

Fast metabolism threatens polar bears

The Dominion Post · 3 Feb 2018

UNITED STATES: Scientists studying the metabolism of free-ranging polar bears in the Arctic have found out why the loss of sea ice is hurting their survival: they burn calories at a faster rate than previously thought.



The findings, described in the journal *Science*, reveal alarming facts about the polar bear's unsustainable physiology in the face of ongoing climate change.

As human-produced greenhouse gas emissions continue to fuel global warming, Arctic sea ice levels are continuing to shrink by about 13.2 per cent per decade.

At the same time, several polar bear populations have been on the decline – for example, dropping by about 40 per cent in the Beaufort Sea in the course of a decade.

“We’ve documented declines in the population, declines in the abundance, declines in the survival rates, declines in the body condition in the population,” said lead author Anthony Pagano, a research wildlife biologist with the US Geological Survey’s office in Anchorage, Alaska. “And it appears to be related to changes in sea ice that are occurring.”

But understanding the exact relationship between the loss of ice and the plight of the polar bear has been a little murky because it is difficult to track the movements of the enormous apex predators in remote regions.

“What we don’t really know much about is, what are the actual mechanisms that are driving these declines?” said Pagano, who is also a PhD student at the University of California, Santa Cruz. “We don’t have a lot of information about really the basic biology and natural history of these animals when they’re on the sea ice and how they utilise the sea ice environment.”

For this study, the scientists put trackers on nine female polar bears in the Beaufort Sea region. The trackers included accelerometers and GPS-equipped video cameras to document the bears’ activities.

From 2014 to 2016, they tracked the bears’ movements for eight to 11 days in April, the

beginning of the season when the bears are usually highly active hunters, putting on the bulk of the body fat that will see them through the rest of the year.

To measure the animals' energy expenditure, the scientists dosed the bears with doubly labelled water – water molecules whose hydrogen and oxygen atoms had been replaced with heavier isotopes with extra neutrons.

The hydrogen atoms would leave the body in water (such as urine), as would some of the oxygen atoms. But other oxygen atoms would leave in the form of exhaled carbon dioxide.

By taking blood and urine samples before and after the observation period, the researchers could track how much the polar bears had been working. They found that the bears' metabolic rates were an average of 1.6 times higher than previously thought. This could be partly because the carnivores typically expended more energy than animals with herbivorous or mixed diets, said John P Whiteman of the University of New Mexico in Albuquerque, who was not involved in the study.

“The high energy requirements of polar bears corroborate previous hypotheses that most terrestrial Arctic habitats, lacking prey as energy-rich as marine mammals, cannot provide enough food for polar bears driven to shore by loss of sea ice,” Whiteman wrote in a commentary on the paper.

That loss of sea ice is a grave problem for polar bears, which rely on the fat-rich seals found in a sea ice environment. Arctic land animals have very little caloric content compared with these marine mammals.

The scientists estimated that a female bear would need to eat either one adult ringed seal, three subadult ringed seals or 19 newborn ringed seal pups every 10 to 12 days to remain in energy balance. The bears need to do better than that during the spring-summer season if they are to survive the harsh Arctic winter.

“Further, thinner sea ice drifts faster, and polar bears have had to increase their movement rates in order to remain in their preferred habitat, incurring higher energy costs,” Whiteman wrote.

Scientists once thought that polar bears should be able to reduce their metabolic rates when there was not much food available. The new study shows that is not the case. This means they quickly start to lose weight that is essential for survival.

Four of the nine bears lost at least 10 percent of their body mass just in the days between blood-sampling events, and one even lost a significant amount of lean tissue such as muscle. – LA Times