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Predispersal Range, Behaviour and Use of Exotic Roost-trees by a Subadult Powerful Owl *Ninox strenua*

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Summary

A subadult Powerful Owl *Ninox strenua* was radio-tracked on 21 nights, over 4 weeks, in order to assess the possible impacts of habitat restoration involving removal of weed-tree roosts at Mt Evelyn, Victoria, in 2003. The Owl was found to be at least partly dependent on its parents until 7–8 months old (5–6 months post-fledging). This bird ranged and roosted in an area of ~90 ha over a period of 4 weeks before dispersing from its natal territory. It often roosted alone during the day, but responded at night when its parents called by meeting them and begging for food. The home-range increased suddenly to ~550 ha over three nights preceding its apparent dispersal away from the adults' territory. The radio-tagged Owl was found roosting in Sweet Pittosporum *Pittosporum undulatum* (18 times), Monterey Pine *Pinus radiata* (4 times), White Willow *Salix alba* (4 times) and Hazel Pomaderris *Pomaderris aspera* (once). Only the last is indigenous to the area, and the other species are considered to be weed trees.

Introduction

The largest Australian owl, the Powerful Owl *Ninox strenua,* has been the subject of a range of studies of various aspects of its biology in recent years (e.g. Cooke 2000; Kavanagh 2002a; Menkhorst *et al.* 2005; Hogan 2007; McNabb *et al.* 2007; Hogan & Cooke 2010). Much work has also been done to assess and conserve its forest habitats (e.g. Kavanagh & Bamkin 1995; Loyn *et al.* 2001; Kavanagh & Stanton 2002; Soderquist *et al.* 2002). The species is listed as *least concern* in Australia (Garnett & Crowley 2000) and *vulnerable* in Victoria (DSE 2007). Radio-tracking studies by Kavanagh (1997) and Soderquist & Gibbons (2007) have reported home-ranges from ~300 ha (breeding female) to >4000 ha, respectively. Young Owls have been shown to be dependent over a long period (up to 6 months) and are guarded by the adults during the early post-fledging period (McNabb 1996). However, little has been published about the roosting behaviour, duration and degree of dependence, or the home-range of young during the later stage of dependence leading up to dispersal. This paper reports on the later period of dependence, daytime roosting and nocturnal movements of a subadult Powerful Owl during the 4-week period preceding its dispersal from the natal area. The work was conducted in response to planned vegetation restoration works, which involved removing weed trees that were known to be used as summer roost-sites by the Owls.

Study area and vegetation restoration

The study was centred at Mt Evelyn Recreation Reserve (37°47′S, 145°23′E), in a hilly semi-urban area, 40 km east of Melbourne, Victoria. Habitat comprised mainly riparian forest of Manna Gums *Eucalyptus viminalis* along the Olinda Creek. The original midstorey of Silver Wattle *Acacia dealbata*, Blackwood *A. melanoxylon*, Hazel Pomaderris *Pomaderris*

aspera and other locally indigenous species had been largely overrun by Sweet Pittosporum *Pittosporum undulatum* which, although a native species, is not indigenous to the area and is considered a pest species. Introduced White Willows *Salix alba* and Hawthorns *Crataegus monogyna* dominated much of the creek-side habitat.

A recreation reserve, including two sporting ovals and a bush recreation camp, lies along the western side of the creek, and a bush reserve along the eastern side adjoins the extensive Dandenong Ranges National Park to the south. A network of narrow bushy corridors, formerly railway or aqueduct easements, provides habitat for Common Ringtail Possums *Pseudocheirus peregrinus*, which are a major prey item for the Owls (Kavanagh 2002b). These corridors also provide sheltered roosting sites for the Owls.

A resident breeding pair of Powerful Owls was known to roost in shady creekside weed trees, White Willows, Sweet Pittosporums and Hawthorns, during extreme summer weather (C. Worsnop pers. comm.; E. McNabb pers. obs.). Other roost-trees used by the Owls during milder conditions and throughout the year included mature, hillside Sweet Pittosporums and eucalypts. These hillside trees were 25–50 m from the creek. At this location, two young Owls were reared in 2002 in a large, living Manna Gum. Powerful Owls are known for their inter-year laying punctuality (e.g. ±16 days) and age at fledging of ~8 weeks (McNabb 1996). These data enabled us to estimate a hatching date of between 8 July and 8 August and a fledging date of between 2 September and 3 October for these owlets, based on known fledging dates for subsequent years. The plumage of these owlets closely matched that of 6-month-old young with which we were familiar through previous studies (McNabb 1996). In 2003, a vegetation restoration project was conducted by Melbourne Water to remove all weed trees, including several Owl roost-trees, from within a 5 × 200-m strip along each creek bank, and replant with indigenous vegetation. Because of community concerns that this work may threaten the Owls, it was deemed necessary to minimise initial disturbance to the Owls and to ensure that their breeding habitat was not degraded in the long term.

A strategy was adopted to first ensure that no work took place near roosting Owls, and second, rather than felling these trees immediately, to inject the trunks of trees in the Owls' preferred roosting area with a slow-acting herbicide (Roundup Bioactive®). This was to allow continued roosting until autumn when the trees began to lose their leaves, therefore replicating normal winter leaf-fall (although somewhat earlier than usual). Creekside weed trees outside the roosting area were felled and removed after ensuring that no owls were roosting nearby at the time (McNabb 2004). An attempt was made to radio-tag an adult Powerful Owl to assist in monitoring any impacts. This attempt was unsuccessful, but during the attempt a subadult Owl was captured and radio-tagged because it was expected to assist us in monitoring the family (see McNabb 2004).

Methods

One of two subadult (~6 months old, sex unknown) Powerful Owls was lured into a mist-net by playback of adult *whoo hoo* calls on the evening of 9 February 2003, ~100 m from the nest-tree. The 1368-g Owl was fitted with a 9-g Biotrack transmitter (0.7% of the Owl's weight) attached ventrally to the right-central rectrix close to the base, by using an epoxy glue (Five Minute Araldite®) and two bindings of dental floss. The whip aerial was tied with dental floss at two points, 40 mm apart along the shaft. Because of the risk of feather breakage, the floss was not threaded through the shaft (see Soderquist & Gibbons 2007). The Owl was banded with an Australian Bird & Bat Banding Scheme band and released 50 minutes after capture.

Radio signals were ground-tracked at night by one or two observers, one equipped with a Telonics TR2 receiver and the other with an Icom IC-R10 receiver, both utilising a three-element Yagi antenna. Because the Owl often stayed at one location for >5 minutes, a single observer could then quickly triangulate to the stationary Owl from two points 100–200 m away, on evenings when a second observer was not available. Signals were received at distances of up to 1 km but, because of radio interference, fixes were usually taken by triangulation at distances of <0.5 km. Both observers used two-way radios to enable them to synchronise the fixes.

The Owl was tracked over 4 weeks (9 February–10 March 2003) until the radio signal was lost. Fixes were taken >15 minutes apart to facilitate independence of the locations.

The recording of fixes was often interrupted when the Owl moved a long distance, changed position too frequently, or was too far away for an accurate fix. Night sessions lasted between 100 minutes (three fixes) and 7 hours (14 fixes), with 17 sessions between sunset (~2000 h, Eastern Summer Time) and 0230 h (<8 fixes), three sessions between 0015 h and sunrise (~0700 h) (<10 fixes), and one session all night (2230 h–sunrise, 14 fixes). Roost-sites were located during daylight. Estimates of home-range were made using Calhome software (United States Forest Service Pacific Southwest Research Station and California Department of Fish and Game) by two methods: minimum convex polygon (MCP: Mohr 1947) and harmonic mean distance minimum (HM: Dixon & Chapman 1980).

Results

Radio-tracking

Night-time tracking was conducted on 21 out of 28 nights, providing 132 fixes (Figure 1). The radio-tagged Owl ranged consistently over an area of ~90 ha until 7 March, when the MCP began to increase dramatically (Figure 2). Over the ensuing three nights before we lost contact with it on 10 March, the Owl conducted apparent reconnaissance flights into surrounding habitat and became difficult to track. On 7 March, contact with the Owl was lost at 2300 h as it headed north-west. It was located again on 8 March, 2.5 km from the Mount Evelyn Recreation Reserve, roosting by day in a mature Monterey Pine *Pinus radiata*, clutching a dead Common Ringtail Possum. It remained in this area until midnight on 8 March, when tracking ceased for the night. We were unable to locate the Owl on 9 March despite an extensive search, but located it again on 10 March, roosting in a Hazel Pomaderris on the bank of Olinda Creek, 400 m south of the earlier MCP. This roost was ~4 km south-east of the pine-tree roost used on 8 March and ~700 m south from the nest-tree.

Shortly after sunset on 10 March, the tagged Owl moved south-west, and the last radio fix was taken at 2245 h, 3 km south-west of the capture site. The signal was then lost, and the Owl was not found again. After contact was lost, extensive radio-tracking and manual searches were conducted throughout the surrounding areas, including two aerial flights that covered ~2500 km^2 each time.

Roosts

Before the radio-tracking, one or more adult or subadult Powerful Owls were located roosting in creekside trees on eight occasions. Roost-trees identified during this period (6–30 January) include Willows (five times), a Hawthorn (once), and a Smooth Teatree *Leptospermum glabrescens* (Plate 17, front cover)(twice) (Table 1). These roosts are not included in the analysis because of doubt about the identity of untagged Owls.

Roost-sites were located by radio-tracking on 27 occasions between 9 February and 10 March. The tagged Owl roosted most often (18 times) in a narrow, steep-sided gully that ran from the north between two residential streets. These roosts were 600–700 m from the nest-tree (and the weed-tree removal area). At night, this Owl moved down the gully to spend most of the night near the capture site or in a narrow strip of bush on the opposite side of the sporting ovals.

The tagged Owl was seen only once roosting in a locally indigenous tree, a Hazel Pomaderris. This was the last roost located before the Owl is believed to have dispersed and the radio signal was lost. All other roost-trees recorded were non-indigenous to the area (Table 1). The tagged Owl roosted most often (66.7%)

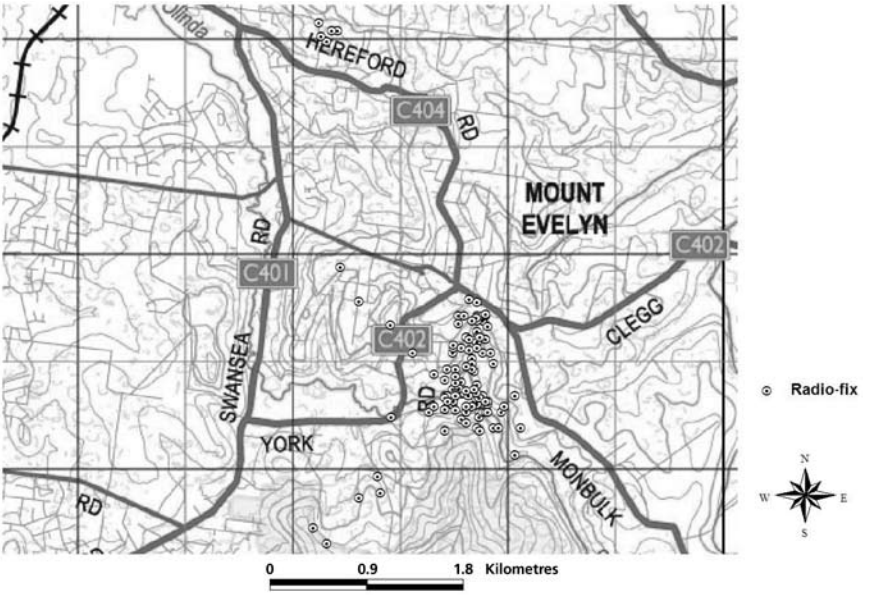

Figure 1. Radio-tracking fixes of a subadult Powerful Owl during 4 weeks of radio-tracking at Mt Evelyn, Vic., February–March 2003.

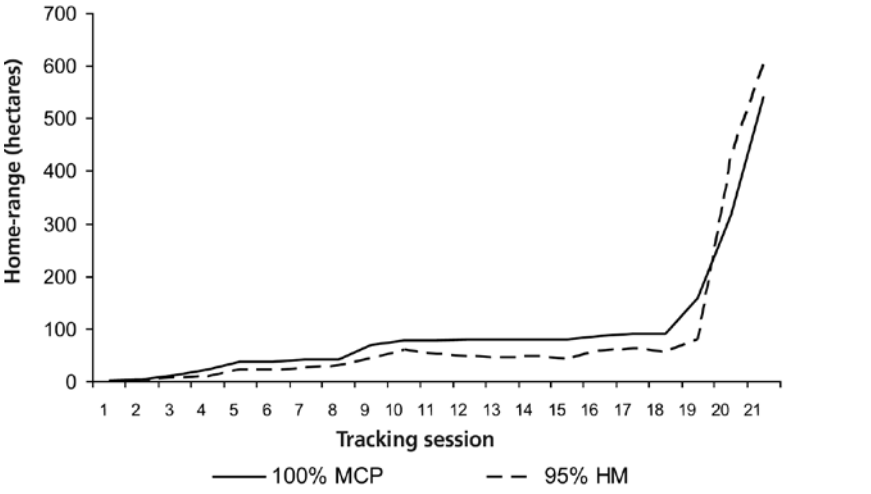

Figure 2. Radio-tracking of subadult Powerful Owl over 21 nights (9 February–10 March 2003) showing sudden increase in home-range before dispersing (100% Minimum Convex Polygon [MCP] and 95% Harmonic Mean [HM] methods).

Table 1

All known roost-trees used by Powerful Owls at Mt Evelyn, Vic., 6 January–10 March 2003, and number of times each of these was used by a radio-tagged subadult Owl between 9 February and 10 March. Note: R02–R07 were trunk-injected with herbicide and R08 was felled during the study. R15 was not confirmed. *= Exotic species, #= non-indigenous species.

Roost	*Roost-tree species*	*Times used by radio-tagged subadult Owl*
R01	Smooth Teatree	
R02	Hawthorn*	
R03	White Willow*	
R04	White Willow*	3
R05	White Willow*	
R06	White Willow*	
R07	White Willow*	1
R08	White Willow*	
R09	Sweet Pittosporum#	4
R10	Sweet Pittosporum#	2
R11	Sweet Pittosporum#	1
R12	Sweet Pittosporum#	1
R13	Sweet Pittosporum#	1
R14	Sweet Pittosporum#	1
R16	Sweet Pittosporum#	1
R17	Sweet Pittosporum#	1
R18	Sweet Pittosporum#	2
R19	Monterey Pine*	2
R20	Sweet Pittosporum#	2
R21	Sweet Pittosporum#	1
R22	Sweet Pittosporum#	1
R23	Monterey Pine*	1
R24	Monterey Pine*	1
R25	Hazel Pomaderris	1

in Sweet Pittosporum (18 times, 12 individual trees), followed by Monterey Pine (14.8%, four times, three trees), Willow (14.8%, four times, two trees) and Hazel Pomaderris (once, 3.7%).

Behaviour

After moving from its roost to the recreation reserve, the tagged Owl spent most of each night perched, making trilling (begging) calls, remaining in or near the reserve for long periods or until an adult, usually the male, was heard hooting. This hooting alerts the young that the parent has prey to share (McNabb 1996), and on these occasions the owlet flew toward the hooting parent. It often made the trilling (begging) call of a dependent young throughout the night, until the hooting of an adult called it to a rendezvous, apparently to receive food. This behaviour was last observed on 2 March at 2100 h, 5–6 months post-fledging. The young Owl was not seen to capture prey during this study, but was observed clutching

prey at the roost on six occasions, often after meeting a hooting parent. On two other occasions, its sibling roosted nearby and held prey. Prey seen comprised four Common Ringtail Possums, an unidentified raven *Corvus* sp., one unidentified mammal and one unidentified bird.

An adult Owl was found roosting close to the tagged Owl on three occasions (15, 16, and 17 February), and the sibling was found roosting close on one occasion (19 February).

Discussion

Previous reports describe a long period of dependence (e.g. McNabb 1996) and that the parents, especially the female, tend to roost close to their offspring (guarding) during the post-fledging period. This study suggests that such close guarding may not continue into the later stage of dependence. It is reasonable to assume that the owlet was only partly dependent during this period before dispersing. For example, Debus *et al.* (2005) reported another *Ninox* owl, the Barking Owl *N. connivens*, to be partly dependent at 5 months post-fledging.

Because of its seemingly exploratory behaviour over three nights before loss of the signal, we can reasonably assume that the tagged Owl dispersed on the night that radio contact was lost, as sudden failure of the transmitter is considered unlikely (though it cannot be discounted entirely). The current observations suggest a short period of extended local exploration (3 days) followed by a longer-distance dispersal (beyond our search range). Direct observations are rarely made of birds of any species dispersing from natal territories. However, similar predispersal forays by captive-bred Masked Owls *Tyto novaehollandiae* were described by Debus (1997), and Kavanagh *et al.* (2009) tracked an apparently young male Masked Owl as it made lengthy excursions away from its initial home-range before settling ~80 km away. We have no information regarding the survival or dispersal of the Powerful Owl's sibling.

This study has shown that non-indigenous or exotic tree species of the right form provided most of the suitable shady summer day-roosts for the subadult Powerful Owl (and for the adults, based on preliminary observations). Mature Sweet Pittosporums offer roosts similar in form to one of the Owls' preferred roost-tree species (Blackwood: Higgins 1999), a species that has largely been replaced in the area by the Pittosporums. Sweet Pittosporums are a regularly used roost-tree in East Gippsland, Victoria (Bilney 2009), where this species is indigenous. Exotic tree species were less numerous than eucalypts in the general area at Mt Evelyn, and were clearly selected preferentially by the Owls during warmer weather presumably because they offered denser, cooler shade beside the creek. The surrounding area contained a range of mature exotic (e.g. Pittosporums) and indigenous (e.g. eucalypts) roost-trees, and the adult Powerful Owls remained in the area after the exotic trees were poisoned. It may be concluded that the weed-tree roosts were not a limiting resource.

Land managers often require the removal of invasive weed species as the first stage of restoring natural habitat. Because some native fauna species are well adapted to roosting, foraging and nesting in weed species, however, some removal methods can have a negative impact. For example, broadscale weed-tree eradication may severely reduce the abundance of owl prey. We recommend that land managers adopt a section-by-section approach when restoring natural habitat. This process will extend the timeframe for the project, but mitigate the negative impacts on native fauna.

In the case of this project, negative impact on the Owls was minimised by sensitive removal of weed-trees including the delayed effect of herbicides, replicating winter leaf-fall. A pair of Powerful Owls has persisted and continues breeding in the area since the weed-tree removal, and it is expected that the planted revegetation will provide new, shady summer roosts as it matures.

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