

The Arctic Realm

The Arctic Realm, as here defined, are those terrestrial areas where the average temperature for the warmest month is below 10°C. It therefore includes all of the Arctic Circle including almost all of Greenland, the northern coast of Siberia and northern Scandinavia, northern Alaska, and northern Canada including the high arctic islands. The focal point is of course the Arctic Ocean, the smallest, shallowest and coldest of the world's oceans and in many ways little more than an estuary of the North Atlantic. It consists of a roughly circular basin generally taken to include the Barents, Beaufort, Chuckchi, East Siberian, Greenland, Kara, Laptev and White seas, along with Hudson Bay and other tributary bodies of water. The latter is connected to the Pacific Ocean by the Bering Strait and to the Atlantic through the Greenland and Labrador seas. The Arctic Realm is bordered by the Nearctic and Palearctic realms to the south, and has affinities to both in terms of its fauna.

The Polar Ice Cap

The Earth's northern polar region is covered by floating pack ice (sea ice) over the Arctic Ocean, which for the purposes of this book are considered terrestrial. Portions of the ice that do not melt seasonally can become very thick, up to 3–4 m over large areas, with ridges of up to 20. One-year ice is usually around 1 m thick. With global warming, the extent of arctic ice has decreased about 4.2 per cent per decade since the 1980s.

The **polar bear** (*Ursus maritimus*) is the largest living bear species, as well as the world's largest land carnivore. It is distributed in low densities throughout the Arctic Circle. Although some occur in the permanent multi-year pack ice of the central Arctic basin, they are most common in the annual ice over the continental shelf and inter-island archipelagos that surround it. The southern limit of the range extends to the coast of Newfoundland in the north-western Atlantic, while the northernmost record is just 25 km from the geographic North Pole. At least some populations seem to be nomadic, moving on the ice from east to west in a large circumpolar loop that includes Greenland and Baffin Island and in the Old World runs chiefly inside the large islands of arctic Eurasia. Polar bears move south in winter and north in summer, following the food supply – mainly seals – as the ice breaks up and shifts. This movement helps to explain the failure until relatively recently of any country to take

responsibility for the welfare of polar bear populations. The species has probably always been confined to arctic areas, although from time-to-time individuals have strayed to Iceland, the Norwegian mainland, Manchuria, and Japan. Those that have continuous access to sea ice are able to hunt throughout the year. However, those living in areas where the sea ice melts completely each summer are forced to spend several months on land, where they primarily fast on stored fat reserves until freeze-up. This use of land by polar bears during the ice-free season is increasing, at least in some areas. Intensive hunting of the species did not begin until the early seventeenth century, but then increased to such a degree that by 1850 it had been seriously depleted, particularly in the Spitsbergen area and on Novaya Zemlya. In addition, when most of the arctic whales had been exterminated men began to hunt the seals, which increased the hunting pressure on the polar bears as well. It soon became evident that polar bears were declining in number all over their range, including the New World. With increased protection populations began to recover, although 'subsistence harvesting' is still allowed in Alaska, Canada, and Greenland (but prohibited in Norway and Russia). Currently, it is the loss of arctic sea ice due to climate change that is the most serious threat.

Tundra

The vast arctic tundra is a circumpolar region in the far Northern Hemisphere, north of the boreal forest belt. It is here defined as comprising parts of northern coastal Scandinavia, northern coastal Russia, northern coastal Alaska, the Canadian High Arctic, and the islands of Greenland and Iceland.

The word 'tundra' usually refers only to areas where the subsoil is permanently frozen ('permafrost'). The lands within this region are typified by cold winters and cool summers, low precipitation, and an absence of trees. Biodiversity in the tundra is low, with the few plants and animals that manage to survive there being adapted to short growing seasons with long periods of sunlight, as well as to extreme cold, dark, snow and ice-covered winter conditions. Today they are essentially climax communities, with lichens serving as a basis for the existence of the large herds of reindeer or caribou (*Rangifer tarandus*), which in their turn are the staple winter food of the grey wolf (*Canis lupus*).

During prehistoric times the muskox (*Ovibos moschatus*) occurred throughout the Siberian and North American Arctic from the Urals east to Greenland and south as far as the ice sheets extended. It appears to have died out in Europe around 9000 years ago, and in Siberia around 2000 years ago. In the nineteenth century it was still to be found from Point Barrow, Alaska east across Canada to north-eastern Greenland and south to north-eastern Manitoba. By the early twentieth century it had been wiped out in Alaska by excessive hunting, but has made a considerable recovery in other areas. In the Canadian arctic they now inhabit most large islands (with the exception of Baffin Island) and the mainland tundra of the Northwest Territories and Nunavut from the coast of Hudson Bay west to almost the Mackenzie River, south to the tree line. They still occur naturally over the entire north of Greenland, in addition to several introduced populations further south. The species has also been reintroduced to parts of Alaska (beginning with Nunivak Island as early as 1935), Norway, and the Taimyr Peninsula and Wrangel Island in Russia. Taken together the species appears to be safe.

The reindeer (*Rangifer tarandus*), also known as the caribou in North America, is a type of deer found, as a species, both in the northernmost regions of North America and Greenland as well as in northern Eurasia. Despite this wide range many subspecies are threatened, and a few have already gone extinct. The Barren Ground caribou (*R. t. groenlandicus*) is found in the Canadian High Arctic islands (Nunavut and Northwest Territories) and western Greenland. The Peary caribou (*R. t. pearyi*) is found in the Canadian High Arctic islands (Nunavut and Northwest Territories). The Labrador caribou (*R. t. caboti*) occurs in the tundra regions of Quebec and Labrador. The Porcupine caribou (*R. t. granti*), so-named for the Porcupine River which runs through much of its range, lives in northern Alaska and adjacent north-western Canada (Yukon). The single herd of around 200,000 animals migrates some 2400 km each year between their winter range and their calving grounds near the Beaufort Sea, the longest land migration route of any mammal. It is highly vulnerable to climatic factors, and the population fluctuates greatly as a result. The Siberian tundra reindeer (*R. t. sibiricus*) is still found across much of northern Eurasia, but has been supplanted almost everywhere by domesticated reindeer. The largest remaining population of wild reindeer in the Old World lives in the Pyasina River drainage on the Taimyr Peninsula in north-central Siberia, where the number of individuals exceeds 100,000 as a result of partial protection.

The **snowy owl** (*Bubo scandiacus*) still has a considerable range across predominantly open tundra regions from western Scandinavia through northern Russia to Alaska, northern Canada, and Greenland. It has also bred occasionally in Iceland and in the United Kingdom. During the winter the birds move further south into the mainland United States, northern Europe, and northern Asia. The species appears to be undergoing a considerable decline in population, however, and is now thought to number less than 30,000.

The **Siberian crane** (*Leucogeranus leucogeranus*) is a large and spectacular snow-white species historically spread over an immense area from the Ural River in the south-east to the coast of the Arctic Ocean in north-eastern Siberia, where it favours bogs in conifer forests and steppes. Although long protected by law over most of its range, it was much persecuted and disturbed by hunters over its long migration routes and, like the more famous whooping crane (*Grus americana*) of North America, had difficulty maintaining its numbers. By the mid-twentieth century it was already reduced to two widely separated groups, known as the Eastern Flyway and Western/Central Flyway populations. The vast majority, the Eastern Flyway population, breed in the Yakutia region of north-eastern Arctic Russia between the Kolyma and Yana rivers and south to the Morma Mountains. Younger, non-breeding birds summer in Dauria on the border between Russia, Mongolia, and China, and occasionally in central Mongolia as well. The main wintering sites were formerly in the middle to lower reaches of the Yangtze River, although today almost all winter at or near Lake Poyang in China. The birds rely on a network of important wetlands along their migration route, which follows the Yana, Indigirka, and Kolyma rivers before continuing along the Aldan River and its tributaries and south into China. The other, remnant population of Siberian cranes (less than 20 birds) breeds in West Siberia and is divided into two further subpopulations, the Western Asian Flyway and Central Asian Flyway flocks. The Central Asian flock breeds in the Kunovat River drainage in Russia, and historically wintered in Keladeo National Park, north-western India. None have been seen at Keoladeo since the early 2000s, although unconfirmed but credible reports of passing birds continue from Russia, Uzbekistan, Kazakhstan, Pakistan, and India. The Western Asian flock breeds in the Konda and Alymka river drainages of West Siberia, and winters in Fereydoonkenar in Iran. It uses the Volga River delta as a migration stopover, and passes over Azerbaijan during its migration. Captive-breeding and reintroduction efforts have recently begun in Iran. Currently, the total population for the species as a whole is about 3750, up from less than 2000 in 1965.

The **red-breasted goose** (*Branta ruficollis*) breeds on the Taimyr, Gydan, and Yamal peninsulas of north-central Russia. Prior to the 1950s much of the population wintered along the western coast of the Caspian Sea, primarily in Azerbaijan, and in Iran and Iraq, although the wintering grounds thereafter rapidly shifted to the western Black Sea coast. The total number is small and prone to dramatic fluctuations for reasons that are not fully understood.

The **lesser white-fronted goose** (*Anser erythropus*) historically bred across much of subarctic Eurasia but is now confined to four main areas of northern Scandinavia and the northern coast of Siberia, from where it migrates in winter to Europe, the Middle East, and southern Asia. It has undergone a significant decline due to by-catch mortality in gillnets, oil pollution, disease, and hunting.

The **long-tailed duck** (*Clangula hyemalis*) has a circumpolar distribution, breeding along the arctic coasts of North America, Greenland, Iceland, Europe, and Asia, from where it winters in the north-eastern United States, north-western Europe, and in central and western coastal Asia. It is threatened by hunting, fisheries by-catch, pollution, and disease.

Steller's eider (*Polysticta stelleri*) is a small sea duck that breeds patchily along the northern coasts of Siberia and Alaska, from where it winters in Novaya Zemlya, Norway, south-western Alaska, and northern Japan. It has undergone a significant decline, particularly in Alaska, due to hunting, habitat destruction, and possibly the effects of climate change.

The **Eskimo curlew** (*Numenius borealis*) was historically abundant in its breeding grounds on the barren tundra of Canada north of the Arctic Circle, roughly between the Bathurst Peninsula and Point Lake and perhaps extending into Alaska. It migrated southward across Hudson Bay to Labrador and New England, whence it started its non-stop flight over the Atlantic Ocean and the Caribbean Sea to winter in southernmost South America. The spring flight followed a more westerly route, because there are records indicating a flyway passing over Yucatán, Texas, and west of the Great Lakes to north-western Canada. Hence, it flew twice a year across both Americas. Excessive shooting during the migration in eastern Canada and New England is thought to account for the tragic decline of this species. In 1863 over 7000 birds were killed in one day on Nantucket Island. As late as the period between 1856 and 1875 immense flocks used to rest in Texas, but by 1905 only three birds were seen there. Hecatombs of these curlews were shot as they migrated across the United States. Hunters sent wagonloads of birds back from the shooting grounds. They were very easy to kill, because they fed close together and were trustful of humans. In 1929 A. C. Bent, in his *Life Histories of North American Shore Birds*, declared of the curlew: 'It is now but a memory of the past.' However, in 1932 an individual was taken in Newfoundland, and a week later four were seen on Long Island. It was last confirmed from its wintering grounds in South America in 1939. Sporadic sight records followed elsewhere at long intervals: 1945, 1946, 1950, 1959, 1960, 1962, 1963, and 1970 on the coast of Texas and Louisiana as well as on the Atlantic coast. Some of these are doubtful, but in 1963 one bird was shot with certainty in Barbados. While there have been several unconfirmed reports in the decades since, with the latest alleged sighting occurring in Barbados as recently as 2012, the species is now almost certainly extinct.

A related species, the **bristle-thighed curlew** (*N. tahitiensis*), breeds in the tundra on the lower Yukon River and the central Seward Peninsula of western Alaska, wintering on various islands in the South Pacific. The total population is estimated at around 10,000.

Two migratory wading birds of the genus *Calidris* are threatened by coastal development in their wintering grounds. The **spoon-billed sandpiper** (*C. pygmaea*) breeds in north-



Figure 1.1 One of four known photos of a living Eskimo curlew, taken on Galveston Island, Texas, in 1962. (Credit: Don Bleitz, courtesy of the archives of the Western Foundation of Vertebrate Zoology, Camarillo, California.)

eastern Russia and winters in South East Asia, where it has declined dramatically since the 1970s. The current total population is believed to be around 500. The **great knot** (*C. tenuirostris*) breeds in north-eastern Siberia and winters mainly in Australia, but also patchily throughout the coastal areas of South and South East Asia and the Arabian Peninsula.

Coasts and Satellite Islands

This section includes the coastal areas of northern Russia, northern Alaska, and northern Canada (along with the High Arctic islands), as well as Greenland, Iceland, and various smaller islands.

The **walrus** (*Odobenus rosmarus*) is a very large, flippers marine mammal characterized by its tusks and whiskers, which it uses to help obtain the molluscs upon which it feeds. It is still found across a large area of polar seas, although its distribution was much reduced as a result of the severe exploitation that began in the sixteenth century. It was not until the introduction of modern firearms and arctic transport, however, that the species began to be seriously threatened. It was considered an important natural resource, yielding oil, hides, and ivory. Now somewhat protected from hunting, it still faces an uncertain future due to habitat changes brought on by climate change. The Atlantic walrus (*O. r. rosmarus*) was historically common along the coasts of the North Atlantic and the Arctic Ocean southward to the Russian and Norwegian mainland and, in the Western Hemisphere, to the coast of Labrador, with vagrants being reported as far south as New England and the Bay of Biscay. Today it is found discontinuously from the eastern Canadian Arctic and Greenland to the western Kara Sea. The Pacific walrus (*O. r. divergens*) recovered remarkably from a seriously depleted state in the mid-twentieth century, and currently ranges from the Bering and Chukchi seas, which constitutes the core of its range, to

the Laptev Sea in the west and the Beaufort Sea in the east. Vagrants are occasionally reported in the North Pacific south to Japan and south-central Alaska.

The **hooded seal** (*Cystophora cristata*) is so-named for an inflatable sac found on the head of adult males. It lives on drifting pack ice in the Arctic Ocean and the central and western North Atlantic, ranging from Svalbard in the east to the Gulf of St. Lawrence. Prior to the 1940s adults were hunted extensively for their leather and oil, and the young for their distinctive blue and black pelts. The animals are also frequently killed for subsistence hunting. Numbers have increased in most areas with better protection in recent decades, which includes an allowable catch limit of 10,000 annually, but the species remains vulnerable to the effects of climate change.

The Ungava harbour seal (*Phoca vitulina mellonae*) is a freshwater species confined to a few lakes and rivers in northern Quebec, where the total population is thought to be less than 100.

The harp seal (*Pagophilus groenlandicus*) occurs in the northernmost parts of the Atlantic and throughout much of the Arctic Ocean. The species is strongly migratory, with the main breeding grounds in the White Sea, on the pack ice in Norwegian waters (particularly off Jan Mayen), off Labrador and northern Newfoundland, and in the Gulf of St. Lawrence. At the beginning of the twentieth century and even as late as the early 1940s the world population was estimated at about 10 million. Owing to reckless hunting this number had fallen to about 3 million within 20 years, where it has remained more or less stable ever since. A particularly cruel and barbaric form of commercial sealing, in which the pups are brutally bludgeoned for their fur, still takes place annually in Canada, Norway, Russia, and Greenland. The destruction is particularly marked in Newfoundland, where the small profit earned by seasonal hunters is far outweighed, economically, by the enormous damage done to Canada's international reputation.

The Arctic Archipelago

The Arctic Archipelago includes all of the high arctic islands lying to the north of the Canadian continental mainland, with the exception of Greenland.

Two subspecies of grey wolf (*Canis lupus*) historically inhabited the Arctic Archipelago. Bernard's grey wolf (*C. l. bernardi*) is known only from a few specimens collected from Banks and Victoria islands, where it died out around 1920. The Arctic wolf (*C. l. arctos*) is confined to the Queen Elizabeth Islands, but is not currently considered to be threatened.

Greenland

Greenland (Kalaallit Nunaat in Greenlandic; Grønland in Danish) is the world's largest island. It is almost entirely covered by a massive ice sheet, the weight of which has depressed the central land area to form a basin lying more than 300 m below sea level. Elevations along the more temperate coasts rise suddenly and steeply.

The East Greenland caribou (*Rangifer tarandus eogroenlandicus*) appears to have been confined to the tundra regions of eastern Greenland, where it went extinct around 1900.

Svalbard

Svalbard is an archipelago located about midway between Norway and the North Pole. Originally used as a whaling station during the seventeenth and eighteenth centuries, today the only permanently inhabited island is Spitsbergen.

The Svalbard reindeer (*Rangifer tarandus platyrhynchus*), the smallest of all the reindeer, is confined to the Svalbard Archipelago.

Novaya Zemlya

Novaya Zemlya is an archipelago in the Arctic Ocean of northern Russia and extreme north-eastern Europe. It is composed of two main islands, the northern Severny Island and the southern Yuzhny Island.

The Novaya Zemlya reindeer (*Rangifer tarandus pearsoni*) is confined to the archipelago. At the end of the nineteenth century there were about 20,000 reindeer on Novaya Zemlya. Heavily hunted both for local consumption as well as export, they would be reduced, only a few decades later, to just a handful of survivors on the northeastern part of Severny Island. Fortunately, a prohibition on hunting was put in place in time to save the subspecies, and it has since recovered.

Wrangel Island

Wrangel Island is located in the Arctic Ocean between the Chukchi and East Siberian seas.

The **Wrangel lemming** (*Lemmus portenkoi*) and **Wrangel collared lemming** (*Dicrostonyx vinogradovi*) are both confined to Wrangel Island, where they are considered intrinsically vulnerable due to their small range and marked population fluctuations.

Balance for the Arctic Realm

The Arctic Realm was among the last places on Earth to be permanently settled by humans. The first to live there arrived in Siberia around 20,000 years ago, from where they slowly migrated eastward across the Bering Strait land bridge to North America and, finally, Greenland. These prehistoric peoples were, and largely remain, nomadic hunter-gatherers, entirely dependent on the reindeer herds and marine mammals for sustenance. They ultimately developed into the Inuit, a group of culturally similar indigenous people that live throughout the region today.

Modern European exploration of the Arctic Realm also began relatively late. Greenland was first reached (and partially mapped) as early as 1499 by the Portuguese explorers Gaspar and Miguel Corte-Real. After that, exploration was undertaken either by land east from Russia, or by western Europeans seeking a Northwest Passage to the Old World. The latter

would result in the mapping of what is now the Canadian High Arctic, Alaska, and the islands of the northern Pacific. By the early twentieth century the focus was the North Pole. In 1908–09 the Americans Frederick Cook and Robert Peary each claimed to have reached it, although both are now widely doubted. In 1926 Roald Amundsen, Lincoln Ellsworth, and Umberto Nobile in the airship *Norge* became the first definitely known to have sighted the North Pole. With the coming of Europeans to the Arctic during the nineteenth and twentieth centuries, pollution and hunting began to take more of a toll, particularly on large animal populations. However, the latter were also responsible for the creation of the first national parks and environmental protections. The northern polar region remained relatively pristine up until very recently. Indeed, it still contains some of the last, and most extensive, wilderness areas remaining in the world. Today, however, the Arctic is being opened up at an increasing pace for exploitation of its vast wealth of natural resources, which include oil, natural gas, minerals, fish,

and, to some extent, forests. Settlement and tourism will only increase as human populations continue to expand, perhaps encouraged by the Arctic's extraordinary abundance of fresh-water (about one-fifth of the world's total). All of this will be to the detriment of its sensitive environment, fragmenting habitats, eroding ground cover and disturbing important breeding grounds. The primary threat, however, is now global warming, with the consequent shrinkage (and ultimately perhaps complete loss) of arctic sea ice and the Greenland ice sheet, as well as the thawing of permafrost.

In recent historical time (i.e. since A.D. 1500), the Arctic Realm has lost three subspecies of mammal and one species of bird. In addition, there are 14 species/9 subspecies currently threatened with extinction (that is to say, either Critically Endangered, Endangered or Vulnerable according to the IUCN Red List, as well as certain forms either listed as Data Deficient or Not Assessed but which are clearly at some risk of extinction). Of these, 5 species/9 subspecies are mammals, and 9 species are birds.

Vertebrate Class	Extinct	Possibly extinct	Extinct in the Wild	Threatened
Mammals	~ species	~ species	~ species	5 species
	3 subspecies	~ subspecies	~ subspecies	9 subspecies
	3 taxa	~ taxa	~ taxa	14 taxa
Birds	1 species	~ species	~ species	9 species
	~ subspecies	~ subspecies	~ subspecies	~ subspecies
	1 taxon	~ taxa	~ taxa	9 taxa
Total vertebrates	1 species	~ species	~ species	14 species
	3 subspecies	~ subspecies	~ subspecies	9 subspecies
	4 taxa	~ taxa	~ taxa	23 taxa

Note: ~, not applicable.