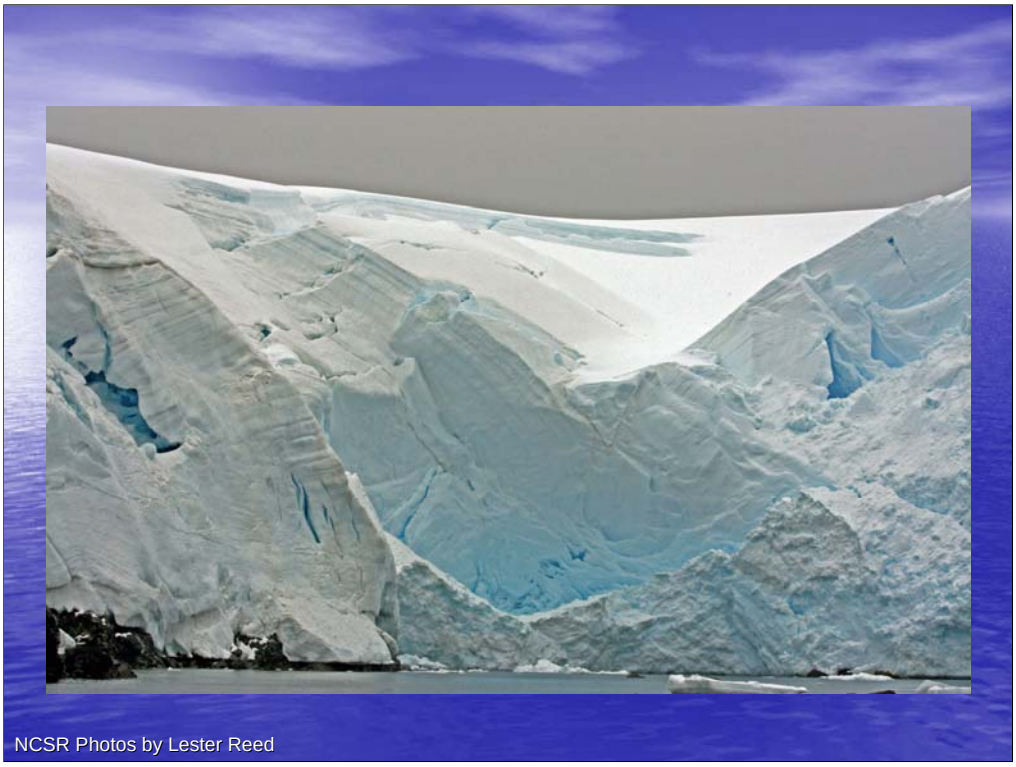
A unique part of the limited flora of Antarctica is “snow algae” (*Chamydomonas nivalis*). These algae are found in numerous high altitude areas with snow and ice fields as well as in low temperature settings such as Polar Regions. Often red or pink, it also comes in other shades. The color protects the algae from ultraviolet rays. *Scientific American* reported in 2003 “scientists report this week in the online edition of the *Proceedings of the National Academy of Sciences* that gas-exchange from snow-algae-covered areas might represent a small, but significant global carbon sink not previously noted, because summer snowfields cover significant areas of the Earth.”



We sailed to below the Antarctic Circle, not generally done due to weather and lack of landing sites. This is one of the major differences between the poles. In the Arctic, there is significant activity well above the circle. The difference is the result of the geographic differences discussed at the beginning of the presentation which make the North Polar Region able to support vegetation, wildlife and human activity. The weather soon turned on our venture south with fog, snow and wind, so we also turned and headed north.

Ice is the major physical presence that defines Antarctica from tubular icebergs, sea ice and massive glaciers and ice cliffs. This berg has an arched formation caused by wind and water erosion. It will soon roll and the bottom surface will bring a new form above water.

This ice cliff illustrates the structure of the Antarctic ice formation. Each year, there is an accumulation of snow that builds the coverage. The layers can be clearly seen much like rings of a tree. The chasm is clearly visible with its deceiving cover at the surface. The danger of walking on a snow-covered area such as this is clearly evident and illustrates how climbers often are victims of falling into chasms.

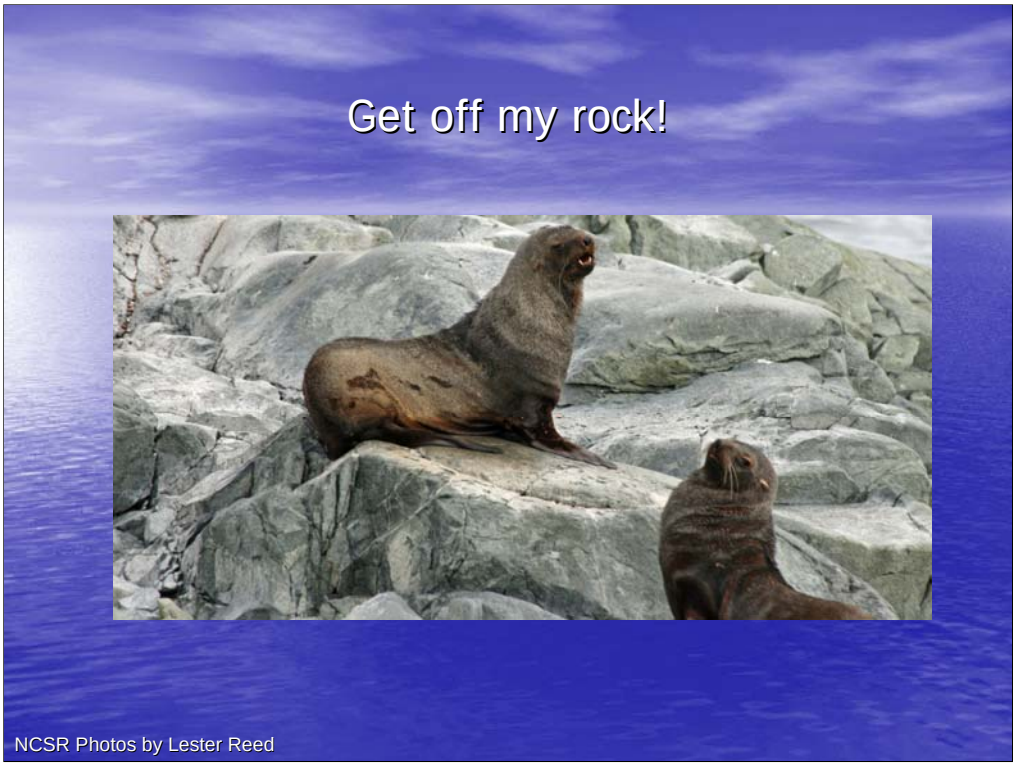


The lower areas of this glacial flow are in contact with the water. This is the eroding force that undermines the flow and causes the break-off of parts of the glacier, a process called “calving”.

The physical presence of the Antarctic is varied. It ranges from cloud shrouded mountains (upper left), ice flows (upper right), massive glacier fronts (lower left), and unique formations such as this ice bridge that formed over a passage between rock formations (lower right).

Winds often keep high and steep areas free from snow accumulation. This formation reflects the sun from its near vertical surfaces, which shimmer as if covered in gold.

Seals are one of the major residents of Antarctica. The seals, order Pinnipedia, have three families. Two of these are found in Antarctica, the true seals or earless seals and the eared seals. Within these families, six distinct species live in the Antarctic region. Besides absence or presence of external ears, the two families differ in their flipper-like feet. The eared seals such as the fur seals can stand on their flippers and are agile on land. The true seal's flippers are short and effective in the water, but do not serve the seals well on land. On land these earless seals squirm for mobility.

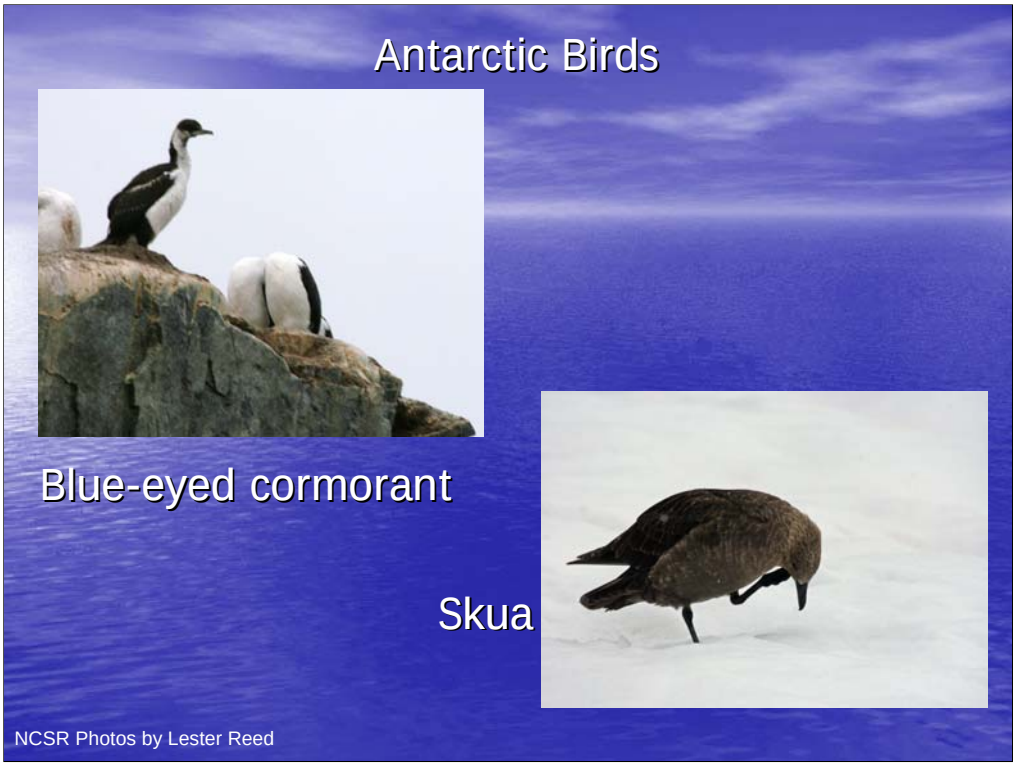


The fur seal is now becoming plentiful. However, at the turn of the 20th century they were thought to be nearly extinct due to hunting by American and British sealers. Over the last 100 years, the populations have rebounded and are currently protected by numerous treaties and national laws. The current population is wide spread and is estimated to be around 4 million.

One of the more rare color variants of the fur seal is this Honey Blonde.

Seals spend most of their time at sea, but do take advantage of hauling out on shore to rest. Obvious comfort is in the eye, or more appropriate in the blubber of the beholder.

These are Weddell seals. They are part of the earless family. There are an estimated 15 million Weddell seals and limited commercial hunting of these seals is allowed.

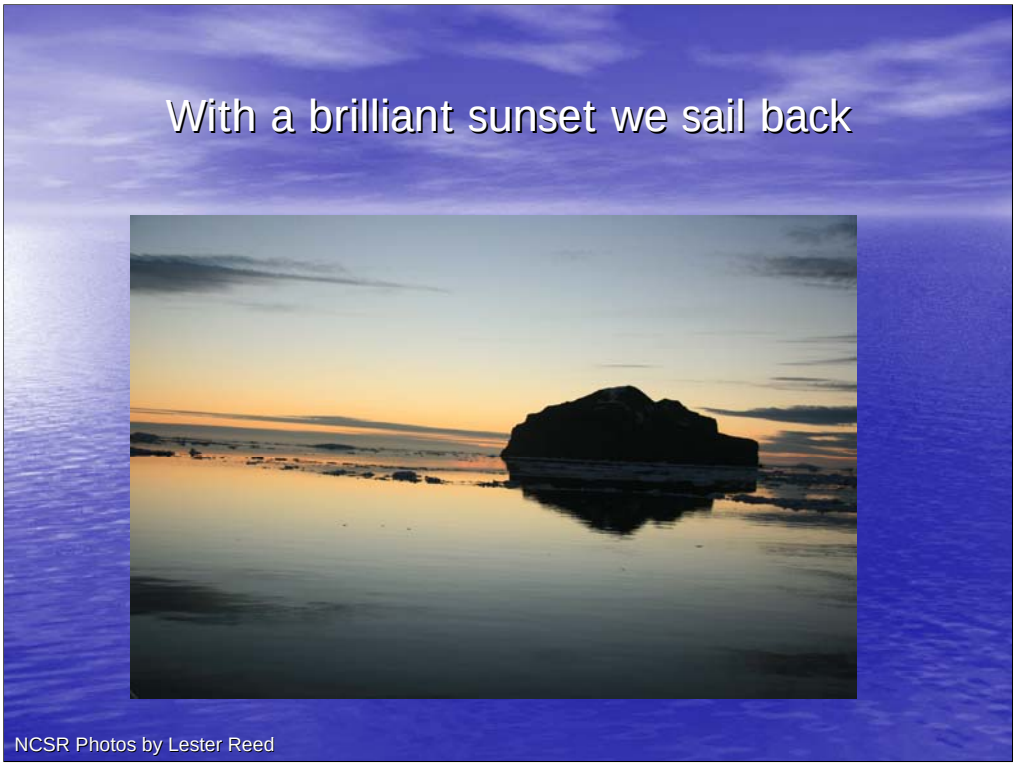


The bird populations of Antarctica include the Blue-eyed Shags or Cormorant and the Skua. The Skua is the infamous bird in recent movies shown killing and eating penguin chicks. They also attack other birds to steal their food and in general are considered to be unfriendly neighbors.

The Kelp Gull is the only gull resident of Antarctica. Their behavior is essentially the same as their northern relatives except they do engage in long migratory flights unlike other gulls who generally stick to home. The Sheathbill, a pigeon- sized bird, is a scavenger living on offal and other decaying foods.

The whale population of Antarctica includes 12 varieties. The Humpback was the one we saw most often. Many of the whales are still recovering from the exploitative hunting through the 20th century. Although there is international and national protection for whales, it is poorly enforced and commercial hunting persists under the guise of “scientific research”.

There are numerous international programs identifying and tracking whales through their unique trailing edge notching on the fluke. One of the largest catalogs is maintained by the College of the Atlantic, Bar Harbor, Maine.



The approaching end of summer results in spectacular sunrises and sunsets. It also signals the end to the summer research and tourist seasons.

The Geographic *Endeavour* sails back north after a very successful cruise to the White Continent.