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DO SOUTHERN BOOBOOKS *NINOX NOVAESEELANDIAE* DUET?

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There is disagreement about whether Southern Boobooks *Ninox novaeseelandiae* duet. A recent review of the species concluded that duetting does occur, based on (i) observations of captives and (ii) two reports from wild birds, including one from New Zealand. We examined definitions of duetting, and attempted to collect evidence for it in the calling behaviour of three mated pairs on adjacent territories observed from October 1996 to October 1999. To identify callers, six adults were colour-marked, and four of the six were radio-tagged. Observations were made on 529 nights from just before the birds left their day roost each evening until one hour after. Of 255 bouts of calling in which Territorial Boobook and Por calls were used, 30 (11.8%) overlapped (owls called at the same time); two (6.7%) of 30 overlapping bouts were between mated pairs, but without the temporal precision or sequential ordering of elements normally found in duetting. The other 28 overlapping bouts (93.3%) were mostly between neighbouring males. We found no convincing evidence in the field, or in the literature, that Southern Boobooks duet. We comment on behaviours that some may interpret as duetting, and suggest caution when estimating, solely from vocalisations, the densities of territorial pairs and sizes of home ranges of *Ninox*.

INTRODUCTION

There is some confusion as to whether Southern Boobooks *Ninox novaeseelandiae* duet, defined here as a mated pair calling with bouts overlapping in a synchronised and co-ordinated fashion (see below for detail). Here we contrast duetting with 'duelling' defined as two unmated owls

from different territories, facing each other, up to 50 m apart and calling with Boobook or Por calls during overlapping bouts, but not in a co-ordinated or synchronised fashion.

Olsen (1997) claimed that captives duetted. Debus (1996, 1997) thought that wild pairs would duet in response to playback, sometimes emitting the mating squeal; he heard croaking duets and mating squeals through October. Where two birds were involved, hooting was call-and-answer in nature, with neighbours and/or mates giving call for call in long bouts. Olsen & Trost (1997) thought that some of the behaviours that observers interpreted as duetting between mated pairs might have been males 'duelling' with each other, probably over territorial boundaries. In a recent review of the literature on the Southern Boobook, Higgins (1999) concluded that duetting does occur, based on three pieces of evidence: (i) captive pairs duet, (ii) two birds, in the wild, apparently male and female, both giving Boobook calls, were collected together from the same tree by Whitlock (1923); and (iii) in New Zealand, birds close together sometimes seemed to duet rather than duel. None of these authors defined duetting, so none of these assertions has been checked.

Campbell & Lack (1985 p. 631) in their definition and description of duetting stated 'the complexity of song is increased by including contributions from two individuals, usually a mated pair. The songs produced are generally quite stereotyped and the two contributions so well coordinated that to the listener it seems to be produced by just one bird, …The precise timing of the different contributions to within hundredths of a second is a striking feature of duetting between mated pairs.' Marks *et al.* (1999 p. 109) said about duetting in the Spotted Eagle Owl *Bubo africanus* '… the two vocalisations sound like only one. Similarly, female Eurasian Scops-owls often duet so closely with their male partners that the monotonously repeated calls sound like a single, but two-part, call. The calls of two or more adjacent Scops-owls, while given at a very regular rate, are not synchronised with each other, and the pattern of calling thus differs from that of duetting mates.'

In an earlier definition, Farabaugh (1982, p. 87) first defined the term bout: 'Vocalisations, like other behaviours, are clumped rather than randomly distributed in time. These clumps are called bouts.' She described duetting as occurring when 'bouts of certain elements in the repertoire of one bird frequently overlap with bouts of certain elements in the repertoire of its mate. … Further, there is some organization of both participants' elements within the region of overlap. This view can be expressed in terms of three variables which can be measured for any species: one measure of bout overlap, ie., the percentage of bouts that overlap with bouts of the mate; and two measures of organization of male and female elements within overlapping bouts, ie., the precision of timing and the sequential ordering of elements. … The percentage of male bouts that overlap with female bouts, and vice versa, can be calculated for each type of bout (bouts of song, bout of each call type, etc.). If the percentage overlap is high, these overlapping bouts may be duets.'

According to Farabaugh there is 'temporal precision of timing' between male and female elements in an overlapping bout when the two calling birds sound like one synchronised two-part call, not like two birds calling in a non-synchronised way. If the calling sounds like two birds, the calling is less likely to be a duet. When elements in a bout are 'sequentially ordered', there is a clear, alternating, non-random pattern in the male and female contribution to the bout. Farabaugh gives the example of male and female elements ordered in the sequence fmfmfmfmfmfmfmfmfmf, as ordered sequentially and indicative of duetting, but male and female elements in the sequence mmmmmmmmmmfffffffffff, as not sequential and not indicative of duetting.

Our aims in this study were to: (1) provide an assessment of duetting in three wild mated pairs of Southern Boobooks by documenting the percentage of male bouts that overlapped with female bouts, and in these overlapping bouts, estimating the precision of timing, and the sequential ordering of elements; and (2) evaluate existing claims in the literature for duetting in this species.

METHODS

Trapping, banding, and radio-telemetry of the three adjacent territorial pairs is described by Olsen *et al.* (2002). From 3 October 1996 to 22 October 1999, we visited the area several nights per week at sundown and stood near the nest or roost of one of the three pairs with a torch, binoculars and notebook. Observations were made throughout the year from just before the birds left their day roost or nest, to one hour after. During the hour, we stood 10–30 m from roosts or nests, or followed individuals after they left the roost or nest as closely as possible without disturbing them (see Olsen *et al.* 2002).

Over 529 nights we counted the number of overlapping bouts of calls, and, where possible, identified the callers by triangulating the location of radio-tagged birds with a hand-held yagi-antenna and Telonics TR–4 receiver, and sighting colour-bands with torch and binoculars. We concentrated our observations on the vocalisations of the three pairs as described in Olsen *et al.* (2002).

On three occasions, we played recordings of Southern Boobook calls, or Powerful Owl *Ninox strenua* calls, near to three pairs prior to egg laying. We describe the pairs' responses, but these nights are not counted in the 529 observation nights. From field observations, we calculated the percentage of bout overlap of Boobook and Por calls in unmated neighbours (duels), in mated pairs (indicating possible duetting), and noted other behaviours that might be interpreted as duetting. Throughout this paper the term 'Territorial Boobook' refers to a call and not an owl, and the word 'Por' denotes another type of call. Vocalisations that 'we heard' refers to vocalisations from owls we observed and identified individually.

RESULTS

Territorial Boobook and Por Calls

Bouts of Territorial Boobook and Por calls occurred on about half (275) of the 529 observation nights. We were able to identify callers in 255 of the 275 bouts, and 188 (74%) were uttered by males and 67 (26%) by females. We could not always discriminate between male and female calls by ear and had to rely on radio-tags and colour-bands. The calls were not stereotyped: either sex gave the Boobook call, sometimes the Por call, and both sexes progressed from Por to Boobook or Boobook to Por calls, or low-pitched to high-pitched calls, in one bout.

Bouts of Territorial Boobook and Por calls were seasonal (Fig. 1). Bouts for both males and females were highest in spring and summer, though female calling was less frequent, especially in November during the incubation and nestling phases, and in autumn; females tended to call more often than males before egg-laying, and less often than males after egg-laying.

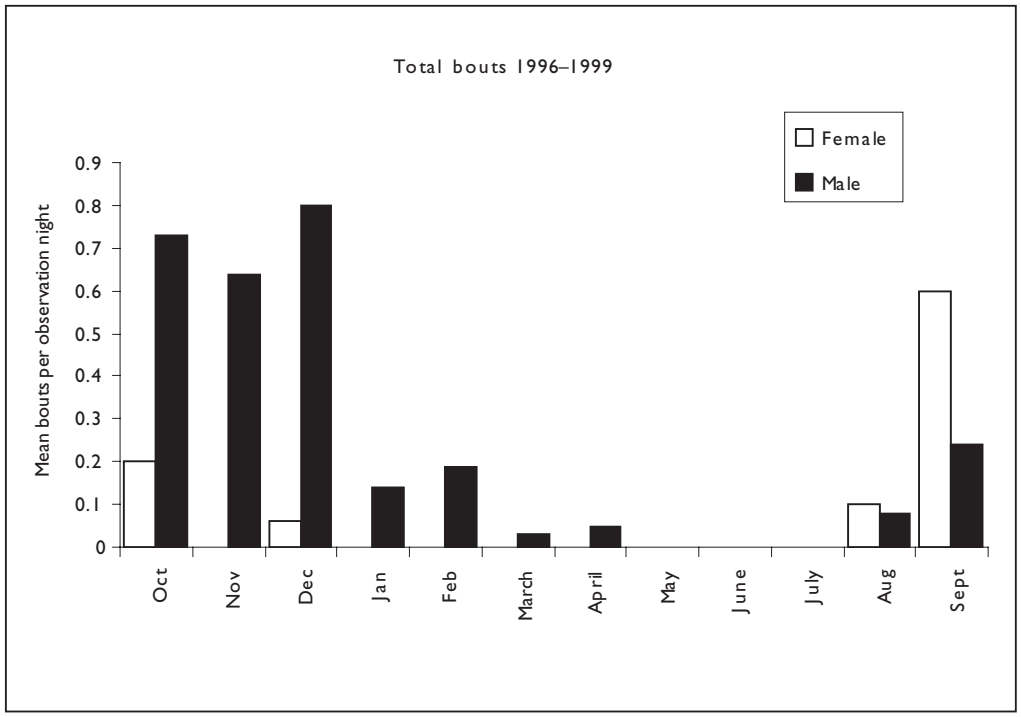

Fig. 1. Territorial Boobook calls identified as male or female (*n* = 255). Mean number of bouts per observation night by month.

Overlapping Bouts

Using Farabaugh's (1982) definition, we calculated percent of bout overlap between mated males and females. Only two of 255 bouts (0.8%) overlapped (Tables 1 & 2). The two overlapping bouts in mated pairs that we heard, one on 3 September 1998 (three disyllabic notes overlapped for nine seconds), and the second in a different pair on 31 August 1999 (three disyllabic notes overlapped for seven seconds), did not fit Farabaugh's definition of duetting. They were brief, and lacked discernible precision of timing or sequential ordering of elements; that is, both overlapping bouts sounded like two birds calling independently, not as one synchronised two-part call.

On several occasions we heard other overlapping (simultaneous) bouts:

Table 1. Percent of overlapping bouts (*n* = 30 of 255 bouts of Boobook or Por calls) that involved neighbours (duels), or mated pairs.

	Percent bouts overlapping between:	
	Neighbours (duels)	**Mated pairs**
Of 255 total bouts	11.0% (28/255)	0.8% (2/255)
Male/male	9.8% (25/255)	–
Female/female	0.4% (1/255)	–
Male/female	0.8% (2/255)	–
Of 30 overlapping bouts	93.3% (28/30)	6.7% (2/30)

Table 2. Percent of observation nights (n = 529 observation nights) when duels were heard between males, between females, or between males and females.

Duels heard:	Percent of observation nights
Between males	4.7% (25/529)
Between females	0.2% (1/529)
Between males & females	0.4% (2/529)
Total	5.3% (28/529)

Duelling

On 28 of 529 nights, we heard duelling bouts, mainly between neighbouring males (Table 2), but no more than one bout per night.

As duels and duetting are both forms of overlapped Boobook calls, we compared the percent bouts of duels (neighbours) with the percent bouts of overlapping calls between members of mated pairs (Table 1). Most overlapping bouts were between neighbouring males which lasted up to one hour on borders. In contrast, the two overlapping bouts between members of mated pairs lasted only a few seconds. At least 14 of 28 duels (50%) had three birds present, one to 50 m apart, but only two of the birds called using Boobook or Por calls.

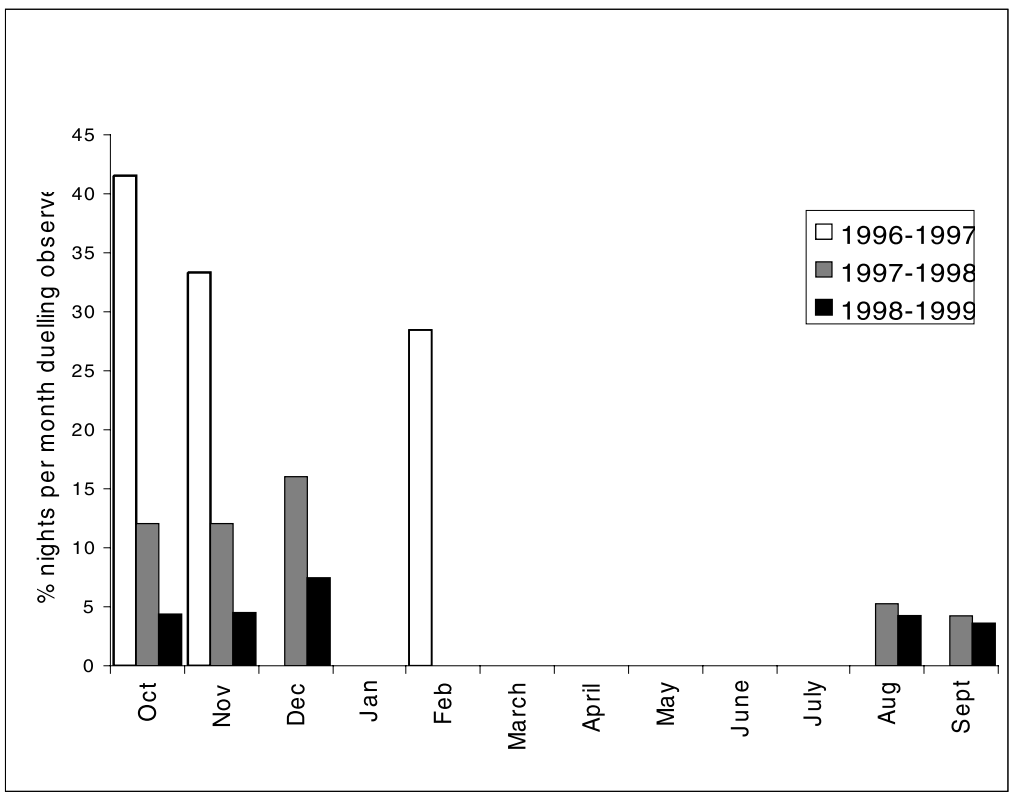

Fig. 2. Percent nights per month when duelling was observed in each of three years. Note: does not include one observation in October 1999.

Duelling was seasonal, beginning in late winter, and peaking when pairs had eggs and nestlings in October – December (Fig. 2). This differed slightly from the frequency of bouts of Territorial Boobook calls (Fig. 1). The frequency of duelling bouts changed between the three years of study, and increased duelling in the spring-summer of 1996–1997 reflected a territorial dispute between an incoming pair that had nested against the borders of two resident pairs (making three pairs in the area), until one of these original males disappeared at the end of December 1997 (see Olsen *et al.* 2002). We saw no duelling between the two original resident males. In August – October 1999 we moved to a nest that we had not studied during the pre-breeding stage and observed the female duelling with the neighbouring male twice, and her mate duelling with him once.

Alternating pitches in a bout

On one occasion (22 Sept 1997) a male in a tree alternated the pitch of his Boobook calls in a bout, low pitched, then high pitched, so he sounded like two birds calling from the same tree.

Playback

On the three occasions when we used playback near a pair before egg laying, the pairs gave simultaneous (overlapping) Boobook calls. Two males caught moths and tried to feed their mates. On one occasion, a male attempted to copulate with the female, and on another occasion the pair copulated and the female gave a Mating Squeal (Higgins 1999).

Simultaneous female Bray and male Boobook call

Males in this study gave Contact Boobook calls (see Olsen *et al.* 2002) when they delivered food to the female, and she sometimes gave simultaneous Bray calls; that is, the calls overlapped.

Mating

During copulation, males made a low croaking (Por call) and females simultaneously made a soft purr, similar to a quiet Bray call (see Olsen *et al.* 2002, Imboden 1975), then one of the pair gave the Mating Squeal.

DISCUSSION

During 529 observation nights over 37 months we twice observed some brief (seven and nine seconds) overlapping of Boobook and/or Por calls between mated pairs. In neither case did the overlapping calls sound coordinated with any precision, nor were they sequentially ordered. Nothing we heard, except perhaps mating, fitted the definitions of duetting given by Farabaugh (1982), Campbell & Lack (1985) or Marks *et al.* (1999).

Evidence for duetting in the literature

None of the studies that reported duetting in Southern Boobooks defined terms, referred to criteria, or provided evidence. The claim for duetting in Higgins (1999) was based on (i) observations of captives, (ii) a report by Whitlock in 1923, and (iii) an unsourced claim that Southern Boobooks in New Zealand appear to duet. Take these claims in turn:

(i) Captive males and females occasionally give Boobook and Por calls simultaneously (J. Olsen pers. obs.). Wild pairs in our study often separated during the night and called from different parts of their territory, even during the pre-egg laying phase. Members of captive pairs cannot separate, and they are often housed in cages next to other calling pairs, and within the territories of calling wild pairs, producing a confusing and artificial situation. Other repeated claims from observations on captive birds, for example that extra females help at the nest (Fleay 1968; Schodde & Mason 1980; Olsen 1994), have yet to be confirmed in the wild.

(ii) Whitlock (1923) did not report duetting. He reported two owls of undetermined species or sex using a call he did not identify; he did not mention synchronisation or co-ordination of these calls.

(iii) None of the five studies of radio-tagged or colour-marked Southern Boobooks (Imboden 1975; Olsen & Bartos 1997; Olsen & Trost 1997; Stephenson 1999; this study), including two in New Zealand, have confirmed duetting with Boobook calls.

Even if the three pieces of evidence presented by Higgins (1999) are valid, two Southern Boobooks giving Boobook or Por calls in overlapping bouts are not necessarily duetting as defined by Farabaugh (1982), Campbell & Lack (1985), or Marks *et al.* (1999). Mated pairs of many other birds vocalise simultaneously but they are not necessarily duetting. For example, both sexes in mated pairs of Spotted Owls *Strix occidentalis* sing giving hooting calls, sometimes simultaneously (Gutiérrez *et al.* 1995), but this is not considered as duetting because their calling does not fit accepted definitions.

Other calling with overlapping (simultaneous) bouts

Duelling

Duelling may be the behaviour most often misidentified as duetting. On a number of nights we observed males duelling with neighbouring males (Table 2), while their mates sat nearby and did not respond. Stephenson (1998) described similar behaviour in Southern Boobooks in New Zealand. The assumption that two owls heard calling in a survey are duetting from inside a territory instead of duelling on their common border may affect an estimate of the breeding pairs in an area. In a survey of Powerful Owls in the ACT, Olsen & Rehwinkel (1995) identified clusters of vocalisations on a map which could be interpreted as pairs on territories. They cautioned that these clusters of vocalisations could be owls from different territories calling on territorial borders, as Southern Boobooks did in this study. Counting such clusters as owls calling from territory centres could over-estimate the density of pairs, and under-estimate their home range sizes, particularly since owls may call from one border then move and call from another.

Response to playback

Three mated pairs responded to recorded playback by calling simultaneously, but the calling was not synchronised, and the pairs were duelling with the recorded voice of an owl they could not identify. This may be particularly threatening to males just before egg laying. We believe these pairs were reacting to an unusual event: an owl, unknown to them, calling near their proposed nest. Individuals of the pair, whether they were together or not, would respond with alarm and confusion to such a threat, often by calling. We saw no similar behaviour during the 37 months

of this study, or during a previous study (Olsen & Trost 1997). The circumstances were contrived, and the behaviour of birds towards playback may not reflect frequent behaviour in normal circumstances.

Simultaneous female Bray and male Boobook call

Olsen & Trost (1997) suggested that this simultaneous calling may be what some authors termed duetting. Most female birds food-beg when males feed them, and Southern Boobook males gave a Contact Boobook call when they arrived at the nest with prey (Olsen *et al.* 2002). This does not fit the definitions of duetting quoted earlier.

Mating

The mating calls made by males and females were simultaneous and we heard these particular calls in no other context. Moreover, many bird species vocalise during copulation and this generally is not considered duetting.

Farabaugh (1982) described three characteristics more common among duetting than non-duetting species: (i) occurrence in the tropics; (ii) year-round territoriality; and (iii) prolonged monogamous bonds. These characteristics did not fit pairs in our study, where: (i) nests were in temperate woodland; (ii) after her young fledged in 1999 and 2000, one female left the breeding territory for a non-breeding home range in a suburban street 7 km from her nest, then returned for the next breeding season; and (iii) during 1993–1999 one female switched mates, and four males obtained new mates (three females disappeared).

Conclusion

We failed to find conclusive evidence that Southern Boobooks duet, as defined by Farabaugh (1982), Campbell & Lack (1985) or Marks *et al.* (1999). We do not believe that duetting with Boobook or Por calls is a normal part of the annual breeding sequence of Southern Boobooks. Verification of duetting is best done in the wild, without artificial means, such as recorded playback, that may modify natural behaviours.

Given our current knowledge of the species, we do not believe that observers can reliably sex callers without sighting colour-bands, nor can they assume that pairs of calling owls in surveys are mated pairs calling from territory centres. They may be neighbours or mated pairs calling at borders.

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REFERENCES

Campbell, B. & Lack, E. (eds.) 1985. *A Dictionary of Birds*. Calton, England: T. & A.D. Poyser.

Debus, S. 1996. Mating behaviour of the Southern Boobook *Ninox novaeseelandiae*. *Aust. Bird Watcher* **16**: 300–301.

Debus, S. 1997. Vocal behaviour of the Southern Boobook *Ninox novaeseelandiae* and other nocturnal birds. In Czechura, G. & Debus, S. (eds.) *Australian Raptor Studies II*. Birds Australia Monograph **3**: 71–85. Melbourne: Birds Australia.

Farabaugh, S.M. 1982. The ecological and social significance of duetting. In Kroodsma, D.E., Miller, E.H. & Ouellet, H. (eds.) *Acoustic Communication in Birds*: 85 – 123. NY: Academic Press.

Fleay, D. 1968. *Nightwatchmen of Bush and Plain*. Milton, Qld.: Jacaranda.

Gutierrez, R.J., Franklin, A. B. & LaHaye, W. S. 1995. In Poole, A. & Gill, F. (eds.) *The Birds of North America*, No.179. The Academy of Natural Sciences, Philadelphia, and the A.O.U., Washington D.C.

Higgins, P.J. (ed.) 1999. *Handbook of Australian, New Zealand & Antarctic Birds. Vol. 4, Parrots to Dollarbird*. Melbourne: Oxford University Press.

Imboden, C. 1975. A brief radio-telemetry study on moreporks. *Notornis* **22**: 221–230.

Karl, B.J. & Clout, N. 1987. An improved radio transmitter harness with a weak link to prevent snagging. *J. Field Orn.* **58:** 73–77.

Marks, J.S., Cannings, R.J. & Mikkola, H. 1999 Family Strigidae (Typical Owls) – Voice. *In* del Hoyo, J., Elliott, A. & Sargatal, L. (eds.). *Handbook of Birds of the World. Vol.5, Barn owls to Hummingbirds*: 107–110. Barcelona: Lynx Edicions.

Olsen, J. & Woollard, P. 1975. The use of the bal-cha-tri in banding. *Canberra Bird Notes*. **3:** 8–9.

Olsen, J. & Rehwinkel, R. 1995. Peregrines and Powerful Owls in Namadgi and Tidbinbilla: A report for the National Estates Grants Programme. Unpublished report, Environment ACT.

Olsen, J. & Trost, S. 1997. Territorial and nesting behavior in Southern Boobook *Ninox novaeseelandiae*. In Duncan, J.R., Johnson, D.H. & Nicholls, T.H. (eds.) *Biology and Conservation of Owls of the Northern Hemisphere. Second International Symposium*: 308–313 General Technical Report NC – 190: 308–313. St. Paul MN: USDA Forest Service.

Olsen, J., Trost, S., & Hayes, G. 2002. Vocalisations used by Southern Boobooks (*Ninox novaeseelandiae*) in the Australian Capital Territory. This volume.

Olsen, P. 1994. Southern Boobook. *In* Strahan, R. (ed.) *Cuckoos, Nightbirds & Kingfishers of Australia*: 79. Pymble, N.S.W.: Angus & Robertson.

Olsen, P. 1997. Egg weight loss during incubation, and growth and development of captive-bred Southern Boobooks *Ninox novaeseelandiae*. In Czechura, G. & Debus, S. (eds.) *Australian Raptor Studies II*. Monograph **3**: 92–97. Melbourne: Birds Australia.

Olsen, P. & Bartos, R. 1997. Home range of the Southern Boobook *Ninox novaeseelandiae* near Canberra ACT. In Czechura, G. & Debus, S. (eds.) *Australian Raptor Studies II*. Monograph **3**: 86–91. Melbourne: Birds Australia.

Schodde, R. and Mason, I. 1980. *Nocturnal Birds of Australia*. Melbourne, Aust.: Lansdowne.

Stephenson, B.M. 1998. The ecology and breeding biology of morepork, *Ninox novaeseelandiae*, and the risk from secondary poisoning, in New Zealand. Unpublished M.S. thesis. Palmerston North, N.Z.: Massey University.

Whitlock, F.L. 1923. A trip to the Fortescue River and Hamersley Ranges, North-West Australia. *Emu* **22**: 259 – 273.