Drought, disease or destiny? Identifying the cause of decline of the eastern quoll (*Dasyurus viverrinus*)

Once widespread throughout south-eastern Australia, the eastern quoll (*Dasyurus viverrinus*) is now extinct on the Australian mainland, with Tasmania representing the species' last remaining refuge. Until recently, the Tasmanian population was considered abundant and secure. However, numbers are declining rapidly. Statewide spotlighting surveys show declines of over 50% in the past 10 years, and live trapping of selected populations during 2010 confirmed local population declines of 60-100% over the past 20-30 years. Declines are not consistent across the state, with some areas showing more marked declines than others. We currently do not know what is causing these declines, or whether they represent a range contraction, decline in abundance, or a combination of both. Therefore, it is currently not possible to design management programs and conservation actions that will enable the eastern quoll to recover.

Eastern quolls have often been described as a 'boom or bust' species, with numbers thought to fluctuate in response to variations in local weather patterns and events. However, this association has not been demonstrated. Given the species' continuing rapid decline and the frequency of extreme weather events predicted to increase into the future, conservation of the species requires a thorough understanding of how key weather and climate variables drive population persistence and affect the temporal and spatial distribution of the species.

Major findings and outcomes of collaboration

In May 2011, I travelled to Townsville to collaborate with Brooke Bateman (James Cook University) who had previously modelled how the distributions of the northern bettong and the Tasmanian bettong are affected by climatic and weather variables. Brooke walked me through the methodology she had adopted in developing her bettong distribution models, and helped me to create species distribution models (SDMs) for eastern quolls using a similar approach. During this short 3-day visit, several SDMs were produced for eastern quolls based on temporal variation of long-term climate averages as well as critical weather variables. Whilst not yet final, these models will provide a vital foundation for further analyses and for testing associations between weather variables and species declines across Tasmania.

The collaboration also enabled me to increase my very limited knowledge of modelling and provided me with invaluable skills that would have otherwise taken months to develop. This was largely due to the time Brooke was able to dedicate to me during my short visit, and the willingness of fellow JCU researchers to allow me to utilise their spatial data resources and facilities. I was also able to spend time with other JCU researchers discussing their projects and establishing a network of contacts for future collaboration.

Significance to adapting and protecting Australia's terrestrial biodiversity

This research will assist in identifying core areas of 'high quality' eastern quoll habitat that are most likely to remain suitable for the species during periods of increased and persistent weather instability. Such areas will constitute critical refugia for the species and as such, the retention and management of these areas is a vital part of the future conservation of the species. Much of the eastern quoll's core distribution currently occurs on private land located outside of state and national reserves. Accordingly, the effectiveness of any conservation efforts undertaken within present reserves will be limited to local populations residing in those areas, and will have minimal benefits to the majority of eastern quoll populations that persist outside of reserved areas (and hence the species as a whole). This research will provide management agencies with a prioritised list of core areas that should be managed and ideally reserved in order to maximise the chances of recovery, and increase the likelihood of the species persisting in the face of long-term climate change.

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