Tree hollows in Tasmanian *Eucalyptus obliqua* forest and their use by vertebrate fauna

By

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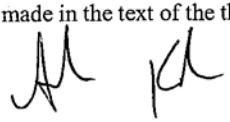
Statement of Originality

This thesis contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution, and to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text of the thesis.



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Preface

Primary data used in this thesis were collected by myself and Chris Spencer (and a couple of other volunteers) between 1993 and 1995. Other sources of data were bird distribution data collected by an array of people and supplied by Birds Australia (Chapter 2). Some tree ring data was provided by Julie von Platen and it is acknowledged where this was used (Chapter 3).

I did all the statistical analyses throughout the thesis using the programs specified. Soil and leaf chemistry analysis was done by Denis Charlesworth. Identification of animal hairs was done by Barbara Triggs.

This thesis is written as a series of independent scientific papers. As such there is some repetition between the chapters, particularly in the introduction and methods section. Chapter 4 has been accepted for publication in Forest Ecology and Management. I have submitted for publication a version of chapters 3, 5 and Appendix 1 and intend to submit chapters 2 and 6 for publication with members of my supervisory panel as co-authors. I collected the data, undertook the analyses and wrote these chapters, but each member of my supervisory panel (or other co-authors) made contributions to project design.

Abstract

Tree hollows provide an essential resource for a range of fauna, both in Australia and worldwide. There is concern over the future availability of the hollow resource in forests managed for timber harvesting because the time required for hollows to form is generally longer than the interval between harvest rotations. One of the strategies used to maintain the hollow resource is to retain specific trees to provide habitat for fauna.

The overall aim of this thesis was to assess the tree hollow resource and its use by fauna in Tasmania, in order to inform the revision of management prescriptions for the conservation of the hollow resource in production forest areas. It was also to assess whether different prescriptions are required for different forest types. As part of this work, two methods of studying tree hollows were assessed for their accuracy and utility. To achieve these aims, 391 trees were examined before and after felling in forestry coupes throughout Tasmania. Data were collected on tree growth rings, hollow occurrence and whether the trees were being used by fauna. Estimates of hollow abundance on felled trees were corrected by the amount of tree that had been successfully surveyed. The trees were located at 39 sites in two broad forest types important to the Tasmanian forest industry, wet and dry *Eucalyptus obliqua* forest.

The main factors associated with both hollow presence and abundance were the number of hollows observed on the standing tree, tree diameter and the amount of dead wood in the canopy. While tree age was strongly associated with hollow presence, it had less bearing on hollow abundance. An increase in the maximum size of hollow found in a tree was related to greater tree senescence, as indicated by higher values of the afore-mentioned factors. Although significantly more hollows of all sizes were found in wet forest than drier forest, the age at which trees began to produce hollows was similar between the different forest types. Trees grow slightly more slowly in dry forest than wet, meaning that trees need to be slightly larger in wet forest before they are hollow-bearing. The difference in hollow abundance between the different forest types was largely a result of the history of logging in dry *E. obliqua* forest which has resulted in trees being smaller and younger in the areas studied.

Although hollow-using fauna are a major component of vertebrate fauna in Tasmania, the number of hollow-using species found in Tasmania (42) is at the lower end of the range found in other areas of Australia. The rate at which trees were used by vertebrate fauna in Tasmania was also at the lower end of the scale found in other areas of Australia, with only 28% of hollow-bearing trees examined showing evidence of use. The variables most strongly

related to the use of a tree were hollow abundance, tree size and senescence. The likelihood of a hollow being used increased with hollow size; hollow depth in particular. There was a slight increase in the proportion of trees that showed evidence of use with increasing forest wetness, which corresponded with an increase in the availability of hollows. The rate of hollow use was very low (5%) and it is proposed that this was due to the often shallow and open nature of the hollows observed in this study. This observation may relate to the low numbers of arboreal termites in Tasmania.

It was recommended that trees identified for retention of habitat in logging coupes be selected primarily based on the presence of large hollows. Despite the difficulties in observing hollows in standing trees, ground-based surveys are one of the most effective ways of establishing hollow presence. In wet forest areas, large hollows are most likely to occur in trees that are at least 125 cm in diameter and have at least six visible hollows. In dry forest areas, large hollows are most likely to occur in trees at least 100 cm in diameter with at least six visible hollows.

It was estimated that between 8 and 15 trees per hectare were used, on average, by hollow-using fauna. This is significantly more than the rate at which trees are currently being retained in production forests in Tasmania (0.4 to 0.6 per hectare). It is therefore recommended that the rate of retention and type of trees being retained be reviewed in order to more adequately meet the requirements of hollow-using fauna.

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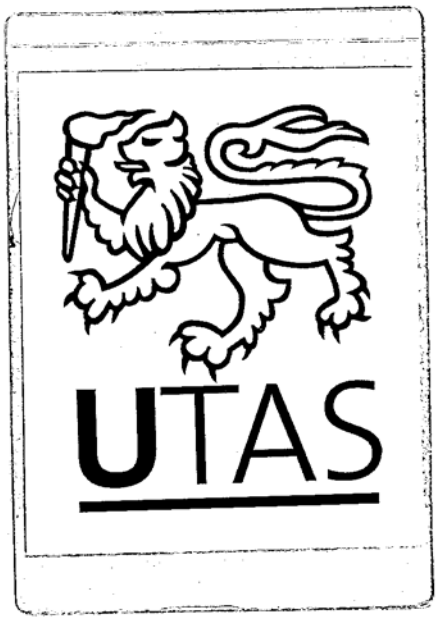
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