

Forty Percent of Lizard Populations World-Wide Face Extinction from Global Warming

By Michael Ricciardi
July 14, 2010



According to a recent, five-continent survey and biological model prediction, researchers estimate that almost 40% of the world's lizard populations, and 20% of all lizard species, will go extinct by 2080.

One might surmise that cold-blooded (*ectothermic*) creatures like lizards would adapt fairly easily to rising, global temperatures. The reptiles, after all, derive much of their energy required for basic functions from external heat sources, while they also tolerate high body temperatures and resist water loss. But it seems that there is an optimal, temperature “window” for most lizards—a “thermal preference”—in which lizards are able to meet their energy needs and successfully reproduce.

Lizards are fairly robust and adaptive creatures owing to their ability to tolerate high body temperatures and resist water loss, but warming trends seem to be pushing temperatures past the thermal threshold that these reptiles need for successful reproduction and long-term survival.



Western Fence
Lizard, *Sceloporus
occidentalis*

Beginning with an analysis of some 200 lizard populations of the genus *Sceloporus* (“spiny” lizards)—found primarily in Mexico—researchers (Sinervo et al) found that 12% of these lizard populations have already gone extinct in the past few decades. Using these populations as the basis for their model predictions, the ‘extinction probability’ was found to be correlated with warming at these sites. Estimates of the lizards’ “maximum available body temperature” (operative temperatures for normal activity) were based only on spring time temperatures and not other seasons.

Reproductive energy demands on such reptiles are highest in the spring, and so, as spring time temperatures get hotter, lizards spend more time seeking refuge in cooler locations (like burrows). This means less time foraging for food, resulting in a lower net energy gain which is believed to be insufficient for reproduction. All this translates into a higher probability of extinction.

Sinervo and fellow researchers then applied this analytical model to current and future warming scenarios as applied to 216 lizard populations, with intact habitats, on four continents (North/South America, Africa, Asia, other surveys also included Australia). Comparing their estimates of the thermal threshold (the critical threshold to meet a lizard’s thermo-biological needs) for each lizard family with the historical records of each lizard population, the scientists “effectively predicted populations that had gone extinct.”

This data was then used to extrapolate future populations trends. Based on these trends, some are calling lizards the “new amphibians” owing to their global pattern of rapid population declines, which is similar to what has been happening to frogs and other amphibians for the past 2-3 decades.

Though the model used in this research has been validated by observations and historical data, and thus would seem to support the researchers’ conclusions, some scientists believe it is too simple a model to make accurate, long-term predictions of local extinctions. Local lizard populations rise and fall naturally over time, and further, failure of field researchers to identify a single species in a given site may represent “transient rarity” as opposed to actual extinction. They are calling for more in-depth, eco-physiological data and modeling.



Underside of a
Thorny devil, an
agamid, Western
Australia

So, can lizards adapt to a changing climate and escape this existential threat? Some animal species—mostly insects—are capable of a rapid genetic response to climate change, while others are able to move to cooler, more hospitable locales.

However, Sinervo and his group doubt that rapid genetic adaptation is feasible for most lizard populations. Further, habitat-splitting (due to natural forces and human activity) often blocks the migration ‘option’, and, for those species that *are* able to make this move into higher elevations (where temperatures are more optimal for survival), there is the problem of a shortage of space. Past observations of mountain-dwelling *Sceloporus* extinctions have been correlated with increased *interspecific competition* from upward-migrating lizard species.

This is a similar situation to what is most likely happening to numerous ‘ruderal’ species of butterflies as they move higher up the Sierra Nevada Mountains of California (see my 2009 article/interview with butterfly expert Arthur Shapiro: California Butterflies See Big Declines from Eco Double Blow).

Some information for this post comes from a summary article (Are Lizards Toast? by Huey/Losus/Moritz, appearing in Science, 21 May, 2010, and based upon the published report Erosion of Lizard Diversity by Climate Change and Altered Thermal Niches, Sinervo et al, Science, 21 May, 2010).

top image: Mengkarung – Oriental Garden Lizard in Malaysia, by Nation kingdom on wikipedia.org, under a Creative Commons Attribution 3.0 Unported license.

Bottom image: Western Fence Lizard, Sceloporus occidentalis, Stephen Lea

Bottom image: Underside of a Thorny devil, an agamid, Western Australia, by KeresH, on wikipedia.org, under a Creative Commons Attribution-Share Alike 1.0 Generic license.