Near-blind shark is world's longest-lived vertebrate

Greenland shark found to be at least 272 years old.

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A Greenland shark swims in Lancaster Sound

A large, almost-blind shark that lives in the freezing waters of the North Atlantic and Arctic oceans is officially the world's longest-living vertebrate, scientists say.

The Greenland shark (*Somniosus microcephalus*) has a lifespan of at least 272 years, and might live as long as 500 years[1]. That is older than the 211-year lifespan of the bowhead whale (*Balaena mysticetus*), the previous record-holder in the scientific literature[2]. It also beats the popular — but unconfirmed — tale of a famous female Koi carp called Hanako, who supposedly lived to 226 years old.

Marine scientists already knew that the Greenland shark was long-lived, says Peter Bushnell, a marine physiologist at Indiana University South Bend and a co-author of the study, published in *Science*. The fish are enormous but grow slowly, suggesting a long lifespan. Adult Greenland sharks have been measured at more than 6 metres long — and researchers think that they could grow even longer. One 1963 study estimated that the species grows at less than 1 centimetre per year[3].

Getting a definitive measure of the shark's age, however, has proved tricky. Conventionally, researchers count layers of calcified tissue that grow on a fish's fin scales or other bony structures — rather like counting tree rings. But Greenland sharks have small, spineless fins, and their vertebrae are too soft for countable layers to be deposited, says marine biologist Julius Nielsen at the University of Copenhagen, who also worked on the study.

The eyes have it

Instead, the team decided to measure levels of radioactive carbon-14 in fibres in the centre of the shark's eye lens. Such measurements reflect levels of radiocarbon in the ocean when the lens was first formed. Measurements of 28 female Greenland sharks, made during surveys in 2010–13, suggested that the largest of them (at 5.02 metres long) must have been between 272 and 512 years old at the time.

The shark's longevity probably arises because it expends very little energy, owing to its cold body temperature and enormous size, Bushnell says. Not all cold, large species live to such an exceptional age, so it would be intriguing to know whether the shark has any

particular quirks or molecular tricks that contribute to its long lifespan, says Mario Baumgart, a biologist at the Leibniz Institute on Aging in Jena, Germany.

Nielsen agrees — but says that he's not working directly on that question. He prefers to explore other mysteries, such as how the sharks catch their prey, and where they mate.

The study also shows that Greenland shark females don't reach sexual maturity until around 150 years old — suggesting that a century of heavy fishing could wipe out the entire species, says Bushnell. Although the sharks aren't themselves being overfished, a greater threat comes from the way climate change is affecting fishing practices in their environment, says Aaron MacNeil, a marine biologist at the Australian Institute of Marine Science near Townsville, Queensland.

"Greenland sharks have been fished by Inuits for centuries and still there's a lot of them right now," he says. "In my view, the real danger is that the Arctic is quickly changing due to global warming, leading to increases in commercial fishing and bycatch that Greenland sharks may not be able to cope with."

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Clarifications

Clarified: Aaron MacNeil's comments have been amended to make clear his view that climate change may affect the Greenland shark by altering fishing practices in its environment.

References

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3. Hansen, P. M. in *International Commission for the Northwest Atlantic Fisheries Special Publication* **4**, 172–175 (1963).