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Looking for 'elakha'

PSU researchers scan ancient otter DNA to find a species that can survive along Oregon's coast

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By Michael Milstein of The Oregonian staff

When archaeologists sifted through the remains of a Native American village at the mouth of the Coquille River in what is now the city of Bandon, they found the bones of wildlife the village's residents depended on for food, clothing and more.

Sea lion bones were the most common among marine mammals, a cultural staple for Oregon's coastal tribes. But the next most common were the bones of sea otters, outnumbering the remains of the seals and whales more prominent in the ocean today.

"It was pretty surprising," said Roberta Hall, an Oregon State University anthropologist who led the excavations. "The otter was a valuable item. It was a wealth item and was traded for great distances."

It was especially surprising because the wild sea otter -- "elakha" to Native Americans -- no longer lives along the Oregon coast.

Now, in the first stage of an effort to return the sea otter to Oregon, Portland State University researchers are focusing a genetic magnifier on otter bones from prehistoric settlements. They want to learn more about the otters that once plied Oregon's shores by the thousands, their valuable pelts fueling early exploration of the region.

The researchers hope to weave information from ancient otter DNA into a detailed picture of the native Oregon otter, once a keystone of the coastal community. In particular, they want to know whether the native otter was more closely related to the northern sea otter, which populates the Aleutian Islands of Alaska, or the southern sea otter, which lives on the California coast -- or whether it was some blend of the two.

The aging bones of the native otters hint at their species, but the Portland State team is searching for the genetic blueprint locked within the otters' DNA. The researchers hope to recover the first DNA from prehistoric sea otter remains. From it, they would try to reconstruct the now-hidden family tree of Oregon's long-missing otter, along with a vision of how that tree grew and changed through time.

"DNA adds that much more clarity," said Kim Valentine, a Portland State graduate student who will conduct most of the laboratory work for the project, which is to be financed through donations and grants. "It adds light to the picture

that you couldn't get any other way."

The blend of archaeological, paleontological, biological and even molecular detective work should tell the researchers which modern species of otter would be best suited for the Oregon coast. They also hope such genetic groundwork will help avoid a repeat of a 1970s reintroduction of almost 100 Alaskan otters to Oregon, which failed when the animals all disappeared.

Question of adaptation

Some scientists suspect those animals might have been a different species, with teeth of a different size and shape, from the original Oregon otter and not as well adapted to life on the Oregon coast.

"It's possible that those just came from the wrong population," said Virginia Butler, a professor of anthropology at Portland State and a leader of the otter project. "There may be characteristics that distinguish the Oregon sea otter, and we'd like to know as specifically as we can what those are."

The sea otter is deeply rooted in Oregon history. Its rich and luxurious pelts were a currency of early coastal commerce. Native Americans so valued their sea otter robes that Lewis and Clark, during their rainy winter at Fort Clatsop, could not persuade a local chief to trade his three "very elegant" sea otter skins for all the expedition's blue beads (a "favourite merchandize (sic)" of the locals, Clark wrote) -- even when they offered him a knife to sweeten the deal.

Such value and prestige carried throughout the world, fueling European exploration and domination of the West Coast. Fur hunters from Russia, Spain, France, England and the fledgling United States had killed more than a million sea otters along the Pacific Coast by the time wagon trains began bringing settlers to Oregon.

The last known native Oregon sea otter is thought to have been killed near Newport in 1906. Its pelt later sold for \$900.

When the Atomic Energy Commission planned nuclear tests in Alaska's Aleutian Islands in the 1970s, biologists shipped Aleutian otters to the Northwest, releasing 59 on the west side of Washington's Olympic Peninsula in 1969 and 1970 and 93 otters on the Southern Oregon coast near Port Orford in 1970 and 1971.

Otters eat mainly shellfish such as sea urchins, crabs, clams, mussels and snails, and biologists figured the rocky reefs on Oregon's south coast, like the Olympic Peninsula, represented prime otter range.

Mysterious disappearance

Now protected from hunting under the Marine Mammal Protection Act, the reintroduced otters held on in Washington and have multiplied into a population of more than 500. In Oregon, though, the otters disappeared by about 1980.

That puzzled biologists such as Ron Jameson, who tracked the transplanted animals and now works for the U.S. Geological Survey's Biological Resources Division in Corvallis. "My feeling is that most of them were trying to get home, and where they ended up, no one knows," Jameson said. "Maybe they ended up in Washington and joined the population there."

A later examination of otter bones from prehistoric sites along the Oregon coast showed that the original Oregon otter might have been a kind of intermediate species, with teeth and a jaw different from those of otters to the north in Alaska and to the south in California. Those differences might have put the Alaskan otters brought to Oregon in the 1970s at a disadvantage, in the same way a plant adapted to the wet Northwest would have a hard time living in the desert.

If that's the case, said anthropologist R. Lee Lyman of the University of Missouri, who examined the otter bones, "perhaps those transplanted sea otters were doomed from the moment they were captured."

He suggested in a 1996 paper that genetic analysis of the otter remains might unearth an answer, especially because most biologists now agree that any reintroduced wildlife should be as closely related to a region's original species as possible.

Lyman's suggestion made sense to David Hatch, an engineer with the city of Portland who researched the history of the sea otter in Oregon while serving on a committee that last year named a new Oregon State University research boat Elakha, for the otter. When he later organized the Elakha Alliance, a group hoping to return sea otters to Oregon's waters, one of its first orders of business was to recruit the Portland State researchers to carry out the genetic analysis.

"When the time comes, we want any otter that comes back to Oregon to have the best possible chance," Hatch said. "We know a lot more now than we did in the 1970s, and we have the tools to learn even more."

Missing ecosystem link

Hatch, a member of the Confederated Tribes of Siletz, has come to see the otter as a missing link in Oregon's coastal ecosystem. Without the otter to control sea urchin numbers, urchin hordes mowed down the kelp forests that grew along rocky sections of coast and served as nurseries for fish.

"When my dad was a kid, we could still catch large flounder at Florence," Hatch said. "The ocean is very different now than it once was. The whole ecosystem was upset when we lost kelp, and if we want that ecosystem to recover, the otter has to be part of it."

Although the southern sea otter is recovering in California, it remains an endangered species. The northern sea otter, native to Alaska, is planned for listing as a threatened species because of a dominolike ecological collapse that underlines Hatch's view.

Biologists think Alaska's orcas, popularly known as killer whales, began eating otters when sea lion numbers declined, triggering an explosion of sea urchins, a collapse of kelp beds and a falloff of fisheries.

"I suspect that sea otters could be some benefit to the kelp beds by reducing urchins, and that would be important to the near-shore fishery," said Jameson, the otter biologist.

In January, the Siletz Tribal Council endorsed sea otter recovery in Oregon and joined the Elakha Alliance, which includes representatives from other tribes, state

and federal wildlife agencies, the Oregon Zoo, the Oregon Coast Aquarium and scientists from Portland State and Oregon State universities.

Opposition to reintroduction

That's not to say sea otter restoration would win support from all quarters: Fisheries groups have contested otter reintroduction in Oregon in the past, and, Hatch noted, many Oregonians do not even realize elakha is missing. "I'm surprised how many people think the otter is still here," he said. "It's going to be a long education process."

That will continue as the Portland State team unravels the genetic secrets of Oregon's vanished sea otter in a kind of a molecular fishing expedition for ancient DNA.

The researchers will first grind a tiny section of tooth from ancient sea otter remains. Then, working in the laboratory, they will fish in that sample for segments of DNA that serve as a sort of biological bar code for different otter species and may even divulge relationships between otter populations up and down the West Coast.

By repeating the process for otter remains from different times -- for instance, one that's 500 years old and another that's 1,000 years old -- they may be able to tell how Oregon's otters evolved through time, perhaps in response to human pressure.

It may be easier said than done.

Ancient DNA sometimes breaks down, like an artifact crumbling to dust. The researchers also must take precautions so they don't accidentally snag a rogue piece of DNA from microbes floating through the air. And they must focus on a section of the biological bar code that varies enough between otter populations to distinguish one from another. Some sections, for instance, may be identical from one population to another. Others may vary from one otter to another.

"We're basically using a variety of techniques to look back in time and learn about the evolution of this species," Butler said. "It's exciting because it brings together biology with archaeology to answer a question that may be important to restoring a healthy ecosystem today."

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