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IMPORTANCE OF YELLOW BOX-BLAKELY'S RED GUM WOODLAND REMNANTS IN MAINTAINING BIRD SPECIES DIVERSITY: INFERENCES FROM SEASONAL DATA

KENNETH B. H. ER[1,2] and CHRISTOPHER R. TIDEMANN[1]

[1]Department of Forestry, School of Resource and Environmental Management, Australian National University, Canberra, Australian Capital Territory 0200

[2]Present address: 65 Mimosa Crescent, #08–43 Mimosa Park, Singapore 808036, Singapore

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Bird species richness and abundance were recorded along 28 fixed-width strip transects located within 10 study sites dominated by Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *E. blakelyi*. This was conducted across four seasons in 1994. This paper reports the seasonal variation in bird species composition and abundance observed in these study sites. The results suggest that Yellow Box–Blakely's Red Gum woodland remnants serve as (1) important bird refuges within the landscape matrix in the lowland of the Australian Capital Territory; (2) wintering sites critical to partial migrants and some resident species; (3) breeding sites for both residents and summer migrants; and (4) refuges for nomadic species during periods of extreme drought. In addition, they demonstrated that birds respond differently to their habitats at different times of the year and the importance of basing management decisions upon information from more than one season.

INTRODUCTION

Nix (1976) predicted that bird breeding activity in the lowland of the Australian Capital Territory (ACT) would be lowest in winter and highest in late spring/early summer (although this may extend through summer and into early autumn during favourable years), coinciding with the period most favourable for plant growth. Migrant activity was also predicted to peak in early autumn, decline in winter and increase again in mid-spring. These predictions are consistent with the observations documented by Frith (1969) and Taylor and COG (1992) for the ACT in general; Bell (1980) and Hermes (1981) in the lowland dry sclerophyll forest; Lamm and Calaby (1950) and Purchase (1985) along the Murrumbidgee River; and Lamm and Wilson (1966) and Tidemann *et al.* (1988) in the Brindabella Ranges. Based on these studies, it is now well established that low autumn temperatures in the Brindabella Ranges (south-west of the lowland of the ACT) serve as a driving stimulus for altitudinal as well as north-south and east-west migration of several bird species, resulting in a temporary influx of bird species into the lowland of the ACT *en route* to their wintering grounds. The return of warmer temperatures in spring triggers an increase in photosynthetic rates and consequently an increase in food abundance. An influx of summer migrants follows. Despite this wealth of knowledge pertaining to bird movements in the ACT, seasonal variation of bird species composition and abundance within the lowland Yellow Box–Blakely's Red Gum *Eucalyptus melliodora–E. blakelyi* woodland has not been reported.

The Yellow Box-Blakely's Red Gum woodland was once well-distributed across the lowland of the ACT (Pryor 1954). Agricultural activities, plantation forestry and urbanization has resulted in the clearing and fragmentation of this woodland. While some remnants are found in nature reserves, the majority persist on lease-hold property where grazing is still prevalent (Frawley 1991). The management of these remnants for the provision of wildlife habitats requires an understanding of their importance to native wildlife.

This paper aims to provide an understanding of the seasonal changes in bird species composition and abundance in the lowland Yellow Box–Blakely's Red Gum woodland remnants. The importance of these remnants in maintaining bird species diversity is then inferred. The study also serves as the first important step towards the development of a management strategy for wildlife conservation in the Yellow Box–Blakely's Red Gum woodland remnants in the ACT.

STUDY AREA AND METHODS

Located in the lowland of the ACT, the study area extended from Tharwa in the south (35°30'43"S, 149°13'57"E), across the city of Canberra (35°16'46"S, 149°07'39"E), north to the New South Wales (NSW)–ACT border, near Hall (35°10'17"S, 149°04'08"E) (Fig. 1). The study area has a temperate climate with monthly mean temperatures ranging from 11.2°C to 27.7°C in summer and –0.2°C to 12.7°C in winter. The mean annual rainfall is 632.8 mm and is not strongly seasonal. The study area is dominated by Yellow Box–Blakely's Red Gum woodland on the more fertile lower slopes at altitudes below 750 m, extending into the fringes of the Canberra plains which is dominated by the Kangaroo Grass–Spear Grass *Themeda triandra–Stipa bigeniculata* grassland. At altitudes above 750 m, the Yellow Box–Blakely's Red Gum woodland is replaced by the Scribbly Gum–Red Stringybark *E. rossii–E. macrorhyncha* dry sclerophyll forest (Banks and Paton 1993).

Within the study area, 43 Yellow Box–Blakely's Red Gum woodland remnants and a Yellow Box arboretum were identified, of which ten were randomly selected as study sites (Er 1995). The study sites ranged from 2 ha to 600 ha in area and were evenly distributed across the study area (Fig. 1).

Differences in tree species composition and relative abundance can be seen across the study sites, although Yellow Box and Blakely's Red Gum featured prominently. Associated tree species, if present, usually included Apple Box *E. bridgesiana,* Scribbly Gum, Red Stringybark and Brittle Gum *E. mannifera.* Exotic tree species, such as the White Poplar *Populus alba* and Velvet Ash *Fraxinus velutina,* are occasionally to be found. Several acacias, such as the Silver Wattle *Acacia dealbata,* Late Black Wattle *A. mearnsii* and Early Black Wattle *Acacia decurrens,* may also dominate the canopy. The understorey is often modified by livestock grazing and consists mainly of Spear Grass, Wallaby Grass *Danthonia* spp., and Red Grass *Bothriochloa macra*; exotic grass and herbaceous species, such as Phalaris *Phalaris tuberosa* and Dandelion *Taraxacum officinale.* Eucalypt regrowth, acacias and exotic shrubs, such as Blackberry *Rubus fruticosa* and Sweetbriar *Rosa rubiginosa,* can be found interspersed between patches of native Kangaroo Grass, only where livestock grazing has been excluded.

Fixed-width strip transects were systematically located at a minimum distance of 500 m from one another in each of the study sites. The number of strip transects ranged from one in sites less than 30 ha to six in those greater than 180 ha (Table 1). A total of 28 strip transects were set up. The strip transects were 200 m in length and 60 m in width (Er *et al.* 1995). They were set up in the field with a 50 m tape and a prismatic compass. Boundaries of the transects were marked on trees along the edge of the transects approximately at 50 m intervals by red flagging tape. Where trees were absent or scarce, survey pegs with red flagging tape were used as markers.

A single observer traversed the centre line of each strip transect at a steady rate of 50 m per 10 min, checking the time at 50 m intervals to achieve uniform speed. Bird species and numbers within the transect strip were recorded only when birds were seen. This excluded birds flying overhead, except those which were foraging or hunting in the air space within the strip. Bird calls were used only as an aid to the location and identification of birds. Further details of the methodology are described in Er *et al.* (1995).

The study was conducted from March 1994 to December 1994 inclusive. Each study site was sampled four times, once during autumn (March to May), winter (June to August), spring (September to November) and summer (December). The between-day effect was minimized by randomising the order in which the study sites, the strip transects within each study site, were sampled. Furthermore, sampling was confined to the period between 0700 to 0900 hours on each day (Keast 1984; Blake *et al.* 1991) and days without rain or strong wind (Robbins 1981).

To analyse seasonal changes in bird species composition in the remnants, the number of bird species detected in all 28 strip transects within the study sites was pooled for each season, autumn (March–May), winter (June–August), spring (September–November) and summer (December). Bird species observed were further classified into residents and migrants, the latter being further classified as partial and total migrants. A resident is defined as one which resides permanently at a given location in the ACT all year round; a partial migrant is one where part of its population migrate to and from the ACT (i.e. resident/migrant); and a total migrant is one where the entire population migrates to and from the ACT (i.e. true altitudinal, winter and summer migrants). All classifications of migratory status follow after Taylor and COG (1992). The number of species observed for each category in all 28 strip transects within the study sites was similarly pooled for each season.

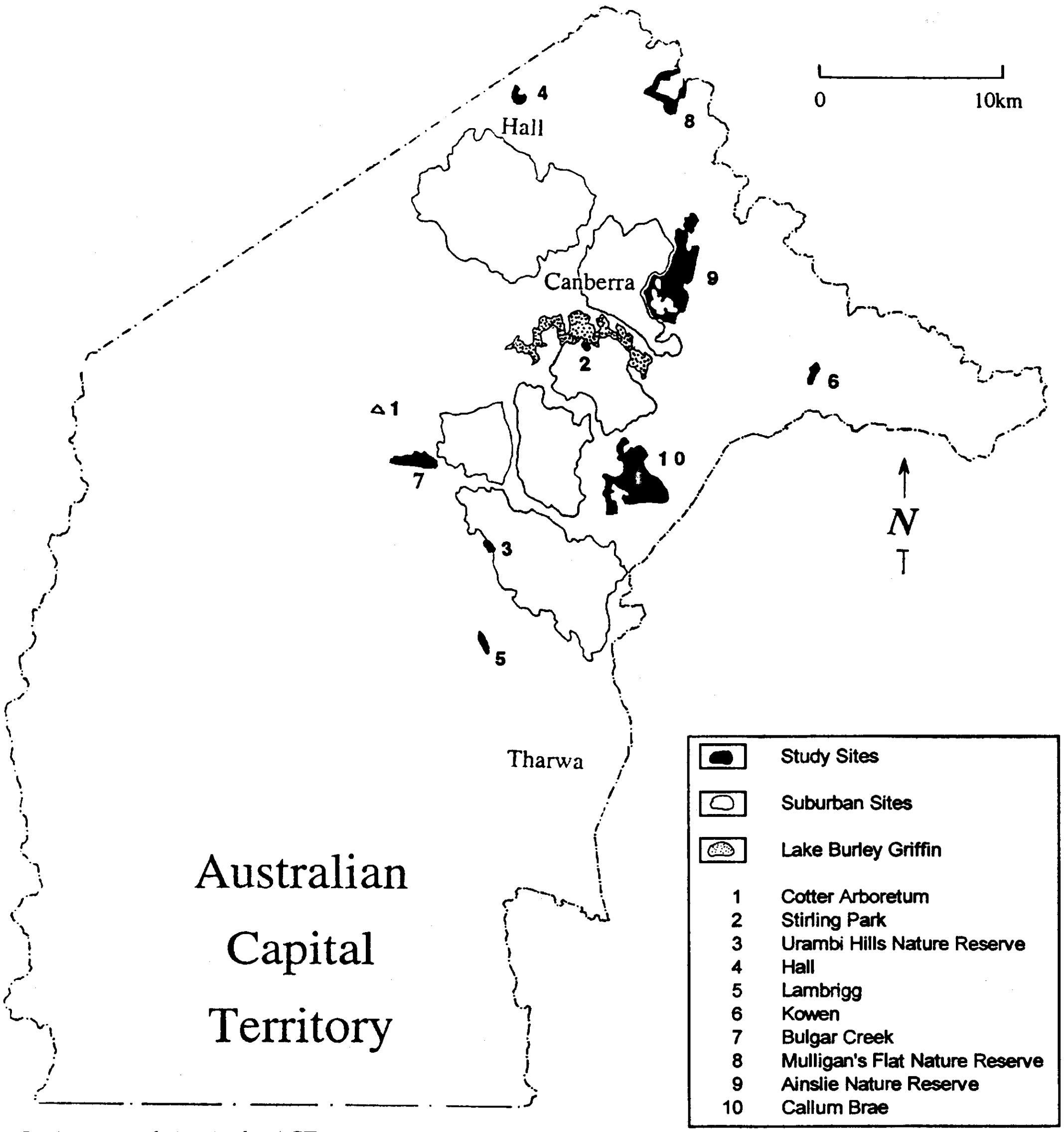

Figure 1. *Study area and sites in the ACT.*

To quantify seasonal changes in bird abundance, bird population density of each study site for each season was calculated using the following formula:

$$\text{Bird Population Density (birds ha}^{-1}) = \frac{\text{TIB}}{1.2 \times \text{N}}$$

where TIB is the total number of individual birds recorded within strip transects in a particular study site, 1.2 is the area of each strip transect in ha and N is the total number of strip transects within the study site.

A mean bird population density across all 10 study sites was then derived for each season as shown below:

$$\text{Mean Bird Population Density (birds ha}^{-1}) = \frac{\sum_{i=1}^{n} B_i}{10}$$

where Bi is the bird population density for each study site and 10 is the total number of study sites.

TABLE 1

Distribution of the number of strip transects across all study sites.

Study Sites	Area Class	No. of transects
Cotter	0–30 ha	1
Stirling	0–30 ha	1
Urambi	0–30 ha	1
Hall	30–60 ha	2
Lambrigg	30–60 ha	2
Kowen	30–60 ha	2
Bulgar	60–120 ha	3
Mulligan	120–180 ha	4
Ainslie	>180 ha	6
Callum	>180 ha	6

Seasonal trends of overall bird species number, bird species number in the resident-migrant categories, and mean bird population density were then graphed. Attempts were made to identify species or groups of species contributing most to the changes in these variables.

RESULTS

Overview of bird species composition

A total of 94 bird species was detected during the study, from March 1994 to December 1994. Of the 94 species, 53.2 per cent were residents, 42.5 per cent were migrants and the remaining 4.3 per cent were nomadic, namely the Brown Quail *Coturnix ypsilophora,* Little Lorikeet *Glossopsitta pusilla,* Red-capped Robin *Petroica goodenovii* and the Masked Woodswallow *Artamus personatus* (Table 2) (see Appendix 1 for list of species observed).

Seasonal variation in bird species composition

The number of bird species increased from autumn (50) to winter (57) and peaked in spring (75) before declining in summer (68) (Table 2).

A comparison of the bird species in autumn and winter revealed that the number of resident and migrant species remained relatively stable between the two seasons (Table 2). Further analysis showed that most of the migrant bird species present in autumn and winter were partial migrants (about two-thirds of all migrant species observed were partial migrants in autumn and winter), e.g. the Silvereye *Zosterops lateralis,* the Yellow-faced Honeyeater *Lichenostomus chrysops* and the White-eared Honeyeater *Lichenostomus leucotis* (Table 2).

Interestingly, the number of total migrant also remained relatively unchanged from autumn to winter (six total migrant species were recorded in winter, compared to five in autumn) (Table 2). This was despite the departure of several summer migrant species from the' lowland woodlands in early autumn, e.g. the Red Wattlebird *Anthochaera carunculata,* Black-faced Cuckoo-shrike *Coracina novaehollandiae,* White-throated Gerygone *Gerygone olivacea* and Rufous Whistler *Pachycephala rufiventris* were recorded in early March, but not in winter (Table 2). Maintenance of a high number of total migrant species in winter was found to be the result of (1) the return of winter migrants, e.g. the Golden Whistler *Pachycephala pectoralis* replaced the Rufous Whistler in winter; (2) overwintering of some total migrant species in the lowland woodland

TABLE 2

Total number, percentage and mean bird density of resident, migrant and nomadic bird species observed in each season.

	Resident spp.	Migrant spp.: Partial migrant spp.	Migrant spp.: Total migrant spp.	Nomadic spp.	Total	Mean bird density (birds ha^{-1} ± 95% confidence interval)
Autumn (Mar.–May)	35 (70%)	10 (20%)	5 (10%)	0 (0%)	50	20.5 ± 4.7
Winter (June–Aug.)	37 (64.9%)	12 (21.1%)	6 (10.5%)	2 (3.5%)	57	24.8 ± 3.6
Spring (Sept.–Nov.)	41 (54.7%)	15 (20%)	17 (22.7%)	2 (2.7%)	75	25.1 ± 4.4
Summer (Dec.)	36 (52.9%)	11 (16.2%)	20 (29.4%)	1 (1.5%)	68	21.0 ± 5.8
Across all four seasons	50 (53.2%)	16 (17%)	24 (25.5%)	4 (4.3%)	94	22.8 ± 2.4

remnants, e.g. the White-naped Honeyeater *Melithreptus lunatus* was still recorded in winter despite being noted to complete its migration out of the ACT in autumn (Taylor and COG 1992); (3) delayed departure of some altitudinal migrants from the Brindabella Ranges so that they were only conspicuous and recorded in winter and not autumn, e.g. the Striated Pardalote *Pardalotus striatus,* Fuscous Honeyeater *Lichenostomus fuscus* and Gang-gang Cockatoo *Callocephalon fimbriatum* were not recorded until the early months of June; (4) early return of summer migrants and hence, a gain of species in winter, e.g. the Grey Fantail *Rhipidura fuliginosa* and Tree Martin *Hirundo nigricans* were found in increasing numbers by August.

The above-mentioned factors, coupled with the record of two nomadic species, the Red-capped Robin and the Little Lorikeet, contributed to the higher number of bird species found in winter, compared to autumn (Table 2).

Return of warmer temperatures and the new flushes of plant growth in spring coincided with the return of summer migrant species to the lowland woodland remnants, e.g. the Noisy Friarbird *Philemon corniculatus,* Dusky Woodswallow *Artamus cyanopterus,* Rufous Whistler, Western *Gerygone fusca* and White-throated Gerygones. The number of total migrants in spring was greater than in winter and also made up a greater percentage of the total number of bird species (22.7% in spring, as compared to 10.5% in winter) (Table 2). This, coupled with the occurrence of two other nomadic species previously unrecorded in winter (the Brown Quail and Masked Woodswallow), resulted in the overall increase in bird species number from winter to spring (Table 2).

The observed decrease in bird species in summer was due to the absence of several resident and partial migrant species (Table 2). Notable bird species recorded in spring, but not in summer, included the Scarlet Robin *Petroica multicolor,* Spotted Pardalote *Pardalotus punctatus* and four raptors, the Nankeen Kestrel *Falco cenchroides,* Whistling Kite *Haliastur sphenurus,* Wedge-tailed Eagle *Aquila audax* and Brown Goshawk *Accipiter fasciatus.* Absence of these species was likely to be a result of their inconspicuousness during nesting in December (Taylor and COG 1992).

Seasonal variation in bird density

Overall mean bird density across all four seasons was 22.8 ± 2.4 (95% conf. int.) birds ha^{-1}, with autumn having the lowest bird density (20.5 ± 4.7 birds ha^{-1}) and spring having the highest bird density (25.1 ± 4.4 birds ha^{-1}). Bird density increased from 20.5 ± 4.7 birds ha^{-1} in autumn to 24.8 ± 3.6 birds ha^{-1} in winter. It then increased slightly to 25.1 ± 4.4 birds ha^{-1} in spring. By summer, bird density decreased to 21.0 ± 5.8 birds ha^{-1} (Table 2). Much of the observed seasonal variation in bird density appeared to be strongly influenced by the movement of honeyeaters and thornbills.

Observations in all study sites revealed that the number of honeyeaters was highest in autumn in the lowland woodland remnants. This coincided with the migration of the Yellow-faced, White-eared and White-naped Honeyeaters, beginning from the Brindabella Ranges and extending northwards across the lowland of the ACT (Frith 1969; Purchase 1985; Tidemann *et al.* 1988; Taylor and COG 1992). Their departure, except for a few Yellow-faced and White-eared Honeyeaters, explains the small number of honeyeaters observed in winter. Honeyeater numbers increased in spring and summer due to the returning migrants. This was lower than in autumn (Fig. 2).

In constrast to the honeyeaters, a larger number of Yellow-rumped *Acanthiza chrysorrhoa,* Buff-rumped *Acanthiza reguloides* and Striated Thornbills *Acanthiza lineata* was recorded (often in large mixed-species flocks) in winter, compared to autumn. This accounted for the high winter bird density. The number of thornbills declined in spring as territories were formed by breeding pairs and slight increases were observed in summer due to the presence of young (Fig. 2).

DISCUSSION

Importance of woodland remnants as bird refuges within the landscape matrix in the lowland of the ACT

The overall mean bird density in the woodland remnants was estimated to be 22.8 birds ha^{-1}, similar to that reported by Ford and Bell (1981) for healthy woodland in Armidale (22.5 birds ha^{-1}) and by Shields and Recher (1984) for woodland in Bombala (17.5–25 birds ha^{-1}). Comparing this

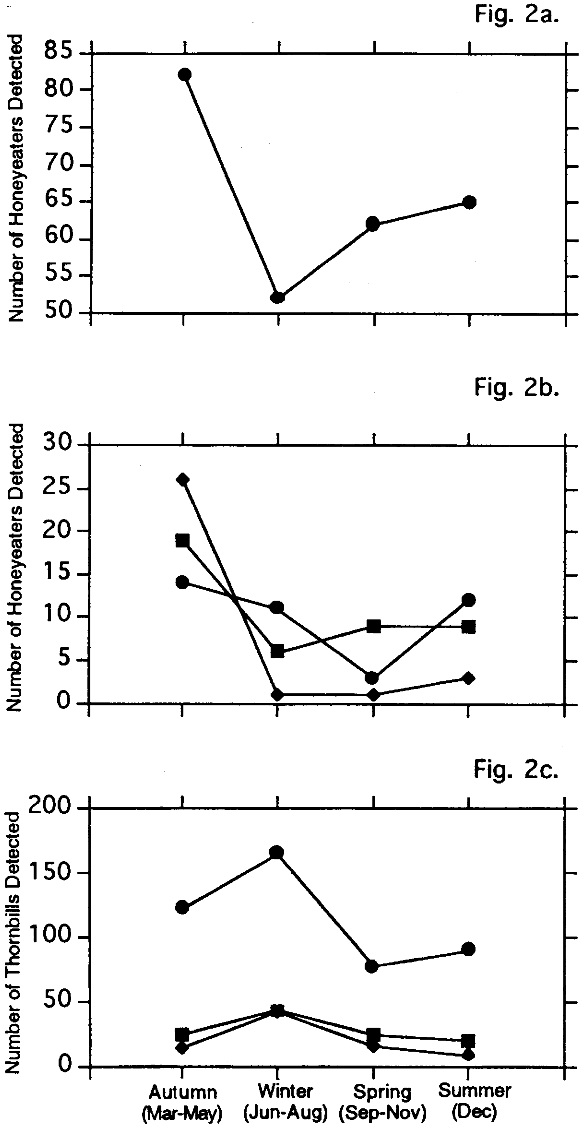

Figure 2. *Seasonal variation in the number of honeyeaters and thornbills detected (a) all honeyeaters; (b) White-eared Honeyeater (circle), Yellow-faced Honeyeater (square), White-naped Honeyeater (diamond); (c) Yellow-rumped Thornbill (circle), Buff-rumped Thornbill (square), Striated Thornbill (diamond).*

to bird densities of adjacent habitat types in the lowland of the ACT, it was found that the woodland remnants had a higher bird density than the dry sclerophyll forest (4.7 birds ha^{-1}, Bell 1980 in Canberra), pine plantation (5.9 birds ha^{-1}, Davidson 1974 in Kowen) and grassland or pasture land (<1–2.4 birds ha^{-1}, based on Ford and Bell 1981 in Armidale as estimates of grassland or pastureland bird density are not available for the ACT). The bird density in woodland remnants was, however, lower than that of suburban areas (35–60 birds ha^{-1}, Stein 1982 and Munyenyembe *et al.* 1989 in Canberra). This can be attributed to the high number of exotic bird species in suburban areas, e.g. House Sparrows *Passer domesticus,* Common Mynas *Acridotheres tristis* and Common Starlings *Sturnus vulgaris* (Lenz 1990; Pell and Tidemann 1994).

The comparisons above emphasize the importance of woodland remnants as integral components of the 'refuge system' for native birds within the landscape matrix in the lowland of the ACT.

Importance of woodland remnants as wintering sites

The observed high winter bird density is inconsistent with the trend of low bird densities in winter and high bird densities in spring and summer, reported by many workers in south-eastern Australia (Bell 1980; Recher *et al.* 1983; Osborne and Green 1992). More importantly, it cannot be explained based upon the trends of low winter breeding and migrant activities predicted by Nix (1976) for Canberra. However, it must be qualified that the bird data employed by Nix (1976) were drawn from the entire Canberra region and not specifically from the Yellow Box–Blakely's Red Gum woodland remnants as in the present study (Henry Nix, pers. comm.). The observed high winter bird density in this study can, in fact, be explained by the surge in thornbill numbers (i.e. Yellow-rumped Thornbill, Buff-rumped Thornbill and Striated Thornbill) in the woodland remnants (Table 2 and Fig. 2). What needs to be appreciated is not the inconsistency of this observation with those of other workers, but that it may point towards the importance of the Yellow Box–Blakely's Red Gum woodland remnants as wintering sites for these birds. This will be discussed in greater detail below.

The high number of thornbills in winter presumably represents an influx of birds from adjacent habitats given that they are known to be resident breeding birds (Taylor and COG 1992). Similar movements of thornbills have been reported by Lamm and Calaby (1950), Recher *et al.* (1983a), Arnold *et al.* (1987) and Recher *et al.* (1987).

Fretwell (1972), with supporting evidence from Willson (1974), Woinarski (1978), Rice *et al.* (1980, 1983) and Anderson *et al.* (1983), suggested that limited food in winter has a tendency to bring about a concentration of resident birds in habitats with the greatest abundance of food. Under the selection pressure of low insect abundance in winter, many small primarily insectivorous Australian passerines (e.g. the thornbills) are able to switch to a diet consisting mainly of carbohydrates (manna, honeydew and lerp associated with foliage and bark of eucalypts) (Paton 1980; Recher *et al.* 1983; Woinarski 1984; Bell 1985b; Recher 1989; Kenneth Er personal observation). Studies by Woinarski and Cullen (1984) and Bell (1985a) further showed that the foliage of box eucalypts contain high densities of lerps in winter (relative to insects). As such, it is plausible that the influx of thornbills into the woodland remnants is a response to the abundance of high quality food in these remnants. In addition, the woodland remnants may be more attractive than the adjacent pasture land to resident birds as foraging grounds in winter due to the presence of increased cover against predators and the cold and high velocity wind (Harris 1984; Miller *et al.* 1991; Weiss and Murphy 1993; Diaz and Telleria 1994). These factors are known to affect the foraging efficiency in small birds (Grubb 1975, 1978; Grubb and Greenwald 1982; Lima 1985; Larsson and Hemborg 1995). On these premises, one may conclude that the woodland remnants are important wintering sites for small resident bird species, such as the thornbills.

A high percentage of partial migrant species in the woodland remnants during winter further suggests that the remnants may be more important than previously thought in contributing to the survival of migrant species moving from the Brindabella Ranges by serving as wintering sites (Table 2). Although this is not conclusive because of the short-term nature of the observations, the importance of woodland remnants as wintering sites for partial migrants in the lowland of the ACT must not be discounted. Studies of wintering migrants in the Neotropics have shown that migrating birds were especially selective of wintering sites and that the observed decline in the migrant bird population could be attributed mainly to the loss of these sites (Robbins *et al.* 1989; Terborgh 1980, 1989; Askins *et al.* 1990; Rappole and McDonald 1994).

Importance of woodland remnants as breeding sites

Although this study did not specifically record breeding bird numbers, the importance of woodland remnants as breeding sites may be inferred from the fact that resident species made up half of all bird species found in the remnants (i.e. 53.2%) (Table 2). The importance of these remnants as breeding sites is further emphasized by the return of summer migrants in spring (Table 2). These migrants are known to breed in (Taylor and COG 1992) and have also been observed breeding in the woodland remnants during this study, for example, the Noisy Friarbird and Dusky Woodswallow (unpubl. data).

Effects of drought conditions

Like most parts of south-eastern Australia, the ACT was subjected to extreme drought conditions during the period of this study. This may explain the record of four nomadic species (Frith 1969; Taylor and COG 1992) in the woodland remnants during this study (Table 2). Their presence in woodland remnants may suggest that these remnants are important refuges during extreme drought conditions for nomadic species.

The drought may also have accentuated the influx of birds, such as the thornbills, into the woodland remnants during winter. Furthermore, it would have had effects on the breeding success of the birds (Smith 1982; Ford *et al.* 1985), thereby influencing the spring and summer bird densities. However, the true effects of the drought cannot be confirmed unless observations extend beyond one year. It is unfortunate that this was not possible within the time frame of this study.

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APPENDIX 1

List of bird species observed in the study sites. *N = nomadic; R = resident; SM = summer migrant; AM = altitudinal migrant; PM = partial migrant. Note: SM and AM constitute total migrants.

Bird species		Migratory status*
PHASIANIDAE		
Brown Quail	*Coturnix ypsilophora*	N
ANATIDAE		
Pacific Black Duck	*Anas superciliosa*	R
Maned Duck	*Chenonetta jubata*	R
PHALACROCORACIDAE		
Little Pied Cormorant	*Phalacrocorax melanoleucos*	R
ARDEIDAE		
White-faced Heron	*Egretta novaehollandiae*	R
THRESKIORNITHIDAE		
Australian White Ibis	*Threskiornis molucca*	R
ACCIPITRIDAE		
Black-shouldered Kite	*Elanus axillaris*	R
Whistling Kite	*Haliastur sphenurus*	R
Brown Goshawk	*Accipiter fasciatus*	SM
Wedge-tailed Eagle	*Aquila audax*	R
FALCONIDAE		
Nankeen Kestrel	*Falco cenchroides*	PM
COLUMBIDAE		
Crested Pigeon	*Ocyphaps lophotes*	R
CACATUIDAE		
Gang-gang Cockatoo	*Callocephalon fimbriatum*	PM
Galah	*Cacatua roseicapilla*	R
Sulphur-crested Cockatoo	*Cacatua galerita*	PM
PSITTACIDAE		
Little Lorikeet	*Glossopsitta pusilla*	N
Australian King-Parrot	*Alisterus scapularis*	AM
Crimson Rosella	*Platycercus elegans*	R
Eastern Rosella	*Platycercus eximius*	R
Red-rumped Parrot	*Psephotus haematonotus*	R
CUCULIDAE		
Pallid Cuckoo	*Cuculus pallidus*	SM
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	SM
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	SM
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	SM
HALCYONIDAE		
Laughing Kookaburra	*Dacelo novaeguineae*	R
CORACIIDAE		
Dollarbird	*Eurystomus orientalis*	SM
CLIMACTERIDAE		
White-throated Treecreeper	*Cormobates leucophaeus*	R
Brown Treecreeper	*Climacteris picumnus*	R
MALURIDAE		
Superb Fairy-wren	*Malurus cyaneus*	R

Appendix 1 — *continued*

Bird species		Migratory status*
PARDALOTIDAE		
Spotted Pardalote	*Pardalotus punctatus*	PM
Striated Pardalote	*Pardalotus striatus*	PM
White-browed Scrubwren	*Sericornis frontalis*	R
Speckled Warbler	*Chthonicola sagittata*	R
Weebill	*Smicrornis brevirostris*	R
Western Gerygone	*Gerygone fusca*	SM
White-throated Gerygone	*Gerygone olivacea*	SM
Brown Thornbill	*Acanthiza pusilla*	R
Buff-rumped Thronbill	*Acanthiza reguloides*	R
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	R
Yellow Thornbill	*Acanthiza nana*	R
Striated Thornbill	*Acanthiza lineata*	R
Southern Whiteface	*Aphelocephala leucopsis*	R
MELIPHAGIDAE		
Red Wattlebird	*Anthochaera carunculata*	PM
Noisy Friarbird	*Philemon corniculatus*	SM
Noisy Miner	*Manorina melanocephala*	R
Yellow-faced Honeyeater	*Lichenostomus chrysops*	PM
White-eared Honeyeater	*Lichenostomus leucotis*	PM
Fuscous Honeyeater	*Lichenostomus fuscus*	AM
White-plumed Honeyeater	*Lichenostomus penicillatus*	R
Brown-headed Honeyeater	*Melithreptus brevirostris*	R
White-naped Honeyeater	*Melithreptus lunatus*	SM
Eastern Spinebill	*Acanthorhynchus tenuirostris*	PM
PETROICIDAE		
Jacky Winter	*Microeca leucophaea*	R
Scarlet Robin	*Petroica multicolor*	R
Red-capped Robin	*Petroica goodenovii*	N
Flame Robin	*Petroica phoenicea*	AM
Hooded Robin	*Melanodryas cucullata*	R
NEOSITTIDAE		
Varied Sittela	*Daphoenositta chrysoptera*	R
PACHYCEPHALIDAE		
Crested Shrike-tit	*Falcunculus frontatus*	R
Golden Whistler	*Pachycephala pectoralis*	AM
Rufous Whistler	*Pachycephala rufiventris*	SM
Grey Shrike-thrush	*Colluricincla harmonica*	R
DICRURIDAE		
Leaden Flycatcher	*Myiagra rubecula*	SM
Restless Flycatcher	*Myiagra inquieta*	R
Magpie-lark	*Grallina cyanoleuca*	R
Rufous Fantail	*Rhipidura rufifrons*	SM
Grey Fantail	*Rhipidura fuliginosa*	PM
Willie Wagtail	*Rhipidura leucophrys*	PM
CAMPEPHAGIDAE		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	PM
White-winged Triller	*Lalage sueurii*	SM
ORIOLIDAE		
Olive-backed Oriole	*Oriolus sagittatus*	SM

Appendix 1 — *continued*

Bird species		Migratory status*
ARTAMIDAE		
Masked Woodswallow	*Artamus personatus*	N
White-browed Woodswallow	*Artamus superciliosus*	SM
Dusky Woodswallow	*Artamus cyanopterus*	SM
Australian Magpie	*Gymnorhina tibicen*	R
Pied Currawong	*Strepera graculina*	PM
Grey Currawong	*Strepera versicolor*	R
CORVIDAE		
Australian Raven	*Corvus coronoides*	R
CORCORACIDAE		
White-winged Chough	*Corcorax melanorhamphos*	R
ALAUDIDAE		
Skylark	*Alauda arvensis*	R
MOTACILLIDAE		
Richard's Pipit	*Anthus novaeseelandiae*	PM
PASSERIDAE		
House Sparrow	*Passer domesticus*	R
Double-barred Finch	*Taeniopygia bichenovii*	R
Red-browed Firetail	*Neochmia temporalis*	R
Diamond Firetail	*Stagonopleura guttata*	R
FRINGILLIDAE		
European Goldfinch	*Carduelis carduelis*	R
DICAEIDAE		
Mistletoebird	*Dicaeum hirundinaceum*	SM
HIRUNDINIDAE		
Welcome Swallow	*Hirundo neoxena*	PM
Tree Martin	*Hirundo nigricans*	SM
Fairy Martin	*Hirundo ariel*	SM
ZOSTEROPIDAE		
Silvereye	*Zosterops lateralis*	PM
MUSCICAPIDAE		
Blackbird	*Turdus merula*	R
STURNIDAE		
Common Starling	*Sturnus vulgaria*	R
Common Myna	*Acridotheres tristis*	R