Ursus arctos and *Ursus maritimus*

Name: Charles Darwin

Biology 11 - Block: A

Ursus arctos - Brown Bear

Kingdom: Animalia

Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Ursidae
Genus: Ursus
Species: arctos

Morphology - *Ursus arctos*

Ursus arctos, the brown bear, is a large carnivore, 1 - 2.8 meters from head to posterior. Their mass ranges from 80 - 600 kg in weight. In general males are larges than females, both in terms of length and mass. The average mass of adult mass is 389 kg and 207 kg for females. All ursids walk on four legs, and *Ursus arctos* ranges from 90 - 150 cm at shoulder height. However, if the bear rears on its hind legs, they are often approximately 8 ft in height.

One of the characteristic features of the brown bear is a large hump above the shoulder and a concave facial profile. As the common name indicates, the fur of *Ursus arctos* is brown in colour. However, there is phenotypic variation from nearly cream to black in colour.

- from Encyclopedia of Life - University of Michigan

Ursus maritimus - Polar Bear

Kingdom: Animalia

Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Ursidae
Genus: Ursus
Species: arctos

Morphology - *Ursus maritimus*

Ursus maritimus is the polar bear. On average it is larger than *Ursus arctos*. The body shape is similar to the brown bear, but it lacks the shoulder hump and displays a more elongated neck.

Polar bears average 1.6 m at the shoulder and 1.8 - 2.5 m in length from nose to rump. Males are larger in terms of length and mass and average 300 - 800 kg. Females, on the other hand, average 150 - 300 kg.

Both males and females have black skin with a transparent fur. The refraction of sun light on the transparent hair gives the polar bear a white colour, though it can often appear to have a yellowish tinge due to oxidation.

- from Encyclopedia of Life - BioPedia

Populations and Conservation Status - *Ursus arctos*

Ursus arctos is the most widespread organism in the *Ursus* genus. Its range spans most of North America and also includes areas of Europe, Asia, the Middle East, and North Africa.

The global population of *Ursus arctos* is estimated at 200, 000. The largest populations exist in Russia, Canada, and in the United States of America, specifically in Alaska.

The conservation status of *Ursus arctos* under the International Union for the Conservation of Nature (IUCN) is “Least Concern”. This means that the species is currently widespread and abundant.

- from IUCN Red List

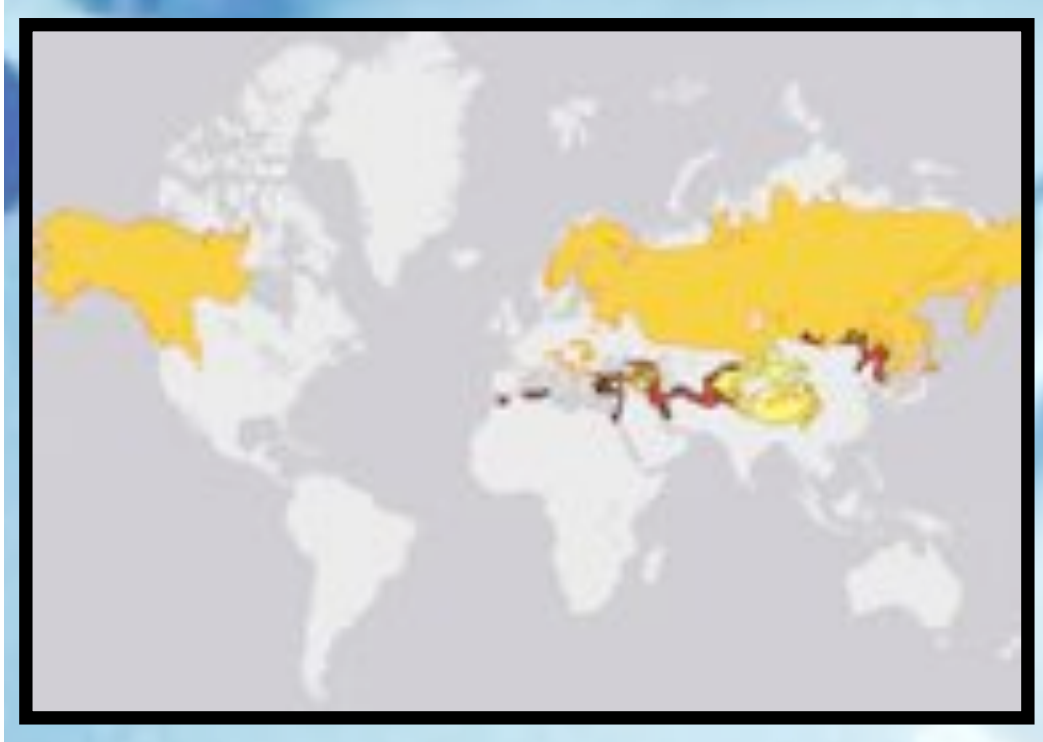
Populations and Conservation Status - *Ursus maritimus*

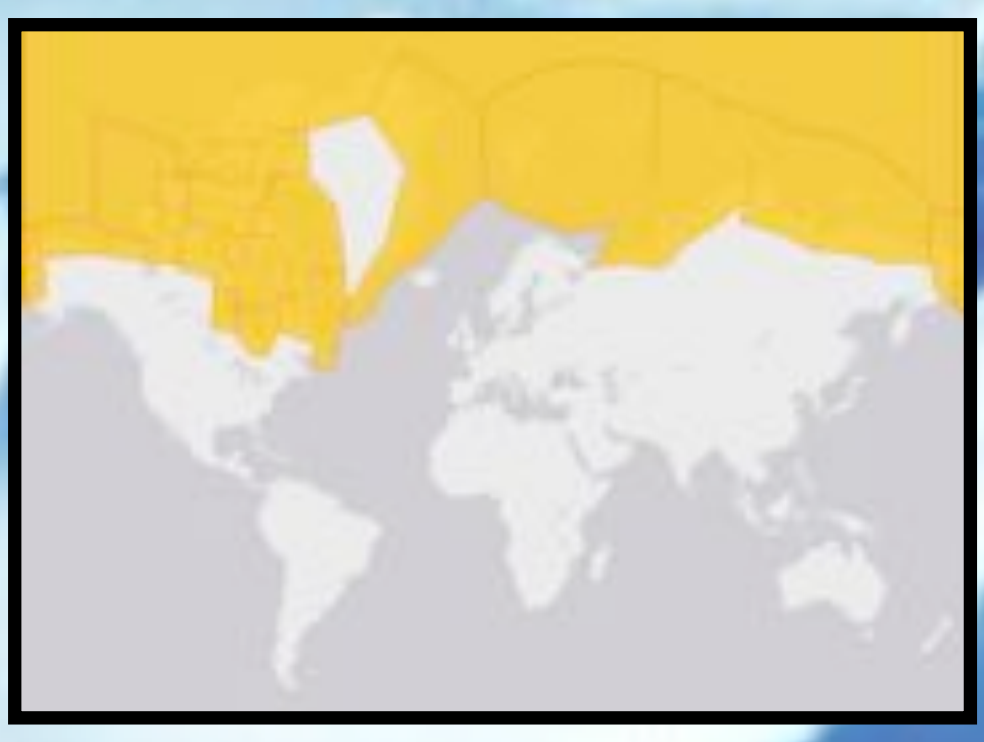
Ursus maritimus are highly specialized for life in the Arctic. Since they are so dependent on sea ice, climate change is a substantial threat to their populations.

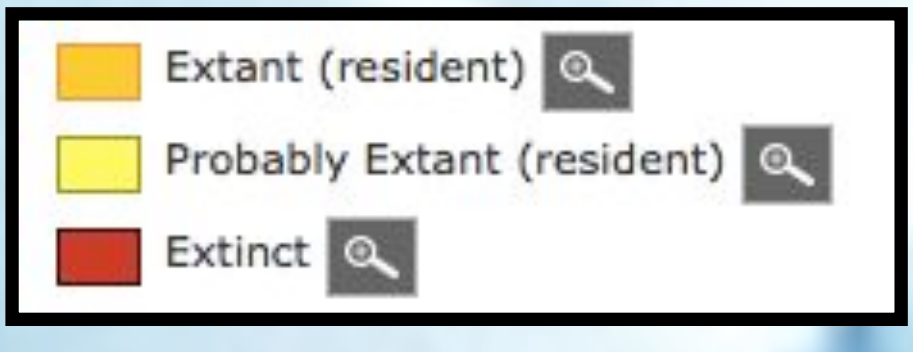
Their range is throughout the ice-covered waters of the Arctic, including Canada, Greenland, Norway, Russia, Svalbard, and the United States of America, specifically in Alaska. Estimated global population is between 20,000 and 25,000 bears.

The conservation status of *Ursus maritimus* under the International Union for the Conservation of Nature (IUCN) is listed as “vulnerable A3”. This classification corresponds to an assessment of an anticipated “[reduction of] more than 50% in the next ten years or three generations”.

- from IUCN Red List







National Geographic News:
Grizzly-Polar Bear Hybrid Found - But What Does It Mean?

In 2006 a bear shot on a hunt in the Canadian Arctic was confirmed to be a hybrid between a polar bear and a grizzly bear, which is a subspecies of *Ursus arctos*. The bear is the offspring of a male grizzly and a female polar bear.

The deceased bear displayed an intermediate phenotype for fur colour, white coloured fur with brown patches. It also possessed the facial features and humped back characteristic of a brown bear.

Unofficial names for the hybrid include “grolar” and “prizzly” bear. The two species have been known to overlap in and around Nunavut for the last 50 years though some believe that climate change may increase incidences of overlap.

The hybrid is possible because the two species are closely related, splitting less than a million years ago. Hybrids have been reported in zoos but never before confirmed in the wild. Genetic analysis confirms this hybrid is not a common occurrence.

BBC News: Polar bear plus grizzly equals?

In 2004 two polar bear-grizzly bear hybrids were born at Osnabruck Zoo in Germany. Though both *Ursus arctos* and *Ursus maritimus* have been kept in the same enclosure since 1980, this is the first hybrid offspring born.

Clockwise: A female hybrid, male hybrid, polar bear and brown bear (all pictures courtesy of Alexandra Preuß)

The offspring were removed from both parents and placed in a separated enclosure so their behaviour and instincts could be studied.

The hybrid bears display many mixed behaviours and characteristics of the parent species. The hybrids are intermediate in size, have the long neck of polar bears and the shoulder hump of a brown bear. The hair of the hybrids exist in a range throughout their bodies from very polar bear like to very grizzly-like. In terms of behaviour the bears act more like *Ursus maritimus* using their front legs to stamp and teeth to hurl objects.

It is important to study these bears as more naturally occurring hybrids may be found in the future.

Ursus arctos x *maritimus* - the current situation

With increasing climate change, some experts theorize that brown bears, specifically the grizzly subspecies, *Ursus arctos* subsp. *horribilis,* may extend their range northward. This co-insides with polar bears, *Ursus maritimus*, moving onto the mainland for longer periods of the year due to melting of sea ice.

This change in range is leading to contact between the species during breeding season. Naturally occurring hybrids of the two species have been reported in Canada's Arctic. Hybrids have been found in zoos in the past but it seems that in the wild reproductive isolation, in the form of geographic isolation, had kept the two species apart since they speciated less than one million years ago.

Hybrids in zoos are currently being studied to observe the behaviour while both live and deceased specimens are being studied for morphology and DNA.

Beaty Biodiversity Museum

A local natural history museum, Beaty Biodiversity Museum, on the University of British Columbia campus houses specimens of both *Ursus arctos* and *Ursus maritimus*.

There are 41 specimens of the brown bear, of varying subspecies, on the online database, VertNet. Of those 41, 21 specimens are grizzly bears. The majority of the specimens come from British Columbia. This is logical as the museum specializes in BC organisms. However, there are also a number of specimens from Alaska. Most of these specimens were collected in the first half of the 20th century. Nine specimens have geolocation data associated with them. Most of the specimens are skulls, but others include skins or paws.

The UBC Beaty Biodiversity Museum has three records of *Ursus maritimus* on their online database. One specimen is from BC and the other two come from the Northwest Territories. They were collected in 1959 and 1965. All three specimens are skulls.

The above represent the data currently available online, this however does not mean the museum does not possess more specimens of the species in question. The museum may have more specimens and electronic data which has not yet been uploaded to VertNet.

However, as the Cowan Tetrapod Collection is no longer actively growing, this information is likely the entirely of specimens for these species.

Museum specimens are a priceless resource to scientists. Studying specimens often allows them to become familiar with a morphology before studying an organism out in the wild. It also allows scientists to compare the morphology of current and past organisms of the same species to see if shifts in phenotypes have occurred. Even though specimens may be hundreds of years old, they are often still a viable source of DNA for genetic testing. Material which can be tested, in animals, includes both the nuclear and mitochondrial DNA.

BEATY
BIODIVERSITY MUSEUM

Experimental Design and Further Evidence

In order to give an accurate evaluation about the species rank of brown bears and polar bears I would want to collect additional evidence.

The first species concept I would test is the Biological Species Concept. In captivity I would take F1 *Ursus arctos* x *maritimus* hybrids and see if they are fertile. If the hybrids are sterile, the reproductive isolation is still complete. If a hybrid is able to produce a fertile offspring with another hybrid of a member from either parent species it would prompt further testing.

My next step would to look in the wild. I would take blood samples from brown bears and polar bears throughout the range overlap. In order for the bears to be considered one species a fertile hybrid would also have to be found in nature. DNA evidence could reveal if F1 or even F2 hybrids already exist in the wild.

Evidence may reveal that certain populations of polar bears and brown bears show an admixture of hybrid DNA in their genome. If this is the case, I would compare the DNA from the current populations to historic populations in the same area using museum specimens.

If fertile hybrids do exist in nature and it is a recent phenomenon and the mixed DNA not a result of previous speciation, I would classify the bears are a single species, though perhaps different subspecies.

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