

Alaska fish adjust to climate change by following the food

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Dolly Varden are a species of char common in southeast Alaska. The fish shown is in spawning coloration. Credit: Jonny Armstrong

Not all species may suffer from climate change. A new analysis shows that Dolly Varden, a species of char common in southeast Alaska, adjust their migrations so they can keep feasting on a key food source - salmon eggs - even as shifts in climate altered the timing of salmon spawning.

The resiliency of species to climate change may depend on how well they adapt to climate-driven changes in their food and habitat, such as altered growth of plants they feed on. A mismatch in timing between predators and the availability of prey could cause some species to lose access to food. But others such as Dolly Varden that successfully adjust to shifts in climate and prey offer a [climate change](#) story with a happy ending, according to the study published in [Freshwater Biology](#).

Ignoring environmental cues may help this predator

The Dolly Varden's secret appears to be that instead of taking its migration cues from environmental variables such as water temperature or streamflow, the species cues directly off the presence of [salmon](#) the Dolly Varden depend on for food, the study found.

"Despite warming temperatures and shifting salmon migrations, Dolly Varden do a great job of following their food," said lead author Chris Sergeant of the National Park Service's Inventory and Monitoring Program in southeast Alaska. "Species that can handle a high degree of variability are the ones that should be most resilient to further changes associated with climate."

Dolly Varden get most of their energy over the course of each year by gorging themselves on salmon eggs, which are abundant in summer and rich in energy thanks to the same fatty acids that make fish healthy for humans. Eggs from any single species of salmon may be available during a narrow spawning window of two to six weeks. The Dolly Varden must follow salmon migrations closely to take full advantage of this annual salmon egg bonanza.

Sticking with salmon to find food

But salmon migrations are shifting as the climate warms. Previous research by the University of Alaska and NOAA Fisheries' Alaska Fisheries Science Center in southeast Alaska's Auke Creek has shown that pink and coho salmon now migrate to their spawning grounds 10 to 17 days earlier while [sockeye salmon](#) migrate eight days earlier.

Instead of falling out of synch with salmon, though, seagoing Dolly Varden in Auke Creek have accurately adjusted their annual migrations

from the ocean back to freshwater to stick with the salmon. The adjustment has maintained their access to egg meals, according to the new research that includes coauthors from the University of Wyoming and NOAA Fisheries' Northwest Fisheries Science Center.

Researchers rely on long record of fish migration data

The research depended on a wealth of fish data from a weir on Auke Creek maintained primarily since 1980 by NOAA Fisheries' Alaska Fisheries Science Center Auke Bay Labs, supported by collaborations with the University of Alaska Fairbanks and Alaska Department of Fish and Game. From 1997 to 2006 crews counted and measured Dolly Varden migrating from the ocean, past the weir and into Auke Creek, providing an unusual long-term picture of fish migration times.

"We're really indebted to the people who kept that record going for so long," said Eric Ward of the Northwest Fisheries Science Center. "It turns out to be very valuable in understanding how species are responding to the changing climate."

Researchers in the new study used the weir data to examine the relationship between migrations of salmon and Dolly Varden from year to year. They found the timing of Dolly Varden migration more closely related to the presence and timing of the salmon than on environmental variables such as temperature and precipitation that are often seen as driving animal migrations.

In short, the Dolly Varden are shifting their migration to follow their food instead of following temperatures or other environmental cues that, as the climate changes, might otherwise lead them to migrate at a different time than the salmon that provide their most important food.

The researchers cautioned that it's unclear whether other salmon

predators could adjust their timing to follow salmon as effectively as Dolly Varden do, apparently by watching salmon passing by or detecting salmon eggs through smell. But the adaptability of Dolly Varden suggests that at least some species may be more resilient to climate-induced changes in migration timing than ecologists might assume.

Provided by NOAA Fisheries West Coast Region

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