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A COMPARISON OF TWO CENSUS METHODS FOR BIRDS IN A SOUTH-WESTERN AUSTRALIAN HEATHLAND

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An instantaneous point method (Pyke 1983) and mist-netting were used to census birds simultaneously on 19 field trips over three years in dense heathland at one site on the south coast of Western Australia. Of the 29 bird species recorded, eight were never netted and six were never sighted. Mist-netting appears to over-represent small species and visual censuses over-estimate larger species.

INTRODUCTION

Monitoring bird communities has been notoriously difficult due, in part, to the different techniques used, to different observers and to the effect on the birds of either the observer or technique used, or both (Ralph and Scott 1981; Pyke and Recher 1984; Recher 1988; Remsen and Good 1996; Mac Nally 1997). The mobility of birds adds a further complication, as it is difficult to avoid recording the same bird more than once. Six techniques are commonly used to census birds, namely: point counts, area counts, transect counts, mapping counts, presence-absence counts and mist-net counts (Pyke and Recher 1984; Recher 1988). During a faunal study in a heathland in south-western Australia (Saffer 1998), the opportunity presented itself to compare two techniques to assess the diversity and relative abundances of birds: an instantaneous point count and mist-net captures. The instantaneous point count was used as the dense vegetation made it difficult to move through unimpeded (Pyke 1983) and territory mapping techniques (Bibby *et al.* 1992) are confounded by the high turnover in heathland bird assemblages (Wooller 1981). Mist-net captures were used as an adjunct to the point count method to help interpret seasonal variation in the composition and morphometrics of the birds.

Ford and Paton (1982) suggested that visual point census techniques of birds tended to over-estimate larger species whereas mist-net captures tended to over-estimate smaller species. This paper compares the results of the two census methods used to estimate the diversity and relative abundances of birds in a heathland in the south of Western Australia and seeks to explore if there is some substance to the suggestion of Ford and Paton (1982).

METHODS

The work was conducted at the western end of the Fitzgerald River National Park (34°12', 119°22') on the south coast of Western Australia in a belt of vegetation, 200 metres wide and greater than 400 metres long, bounded on the west and east by parallel firebreaks. The vegetation consisted of 1 metre tall dense kwongan heathland (Beard and Pate 1984) with clumps of shrubs and mallee up to 3.5 metres. Census sessions were conducted on 19 field trips between July 1994 and March 1997, usually about two months apart, and in all except two months of the year. On each occasion, birds were censused using instantaneous point counts (after Pyke 1983) and were caught using mist-nets over several consecutive days.

Instantaneous point counts were conducted in the vegetation between the two firebreaks. Four census points were selected at random, one within each 100 metre section of the 400 metres long vegetation belt, and these were used on each of two mornings during each session. On the two mornings of each session when censuses were conducted, the four sequential counts were started at different ends of the belt. At each point, a circle with a radius of 20 metres was identified using marker stakes. The density of the vegetation hampered visibility. Therefore, each census was conducted atop a 2.5 metre high aluminium ladder painted green (see Pyke 1983). Once in position on the ladder, two minutes were allowed for birds to settle, then half the circle was scanned every minute for ten minutes facing due east; the procedure was then repeated facing due west. All birds sighted with both the naked eye and binoculars were recorded using a hand-held tape recorder, and every attempt was made not to record the same individual twice. As visibility was compromised by the density of the vegetation and as distances based on auditory cues could not be estimated accurately, only visual sightings were used (see also Pyke and Recher 1984). All observations were made by the author, who was familiar with all the species encountered.

During each session, six 12 metre long mist-nets, each 2.5 metres high, were placed in a line at the same positions along each of the two, parallel firebreaks. The nets were opened about 15 minutes before sunrise and closed three hours later, on each of the three consecutive mornings after which time birds appear to learn to avoid mist-nets (Wooller 1986). Birds retrieved from the mist-nets were held in individual calico bags until they were processed. All birds were banded and were weighed to ± 0.1 grams with a spring balance before being released near their point of capture.

RESULTS

Over the three years, a total of 29 species of birds was recorded using the two techniques (Table 1). Of these, six species (21%) were netted, but never sighted: five of these weighed less than 50 grams. Eight species (28%) sighted were never netted: six of these weighed over 50 grams.

The smaller species (less than 50 grams) were caught in the nets on 91 per cent of the 123 occasions on which they were recorded (see Table 1), but observed by visual census on only 54 per cent of these times. In contrast, larger species were detected by visual census in 86 per cent of the 63 occasions in which they were recorded, but caught in nets only 33 per cent of these times.

DISCUSSION

Census procedures of community composition and diversity of birds have frequently been assessed (Recher *et al.* 1983; Recher 1988; Remsen and Good 1996; Nicols

TABLE 1

Birds recorded in heathland using two census methods. Species are ranked in approximately decreasing order of weight. Of the 19 field trips on which point census and mist-netting were done, the total number of field trips in which the species were recorded using either method is given, together with the number of field trips in which the species were recorded for each method separately. The number of birds recorded for each species using each method are given in parentheses. The numbers of occasions and captures are sub-totalled for species weighing more and less than 50 grams.

Species	Weight (grams)	Total number of field trips in which species were recorded	Number of field trips in which species were recorded (total captures) Visually	In nets
Australian Raven *Corvus coronoides*	675	4	4(8)	—
Australian Magpie *Gymnorhina tibicen*	314	3	2(3)	1(1)
Grey Currawong *Strepera versicolor*	300	4	2(2)	2(2)
Brush Bronzewing *Phaps elegans*	200	1	1(1)	—
Red-capped Parrot *Purpureicephalus spurius*	128	6	6(9)	—
Australian Ringneck *Barnardius zonarius*	118	12	12(32)	2(2)
Red Wattlebird *Anthochaera carunculata*	103	4	3(8)	4(4)
Black-faced Cuckoo-shrike *Coracina novaehollandiae*	93	2	2(2)	—
Grey Butcherbird *Cracticus torquatus*	86	4	2(2)	2(3)
Western Rosella *Platycercus icterotis*	63	2	2(5)	—
Western Whipbird *Psophodes nigrogularis*	62	1	1(1)	—
Grey Shrike-thrush *Colluricincla harmonica*	59	1	—	1(2)
Little Wattlebird *Anthochaera chrysoptera*	57	19	17(180)	9(18)
Total number of occasions and captures		63	54(90)	21(32)
Rufous Whistler *Pachycephala rufiventris*	27	1	—	1(1)
Golden Whistler *Pachycephala pectoralis*	23	2	—	2(4)
New Holland Honeyeater *Phylidonyris novaehollandiae*	20	19	19(338)	17(627)
White-cheeked Honeyeater *Phylidonyris nigra*	18	19	19(921)	19(395)
Purple-gaped Honeyeater *Lichenostomus cratitius*	18	5	1(1)	4(5)
Tawny-crowned Honeyeater *Phylidonyris melanops*	16	15	8(53)	14(61)
Welcome Swallow *Hirundo neoxena*	15	1	1(1)	—
Red-eared Firetail *Stagonopleura oculata*	13	6	—	6(15)
White-browed Scrubwren *Sericornis frontalis*	11	9	1(1)	8(12)
Brown Honeyeater *Lichmera indistincta*	10	11	4(4)	10(20)
Striated Pardalote *Pardalotus striatus*	10	3	—	3(3)
Silvereye *Zosterops lateralis*	9	6	2(4)	5(10)
Western Spinebill *Acanthorhynchus superciliosus*	9	15	9(28)	15(55)
Spotted Pardalote *Pardalotus punctatus*	8	4	—	4(6)
Inland Thornbill *Acanthiza apicalis*	7	5	1(2)	4(9)
Southern Emu-wren *Stipiturus malachurus*	6	2	2(5)	—
Total number of occasions and captures		123	67(1 358)	112(1 223)

et al. 2000) and compared in terms of techniques used (Pyke and Recher 1984; Shields and Recher 1984; Bell and Ferrier 1985) and in different habitats (Keast 1984; Recher 1988). Most critiques conclude that no one method of censusing is entirely appropriate to all species and that combinations of different methods are required for accurate estimates (Bell and Ferrier 1985; Nicols *et al.* 2000).

In this study, the species recorded visually on the greatest number of field trips were also those which were captured on the greatest number of field trips and in the largest numbers. For instance, New Holland *Honeyeaters Phylidonyris novaehollandiae* and White-cheeked Honeyeaters *P. nigra* were recorded on almost all field trips and in by far the greatest numbers. However, New Holland Honeyeaters were netted almost twice as often as they were counted in visual censuses, whereas for White-cheeked Honeyeaters the reverse was true. Presumably this difference reflects the habits of these birds that make them more readily caught or seen.

The results presented in this paper suggest that using only one technique may well yield a skewed representation of the avian assemblage that was present at the time. Without further work it is not possible to judge which of the two techniques more accurately estimates relative or absolute density. The two techniques used in conjunction are likely to provide a more complete picture of the avian assemblage present than either one used alone. Nonetheless, there is some support for the initial proposition of Ford and Paton (1982) that smaller species may be over-represented in mist-net captures, whereas larger birds are over-represented by visual census techniques.

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