Soundscape monitoring in assessing climate change impacts. An experience in temperate anurans

Diego Llusia*[1,2], Rafael Márquez[3], and Juan Francisco Beltrán[4]

[1]Fonoteca Zoológica. Dept. Biodiversidad y Biología Evolutiva. Museo Nacional de Ciencias Naturales (MNCN-CSIC) – José Gutiérrez Abascal 2, 28006 Madrid., Spain

[2]UMR CNRS 7205. Département Systématique et Evolution. Muséum national d'histoire naturelle (MNHN) – Ministère de l'Ecologie, du Développement Durable et de l'Energie, Ministère de l'Enseignement Supérieur et de la Recherche, Muséum National d'Histoire Naturelle (MNHN) – 57, rue Cuvier - 75231 Paris Cedex 05, France

[3]Fonoteca Zoológica. Dept. Biodiversidad y Biología Evolutiva. Museo Nacional de Ciencias Naturales (MNCN-CSIC) – C/ José Gutiérrez Abascal 2, 28006, Madrid, Spain

[4]Depto. de Zoología, Facultad de Biología, Universidad de Sevilla – Avenida de la Reina Mercedes, s/n, 41012, Sevilla, Spain

Abstract

Soundscape monitoring may provide insights into basic biological traits of animal populations and their response capacity to changing environments. Climate change forces species to confront altered thermal conditions and hence might compromise the performance of calling behaviour in ectothermic animals, such as insects and amphibians. The recent development of automated sound recording systems now allows for long-term acoustic monitoring of multiple populations, even if they are located at the latitudinal margins of the species' distribution range. Thus, we are able to evaluate how species respond to distinct thermal environments at time of displaying calling behaviour, enhancing our predictions of the impacts of global warming on biodiversity. By a long-term automated sound monitoring, we examined temporal patterns of calling activity of anuran populations located at the thermal extremes of their distribution range, and estimated annual and inter-annual calling temperatures for populations and species. In all cases, the diel patterns of calling activity were similar between conspecific populations, whereas their calling temperatures differed both geographically and seasonally, both in terrestrial and aquatic species. Our results suggest that temperate anurans may perform calling behaviour at a wide thermal range and show plasticity mechanisms to adjust to changing thermal environments. These findings imply that global warming would not directly inhibit calling behaviour in these species, although might affect other temperature-dependent features of their acoustic communication system. We discuss the methodological constraints of these new acoustic monitoring tools as well as some suggestions for future research.

Keywords: population monitoring, passive acoustic methods, temporal patterns, thermal breadth, global warming, amphibians

*Speaker