Impact of wildfire on the spotted-tailed quoll *Dasyurus maculatus* in Kosciuszko National Park.

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A spotted-tailed quoll captured in the Jacobs River study area in 2004.

Photo: J. Dawson.

Certificate of Originality

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

James Patrick Dawson

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Abstract

A population of spotted-tailed quolls *Dasyurus maculatus* was studied for three years (2002-2004) in the lower catchment of the Jacobs River, in the Byadbo Wilderness Area of southern Kosciuszko National Park, south-eastern New South Wales, Australia. Survey and monitoring of quoll latrine sites and prey populations, dietary analysis and live-trapping was carried out for one year before and two years after the widespread wildfires of January 2003, which had a very high impact on the study area.

Survey for spotted-tailed quoll latrine sites was successful in locating a total of 90 latrine sites in the Jacobs River study area over the three years of the study. These were found throughout all parts of the topography among large, complex granite outcrops and along rocky sections of riparian habitat. After the fire in 2003, lower numbers of latrines were in use than observed pre-fire, and there was a lower level of usage (number of scats) of individual latrines. Continued monitoring in 2004 revealed that many latrines that had become inactive in 2003 following the fire were re-activated in the second breeding season following fire.

1466 spotted-tailed quoll scats were collected from latrines and live-trapped quolls over the three years of the study. Hair analysis from scats identified twenty-two different species of mammal in the diet of the spotted-tailed quoll from the Jacobs River study area, representing the majority of all prey identified (98.5% occurrence) and contributing almost all of the biomass consumed (99.6%). Medium-sized mammals were the most important prey category, followed by small mammals, large mammals (most likely taken as carrion) and non-mammalian prey (birds, reptiles, insects and plants). Brushtail possums were the most important single prey item by both frequency of occurrence and percentage biomass in all years, followed by lagomorphs (rabbits and hares), *Rattus* spp., and swamp wallabies.

There was a significant difference in the composition of the diet by major prey category across the years of the study as a result of the fire, indicated by a shift in utilisation of food resources by quolls in response to significant changes in prey

availability. Monitoring of prey populations revealed that brushtail possums, lagomorphs and bandicoots were all significantly less abundant in the study area in the winter directly following the fire, followed by a significant increase in abundance of lagomorphs, but not of possums, in the second winter after the fire.

Quolls adapted well to this altered prey availability. While there was a significant decrease in occurrence of brushtail possum in scats after the fire, significantly more scats contained hair of lagomorphs, to the point where almost equal proportions of lagomorphs and possum hair occurred in scats by the winter of 2004. Other fire-induced changes to the diet were evident, such as a significant drop in the occurrence of small mammals in scats for both winters after the fire, and a peak in occurrence of large mammals in the winter directly following the fire that strongly suggests there was a short-term increase in the availability of carrion.

A large, high-density population of spotted-tailed quolls was live-trapped and marked during the winter breeding season of 2002. Twenty-two quolls (13 male and 9 female) were present in the study area in 2002, and subsequent trapping over the 2003 and 2004 winter breeding seasons following the fire revealed that the high-intensity wildfire did not result in the extinction of the local population. There was evidence of a small, short-term decline in the number of quolls present in the study area in the 2003 breeding season, with 16 individual quolls captured. Males were outnumbered two-to-one by females, due either to mortality or emigration. Trapping in 2004 showed a recovery of the population to numbers exceeding that observed prior to the fire, with 26 individuals captured (16 male, 10 female), most likely as a result of immigration. There was some evidence that recruitment of young from the post-fire breeding season in 2003 was reduced because of the fire.

This study took advantage of an unplanned wildfire event to monitor the response of a population of spotted-tailed quolls and their prey. In this regard it was fortuitous since it has been recognised that the use of replicates and controls in the study of the impacts of wildfire on such species is likely to be logistically impossible. Consequently, the effects of fire on forest and woodland fauna such as the spotted-tailed quoll are poorly understood, with many authors expressing concern that, potentially, wildfires are likely to be highly detrimental to resident quoll populations. The results of this study, however, concur with the few other studies in which forest mammal populations have been monitored before and after wildfire in suggesting that wildfires may not be as destructive to fauna as that imagined. The results of this work will provide information to assist in the preparation of management strategies for the species, such as recovery plans, as well as information for land managers preparing management plans, including fire management plans, for habitats in which spotted-tailed quolls are found throughout their range.

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