

Vanishing Frogs

**Amphibians are dying by the legions--
and the killer probably looks a lot like us.**

All around the world, familiar faces are disappearing: the population of frogs and other amphibians is in a serious decline. Scientists have known about the problem for a few years, but only recently has the magnitude--and the causes--of the problem become clear. According to George Rabb, of the Chicago Zoological Society and the Task Force on Amphibian Declines and Deformities, more than 200 amphibian species are now extinct, critical, or endangered.

The loss of such a broad range of species is deeply unsettling. Frogs and other amphibians have been called thermometers that indicate the health of the environment. The permeable skin through which they breathe and drink makes them vulnerable to environmental degradation. In addition, they have variable diets and they live in both water and on land, making them highly sensitive to changes in their surroundings.

Amphibians face numerous possible assaults, many of them direct consequences of human activity: general pollution (acid rain and agricultural pesticides, for instance); disappearing wetlands and other loss of habitats; the introduction of exotic species such as bullfrogs and game fish; microscopic parasites; infectious diseases; and even ultraviolet radiation.

Yet pinpointing the exact causes of the decline has been difficult, especially because some species thrive alongside others that

suffer in both polluted and seemingly pristine areas. A consortium of researchers from Australia, the United States, and Great Britain recently uncovered one surprising culprit. The researchers discovered that a previously unknown fungus--a species of aquatic chytrid fungi yet to be named--has been attacking frogs in Central America and Australia. This fungus was found in ten frog species and has been shown to kill frogs in laboratory trials.

The parasite was first detected in the forests in Northern Queensland, Australia, as well as at the Melbourne Zoo in 1993. Scientists now realize the fungus has been plaguing frogs in countless zoos across the United States since as early as 1988. The fungus attacks the keratin layer of the skin, according to D. Earl Green of the U.S. National Institutes of Health. Frogs drink and breathe through skin, so the fungus may cause the frogs to dehydrate and suffocate, Green says.

How this sinister fungus found its way into so many environments, even unsullied ones, is anyone's guess. "Maybe the fungus got stuck on a shoe or a camera tripod of an America tourist, or even in the digestive systems of birds, and was brought in. It's not certain," says Green. Nor does anyone know if the fungus is the primary cause of the deaths or a secondary one; environmental changes may have made the frogs more susceptible to the parasite. Whatever the case, the effect of the fungus is clear enough. Half the 40 known amphibian species have disappeared in the Monteverde region in Central America.

In other settings the threats facing amphibians probably have more to do with pollution than fungi. Earlier this year, a group of schoolchildren happened upon hundreds of deformed frogs

during a field trip in Henderson, Minnesota. Researchers suspect the deformities were caused by chemicals similar to retinoids-- compounds which are known to cause limb deformities and birth defects in humans. Some agricultural pesticides--such as methoprene, used to kill insect larvae--chemically resemble retinoids. These chemicals have been found in high levels in lakes where deformed frogs have been discovered, but researchers note that retinoids are also produced by water-dwelling microorganisms such as trematodes.

Since the Minnesota school field trip, people have reported frog deformities in other areas, including Wisconsin and Canada. There are signs that Canadian frogs may also suffer from the effects of pesticide use. Researchers at the University of Windsor in Ontario have found high levels of organochlorine pesticides in parks and wildlife preserves where frogs are severely threatened; high levels of DDT have been detected in the bodies of those species that survive. Pesticides are also a possible cause of the shocking amphibian declines observed in California, most notably along the Sierra Nevada. In Yosemite National Park, 50 to 80 percent of the frog population has vanished. In this case, researchers think that pesticides used on farmland in the Central Valley have drifted with the west-to-east winds to the Sierra ridge.

Introduced species are another threat to amphibians, especially the western parts of the United States. Importing game and fish has been a common practice for the last hundred years. In Arizona, for example, the wild was stocked with foreign bullfrogs, bass, sunfish, and catfish in the late 1960s and early 1970s. Although these foreign species were brought in for recreational

purposes, they turned out to be nasty predators of amphibians. The problem is now being addressed, according to Eric Wallace of the Arizona Game & Fish Department. "Eradication programs are taking place now so native species can regain a foothold," he says.

Even ultraviolet rays may contribute to the vanishing of the amphibians. At Oregon State University, researchers experimented with salamander spawn. Some were exposed to normal sunlight while others were shielded. Some of the exposed spawn did not hatch, and those that did suffered deformities. According to David Wake, at the University of California at Berkeley, "[Ultraviolet sensitivity] seems to be a species-specific phenomenon. Some are less sensitive, while others are not. Some have a lot of DNA repair enzyme, which makes them more immune." Normally frogs lay their eggs where they are adequately protected from sunlight and the associated ultraviolet rays. Researchers say that the diminished ozone layer and increased amount of scattered light (associated with smog and other chemical emissions) may have something to do with this.

According to Wake, there just are not enough workers in the field to monitor the amphibian declines. Authoritative data exist for populations in only three tropical nations--Australia, Panama, and Costa Rica. No one really knows what is happening to amphibians in far-flung regions of Africa or Asia.

Fortunately some action is finally taking place. The U.S. National Science Foundation is funding research grants to study amphibian biology. And the Department of Interior wants to establish 3,000 frog-monitoring sites around the country. Such an

endeavor will require the help of individual volunteers. Concerned citizens also are pitching in. For example, cattle ranchers in Arizona and New Mexico are nurturing amphibian populations. One rancher even trucks water to custom-built ponds and tanks dotting his 17,000-acre ranch to save the vanishing Chiricahua leopard frog. It may seem a small effort, but at this point any effort would be much obliged.

--Lybi Ma
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Researchers

[David Wake](#)

[George Rabb](#)