

Ecological drivers of nest temperature variation in the American alligator: predicting the impact of future climatic scenarios

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Abstract: Species displaying temperature-dependent sex determination – including all crocodylians, many turtles, and some fish – are especially vulnerable to the effects of a rapidly changing global climate due to their profound sensitivity to thermal cues during development. Predicting the effects of climate change on species with TSD, including skewed offspring sex ratios, requires understanding how environmental factors interact with their nesting ecology to shape the developmental environment experienced by embryos in nature. For example, climate change may alter nest temperatures directly through changes to the nest microclimate as well as indirectly through influences on nesting phenology, nest site choice, and nest architecture. To understand the climatic and ecological drivers of nest temperature variation in the American alligator, *Alligator mississippiensis*, we deployed temperature loggers in 86 nests over 9 years at two geographically distinct sites in the northern and southern regions of the species' geographic range. Our findings suggest that alligator nests exhibit considerable thermal variation across multiple spatial and temporal scales. While variation in mean nest temperature across years is largely explained by variation in mean daily maximum air temperature, variation in individual nest temperatures also appears to be related to local habitat factors and microclimate characteristics. With increasing air temperatures, nest temperatures are projected to increase by 1.6°-3.7°C by the year 2100, changes which are predicted to have dramatic consequences for offspring sex ratios. Our findings provide insights into how nesting ecology interacts with climatic variables to influence population sex ratios in a species with TSD.

Keywords: Ecological drivers; American alligator; Climate change

Type of Presentation: Oral

Thematic Area: Research and knowledge (Natural History)