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POSTER

Physiological tolerances of high temperatures in fynbos birds and implications for climate change

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The fynbos biome of South Africa is the smallest of the world's floral kingdoms, and covers a narrow band of coastline and mountains in the southwestern corner of South Africa. However, despite its small size it is also a biodiversity hotspot. This region supports a rich diversity of birds, and seven species are endemic to the fynbos biome. Many of these species have ranges centred in the montane fynbos habitats.

Climate change is a major threat to the biodiversity of this biome, and the region is expected to become both hotter and drier in the next few decades. Recent climate envelope models suggest that many of the montane species' ranges might be restricted by temperature. With increasing temperatures the availability and extent of suitable cool habitat will be drastically reduced. These predictions paint a sombre picture for the future distributions of many of these species. However, these models are largely correlative and require additional empirical data on factors driving distributions.

We investigated physiological responses to heat in 12 species inhabiting the fynbos mountain regions, including six of the fynbos endemic species. We measured evaporative water loss (EWL), metabolic rate and body temperature at air temperatures ranging from 24 to 42 °C. We tested predictions that species with a highly specialized, high-altitude distribution would show lower temperature thresholds compared with generalized species.

Preliminary data showed that the air temperature where birds started panting and where EWL rates increased ranged from 32 °C to almost 38 °C. The rate of EWL increased as a function of increasing air temperature and the magnitude of these increases was dramatic in some species. The two species that prefer montane habitat, Protea Seedeater *Crithagra leucopterus* and Cape Rock-jumper *Chaetops frenatus*, started panting before temperatures reached 34 °C and showed > 3-fold increases in EWL rates at 38 °C. This pattern was also seen for Victorin's Warbler *Cryptillas victorini*. The two nectarivorous species (with a more widespread distribution within the biome) seem to tolerate heat better. Orange-breasted Sunbird *Anthobaphes violacea* and Cape Sugarbird

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Promerops cafer only started panting at ambient temperatures above 35 °C and showed < 3-fold increases in EWL at 38 °C.

Our data provide vital information on the vulnerability of these endemic species to climate change. These findings illustrate the importance of including mechanistic data into climate change predictions. Finally, these data provide support that climate envelope predictions, combined with comparative mechanistic data, might be valuable for identifying potential range restrictions driven by temperature in montane species.