
Climate chaos: Examining the pressures of climate change on Eurasian amphibians and reptiles

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Abstract. Amphibians and reptiles are highly vulnerable to climate change because of their ectothermic nature and dependence on specific environmental conditions. Across the entire Eurasian continent, climatic conditions range from the Mediterranean to the Arctic. The far-reaching consequences of climate change threaten the conservation of these species. These are such factors as a rise in temperature, a change in precipitation patterns and the consequent shift of their distribution.

This review summarises recent literature on climate change and its effects on reptiles and amphibians in Eurasia. It also discusses phenomena such as changes in species distribution, habitat loss/destruction, changes in phenology and disease risk. The study shows that species such as montane or wetland-dependent amphibians, which have a limited ability to disperse, are particularly vulnerable. It also examines the contribution of thermal stress, fluctuations in prey availability and the increasing presence of invasive species as climate-related factors affecting population dynamics. The review highlights conservation actions that focus on adapting to climate change, habitat connectivity and genetic diversity to mitigate the impacts of climate change on species. This comprehensive assessment highlights the need for region-specific conservation efforts to address the increasing threats posed by climate change to the herpetofauna of Eurasia.

The text of the article: Climate change poses a significant threat to biodiversity, with rising temperatures and shifting habitats particularly affecting amphibians and reptiles in Eurasia (Araújo et al., 2006; Biber et al., 2023). The synergistic effects of climate change and land-use alterations further exacerbate these vulnerabilities, leading to potential species richness and distribution declines (Newbold, 2018; Williams et al., 2021). This review examines the sensitivity of amphibians and reptiles to temperature changes and habitat degradation, emphasising their disproportionate susceptibility to these changes and the implications for future climate scenarios.

Amphibians and reptiles are highly vulnerable to changes in temperature and habitat conditions. Research suggests that climate change will also alter the range and number of species and their diversity (Biber et al., 2023). Those that are geographically restricted to only a few locations or depend on a particular environment will be massively threatened with extinction (Araújo et al., 2006). The interaction of climate change and land-use change compounds these challenges. As their habitats become more fragmented or further degraded, the chances of even resilient species surviving rapid temperature changes are significantly reduced (Newbold, 2018; Hof et al., 2018). The combined effects of these stresses may prove even worse for biodiversity than those triggered by climate change.

Recent studies also suggest that rising temperatures may affect amphibians and reptiles more than we had previously thought. However, some studies show that cooling is more unfavourable for some species (Biber et al., 2023), while warming has some clearly negative effects. Even if there are no reliable data, it is possible that decreasing precipitation may be more significant than increasing temperature. Amphibians, for example, include many species that breed in wetlands and swamps for their skin and shelter. This could lead to a reduction in their numbers. They are also changing the climate, which is extreme for reptiles, but some boreal and freshwater species experience the harshest conditions or adopt a simpler lifestyle (Araújo et al., 2006; Cox et al., 2022).

In Eurasia, changes in climatic vectors have already been observed to shift the distribution of herpetofauna. Reptiles living in tropical and freshwater systems are particularly vulnerable as climate change disrupts their environmental relationships (Cox et al., 2022). Despite these emerging patterns, there is a gap in research on climate change impacts on specific reptile populations, and such studies are urgently needed in biodiversity-rich regions. For example, Sri Lanka is a biodiversity hotspot where climate change is understudied for reptiles (Dayananda et al., 2021). Such research is crucial to anticipate local extinctions and guide conservation efforts (Diele-Viegas et al., 2020; Dayananda et al., 2021).

Another issue is temperature shifts and their effects on temperature-dependent sex determination in reptiles. According to Valenzuela et al. (2019), extreme shifts in temperature regimes lead to population imbalances due to abnormal sex ratios, which distort the viability of the population's birth rate and thus lead to population declines over time. These population effects are important for assessing the persistence of reptile populations under future climate warming.

In addition, the projected increase in the number of species threatened with extinction speaks to the more latent effects of climate change on species biodiversity. Climate change has a modest impact on current rates of biodiversity loss; such trends are not sustainable in the longer term, as other factors, such as habitat destruction, may not be as prominent as climate change in the twenty-first century (Bellard et al., 2012). Disruption of ecological and physical systems has always put amphibian and reptile populations at risk.

In summary, the impacts of climate change on amphibians and reptiles in Eurasia are, on average, what might be described as some challenges. These species are increasingly threatened by habitat destruction, changes in climatic factors and the interaction between climate change and land development. The review addresses the challenge of the continuing need for research, particularly in areas of high biodiversity, as well as changes in policy to mitigate these impacts and to conserve amphibians and reptiles in the face of environmental change.

The list of used literature

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