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OWLS IN THE SOUTHWEST FORESTS OF WESTERN AUSTRALIA

G. L. LIDDELOW¹, I. B. WHEELER¹ & RODNEY P. KAVANAGH²

¹ Conservation and Land Management, CALMScience Division, Brain Street, Manjimup, WA 6258.

² State Forests of New South Wales, Forest Research Division, PO Box 100, Beecroft, NSW 2119



The first systematic survey of owls in the southwest of Western Australia was conducted during spring 1999 and autumn 2000. This focused on the Masked Owl (*Tyto novaehollandiae*) and the Barking Owl (*Ninox connivens*) and covered an area from Toodyay (near Perth) in the north to Augusta in the southwest and York/Narrogin in the east and Stirling Range National Park and Two Peoples Bay (near Albany) in the southeast.

Seventy sites, stratified by major forest type (Jarrah, Karri, Wandoo) and logging history (up to three categories), were surveyed using taped playback, once in each season, and all nocturnal birds and mammals seen or heard were recorded. A further 30 sites were surveyed to sample transitional vegetation communities (e.g. Jarrah/Wandoo woodland), forest fragments (e.g. Tuart woodland), and forests at a number of outlying locations (e.g. Boranup, Dryandra, Boyagin and the Stirling Ranges).

A total of 196 Southern Boobooks (*Ninox novaeseelandiae*) and 15 Masked Owls were recorded at 67% of sites. Seventy-six Australian Owlet-nightjars (*Aegotheles cristatus*) and 21 Tawny Frogmouths (*Podargus strigoides*) were also recorded. One hundred and fifty-six owls were recorded within the main forest belt and 55 from the outlying forest sites. No Barking Owls were recorded, although the species was reported from privately-owned land outside or adjacent to the main forest belt.

A range of mammals, including 18 Western Ringtail Possums (*Pseudocheirus occidentalis*) and 15 Common Brushtail Possums (*Trichosurus vulpecula*), was also recorded at the survey sites.

INTRODUCTION

Owls are an important component of Australian forest ecosystems, but their cryptic habits often result in them being overlooked in land management planning decisions. To remedy this situation, the first step is to describe their patterns of distribution and associations with different

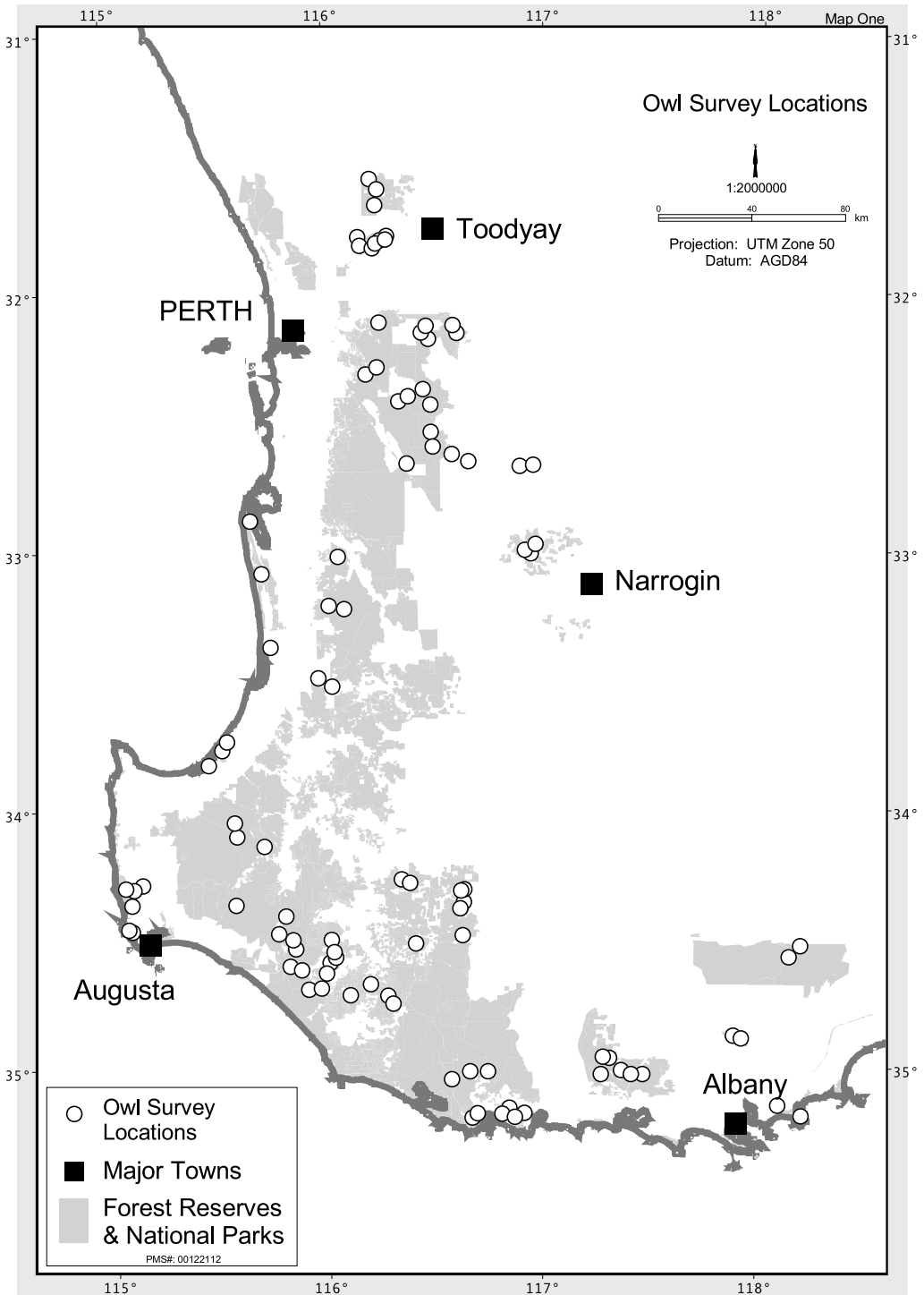


Fig. 1. Location of survey sites in the southwest forests.

forest types and disturbance classes in the forest. Appropriate surveys have now been conducted over the past 12 years in New South Wales and Victorian forests (e.g. Milledge *et al.* 1991, Kavanagh & Peake 1993, Kavanagh *et al.* 1995b, Kavanagh & Stanton 1998, Loyn *et al.* 2002). These surveys focus on the status of each species and their broad habitat requirements, and formed the basis for owl-habitat models that assisted land-use decisions in several Commonwealth-State Regional Forest Agreements.

In this study, we report the results of the first such survey in Western Australia. Nocturnal fauna were sampled using a standard procedure during two seasons at 100 widely-distributed sites throughout the southwest forests. We found that, while the nocturnal fauna was comprised of fewer species than that in the east coast forests, several species displayed similar patterns of abundance between east and west coast forests and the four owl species encountered showed similar associations with forest habitat types.

METHODS

Study area and site stratification

The study area included all public forest lands (state forest and national park) within the southwest forests, extending from Toodyay (near Perth) in the north to Augusta in the southwest and York/Narrogin in the east, and Stirling Range National Park and Two Peoples Bay (near Albany) in the southeast (Fig. 1). Survey sites were selected with the assistance of GIS maps (produced by CALM's Information Management Branch, Perth), but with sampling restricted to forest areas of at least 600ha (for the first 70 sites) and preferably outside areas zoned to quarantine the spread of the root-rot fungus *Phytophthora cinnamomi*. The minimum distance between survey sites was set at 3 km.

Seventy sites were selected within the three major forest and woodland types of the region: Jarrah *Eucalyptus marginata*, Karri *E. diversicolor* and Wandoo *E. wandoo* (Fig. 1). Ten sites were located in each forest type in areas with no record of logging (based on CALM logging history maps of the region). A further ten sites within each forest type were allocated to areas that had been logged on one or two occasions. In the case of Karri, the ten sites represented 15–70 year-old forest regrowth following clearfelling. In Jarrah and Wandoo, the sites had been selectively logged. Finally, ten sites were chosen in Jarrah forests that had been selectively logged on three or more occasions.

A further thirty sites (mainly outliers from the main forest belt) were also surveyed to sample transitional vegetation communities (Jarrah/Wandoo woodland; eight unlogged sites), forest fragments (Tuart *E. gomphocephala* woodland; seven unlogged sites), and forests at outlying locations (Boranup, four logged Karri sites; Porongorup Range National Park, two unlogged Karri sites; Dryandra, three unlogged Wandoo sites; Boyagin Rock Reserve, two unlogged Wandoo sites; Stirling Range National Park, two unlogged Wandoo sites; and Two Peoples Bay Nature Reserve, two unlogged coastal woodland sites) (Fig. 1).

Survey method

A total of two surveys were conducted, spring (13–25 September 1999) and autumn (6–24 March 2000) and all nocturnal birds and mammals seen or heard were noted. At each site, 15 minutes was spent listening for unelicited vocalisations, followed by 10 min (5 min for each species) of

intermittently broadcasting pre-recorded calls of Masked Owl (*Tyto novaehollandiae*) and Barking Owl (*Ninox connivens*) and listening for a response. Finally, ten minutes was spent searching a 1ha plot (56.5 m radius) with a hand-held 12V 100W spotlight for animals present at the site that did not call. The numbers of individuals of each species were recorded and the closest distance for each species to the plot centre was estimated. This technique was similar to that described and used by Kavanagh & Bamkin (1995). The maximum number of each species recorded at each site during either the spring or the autumn survey comprised the data used in analysis. Arboreal mammals were recorded as an indication of likely prey abundance for owls.

Surveys began after dark, usually 1900 hours, and extended until about 0300 hours. Owl vocalisations were broadcast using a Toa ER-2015 megaphone coupled to a Sony TCM-333 cassette recorder. A rapid habitat assessment was also conducted at each site to record the predominant tree species, the numbers of trees with visible large hollows, and understorey height and density.

During the survey period, a number of requests were made through local media (radio, newspaper) inviting members of the public to supply records of the Masked Owl and Barking Owl in the southwest region.

RESULTS

A total of one hundred and fourteen Southern Boobooks (*Ninox novaeseelandiae*), five Masked Owls, thirty Australian Owlet-nightjars (*Aegotheles cristatus*) and eleven Tawny Frogmouths (*Podargus strigoides*) were recorded in spring 1999, while in autumn 2000, eighty-two Boobooks, ten Masked Owls, forty-six Owlet-nightjars and nine Frogmouths were recorded from the same sites (Table 1). The Southern Boobook and the Masked Owl appeared to be more common among the forest outlier sites than among the sites within the main forest belt (Table 1). However, detectability of the Southern Boobook declined among these outlying sites during autumn, while it increased for the Masked Owl. Counts of the Australian Owlet-nightjar also increased during autumn, but only within the main forest belt (Table 1). Overall the Jarrah and Woodland sites held 21% of the owls recorded in spring and 28% of those in autumn, the Karri had 26% in spring and 25% in autumn, and the Wandoo had 23% in spring and 26% in autumn, with the Outliers having 30% in spring and 21% in autumn.

Within the main forest belt, the Southern Boobook was recorded at 97.5% of sites with the Western Australian smooth-barked tree species (Karri and Wandoo), but at only at 56.6% of sites dominated by Jarrah (a rough-barked species). Proportion of sites at which Boobooks were detected in the main forest belt was compared with the Outliers using Chi Square analysis; no significant difference was found ($\chi^2 = 0.527$, $dF = 1$, $P = 0.468$). Over the period of the survey, in both spring and autumn, recording rates for the Southern Boobook in the Karri were 90% in the unlogged and 100% in logged forest sites, and 100% in both logged and unlogged Wandoo woodland sites. However, in Jarrah forest, these owls were recorded at 70% of the unlogged sites, at 60% of sites logged once or twice and at 40% of sites logged three or more times (Table 1). A comparison of the frequency of detection of Southern Boobooks in relation to logging history within the main forest belt was conducted using Chi Square analysis; a significant difference was found ($\chi^2 = 20.9$, $dF = 7$, $P = 0.004$). Thus the Southern Boobook was more likely to be recorded in relatively undisturbed forests, but due to the small sample size, some caution is required with this finding.

Table 1. Distribution of nocturnal forest birds and mammals in each forest type.

Figures show the number of sites where each species was detected, using records from both spring and autumn, and the number of individual night birds and mammals recorded during spring and autumn.

Forest Type	No. Sites Surveyed		Southern Boobook <i>Ninox novaeseelandiae</i>		Masked Owl <i>Tyto novaehollandiae</i>		Tawny Frogmouth <i>Podargus strigoides</i>		Australian Owlet Nightjar <i>Aegotheles cristatus</i>		Common Brush Tail Possum <i>Trichosurus vulpecula</i>		Western Ringtail Possum <i>Pseudocheirus occidentalis</i>		Total				
	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut					
	Occ.		Occ.		Occ.		Occ.		Occ.		Occ.		Occ.						
Main Forest																			
Jarrah unlogged	10	5	7	7	1	1	2	2	1	5	5	2	1	1	1	10			
Jarrah logged one or twice	10	3	4	6			1	1	2	2	3	1	1	3	2	9			
Jarrah logged 3 times or more	10	3	2	4			1	1	1	3	3	1	1	3	1	5			
Karri unlogged	10	7	9	9			1	1	1	5	5	6				10			
Karri logged once or twice	10	10	6	10			1	1	2	5	6	8				10			
Wandoo unlogged	10	8	9	10	1	1	1	1	2	3	5					10			
Wandoo logged one or twice	10	8	8	10			3	3	5	5						10			
Woodland	8	4	5	6	1	1	2	1	2	3	3	4	2	2	2	8			
sub total - Sites	78	48	50	62	1	2	7	8	13	18	32	39	4	2	5	6	72		
sub total - Individuals	82	71			1	2	10	9	22	40	4	0	4	0	9	1	252		
Outliers																			
Tuart	7	5	4	6	1	3	3	1	1	1	1	4	2	2	2	6			
Boranup	4	4	4	4	1	1	1	3	3							4			
Dryandra	3	3	1	3	2	2	3		1	1	2	1				3			
Boyagin	2	2			2					1	1	1	1			2			
Stirlings	2	2	2	2				2					1	1		2			
Porongurups	2	1	1	1				1	2	2	1	1				2			
T-P-Bay	2	1	1	1					2	2			5	1		2			
sub total - Sites	22	17	6	19	4	6	7	1	0	1	7	6	10	5	1	6	21		
sub total - Individuals	32	11			4	8	2	0	8	6	8	1	7	1	7	1	87		
TOTAL SITES	100	65	56	81	5	8	10	8	14	25	38	49	9	2	11	10	2	8	93
TOTAL INDIVIDUALS	144	82			5	10	12	9	30	46	12	3	16	2	2	339			

Arboreal mammals were generally uncommon in the southwest forests, and the Karri forest appeared to be the most depauperate (Table 1).

DISCUSSION

No Barking Owls were found during this survey at any of the sites in either spring or autumn. As this species breeds in spring, it should have been readily detectable if present (Fleay 1968, Calaby 1990, Hollands 1991, Kavanagh *et al.* 1995a). There were recent reports of Barking Owls (since 1999) from Forest Grove near Margaret River, Deepdene near Augusta, farmland to the east of Balingup, South Coast Highway near the Valley of The Giants at Walpole, Congelin near Narrogin, Mulyinning near Wickepin, Fitzgerald National Park and Torndirrup National Park near Albany. These recent records are taken from the Department of Conservation and Land Management Fauna File and came from a variety of sources. All of these sites are outside the main forest belt and, in this regard, the habitat of the Barking Owl appears to be similar to that in the eastern States where it is not regarded as a bird of tall, continuous forests (Kavanagh *et al.* 1995a). Abbott (1999) also lists a number of sites outside the main forest belt where this species has been either heard or seen. Records from the WA Museum over the past forty-five years indicate occurrences of Barking Owls from Margaret River (1986), Manjimup (1995), Pemberton (1955), Mundaring (1984) and Toodyay (1979) (Fig. 2). All previous records are from 1842 through to 1931. This species was rarely reported in the southwest during the national Bird Atlas surveys during 1977–1981 (Blakers *et al.* 1984). The Barking Owl is clearly uncommon in the southwest and in need of further attention.

Masked Owl records in the southwest of WA were also sparse. The sites where they were recorded by us range from Boranup and the Tuart forest in the west, the proposed Milyeannup Nature Reserve on the Blackwood Plateau, Dryandra Forest, the Avon Valley and Woodland at Walpole. Most of the Masked Owl records came from the Tuart forests and Dryandra. Masked Owls comprised 4.2% of the counts in spring and 11% of those in autumn. The Masked Owl occurs in open forest and woodland, and appears to be associated with ecotones for hunting, either as clearings or natural openings within the forest or forest edges with another vegetation type, but it roosts among dense foliage in gullies, or in caves or tree hollows (Blakers *et al.* 1984, Kavanagh & Murray 1996, Abbott 1999). Apart from the Milyeannup record, all the other records were in woodland with open understorey and forest edges nearby. Two road-killed Masked Owls were recently handed into the CALMScience office (Manjimup) from Palgarup, north of Manjimup (August 1999) and Bengier, between Harvey and Brunswick Junction (July 1999). Another Masked Owl was seen between survey points at Lake Muir east of Manjimup and two further individuals were seen at a CALMScience study site in Kingston northeast of Manjimup by Graeme Liddel and Ian Wheeler of CALMScience, Manjimup. All of these records were in woodland or open forest with cleared agricultural land nearby. There have also been recent reliable records from Bridgetown and Manjimup (Liddel and Wheeler).

The Barn Owl occurs in even more open, sparsely wooded country, and its numbers can fluctuate greatly from year to year depending on food supply (Calaby 1990b). No Barn Owls were recorded during the survey and only three birds were seen while travelling between sites (between Dryandra and Boyagin). One other bird was seen while travelling between Mumballup and Boyup Brook on the night of 13 September just before the spring survey.

The Southern Boobook was recorded in all of the forest types in this survey. It is clearly widespread throughout the southwest of Western Australia.

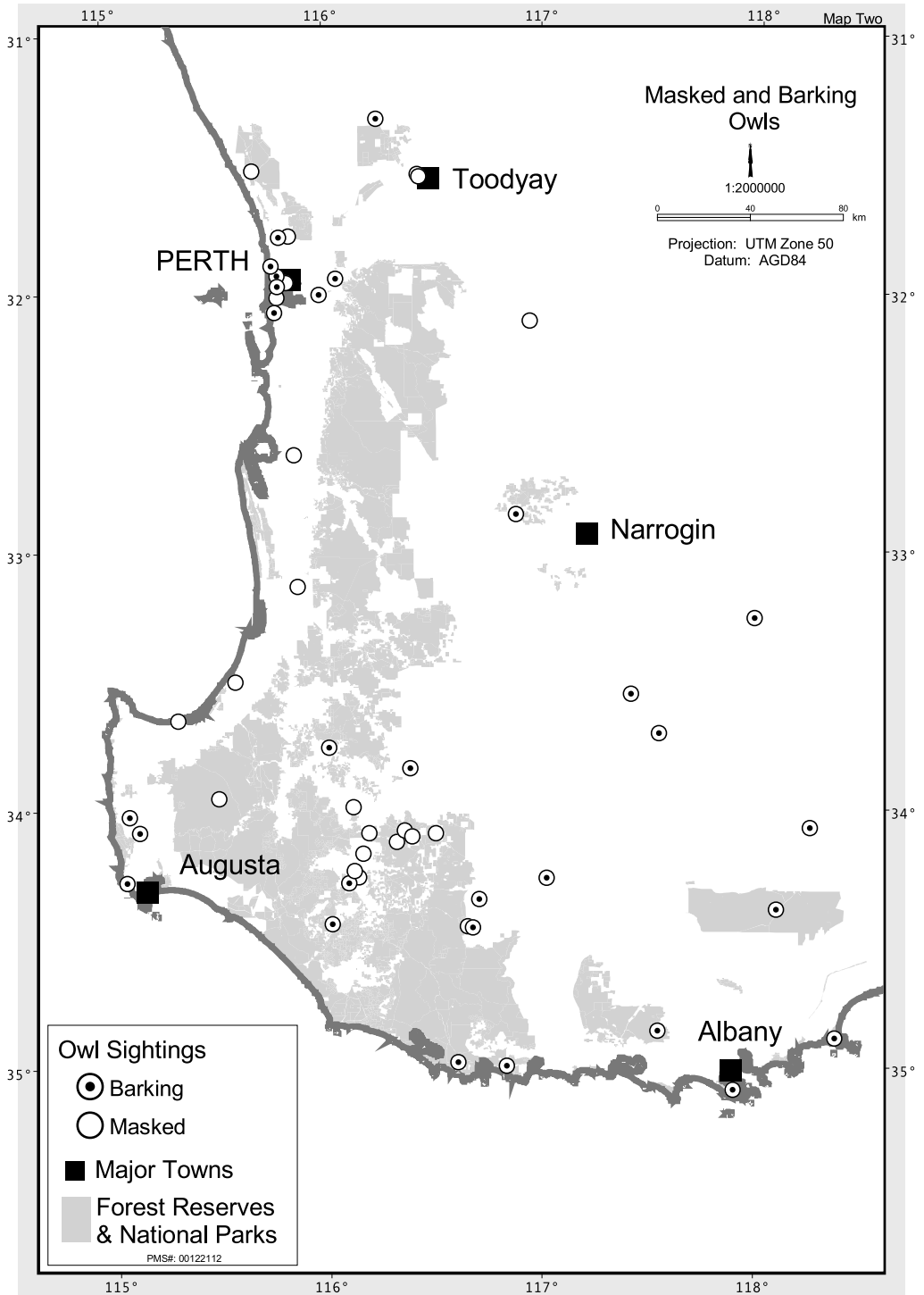


Fig. 2. Distribution of records for Masked Owl and Barking Owl from this survey, from the WA Museum, and from information from the general public on Barking Owls.

Few arboreal mammals were detected, particularly in the Karri forest. However, ground dwelling mammals (*Rattus fuscipes* and *Antechinus flavipes*) are usually abundant in Karri forest (Per Christensen, pers. comm., CALM unpublished data), and these species could be expected to form prey for the Masked Owl and possibly also the Barking Owl (Kavanagh *et al.* 1995, Kavanagh 1996). The tall dense nature of the understorey in the Karri forest may preclude effective hunting by large owls.

CONCLUSIONS

This survey was a preliminary study of the occurrence of owl species in the forests and woodlands of southwest Western Australia. The Southern Boobook Owl is common and widespread throughout this region and the Masked Owl occurs mainly in the woodland region or where agricultural land intrudes into the heavier forest. Barking and Barn Owls do not appear to be forest species in Western Australia, a pattern that is similar to New South Wales and Victoria. The conservation status of the Barking Owl is uncertain and of concern because the species appears to be confined mainly to private land in the southwest. In its open-forest habitat, this species may be more sensitive to continuing fragmentation than is the Barn Owl, which is commonly associated with agriculturally-dominated landscapes.

The sites used in this study should form part of future long-term monitoring of owls in Western Australia. Surveys should also be conducted on private lands, particularly around farmland edges and along the main river systems, to determine the importance of these areas for the conservation of the Masked Owl and the Barking Owl in the southwest. Studies of the ecology of these owls in WA are needed to determine the importance of various habitat components to the conservation of these species.

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