

Study suggests warmer water tough on juvenile salmon

NEWPORT — A new analysis of juvenile Chinook salmon in the Pacific Ocean documents

a dramatic difference in their foraging habits and overall health between years of warm

water and those when the water is colder.

The study found that when the water is warmer than average — by only two degrees Celsius — young salmon consume 30 percent more food than during cold-water regimes.

Yet they are smaller and skinnier during those warm-water years, likely because they have to work harder to secure food and the prey they consume has less caloric energy.

Results of the research, conducted by researchers from Oregon State University and the National Oceanic and Atmospheric Administration, are being published this week in the journal PLOS One.

"When young salmon come out to sea and the water is warm, they need more food to

keep their metabolic rate up, yet there is less available food and they have to work harder," said Elizabeth Daly, an Oregon State senior faculty research assistant with the Cooperative Institute for Marine Resources Studies, a joint program of OSU and NOAA.

"Our long-term data set contradicts the long-held assumption that salmon eat less during warm-water regimes," Daly added. "They actually eat more. But they still don't fare as well. When the water is warm, salmon are smaller and thinner."

Daly teamed with Richard Brodeur, a NOAA Northwest Fisheries Science Center researcher, to examine 19 years of juvenile salmon surveys, from 1981-85 and 1998-2011.

The rich, long-term data set revealed the trophic habits, size and condition of yearling Chinook salmon caught soon after they migrated to the ocean.

The researchers found that during both warm- and cold-water regimes, the diet of the salmon is primarily fish, but when the water is cold, they also consume more lipid-rich krill and Pacific sand lance. When the water is warmer, the salmon's diet had more juvenile rockfish and crab larvae.

Previous research led by Bill Peterson, a NOAA fisheries biologist and courtesy professor in OSU's College of Earth,

Ocean, and Atmospheric Sciences (CEOAS), found that the makeup of copepods during cold-water years differs greatly than during warm-water years. In cold years, these small crustaceans drift down from the north and are lipid-rich, with much higher nutrient levels than copepods from the south.

And though salmon may not directly consume these copepods, they are eating the fish that do consume them, noted Brodeur, also a courtesy faculty member in CEOAS.

"The warm years typically have less upwelling that brings the cold, nutrient-rich water to the surface," Brodeur said. "Or in the case of 2005, the upwelling was so late that many of the salmon died because there was no food when they entered the ocean."

"Salmon populations may be able to handle one year of warm temperatures and sparse food," Brodeur added. "But two or three years in a row could be disastrous — especially for wild fish populations. They may have to travel much farther north to find any food."

Hatchery-raised salmon that are released in similar numbers in warm- or cold-water years may fare slightly better during bad ocean conditions, the researchers noted, because they tend to be larger when they enter the marine environment.

Daly and Brodeur, who work out of OSU's Hatfield Marine

Science Center in Newport, Oregon, said that the 19 survey years they analyzed included 10 warm-water years and nine cold-water years. In some cases, the warm water was a result of an El Niño, while in other years it was a lack of upwelling.

During the last two years, an unusually large, warm body of water has settled into the ocean off the Pacific Northwest that scientists have dubbed "The Blob," which is forecast to be followed this winter by a fairly strong El Niño event.

Though recent spring Chinook salmon runs have been strong due to cooler ocean conditions in 2012-13, the impact of this long stretch of warm water on juvenile fish may bode poorly for future runs.

"So far this year, we've seen a lot of juvenile salmon with empty stomachs," Daly said. "The pressure to find food is going to be great. Of those fish that did have food in their stomachs, there was an unusual amount of juvenile rockfish and no signs of Pacific sand lance or krill."

"Not only does this warm water make it more difficult for the salmon to find food, it increases the risk of their own predation as they spend more time eating and less time avoiding predators," she added.

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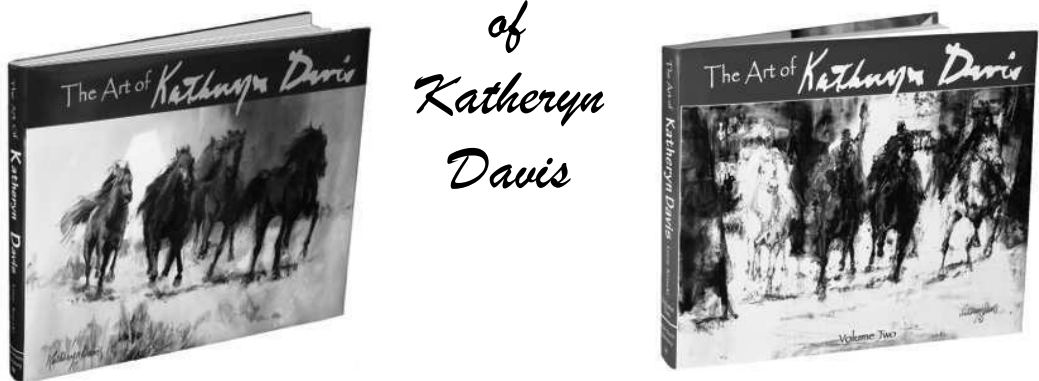
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'Speak Whale' along the Oregon coast

For the holiday season, share the gift of whale watching on the Oregon Coast.

From Dec. 27 through 31, Winter Whale Watch Week is one of the best times of the year to spot gray whales off the stormy Oregon coastal shores.

Approximately 18,000 whales will travel 12,000 miles south to Mexico, where they will give birth to their calves.

There are nearly 40 different volunteer staffed locations where you can spot gray whales on the Oregon Coast, including the 10th floor of the prestigious Inn at Spanish Head in Lincoln City.

From the top floor, visitors can spot these creatures nearly every hour in late December as they make their journey.

For a more up-close and personal view, Dockside Charters in Depoe Bay offers daily whale watching excursions starting in mid-December.

Just 8 miles south of Lincoln City, Depoe Bay is considered the "Whale Watching Capital of the Oregon Coast" and is also home to the Oregon State Parks Whale Watching Center.

"We offer 90-minute whale



COURTESY PHOTO

The tail of a migrating gray whale appears off the coast near Cape Perpetua.

watching excursions for the winter," says Loren Goddard, one of the owners of Dockside Charters. "Typically our excursions are an hour long, but because the whales are moving fast to Mexico, we have to accommodate for that. We recommend that visitors make reservations early because the winter excursions are very popular."

Goddard says what makes the trips so popular is that "Visitors are curious about whales on the coast. And the whales are just as curious about us as we are of them," Goddard explains. "The best part is when they come right up to the boat. Seeing these mammals up-close is a very special experience."

During the winter and spring months, Oregon State Parks posts trained volunteers at prime viewing points along the Oregon Coast to help visitors spot the mighty mammals.

Its "Whale Watching Spoken Here" signs identify the volunteers. They will point out special behaviors such as spy hopping, breaching, and spouting, as well as discuss whale feeding, courtship and migration patterns.

Just a few years ago, the whale population dipped to 1,800 making them "commercially extinct."

Today, under the protection of the Mexican and US governments, the population has grown to more than 20,000 whales.

Gray whales can grow up to 45 feet in length (13.7 meters) — longer than a city bus — and weigh more than 45 tons (41,000 kg).

To schedule a whale-watching trip, contact Dockside Charters at 541-765-2545.

To learn more about the winter and spring whale-watching seasons, contact the Depoe Bay Whale Watching Center at 800-551-6949 or visit www.whalespoken.org.

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