Ecological responses of squamate reptiles to nocturnal warming

Jean-François Le Galliard*[1,2], Alexis Rutschmann[3], Constant Perry[3], Olivier Lourdais[4], Andréaz Dupoué[5], Michaël Guillon[4], Georges A. Brusch[6], Julien Cote[7], Richard Murielle[8], Jean Clobert[9], and Donald B. Miles[10]

[1]Centre de Recherche en Ecologie Expérimentale et Prédictive (CEREEP) – CNRS : UMS3194, Ecole Normale Supérieure de Paris - ENS Paris – 77431 St Pierre les Nemours, France
[2]Institut d'écologie et des sciences de l'environnement de Paris – CNRS, Sorbonne Université – France
[3]Station d'Ecologie Théorique et Expérimentale – CNRS – France
[4]Centre d'Études Biologiques de Chizé - UMR 7372 – CNRS – France
[5]Laboratoire des Sciences de l'Environnement Marin (LEMAR) – Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER) – France
[6]California State University San Marcos – États-Unis
[7]Centre de Recherche sur la Biodiversité et l'Environnement – Institut de Recherche pour le Développement, Université Toulouse III - Paul Sabatier, Centre National de la Recherche Scientifique, Institut National Polytechnique (Toulouse) – France
[8]Station d'Ecologie Théorique et Expérimentale – Centre National de la Recherche Scientifique, Fédération de Recherche Agrobiosciences, Interactions et Biodiversité – France
[9]Station d'Ecologie Expérimentale et Théorique de Moulis (SETE) – CNRS : UMR5321 – 02 route du CNRS, Moulis (09200), France
[10]Ohio University – États-Unis

Résumé

Nocturnal temperatures are increasing at a pace exceeding diurnal temperatures in most parts of the world. Yet, the role of warmer nocturnal temperatures in animal ecophysiology has received scant attention and most studies focus on diurnal or daily descriptors of the temporal trends of the thermal environment to draw their conclusions. Here, I will illustrate the complex effects of nocturnal warming on squamate reptiles, a keystone group of vertebrate ectotherms, using qualitative and quantitative reviews as well as a energetic model of ectotherm foraging. I will first discuss the physical consequences of nocturnal warming on habitats used by squamate reptiles, and describe how such changes can alter a diurnal species immediate energetic balance. I will then make use of a mechanistic approach based on an energy-balance model to draw more general conclusions about the effects of nocturnal temperatures. Eventually, I will examine how warmer nights may affect squamates over their lifetime, with potential consequences on individuals' fitness and population dynamics. This review emphasizes the importance of considering the joint influence of diurnal and nocturnal warming on vertebrate ectotherms' response to climate warming.

Mots-Clés: warming, energy balance, nightime ecology, reptiles

*Intervenant