Climate change threatens survival of common lizards

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A lizard is pictured on October 21, 2015 in Lenggries, Germany

While there is no doubt that climate change is affecting many organisms, some species might be more sensitive than others. Reptiles, whose body temperature depends directly on environmental temperature, may be particularly vulnerable. Scientists have now shown experimentally that lizards cope very poorly with the climate predicted for the year 2100.

In a new study, publishing in the Open Access journal *PLOS Biology* on October 26th, Elvire Bestion, Julien Cote and colleagues examined the consequences of a 2°C warmer climate on the persistence of populations of common lizards (*Zootoca vivipara*), a widespread European reptile. Their results show that many common lizard populations could disappear rapidly as a consequence of such warmer temperatures.

"Breed fast and die young" seems to be the new mantra of common lizards in the face of climate change; it is also the conclusion reached by researchers from the Station d'écologie expérimentale du CNRS à Moulis (SEEM) and the Laboratoire Evolution et Diversité Biologique (EDB, CNRS/Université Toulouse 3 Paul Sabatier/ENFA) who studied this small European reptile species.

The team used the Metatron - a system of semi-natural enclosures in which temperature can be manipulated - to create two distinct climates: one similar to the present climate and another 2 °C warmer, corresponding to the predicted climate for the end of the century. Eighteen populations of common lizards were put into Metatron enclosures over two years in the "present" or "warmed" climate. Populations were surveyed for one year, allowing the team to determine the impact of warmer climates on demographic parameters such as growth rate, reproduction and survival.

"While a two-degrees warmer climate might seem beneficial at first, as it leads to faster growth of juvenile lizards and earlier access to reproduction, it also leads to lower survival in adult individuals, which should endanger population survival", says Elvire Bestion, co-lead author of the study and currently working at Exeter University (United Kingdom). A model of population dynamics showed that the increased adult mortality would lead to decreased population growth rates, and ultimately to rapid population extinctions in around 20 years.

"Although these results might seem dramatic, we do not predict extinction of common lizards at the scale of the species, but we suggest that populations at the southern edge of their range of distribution might particularly suffer from warmer climates", adds Julien Cote, biologist at the Laboratoire Evolution et Diversité Biologique (France) and co-lead author of the study. Indeed, comparisons of experimental conditions to climatic conditions encountered by European populations of common lizards show that warmer climates might threaten between 14 and 30 % of European populations depending on the carbon emission scenario.

"Anecdotally, we also showed that warmer climates led some adult females to engage into a second reproduction event during the summer, while these lizards normally reproduce only once a year during the spring. Combined with the earlier juvenile reproduction and the higher adult survival, these results suggest a shift of demographic strategy from a relatively long life and low reproductive output to a faster life, higher reproductive investment. We can wonder whether this strategy shift may help adaptation of populations to warmer climates over time", concludes Elvire Bestion, adding a positive note to overall pessimistic results.

More information: Bestion E, Teyssier A, Richard M, Clobert J, Cote J (2015) Live Fast, Die Young: Experimental Evidence of Population Extinction Risk due to Climate Change. *PLoS Biol* 13(10): e1002281. doi:10.1371/ journal.pbio.1002281

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