

**INVESTIGATING PAST, PRESENT AND FUTURE DISTRIBUTIONS
OF CRYPTIC SPECIES OF VLEI RATS (*OTOMYS AURATUS*, *O.
IRRORATUS S.S* AND *O. ANGONIENSIS*) IN SOUTH AFRICA, WITH A
FOCUS ON LIMPOPO PROVINCE**

by

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ABSTRACT

How the living world will respond to changes in climate is still a pressing issue to biologists today. This study investigated past, present and potential future distribution of three cryptic species of Afromontane rodents (*Otomys auratus*, *O. angoniensis* and *O. irroratus s.s*); as well as geographical and temporal trends of two species (*O. auratus* and *O. angoniensis*). Investigation of past distributions included two species only (*O. auratus* and *O. angoniensis*) in the northern escarpment (Limpopo, Gauteng, North West and Mpumalanga Provinces); current and potential future distribution considered the South African range of all the three species (*Otomys auratus*, *O. angoniensis* and *O. irroratus s.s*). We assessed the potential impact of changes in future climate on *O. auratus*, *O. angoniensis* and *O. irroratus s.s* using predictive niche modelling. Distributional data were obtained from: field trapping, owl pellets analysis and Museum records [Ditsong National Museum of Natural History (formerly Transvaal, TM) and Durban Natural Science Museum (DM)]. Maximum Entropy (Maxent) was used to model the current distribution of all three species. A general circulation model was used to predict the distribution of these species in 2070. Each of the three species is associated with a particular Biome i.e. *O. irroratus s.s* is associated mostly with Fynbos and Thicket Biomes, *O. auratus* with Grassland Biome and *O. angoniensis* with Savannah Biome and we predict that their distribution will follow those predicted for their respective Biomes. Niche models were found to follow biome boundaries of each species. This scenario predicted a south east shift (*auratus*), a south west shift (*angoniensis*) and a shrink (*irroratus s.s*) in future distribution, according to each species preferred habitat. A concomitant 66% (*auratus*) and 36% (*irroratus s.s*) reduction in areas of high environmental suitability of these species is shown, with a 1 % gain in *angoniensis*. High rainfall and low temperatures modulated the distribution of both *auratus* and *irroratus s.s* while *angoniensis* was high rainfall and high temperatures. And this was consistent with the ecological requirements of each species. No historical distribution changes were documented in Rietvlei Nature Reserve and at the Waterberg Mountain Range for *angoniensis* and *auratus* when tested in Chi-square tests but changes were observed at the Soutpansberg Mountain Range.

This study found that both multivariate and univariate morphometric approaches support the fact that cranial size (and presumable therefore body size) in *O. auratus* but not in *O. angoniensis*, is showing some response to climate variables, even within the restricted northern South African region (former Transvaal). Skull size of *O. auratus* decreased



significantly in relation to the year of collection and was also significantly and positively related to latitude, thus conforming to Bergmann's rule.

Keywords: *O. auratus*, *O. irroratus s.s.*, *O. angoniensis*, climate warming, body size, latitude.