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Conference Abstract

Metabolic scaling and thermal acclimation of the cave asellid *Proasellus lusitanicus*

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Abstract

Metabolism is the set of life-sustaining chemical reactions in organisms. It scales allometrically to the body mass in ecto- and endotherm organisms, implying that larger individuals are more economical in terms of energy requirements. Within the limited range of "biologically relevant" temperatures (from 0° to 40°C), the allometric scaling with a factor between 0.66 and 0.75 has been consistently observed in unicellular microbes and plentiful multicellular plants and animals (Gillooly et al. 2001). The allometric scaling factor does not vary when organisms acclimate to changing temperatures where thermal acclimation represents a phenotypic response with essential implications for coping with global climate change. Cave fauna, which live in thermally-stable habitats, are expected to conform to allometric scaling though showing a substantial inability to acclimate to increasing temperatures rapidly. We measured the individual oxygen consumption (as a proxy of metabolic response to temperature variation) of *Proasellus lusitanicus*, a cave asellid (Crustacea Isopoda: Asellidae) endemic of the Estremenho karst massif in central Portugal (Reboleira et al. 2011). We measured the thermal acclimation ability of this species in a thermal ramp-up experiment over a range of temperatures (from 17 ° to 22.5 C), also assessing the scaling of oxygen consumption with body mass. We found out that *P. lusitanicus* shows low thermal plasticity, likely inadequate to protect this species from the temperature increase expected in the next 90 years. Furthermore, we observed that the

metabolism of *P. lusitanicus* does not scale allometrically with the body mass. Rather, the metabolism of this species does not vary with body mass, similarly to two other subterranean species (Di Lorenzo et al. 2014), and contrarily to other epigean animals. The lack of metabolic scaling is likely to be a novel trait in subterranean ecosystems where the temporal unavailability of food and oxygen can be relevant and protracted. Our study sheds light in understanding regarding the phenotypical adaptations of cave animals to subterranean environments and also highlighted that narrowly-distributed cave species may be at extinction risk because of temperature increase to climate change.

Keywords

oxygen consumption, metabolism, allometric scaling, functional trait

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Author contributions

Conceptualization, TDL, ASR; methodology, TDL; validation, TDL, ASR; formal analysis, TDL; investigation, TDL, ASR; resources, TDL, ASR; data curation, TDL, ASR; writing-original draft preparation, TDL, ASR; writing-review and editing TDL, ASR; project administration, TDL, ASR; funding acquisition, TDL, ASR.

Conflicts of interest

None declared.

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