With the future of all polar bears hanging in the balance, it's vital that scientists find a way to monitor numbers to see if conservation efforts are mitigating the effects of climate change

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Hello!

Welcome to your latest polar bear update

Melanie Lancaster, senior specialist, Arctic species, WWF Global Arctic Programme

Hello again! My research has taken me to the ends of the Earth, and a couple of years ago I went to the northernmost part of Alaska, close to a place called Utqiaġvik. I'm working on a project that involves collecting snow samples from fresh polar bear tracks, which we can use to create genetic fingerprints – or rather, pawprints – of individual bears. Utqiaġvik is an interesting spot as there are two subpopulations of polar bears here, so we had no idea which one we were sampling tracks from. Last year this project also took me to Svalbard, where your adopted bears live. Turn over to find out how we can gain valuable insights into polar bears from their pawprints.

MEET THE ADOPTION TEAM

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SECRETS IN THE SNOW

Learning everything we can about polar bears is vital if we're to protect them – and now we're finding answers in their pawprints

Elusive, solitary and inhabiting vast territories, polar bears are notoriously tricky to study. Scientists' usual approaches – such as darting bears from helicopters, then collecting hair and skin samples on the ground – are costly and time consuming. Then there are the difficulties of reaching the bears' remote, often inhospitable habitats. It's hardly surprising that, of the 19 subpopulations of polar bears across the Arctic, more than half of them are considered data-deficient.

Yet the tracks we trace to find polar bears reveal more than just their direction of travel. As a polar bear pads across the snow, it leaves tiny traces of itself behind. Known as environmental DNA, or eDNA, this 'genetic footprint' is made by every living thing wherever it goes, whether it's through shedding skin, hair or poo.

Just as forensic scientists scrutinise a crime scene, we're gathering snow samples from polar bear tracks to extract the eDNA within them. Part of an eight-year project, this allows us to gather vital data without the need for close encounters. In fact, collecting these snow samples is simple enough for non-scientists to do with some training, and the plan is to eventually involve interested local communities in sampling (for example, during the winter months when scientists aren't usually around).

From its DNA, we can build a profile of the bear

As a polar bear walks across the snow, it leaves behind skin cells from its paws on the ground

Melanie gets to work

Spoon science!

It's in the lab of our expert partners in Sweden where the magic unfolds. Genetics can often feel like sorcery, as all we're working with are test tubes full of mysterious liquid. But once processed and analysed, these samples can reveal the answers to all sorts of questions – if you can get the right kind of DNA.

Skin cells contain two types of DNA. There's nuclear DNA that's unique to every individual, and mitochondrial DNA, which isn't unique but can answer more general questions, such as which region a polar bear is from. There's far more mitochondrial DNA than nuclear DNA in cells, so accessing the unique genetic code needed to identify individuals is an enormous challenge. But in the last few years, we've made a breakthrough.

We're now able to extract this all-important nuclear DNA, and it's beginning to unlock the lives of these solitary mammals. For example, we can estimate the size of a subpopulation, map out family trees and see if a bear has migrated from elsewhere. Perhaps most crucially, we can gauge genetic diversity, which determines a population's ability to adapt to change. From this, we can work out which groups of bears are most vulnerable to climate change – and plan how we can help give them a fighting chance in their warming Arctic home.

Melanie

DNA DETECTIVES

Just how do we turn snow into polar bear insights?

1 Snow is scooped up from polar bear tracks using sterilised spoons, then bagged and taken to a portable lab aboard the research ship.

2 The snow is melted then passed through a filter that catches the skin cells that have fallen from a polar bear's foot pads. A special buffer solution is added to the filter to preserve the cells.

3 The sample is labelled and refrigerated until it can be shipped to the main lab.

4 At the laboratory, DNA is extracted, then analysed to identify individual bears and reveal each one's unique genetic code. With this information, we can determine relatedness between individuals, genetic diversity, population size and growth, and how far the bears roam.

Scientists studying polar bear eDNA have to cope with harsh conditions in the Arctic

On the look-out

Paws shed skin cells