

# CALLING BEHAVIOUR OF THE SOUTHERN BOOBOOK *Ninox novaeseelandiae* IN RELATION TO DISTANCE FROM THEIR NEST TREES

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Received: 4 December 2008

Between 1996 and 1999 we measured the distance from the nest that four Southern Boobooks called using 'territorial boobook' and 'bray' calls, the latter used only by females. Median distances from the nest tree that they used 'territorial boobook' calls were 175 metres and 250 metres for two females, 210 metres and 525 metres for two males. The two females used 'territorial boobook' calls within a 100 metres radius of the nest tree only 12 per cent of the time, the two males only 31 per cent and 0 per cent of the time. Median distances from the nest that both females called using 'bray' calls were 10 metres, range 0–450 metres for one, 0–350 metres for the other. Females used 'bray' calling within 100 metres of the nest 70 per cent and 88 per cent of the time. 'Territorial boobook' calling was not an effective way of finding boobook nests; 'bray' calls of females more often revealed precise nest locations.

## INTRODUCTION

The Southern Boobook *Ninox novaeseelandiae* is the smallest of the eight owl species, four *Tyto* and four *Ninox*, that breed on mainland Australia (Pizzey and Knight 2007). They are a single-brooded, monogamous species that may use different nests from year to year inside a territory (Olsen and Trost 2007). Territories are defended through territorial singing and, near Canberra, are about 100 hectares in area (Olsen and Trost 1997). Though Southern Boobooks are a common species, there is some confusion in the literature about aspects of their biology (see Olsen and Debus 2005; Olsen and Trost 2003, 2007; Olsen *et al.* 2006). Much of what is known about the behaviour of *Ninox* owls is inferred from their vocalisations. Sexual behaviour is said to begin in late winter and spring, when male Boobooks give vocal advertising displays before laying, and utter 'boobook' calls, a call similar to the call of the Common Cuckoo *Cuculus canorus* of Europe, from vantage perches mostly near the nest-site (Higgins 1999). However, much of this is speculation based on captives, or observations of un-marked birds where sex was not determined. Boobooks give the 'boobook' call year round (Higgins 1999), and there is some evidence that they continue sexual behaviour through late summer. Another call, the 'bray' call, is used by females to elicit food or co-operation from males; 'bray' calls are a long, single-note call that sounds something like an Australian Wood Duck *Chenonetta jubata* or fledgling Australian Magpie *Gymnorhina tibicen*. Olsen *et al.* (2002) recorded these calls from early September through late January, and in a subsequent study, recorded them to the end of February, with males continuing to feed females during this period (J. Olsen and S. Trost unpub. data).

If Southern Boobooks do give 'boobook' calls close to the nest, as suggested by Higgins (1999) these calls should provide an important tool for finding nests. However, Olsen and Trost (1997) suggested that male Boobooks spend time during the nestling phase 'duelling' on territory boundaries away from nests. Hill and Lill (1998) and Stephenson (1998) reported

similar behaviour for the Christmas Island Hawk-Owl *Ninox natalis*, and New Zealand Southern Boobook *N. n. novaeseelandiae* respectively. In contrast, female Southern Boobooks often use 'bray' calls close to the nest (Higgins 1999; Olsen *et al.* 2002; Hollands 2008), so these calls may be a more reliable tool for locating nests.

In this study we scored 'territorial boobook' calls (termed 'boobook' calls below) made by two pairs of radio-tagged Southern Boobooks in adjoining territories, and 'bray' calls used by the two females on the same two territories to determine the distances they called from the nest tree.

## STUDY AREA AND METHODS

### Study area

The study area was located on and near Black Mountain in north Canberra in the Australian Capital Territory (35° 16' 33"S, 149° 05' 49"E). The owls ranged over all of the 80-hectare Aranda Bushland, and the north-western corner of the 600-hectare Black Mountain Reserve, the suburbs of Cook and Aranda, open grazing land to the south of Aranda Bushland and Cook, and occasionally the wooded northern flank of Mount Painter (see Olsen and Trost 1997, 2007 and Olsen *et al.* 2002 for details).

### Trapping, banding, and radio-telemetry

We used wire bal-cha-tri traps (Olsen and Woollard 1975) baited with a House Mouse *Mus musculus*, a noose mounted on the end of a surf-casting rod, and fishing nets on extended poles, to trap adults. All adults were sexed - those with a brood patch were deemed females, those without a brood patch deemed males (Olsen and Trost 1997). We fitted each owl with a stainless steel, numbered Australian Bird and Bat Banding Scheme band, and a plastic colour-band sealed with super-glue, or a numbered aluminium band, that allowed us to identify them as 1) White male, 2) White female, 3) Green male, 4) Green

female. We fitted each with a back-pack style Sirtrack single-stage transmitter with a string harness and weak link designed to break if the bird became entangled by its transmitter and harness (Karl and Clout 1987). Radios weighed 5.4 grams and harnesses 1.0 gram, making 6.4 grams on a 270-gram male (2.4% of body wt.) and on a 340-gram female (1.9% of body wt.) (see Olsen and Trost 1997, 2007 and Olsen *et al.* 2002 for details). We scored the number of bouts (clusters) of ‘boobook’ calls (given by both sexes) or ‘bray’ calls (given by females only).

Observation periods (25 August–15 January) covered the breeding seasons for 1996–1997, 1997–1998 and 1998–1999 when adults were selecting a nest site, or had eggs, nestlings or just-fledged young. Observations were made from sundown to 70 minutes after sundown, just before the birds left their day roost or nest.

Calling was observed in these time frames:

Male White: 10/10/96 – 15/1/97; 17/11/97 – 22/12/97; 8/9/98 – 8/12/98,

Male Green: 24/10/97 – 14/1/98; 25/8/98 – 12/10/98,

Female Green: 5/10/97 – 12/1/98; 30/8/98 – 15/1/99,

Female White: 2/12/98 – 7/1/99; 25/8/99 – 16/11/99.

We visited the area several nights per week and stood 10–30 metres from the nest or roost, then followed individuals after they left, as closely as possible without disturbing them. We recorded the owls’ location within each ten-minute interval, and scored any bouts of ‘boobook’ or ‘bray’ calling we heard. The owls had different nest sites each year, and in one year, 1997, the Green pair failed three times and used a different nest tree each time.

Each nest location was recorded on a map and the distances measured between the nest tree and each bout of ‘boobook’ or ‘bray’ calling. We marked each call location on a 1: 2,500 map and measured (retrospectively) the distance from the call location to the nest site chosen that season or part-season. For example, if we saw the pair first occupy a nest site on 15

September we measured the distances from call locations to that nest from 25 August to 15 September, and after that date. If the pair failed and occupied a second nest site on 15 October, we measured the distance from call locations to this second nest from 15 October to the date when the pair either failed again or had recently fledged young at this second nest site, and so on.

We also scored the frequency that males or females gave bouts of ‘Boobook’ calls greater than 100 metres from the nest, or that females gave ‘bray’ calls greater than 100 metres from the nest. A  $\chi^2$  analyses (Zar 1984) was used to statistically compare the frequency of owl call type (Bray versus Boobook) by distance from the nest (less than or greater than 100 m).

**RESULTS**

The number of observation nights and the number of nights we heard bouts of ‘boobook’ calls or ‘bray’ calls from each owl is shown in Table 1. All four owls tended to use ‘boobook’ calls away from the nest tree (Table 2). Females gave ‘Bray’ calls closer to the nest than either males or females gave ‘boobook’ calls (Table 3). Fewer bouts of ‘boobook’ calling were within 100 metres of the nest tree – Female White = 12 per cent, Female Green = 12 per cent, Male Green = 31 per cent, and Male White = 0 per cent (Table 4). Male White spent considerable time on his border with Male Green calling near Green’s three nest sites. Male Green nested close to this border with White and another male in 1997 so he gave ‘boobook’ calls closer to his nest tree than the other owls did during the study (see Olsen and Trost 1997, 2007). Owls used ‘bray’ calls more often within 100 metres of the nest tree – Female White = 70 per cent, Female Green = 88 per cent (Table 4). There was a significant difference in the frequency of calls between the two call types and calling distance ( $\chi^2 = 94.8$ ,  $df=1$ ,  $p<0.0001$ ) (Table 4). Bray calls were more commonly heard closer to the nest (<100m) whereas boobook calls were more likely to be heard further away from the nest (>100m).

**TABLE 1**

Total number of observation nights for each pair (White and Green) and the number of nights that we heard bouts of ‘boobook’ calls from two males (Male White and Male Green) and two females (Female White and Female Green), and ‘bray’ calls from the two females (Female White and Female Green). On some nights we heard more than one bout of calling from each owl.

Subject	Total Observation nights	Boobook Calls	Bray Calls
		Total nights calls heard	Total nights calls heard
Female White	155	26	39
Female Green	158	17	66
Male Green	158	36	–
Male White	155	15	–

**TABLE 2**

Median distance from the nest in metres that two male (Male Green, Male White) and two female (Female White, Female Green) Southern Boobooks called using ‘territorial boobook’ calls (n = number of bouts of calls recorded for that individual).

Subject	Year	n	Median	Range
Female White	1998-99	26	250 m	10 - 950 m
Female Green	1997-99	17	175 m	0 - 450 m
Male Green	1997-98	56	210 m	2 - 600 m
Male White	1996-98	15	525 m	200 - 1225 m

TABLE 3

Distance from the nest in metres, median and range, that two female Southern Boobooks (Female White, Female Green) called using bouts of bray calls (n = number of bouts recorded for that individual).

Subject	Year	n	Median	Range
Female White	1999	56	10 m	0 - 450 m
Female Green	1997-98	91	10 m	0 - 350 m

TABLE 4

Frequency of bouts of 'territorial boobook' and 'bray' calling by females (Female White, Female Green) and males (Male Green, Male White), greater than 100 metres versus less than 100 metres from the nest being used at that time.

Subject	Boobook Calls		Bray Calls	
	<100 m	>100 m	<100 m	>100 m
Female White	3	23	39	17
Female Green	2	15	80	11
Male Green	17	38	–	–
Male White	0	15	–	–

## DISCUSSION

Because Southern Boobooks in this study used 'boobook' calls away from the nest more often than close to the nest, 'boobook' calls were not reliable indicators of nest site locations, or effective tools for locating nests. 'Bray' calls were better indicators of nest site locations because females more often used this call near the nest. Females used 'bray' calls from well before eggs were laid through to the hatching of nestlings and after young fledged. Hollands (2008) noted that the 'bray' call equivalent in other *Ninox*, for example the 'bleating' calls made by female Rufous Owls *Ninox rufa*, and Powerful Owls *Ninox strenua*, are also used exclusively around the nest. Sometimes, early in the season, females 'bray' called at a nest hollow, occupied this hollow for a week or more, then switched to another nest hollow as far as 500 metres away, and continued to 'bray' call there (J. Olsen and S. Trost unpub. data). 'Mating squeals' (Olsen *et al.* 2002) also revealed nest locations but were heard less often and usually not after eggs were laid. The 'trilling' calls of nestlings inside a nest hollow revealed some nest locations, but these calls were difficult to hear and helpful only later in the nesting cycle. 'Contact boobook' calls are short, muffled calls given by the pair to each other, or sometimes to the young, and usually in short bouts of two or three calls (Olsen *et al.* 2002). These were not scored in this study but may also be useful for finding nests.

In summary, we found no evidence that male boobooks give 'boobook' calls from mainly near the nest tree. Female 'bray' calls were more useful for precisely locating boobook nests, and the equivalent calls in other *Ninox* species are probably the

most useful vocalisation for precisely locating nests. All published studies of marked and/or radio-tagged Australian owls tend to have small sample sizes, for example, the two pairs in this study, and the two pairs of Powerful Owls in the study of home range by Soderquist and Gibbons (2007). It remains to be seen whether these findings hold with a larger sample of owls.

## ACKNOWLEDGEMENTS

The authors wish to thank a number of people who assisted in the field including Greg Hayes, Dalice Trost, David Mallinson, and Frank and Tanya Barnes. Thanks also to the ACT Parks and Conservation especially Odile Arman, Steve Taylor, Christie Gould, Murray Evans, Brett McNamara, Monica Muranyi, Paul Higginbotham, Kate Boyd, Meg Doepel, Simon Tozer, and Darren Rosso for assistance in the field and access to ACT Nature Parks. Thanks also to Vic Hurley who generously supplied colour bands for the study, and to Terry Dennis, Jeff Jolly, Nick Mooney, David Bird and Les Boyd for helpful discussion, and two anonymous referees whose comments improved an earlier draft. This study was carried out with permission from the University of Canberra Animal Ethics Committee #97/5.

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