

ARCTIC SEA ICE IS DISAPPEARING.

You Should Be Concerned

Report by **Jenny E. Ross**

During the past few decades, as the concentrations of carbon dioxide and other greenhouse gases in our atmosphere have significantly increased, temperatures have been rising ominously in the Arctic, and the vast cap of sea ice floating on the Arctic Ocean has been shrinking dramatically. By the end of the annual summer melt season in September 2012 – the last melt season for which final data were available before this issue of Ocean Geographic went to press in August – arctic sea ice had shrivelled to the lowest surface extent and volume ever documented by scientists. Compared to the average amount of sea ice that existed from 1979 to 2000, in September 2012 the ice covered only 51% as much of the ocean surface. The total volume of ice calculated by scientists in 2012 was 80% smaller than it was in 1979.

Ongoing human emissions of planet-heating gases will cause global climate change to worsen, and this arctic meltdown will continue and perhaps even accelerate. In fact, many scientists who specialize in studying the sea ice now expect the Arctic Ocean to be essentially ice-free for at least a portion of the summer within only a couple of decades, and perhaps sooner.

But most of us do not live in the Arctic and will never even visit the Far North. So why does the disappearance of the sea ice in that distant realm really matter?

Sea ice serves a wide variety of vital functions, and loss of the ice will have many extraordinarily important effects with far-reaching repercussions. Crucially, the vast expanse of reflective ice cover on the Arctic Ocean serves as our planet's most important air-conditioning system. Much of the sun's energy reaching the Arctic Ocean is reflected back out into space by the sea ice. On the other hand, in areas where the sea ice has melted, the dark ocean absorbs most of the sun's energy – a process that adds a lot of heat to Earth's climate system. In a vicious cycle, that additional temperature rise causes more ice to melt, which increases absorption of solar energy by the ice-free portions of the ocean, which raises temperatures even higher and causes more ice to melt.

The effects of sea-ice loss on arctic ecosystems will be extremely significant. Marine species dependent on the ice itself for essential life functions – from ice algae and zooplankton to arctic seals, walruses, and polar bears – are already being affected, and some are unlikely to survive over the long term if the ice continues to vanish. Rising ocean, air, and land temperatures associated with ice loss will transform ecosystems throughout the Far North, and some will eventually disappear entirely. Arctic Ocean waters once covered by a thick layer of ice will increasingly be in contact with the air as the ice shrinks, and will progressively acidify as they absorb more carbon dioxide directly from the atmosphere. This alteration of seawater chemistry will eventually impair the crucial shell-building and skeleton-constructing capacities of numerous organisms, including bivalve mollusks and crustaceans of all kinds. The resulting decline of these creatures will have devastating ripple effects throughout the entire Arctic Ocean food web.

As the sea ice continues to shrink and larger regions of the ocean are exposed to solar heating, the arctic atmosphere will become warmer and moister, likely increasing the frequency and severity of storms in the Far North. Tempests will churn the ocean, contribute to the ongoing disintegration of sea ice, endanger coastal communities and infrastructure as well as ocean-going vessels, and accelerate the speed and magnitude of shoreline erosion. Furthermore, far beyond the Arctic, weather in northern hemisphere temperate regions will be influenced in significant and potentially dangerous ways by the effects of ice loss on large-scale atmospheric circulation patterns. Extreme weather events including severe droughts and devastating floods – and, paradoxically, unusual outbreaks of bitterly cold temperatures – are expected to become more common as a consequence. In addition, melting of the Greenland ice sheet will worsen as the loss of sea ice continues to push arctic temperatures higher. Accelerated melting of the immense ice sheet will in turn escalate the rate and magnitude of sea level rise worldwide.

Relentlessly climbing arctic temperatures, dramatically worsened by loss of sea ice, will cause permafrost – permanently frozen ground – throughout the Far North to begin thawing on a very large scale. Much of the defrosting ground will collapse, the resulting damage to infrastructure in slumping areas will be widespread and costly, and some entire communities will have to be relocated. Ultimately, as huge regions of permafrost continue to thaw both on land and on the shallow continental shelves of the warming Arctic Ocean, gargantuan additional quantities of powerful greenhouse gases will be released into the atmosphere from decomposition of organic material in the previously-frozen soils. The result will be significant additional global heating and dire consequences around the world.

Clearly the disappearance of sea ice matters. In fact, the stakes could not be higher for the Arctic and for all of us. ○

Jenny E. Ross is an award-winning photographer and writer specializing in wildlife, ecosystems, earth systems, environmental issues, scientific research, and policy topics, with particular emphasis on the Arctic and climate change. She last wrote for Ocean Geographic about polar bears in the January 2012 issue. Look for a full discussion of arctic sea ice topics in a major feature article by Ms. Ross appearing in the January 2014 issue of Ocean Geographic.

RAPIDLY-MELTING SEA ICE in the Arctic Ocean's central polar basin during the record-setting melt season in 2012. © Jenny E. Ross




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