National survey finds frog abnormalities rare

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Researchers collected more than 68,000 frogs and toads for the study, and the dataset is available to researchers and the public online. Credit: Buchanan/USFWS

A 10-year study shows some good news for frogs and toads on national wildlife refuges. The rate of abnormalities such as shortened or missing legs was less than 2 percent overall—indicating that the malformations first reported in the mid-1990s were rarer than feared. But much higher rates were found in local "hotspots," suggesting that where these problems occur they have local causes. The results were published Nov. 18 in the journal *PLOS ONE*.

"We now know what the baseline is and the 2 percent level is relatively good news, but some regions need a deeper look," said Marcel Holyoak,

professor of environmental science and policy at the University of California, Davis, and a co-author on the study. Hotspot regions included the Mississippi River Valley, California and south-central and eastern Alaska.

Mari Reeves, a graduate student working with Holyoak, led the data analysis and is corresponding author on the paper. Reeves now works at the U.S. Fish and Wildlife Service in Alaska.

Fieldwork for the study was carried out by the Fish and Wildlife Service at 152 refuges across the country between 2000 and 2009. Researchers collected more than 68,000 frogs and toads for the study. The complete dataset is available to researchers and the public online.

The aim of the study was to understand where and when these abnormalities occur—are they widespread, or localized? Are they persistent, or do they appear and fade away?—rather than to identify specific causes, Holyoak said. Understanding the patterns of these hotspots in space and time can help researchers home in on likely causes, he said.

The results show that abnormality hotspots occur in specific places, but within these hotspots the rate of malformations can change over time, Holyoak said.

"We see them at an elevated frequency one year or for a few years, and then they recover," he said.

The most common problems observed were missing or shortened toes or legs, and skin cysts. Only 12 cases of frogs with extra legs were found.

Many different potential causes have been put forward for the abnormalities, including pollution from industry or agriculture, parasites,

ultraviolet exposure and naturally occurring heavy metals leaching into water bodies. The exact cause may vary from place to place, Holyoak noted.

The study comes against a background of a general decline in amphibian populations both in the U.S. and worldwide. For example, the California red-legged frog celebrated by Mark Twain's story is now listed as threatened. Frogs and toads may be especially sensitive to changes in climate and air or water quality. It's not clear whether hotspots of malformations contribute to this general decline, Holyoak said, but the new dataset will help researchers explore the problem.

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