

Sharks contain more pollutants than polar bears

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The polar bear is known for having alarmingly high concentrations of PCB and other pollutants. But researchers have discovered that Greenland sharks store even more of these contaminants in their bodies.

Researchers have studied Greenland [sharks](#) in the ocean off Svalbard, Spitsbergen. Greenland sharks are one of the largest species in the world. It can grow to as much as seven metres long and weigh over a metric ton.

Greenland sharks live in deep water, at depths of 200 to 600 meters, and live farther north than any other shark. It is also long lived, and can live to be 100 years old. They are also known as the grey shark or gurry shark.

Researchers from the Norwegian University of Science and Technology (NTNU), the Norwegian Polar Institute and Windsor University in Canada have learned a great deal new about this species during the course of their research.

"We had this theory that the sharks would occasionally move south, but it turns out that they stay in the waters around Svalbard. This makes our results clearly connected to the area around Spitsbergen," says Professor Bjørn Munro Jenssen, an NTNU biologist who specialized in pollutants and arctic biology.

You are what you eat

The researchers wanted to study behaviour, distribution, population size, concentrations of pollutants and the effect of pollutants on the species. Forty-three individuals were marked with a tracking device and a depth gauge. The researchers also took liver samples.

This species has not been extensively studied before, and for a long time researchers thought that the Greenland shark was a carrion feeder. But the shark catches a lot of live prey, both fish and seals. The liver samples showed accumulation of alarmingly high concentrations of PCB, brominated flame retardants and other pollutants.

"We think this is due to their diet, because Greenland sharks around Svalbard eat a lot of seals, which are high on the food chain, which leads to an accumulation of pollutants," Jenssen says.

The same thing happens to [polar bears](#). They also prey on species high on the food chain, as well as preferring to eat the fat, where [contaminants](#) tend to be found in higher concentrations.

Since Greenland sharks also live so long, contaminants can accumulate in their bodies over decades. The species is also poor at excreting the pollutants.

Surprising finds

The researchers were surprised to find such high levels of contaminants in the sharks. Previous studies of Greenland sharks around Iceland, Greenland and in the waters off Canada have shown much lower contaminant levels. This is due to differences in diet, the researchers say.

"The reason we found lower concentrations (in these areas) is because the sharks eat less seal. Around Svalbard, 43 per cent of the individuals we studied had seal remains in their stomachs. In Canada, around Iceland

and off Greenland, we found seal in only 14 per cent of sharks. There the sharks prey lower down in the food chain, mostly on fish, which again results in less accumulation of pollutants," Jenssen said.

Defence mechanism

The liver samples from the Greenland sharks around Svalbard also had low concentrations of vitamin A and high concentrations of vitamin E.

"We can conclude that the contaminants lead to reduced levels of vitamin A and increased levels of vitamin E in the sharks around Svalbard, but we don't know if this affects their health or reproduction. We would have to study the species for many years," says Jenssen.

Vitamin E is an antioxidant, and the increased levels might be a defence mechanism.

"It seems that animals mobilize vitamin E stored in the liver and send it into the blood stream. Greenland sharks seem to be able to do this when needed. Lower levels of vitamin A in the body lead to a reduced immune defence and may affect reproduction negatively," he added.

Research on Svalbard

Researchers have studied contaminants, their accumulation and the effect they have on animals and plants extensively in Svalbard. The focus has particularly been on polar bears. Studies have shown that polar bears have high concentrations of fat-soluble pollutants in their adipose tissue and blood. The researchers have found that the pollutants affect the bear's hormone levels and immune system. The exposure starts when the bears are just cubs, because they get large doses of the contaminants from the mother bear's fatty milk, which is all that they eat the first three

or four months in the den.

Svalbard's location exposes the archipelago to contaminants that come from both Europe and North America, but Norway itself is also exposed to these pollutants.

"But if we had polar bears along the Norwegian coast or measured pollutants in Greenland sharks along the shores or in the fjords you would make surprising finds," Jenssen says. "You could expect far higher concentrations. Seals living along the coast in Trøndelag in mid-Norway have pollutant levels five times higher than those in seals around Svalbard. In the Oslo fjord the levels are ten times higher."

Transfer value

Bears and Greenland sharks are not the only creatures that are exposed to daily doses of contaminants – humans are also at the top of the food chain. For that reason, research on Greenland sharks helps scientists understand how pollutants affect living organisms over time, including humans.

"These finds are very provocative. We are affected by pollutants, especially hormone inhibiting substances. Studies of wild animals give us information about effects that are also relevant for humans. The [species](#) highest up on the [food chain](#) are the most affected. We are among them," Jenssen said.

NTNU and the Norwegian Polar Institute have several on-going projects where researchers are looking at the effects contaminants have on animals in the Arctic Ocean. These studies also give researchers a sense of how these substances might affect humans.

Provided by Norwegian University of Science and Technology

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