

SEMINAR

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Hot... hotter... gone? Physiological and behavioural aspects of avian vulnerability to global heating

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In this presentation, I summarise 15 years of research into physiological and behavioural aspects of avian sensitivity to rising air temperatures and how species-specific sensitivity can be combined with spatial patterns of exposure under current and predicted future conditions in vulnerability assessments. Our work on heat tolerance and evaporative cooling capacity among ~ 60 species of arid-zone birds has revealed considerable phylogenetic and adaptive variation in heat tolerance. Passerines are one of the least heat-tolerant orders, with their evaporative cooling capacity constrained by a reliance on panting, a relatively inefficient pathway for heat dissipation. Our research recently expanded to include birds occupying humid lowland forests, with early data revealing unexpected patterns of physiological adaptation. Although forest birds have evolved pronounced hyperthermia tolerance in response to elevated humidity, anticipated future conditions will substantially increase their exposure to conditions associated with lethal hyperthermia. In addition to physiological aspects of sensitivity, we have also investigated how rising temperatures affect behavioural trade-offs between foraging and heat dissipation. In the arid-zone species we have investigated so far, very hot weather reduces foraging efficiency, with the consequences including progressive body mass loss in adults and reductions in nest provisioning rates and breeding success during sustained hot weather. In the case of a southern African hornbill, a combination of rising temperatures and declining precipitation was associated with a collapse of breeding success over a decade. Collectively, our findings reveal that unmitigated global heating will drive major declines in avian biodiversity in habitats ranging from deserts to tropical rainforests.