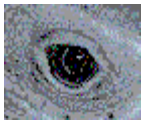

Melissa Kaplan's
Herp Care Collection
Last updated August 17, 2002

Frog population declines continue

Amphibian mortality linked to climate change

David Strauth, Oregon State University, 04/04/01

CORVALLIS, Ore. - Toad embryos in the Cascade Range of Oregon appear to be dying due to a chain of events that's ultimately linked to climate change, a new study suggests, demonstrating both the importance of large-scale global trends and the complexity of their impact on individual species.

The report by scientists from Oregon State University and Pennsylvania State University will be published Thursday in the journal Nature.

It traces one link to another in a pattern that begins in the southern Pacific Ocean and ultimately results in masses of dead, rotting toad eggs in a small alpine lake many thousands of miles away, which are those of an amphibian species in decline.

"This study suggests a causal explanation for problems with one amphibian species in the mountains of Oregon," said Andrew Blaustein, a professor of zoology at Oregon State University. "But in a larger sense it shows that if we want to understand the complex ecology of the world around us, we must start looking at the big picture. There will not be simple or easy answers for all of our problems."

Blaustein co-authored this study with Lisa Belden of OSU and Joe Kiesecker, a professor of biology at Penn State and leader of the research team. For years these scientists have studied the level of amphibian declines around the world and those of the Pacific Northwest in particular. Among other findings, they have linked amphibian declines in Oregon to elevated level of exposure to UV-B radiation in sunlight, and also to infection of embryos by a fungus, Saprolegnia ferax.

In this study, they were able to identify connections in the struggle of this individual toad species to survive that took them all the way to global warming and the greenhouse effect.

"Although the results reveal the amazing complexity associated with understanding biological systems, they also demonstrate that there may be simple rules that we can follow to help us understand this complexity," Kiesecker said. That could include the use of simple indicators of global climatic fluctuations to make predictions about ecological interactions on local scales, he said.

In this study, the research cited evidence that greenhouse warming and other climate changes may be increasing the frequency and intensity of El Nino events, which are an unusual warming and ocean circulation pattern of the southern and equatorial Pacific Ocean.

In turn, other studies have shown clear connections between El Nino events and reduced precipitation in the Pacific Northwest during the winter, when that region gets most of its rain or snow.

"At this point, we looked at the effect of low precipitation on water depth in the Cascade lakes and

the amphibians that live in them," Blaustein said.

"We've known for some time that elevated levels of UV-B radiation can cause stress and higher levels of mortality to embryos of the western toad and some other species. Egg mortality has approached 100 percent in some recent years."

At first, the scientists thought the explanation was the documented depletion of the Earth's ozone layer and the higher, damaging levels of UV-B associated with that.

That still is a factor, the researchers say, but it also appears to involve a synergistic effect with the actual depth of the water. Quite simply, deeper water shields the toad eggs from some of the damaging effects of UV-B radiation. The toads have evolved to always lay their eggs in the same location with relatively shallow water that, in the past, apparently provided the optimal combination of warmth for quick hatching and adequate protection from UV-B radiation. But when the water levels dropped too low at that location due to lower winter precipitation, the eggs were exposed to much higher levels of UV-B radiation, the scientists found. They then weakened and became vulnerable to the opportunistic fungus that ultimately killed them by the thousands.

The study showed that more than 50 percent of the western toad embryos that developed in very shallow water less than eight inches deep developed fungal infections. Those which developed in water which was even a few inches deeper were exposed to about half the level of UV-B radiation and never experienced mortality higher than 19 percent.

In other words, the climate-induced fluctuations in water depth directly caused high mortality of embryos by increasing the level of UV-B radiation and their vulnerability to infection. And those climate-induced fluctuations in turn are linked to global processes that are affecting the entire Earth and, almost certainly, many more species than just this one frog in the Cascade Range lakes of Oregon.

"The climate change-induced increase in various lethal diseases affecting a wide range of organisms may explain the recurring theme of epidemic disease associated with many amphibian declines," the researchers said in their report. "It has become increasingly clear that if we are to predict how climate change may translate into species losses we must link global and local interactions."

Amphibian declines around the world have alarmed ecologists in recent years. More than a dozen species have disappeared from Australia and declines have been documented in Europe, South America, Asia, Africa and North America. Several species in the Pacific Northwest are listed as candidates for the endangered species list.

In various studies researchers have linked the declines and deformities to habitat destruction, invading species, elevated UV-B radiation, pathogens, and even crop fertilizers.

Research Supports Pesticide Link in Decline of Threatened California Red-Legged Frogs

Ascribe Public Interest Newswire, 04/02/01

SACRAMENTO, Calif., April 2 (AScribe News) -- Though the California red-legged frog recently earned sweeping federal protection from habitat destruction, researchers from California State University, Sacramento and University of California, Davis have found new evidence that their decline may also be pesticide-related.

"It's the first time scientists have been able to link a known declining frog species with pesticides," says Carlos Davidson, an environmental studies professor at CSUS. "We found there

is a very strong association between declines of red-legged frogs and the amount of agricultural land use upwind from the site. It strongly suggests that windborne agrochemicals may be contributing to the decline."

In a study that encompassed almost all of California, Davidson and co-author H. Bradley Shaffer, a professor at the Center for Population Biology at the University of California, Davis, mapped out the disappearance of red-legged frog populations. Using those geographic patterns they analyzed possible causes of the declines. Mark Jennings of the U.S. Geological Survey also contributed to the study. Their findings were published in the April issue of the journal Ecological Applications.

The red-legged frog has disappeared from over 70 percent of its historic range in California. It was added to the threatened species list by the U.S. Fish and Wildlife Service in 1996.

To identify historic concentrations of red-legged frogs, Davidson and Shaffer compared museum records of their habitats, dating back to the mid-1800s, with recent survey data.

"From the museum specimens we know where the frogs used to be. Recent survey data tells where they are now," Davidson says. Of the 237 sites they looked at that once had frog populations, 48 percent no longer do.

The researchers looked at several possible causes of the declines, including global warming, ultraviolet radiation, pesticide use and habitat destruction due to urbanization and agriculture, and concluded that both urbanization and pesticides may be important factors in the declines.

At each site they calculated the predominant wind direction and the amount of agricultural land use upwind. The percentage of upwind land use in agriculture for sites where the red-legged frog has disappeared was six and a half times greater than for sites where they still exist, suggesting that windborne agrochemicals may be an important factor in frog declines.

"The results were consistent," Davidson says. "We found areas with a lot of agricultural land use upwind from them are more likely to have declines than sites with less upwind agriculture."

"It's an issue that has impact far beyond California," Davidson adds. "There have been amphibian declines in many locations around the world and pesticides are definitely a possibility," Davidson says. "In both Central America and Australia, declines have been found close to major agricultural areas."

"If it turns out pesticides are the cause, we'll have to do more than set aside habitats to protect the species. We'll have to do something about the types and amounts of pesticides that are used and how they are applied."

AScribe - The Public Interest Newswire / 510-645-4600

www.anapsid.org/frogdecline.html

Amphibians	Conservation	Health	Lizards	Resources
Behavior	Crocodilians	Herpetology	Parent/Teacher	Snakes
Captivity	Education	Humor	Pet Trade	Societies/Rescues
Chelonians	Food/Feeding	Invertebrates	Plants	Using Internet
Clean/Disinfect	Green Iguanas & *Cyclura*	Kids	Prey	Veterinarians
Home	About Melissa Kaplan	CND	Lyme Disease	Zoonoses
Help Support This Site				


powered by