Heather Lynch: Penguins of Antarctica

STUDENT PRESENTATION STUDY GUIDE

Werklund Centre

Meet the Explorer

Dr. Heather Lynch is a quantitative ecologist, dedicated to understanding the population dynamics of Antarctic wildlife, with a particular focus on Antarctic penguins. She has more than a decade of field experience on the continent. She is an Associate Professor at Stony Brook University with a joint appointment in the Department of Ecology & Evolution and the Institute for Advanced Computational Science. Lynch serves as the principal investigator for a large, multi-institution National Science Foundation award.

She received an NSF CAREER Award for her work on the spatial dynamics of Antarctic penguins and was elected an early career fellow of the Ecological Society of America. Lynch has an A.B. in Physics from Princeton University, an M.A. in Physics from Harvard University, and a Ph.D. in organismic and evolutionary biology from Harvard University.

Heather Lynch Resources

» Instagram @thelynchlab

SIMPLE but BIG Scientific Questions

Dr. Lynch and her team ask deceptively simple questions:

- How many penguins live in Antarctica?
- Where are they located?
- Why do some populations grow while others decline?
- How is climate change reshaping the Antarctic ecosystem?

The answers are difficult because Antarctica is vast, remote, and constantly changing.

How Do Scientists Study Penguins?

1. **Field Research**
   Researchers travel to penguin colonies to count nests, eggs, and chicks.
   Long-term studies track changes over **years and decades.**
2. **Satellite Technology**
   High-resolution satellite images allow scientists to survey penguins across the entire continent.
   Penguin colonies can be identified by the stains left by guano (penguin poop!).
   This method reduces disturbance to animals and increases accuracy.
3. **AI & Predictive Modeling**
   Artificial intelligence helps analyze large datasets.
   Scientists can predict **population changes in real time.**

Why This Conservation Work Matters

Antarctica is officially a **nature reserve devoted to peace and science**, but it is not protected from:

- Climate change
- Tourism
- Fishing pressure
- Pollution
- Even scientific activity

Dr. Lynch's research helps guide **policy decisions** to protect Antarctic ecosystems for future generations.

Learn how to be a Penguin Detective on page 6.

IT'S SHOWTIME

The Show

Heather Lynch: Penguins of Antarctica
April 20, 2026 at 10:15 am
Jack Singer Concert Hall at Werklund Centre

About the Show

Learn from our Explorer about how penguins live, adapt, and struggle in one of the harshest environments on Earth—and what the penguins reveal about the health of the entire Antarctic ecosystem.

Penguins may seem cute and distant, but they are powerful indicators of environmental change. By studying them, scientists can understand how climate change, fishing, pollution, and tourism are affecting Antarctica as a whole.

She uses satellites, maps, and technology to learn where penguins live, how many there are, and how climate change affects them. She is especially known for discovering new penguin colonies from space!

Before the Show: What to LEARN

- Locate Antarctica on a world map. How far is it from Canada?
- Discuss what an ecosystem is. Think about the similarities of the ecosystems of Antarctica and Alberta
- Learn key vocabulary such as penguin, krill, habitat, ecosystem, climate change
- Make predictions about how climate change might affect animals living in cold environments

During the Show: What to NOTICE

- How penguins survive in extreme cold?
- How scientists study animals without disturbing them?
- How ice, ocean, and animals are connected?
- How technology helps scientists learn from far away?

After the Show: What to CHAT about?

- One penguin behavior you noticed
- One question you have
- One surprising fact

ECOSYSTEM MESSENGERS
Penguins (and Krill)

Penguins act like messengers of ecosystem health. Changes in penguin numbers, behavior, or location can tell scientists when something is wrong in the Antarctic ecosystem.

Penguins help scientists understand the health of Antarctica because they depend heavily on **Antarctic krill**. Krill are a keystone species in Antarctica because so many animals rely on them for survival. By tracking penguin populations and movement, scientists can learn what is happening to krill — even when krill are hard to see directly.

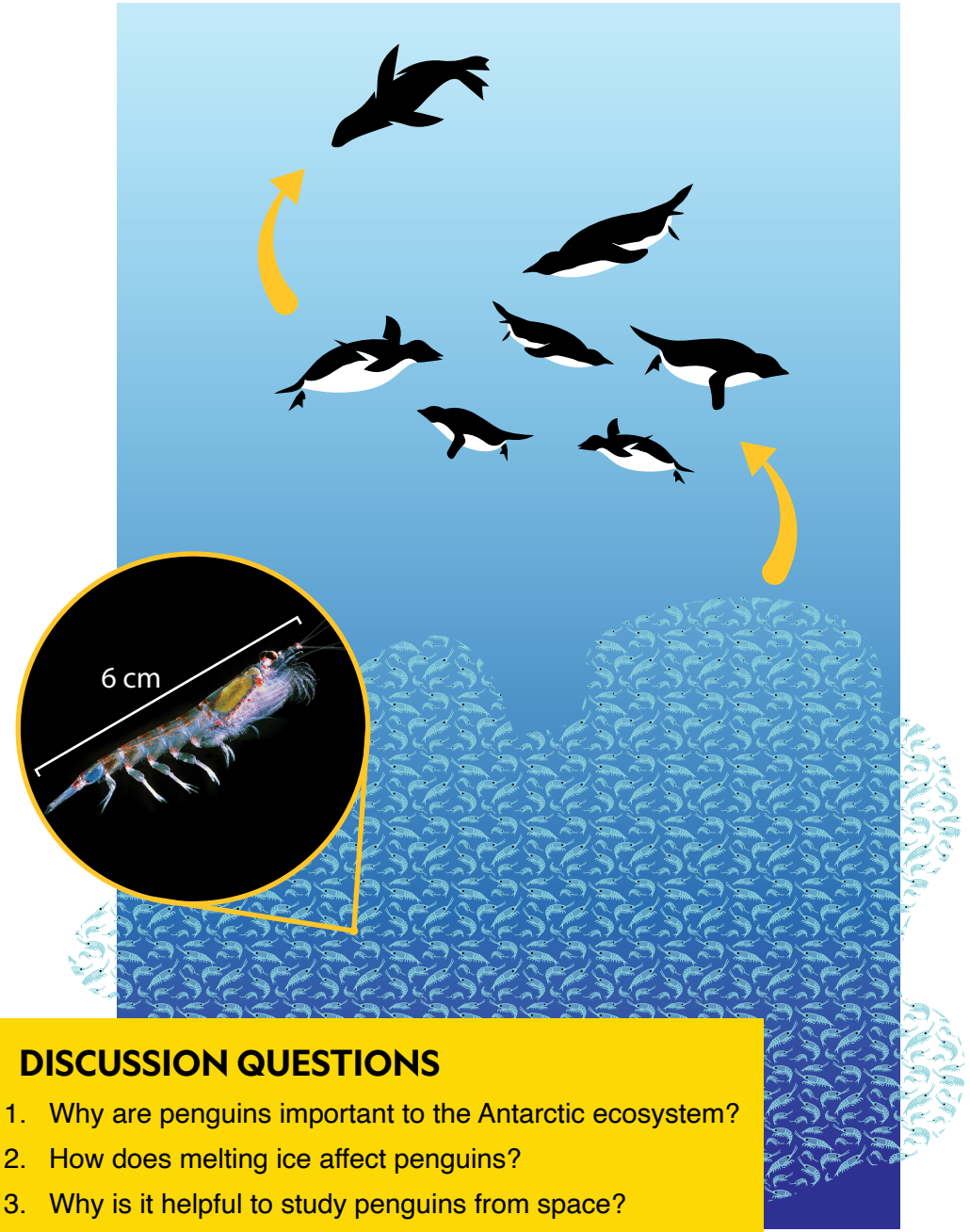
Using satellite technology and long-term surveys, Heather Lynch can see how penguin populations change over time. These changes help scientists understand how climate change, fishing, and human activity are affecting the whole Antarctic system.

Because krill are very sensitive to changes in **sea ice and temperature**, scientists study them to understand how climate change is affecting Antarctica. When krill numbers change, it sends a signal through the entire food web.

Krill are tiny, shrimp-like animals that live in the Southern Ocean. Even though they are small, krill are **one of the most important species in Antarctica** as they form the **base of the Antarctic food web**

If krill populations decline:

- penguins decline
- seals and whales decline
- the entire ecosystem becomes unstable



DISCUSSION QUESTIONS

1. Why are penguins important to the Antarctic ecosystem?
2. How does melting ice affect penguins?
3. Why is it helpful to study penguins from space?
4. How are Antarctic ecosystems connected to the rest of the planet?

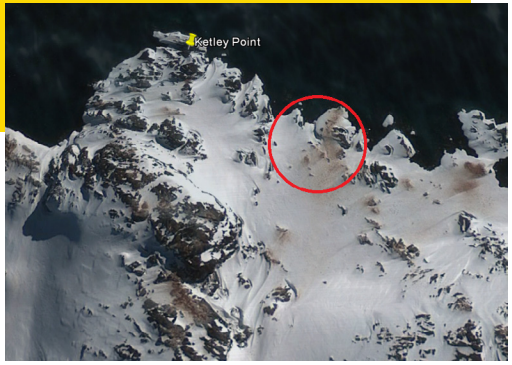
ECOSYSTEMS: ANTARCTICA EDITION

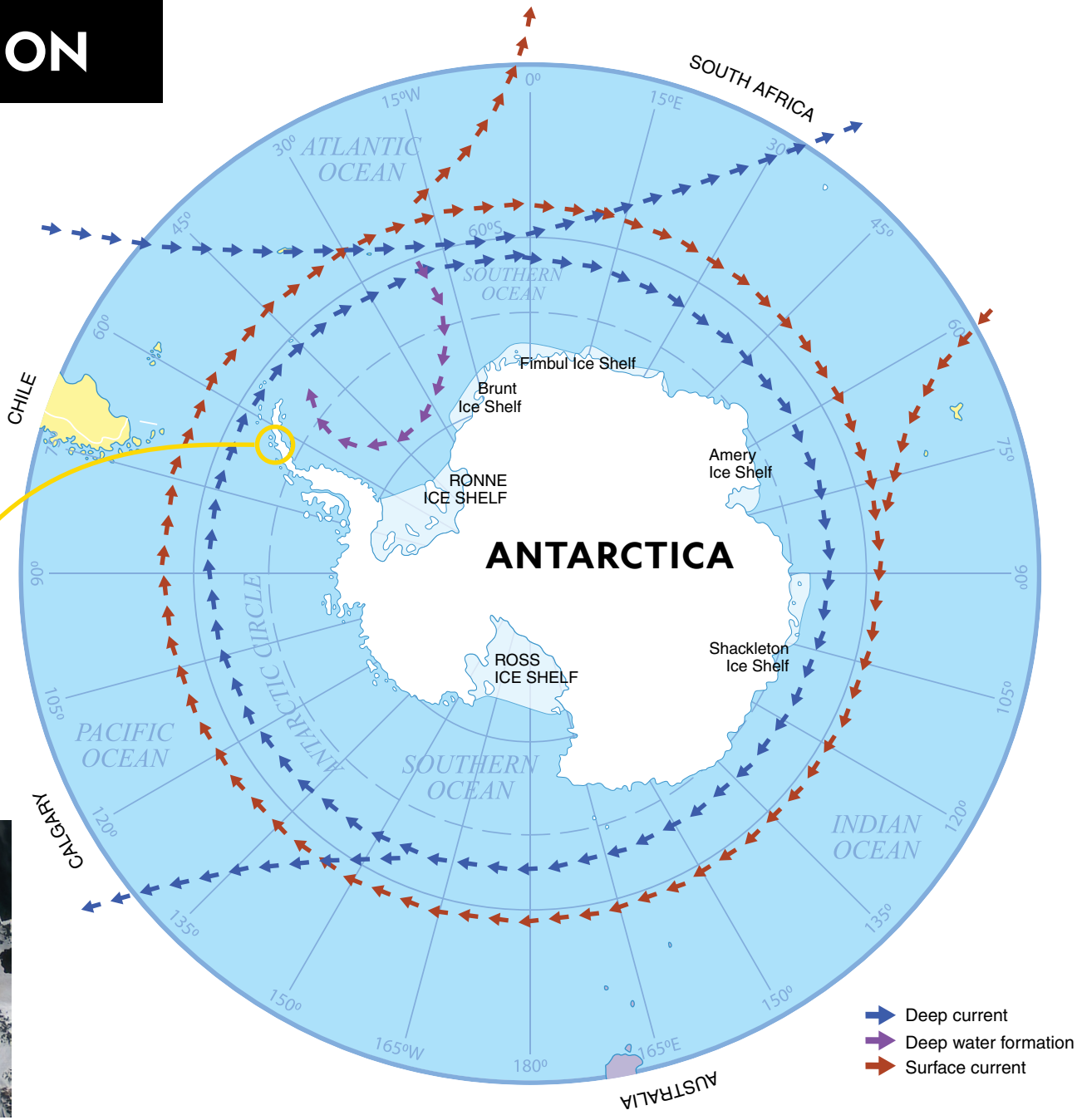
Penguins connect us to the whole planet. Pollution like plastic can reach Antarctica, showing that all oceans are connected.

- Antarctica is the coldest, windiest, and driest continent on Earth.
- It is covered mostly in ice and surrounded by the Southern Ocean.
- No people live there permanently—but millions of penguins do!

CALLING ALL PENGUIN DETECTIVES.

Can you spot the penguin poop on the snow? This is how scientists track penguin colonies through satellite images. You can add to the data through penguinmap.com





PENGUIN PARADE

Emperor Penguin

Where they live
Antarctic

What they eat
Marine food supported by the krill-based food web

Family life
Breed in extreme cold; depends on stable ice

Climate change impact
Population projected to decline due to climate change

Why scientists study them
As the largest penguin species, their survival reflects changes in sea ice and climate

King Penguin

Where they live
Traditionally sub-Antarctic islands; now moving south

What they eat
Marine food connected to krill-based ecosystems

Family life
Breed in very large colonies

Climate change impact
Expanding range deeper into Antarctica as temperatures rise

Why scientists study them
Movement shows how species ranges shift in real time due to warming

Adélie Penguin

Where they live
Antarctic Coastline and sea ice

What they eat
Krill, plus fish and squid

Family life
Build nests on the ground
Chicks gather in groups called crèches

Climate change impact
Struggling as sea ice and habitat change too quickly

Why scientists study them
Population changes help us understand krill availability and ecosystem health

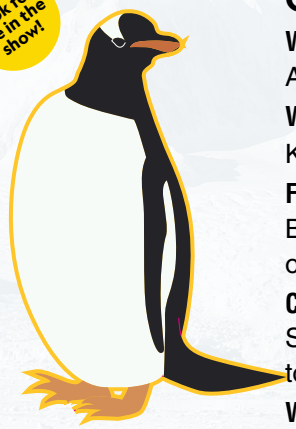

Photo: via National Geographic


Photo: Liam Quinn via WikiCommons


Photo: via National Geographic

OF ANTARTICA

Look for me in the show!



Gentoo Penguin

Where they live
Antarctic Peninsula

What they eat
Krill

Family life
Breed in colonies and rely on nearby ocean food

Climate change impact
Showing signs of adapting to warmer conditions

Why scientists study them
Easy to survey and helpful for tracking changes in the Antarctic ecosystem

Chinstrap Penguin

Where they live
Antarctic Peninsula and surrounding islands

What they eat
Krill

Family life
Breed in large colonies

Climate change impact
Struggling as environmental changes affect food and habitat

Why scientists study them
Strong connection to krill makes them a key indicator species

Photo: via National Geographic

Photo: Lewnwdc77 via WikiCommons

Not all penguins react the same to climate change.

Some penguins, like gentoo penguins, are adapting to warmer temperatures, while Adélie and chinstrap penguins are having a harder time.

Penguins show how everything is connected.

Plastic pollution has been found even in Antarctica — including a penguin seen incubating a plastic bottle, showing that pollution travels across the whole planet.

Penguins are moving as the planet warms.

King penguins are starting to move deeper into Antarctica as temperatures rise — something scientists would only know because penguins are being carefully monitored.

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LOCAL CONNECTIONS AND ACTIONS

LOCAL CONNECTION

Many animals in Alberta face challenges similar to penguins, such as habitat loss, climate change, and pollution:

- Waterfowl (ducks and geese) — affected by wetland loss and pollution
- Fish species — impacted by warming water and plastic pollution
- Beavers — depend on healthy waterways and ecosystems
- Amphibians — sensitive to changes in water quality and temperature

Just like penguins, these animals help scientists understand the health of ecosystems.

LEARNING FROM INDIGENOUS KNOWLEDGE

Indigenous peoples, including the Blackfoot Nations, have long understood that all living things are connected. Water is considered sacred, and caring for the land and water is a shared responsibility.

- Wetlands, rivers, and animals are seen as part of a living system
- Respect for nature helps ensure it remains healthy for future generations
- Protecting water locally supports life far beyond Alberta

This way of thinking connects closely to how scientists study ecosystems today.

HOW CAN WE HELP PENGUINS?

CONNECT ANTARCTICA TO ALBERTA

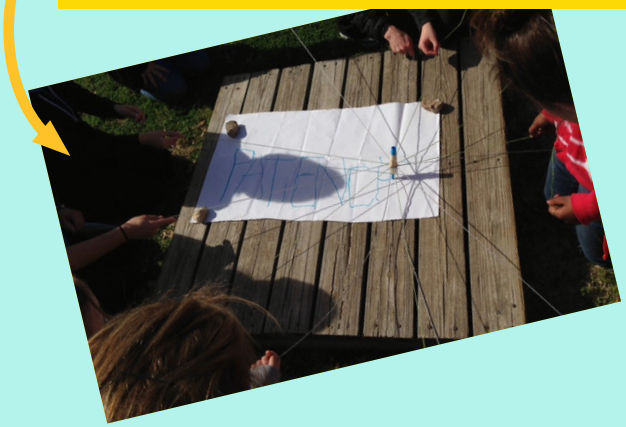
- **Monitor a local creek or river** with River Watch or Creek Watch tools and see how water quality affects wildlife
- **Use Water for Life activities** to understand how water supports life
- **Explore community stewardship projects** like park clean-ups

AT HOME

- **Reduce plastic use** — Use reusable water bottles, bags, and containers to keep plastic out of rivers and oceans.
- **Water** — Protecting local rivers, lakes, and wetlands helps keep water clean before it reaches the ocean.
- **Learn about climate change** — Understanding how climate change affects animals helps us make better choices for the planet

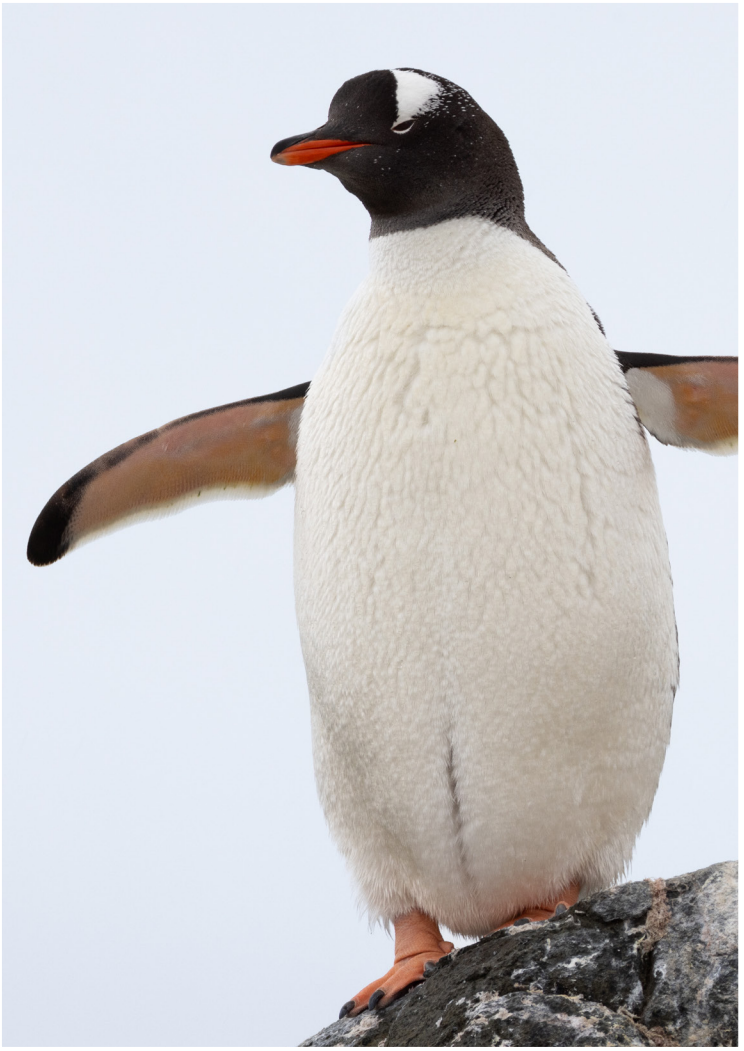
RESOURCES

» Inglewood Bird Sanctuary
» Inglewood Wildlands
» Ralph Klein Park & Environmental Education Centre
» Fish Creek Environmental Learning Centre
» Calgary Zoo – Penguin Walk
» City of Calgary – Nature Kits: Free kits to help students explore urban biodiversity in local parks, promote environmental stewardship and scientific thinking.
» CPAWS Southern Alberta – Bring Nature Home Toolkit: Free resources and activities on water, species at risk, ecosystems, and climate change.



CHILLING VOCAB

Keystone species	A species that many others depend on
Food web	How plants and animals are connected through food
Indicator species	Animals that show how healthy an ecosystem is
Antarctica	The icy continent at the bottom of the Earth
Colony	A large group of animals living together
Adaptation	A feature that helps an animal survive
Blubber	A thick layer of fat that keeps animals warm
Satellite	A machine that orbits Earth and takes pictures
Ecosystem	Living things and their environment working together
Climate Change	Long-term changes in Earth's weather and temperature
Sea Ice	Frozen ocean water
Predator	An animal that hunts other animals
Conservation	Protecting nature and wildlife
Population	The number of animals living in one area
Survey	A method that scientists use to collect information
Satellite imagery	Pictures of Earth taken from space
Stewardship	Caring for the land and water
Sustainability	Using resources without harming the future



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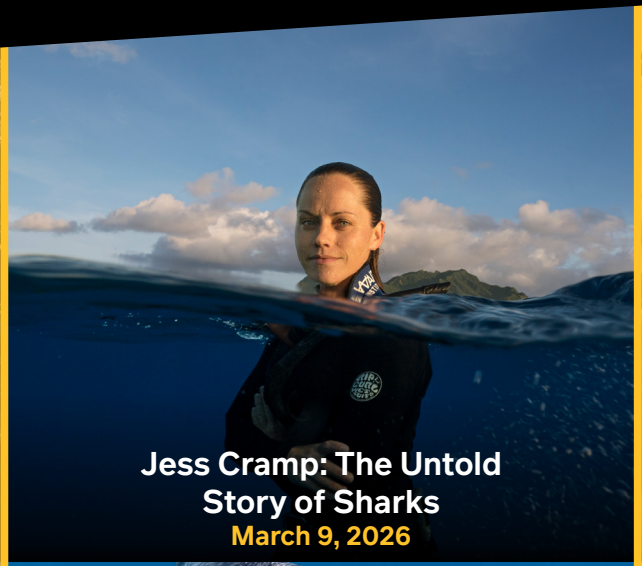
Jaime Rojo: Chasing Monarchs
February 2 & 3, 2026



Jess Cramp: The Untold Story of Sharks
March 9, 2026

Heather Lynch: Penguins of Antarctica
April 20, 2026

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