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Photographs by Dante Fenolio/Atlanta Botanical Garden and Ignacio de la Riva (Peruvian harlequin)

HARD TO MISS Three varieties of glass frogs rescued from Panama: *Cochranella granulosa*, top left; *Cochranella albomaculata*, bottom left; and *Centrolene ilex*, bottom right. At top right is an *Atelopus harlequin* from the middle Andes in Peru.

By [ANDREW C. REVKIN](#)
Published: March 25, 2008

In the scientific equivalent of the board game Clue, teams of biologists have been sifting spotty evidence and pointing to various culprits in the widespread vanishing of harlequin frogs.

The amphibians, of the

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genus *Atelopus* — actually toads despite their common name — once hopped in great numbers along stream banks on misty slopes from the Andes to Costa Rica. After 20 years of die-offs, they are listed as critically endangered by conservation groups and are mainly seen in zoos.

It looked as if one research team was a [winner in 2006](#) when [global warming](#) was identified as the “trigger” in the extinctions by the authors of a much-cited paper in *Nature*. The researchers said they had found a clear link between unusually warm years and the vanishing of mountainside frog populations.




The “bullet,” the researchers said, appeared to be a chytrid fungus that has attacked amphibian populations in many parts of the world but thrives best in particular climate

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The authors, led by J. Alan Pounds of the Monteverde Cloud Forest Preserve in Costa Rica, said, "Here we show that a recent mass extinction associated with pathogen outbreaks is tied to global warming." The study was featured in reports last year by the Intergovernmental Panel on Climate Change.

Other researchers have been questioning that connection. Last year, two short responses in *Nature* questioned facets of the 2006 paper. In the journal, Dr. Pounds and his team said the new analyses in fact backed their view that "global warming contributes to the present amphibian crisis," but avoided language saying it was "a key factor," as they wrote in 2006.

Now, in the [March 25 issue of PLoS Biology](#), another team argues that the die-offs of harlequins and some other amphibians reflect the spread and repeated introductions of the chytrid fungus. They question the analysis linking the disappearances to climate change. In interviews and e-mail exchanges, Dr. Pounds and the lead author of the new paper, Karen R. Lips of Southern Illinois University, disputed each

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other's analysis. Experts who have researched the amphibian said neither group had enough evidence to nail down its case and warned that this normal tussle over scientific details should not distract from the reality that humans are clearly roiling biology in ways important and yet poorly understood.

“There is so much we still do not know!” David B. Wake, a biologist at the University of California, Berkeley, wrote in an e-mail note after reading the new paper. The origin of the fungus and the way it kills amphibians remain unknown, he said, and there are ample mysteries about why it breaks out in certain places and times and not others.

Dr. Pounds and Dr. Lips have both done important work, Dr. Wake said, adding, “I hope this does not turn into a ‘spitting contest,’ because we all have a lot to learn about amphibian declines.”

Ross A. Alford, a tropical biologist at James Cook University in Townsville, Australia, said such scientific tussles, while important, could be a distraction, particularly when considering the uncertain risks attending global warming.

“Arguing about whether we can or cannot already see the effects,” he said, “is like sitting in a house soaked in gasoline, having just dropped a lit match, and arguing about whether we can actually see the flames yet, while waiting to see if maybe it might go out on its own.”

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