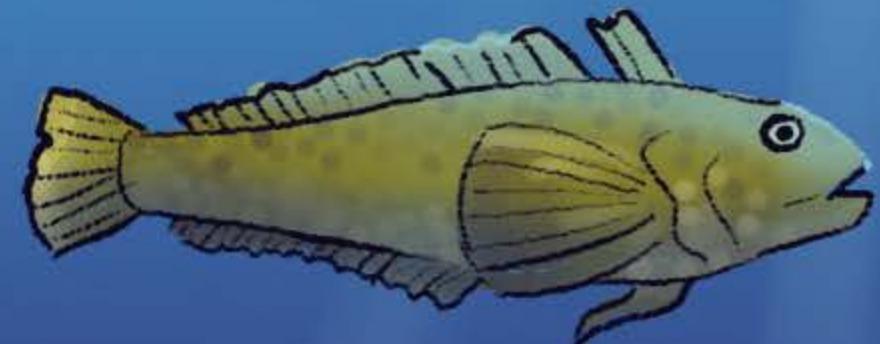
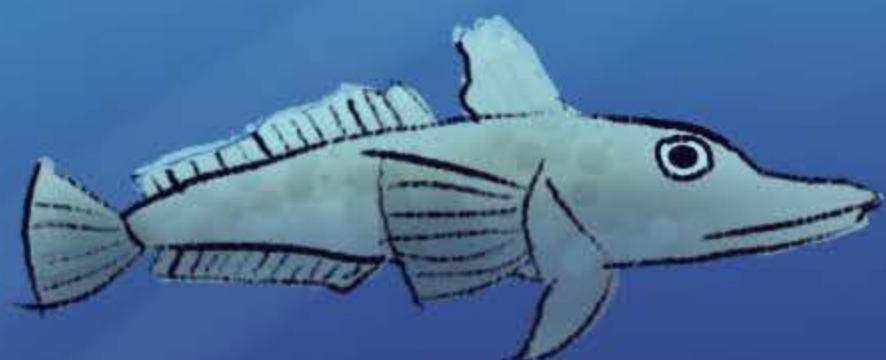


What cool fish live in icy Antarctica?



Isabel Lopez,
John H. Postlethwait,
and Thomas Desvignes



Ancestors of the largest group of Antarctic fishes, called notothenioids, likely originated about 60 million years ago (MYA) in the ocean where South America and Antarctica were connected.

They lived on the ocean floor
– they were benthic fish.

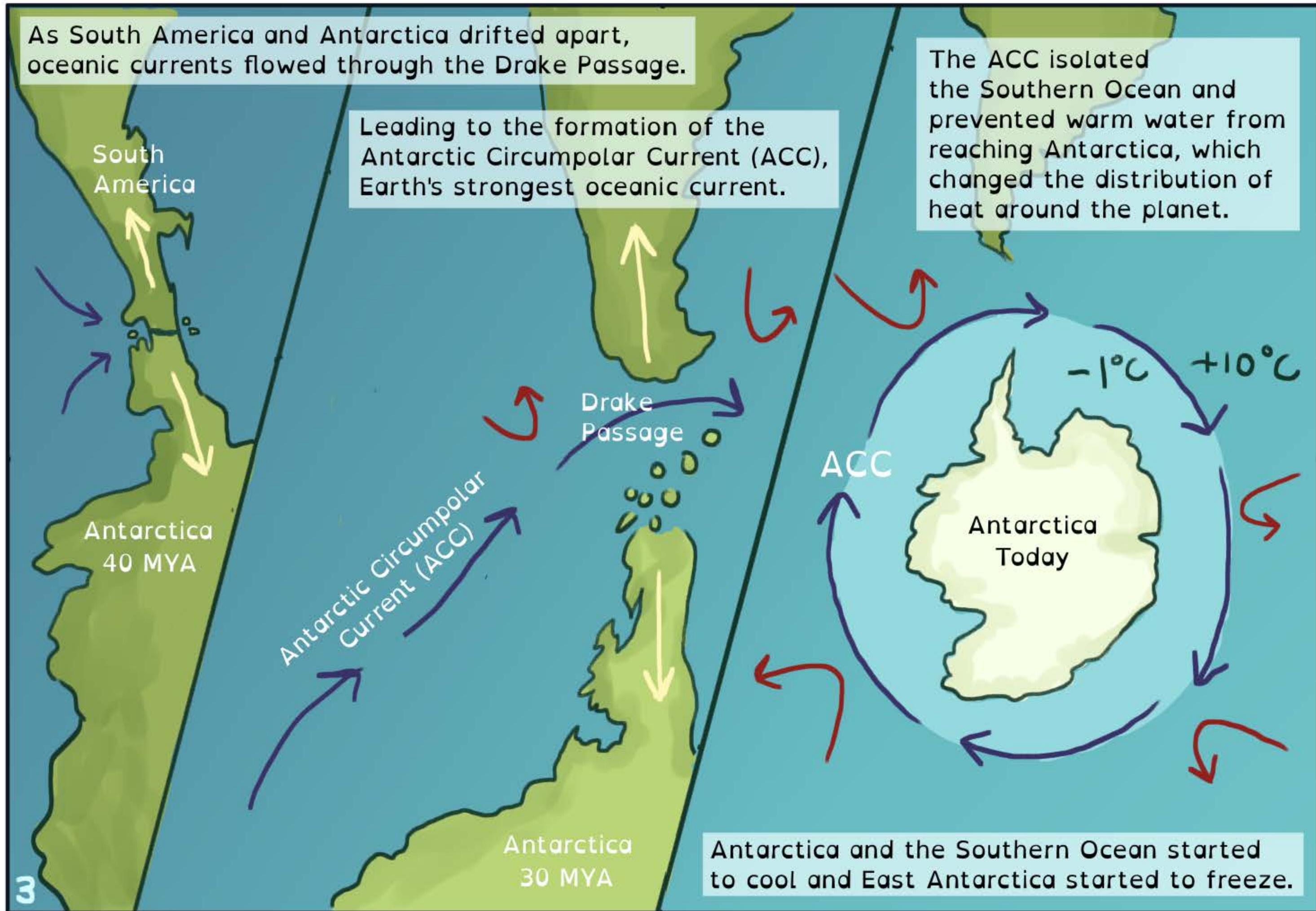


Few non-Antarctic lineages from those early ancestors still exist. They can be found in Chile, Argentina, Australia, New Zealand, and a few islands close to Antarctica.

As South America and Antarctica drifted apart, oceanic currents flowed through the Drake Passage.

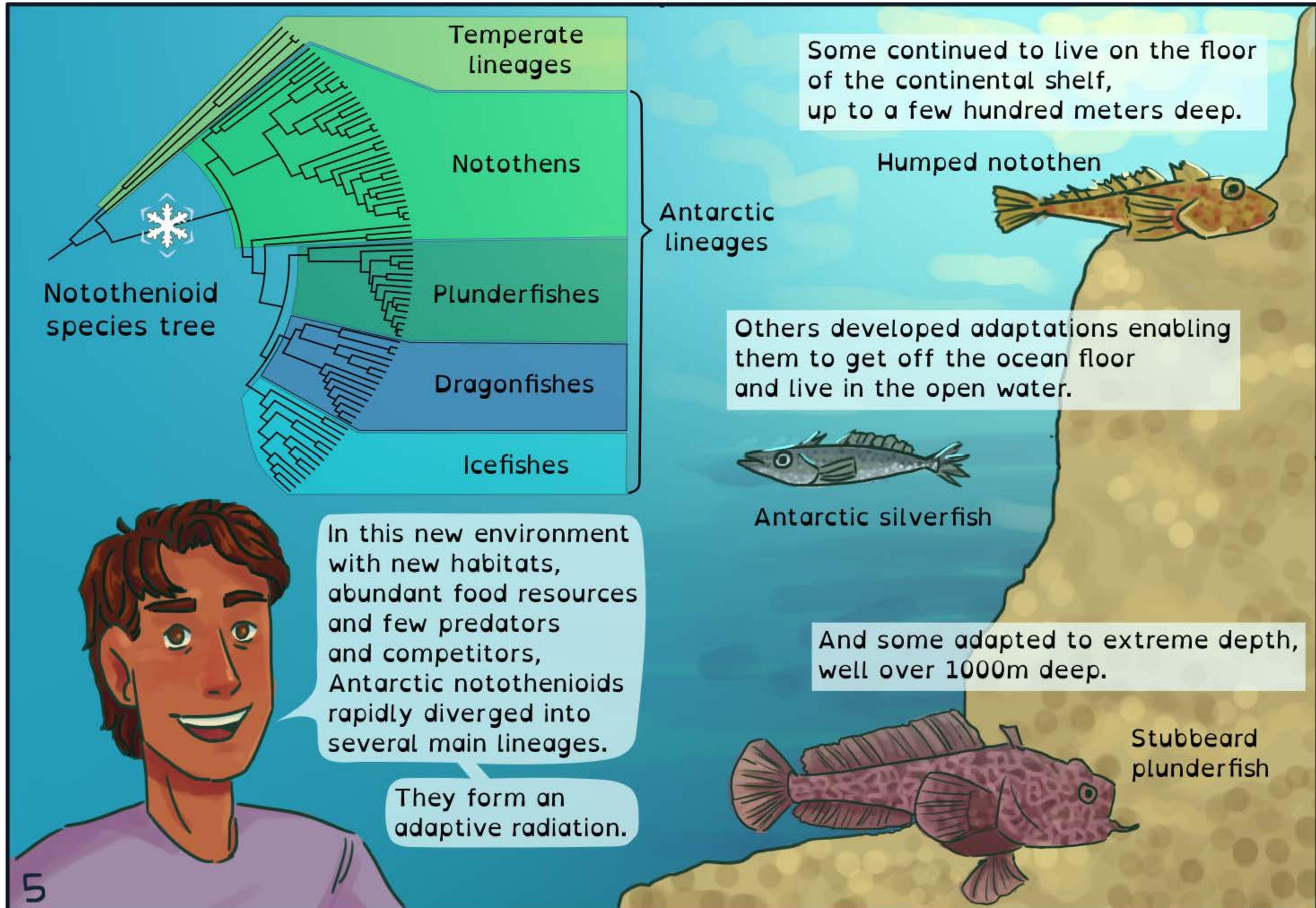
Leading to the formation of the Antarctic Circumpolar Current (ACC), Earth's strongest oceanic current.

The ACC isolated the Southern Ocean and prevented warm water from reaching Antarctica, which changed the distribution of heat around the planet.



Ice shelves extended all around Antarctica about 14 million years ago. Most fish couldn't survive the ocean's new icy conditions and vacated the Southern Ocean.





Other ways notothenioids diversified

Size

Toothfishes can be longer than 2m



Reproduction

Marbled notothens release their eggs in the open water

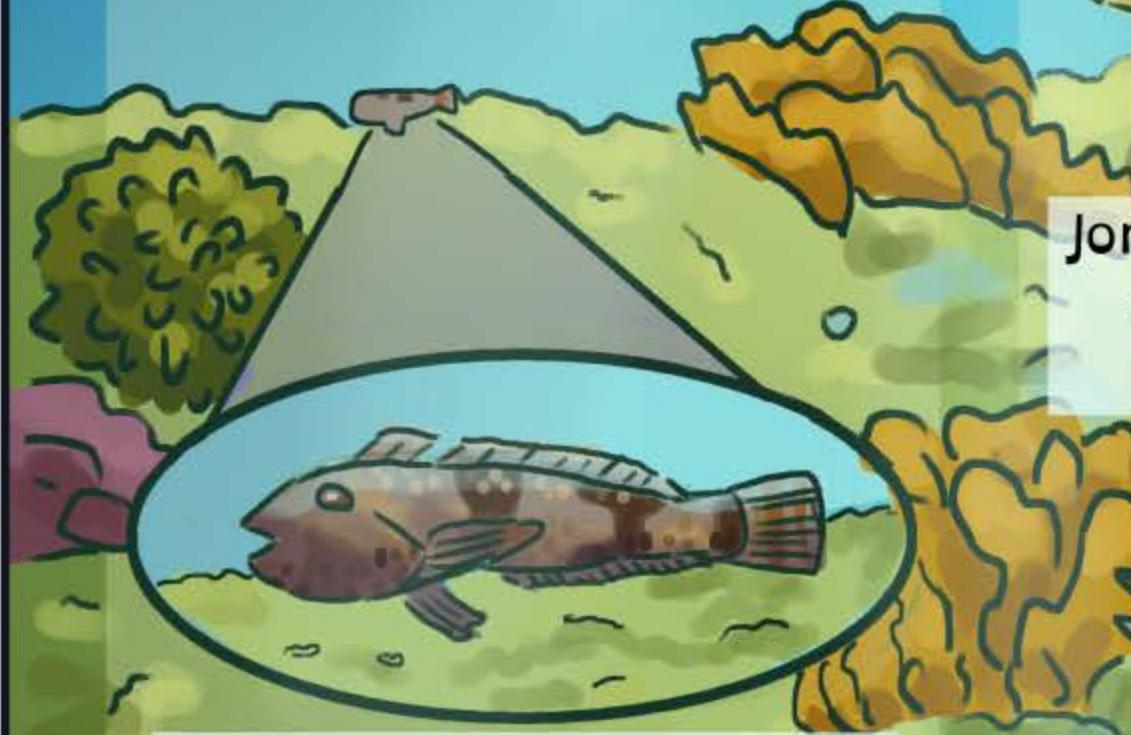


Life expectancy

Longfin icedevils can live over 60 years



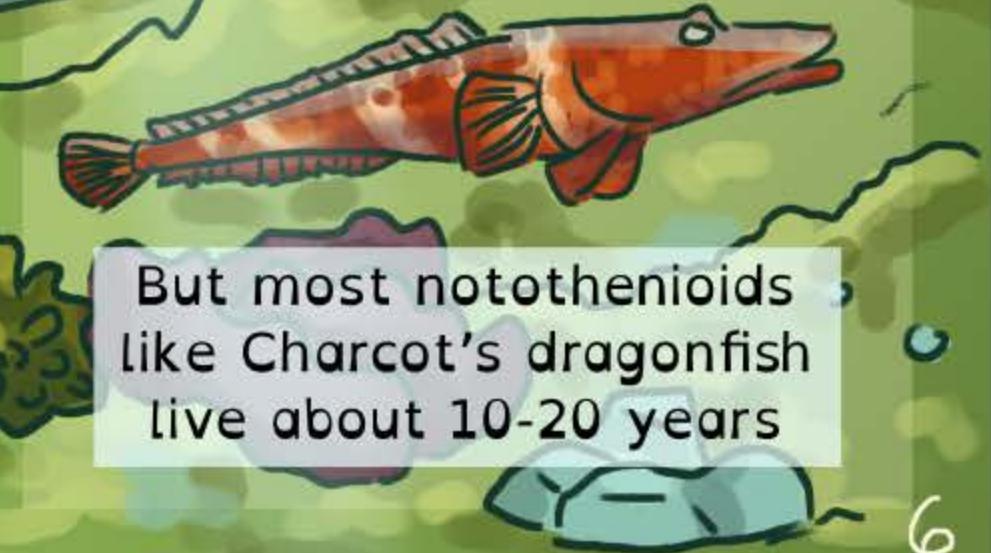
Jonah's icefish make nests and guard their eggs until hatching



Spiny plunderfishes grow less than 10cm long

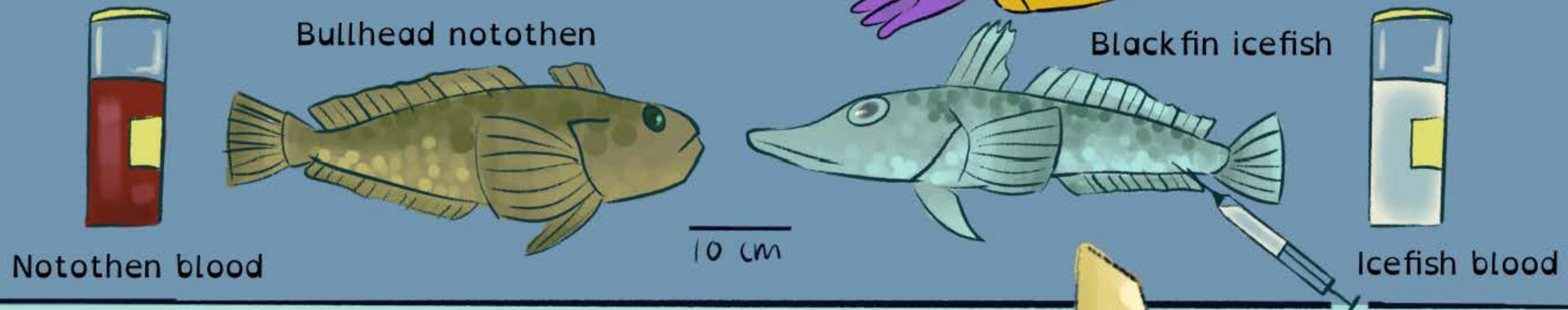


But most notothenioids like Charcot's dragonfish live about 10-20 years



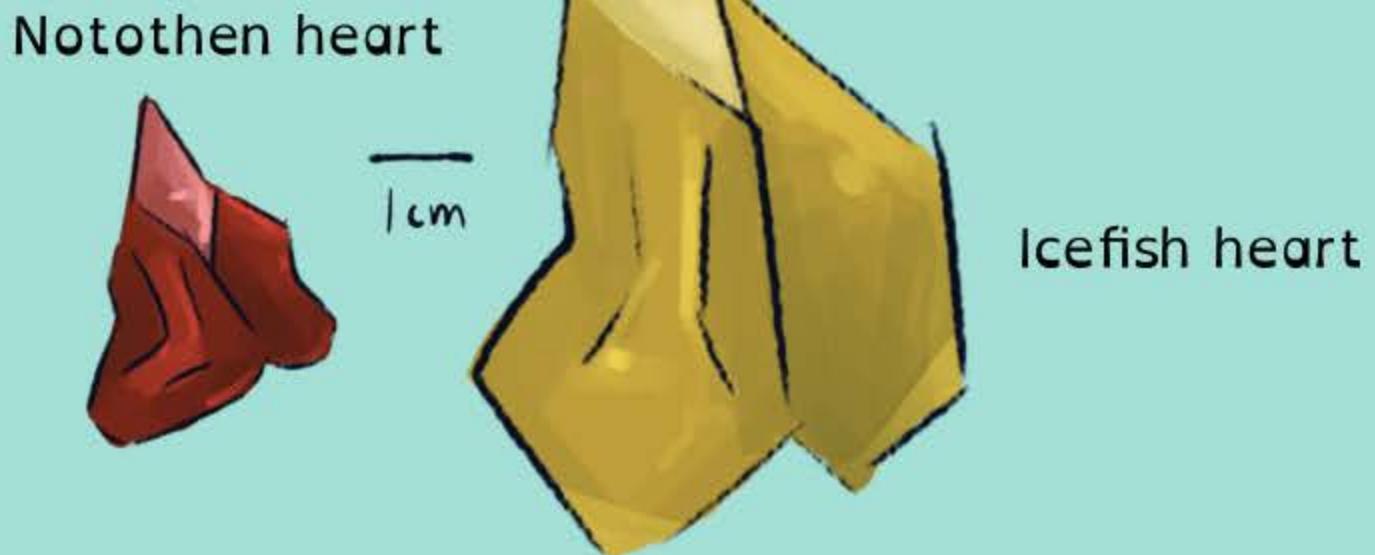
Icefishes are among the strangest of fishes:
their blood is translucent white instead of deep red!

That's because they live without hemoglobin,
the red protein that carries oxygen
in the blood in all other vertebrates.

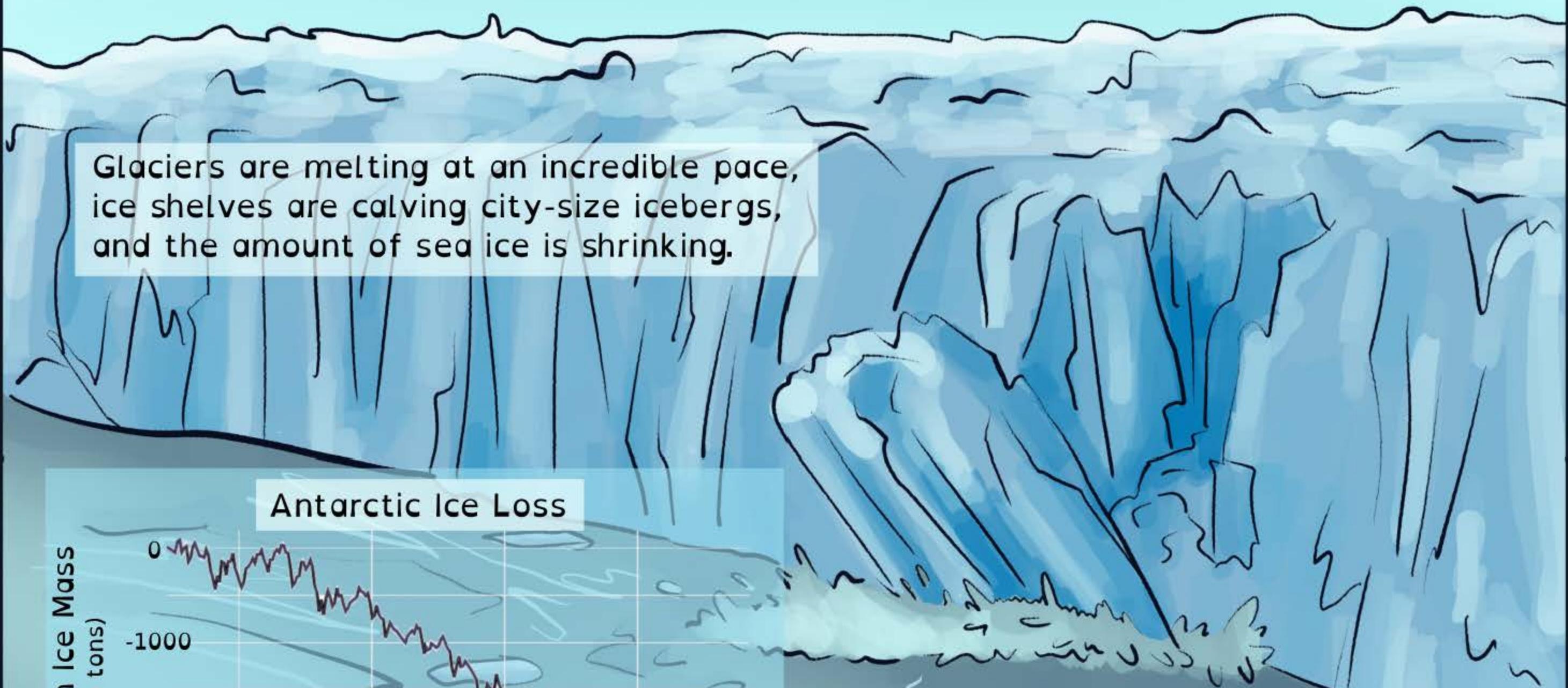


And to make up for lower ability to distribute oxygen, icefish have a large volume of blood and proportionally enormous hearts to circulate it.

How that happened is still an unanswered scientific question.



But Antarctica and the Southern Ocean are changing fast.



Glaciers are melting at an incredible pace, ice shelves are calving city-size icebergs, and the amount of sea ice is shrinking.



Will the highly specialized Antarctic fishes, which have adapted to stable freezing conditions for millions of years, be able to adapt to forecasted changes to their environment?

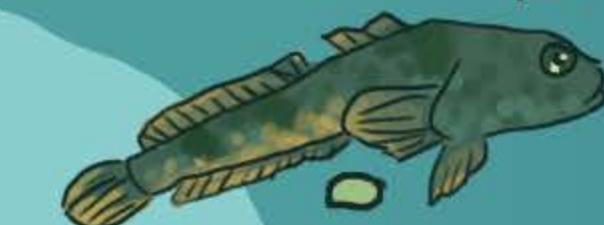
Hope comes from natural “experiments” of the past.

South America

Yellowfin notothen



Kerguelen's spiny plunderfish



Pike icefish

In the last 10 million years, Antarctic ice shelves fluctuated in size, occasionally pushing north. Some notothenioids remained there when the ice receded.

At least five times, different cast-away Antarctic lineages reacclimated and diversified in these warmer and seasonally changing environments. We call them “returnees”.

ACC

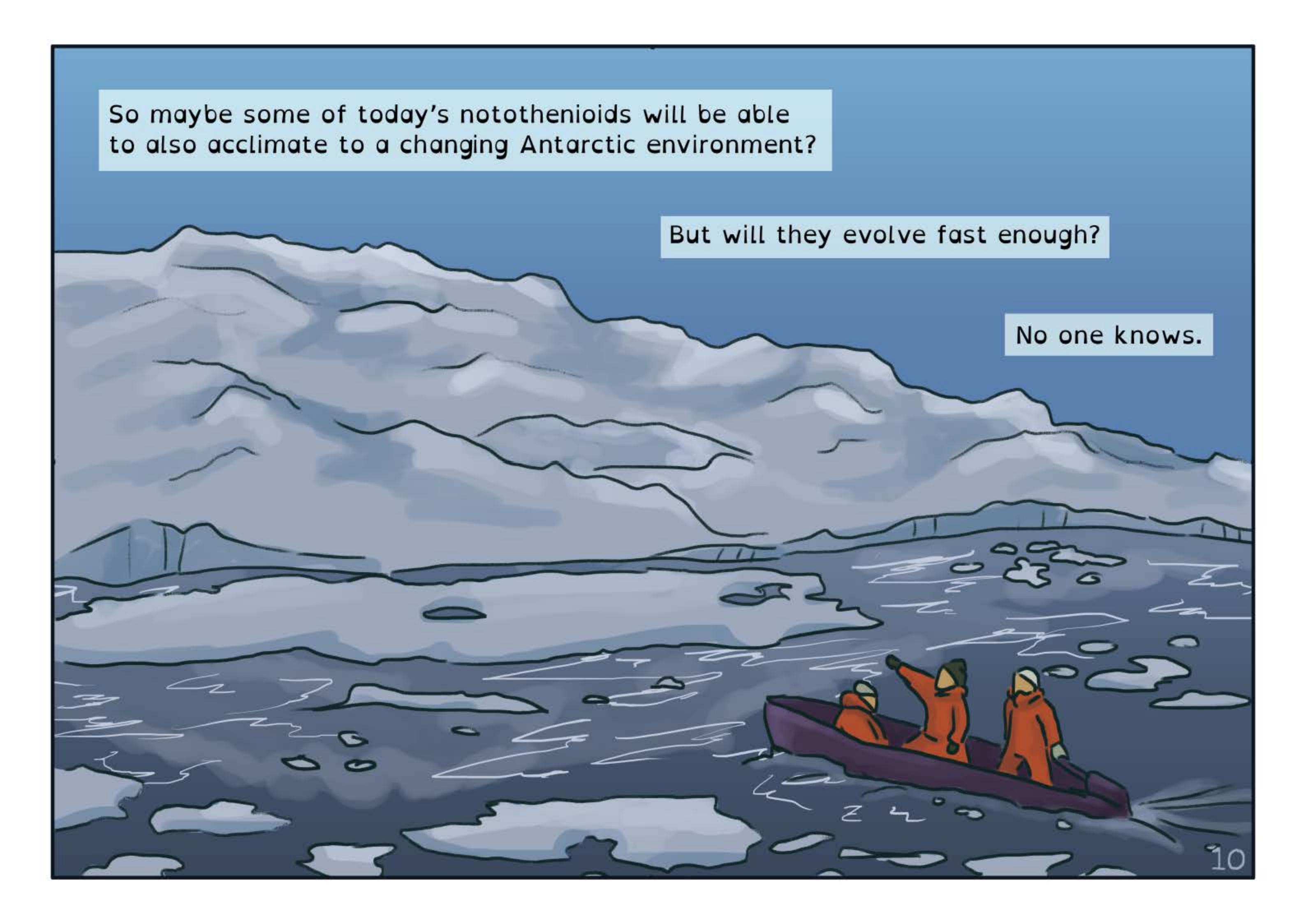
-1°C

+10°C

Australia

New Zealand

Maori Chief



So maybe some of today's notothenioids will be able to also acclimate to a changing Antarctic environment?

But will they evolve fast enough?

No one knows.

Translation credits

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