

ABSTRACT

Perhaps the most important function that can be fulfilled by ecological studies is the identification of factors that threaten the survival of flora and fauna and subsequently influence their distribution and abundance. In the jarrah forest of southwestern Western Australia, one particular human activity that threatens the survival of wildlife is bauxite mining, which involves the removal of all vegetation from an area, disturbance of the soil profile and subsequent revegetation. In particular, the thinning-and-burning of revegetated minesites, which is conducted to increase water runoff in catchments and accelerate the development of natural jarrah forest structure within rehabilitation, may be having an important influence on the distribution and abundance of small mammals inhabiting the jarrah forest and the way they use their habitat. One particular small mammal that might be affected in this way is the nectivorous Western Pygmy-possum *Cercartetus concinnus*, of the family Burramyidae.

In this study, Western Pygmy-possums were captured in pit-traps and subjected to diet analysis (by pollen swabbing and scat analysis), radio-tracking (to identify patterns of nest selection and movement) and fluorescent powder tracking (to identify patterns of microhabitat selection). The incidence and severity of *Phytophthora* Dieback within the mining landscape and its flow-on impacts on the Western Pygmy-possum were also assessed. The aim was to determine the impacts of mining activity, particularly the thinning and burning of rehabilitation, on the Western Pygmy-possum.

As the first detailed study on the Western Pygmy-possum in the jarrah forest, this study has greatly increased our current knowledge about the species, especially in relation to diet and nest selection. It appeared that Western Pygmy-possums rely on unmined forest for suitable nest sites in the form of large trees, but used rehabilitation

for their nocturnal activities, which likely mostly consists of feeding. Although it was clear mining has a negative impact on the Western Pygmy-possum by reducing the abundance of suitable nest sites, there was no consistent evidence that the thinning-and-burning of restoration has an important impact. However, it was revealed that thinning-and-burning has a significant effect on vegetation structure, especially by reducing ground leaf matter and increasing understorey density. Notably, restoration that had not been thinned-and-burned was more similar to unmined forest than was thinned-and-burned restoration, and thus it was revealed that thinning-and-burning was not effective in accelerating the development of natural jarrah forest structure within restored minesites. Importantly, no significant results were obtained about the importance of structural vegetation features for the way Western Pygmy-possums use their habitat, which supports the idea that the availability of plant species that are an important source of food in the form of nectar and pollen is likely the greatest limiting factor for the distribution of the Western Pygmy-possum. There was no evidence that *Phytophthora Dieback* affects the Western Pygmy-possum, but this was most likely because there was a lack of susceptible species in rehabilitation.

While the results of this study have important implications for the future management of minesites in the jarrah forest, in particular by highlighting the importance of unmined forest as a source of nest sites and revealing that thinning-and-burning is not achieving its aims, this study has wider significance. In particular, the information gained from this study will be of increasing importance in Western Australia as water becomes a scarcer resource. Climate change predictions are that rainfall and water run-off will continue to decline in south-west Western Australia over

the next 100 years and consequently thinning is increasingly being considered as a way of boosting the State's water supply.