

Scientists unravel the mysteries of the Salish Sea

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By now, the millions of people around the world who followed the saga of a mother orca carrying her dead calf know the endangered southern-resident orca whales exclusively eat chinook salmon. But what do the chinook eat?

A team of research scientists climbed into a small submarine and plunged to the bottom of the Salish Sea off San Juan Island last week, in search of the forage fish that are a staple of the chinook's diet.

They were looking for sand lance—a bottom-dwelling fish rich in fats and protein. Scientists know very little about its life and habitat in the Salish Sea. But they know it's a critical link in the food chain.

"If this [forage fish](#) disappears, the salmon will disappear," said Gary Greene, a marine geologist who works with the nonprofit SeaDoc Society. "We're just starting to get a handle on these things now."

The scientists had a rare opportunity to view the sand lance's habitat through the porthole of the small sub, which was built by Everett-based OceanGate. The submersible has a bulbous viewing window on the front, and can hold five people and dive about 500 meters, or 1,640 feet—one-and-a-half times as deep as the Columbia Center, Seattle's tallest building, is high.

Scientists want to develop a baseline of knowledge about the sand lance to see if their habitat is changing. One concern: [sea level rise](#), which will

affect the currents, could sweep away the sandy sediment that sand lance live in.

The sub "was a really good observatory," said Greene after his first dive in the vessel.

SeaDoc, an 18-year-old nonprofit based on Orcas Island, works to understand the environmental factors that could affect the health of the inland sea.

"Our role is to gather the science needed to make decisions about how we can better take care of this place," said Joe Gaydos, science director for SeaDoc. "We saw a clear need for [deep sea research](#) that was not happening" because of the cost and logistics of underwater exploration, he said. SeaDoc used private funding to partner with the OceanGate Foundation to make the sub available.

Greene, a researcher with Moss Landing Marine Labs in California who now lives in the San Juans, is an expert in underwater topography, and has mapped the entire Salish Sea floor. On Sept. 11, he dived in the sub with Matt Baker, a marine biologist and sand-lance expert. Both scientists work out of the University of Washington's Friday Harbor Labs.

Greene said he and Baker were surprised to see many more sand lance than they expected. The fish popped out of the sand as the sub approached, an arresting sight that hinted at how the chinook may be able to hunt them.

The sand lance is so oily that if you dry it out, it will burn, Greene said. It has no swim bladder to stabilize it in the water column, unusual among fish. To rest, escape predators and overwinter during cold months, the slender fish uses its pointed snout to dive headfirst into shifting "waves"

of sand hundreds of feet below the surface.

It dines on tiny organisms like copepods and zooplankton, transferring energy from organisms at the bottom of the food chain to animals at the top, like killer whales.

The sub's scientists have also explored whether scientific trawling on the sea floor is causing any damage to the environment (so far, it looks like it is not). They also took a close look at the red sea urchins that live in Haro Strait, the deep channel west of San Juan Island's Lime Kiln Point State Park, where orcas hunt for salmon—and where J50, the 3-year-old resident of J pod, was last seen alive.

Here at the edge of the island, the bottom drops off precipitously. It's an ideal habitat for red sea urchins, which can live up to 150 years. They move so little that "they're kind of like an old growth forest," said Alex Lowe, a UW graduate student studying biology.

On a dive last week, Lowe and Aaron Galloway, an assistant professor at the University of Oregon's Institute of Marine Biology, spotted a red sea urchin at about 284 meters—more than double the known range of the urchin.

The urchins feast on a conveyor belt of kelp salad—leaves that have broken off kelp plants. "This expands our perspective on what this particular species does," Galloway said.

Last Wednesday, four graduate students took a turn underwater in the sub to study the effects of trawling on the sea's floor.

After a three-hour dive, the sub came to the surface in a froth of bubbles. Two OceanGate boats, a big UW research towing vessel and a small inflatable craft zoomed in, helping to guide the sub onto a cradle

on a barge that is used to tow the submersible around. The sub moves slowly, and needs to be towed long distances.

Once it was secured to the cradle, the four graduate students popped out of the top hatch, perching on the vessel's top to put their shoes on before climbing a ladder down to the barge. They were followed by their pilot, Stockton Rush, the CEO of OceanGate.

The students, all studying with UW professor Adam Summers, were beaming as they returned to one of the UW research boats, the Molly B, for the ride home.

How was it down there?

In a word: "Awesome!"

For a period of time, they turned off the lights in the sub and sat on the bottom. "You can't imagine the blackest black," said Kayla Hall. "You could see nothing." Wednesday's dive took her 360 feet below the surface, 330 feet beyond her lowest plunge to date.

"And you build this picture in your head, and it's kind of an abstraction from the real world, but you want it to be accurate," said Lowe, the graduate student studying sea urchins.

Seeing something like the red sea urchin living at a depth greater than anyone had ever seen before, he said, "changes your entire vision of the way the system works."

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