

CORELLA

Journal of the Australian Bird Study Association

VOLUME 14

MARCH, 1990

NUMBER 1

Corella, 1990, 14(1): 1-15

A BIRD BANDING STUDY IN THE BLUE MOUNTAINS, NEW SOUTH WALES 1. OVERVIEW

J. W. HARDY¹ and J. R. FARRELL²

¹R.M.B. 6121 Tapley Road, Lisarow, NSW 2251

²73 Ellison Road, Springwood, NSW 2777

Received 11 August, 1988

Over eleven years, 1977–1987, 3 450 birds were trapped and banded at Blue Gum Swamp Creek, Winmalee, New South Wales, 724 of which were recovered a total of 1 564 times. The geography of the study site, its vegetation, climate and the local fire regime are documented, together with an overview of the results of the study. This paper sets the background for future papers which will more fully examine the results and discuss particular aspects of this study.

INTRODUCTION

Several long-term banding studies, which have sampled the bird population at established sites, have been undertaken in various parts of New South Wales and the Australian Capital Territory (Lane 1969; Horey and Wilson 1971; Marchant 1980, 1981, 1982; Tidemann, Wilson and Marples 1988). This paper is the first to describe such a project carried out in the Blue Mountains region of New South Wales.

The study site was established at Blue Gum Swamp Creek, Winmalee, New South Wales (33°39'48" S., 150°36'30" E.) in January 1977. The site is within the Blue Mountains National Park and was chosen both for its habitat diversity and ease of access. It was visited regularly by a number of banders working co-operatively under the supervision initially of P. J. Thomas, a ranger with the National Parks and Wildlife Service, and since April 1979 by J. W. Hardy.

The objectives of this study were to capture and mark as many individual birds of different species as possible within a tall open forest community typical of the Blue Mountains region and to gather information on:

- i) changes in the size and structure of the bird population brought about by seasonal and other factors, such as habitat alteration by fire;
- ii) measurements, plumage and soft parts characters for ageing and sexing birds;
- iii) survival of individual birds within the resident population;
- iv) territoriality of individual birds;
- v) constancy of return of breeding migratory species.

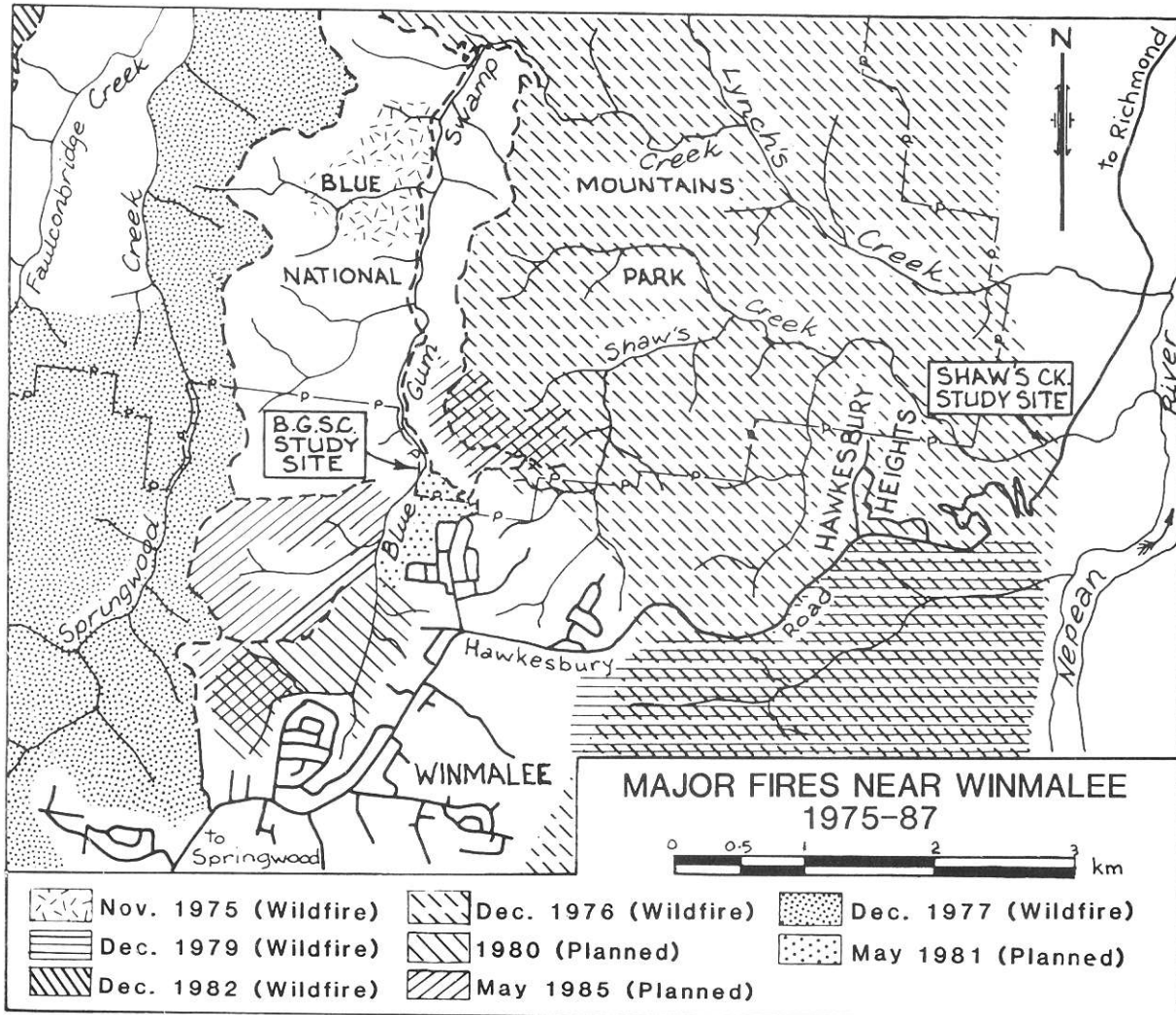


Figure 1. Location of Blue Gum Swamp Creek (B.G.S.C.) study site and the extent of major fires near Winmalee from 1975 to 1987.

STUDY SITE

Geography

The study site covers about 6 ha at the junction of Blue Gum Swamp Creek and a small unnamed gully. Access is along a fire trail commencing at the end of Whitecross Road, Winmalee. The source of Blue Gum Swamp Creek is approximately 2 km south. It flows generally northwards through the study site before turning south-east to meet Lynch's Creek, which then passes through the eastern escarpment of the mountains

to join the Nepean River near Hawkesbury Heights (Fig. 1).

The study site is on the eastern slopes of the Great Dividing Range about 80 km west of Sydney. The altitude ranges from about 230 m along Blue Gum Swamp Creek to 255 m towards the upper reaches of the unnamed gully (Fig. 2). The narrow valley formed by Blue Gum Swamp Creek is flanked by Triassic Hawkesbury Sandstone ridges, which rise to 70 m above the creek near the study site. The narrow floor of the valley consists of Quaternary alluvium.

Vegetation

The dominant canopy species along the main creek system are Deane's Gum *Eucalyptus deanei*, Sydney Peppermint *E. piperita* and Blue Mountain Mahogany *E. notabilis*. Black Wattle *Callicoma serratifolia* is the predominant understorey species along and up to 10 m on either side of the creek, with *Melaleuca linariifolia* also well represented. Much of the forest floor is covered by the ferns *Pteridium esculentum* and *Culcita dubia*.

The unnamed gully in the eastern portion of the site includes a small ephemeral creek and supports more open canopy trees than the main creek. This gully and its flanks contain a number of distinct vegetation zones with four tall tree species: Sydney Peppermint, Blue Mountain Mahogany, White Stringybark *E. globoidea* and Smooth-barked Angophora *Angophora costata*. The understorey vegetation zones are comprised of *Acacia* (3 species), *Callistemon citrinus*, *Leucopogon* spp., *Hakea sericea*, *Leptospermum attenuatum*, *Banksia oblongifolia*, *B. serrata* and *B. spinulosa*.

The ridges on either side of both creeks are thickly vegetated with various heath species growing under a canopy of Smooth-barked Angophora, Red Bloodwood *E. gummifera* and Narrow-leaved Stringybark *E. oblonga*.

Table 1 lists the main plant species in the study area and their flowering times based upon the observations made by ourselves and others (N. Kirby and J. Joyce, pers. comm; Beadle, Evans and Carolin 1982).

Climate

The altitude and geography of the site are such that it experiences neither the extremes of heat and cold of the western plains of the Sydney Basin nor the cold of the upper mountains. Temperatures below 5° C are rare and frosts have been recorded only on a few occasions.

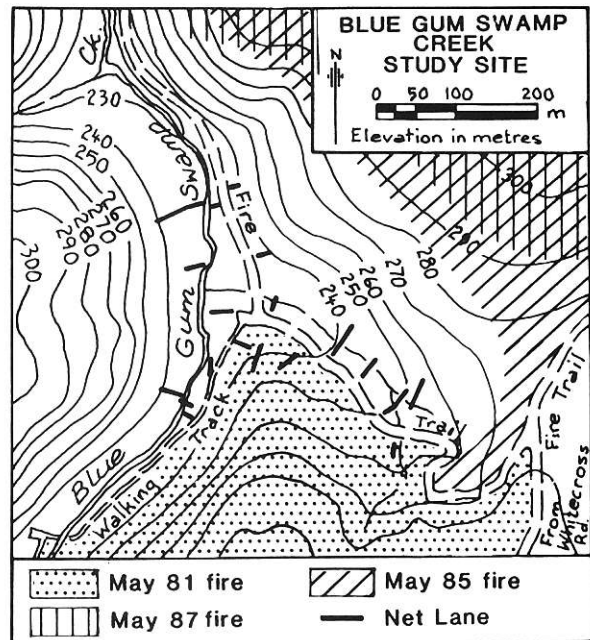


Figure 2. Topography, location of net lanes and extent of fires within and near Blue Gum Swamp Creek study site.

The rainfall pattern is similar to that of Sydney. Rainfall records maintained by the Bureau of Meteorology since 1883 for nearby Springwood show a mean annual rainfall of 1 085 mm with a summer maximum. The monthly rainfall for Springwood during the study and the mean of records since 1883 are shown in Table 2. August is generally the driest month (mean 50 mm) and February the wettest (mean 135 mm), but this varies considerably from year to year. Extended periods of high wind occur more often in August and September than in other months.

Fire

A number of wildfires and planned hazard-reduction fires occurred in and around the study site between 1975 and 1987. Wildfires in 1975, 1976, 1977 and 1979 burnt large areas near Winmalee (Fig. 1). Low intensity hazard-reduction fires burnt areas along Blue Gum Swamp Creek in 1980, 1981, 1985 and 1987 (Figs. 1 and 2). The only fire within the study site occurred in 1981.

TABLE 1

Flowering times of dominant plant species at Blue Gum Swamp Creek. (X = primary flowering period; x = extended intermittent flowering period.)

| Species | Month | | | | | | | | | | | |
|--------------------------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| <i>Acacia linifolia</i> | XXX | X | | | | | | | | | | |
| <i>A. longifolia</i> | | | | | | | XXX | XXX | XXX | XXX | | |
| <i>A. parvipinnula</i> | | | | | | | | | XXX | XXX | XXX | X |
| <i>Angophora costata</i> | | | | | | | | | | XXX | XXX | XXX |
| <i>Baeckea linifolia</i> | XXX | XXX | | | | | | | | | | |
| <i>Banksia oblongifolia</i> | | XXX | XXX | XXX | | | | | | | | |
| <i>B. serrata</i> | XXX | XXX | XXX | | | | | | | | | |
| <i>B. spinulosa</i> | | | xx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xx |
| <i>Bossiaea rhombifolia</i> | | | XXX | XXX | | | | | | | | |
| <i>Callicoma serratifolia</i> | | | | | | | | | | XXX | XXX | |
| <i>Callistemon citrinus</i> | | | | | | | | | | XXX | XXX | XXX |
| <i>Eucalyptus deanei</i> | XXX | XXX | | | | | | | | | | |
| <i>E. globoidea</i> | | | | XXX | XXX | XXX | | | | | | |
| <i>E. gummifera</i> | XXX | XXX | XXX | XXX | | | | | | | | |
| <i>E. notabilis</i> | XXX | | | | | | | | | | | |
| <i>E. oblonga</i> | | XXX | XXX | XXX | | | | | | | | |
| <i>E. piperita</i> | | | | | | | | | | | | XXX |
| <i>Grevillea mucronulata</i> | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| <i>G. phylloides</i> | | | | | | | | | | XXX | XXX | |
| <i>Hakea scircea</i> | | | | | | | | | | XXX | XXX | |
| <i>Lambertia formosa</i> | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| <i>Leptospermum attenuatum</i> | XXX | XXX | | | | | | | | | | XXX |
| <i>L. flavescens</i> | | | | | | | | | | XXX | XXX | XXX |
| <i>Leucopogon</i> spp | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| <i>Melaleuca linarifolia</i> | XXX | xxx | | | | | | | | xxx | xxx | XXX |
| <i>Persoonia levis</i> | XXX | XXX | | | | | | | | | | XXX |
| <i>P. pinifolia</i> | XXX | XXX | XXX | | | | | | | | | XXX |
| <i>Telopea speciosissima</i> | | | | | | | | | | XXX | XXX | XXX |

TABLE 2

Monthly Rainfall (mm) at Springwood, N.S.W.

| Year | J | F | M | A | M | J | J | A | S | O | N | D | Total |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Mean | | | | | | | | | | | | | |
| 1883-1987 | 127 | 135 | 131 | 91 | 77 | 80 | 60 | 50 | 58 | 78 | 95 | 103 | 1 085 |
| 1977 | 68 | 259 | 365 | 34 | 197 | 32 | 1 | 11 | 51 | 9 | 22 | 45 | 1 094 |
| 1978 | 318 | 25 | 384 | 39 | 86 | 211 | 16 | 11 | 86 | 68 | 149 | 96 | 1 489 |
| 1979 | 56 | 28 | 105 | 13 | 113 | 81 | 19 | 3 | 21 | 57 | 113 | 13 | 622 |
| 1980 | 88 | 65 | 57 | 2 | 195 | 30 | 32 | 3 | 6 | 59 | 65 | 70 | 672 |
| 1981 | 93 | 316 | 11 | 218 | 148 | 8 | 37 | 5 | 9 | 217 | 247 | 116 | 1 425 |
| 1982 | 124 | 76 | 186 | 10 | 2 | 13 | 10 | 1 | 159 | 47 | 9 | 49 | 686 |
| 1983 | 62 | 67 | 244 | 86 | 194 | 96 | 20 | 19 | 56 | 85 | 59 | 217 | 1 205 |
| 1984 | 186 | 208 | 95 | 149 | 49 | 44 | 163 | 26 | 44 | 59 | 259 | 120 | 1 402 |
| 1985 | 13 | 70 | 67 | 144 | 116 | 40 | 55 | 17 | 99 | 234 | 70 | 59 | 984 |
| 1986 | 145 | 99 | 17 | 35 | 26 | 3 | 18 | 485 | 115 | 110 | 224 | 24 | 1 301 |
| 1987 | 44 | 45 | 297 | 21 | 60 | 53 | 49 | 246 | 11 | 145 | 91 | 116 | 1 179 |

METHODS

Mist nets used to capture birds had a mesh size of 32 mm (1 1/4 in) and were opened to an effective height of 2.7 m. Most were 12 m long, but several 9 m and 18 m long nets were also used. Only two nets were used until early 1979, after which eight or more were used consistently. After 1980 up to 16 nets were erected on occasions when visiting "A" Class banders assisted in the study. Mist nets were erected and opened soon after first light and usually closed when capture rates declined around midday.

Net lanes were cleared in various vegetation zones and habitat types (Fig. 2). Experience at this site indicated that most bird movement was either up or down the gullies, so most net lanes were perpendicular to or across creek beds rather than parallel to them. Unlike the Brindabella Range study (Horey and Wilson 1971; Tidemann *et al.* 1988), nets were not usually placed on the fire trail or path. This site is located in an area frequented by horse riders, bushwalkers and joggers, who are occasionally accompanied by dogs which may inadvertently damage nets or attack entangled birds. Trail bikes and four-wheel-drive vehicles also used the fire trail. Net lanes, or groups of lanes within the same habitat types, were numbered and recorded for each bird captured. These data were useful in documenting constancy of return to particular vegetation zones and in the mapping of territories of individual birds.

We aimed to band at the site at least once each month, but this was not always possible because heavy rain or high winds sometimes coincided with planned banding days.

Birds were placed in cotton holding bags and taken to a central banding station where they were banded with individually numbered metal bands provided by the Australian Bird Banding Scheme. The net site at which they were caught and several measurements, usually weight, wing length, wingspan and tail length, were recorded

(Disney 1974). The sex, breeding condition and occasionally moult and soft part descriptions were also noted. Birds were usually released at the banding table, but dependent juveniles were returned to the vicinity of where captured before release.

From 1983, all individuals of the following ten species were colour-banded to assist determination of territories and social structures: White-browed Scrubwren, Large-billed Scrubwren, Variegated Fairy-wren, Eastern Yellow Robin, Golden Whistler, White-throated Treecreeper, Red-browed Treecreeper, Striated Thornbill, Rufous Fantail and Grey Shrike-thrush. The scientific names of all bird species referred to in the text are given in Table 3. These species were selected for colour-banding because they were all resident breeding species or, in the case of the Rufous Fantail, a regular summer visitor which breeds in the study area.

The information from each bird caught was transcribed onto field data cards (Lane 1987). A separate card was used for each bird banded, and subsequent recoveries were recorded on this card. This system provided a quick reference to capture/recapture histories.

Every species seen, heard or banded was recorded on a checklist each banding day for the duration of the study. The frequency of encounter estimated from these records, was calculated by dividing the number of days on which each species was recorded by the total number of days on which records were kept, and the result expressed as a percentage (Tables 3 and 4).

To examine annual and monthly changes in the population of each species, a mean capture-rate was calculated by dividing the total number of birds caught over the study period in each year/month by the number of banding days in that year/month (Tables 7 and 8). Arrival and departure dates for the regular seasonal visitors to Blue Gum Swamp Creek were noted from year to year. Their period of residency is presented in Figure 3.

TABLE 3

Birds Banded at Blue Gum Swamp Creek, Winmalee. IB = No. of individuals banded; IR = No. of individuals recovered; TR = Total number of recoveries; TR% = Recovery percentage (IR/IB %); JB = Juveniles banded (included in IB); JR = Juveniles recovered over one year after banding); JR% = Percentage of juveniles recovered over one year after banding (JR/JB%); ET = Longest elapsed time between banding and last recovery of an individual bird at this study site; FE = Frequency of encounter (% days recorded); ST = Status: C = common; U = uncommon; R = rare; H = resident; N = nomad; S = summer visitor; W = winter visitor.

| Species | IB | IR | TR | TR% | JB | JR | JR% | ET | FE | ST |
|--|------|-----|------|------|------|-----|------|----------|-----|-------|
| Brown Goshawk <i>Accipiter fasciatus</i> | 1 | — | — | — | — | — | — | — | 8 | RN |
| Peaceful Dove <i>Geopelia placida</i> | 10 | 2 | 2 | 20.0 | — | — | — | 2 y 9 m | 94 | UH |
| Gang-Gang <i>Callocephalon fimbriatum</i> | 1 | 1 | 1 | — | — | — | — | 0 y 4 m | 91 | CH |
| Crimson Rosella <i>Platycercus elegans</i> | 6 | — | — | — | 2 | — | — | — | 100 | CH |
| Brush Cuckoo <i>Cuculus variolosus</i> | 1 | — | — | — | 1 | — | — | — | 19 | RS |
| Fan-tailed Cuckoo <i>C. pyrrhophanus</i> | 14 | — | — | — | 4 | — | — | — | 73 | CH |
| Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i> | 2 | 1 | 1 | 50.0 | — | — | — | 0 y 1 m | 19 | RS |
| Azure Kingfisher <i>Ceyx azureus</i> | 2 | — | — | — | — | — | — | — | 2 | RH |
| Laughing Kookaburra <i>Dacelo novaeguineae</i> | 2 | — | — | — | — | — | — | — | 42 | UH |
| Sacred Kingfisher <i>Halcyon sancta</i> | 3 | — | — | — | 3 | — | — | — | 28 | US |
| Rose Robin <i>Petroica rosea</i> | 27 | 3 | 4 | 11.1 | 3 | — | — | 0 y 4 m | 13 | UW |
| Scarlet Robin <i>P. multicolor</i> | 1 | — | — | — | — | — | — | — | 6 | RW |
| Eastern Yellow Robin <i>Eopsaltria australis</i> | 102 | 34 | 102 | 33.3 | 51 | 7 | 13.7 | 5 y 10 m | 95 | CH |
| Shrike-tit <i>Falcunculus frontatus</i> | 8 | 1 | 3 | 12.5 | 2 | — | — | 9 y 1 m | 53 | UH |
| Golden Whistler <i>Pachycephala pectoralis</i> | 118 | 25 | 63 | 21.2 | 48 | 2 | 4.2 | 7 y 9 m | 95 | CH |
| Rufous Whistler <i>P. rufiventris</i> | 9 | 5 | 5 | 55.6 | — | — | — | 1 y 11 m | 39 | US |
| Grey Shrike-thrush <i>Colluricincla harmonica</i> | 19 | 5 | 11 | 26.3 | 9 | 2 | 22.2 | 5 y 10 m | 92 | CH |
| Black-faced Monarch <i>Monarcha melanopsis</i> | 7 | — | — | — | 2 | — | — | — | 34 | US |
| Leadend Flycatcher <i>Myiagra rubecula</i> | 3 | — | — | — | — | — | — | — | 34 | US |
| Rufous Fantail <i>Rhipidura rufifrons</i> | 81 | 23 | 44 | 28.4 | 14 | 3 | 21.4 | 6 y 3 m | 52 | CS |
| Grey Fantail <i>R. fuliginosa</i> | 96 | 15 | 20 | 15.6 | 30 | 1 | 3.3 | 3 y 11 m | 100 | CH/CW |
| Eastern Whipbird <i>Psophodes olivaceus</i> | 19 | 5 | 9 | 26.3 | 10 | — | — | 1 y 10 m | 98 | CH |
| Variegated Fairy-wren <i>Malurus lamberti</i> | 59 | 26 | 56 | 44.1 | 16 | 2 | 12.5 | 4 y 4 m | 80 | CH |
| Pilotbird <i>Pycnoptilus floccosus</i> | 7 | 1 | 1 | 14.3 | 2 | — | — | 0 y 8 m | 91 | CH |
| Origma <i>Origma solitaria</i> | 7 | — | — | — | — | — | — | — | 41 | UH |
| White-browed Scrubwren <i>Sericornis frontalis</i> | 96 | 37 | 132 | 38.5 | 36 | 7 | 19.4 | 5 y 4 m | 94 | CH |
| Large-billed Scrubwren <i>S. magnirostris</i> | 21 | 8 | 29 | 38.1 | 1 | — | — | 9 y 0 m | 25 | UH |
| Yellow-throated Scrubwren <i>S. citreogularis</i> | 1 | — | — | — | — | — | — | — | 2 | RH |
| Crestnut-rumped Hylacola <i>Hylacola pyrrhopygia</i> | 4 | — | — | — | 1 | — | — | — | 5 | RH |
| Brown Gerygone <i>Gerygone mouki</i> | 11 | 1 | 1 | 9.1 | 2 | — | — | 3 y 7 m | 61 | CH |
| Brown Thornbill <i>Acanthiza pusilla</i> | 165 | 56 | 129 | 33.9 | 61 | 5 | 8.2 | 6 y 5 m | 98 | CH |
| Buff-rumped Thornbill <i>A. reguloides</i> | 2 | — | — | — | — | — | — | — | 5 | RH |
| Striated Thornbill <i>A. lineata</i> | 80 | 34 | 72 | 42.4 | 9 | 3 | 33.3 | 5 y 1 m | 88 | CH |
| Red-browed Treecreeper <i>Climacteris erythroptera</i> | 7 | 4 | 4 | 57.1 | — | — | — | 1 y 0 m | 36 | UH |
| White-throated Treecreeper <i>C. leucophaea</i> | 24 | 11 | 45 | 45.8 | 6 | 1 | 16.7 | 7 y 6 m | 98 | CH |
| Little Wattlebird <i>Anthochaera chrysoptera</i> | 10 | — | — | — | 1 | — | — | — | 11 | RN |
| Lewin's Honeyeater <i>Meliphaga lewinii</i> | 39 | 15 | 24 | 38.5 | — | — | — | 4 y 6 m | 75 | CH |
| White-eared Honeyeater <i>Lichenostomus leucotis</i> | 13 | 1 | 1 | 7.7 | 4 | — | — | 0 y 1 m | 22 | UH |
| Yellow-faced Honeyeater <i>L. chrysops</i> | 311 | 22 | 25 | 7.1 | 22 | — | — | 4 y 6 m | 66 | UH/CW |
| Yellow-tufted Honeyeater <i>L. melanops</i> | 24 | 4 | 4 | 16.7 | 8 | — | — | 0 y 7 m | 8 | RH |
| White-naped Honeyeater <i>Melithreptus lunatus</i> | 24 | 1 | 1 | 4.2 | 15 | — | — | 0 y 2 m | 27 | UN/CW |
| Brown-headed Honeyeater <i>M. brevirostris</i> | 11 | 3 | 6 | 27.3 | 1 | — | — | 4 y 7 m | 28 | UN |
| Crescent Honeyeater <i>Phylidonyris pyrrhoptera</i> | 11 | 2 | 3 | 18.2 | 3 | — | — | 3 y 5 m | 19 | RN |
| New Holland Honeyeater <i>P. novaehollandiae</i> | 871 | 221 | 455 | 25.4 | 495 | 57 | 11.5 | 9 y 0 m | 100 | CH |
| White-checked Honeyeater <i>P. nigra</i> | 59 | 4 | 4 | 6.8 | 27 | — | — | 0 y 3 m | 30 | UN |
| Eastern Spinebill <i>Acanthorhynchus tenuirostris</i> | 603 | 91 | 203 | 15.1 | 289 | 10 | 3.5 | 7 y 3 m | 100 | CH |
| Scarlet Honeyeater <i>Myzomela sanguinolenta</i> | 1 | — | — | — | 1 | — | — | — | 8 | RS |
| Spotted Pardalote <i>Pardalotus punctatus</i> | 21 | 3 | 3 | 14.3 | 1 | — | — | 1 y 4 m | 89 | CH |
| Silvereye <i>Zosterops lateralis</i> | 167 | 21 | 37 | 12.6 | 5 | — | — | 4 y 0 m | 70 | CW |
| Red-browed Firetail <i>Emblema temporalis</i> | 248 | 38 | 64 | 15.3 | 82 | 2 | 2.4 | 2 y 11 m | 91 | CH |
| Beautiful Firetail <i>E. bellum</i> | 15 | — | — | — | 7 | — | — | — | 19 | RH |
| Olive-backed Oriole <i>Oriolus sagittatus</i> | 2 | — | — | — | 2 | — | — | — | 11 | RN |
| Grey Butcherbird <i>Cracticus torquatus</i> | 2 | — | — | — | 2 | — | — | — | 27 | UH |
| Pied Currawong <i>Strepera graculina</i> | 2 | — | — | — | — | — | — | — | 97 | UH/CW |
| Totals | 3450 | 724 | 1564 | 21.0 | 1278 | 102 | 8.0 | | | |

RESULTS

Between January 1977 and December 1987, 187 banding visits were made to the study site. One hundred native and two introduced species were recorded (seen, heard or captured) at Blue Gum Swamp Creek. Tables 3 to 8 summarize the results.

Table 3 lists the 54 species captured at the study site and provides: i) a summary of the numbers of each species banded and their recovery-rates; ii) the minimum age of the oldest individual recorded, based on elapsed time between first banding and recovery dates; iii) the status of each species, based on frequency of encounter. Table 4 lists the 48 species observed but not captured at the study site and their status at Blue Gum Swamp Creek. Table 5 provides details of birds banded at the study site and recovered elsewhere. Table 6 lists birds which were banded elsewhere but recaptured at Blue Gum Swamp Creek. Table 7 gives the mean number of each species caught per banding day in each of the years 1979 to 1987. Table 8 lists the monthly mean number of each species caught.

Data for 1977 and 1978 were not used in the calculation of capture-rates because few nets were used, and consequently only a small number of birds were caught during those years. The Crimson Rosella, Grey Fantail, New Holland Honeyeater and Eastern Spinebill were the only species recorded on every visit to the study site (Table 3). The most notable trends in capture-rates were for New Holland Honeyeater, Eastern Spinebill and Red-browed Firetail (Tables 7 and 8). The New Holland Honeyeater was captured most frequently and capture-rates declined after the hazard reduction fire in May 1981 (Figs. 1 and 2). In 1985 the capture-rates of this species and the Eastern Spinebills increased (Table 7). Capture-rates for Red-browed Firetails increased considerably in 1982, but decreased markedly in 1983, and increased again in 1984 and 1985 (Table 7). Several species were recorded only as either summer or winter visitors and their periods of residence in the Lower Blue Mountains are shown in Figure 3.

Capture-records for seasonal visitors are sparse except for three species: Rufous Whistler, Rufous Fantail and Rose Robin (Table 3). All nine Rufous Whistlers were adults when banded but only two were recaptured in subsequent breeding seasons. Rufous Fantails, however, were far more common, and several birds were recaptured or colour-banded individuals sighted over many seasons. Rose Robins were the only non-nectarivorous visitors in the study area in significant numbers during winter, but only 27 were banded and none were retrapped in subsequent seasons.

Although Yellow-faced Honeyeaters and Silveryeyes were recorded in all months, capture-rates increased during late autumn/early winter. Yellow-faced Honeyeaters also had a high capture-rate in summer. Capture-rates for White-naped Honeyeaters also increased during winter when migrating birds passed through the site (Table 8). Yellow-tufted Honeyeaters were recorded in the study area only between 1979 and 1983.

The overall recovery-rate for the study site was 21.0 per cent (Table 3). Recovery-rates of some species were quite high. The Eastern Yellow Robin, Variegated Fairy-wren, White-browed and Large-billed Scrubwrens, Brown and Striated Thornbills, White-throated and Red-browed Treecreepers and Lewin's Honeyeater, all of which are year-round residents, had recovery-rates >33.3 per cent. Other readily caught year-round residents were readily caught but had lower recovery-rates, for example, the New Holland Honeyeater (25.4%) and the Eastern Spinebill (15.1%), but our data suggest that there was some nomadic or migrant influx in both these species.

The average number of birds caught per banding day was 27.8. This fluctuated from year to year and peaked in 1985 to over 45 (Table 7).

TABLE 4

Birds observed but not captured at Blue Gum Swamp Creek. FE — Frequency of encounter (% days recorded). ST — Status, C — Common, U — Uncommon, R — Rare, H — Resident, S — Summer Visitor, N — Nomad, V — Vagrant, * — Usually only observed or heard from the surrounding ridges or residential development adjoining the study area. † — Observed only at night while spotlighting.

| Species | FE | ST |
|---|----|-----|
| Pacific Black Duck <i>Anas superciliosa</i> | 5 | RN |
| Pacific Baza <i>Aviceda subcristata</i> | 2 | RV |
| Whistling Kite <i>Haliastur sphenurus</i> | 3 | RV |
| Collared Sparrowhawk <i>Accipiter cirrhocephalus</i> | 3 | RN |
| Australian Hobby <i>Falco longipennis</i> | 3 | RN |
| Spotted Turtle Dove <i>Streptopelia chinensis</i> | 15 | UH* |
| Brown Cuckoo-Dove <i>Macropygia amboinensis</i> | 8 | RH |
| Common Bronzewing <i>Phaps chalcoptera</i> | 28 | UH |
| Brush Bronzewing <i>P. histrionica</i> | 2 | RH |
| Wonga Pigeon <i>Leucosarcia melanoleuca</i> | 3 | RH |
| Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i> | 13 | RH |
| Yellow-tailed Black-Cockatoo <i>C. funereus</i> | 66 | UH |
| Galah <i>Cacatua roseicapilla</i> | 6 | UH |
| Sulphur-crested Cockatoo <i>C. galerita</i> | 69 | UH |
| Little Lorikeet <i>Glossopsitta pusilla</i> | 13 | RN |
| Australian King Parrot <i>Alisterus scapularis</i> | 92 | CH |
| Eastern Rosella <i>Platycercus eximius</i> | 14 | UH* |
| Common Koel <i>Eudynamis scolopacea</i> | 5 | RS* |
| Channel-billed Cuckoo <i>Scythrops novaehollandiae</i> | 11 | RS |
| Southern Boobook <i>Ninox novaeseelandiae</i> | | CH† |
| Masked Owl <i>Tyto novaehollandiae</i> | | RN† |
| Tawny Frogmouth <i>Podargus strigoides</i> | | CH† |
| Australian Owllet-nightjar <i>Aegotheles cristatus</i> | | UH† |
| White-throated Needle-tail <i>Hirundapus caudacutus</i> | 11 | US |
| Rainbow Bee-eater <i>Merops ornatus</i> | 2 | RS |
| Dollarbird <i>Eurystomus orientalis</i> | 38 | US |
| Superb Lyrebird <i>Menura novaehollandiae</i> | 94 | CH |
| Welcome Swallow <i>Hirundo neoxena</i> | 18 | UR* |
| Tree Martin <i>Cecropis nigricans</i> | 16 | US |
| Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i> | 47 | UH* |
| Cicadabird <i>C. tenuirostris</i> | 11 | RS |
| Red-whiskered Bulbul <i>Pycnonotus jocosus</i> | 6 | RH* |
| White's Thrush <i>Zosterops dauma</i> | 2 | RH |
| Restless Flycatcher <i>Myiagra inquieta</i> | 1 | RV* |
| Willie Wagtail <i>Rhipidura leucophrys</i> | 5 | RV* |
| Weebill <i>Smicromis brevirostris</i> | 3 | RH* |
| White-throated Gerygone <i>Gerygone olivacea</i> | 3 | RS* |
| Yellow Thornbill <i>Acanthiza nana</i> | 3 | UH* |
| Varied Sittella <i>Daphoenositta chrysoptera</i> | 13 | UH |
| Noisy Friarbird <i>Philemon corniculatus</i> | 16 | UN |
| Regent Honeyeater <i>Xanthomyza phrygia</i> | 1 | RN |
| Mistletoebird <i>Dicaeum hirundinaceum</i> | 3 | RH |
| Striated Pardalote <i>Pardalotus striatus</i> | 2 | RW |
| Common Mynah <i>Acridotheres tristis</i> | 13 | UH* |
| Satin Bowerbird <i>Ptilonorhynchus violaceus</i> | 17 | UH |
| Dusky Woodswallow <i>Artamus cyanopterus</i> | 5 | RN |
| Australian Magpie <i>Gymnorhina tibicen</i> | 39 | UH* |
| Australian Raven <i>Corvus coronoides</i> | 97 | CH |

DISCUSSION

As the mist nets we used had an effective opened height of only 2.7 m, the species captured and their relative numbers are biased toward species that usually forage in the understorey. This accounts for the differences between the numbers captured and the abundance of species observed (Tables 3 and 4) for several species. The four species which were recorded on all banding visits to the study site forage at all levels in the forest. The Crimson Rosella and Grey Fantail are predominantly canopy feeders, whereas the New Holland Honeyeater and Eastern Spinebill feed mainly in the understorey. Only six Crimson Rosellas and 96 Grey Fantails were captured, but 871 New Holland Honeyeaters and 603 Eastern Spinebills were caught. The Grey Fantail, however, is sometimes able to see the net and rapidly change its flight direction to avoid contact. This species is notorious for its frustrating habit of perching on net shelf strings. Other species were recorded in the study area during most visits but

spent little time in the capture zone; the Crested Shrike-tit, Leaden Flycatcher (in summer) and White-naped Honeyeater are examples. Tree-creepers also fall into this category as they are likely to be caught only when they fly to the base of a tree located behind a net to commence their ascent in search of insects. Nets were usually set with the bottom shelf string about 20 cm to 30 cm above the ground to avoid entanglement of ground litter. Pilotbirds, which forage in leaf litter, were only caught when the bottom shelf of a net was allowed to lie on the ground.

The mesh size of the nets affected the species captured. Crimson Rosellas, Fan-tailed Cuckoos, Eastern Whipbirds and Grey Shrike-thrushes, for example, usually do not become tangled in 32 mm mesh and escape on most occasions. Two species, the Variegated Fairy-wren and the Brown Gerygone, were observed on a number of occasions to pass through the mesh without becoming entangled.

TABLE 5
Birds banded at Blue Gum Swamp Creek and recovered elsewhere.

| Species | Band No. | Date banded | Recovery date and location | Elapsed time and distance | Status |
|--------------------------|-----------|-------------|----------------------------|---------------------------|---|
| Peaceful Dove | 061-14056 | 21 Jan 79 | 3 Aug 79 Winmalee | 6 mth 0.5 km | Killed by cat |
| Peaceful Dove | 050-79821 | 16 May 81 | 1 Feb 84 Winmalee | 4 y 2 mth 0.5 km | Captured — leg injured and band removed |
| Eastern Yellow Robin | 022-71012 | 10 Jan 85 | 6 Jul 86 Lawson | 1 y 5 mth 17.9 km | Killed by cat |
| Golden Whistler | 032-66507 | 30 Dec 86 | 1987 Winmalee | <1 y 2 km | Leg and wing found |
| Eastern Whipbird | 061-14060 | 11 Mar 79 | 10 Apr 79 Winmalee | 3 mth 0.5 km | Killed by dog |
| Lewin's Honeyeater | 040-70960 | 15 Apr 79 | 11 Sep 80 Winmalee | 1 y 5 mth 2 km | Found dead |
| Lewin's Honeyeater | 040-70974 | 27 Apr 80 | 13 Sep 80 Shaw's Ck. * | 5 mth 5 km | Captured by bander and released |
| Yellow-tufted Honeyeater | 031-91930 | 2 Feb 80 | 4 Sep 80 Shaw's Ck. * | 7 mth 5 km | Captured by bander and released |

* Shaw's Creek Bird Banding Site, near Hawkesbury Heights, N.S.W., 33° 40' S., 150° 39' E. (Fig. 2).

Most plants in the study area flower between September and April (Table 1). Although many species do not produce sufficient nectar to be a primary food resource for birds, they do, however, attract large numbers of insects, which are an important food source for many birds (including honeyeaters) during the breeding and post-breeding seasons.

Since few plants flower during the winter months, Blue Gum Swamp Creek does not receive a vast influx of winter migrants. The capture-rates for Yellow-faced Honeyeaters and Silvereyes, which are present throughout the year, increased during the late autumn/early winter period and this coincided with the flowering of *Banksia spinulosa* (Table 8). The capture-rate for White-naped Honeyeaters also increased during the winter, but few were caught as they were more attracted to the canopy of the forest to feed in the flowering *Eucalyptus globiodes*. Recovery-rates for these three winter migrants were low (Table 3).

Tidemann *et al.* (1988) reported autumn increases in the populations of Red-browed Firetail, Grey Fantail, Yellow-faced and White-naped Honeyeaters and Silvereyes at the Brindabella Range sites resulting from an influx of altitudinal migrants and a gathering of migratory species before they moved north. This was not observed for any of these species at Blue Gum Swamp Creek. Red-browed Firetails were in greatest numbers in summer. There was no evidence of a higher population of Grey Fantails in autumn or winter than at any other time of the year. However, there is evidence (Frith 1969; Ford 1981; Blakers, Davies and Reilly 1984; Recovery Roundup 1988) that some Grey Fantails are altitudinal migrants and move north during the colder months. At least some of the Grey Fantails recorded at Blue Gum Swamp Creek during winter could be representatives of a higher altitude or more southern breeding population. The influx of the Yellow-faced and White-naped Honeyeaters and Silvereyes at our site was later than the increases in numbers reported at the Brindabella Range sites and this may reflect the additional time required by birds which migrate further north.

TABLE 6

Birds banded elsewhere and recovered at Blue Gum Swamp Creek, Winmalee.

| Species | Band No. | Date banded | Location banded | Date recovered | Elapsed time | Distance |
|--------------------------|-----------|-------------|-----------------|----------------|--------------|----------|
| Yellow-tufted Honeyeater | 031-41982 | 1 Dec 79 | Shaw's Ck.* | 17 Feb 80 | 2 mth | 5 km |
| New Holland Honeyeater | 031-41990 | 1 Dec 79 | Shaw's Ck.* | 20 Jan 80 | 1 mth | 5 km |
| New Holland Honeyeater | 031-76149 | 27 Jan 85 | Munghorn Gap† | 17 Feb 85 | 21 days | 158.4 km |
| Brown-headed Honeyeater | 022-35101 | 29 Apr 78 | Shaw's Ck.* | 18 Oct 80 | 2 y, 6 m | 5 km |

* Shaw's Creek Bird Banding Site, near Hawkesbury Heights, N.S.W. (33° 40' S, 150° 39' E.) (Fig. 2).

† Munghorn Gap Nature Reserve Co-operative Bird Banding Site, near Mudgee, N.S.W. (32° 24' S, 149° 50' E.).

TABLE 7
Mean capture rates per banding day each year at Blue Gum Swamp Creek for years 1979–1987.

| Species | 1979 | 1980 | 1981 | 1982 | Year 1983 | 1984 | 1985 | 1986 | 1987 |
|----------------------------|-------|-------|-------|-------|--------------|-------|-------|-------|-------|
| Brown Goshawk | 0.03 | — | — | — | — | — | — | — | — |
| Peaceful Dove | 0.13 | 0.04 | 0.06 | — | 0.09 | 0.20 | 0.22 | — | — |
| Gang-Gang | — | — | — | — | 0.09 | — | — | — | — |
| Crimson Rosella | — | — | 0.06 | 0.13 | 0.09 | — | 0.11 | 0.09 | — |
| Brush Cuckoo | 0.03 | — | — | — | — | — | — | — | — |
| Fan-tailed Cuckoo | 0.07 | 0.22 | 0.12 | — | — | — | — | — | — |
| Shining Bronze-Cuckoo | — | 0.04 | — | — | — | — | — | — | — |
| Azure Kingfisher | — | 0.04 | — | — | — | — | 0.11 | — | — |
| Laughing Kookaburra | — | — | — | — | — | — | — | 0.18 | — |
| Sacred Kingfisher | 0.03 | 0.04 | — | — | — | — | 0.11 | — | — |
| Rose Robin | 0.27 | 0.07 | 0.18 | — | 0.09 | — | 0.44 | 0.09 | 0.17 |
| Scarlet Robin | — | — | 0.06 | — | — | — | — | — | — |
| Eastern Yellow Robin | 0.83 | 0.74 | 0.59 | 0.67 | 1.09 | 1.60 | 1.33 | 1.36 | 0.78 |
| Shrike-tit | 0.07 | 0.04 | 0.06 | — | — | — | — | — | 0.07 |
| Golden Whistler | 0.83 | 0.67 | 0.82 | 0.67 | 1.09 | 1.20 | 1.33 | 0.55 | 0.83 |
| Rufous Whistler | 0.03 | 0.15 | — | — | 0.09 | — | — | 0.18 | 0.11 |
| Grey Shrike-thrush | 0.16 | 0.11 | — | 0.40 | 0.09 | 0.40 | 0.11 | 0.18 | 0.11 |
| Black-faced Monarch | 0.07 | — | 0.06 | — | 0.09 | — | 0.22 | 0.09 | — |
| Leaden Flycatcher | — | 0.04 | — | — | — | — | — | — | — |
| Rufous Fantail | 0.80 | 0.63 | 0.53 | 0.93 | 0.36 | 0.60 | 0.78 | 0.91 | 0.39 |
| Grey Fantail | 0.37 | 0.19 | 1.18 | 0.60 | 0.27 | 1.80 | 1.33 | 0.82 | 0.72 |
| Eastern Whipbird | 0.13 | 0.11 | 0.24 | — | 0.18 | — | — | 0.18 | 0.22 |
| Variegated Fairy-wren | 0.40 | 0.33 | 0.41 | 0.53 | 0.45 | 0.60 | 0.78 | 1.09 | 0.39 |
| Pilotbird | 0.03 | — | 0.12 | 0.13 | — | — | — | — | 0.06 |
| Origma | — | — | — | 0.20 | 0.09 | — | 0.11 | — | 0.11 |
| Large-billed Scrubwren | 0.17 | 0.22 | 0.29 | 0.13 | 0.82 | 0.60 | 0.33 | 0.18 | 0.17 |
| Yellow-throated Scrubwren | — | 0.04 | — | — | — | — | — | — | — |
| White-browed Scrubwren | 0.63 | 0.59 | 0.88 | 0.67 | 0.82 | 2.60 | 2.00 | 1.45 | 0.72 |
| Chestnut-rumped Hylacola | — | — | 0.06 | 0.07 | — | — | — | 0.09 | 0.06 |
| Brown Gerygone | 0.10 | 0.11 | — | 0.13 | 0.09 | — | 0.33 | — | — |
| Brown Thornbill | 0.87 | 1.00 | 1.01 | 1.47 | 1.91 | 1.80 | 2.22 | 2.36 | 1.61 |
| Buff-rumped Thornbill | 0.07 | — | — | — | — | — | — | — | — |
| Striated Thornbill | 0.37 | 0.56 | 1.18 | 1.60 | 1.09 | 0.60 | 0.33 | 0.55 | 0.50 |
| White-throated Treecreeper | 0.17 | 0.26 | 0.18 | 0.33 | 0.27 | 0.60 | 0.33 | 0.55 | 0.39 |
| Red-browed Treecreeper | 0.03 | 0.04 | — | — | — | — | 0.11 | — | 0.06 |
| Little Wattlebird | 0.03 | 0.15 | 0.06 | — | — | — | 0.22 | 0.09 | — |
| Lewin's Honeyeater | 0.17 | 0.41 | 0.24 | 0.20 | 0.73 | — | 0.67 | 0.27 | 0.50 |
| Yellow-faced Honeyeater | 3.93 | 1.63 | 2.12 | 3.13 | 1.09 | 1.60 | 1.67 | 1.09 | 1.28 |
| White-eared Honeyeater | 0.07 | 0.04 | 0.11 | 0.13 | 0.09 | — | 0.33 | 0.09 | 0.06 |
| Yellow-tufted Honeyeater | 0.07 | 0.63 | 0.06 | 0.07 | 0.27 | — | — | — | — |
| Brown-headed Honeyeater | 0.07 | 0.07 | 0.12 | 0.20 | 0.09 | — | 0.33 | — | — |
| White-naped Honeyeater | 0.03 | 0.07 | 0.06 | 0.33 | 0.18 | — | — | 0.18 | 0.17 |
| Crescent Honeyeater | 0.03 | 0.07 | 0.18 | 0.13 | — | — | 0.22 | 0.09 | 0.06 |
| New Holland Honeyeater | 5.37 | 8.19 | 3.88 | 3.80 | 7.18 | 9.20 | 16.56 | 5.18 | 6.67 |
| White-checked Honeyeater | 0.30 | 1.00 | 0.24 | 0.33 | — | 0.60 | 0.78 | — | 0.11 |
| Eastern Spinebill | 3.43 | 3.78 | 3.41 | 4.73 | 5.91 | 3.00 | 6.67 | 5.00 | 5.94 |
| Scarlet Honeyeater | — | 0.04 | — | — | — | — | — | — | — |
| Spotted Pardalote | 0.27 | 0.30 | 0.12 | 0.27 | 0.09 | 0.20 | 0.11 | — | 0.11 |
| Silveryeye | 2.10 | 2.33 | 0.24 | 3.07 | 0.45 | 1.40 | 1.44 | 0.82 | 0.17 |
| Red-browed Firetail | 1.17 | 1.70 | 1.71 | 2.47 | 1.64 | 2.20 | 3.22 | 1.73 | 1.39 |
| Beautiful Firetail | 0.10 | 0.19 | 0.06 | 0.13 | 0.18 | — | 0.11 | — | — |
| Olive-backed Oriole | — | — | — | — | — | — | 0.22 | — | — |
| Grey Butcherbird | — | 0.04 | — | 0.07 | — | — | — | — | — |
| Pied Currawong | — | — | 0.06 | — | — | — | 0.11 | — | — |
| No. of banding days | 30 | 27 | 17 | 15 | 11 | 5 | 9 | 11 | 18 |
| All species | 23.77 | 25.11 | 20.76 | 27.73 | 27.00 | 30.66 | 45.33 | 25.45 | 24.00 |

Our records suggest that few Yellow-faced Honeyeaters nest in the study site and we attribute the increase in numbers of this species in summer (Table 8) to an influx in response to the primary flowering period of the predominant nectar producing plants in both the canopy and the understorey (Table 1). There was also a peak in numbers of several other nectarivorous species at this time (Table 8). White-checked Honeyeaters were most common during February, and New Holland Honeyeaters also increased in February and March to near peak numbers after a post-breeding season decline. The most notable movement record for this site was that of a New Holland Honeyeater Banded at Munghorn Gap Nature Reserve, and recovered 158.4 km to the south-east (Table 6).

The decline in the New Holland Honeyeater population in 1981 (Table 7) followed the hazard-reduction fire which destroyed most of the *Banksia* species and associated heath habitat in the study area (Figs. 1 and 2). The increase in capture-rates in 1984 and 1985 for this species and for Eastern Spinebills was probably a response to the regeneration of the heath habitat.

Red-browed Firetails, on the other hand, may have benefited from the 1981 fire. Capture-rates increased in 1982 (Table 7), and we believe that the fire-induced succession of native grasses increased their food resources in the area formerly covered by dense heath. Stokes (1975), Recher, Allen and Gowing (1985) and Smith (1989) mention several species similarly advantaged by fire-altered habitat. The reasons for the decrease in capture-rates in 1983 and high rates again in 1984 and 1985 are not so readily explained. We believe the Red-browed Firetail flocks are locally nomadic in their search for food. This species may be short-lived relative to other species, but our recovery data and low recapture-rate (15.3% overall and 2.4% for juveniles – Table 3) tend to support this hypothesis. These recapture-rates are consistent with the results from several other banding studies in New South Wales (J. Hardy, D. I. Smedley, unpublished data).

The speed and intensity of the 1976, 1977 and 1982 wildfires were probably fatal to the majority of birds resident within the areas burnt, certainly from a depleted food supply if not as a direct consequence of the fire. The portions of Blue Gum Swamp, Springwood and Faulconbridge Creeks unburnt since 1975 (Fig. 2) were devastated in 1968 when an intense wildfire caused considerable destruction to natural areas over much of the Blue Mountains. These gullies, and an area to the south of Springwood, provided the only extensive areas of diverse habitat in the eastern half of the mountains which had not been burnt in recent years.

The numbers of adult New Holland Honeyeaters in breeding condition (active brood patches/prominent tubules) and of juveniles banded indicate that this area is a breeding stronghold for this species. As part of the study area and most nearby habitat was burnt during the period of the study (Figs. 1 and 2), an influx of juvenile birds from other areas was unlikely. The low recovery-rate for juveniles may be more a reflection of dispersal from the study area to surrounding habitats which were regenerating after fire than juvenile mortality.

The Eastern Yellow Robin, banded as a juvenile and recovered at Lawson (Table 5) was, at the time of writing, the longest recorded movement for this species. It is interesting to speculate that many of the progeny of resident pairs of several species may have successfully recolonized areas throughout the mountains previously ravaged by fire. Unfortunately, there are few readily accessible gullies with a habitat similar to that of Blue Gum Swamp Creek and too few banders to net these areas.

It is worth noting that at least three, and possibly five, of the eight birds recovered away from the site were killed by domestic cats or dogs (Table 5).

TABLE 8
Mean capture rates per banding day each month at Blue Gum Swamp Creek for years 1979–1987.

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Brown Goshawk | — | — | — | — | — | — | 0.11 | — | — | — | — | — |
| Peaceful Dove | 0.05 | 0.54 | — | 0.06 | 0.09 | — | — | — | — | — | — | 0.10 |
| Gang-Gang | — | — | — | 0.06 | — | — | — | 0.08 | 0.8 | — | — | — |
| Crimson Rosella | — | — | — | 0.13 | — | — | 0.22 | 0.08 | — | — | — | 0.10 |
| Brush Cuckoo | — | — | — | — | — | — | — | — | — | — | — | 0.10 |
| Fan-tailed Cuckoo | 0.11 | — | — | 0.31 | 0.18 | 0.10 | — | — | — | 0.15 | — | 0.20 |
| Shining Bronze-Cuckoo | 0.05 | — | — | — | — | — | — | — | — | — | 0.06 | 0.10 |
| Azure Kingfisher | 0.05 | 0.08 | — | — | — | — | — | — | — | — | — | — |
| Laughing Kookaburra | — | — | — | — | — | — | — | 0.17 | — | — | — | — |
| Sacred Kingfisher | 0.05 | 0.15 | — | — | — | — | — | — | — | — | — | — |
| Rose Robin | — | — | 0.17 | 0.50 | 0.55 | 0.20 | — | 0.25 | 0.67 | — | — | — |
| Scarlet Robin | — | — | 0.08 | — | — | — | — | — | — | — | — | — |
| Eastern Yellow Robin | 1.63 | 2.08 | 0.58 | 1.13 | 2.36 | 0.90 | 0.67 | 1.17 | 1.27 | 0.85 | 0.89 | 2.00 |
| Shrike-tit | 0.11 | — | — | — | — | — | — | — | 0.07 | — | 0.17 | 0.50 |
| Golden Whistler | 1.26 | 2.31 | 0.83 | 0.81 | 0.73 | 0.40 | 0.56 | 0.58 | 1.20 | 1.15 | 1.33 | 2.40 |
| Rufous Whistler | 0.11 | — | — | — | — | — | — | — | — | 0.46 | 0.06 | 0.50 |
| Grey Shrike-thrush | 0.05 | 0.23 | 0.25 | 0.31 | 0.27 | — | — | 0.25 | 0.07 | 0.23 | 0.22 | 0.40 |
| Black-faced Monarch | 0.21 | 0.15 | — | — | — | — | — | — | — | — | 0.06 | — |
| Leaden Flycatcher | 0.05 | 0.08 | — | — | — | — | — | — | — | — | — | 0.10 |
| Rufous Fantail | 1.47 | 2.77 | 0.33 | — | — | — | — | — | — | 0.92 | 1.22 | 2.30 |
| Grey Fantail | 0.58 | 0.62 | 0.67 | 0.56 | 0.36 | 0.70 | 0.33 | 0.50 | 1.73 | 0.85 | 0.67 | 1.10 |
| Eastern Whipbird | 0.21 | — | 0.33 | — | — | — | 0.11 | 0.25 | 0.40 | 0.31 | 0.11 | 0.40 |
| Variiegated Fairy-wren | 0.68 | 1.00 | 0.83 | 0.69 | 0.91 | 1.00 | 0.67 | 0.58 | 0.53 | 0.85 | 0.56 | 0.60 |
| Pilotbird | 0.05 | 0.15 | — | 0.06 | — | — | — | — | — | 0.08 | 0.11 | 0.10 |
| Origma | 0.05 | 0.08 | — | — | 0.09 | — | 0.22 | — | 0.07 | 0.08 | — | — |
| Large-billed Scrubwren | 0.42 | 0.62 | 0.08 | — | 0.45 | — | 0.22 | 0.33 | 0.60 | 0.31 | 0.44 | 0.10 |
| Yellow-throated Scrubwren | — | — | — | — | 0.09 | — | — | — | — | — | — | — |
| White-browed Scrubwren | 1.37 | 1.46 | 0.67 | 1.19 | 2.36 | 1.80 | 1.67 | 1.25 | 1.07 | 1.15 | 1.94 | 1.60 |
| Chestnut-rumped Hylacola | — | — | — | 0.06 | — | — | — | — | — | — | 0.06 | 0.20 |
| Brown Gerygone | — | — | — | 0.19 | 0.18 | 0.30 | — | — | 0.07 | 0.08 | 0.11 | — |
| Brown Thornbill | 0.89 | 2.15 | 1.42 | 1.69 | 3.36 | 2.60 | 1.44 | 2.25 | 1.67 | 2.31 | 1.50 | 2.00 |
| Buff-rumped Thornbill | — | — | — | — | — | — | — | 0.17 | — | — | — | — |
| Striated Thornbill | 0.26 | 0.54 | 1.25 | 0.31 | 2.36 | 2.70 | 1.11 | 0.75 | 0.80 | 1.15 | 0.83 | 0.60 |
| White-throated Treecreeper | 0.47 | 0.23 | 0.25 | 0.31 | 0.45 | 0.10 | 0.44 | 0.58 | 0.80 | 0.62 | 0.22 | 0.80 |
| Red-browed Treecreeper | 0.05 | — | — | — | — | — | 0.11 | — | 0.40 | 0.08 | 0.06 | 0.10 |
| Little Wattlebird | 0.26 | — | — | 0.19 | — | — | — | — | — | — | — | 0.20 |
| Lewin's Honeyeater | 0.42 | 0.31 | 0.25 | 0.44 | 0.64 | 0.40 | 0.22 | 0.33 | 0.93 | 0.15 | 0.39 | 0.10 |
| Yellow-faced Honeyeater | 1.84 | 2.08 | 0.58 | 0.69 | 7.18 | 4.00 | 5.44 | 0.67 | 0.40 | 0.46 | 0.50 | 5.90 |
| White-eared Honeyeater | 0.11 | 0.08 | 0.17 | 0.06 | 0.18 | 0.10 | — | — | — | — | 0.11 | 0.30 |
| Yellow-tufted Honeyeater | 0.47 | 0.69 | — | — | 0.18 | 0.30 | — | — | 0.07 | — | 0.06 | 0.30 |
| Brown-headed Honeyeater | 0.05 | — | — | — | 0.18 | — | 0.22 | 0.25 | 0.20 | 0.15 | 0.17 | 0.10 |
| White-naped Honeyeater | 0.11 | 0.08 | — | — | 0.18 | 0.40 | 0.89 | 0.50 | 0.13 | — | — | — |
| Crescent Honeyeater | 0.11 | 0.15 | 0.25 | 0.06 | 0.09 | — | 0.22 | — | 0.13 | — | 0.06 | — |
| New Holland Honeyeater | 5.26 | 12.92 | 11.58 | 7.56 | 9.45 | 7.00 | 6.89 | 6.00 | 7.47 | 5.08 | 13.22 | 7.40 |
| White-cheeked Honeyeater | 0.32 | 2.08 | 0.42 | 0.13 | 0.18 | 0.10 | 0.33 | 0.17 | 0.07 | 0.08 | 0.50 | 0.40 |
| Eastern Spinebill | 2.79 | 5.08 | 7.33 | 4.38 | 9.73 | 9.40 | 7.89 | 5.67 | 5.07 | 1.85 | 2.89 | 3.70 |
| Scarlet Honeyeater | 0.05 | — | — | — | — | — | — | — | — | — | — | — |
| Spotted Pardalote | 0.05 | 0.08 | — | 0.19 | — | — | 0.11 | 0.25 | 0.47 | 0.15 | 0.17 | 0.30 |
| Silvereye | 1.32 | 2.15 | 0.25 | 0.25 | 4.00 | 3.00 | 0.77 | 1.17 | 2.00 | 0.15 | 0.22 | 1.30 |
| Red-browed Firetail | 4.74 | 3.69 | 2.17 | 2.06 | 2.45 | 2.10 | 0.67 | 0.42 | 0.60 | 0.62 | 1.06 | 2.00 |
| Beautiful Firetail | 0.26 | 0.15 | — | 0.13 | 0.18 | — | — | — | — | 0.08 | 0.06 | 0.20 |
| Olive-backed Oriole | — | 0.15 | — | — | — | — | — | — | — | — | — | — |
| Grey Butcherbird | — | — | — | — | 0.09 | 0.10 | — | — | — | — | — | — |
| Pied Currawong | — | — | 0.08 | — | — | — | — | — | — | 0.08 | — | — |
| No. of banding days | 19 | 13 | 12 | 16 | 11 | 10 | 9 | 12 | 15 | 13 | 18 | 10 |
| All species | 28.42 | 44.92 | 31.08 | 24.50 | 49.45 | 37.70 | 31.56 | 24.67 | 28.93 | 20.46 | 30.00 | 38.40 |

| Species | Month | | | | | | | | | | | |
|---------------------------|-------|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| Brush Cuckoo | — | | | | | | | | | | | |
| Shining Bronze-Cuckoo | | | | — | | | | | | | | |
| Common Koel | | | | | | | | — | | | | |
| Channel-billed Cuckoo | | | | | | | | | — | | | |
| White-throated Needletail | | | | | | | | | | — | | |
| Sacred Kingfisher | | | | | | | | | | | — | |
| Dollarbird | | | | | | | | | | | | — |
| Tree Martin | | | | | | | | | | | | — |
| Cicadabird | | | | | | | | | | | | — |
| Rose Robin | | | | | | | | | | | | — |
| Rufous Whistler | | | | | | | | | | | | — |
| Black-faced Monarch | | | | | | | | | | | | — |
| Leaden Flycatcher | | | | | | | | | | | | — |
| Rufous Fantail | | | | | | | | | | | | — |
| White-throated Gerygone | | | | | | | | | | | | — |
| Scarlet Honeyeater | | | | | | | | | | | | — |

Figure 3. Periods of residence of species which are seasonal visitors to Blue Gum Swamp Creek. Scientific names are given in Tables 3 and 4.

Some of the migratory species, such as Rainbow Bee-eater, though listed in Table 4, were recorded only as 'flyovers' and therefore were not included in Figure 3. Scarlet Robins were trapped or sighted on only a few occasions during 1981 and 1982, so no period of residence has been determined. We have also excluded from Figure 3 isolated records of overwintering Rufous Whistlers. The period of residence indicated for the Channel-billed Cuckoo and Common Koel are for adults, but some juveniles have been recorded in the area for up to three weeks after the adults have departed. The arrival and departure dates of the White-throated Needletail were spasmodic, as first and last sightings were usually associated with storm fronts.

The Rufous Fantail was the most common and regularly captured of the summer visitors (Tables 3, 7 and 8). This species was colour-banded and results will be discussed in a future paper. The other summer visitors (Fig. 3, Tables 3, 4, 7 and 8) were uncommon to rare at the site, or were not often within the capture zone.

Our data indicate that Rose Robins are only present in the study site from mid-March until late September, but observations made in the Lower Blue Mountains extend this period by up to two weeks in both autumn and spring (K. Schaefer and P. Lester, pers. comm.). We believe that this species is an altitudinal migrant moving from the upper to the lower mountains and to the western plains of the Sydney Basin in the colder months. Rose Robins have not been recovered in subsequent years at or away from the study site.

The Yellow-tufted Honeyeater first appeared in 1979 and was relatively common until early 1983, but has not been sighted since. Its disappearance from Blue Gum Swamp Creek coincided with heavy, above average rainfall (Table 2). There is evidence of local movement by this species. A Yellow-tufted Honeyeater banded at Shaw's Creek, 5 km to the east, was recaptured at the study site in December, 1979 (Table 6). Another individual, banded at the study site, was recaptured at Shaw's Creek in September, 1980 (Table 5).

The fluctuation in numbers of birds caught from year to year was caused in part by an increase in the resident population of some species. Eastern Spinebills and New Holland Honeyeaters, for example, responded to improved habitat with the regeneration of heath after the hazard reduction fire in 1981 (Figs. 1 and 2) and possibly to improved nectar flow following above average rainfall during 1983 and 1984 (Table 8).

This outline of our results from the Blue Gum Swamp Creek banding study illustrates aspects of the study. It will be used as a 'base reference' for future papers which will discuss in detail the results obtained from species which were captured regularly or were colour-banded.

ACKNOWLEDGEMENTS

We thank Peter Thomas who started the project and without whom we may never have become involved with bird banding. We also acknowledge the assistance provided by several visiting banders, especially Win Filewood and Annette Cam, who visited the site more frequently than others; Warren Sweeney, Alan Vanderwielen, Ron Lachlan, Pam Donohue and others provided much appreciated assistance over the years; Neil Kirby assisted in plant identification; John Joyce verified flowering periods; Nicholas Gellie of the National Parks and Wildlife Service provided advice on limits of fires in the eastern Blue Mountains; Paul Lester and Ken Schaefer provided arrival and departure dates for some migratory species and the Bureau of Meteorology provided rainfall and temperature records. We acknowledge Judy and Peter Smith, Leighton Llewellyn and Geoff Smith for their useful and constructive comments on an early draft of this paper. Finally, we thank the National Parks and Wildlife Service for granting authority for the study to be undertaken in Blue Mountains National Park.

REFERENCES

- Beadle, N. C. W., Evans, O. D. and Carolin, R. C. (1982). 'Flora of the Sydney Region'. (A. H. & A. W. Reed: Sydney.)
- Blakers, M., Davies, S. J. J. F. and Reilly, P. N. (1984) 'The Atlas of Australian Birds'. (Melbourne University Press: Carlton.)
- Disney, H. J. (1974). Topography, colour and measurements. In 'Bird in the Hand'. (Ed. S. G. Lane) pp. 5,6. (Bird Banders Association of Australia: Sydney.)
- Ford, J. (1981). Evolution, distribution and stage of speciation in the *Rhipidura fuliginosa* complex in Australia. *Emu* 81: 128-144.
- Frith, H. J. (1969). Grey Fantail *Rhipidura fuliginosa*. In: 'Birds in the Australian High Country'. (A. H. & A. W. Reed: Sydney.)
- Horey, G. M. and Wilson S. J. (1971). A banding project in the Brindabella Ranges, Australian Capital Territory. *Aust. Bird Bander* 9: 27-33.
- Lane, S. G. (1969). Tumbi Umbi banding summary. *Aust. Bird Bander* 7: 27-32.
- Lane, S. G. (1987). Data record cards: their history and method of use. *Corella* 11: 121-123.
- Marchant, S. (1980). Incubation and nesting periods of some Australian birds. *Corella* 4: 30-32.
- Marchant, S. (1981). The breeding season at Moruya, N.S.W. *Corella* 5: 19-25.
- Marchant, S. (1982). The sedentary nature of passerine birds in woodland at Moruya, New South Wales. *Corella* 6: 87-88.
- Recher, H. F., Allen, D. and Gowing, G. (1985). The impact of fire in an intensively logged forest. In 'Birds of eucalypt Forests and Woodlands: Ecology, Conservation, Management'. (Eds A. Keast, H. F. Recher, H. Ford and D. Saunders) pp. 283-290. (Surrey Beatty & Sons: Chipping Norton.)
- Smith, P. (1989). Changes in a forest bird community during a period of fire and drought near Bega, New South Wales. *Aust. J. Ecol.* 14: 41-54.
- Stokes, T. (1975). The effect of a bushfire on the banding of Flame Robins in the Brindabella Ranges. *Aust. Bird Bander* 13: 75-76.
- Tidemann, S. C., Wilson, S. J. and Marples, T. G. (1988). Some results from a long-term bird-banding project in the Brindabella Range, A.C.T. *Corella* 12: 1-6.