Eco-Physiological Framework Reveals Divergent Future Distribution Patterns Among Italian Anurans

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One of the main consequences of the current, anthropogenic-driven global warming is the shift of geographical ranges of natural populations, which move to areas where their climatic requirements are now met. The aim of this study was to predict the future distribution of three Italian anuran species with different ecological and biological characteristics (Rana italica, Bufo bufo and Bufotes balearicus). We first quantified the thermal performance curves of each species through laboratory trials. We then combined such performance curve with species distribution models, to assess how both the species' physiology and the environment affect the current and future climate vulnerability. Our results show that the Italian stream frog will be affected more severely than the common and the Italian green toads, due to the combined effects of its narrow thermal range and its specific habitat requirements. Under the highest temperature scenarios, the predicted habitat loss for the former species suggests a high probability of local extinction across its geographical range. Our approach, based on the development of hybrid models that link physiology and ecology, showed to enhance the predictivity power of our analyses and advocates for the importance of incorporating specie-specific physiological parameters into distribution models designed to inform conservation policies.