The Population Ecology of Wild Horses in the Australian Alps

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ABSTRACT

In this thesis I examine the population ecology of wild horses (*Equus caballus*) in the Australian Alps. Wild horses were first introduced into the Alps over 150 years ago. Paradoxically, they are a feral animal impacting on the environment, but are also a cultural icon. Managing wild horse populations is contentious and needs to be founded on knowledge of their population ecology. This is the first study of its kind in the Australian Alps and therefore has a broad focus. Four general areas were addressed: distribution, estimation of abundance and density, population dynamics and the influence of brumby-running. The study was conducted between 1999 and 2002 inclusive in the Australian Alps national parks, which form a contiguous protected area in south-eastern Australia from the Australian Capital Territory (ACT) in the north, through New South Wales (NSW) and into Victoria in the south.

The current distribution of wild horses in the Australian Alps national parks is patchy. There are five major discrete populations in NSW and Victoria with the northern most population in Kosciuszko National Park (NSW) bordering on the ACT. A review of published material and oral history reveals historic influences on distribution. The presence of each population is associated with introductions by people. The distribution of some populations expanded after introductions and many have fluctuated over time. Distributions have been contained or reduced through control by people, natural events such as snow and drought and by geographical barriers. Park managers eliminated a population of wild horses in the ACT in the 1980s. Distributions have expanded in areas without active management (notably northern Kosciuszko National Park) and are likely to continue expanding under a policy of no management.

In February and March 2001, abundance and density of wild horses were estimated by helicopter aerial survey in areas where the mapping showed horses to occur. This was the first time that these parameters have been estimated empirically. I compared three different aerial survey techniques (strip, mark-recapture and line transect) based on relative accuracy and precision and found that line transect analysis gave the highest, most precise estimate.

Given that aerial surveys usually underestimate abundance, this method was also likely to be the most accurate. Mark-recapture over a 50m wide strip gave a similar result but lacked precision. Strip and mark-recapture techniques performed poorly over 200m strips because animals were missed. Numbers observed dropped off dramatically beyond the 50m strip. Line transect analysis (for both observers combined) gave an estimate of 5010 (+/- 1408SE) horses while mark recapture over 50 metres gave an estimate of 4915 (+/-2733SE). These estimates correspond to a density of 1.8 horses km^{-2} over the area surveyed ($2789km^2$). The results suggest that aerial surveys of large mammals using a wide strip width (200m) and mark recapture analysis may seriously underestimate population density.

The population dynamics and demography of wild horses were estimated at three sites, Big Boggy, Cowombat and Currango, every spring and autumn over 3 years. The sites were spread widely across the Alps with the aim of obtaining a broad understanding of population dynamics. The survey used Pollock's robust design and natural markings were used to identify individuals. There was a seasonal spring peak in population size at Big Boggy with no clear seasonal trend at the other two sites. Mean wild horse densities determined at Big Boggy ($2.01km^{-2}$) and Currango ($2.13km^{-2}$) were not significantly ($p<0.5$) different to the density calculated in the aerial survey, whereas density was significantly higher at Cowombat ($6.4\ km^{-2}$). Census techniques were of limited use in estimating annual population growth rate because of low precision.

Demographic analysis showed that none of the populations were increasing at the maximum intrinsic rate (l = 1.2), and the Big Boggy and Cowombat populations may be stable (l = 1.0/yr). There was an apparent trend of food limitation across the sites. Body condition was positively related ($p<0.01$) to pasture biomass. The Currango population was increasing (l = 0.09) associated with higher recruitment, body condition and pasture biomass than in the other two populations studied. The Cowombat population had the lowest annual finite rate of increase (l = 1.03), and horses at this site were in the poorest condition and pasture biomass was lowest. The Big Boggy population was intermediate between the two.

Annual adult survival was constant in all populations at 0.91. Survival in the first three years of life was more variable with the average at each site ranging from 0.63/yr to 0.76/yr. An average of 0.26 female foals was born per adult female per year. Sensitivity analysis showed that population growth rate is most sensitive to changes in adult survival, followed by fecundity and then survival in the first three years of life. The dynamics observed at each site was representative of the demography of wild horses in other parts of the world and is typical for large mammalian herbivores.

Brumby-running is a form of harvesting that is currently being used to control wild horses in the Alpine National Park (Victoria) and is soon to be trialled in Kosciuszko National Park (NSW). The effectiveness of brumby-running has not been assessed prior to this study. Data collected by the Alpine Brumby Management Association and predictive modelling were used to examine the influence of brumby-running on the wild horse population in Alpine National Park. Brumby-runners remove about 200 horses per year with a preference for young animals and adult females. More horses are caught in autumn (61/yr) and least in summer (30/yr) ($p<0.05$). Brumby-runners do not appear ($p>0.05$) to target horses in poor condition. One skilled brumby-runner caught an average of 1.16 horses/day, while his companions caught an average of 0.55 horses/day. Brumby-runners show behaviour analogous to social carnivores. Predictive modelling suggests that brumby-runners could suppress the population of wild horses in Alpine National Park similar to the effects of predators, or human harvesting of other large mammals. Selecting young animals in the harvest reduces the impact of harvesting on the population compared to unselective harvesting, while selecting adult females increases the predicted impact.

There are several management recommendations based on the findings of this thesis that address concerns for both environmental impact and the cultural value of wild horses. The distribution of wild horses should not be allowed to expand further, and the size of the wild horse population should be prevented from increasing further. Other management recommendations that are more complex involve reducing some populations so that the level of environmental impact they are causing is acceptable. This requires a definition of 'acceptable impact.' Finally managers should consider eradicating smaller populations.

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