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ASSESSING SPECIES' VULNERABILITY TO CLIMATE CHANGE

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ABSTRACT

Climate change (CC) is expected to have profound impacts on biodiversity, but predicting these remains a major scientific challenge. Current approaches to quantifying such impacts focus largely on measuring exposure to CC, ignoring the biological traits that may significantly increase or reduce species' vulnerability. In addition, their input requirements restrict use to wide-spread and better-studied species, creating taxonomic and geographic biases in global CC vulnerability estimates.

To address this, I developed a framework which draws on both biological traits and exposure modelling to assess three dimensions of CC, namely exposure, sensitivity and adaptive capacity. In the first fully-representative study of entire taxonomic groups, my collaborators and I applied this framework to each of the world's birds, amphibians and corals (16,857 species). Results identify the Amazon as an area of high concentration of CC vulnerable birds and amphibians, and the central Indo-west Pacific (Coral Triangle) for corals. Comparisons with species' IUCN Red List threat statuses reveal species and regions both of new and greatest overall priority for conservation globally.

My collaborators and I propose developments in trait-based methods, including a framework for combining their strengths with those of correlative methods. We apply suggestions to a CC vulnerability assessment (CCVA) of sub-Saharan amphibians, highlighting the potential influence of biological traits on regions identified as of greatest CC vulnerability. We also investigate use of CCVA approaches for addressing the need for a global indicator of CC impacts on biodiversity.

Finally, I explore the role of CCVA of species in conservation. I present a seven-step framework for integrating CC into conservation planning and implementation, and highlight the underpinning role of CCVA. I include 13 lessons that representatives from 23 tropical CC adaptation projects learned from carrying out their work, and four over-arching recommendations for CC adaptation. Recognising conservation practitioners' need for practical guidance on carrying out CCVA, I present guidelines for selecting methods, interpreting results and working with uncertainty. Through the seven papers comprising this thesis, I endeavour to advance methods for and use of CCVA of species, and ultimately to strengthen global strategies for reducing CC impacts on biodiversity.