

The Response of Mammal Populations to Abrupt Changes in Fire Regimes in Montane Landscapes of South-Eastern Australia

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Abstract : Fire regimes, climate and topographic gradients interact to influence ecosystem structure and function across fire-prone, montane landscapes worldwide. Biota have developed a range of adaptations to historic fire regime thresholds, which allow them to persist in these environments. In south-eastern Australia, a signal of fire regime changes is emerging across these landscapes, and anthropogenic climate change is likely to be one of the main drivers of an increase in burnt area and more frequent wildfire over the last 25 years. This shift has the potential to modify vegetation structure and composition at broad scales, which may lead to landscape patterns to which biota are not adapted, increasing the likelihood of local extirpation of some mammal species. This study aimed to address concerns related to the influence of abrupt changes in fire regimes on mammal populations in montane landscapes. It first examined the impact of climate, topography, and vegetation on fire patterns and then explored the consequences of these changes on mammal populations and their habitats. Field studies were undertaken across diverse vegetation, fire severity and fire frequency gradients, utilising camera trapping and passive acoustic monitoring methodologies and the collection of fine-scale vegetation data. Results show that drought is a primary contributor to fire regime shifts at the landscape scale, while topographic factors have a variable influence on wildfire occurrence at finer scales. Frequent, high severity wildfire influenced forest structure and composition at broad spatial scales, and at fine scales, it reduced occurrence of hollow-bearing trees and promoted coarse woody debris. Mammals responded differently to shifts in forest structure and composition depending on their habitat requirements. This study highlights the complex interplay between fire regimes, environmental gradients, and biotic adaptations across temporal and spatial scales. It emphasizes the importance of understanding complex interactions to effectively manage fire-prone ecosystems in the face of climate change.

Keywords : fire, ecology, biodiversity, landscape ecology

Conference Title : ICFEB 2024 : International Conference on Forest Ecology and Biodiversity

Conference Location : Vancouver, Canada

Conference Dates : May 20-21, 2024