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# Conservation management and diets of powerful owls (*Ninox strenua*) in outer urban Melbourne, Australia

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## Abstract

The Powerful Owl *Ninox strenua* is Australia's largest owl, and is mainly found east of the Great Dividing Range on the mainland in tall-open forests. The species is considered rare, both nationally and in the State of Victoria; and threatened in the Greater Melbourne area. Recovery plans for the future conservation management of *N. strenua* are being prepared in 2 states.

Historically, Powerful Owls have been thought to require large home ranges (about 1000 ha per pair) in suitable old-growth forest, which provides nest hollows for the owls and their arboreal marsupial prey. Recent research, however, has found *N. strenua* may be more numerous and breed more successfully in a wider range of habitats than previously believed. In particular, the birds have been found living in forests and woodlands within the greater metropolitan areas of cities. The most extreme case is where a nest tree has been found within 800m of urban settlement and 6km from the centre of Brisbane.

In this paper we report on the diet, habitat use, and conservation management by a number of breeding pairs of owls in outer urban Melbourne. Study sites range from a relatively undisturbed rainforest habitat 80km from central Melbourne, through dry sclerophyll, eucalyptus-dominated open forest with some disturbance to a site 8km from central Melbourne in highly disturbed urban parkland.

Diets of the families of owls were determined by analyzing remains in regurgitated pellets. The data confirm that arboreal marsupials constitute the major prey items, especially the Common Ringtail Possum *Pseudocheirus peregrinus*. There were differences in diets depending on the availability of prey species, which suggest a level of opportunism not previously suspected. Our study is also the first to confirm the owls capture adult Common Brushtail Possums *Trichosurus vulpecula* (15% of pellets containing the remains of this large opossum have bones of mature adults at 1 site) and thus take prey up to two and a half times their own weight. As well our data suggest Powerful Owls are not restricted to hollow-dwelling prey, as in some sites the marsupials rested during the day either in leafy nests called dreys (*P. peregrinus*) or in house roofs (*T. vulpecula*).

In the most heavily disturbed sites, breeding success has been reduced, and we have evidence that in one particular year the young were eaten by one of the parents. This followed construction of a bicycle track under the nest during the breeding season. Recommendations are made for the future conservation and habitat management of Powerful Owls in the Yarra Valley corridor.

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## INTRODUCTION

The Powerful Owl (*Ninox strenua*) is Australia's largest owl, with males weighing up to 1.7 kg and growing to 65 cm high with a wingspan of 135 cm. It is found in eastern Australia in mainly tall open forests and coastal foothills east of the Great Dividing Range. The Powerful Owl is classified rare at both a national and state level (in Victoria), and is considered threatened in the Greater Melbourne Area (Garnett 1992; Department of Natural Resources and Environment 1995; Mansergh et al. 1989). Historically, Powerful Owls have been considered dependent on old-growth forests and of being susceptible to habitat modification and human-induced disturbance (Fleay 1968). They have been thought to require large home ranges (about 1000 ha per pair), and need habitat with nest hollows for their own breeding and that of their arboreal marsupial prey (Schodde and Mason 1980). However, recent habitat and dietary studies on the Powerful Owl have found that it is more numerous, flexible and tolerant of low level disturbance with a wider habitat, altitudinal and dietary tolerance than formerly believed (Debus and Chafer 1994).

The Powerful Owl has been found living in forests and woodlands within the suburbs of several Australian cities including Brisbane (Pavey 1995), Sydney (Rose 1993) and Melbourne (McNabb 1996; Cooke et al. 1997). Pavey et al. (1994) reported a nest tree of *N. strenua* within 800 m of urban settlement at Mt. Coot-tha in Brisbane.

Here we report on diets and conservation management of 3 breeding pairs of Powerful Owls in outer urban Melbourne. Study sites range from a relatively undisturbed wet sclerophyll 80 km from central Melbourne, through a dry sclerophyll-dominated open forest with moderate disturbance, to a site 8 km from central Melbourne in a highly disturbed urban parkland.

## METHODS

A total of 1266 regurgitated food pellets were collected under roost trees over 3 years at the 3 sites and analyzed for their contents using techniques described in Brunner and Coman (1974) and Cooke et al. (1997).

## RESULTS AND DISCUSSION

Over 90 percent of the pellets from each site contained the remains of mammalian prey. Tables 1, 2, and 3 show the main mammalian species detected in pellets over 4 seasons at Yarra Valley Metropolitan Park (urban park 8 km from Melbourne), One Tree Hill Reserve (open forest 40 km from Melbourne), and Toolangi Forest (closed forest 80 km from Melbourne), respectively. The

Common Ringtail Possum (*Pseudocheirus peregrinus*) was the most frequently detected prey item at all 3 sites. Common Brushtail Possum (*Trichosurus vulpecula*) and Sugar Glider (*Petaurus breviceps*) remains were found in pellets collected at each site. Remains of the Greater Glider (*Petauroides volans*) were only found at Toolangi Forest.

The proportion each prey species constituted within the food pellets changed with location. More Common Brushtail Possum remains were detected in pellets collected from the urban park than at the other 2 sites. This is consistent with spotlight data, which indicates high numbers of this species, which readily adapts to human settlement, establishing nest sites in house roofs and other structures. Sugar Gliders, on the other hand, are more rare in urban settings (mainly, because of intensive predation by household cats) and in the rainforest where there are fewer suitable food sources. The Greater Glider has only been seen at Toolangi (of the 3 sites) and is a major prey item of Powerful Owls, as has been reported elsewhere in Australia in high altitude habitats (Kavanagh 1988). This data suggests an opportunism displayed by the owls in taking prey that is available and abundant. The prey is not always dependent on tree hollows for nesting; at Yarra Valley Metropolitan Park Common Ringtail Possums build leafy nests in thick shrubs because of a shortage of suitable tree hollows. In contrast, at One Tree Hill Reserve such nests (called dreys) are rarely seen (Lavazanian et al. 1996).

The data show a peak in occurrence of Common Brushtail Possums in spring. It is then that young possums emerge from the pouch 4 to 5 months after birth. The young remain close to their mothers often riding on their backs thus facilitating capture by the owls. Cooke et al. (1997) aged Common Brushtail Possums taken as prey in 166 pellets collected at Warrandyte State Park, some 24 km northeast of Melbourne between Yarra Valley Metropolitan Park and One Tree Hill Reserve. They found 15% of the possums taken were adults, which can weigh up to two and a half times the weight of the owls. A similar prey/predator weight ratio has been reported for the Masked Owl (*Tyto novaehollandiae*) in Tasmania (Mooney 1993).

The Powerful Owls at Yarra Valley Metropolitan Metropolitan Park had an interesting history, as reported in Webster et al. (1999). A boardwalk was constructed for a bicycle track directly under the owls' nest tree in 1995. That year the birds successfully hatched at least 1 egg, however, the young failed to fledge. On 11 September 1995, clumps of broken wing feathers of juvenile Powerful Owls were collected amongst fresh pellets.

This situation has not been reported previously. The nest tree and the 9 roost trees used by the owls

were located within 10m of the boardwalk. Groups of between 15 and 30 people have been seen using the boardwalk at 1 time and on 2 occasions the adult male dropped its prey item during the day. The trilling of an owlet was heard on the evening of 31 August 1995, and an adult was seen roosting nearby on the 6 September 1995. On 22 September 1995, the nest hollow was inspected and a half eaten carcass of a young Common Brushtail Possum was found in the hollow. We suggest this implies that if the adults did indeed ingest the young, it was not because of lack of suitable prey being available.

In 1996, the 2 adult Powerful Owls attempted breeding again in the same nest hollow. Because of the unusual circumstances of the 1995 breeding season *Parks Victoria* closed the boardwalk section of the Main Yarra Trail near the nest tree so that human disturbance could be minimized. On the other side of the river, however, a lookout was being built which created a lot of excess noise by the builders and their machinery.

The female Powerful Owl entered the nest hollow in the first week of June. By the first week of July the female had abandoned the nest, and by mid July both birds had left the area altogether. In late September there was no sign of either adult bird and as a result a tree climber was brought in to inspect the tree hollow. The tree hollow was very clean inside with no evidence of owls. During October of the same year the nest tree collapsed and fell into the Yarra River.

In the 1997 breeding season, the adult pair had relocated to less disturbed forest some 2.5 km from the original nest tree in the Park. The pair produced 2 young, confirmed on 27 October 1997. We believe that the above observations suggest that high levels of disturbance prevented breeding during the 1996 season, and may have contributed to possible infanticide or cannibalism in the 1995 season.

## CONSERVATION OF POWERFUL OWLS IN URBAN ENVIRONMENTS

Our data suggest that if disturbance levels are kept to low levels, Powerful Owls can successfully breed and raise young in urban settings. However, it is important that suitable nest trees with large hollows be available. Data we have from 7 pairs of birds suggest that breeding pairs of owls alternate between 2 suitable nest trees each year. Furthermore, we suggest the apparent recent dispersal of Powerful Owls into urban Melbourne could be because of an increase in the suitable habitat for opossums with high densities of food trees provided by replantings in urban parklands and an increased preference for householders to have native gardens

with many flowering shrubs and trees. Although possums in less disturbed forests seem to prefer to nest in tree hollows, those in urban environments appear to use other structures (dreys and buildings) as nest sites. Our preliminary data on home ranges also suggest Powerful Owls use much less of the reported 1000 ha suggested by earlier studies. This is perhaps an indication of the richness of the food supply in the Yarra Valley.

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**Table 1. Number of pellets that contained remains of mammalian prey for each season at Yarra Valley Metropolitan Park**

Values in parentheses represent the percentage of pellets containing the species of the number of pellets containing mammalian prey for the relevant season

Mammalian Prey	Summer	Autumn	Winter	Spring	Total
Common Ringtail Possum	70 (69)	66 (65)	72 (66)	57 (55)	265 (64)
Common Brushtail Possum	24 (23)	32 (31)	35 (32)	40 (39)	131 (31)
Sugar Glider	8 (8)	4 (4)	2 (2)	6 (6)	20 (5)
Total	102	102	109	103	416

**Table 2. Number of pellets that contained remains of mammalian prey for each season at One Tree Hill Reserve**

Values in parentheses represent the percentage of pellets containing the species of the number of pellets containing mammalian prey for the relevant season

Mammalian Prey	Summer	Autumn	Winter	Spring	Total
Common Ringtail Possum	88 (76)	74 (73)	66 (64)	52 (50)	280 (66)
Common Brushtail Possum	12 (10)	11 (11)	25 (24)	42 (40)	90 (21)
Sugar Glider	16 (14)	16 (16)	12 (12)	10 (10)	54 (13)
Total	116	101	103	104	424

**Table 3. Number of pellets that contained remains of mammalian prey for each season at Toolangi**

Values in parentheses represent the percentage of pellets containing the species of the number of pellets containing mammalian prey for the relevant season

Mammalian Prey	Summer	Autumn	Winter	Spring	Total
Common Ringtail Possum	57 (56)	61 (59)	66 (61)	55 (49)	239 (56)
Common Brushtail Possum	25 (24)	20 (19)	20 (19)	31 (28)	96 (23)
Sugar Glider	1 (1)	1 (1)	0	2 (2)	4 (1)
Greater Glider	19 (19)	22 (21)	22 (20)	24 (21)	87 (20)
Total	102	104	108	112	426