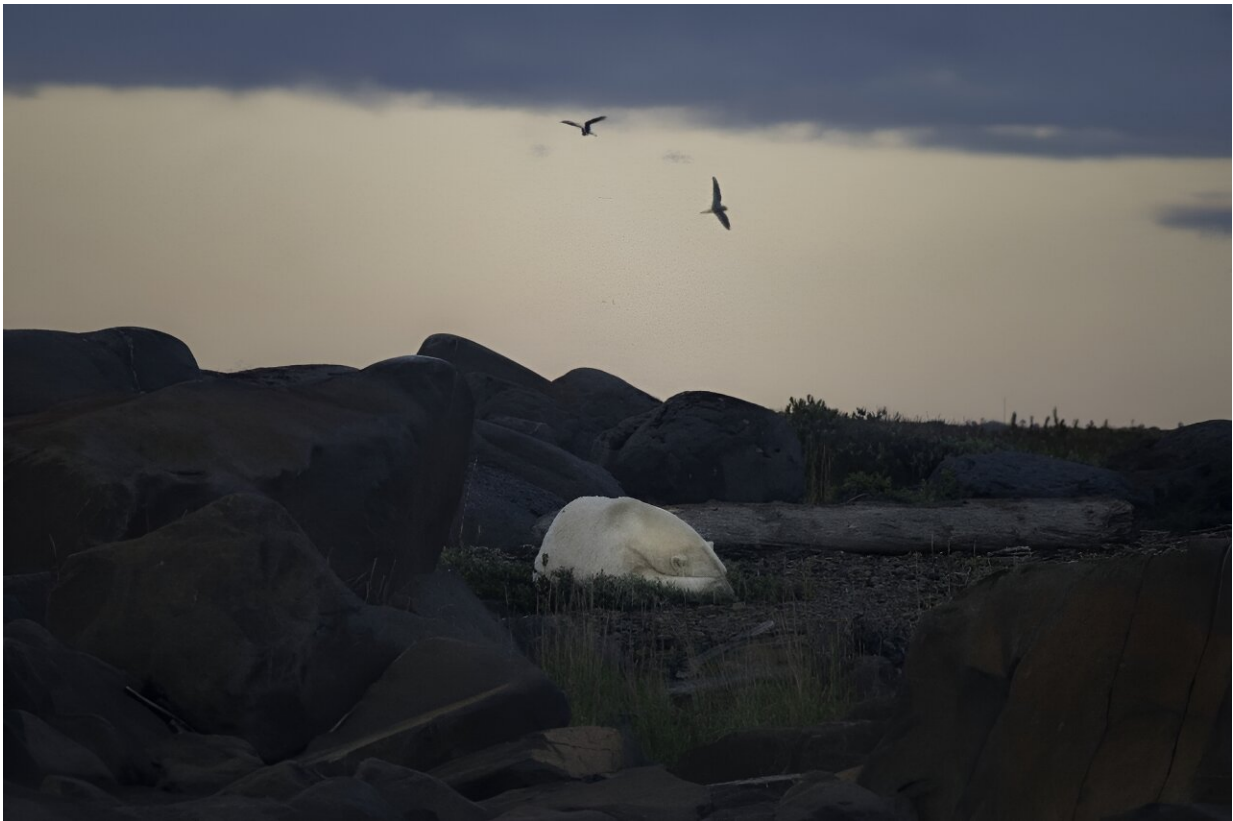


# Study quantifies link between greenhouse gases, polar bear survival

September 3 2023, by Issam AHMED

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A polar bear sleeps at the end of the night along the shoreline of the Hudson Bay near Churchill, Canada.

Polar bears have long symbolized the dangers posed by climate change, as rising temperatures melt away the Arctic sea ice they depend upon for

survival.

But quantifying the impact of a single oil well or coal power plant on the tundra predators had eluded scientists, until now.

A new report published in the journal *Science* on Thursday shows it is possible to calculate how much new greenhouse gas emissions will increase the number of ice-free days in the bears' habitats, and how that in turn will affect the percentage of cubs that reach adulthood.

By achieving this level of granularity, the paper's two authors hope to close a loophole in US law.

Although the apex carnivores have had endangered species protections since 2008, a long-standing legal opinion prevents climate considerations from affecting decisions on whether to grant permits to new fossil fuel projects.

"We have presented the information necessary to rescind the Bernhardt Memo," first co-author Steven Amstrup, a zoologist with Polar Bears International and the University of Wyoming, told AFP, referring to the legal caveat which was named after an attorney in former president George W. Bush's administration.

The memo stated it was beyond the scope of existing science to distinguish the impacts of a specific source of carbon emissions from the impacts of all greenhouse gasses since the beginning of the industrial age.



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### **Cub survival imperiled**

Polar bears rely heavily on the sea ice environment for hunting seals, traveling, mating and more.

When sea ice melts in summer, they retreat onto land or unproductive ice far from the shore, where they endure long stretches of fasting. These periods are growing longer as global temperatures rise.

A landmark paper published in *Nature* in 2020 was the first to calculate

links between changes in the sea ice caused by climate and polar bear demographics.

Building on this work, Amstrup and Bitz established the mathematical relationships between [greenhouse emissions](#) and fasting days as well as cub survival, in 15 out of 19 of the [polar bears](#)' subpopulations, between 1979 and 2020.

For example, the world currently emits 50 billion metric tons of carbon dioxide or equivalent gases into the atmosphere annually, and that is reducing the rate of cub survival by over three percentage points per year in the South Beaufort Sea subpopulation.



A female polar bear walks between rocks to find something to eat along the shoreline of the Hudson Bay near Churchill.

In healthy populations, cub survival during the first year of life is around 65 percent.

"You don't have to knock that down very far before you don't have enough cubs entering the next generation," said Amstrup.

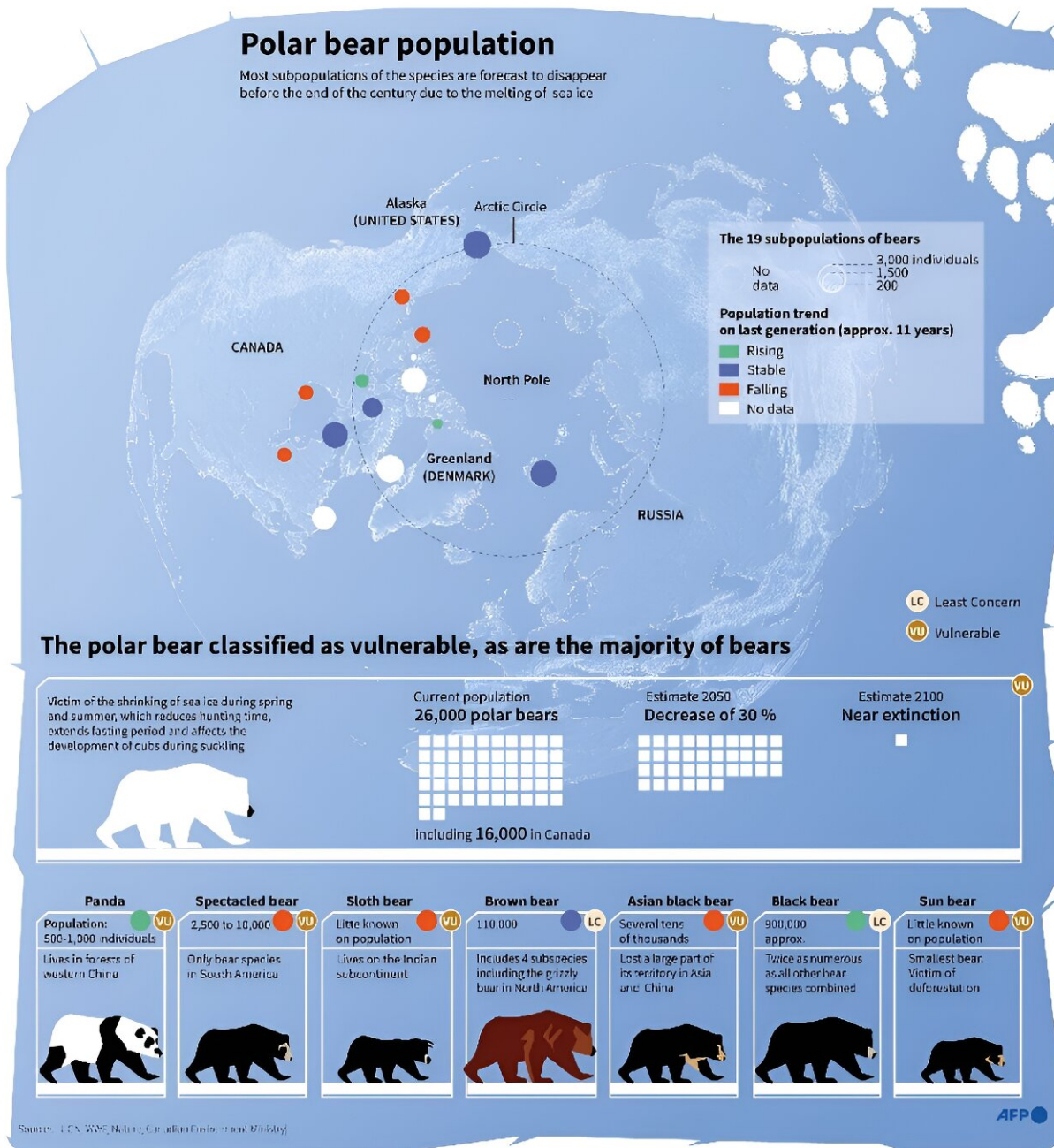
In addition, the paper provides US policy makers with the tools they need to quantify the impact of new fossil fuel projects slated to occur on public lands in the coming decades.

It can also be applied retrospectively to understand the emissions from specific projects, companies or even countries in the past, to inform global negotiations about climate and biodiversity.

## **Implications for other species**

While the pair are confident in their calculations, they say their work can be further refined by more ground research, for example better estimates of the mass of polar bears at the time they enter their fasting period.





Map of subpopulations of polar bears and estimates of the total population to 2100 and comparison with other species.

Joel Berger, university chair of wildlife conservation at Colorado State

University, praised the paper.

"Amstrup and Bitz render an incontrovertible quantitative link among [greenhouse gas emissions](#), sea ice decline, fasting duration—a physiological response to lost hunting opportunities for seals—and subsequent polar bear demographics," said Berger, who was not involved in the research.

Beyond providing a potential policy solution to the [legal loophole](#), the new research could have implications that reach far beyond polar bears, second co-author Cecilia Bitz, a climatologist at the University of Washington, told AFP.

Methods laid out in the paper can be adapted for other species and habitats, such as coral reefs, or Florida's Key deer.

"I really hope this stimulates a lot of research," Bitz said, adding she was already reaching out to new collaborators.

**More information:** Steven C. Amstrup, Unlock the Endangered Species Act to address GHG emissions, *Science* (2023). [DOI: 10.1126/science.adh2280](#).  
[www.science.org/doi/10.1126/science.adh2280](http://www.science.org/doi/10.1126/science.adh2280)

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