ANALYSIS OF THE IMPACT OF HEAT AND COOLING WAVES ON ITALIAN AMPHIBIANS AND REPTILES THROUGH VTL

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Climate change is likely affecting biodiversity globally and knowledge of the thermal physiology of organisms is essential for their conservation. Assessing interspecific and intraspecific variation in thermal adaptations and vulnerability to temperature extremes is a key aspect in developing effective conservation strategies. Future climate trends and spatial variability are expected to limit the spatial distribution of individuals and species, leading to population decline or local extinction. The extent and magnitude of this phenomenon is expected to vary geographically, according to both environmental and genetic variation. Indeed, the ability of populations to cope with the current velocity of temperature changes depends on their reservoir of genetic diversity and ecological plasticity, which, in turn, depend on demographic and selective aspects of their evolutionary past. In most European temperate species, those populations that result from post-glacial population expansions typically occupy the highest latitudes within a species range and may thus be perceived to be less threatened by increasing temperatures. However, quick post-glacial range expansions have been often associated with reduction in effective population size and, consequently, genetic diversity. This may have: i) reduced the adaptive potential of populations afforded by standing genetic variation, ii) decoupled phenotypic variation from local thermal conditions because of reduced effectiveness of natural selection. It is, therefore, crucial to understand how the response of animal's thermal stress varies across populations.

The recording of Voluntary Thermal limits (VTL) provides an ecologically relevant measure of thermal niches that is thus suitable for the study of thermal adaptation in threatened species. VTL represent the temperatures at which the animal moves away from sub-optimal temperature condition. In amphibians and reptiles, it typically represents the temperature at which the individual seeks shelter underground, or at the surface. In practice, VTL are measured by placing an animal in a thermal chamber whose internal temperature gradually increases/decreases by a fixed rate (about 1°C per minute). VTL (minimum and maximum) are defined as the temperatures at which the animal voluntarily leaves the thermal box.

For this project, I will sample animals along latitudinal and altitudinal gradients in two model species endemics to the Italian peninsula, whose phylogeographic structure is well known: the threatened anuran *Bombina pachypus* (Bonaparte, 1838) and the broadly distributed lacertid *Podarcis siculus* (Rafinesque, 1810). The study aims to i) assess whether the application of the VTL method guarantees repeatable and consistent results for individuals of each of the two species ii) measure the plasticity of a selected population for each species by longitudinally sampling throughout one year iii) establish how VTL measures vary across latitudinal (phylogeographic) and altitudinal gradients and iv) develop models using physiological, genetic diversity and biophysical variables to predict species persistence in the future.

List publications or congress abstracts:

- XIV National Congress SOCIETAS HERPETOLOGICA ITALICA (SHI)
  Torino (TO) 13/09/2022 - 17/09/2022
  Presentation of work "Time of attainment and loss of critical temperatures in two Italian anuran species from different habitats " C. Roscetti, A. de Meis, L. Vignoli, M. Tejedo

- XIV National Congress SOCIETAS HERPETOLOGICA ITALICA (SHI)
  Torino (TO) 13/09/2022 - 17/09/2022
  Presentation of work "Routinary thermal fluctuations make frogs less vulnerable to heat impacts" A. de Meis, C. Roscetti, M. Tejedo, L. Vignoli

- XIII National Congress SOCIETAS HERPETOLOGICA ITALICA (SHI)
  Lipari (ME) 22/09/2021 - 26/09/2021
  Presentation of work " Thermal vulnerability and plasticity in six Italian amphibian species" A. de Meis, C. Roscetti, M. Tejedo, L. Vignoli