WILDLIFE AND GLOBAL WARMING

Navigating the Arctic Meltdown

WALRUSES

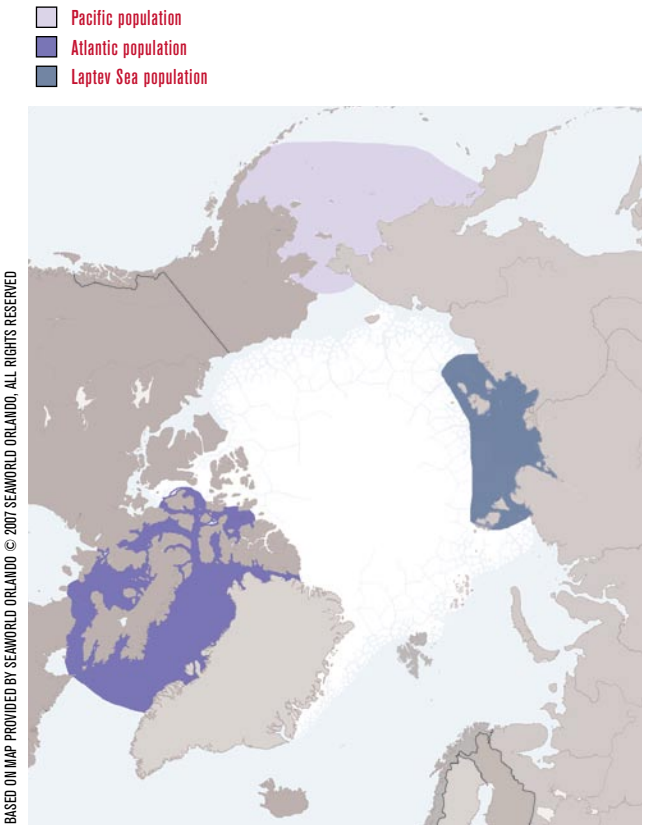
Food or rest—which to give up? This is the harsh choice faced by walruses as global warming accelerates melting of Arctic sea ice and lengthens the distance between shallow-water feeding grounds and ice floes where the animals haul out to rest and give birth. Newborn walrus calves must remain on the ice, safe from predation by orca whales, while their mothers shuttle between nursing the young and foraging on the sea-bottom. As climate change impacts shrink the sea ice pack, it puts the newborns' safe haven farther away from the mothers' food—meaning long, exhausting swims for the mothers, and more time alone for the calves.

In the summer of 2004, as the sea ice dwindled, shipboard researchers in the Beaufort Sea off the coast of Alaska encountered one of the starkest consequences of global warming: walrus calves abandoned by mothers that had returned to shallows, now far from ice, to feed. The nine calves spotted near the retreating ice were in water 3,000 feet deep—five times deeper than a walrus can dive. "We were [there] for 24 hours, and the calves would be swimming around us and crying," said Carin Ashjian, a biologist from Woods Hole Oceanographic Institution on the research expedition.

WEDDED TO THE ICE

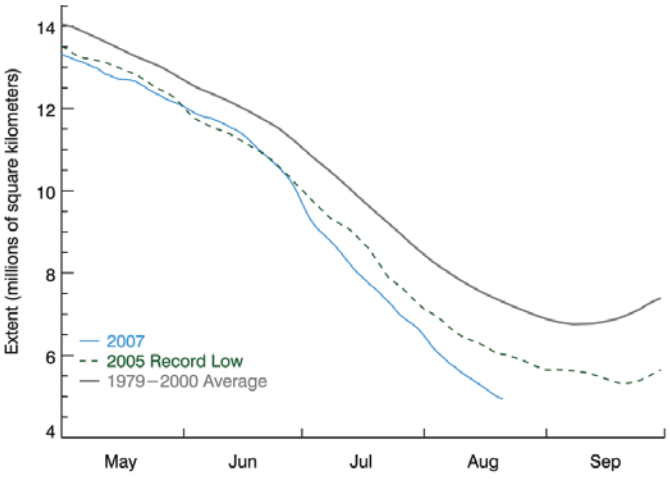
Walruses live exclusively in northern waters and are distributed around the Arctic Circle in three distinct populations. The Pacific population, found between Alaska and Russia in the Beaufort, Chukchi and Bering seas, is the largest, numbering about 200,000. The Atlantic population, found in the Hudson Bay and the waters off Baffin Island, Greenland and the Novaya Zemlya islands north of Russia, numbers about 15,000 individuals. A third population inhabits the Laptev Sea north of Siberia and little is known of the size and status of this population.

Walrus Habitat and Distribution



Walruses inhabit cold waters of the far north, and live in three distinct groups: the Pacific population, found between Russia and Alaska; the Atlantic population, found around Greenland and northeastern Canada; and the Laptev Sea population, north of Siberia.

Arctic Sea Ice Extent
(Area of ocean with at least 15 percent sea ice)



As the climate warms, it shrinks the Arctic sea ice on which walruses depend. A new record low for sea ice extent was set in 2007.

The walrus is one of the largest members of the pinniped family, a group that also includes seals and sea lions. Adult males can weigh as much as 5,000 pounds but typically are between 1,800 and 4,000 pounds, while female weights range from 900 to 2,500 pounds. Their front and hind limbs have evolved as two sets of flippers, making them ungainly on land but expertly adapted to swimming in the ocean at speeds of up to 20 miles per hour. Their wrinkled, brown skin, about an inch thick, covers a layer of insulating blubber that can be four to six inches thick, protecting the animal from frigid Arctic temperatures.

Walruses feed on the ocean floor in the relatively shallow waters of the continental shelf with the aid of their thick "mustaches" and long ivory tusks, common to both sexes. They drag their tusks, which are actually continually growing canine teeth, along the ocean floor to stir up a wide swath of sediment and the creatures living there. The animals then "root" through the sediment with their snouts, using the 450 or so sensitive bristles of the "mustache" to locate clams, mussels, worms and other invertebrates. A walrus can hold a clam in its lips to suck out the edible portion, then spit out the shell—sometimes eating thousands of clams in a single meal. They will also eat fish, carrion and occasionally seals.

Walruses can spend days at sea, but they haul out on ice floes, using their tusks for leverage, or on land to rest between foraging trips. When resting, the animals usually form large single-sex groups—often a thousand individuals or more—for protection from polar bears. Walruses can wield their tusks as weapons against predators, but their best defense is to haul out on remote sea ice. "They're very slow and clumsy out of water, hence they are vulnerable to predation," says Brian Kelly, manager of the National Science Foundation's Arctic sciences program. "They have to find offshore islands or rocks where there's no bears, no wolves, no humans. Sea ice, on the other hand, offers this huge expanse of area which is relatively predator-free."

The sea ice serves another important function: It sustains an entire food web. Algae grow in long trailing strands at the edge of the ice and in the nearby waters. These algae are eaten by tiny animals called zooplankton, which in turn feed larger animals. At every step along the way, particles of food and nutrients "rain" down onto the ocean floor, sustaining the massive beds of mollusks on which walruses feast.

During the breeding season in January and February, groups of 20 to 50 females haul out on the ice, and the males compete—pointing and striking their tusks at each other—for prime space in the adjacent water to display. Successful males display by making bell-like sounds underwater and clicking and whistling sounds above water. Females attracted by a male's "song" enter the water to mate. Young, weighing about 140 pounds, are born on land or on ice in the spring of the following year. Calves remain topside to avoid orca

predation. A rich food supply near the haul-out is critical to sustain the mothers while they nurse. Lactation lasts as long as two years and requires a lot of energy, so any extra time spent traveling to feeding grounds further depletes a nursing female's reserves, weakening her and her calf.

Females take six or seven years to reach breeding age, and then produce a calf only about once every three years. Their slow reproductive rate makes them vulnerable to increased mortality, such as from over-hunting. Inuit have long taken small numbers of walruses, but European exploitation of walruses for ivory, hides and blubber began in the 16th century and continued at unsustainable levels for hundreds of years. As a result, the Atlantic walrus population suffered substantial losses and was extirpated from the southern part of its range by the mid- to late-19th century. Whether current legal hunting levels are sustainable for the remaining northern populations is difficult to determine, given the challenges of counting and tracking these large mammals. In the spring of 2007, a team of researchers successfully satellite-tracked a female and her calf as they swam from Greenland to Baffin Island. This suggests that surveys in Greenland and Canadian high Arctic islands might be double-counting some of the same animals and thus overestimating population sizes and conservation status.

The Pacific population escaped large-scale commercial exploitation until the 19th century, and is more than 10 times larger than the Atlantic population today. Lack of coordination between the United States and Russia may still lead to unsustainable levels of hunting, and poaching remains a threat to the species given restrictions on trade in elephant ivory.

Walruses are potentially vulnerable to other disturbances in the Arctic as well, particularly any reduction in their food sources; noise from low-flying aircraft; and degradation, development or oil and mineral exploration at their land-based haul-out sites. Climate change, however, is rapidly becoming the most serious threat to walruses.

WARMING TRENDS

The Arctic ice cap varies in thickness and extent by season. In winter, a wider area of the ocean freezes, and the ice pack extends all the way to the northern edge of the landmasses surrounding the Arctic Ocean. In summer, some of this ice melts, creating a zone of open water between the continents and the ice. One of the most striking consequences of climate change has been the retreat of Arctic sea ice—that is, more of the ice pack is melting each summer and less is re-forming each winter. To make matters even worse, as ice that reflects most of the sun's light and heat is replaced by dark open water that absorbs most of the sun's heat, the process accelerates. As measured by its annual minimum extent in September, Arctic sea ice declined at a rate of 7.8 percent per decade from 1953 to 2006, and a new record low was set in August 2007.

The accelerated retreat of summer sea ice means that the ice edge disappears from the near-coast shallow water and instead moves to the deeper water of the open ocean. Walruses that haul out here to rest find that the sea floor is too far away for feeding. Even if the walruses could make the plunge, the sea bottom is much less productive—the nutrient "rain" of algae and organisms at the ice edge does little good in deep, frigid, lightless waters.

Walruses spend much of their lives in the water, but haul out on ice floes to rest and give birth. The ice provides a predator-free platform close to feeding grounds.

"The mollusks walruses feed on are confined to relatively shallow waters," says Erik Born of the Greenland Institute for Natural Resources. "Either the walruses can follow the pack-ice north, and stay over deeper waters where they cannot feed; or they could stay behind in open water without a chance to haul out and rest between their feeding." The problem is particularly acute for the Pacific population, because these animals do not have much option for hauling out on land instead of on ice: The feeding banks of the Bering Strait are located far from land. The animals in the Atlantic population can haul out on the shores of Greenland and Baffin Island—but there they are more vulnerable to hunters and poaching.

PREPARING FOR THE MELTDOWN

To protect the sea ice that shelters and helps feed walruses, we must act now to reduce the emission of greenhouse gases. In addition, we should take other important steps to help the walrus navigate a looming bottleneck of complex threats posed by climate change.

- **Improve understanding of the population dynamics and migration patterns of the Atlantic population.** The spring 2007 satellite-tracking project provided some of the first clues about walrus migrations and the connection between walruses on either side of the Labrador Sea. Much more information is needed to understand this population's habitat needs, fluctuations in numbers, and sensitivity to hunting and other human pressures.

- **Protect walruses at land-based haul-outs. As sea ice retreats far from the productive mussel beds, more walruses will be forced to haul out on land to rest near their food source.** Countries that have suitable land-based habitats should protect those areas where walruses are hauling out, and should take strong enforcement measures to protect walruses from illegal ivory harvesting.

- **Consider the impacts of commercial clam or mussel harvest.** As over-harvest, pollution, dredging and invasive species decimate clam and mussel beds farther south, commercial pressure mounts on mollusks in the north Atlantic and Pacific. Any expansion of clam and mussel harvest in walrus habitat should consider impacts on this marine mammal.

- **Limit continental shelf oil and gas exploration.** Oil and gas exploration activities, from low-flying airplanes to seismic testing, potentially disturb walruses and interfere with feeding, resting and rearing of young. Drilling activities also bring the risk of damaging spills, as well as sea floor infrastructure that degrades mussel beds.

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