

# Arctic spring comes weeks earlier than a decade ago

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In the Earth's cold and icy far north, the harsh winters are giving way to spring weeks earlier than they did just a decade ago, researchers have reported in the June 19th issue of *Current Biology*. The finding in the Arctic, where the effects of global warming are expected to be most severe, offers an "early warning" of things to come on the rest of the planet, according to the researchers.

"Despite uncertainties in the magnitude of expected global warming over the next century, one consistent feature of extant and projected changes is that Arctic environments are and will be exposed to the greatest warming," said Dr. Toke T. Høye of the National Environmental Research Institute, University of Aarhus, Denmark. "Our study confirms what many people already think, that the seasons are changing and it is not just one or two warm years but a strong trend seen over a decade."

To uncover the effects of warming, the researchers turned to phenology, the study of the timing of familiar signs of spring seen in plants, butterflies, birds, and other species. Shifts in phenology are considered one of the clearest and most rapid signals of biological response to rising temperatures, Høye explained.

Yet most long-term records of phenological events have come from much milder climes. For example, recent comprehensive studies have reported advancements of 2.5 days per decade for European plants and 5.1 days per decade across animals and plants globally.

Using the most comprehensive data set available for the region, the researchers now document extremely rapid climate-induced advancement of flowering, emergence, and egg-laying in a wide array of High Arctic species. Indeed, they show that the flowering dates in six plant species, median emergence dates of twelve arthropod species, and clutch initiation dates in three species of birds have advanced, in some cases by over 30 days during the last decade. The average advancement across all time series was 14.5 days per decade.

“We were particularly surprised to see that the trends were so strong when considering that the entire summer is very short in the High Arctic—with just three to four months from snowmelt to freeze up at our Zackenberg study site in northeast Greenland,” Høye said.

They also found considerable variation in the response to climate change even within species, he added, with much stronger shifts in plants and animals living in areas where the snow melts later in the year. That variation could lead to particular problems by disrupting the complex web of species’ interactions, Høye said.

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