Biodiversity and climate change: a South African perspective

by

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Abstract

The responsiveness of South African fauna to climate change events is poorly documented and not routinely incorporated into regional conservation planning exercises. The lack of detailed distribution data for appreciable numbers of taxa demands a modeling solution. We develop a climate envelope model to predict potential distribution range changes. The model can be used to interpolate the distributions of poorly sampled taxa as well as predict responses to a changing climate. It is predicted that species from the more arid western parts of South Africa will be subject to severe range contraction and range shifts whereas the species from the more mesic eastern parts will experience range contraction with limited range shift. Species that could act as climate change indicator taxa are identified based on their predicted extreme range change responses to climate change. Red-data and vulnerable species were more likely to display range change than less threatened species. Without mitigatory action, conservation areas are likely to lose species. The likelihood of successful range shifts will be affected by the nature of novel communities, habitat suitability and the degree of land transformation encountered. Given the extent of the predicted spatial responses, conservation planners can no longer afford to ignore future climate impacts on species distribution patterns. Disease risk profiles are also expected to change with climate; currently, susceptible forestry plantations exist in areas which may be invaded by an economically important pathogen. Resistant clones should be planted in these future high-risk areas. A decrease in precipitation is an important feature of a future climate. This decrease is expected to impact on the agricultural sector by reducing total employment as producers switch to a more extensive production pattern. The total decline in welfare, therefore, will fall disproportionately on the poor. Climate change presents a significant threat to the South African biodiversity estate, and our ability to manage this transition in the face of changing and competing land uses. Adaptation and mitigation options do exist but they are hampered by a lack of definitive analyses, and ultimately, political will to prioritise the threat of climate change.

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Disclaimer

This thesis consists of a series of chapters that have been prepared for submission to, or publication in, a range of scientific journals. As a result styles may vary between chapters in the thesis and overlap may occur to secure publishable entities.

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