# 94% Decline In Aleutian Islands Sea Otter Population

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"We aren't aware of any mammalian decline of either this magnitude or geographic extent. It's really kind of mind boggling, actually."

- Tim Tinker, Marine Ecologist, University of California, Santa Cruz

Sea otter with arms folded floating on its back in Aleutian Islands. Photograph courtesy U. S. Fish and Wildlife, Alaska.

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Changing Environment and Impact On Animals

The past ten years have been the warmest in a thousand years; the Arctic ice cap has shrunk over the past three decades to about half the size it was.

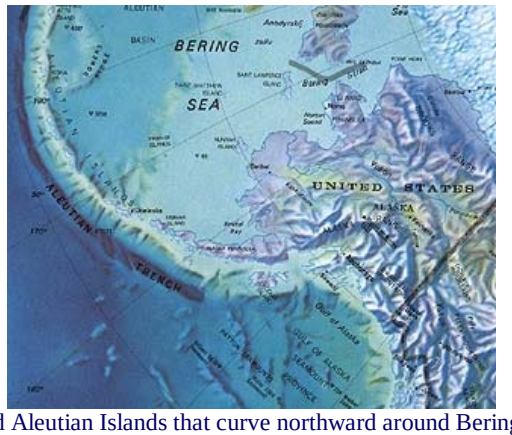
Polar bear survival is threatened as the ice shrinks.

The hole in the ozone over Antarctica in Fall 2000 was the biggest it has ever been.

Increased ultraviolet exposure from thinning ozone has been linked to amphibian deaths.

The temperature of the stratosphere is becoming much colder while the air close to the earth continues to warm, increasing atmospheric instability and wind speeds.

Sea Otters Near Extinction - Data analyzed from 1977 show the Gulf of Alaska waters suddenly warmed up 2 degrees Celsius. No one at the time thought that temperature change would create big problems. But today, researchers hypothesize that those two degrees ultimately have produced the near extinction of sea otters in the Aleutian Islands. Since 1992, the otter population fell from around 100,000 down to 6,000 - a decline of 94%. That rate of decline is unprecedented for any mammal population in the world to date.




Gulf of Alaska and Aleutian Islands that curve northward around Bering Sea off the west coast of Alaska.
It is estimated that 90% of the world's sea otter population resides in the near shore coastal waters of Alaska.
But only 6,000 are left in the Aleutian archipelago down from more than 100,000.

Scientists have been completely baffled about the sea otters' steep decline. First they wondered if disease was sweeping through the marine animals. But if so, where were the thousands of dead bodies? It began to dawn on University of California - Santa Cruz grad student, Tim Tinker, that perhaps the otters were being eaten. But by what? The surprising answer is a predator that until now had lived peacefully with the otters for thousands of years: orca, the killer whale.

Scientists now have watched the whales eat the sea otters. Marine ecologist, Tim Tinker, calculated that four killer whales could eat 40,000 otters in five years. But what would provoke the whales to turn to the sea otters for food? Scientists speculate that the sudden and unusual warming of the Gulf of Alaska killed temperature-sensitive plankton. Then like falling dominoes, without plankton to eat, shrimp, crab, herring and other smelt fish starved and vanished. Smelt was always a major source of fat for baby marine animals, so when the smelt disappeared it triggered the collapse of seal and sea-lion populations that killer whales depended upon. Finally, the killer whales started eating the sea otters.

As the sea otters began to disappear, one of the animals they fed upon - the sea urchin - had a population explosion. Scientists have recently counted as many as 100 of the spiny creatures per square foot on the ocean floor. As the sea urchins spread in such density, they destroyed kelp forests that in turn caused the rapid decline of fish species that depend upon the kelp for protection. Cod, pollock and salmon like warmer water and moved in, followed by sharks.

Sea otter floating on its back eating sea urchins.
Photograph courtesy U. S. Fish and Wildlife, Alaska.

The rapid and extreme transformation of the Aleutian Islands has shocked scientists who are trying to understand exactly how it all happened and what the implications are for the earth's future in a projected period of global warming. I talked this week with Tim Tinker who has traveled to the Aleutian Islands with marine expert Dr. Jim Estes and others to count the remaining sea otters. The scientists suspect that however the Aleutian Island puzzle pieces ultimately fit

together, the big changes probably started with that warmer water in the Gulf of Alaska.

Sea otters near Alaskan coast.
Photograph courtesy U. S. Fish and Wildlife Service.

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## Interview:

**Tim Tinker, Ph.D. Candidate in Marine Ecology, Dept. of Ecology and Evolutionary Biology, University of California, Santa Cruz, California:** "It shows us that what might be perceived as fairly minor ecological changes, a change in water temperature by a few degrees or the change even in species composition or prey composition in the diet of one species in response to over fishing or any other human-caused change in the ecosystem, can have really profound and unforeseen consequences.

**IS IT FAIR TO SAY THAT IT IS ALMOST SHOCKING TO YOU AS SCIENTISTS THAT SEA OTTERS WOULD HAVE A POPULATION DECLINE THAT PRECIPITOUS?**
Oh, yes! Yeah! That was extraordinarily shocking! That was completely unanticipated by us or anyone, really, that a population - that we could even see a decline both that extensive geographically and that rapid among, in a species, a large mammalian species that does not typically undergo that sort of population fluctuation of that magnitude. Again, as I alluded to before, that sort of demonstrates to us our very limited understanding of the linkages between ecosystems and the complex relationships that exist both within specific ecosystems and can link to ecosystems in ways we cannot anticipate and the sudden inclusion of sea otters as prey to killer whales was completely unanticipated by us. And even when we saw it, we knew it was occurring for about 4 to 5 years, we had been seeing this and were aware it was occurring and thought of it more as an interesting observation before it really dawned on us that in fact this could have that sort of effect.

**BUT SOMETHING PROVOKED THE KILLER WHALES TO SUDDENLY START SWITCHING AND FOCUSING ON THE SEA OTTERS?**
Yes, that seems pretty clear just based on all the observations that , all the people who have studied sea otters throughout this century and all the people who have spent a lot of time watching sea otters, predation events by killer whales of sea otters were just completely unheard of or unwitnessed entirely until our first observations in the early 1990s. Since that time, we've seen it fairly regularly. So it does seem clear that something caused them to add sea otters to their diet. We believe that a logical explanation of that would be decrease in some of the other marine mammal species that we know were included in their diet before, primarily stellar sea lions.

**IF IT''S DOWN TO 6,000 SEA OTTERS FROM OVER 100,000 NOW IN THE ALEUTIAN ISLANDS, AND IF IT KEEPS DROPPING, IT'S POSSIBLE THAT IN THE ALEUTIAN ISLANDS, THE SEA OTTER POPULATION MIGHT GO TO ZERO THERE?**

I don't really think that's likely to transpire. But it certainly is one conceivable result. At this point, I don't think so. I think it's more likely that small local populations will continue to persist. However, when the numbers are that low, what certainly can happen is that at smaller islands that are only sustaining really tiny populations that you could have local extinctions. So we could start to see fragmentations of the population. In fact, we already know that has occurred. There are a few islands during this past year that were surveyed on which no otters were found. So, it appears that some local extinctions have occurred.

**THE SIGNIFICANCE IS THAT IN THE LONG ANNALS OF HUMAN RESEARCH, THIS IS AN UNPRECEDENTED EVENT AMONG MAMMALS?**
Yes, we aren't aware of any mammalian decline of either this magnitude or geographic extent. It's really kind of mind boggling, actually. We think the significance is really more than that because attending the decline of the sea otters has been this whole suite of changes in the coastal ecosystem of the Aleutian islands with a dramatic increase of sea urchins, their primary prey and resulting decrease in kelp forest stands. And we're only beginning to understand and document the changes that are occurring in response to decrease in kelp density. Another student of Dr. Estes is looking at kelp bed fish populations and just based on her early analysis of her data, it looks like there has been really dramatic changes in the fish population have occurred. And all this has happened just within the last five years. So, we think this is a pretty extraordinary event and it definitely effects just more than the sea otter population.

**THE CURRENT U. N. REPORT RECENTLY CAME OUT ABOUT GLOBAL CLIMATE CHANGE PROJECTIONS OVER THE NEXT 100 YEARS BASED ON DATA FROM SEVERAL INTERNATIONAL LABORATORIES. THE DATA PROJECTS THAT THE GLOBAL MEAN AVERAGE TEMPERATURE COULD RISE ANYWHERE FROM 3 TO 10.5 DEGREES FAHRENHEIT OVER THE NEXT 100 YEARS.**

**OVER THE 100 YEARS OF THE 20TH CENTURY, THE GLOBAL TEMPERATURE ONLY ROSE 1 DEGREE. A 3 TO 10.5 DEGREE INCREASE IS ALMOST INCOMPREHENSIBLE. COULD WE BE SEEING IN THE ALEUTIAN ISLANDS A SMALL PRELUDE OF THINGS TO COME?**
I think that's probably a good appraisal of the situation. Whatever the whole suite of causes for this change, it definitely appears that a change in temperature has played a part and it certainly gives us an idea of the really broad and dramatic changes that can happen in response to what we might think are relatively minor changes. So, yeah, I think that does give us a good taste of what more we might expect to see."

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## More Information:

Tim Tinker, Dr. Jim Estes and their UCSC and USGS colleagues will travel to the Aleutian Islands again in the 2001 summer to count sea otters on three islands from a slow moving boat.

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## Websites:

**http://alaska.fws.gov/**

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