

Walking is more efficient than thought for threatened polar bears

June 19 2018



Polar Bear (*Ursus maritimus*) near Kaktovik, Barter Island, Alaska. Credit: Alan Wilson/Wikipedia.

A polar bear plunges into the icy Arctic waters in search of firmer ice; its world, which was once a sea of white, is melting beneath its paws. 'Research has documented declines in polar bear populations in some regions of the Arctic', says Anthony Pagano from the US Geological Survey, explaining that the bears now have to roam further on the

receding ice to locate the seals upon which they dine. And, to make their predicament worse, measurements in the 1970s and 1980s suggested that polar bears consume more energy than other similarly sized animals because they have to generate heat to remain warm in the frigid environment and walk long distances to catch food. Knowing how much energy polar bears use just to remain alive is essential if we are to understand how the animals will survive in their dwindling environment, so Pagano and colleague Terrie Williams from the University of California, Santa Cruz, embarked on an ambitious programme of measuring how much energy polar and grizzly bears consume as they amble along. The scientists publish their discovery that polar bears and grizzly bears walk efficiently, consuming the same amount of energy while walking as other large animals, in *Journal of Experimental Biology*.

'Our conversations with zoos for this study started in 2012', says Pagano, recalling how he and Williams contacted Amy Cutting, Nicole Nicassio-Hiskey and Amy Hash at Oregon Zoo, Portland, USA, and Megan Owen, Tammy Batson and Nate Wagner at San Diego Zoo, USA, as both teams had trained [polar bears](#) to participate in husbandry procedures such as providing blood samples for health test. However, Pagano and Williams wanted to measure how much oxygen the 240kg [animals](#) consumed to calculate how much energy they were using while walking and the conventional method of placing a mask over the bear's muzzle would not work: 'Big carnivores do not like things on their faces', Williams explains. Instead, Charlie Robbins and Tony Carnahan from Washington State University, USA, built a custom-designed bear-proof metabolic chamber by installing a 3.6m long horse treadmill in a steel-framed chamber constructed from bullet-proof polycarbonate.

The team then transported the 2000kg structure to the polar bears' respective locations, where Nicassio-Hiskey and Hash (Portland) and Batson, Owen and Wagner (San Diego) spent months patiently training the animals to walk on the treadmill. Recalling this period, Pagano says,

'Finding foods that the polar bears would be highly motivated to walk for was challenging'. However, the grizzly bears at Washington State University, USA, were more eager: 'They just bowled right in; they did not care if the treadmill moved fast or slow, all they cared about were the training treats', laughs Williams. Once the bears were comfortable with walking in the metabolic chamber, the team begin measuring the animals' oxygen consumption while filming and recording their movements.

However, when they calculated the amount of energy consumed by the polar bears and grizzlies while sauntering at speeds of up to 4.6km/h, they were surprised that the two species consumed the same amount of [energy](#) (2.21kJ/kg m) and no more than similarly sized animals. The polar bears' walking metabolic rate was not intrinsically higher than that of other large mammals, but the team suspect that swimming could be more costly. And when they fitted GPS collars to six wild female polar bears on the Alaskan sea ice, it was clear that they were moving at similar speeds to the captive animals, ambling at around 3.4km/h and rarely breaking into a run, so their movements were as efficient. However, the news wasn't all good: simply standing up was more costly for both species than it is for other large animals, which could impact polar bears detrimentally as their survival teeters on thin ice.

More information: Pagano, A. M., Carnahan, A. M., Robbins, C. T., Owen, M. A., Batson, T., Wagner, N., Cutting, A., Nicassio-Hiskey, N., Hash, A. and Williams, T. M. (2018). Energetic costs of locomotion in bears: is plantigrade locomotion energetically economical? *J. Exp. Biol.* 221, [DOI: 10.1242/jeb.175372](https://doi.org/10.1242/jeb.175372)

Provided by The Company of Biologists

Citation: Walking is more efficient than thought for threatened polar bears (2018, June 19)
retrieved 26 April 2024 from

<https://phys.org/news/2018-06-efficient-thought-threatened-polar.html>

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