



# COUNTING EMPEROR PENGUINS

## HOT TAKES

- 1 There is no evidence overall Emperor Penguin numbers are in decline.
- 2 The population 'crash' of penguin colonies that has been observed reflects emigration and colony relocation, not extinction.
- 3 There is no evidence population swings between colonies are driven by climate change. Instead, ever-changing local factors dominate.

**Researchers concerned with possible effects from global warming on Emperor Penguin populations theorise that critical breeding habitat could be lost as the Earth warms. That concern leads to model projections of catastrophic population declines, based on the predictions of climate models. But is this consistent with what we understand about the adaptive behaviour of the largest and one of the best studied penguin species?**

The adaptability of Emperor Penguins to the dynamic nature of Antarctica's ever-changing icescape is critical to their survival. An ideal penguin colony site consists of stable sea-ice fixed to the shoreline that can support a colony for at least nine months, and with reasonable access to open water. If conditions change that render a colony site unsuitable, the penguins will simply relocate. If they didn't have the good sense to do this they really would face extinction. For example, if high winds or an iceberg collision destabilises the fixed sea-ice they depend on, they will simply move elsewhere.

## Failed Predictions

Because climate models predict more warming as carbon dioxide (CO<sub>2</sub>) concentrations increase, researchers studying a conveniently accessible penguin colony at Point Géologie,

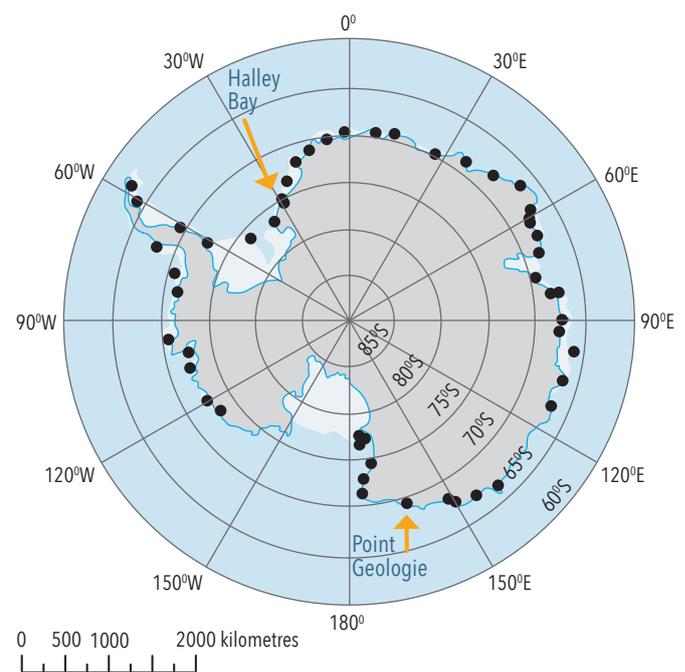
**Figure 1: Emperor Penguins at Terre Adélie, Antarctica<sup>1</sup>**



located just 500 metres from the French research station Dumont d'Urville, predicted a quasi-extinction by the year 2100. They asserted at least 96% of the population would be lost<sup>2</sup>. In their later paper<sup>3</sup> they unwisely extrapolated their Point Géologie Emperor Penguin declines to suggest global warming will cause all Emperor Penguin colonies to decline by 2100.

For Antarctica overall, climate models incorrectly predicted CO<sub>2</sub>-driven warming would reduce sea ice, but sea-ice extent increased for three decades, reaching record highs in 2014, dramatically fell in 2016, then rebounded in 2018. Researchers now suggest such sea-ice changes are likely due to natural climate variations. A clear human influence has not emerged<sup>4</sup>.

**Figure 2: Known locations of Emperor Penguin colonies<sup>5</sup>**



Black dots are the locations of known Emperor Penguin colonies in 2019.

## Flawed Survey Methods

Accurately counting the total number of penguins foraging at sea is impossible. Therefore the number of non-breeding individuals is unknown, but monitoring Emperor Penguins' breeding populations in colonies on land in the harsh winter conditions endured by breeding populations, is also extremely difficult.

It has been found the 'mark and recapture' method previously used by researchers to measure penguin survival rates confounded the interpretation of observed population changes

at Point Géologie. That method required attaching a uniquely numbered band to a penguin's flipper. But flipper bands are now known to be detrimental to the penguins' survival<sup>6</sup>. Researchers attached flipper bands from 1967 to 1980, coinciding with the period during which the Point Géologie population steadily plummeted to half of their pre-banding abundance. After banding ceased in 1980, the population quickly stabilised. Researchers then assumed the population decline must have been due to environmental disruption that lowered survival. Climate change was conveniently blamed. However the more likely hypothesis for Point Géologie's declining population is the Emperor Penguins had simply emigrated elsewhere to avoid researcher disruptions<sup>7</sup>. A newly discovered colony nearby supports that hypothesis, as do additional observations of other Emperor Penguins rapidly relocating between colonies.

Even without the problems of the 'mark and recapture' method, counting penguins is not an exact science. A single colony's growing abundance may be the result of reproductive success, or immigration, or both.

However some researchers mistakenly assumed changes in one colony exemplified a trend for all colonies. That erroneous assumption prompted predictions of approaching species extinctions.

## Improved Survey Methods

The advent of the satellite era has improved our ability to estimate emigration and immigration between breeding colonies. Instead of extrapolating the dynamics of one colony to estimate changes in the entire species abundance as Jenouvrier did in 2014, satellite estimates now allow researchers to integrate changes in all colonies within a defined region. Genetic analyses can define a region as containing closely related individuals, suggesting ongoing interbreeding between those colonies.

Interbreeding requires frequent movements between colonies. Such short-distance relocations are unlikely to be driven by global factors, but by local factors.

For example the Halley Bay colony experienced its highest average wind speeds in 30 years, which destabilised the colony's fixed sea-ice. As a result, the colony's population crashed. Coincident with the Halley Bay population 'crash', a small colony 55 kilometres away experienced a population increase of more than 1,000%, adding more than 13,000 breeding pairs in less than three years. Such an increase can only be due to immigration. So colonies don't just 'vanish'. They relocate.

Unfortunately, the public understanding of penguin adaptability is obscured when media outlets hyped the colony's probable relocation as a 'colony wiped-out' and a 'colony vanishes'<sup>8</sup>.

## Misleading Official Designation

In 2009, the Union for the Conservation of Nature (IUCN) ranked this ice-dependent penguin as 'least concern'. At that time the Emperor Penguin population consisted of an estimated 270,000 to 350,000 adults. In 2012, their population was still considered stable, and the estimated number of known adults had increased by 36% to 476,000 adults. But the IUCN downgraded their status to 'near threatened', despite the increase in numbers, because population models projected a rapid decline due to the effects of future climate change<sup>9</sup>.

However by 2017, the Emperor Penguins increased again to about 595,000 adults and that number is likely still rising, as new colonies have been discovered. However, the IUCN maintains the Emperor Penguin's status as 'near threatened'<sup>10</sup>, even though there is no evidence the species' overall numbers are diminishing.

## SEE ALSO

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Information in this fact sheet has been drawn from *Climate Change: The Facts 2020* (IPA 2020), Chapter 3, by Jim Steele. Fact Sheet series general editor: Dr Arthur Day

1. Source: Adobe Stock, photograph by Fabrice Beauchene.
2. Jenouvrier et al. 2009, 'Demographic models and IPCC climate projections predict the decline of an emperor penguin population', *PNAS*, vol. 106, pp. 1844–1847.
3. Jenouvrier et al. 2014, 'Projected continent-wide declines of the emperor penguin under climate change', *Nature Climate Change*, vol. 4, pp. 715–718.
4. Wang et al. 2019, 'Compounding tropical and stratospheric forcing of the record low Antarctic sea-ice in 2016', *Nature Communications*, vol. 10.
5. Source: Dr Barbara Wienecke (Wienecke, B 2011, 'Review of historical population information of emperor penguins', *Polar Biology*, vol. 34, pp. 153–167).
6. Saraux et al. 2011, 'Reliability of flipper-banded penguins as indicators of climate change', *Nature*, vol. 469, pp. 203–206.
7. Steele J 2013, *Landscapes and Cycles: An Environmentalists Journey to Climate Skepticism*, CreateSpace Independent Publishing Platform.
8. *New York Times* 2019, 'An Emperor Penguin Colony in Antarctica Vanishes', viewed 26 April 2019, <https://www.nytimes.com/2019/04/25/science/emperor-penguins-antarctica.html>
9. Ainley, et al. 2010, 'Antarctic penguin response to habitat change as Earth's troposphere reaches 2°C above preindustrial levels', *Ecological Monographs*, vol. 80, pp. 49–66.
10. Bird Life International 2018, 'Emperor Penguin, *Aptenodytes forsteri*' The IUCN Red List of Threatened Species, viewed 26 April 2019, <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697752A132600320.en>

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