Corella, 1995, 19(2): 55–60

ABUNDANCE, SITE FIDELITY, MORPHOMETRICS AND SEX RATIOS OF SCARLET HONEYEATER *Myzomela sanguinolenta* AT A SITE IN SOUTH-EAST QUEENSLAND

S. J. M. BLABER
33 Wuduru Road, Cornubia, Queensland 4130

Received 5 April, 1994

Scarlet Honeyeaters were banded at a study site at Mount Cotton, south-east Queensland from 1986 to 1993. The site consisted of sclerophyll woodland, creek vegetation and a rural garden. There was a marked seasonal change in Scarlet Honeyeater abundance, with numbers increasing from a minimum in March to a maximum in August followed by a decline to December. No birds were recorded in January or February. There was no significant interannual variation in mean trapping rates. The numbers of birds caught each month were significantly and negatively correlated with rainfall. Changes in abundance may not be related to availability of blossoms. Morphometric data indicate that males have significantly greater wing, tail and tarsus lengths than females, and are heavier. The sex ratio was skewed in favour of males (3:2) and this phenomenon is discussed. Retrap data show that a small proportion of birds return annually to the study site and are resident for part of the year. The remaining birds were assumed to be passage migrants, possibly moving inland to the Dividing Range during the wet season.

INTRODUCTION

The nominate subspecies of the sexually dimorphic Scarlet Honeyeater *Myzomela sanguinolenta sanguinolenta* occurs along most of the east coast of Australia, with an additional 10 subspecies extending in an arc through the Lesser Sundas (e.g. Tanimbar Is., Scram Is.) to the Molluccas and Sulawesi (White and Bruce 1986). It does not occur in New Guinea.

In Australia the species is nomadic in the southern part of its range, particularly around Sydney, but northern populations may be more resident (Longmore 1991). Despite its broad geographic range and abundance in eastern Australia, the species has received relatively little attention. The sparse information on its seasonal abundance was summarized by Keast (1968), while its general food requirements and habitat preferences in relation to other meliphagids have been discussed by Ford and Paton (1985). The adaptive radiation and morphometrics of the genus were compared with African counterparts by Keast (1984) and isolated observations on breeding, such as that of Wolstenholme (1930), have been summarised by Longmore (1991). An anomaly in the sex ratio, with coloured males greatly outnumbering brown females, has also been reported (Longmore 1991). Outside Australia, published information is limited to casual observations (e.g. Forbes 1885) and brief studies (e.g. Ripley 1959).

As part of a long-term banding study in sub-coastal south-east Queensland, particular attention was paid to Scarlet Honeyeaters. The main objectives of the study were to (a) monitor monthly and annual cycles of abundance, (b) to obtain detailed information on morphometric differences between the sexes and accurately describe the sex ratio, (c) to examine interannual site fidelity, and (d) to relate these to the life history and ecology of the species.

METHODS

The study site (27°39′30″S, 153°13′45″E; 15 m ASL) near Mount Cotton consists of a 4.5 ha area of primary sclerophyll forest, some creek vegetation and a rural garden planted with numerous *Callistemon*, *Grevillea* and *Melaleuca* species. The site is contiguous with large areas of sclerophyll forest although these are gradually becoming fragmented by development.

Mist nets were used to capture birds at established net sites. The sampling strategy was based on the 'constant effort principle' (Underhill and Oatley 1989) and nets were set (from sunrise to sunset) as often as possible from March 1986 until December 1993. A total of 586 days netting was conducted in the 2825-day sampling period (21%). The number of days netting each month and year are shown in Table 1.

TABLE 1

Number of days mist netting each month and year at Mount Cotton study site.

Year Month	86	87	88	89	90	91	92	93	Total
January	—	8	12	5	12	6	4	6	53
February	—	2	5	12	7	8	4	2	40
March	—	3	3	—	9	8	2	2	27
April	7	2	6	5	20	10	7	12	69
May	8	9	10	11	7	8	9	4	66
June	6	4	7	8	10	—	2	—	37
July	7	1	5	11	11	—	6	8	49
August	3	5	4	7	8	8	10	4	49
September	6	5	6	6	7	8	2	6	46
October	7	6	12	9	6	8	8	3	59
November	2	2	6	3	11	7	4	2	37
December	5	7	8	13	3	6	4	8	54
Total	51	54	84	90	111	77	62	57	586

TABLE 2

Trap rate per day of Scarlet Honeyeaters (including retraps) for each month of each year and overall mean trap rate *(tr)* (including retraps) at the Mount Cotton study site (— = no trapping; 0 = no birds caught; S.E. = Standard Error).

Year Month	86	87	88	89	90	91	92	93	*tr* mean	S.E.
January	—	0	0	0	0	0	0	0	0.00	—
February	—	0	0	0	0	0	0	0	0.00	—
March	—	0	0	—	0	0	0	0.5	0.06	0.06
April	0.14	0	0.17	0.4	0	0	0.29	0.5	0.19	0.07
May	0	0	0.2	0	0	0	0.56	0.75	0.19	0.10
June	0	0	0.86	1.25	0.6	—	4.0	—	0.84	0.48
July	0.29	1.0	0.2	0.64	0.36	—	3.33	2.13	0.99	0.41
August	1.0	1.0	0	2.0	3.38	1.63	1.3	2.25	1.57	0.36
September	1.0	0.4	0.17	1.83	0.43	2.88	1.0	2.33	1.26	0.35
October	0.29	0.17	0.17	1.44	0.67	0.13	0.38	0	0.41	0.16
November	0	0	0	0	0	0.14	1.25	0	0.17	0.15
December	0	0	0	0	0	0.25	0	0	0.03	0.03

All birds were banded using bands supplied by the Australian Bird and Bat Banding Scheme. All morphometric measurements and ageing were performed using standard techniques, as described in the Australian Bird Banders Manual (Lowe 1989). Rainfall has been monitored daily at the study site since 1977.

RESULTS

Seasonal and interannual abundance

Scarlet Honeyeaters were caught in all months except January and February. The mean trap rate increased from 0.06 birds per day in March to a high of 1.57 in August, thereafter declining to 0.03 in December (Table 2). The months of peak abundance were from June to September. The mean trap rates per month in each year are also shown in Table 2.

The overall mean trap rates (based on mean monthly trap rates) for each year from 1986 to 1993 are shown in Figure 1. Although this mean showed marked interannual variation, variances within years were high and hence interannual means were not significantly different.

Correlations with rainfall

Annual rainfall totals at the study site from 1978 to 1993 are plotted in Figure 2. These ranged from 693 mm in 1993 to 1 875 mm in 1988.

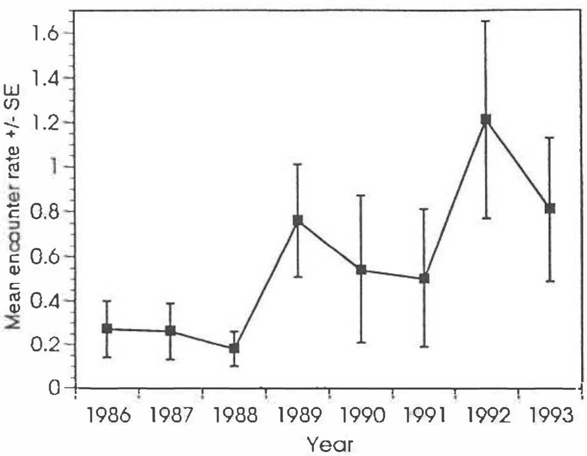

Figure 1. *Overall mean (±S.E.) trap rate of Scarlet Honeyeaters at Mt Cotton study site.*

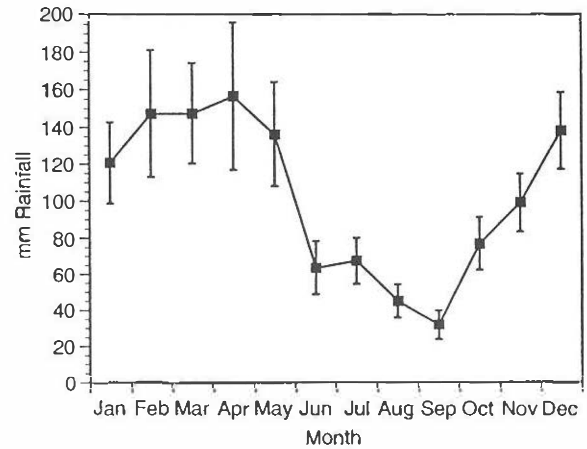

Figure 3. *Monthly 15 year (1978–1993) rainfall means (±S.E.) at Mt Cotton study site.*

Monthly 15-year means are shown in Figure 3 and indicate that most rain falls between December and May with a low in September, although the monthly variances are very high.

Multiple regression analyses were used to examine any correlations between the abundance of Scarlet Honeyeaters and rainfall. Rainfall was chosen because it is the only major environmental variable which shows high variation between months and years, whereas temperature and day-length follow the same pattern every year. The monthly trap rate of birds was significantly negatively correlated with monthly rainfall ($r = -0.322$, n = 89, $P < 0.001$). Similarly, monthly mean trap rates were negatively correlated with 15 year monthly mean rainfall ($r = -0.894$, n = 12, $P < 0.001$). Mean yearly trap rates were not significantly correlated with yearly rainfall totals.

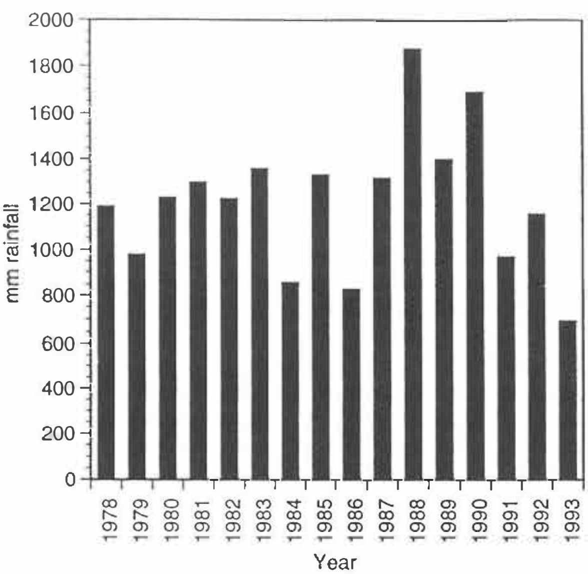

Figure 2. *Annual rainfall totals (1978–1993) at Mt Cotton study site.*

Feeding

Scarlet Honeyeaters were seen feeding on blossoms of the following trees and shrubs in the study area (I = known to have been introduced into the area): *Calliandra haematocephala* (I), *Callistemon viminalis*, *Grevillea pteridifolia*, *G. robusta*, *G. sessilis*, *G. venusta*, *Grevillea* spp. (various hybrids) (I), *Lophostemon confertus*, *Melaleuca leucodendron*, *M. linariifolia*, *M. quinquenervia*, *M. viridiflora* and *Westringia grandifolia* (I). They were not seen feeding on the blossoms of any *Eucalyptus* or *Acacia* species, both of which outnumber the genera listed above.

Morphometrics

Measurements of wing length, tail length, tarsus length and weight of male and female Scarlet Honeyeaters are shown in Table 3. Although there is some overlap, males have

TABLE 3

Measurements of wing length, tail length, tarsus length and weight of Scarlet Honeyeaters from Mount Cotton study site.

	Male	Female
WING (mm)		
n	115	43
$\bar{x}$	58.3	54.6
SE	0.16	0.22
min–max	54–62	51–59
TAIL (mm)		
n	114	62
$\bar{x}$	37.4	34.1
SE	0.19	0.19
min–max	34–47	30–37
TARSUS (mm)		
n	111	43
$\bar{x}$	14.4	14.1
SE	0.05	0.08
min–max	13.2–16.5	13.2–16.0
WEIGHT (g)		
n	166	66
$\bar{x}$	8.59	8.12
SE	0.08	0.11
min–max	6.0–11.0	6.0–10.0

significantly longer wing ($t = 12.8$, $P < 0.001$), tail ($t = 11.2$, $P < 0.001$) and tarsus ($t = 2.9$, $P < 0.01$) than females, and are usually heavier.

Sex ratios

The overall sex ratio, comparing males and females from either all newly captured individuals (119 males, 80 females) or all traps (including retraps) (171 males, 112 females), was 3:2 in favour of males. The monthly numbers (all years combined) of each sex are shown in Figure 4. More males than females were caught in most months but both sexes showed similar monthly patterns of abundance. Juvenile birds of unknown sex were rarely captured (four individuals) and were recorded only in October and November.

Nesting was recorded only twice in the study area, once at about 10 m high in a *Lophostemon confertus*, and once in a *Leptospermum* sp. at a height of about 5 m, both during winter. No further details on breeding are available.

Retraps and site fidelity

The number of retraps showed the same monthly abundance pattern as the overall trap rate, as well as the trap rate for newly captured

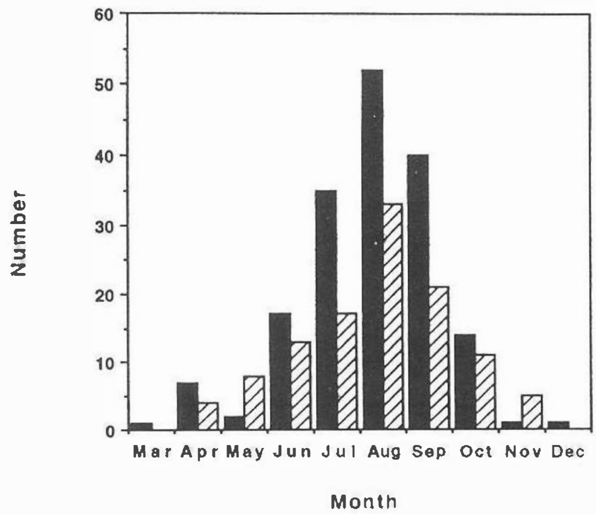

Figure 4. *Monthly sex ratios (1986–1993) of Scarlet Honeyeaters at Mt Cotton study site (males: black, females: white).*

birds. The site fidelity of individual birds is plotted in Table 4. A small proportion of birds return to the study site on a regular basis, with the oldest retrap being at least seven years old. Multiple retrap data within the same year shows that some birds spend up to four months in or around the study area (Table 4). However, the majority of birds that were banded were not retrapped.

DISCUSSION

Although Scarlet Honeyeaters were recorded at the study site in all but two months of the year, they show a regular seasonal cycle of abundance, appearing first in March/April and disappearing after December. Keast (1968) proposed a relationship between the amount and reliability of rainfall and the degree of residency shown by species within a community of honeyeaters. Peak numbers of Scarlet Honeyeaters in the Mt Cotton area were in the winter or dry season, and the present results indicate that their abundance was significantly negatively correlated with rainfall. A similar pattern of dry season abundance was recorded on Peel Island, south-east Queensland by Agnew (1921) and at Wellington Point by Robertson and Woodall (1983).

Scarlet Honeyeaters are nectar feeders (Longmore 1991) and were classified as 'blossom nomads' by Keast (1968) and hence their movements may also be influenced by the availability

TABLE 4

Site fidelity, maximum recorded residence time and minimum final age of retrapped Scarlet Honeyeaters at Mount Cotton study site (× = captured, — = not caught, m = male, f = female).

Year / Number	86	87	88	89	90	91	92	93	Maximum residence in months	Minimum age years/sex
03412	×	×	×	—	—	—	—	—	—	3/m
03422	×	—	—	×	×	—	—	—	1	5/m
03439	×	—	—	—	×	—	—	—	—	5/f
03442	×	×	—	×	×	×	×	—	4	7/f
03477	—	×	—	×	×	—	—	—	2	4/m
13318	—	—	—	×	—	—	—	×	1	5/m
13327	—	—	—	×	×	—	—	—	4	2/f
13331	—	—	—	×	×	—	—	—	—	2/m
20820	—	—	×	—	×	—	×	—	—	5/m
20866	—	—	—	×	×	—	×	×	4	5/m
20868	—	—	—	×	×	—	—	×	—	5/m
20881	—	—	—	×	×	—	×	—	2	4/m
20883	—	—	—	—	×	—	×	—	—	3/f
20899	—	—	—	×	×	—	×	—	1	4/m
46363	—	—	—	—	—	×	×	—	1	2/f
91973	—	—	—	—	—	—	×	×	—	2/m
92041	—	—	—	—	—	—	×	×	2	2/m
92048	—	—	—	—	—	—	×	×	—	2/m

of blossoms. However, they were observed feeding on a wide range of blossoms in the study area, some of which were available during periods when *M. sanguinolenta* was absent. They have also been recorded feeding on both insects and seeds (Blakers *et al.* 1984). There was considerable site fidelity with a small proportion of birds remaining in the study site for several months, feeding on a variety of blossoms. These data suggest that absence of blossoms was not a primary factor influencing the seasonality of Scarlet Honeyeaters in the study area.

The present study shows that at the study site the population of Scarlet Honeyeaters consists of a small number of regular migrants that return to the site for several months, plus a larger number of birds caught only once suggesting that they were passing through the area. This pattern accords with the observation by Blakers *et al.* (1984) that some birds in south-east Queensland may be winter visitors and others passage migrants. It is interesting that at times of minimum abundance in the Mt Cotton area, the species is at its most abundant on the eastern slopes of the Dividing Range in the Toowoomba region (Lord 1956). Similarly, I have recorded Scarlet Honeyeaters in the summer months, but not the winter months, in the Mt Barney area of the Dividing Range. Hence it is possible that the Mt Cotton birds move inland during times of peak rainfall in the summer. They may also represent southern birds moving north, but this seems less likely as the species occurs in coastal New South Wales in winter and spring (Keast 1968) and reporting rates for the Atlas showed little change between summer and winter (Blakers *et al.* 1984).

The morphometric data from this study confirms the general measurements given by Longmore (1991) (wing — 60 mm; tail — 38 mm; weight — 8–9 g; females slightly smaller than males) with the exception of the tarsus measurement. Longmore's (1991) value of 17 mm for tarsus is greater than the maximum of 16.5 mm recorded in this study. This discrepancy could be due to different methods of measuring tarsus length — that used in this study was *tarsus length with foot (TZ)* (Lowe 1989) because it is the easiest to perform and most consistent.

The biased sex ratio of 3:2 in favour of males in the study area is difficult to explain without further data, but confirms previous suggestions that males make up a greater proportion of the population than females (Longmore 1991). A similar sex ratio bias has been recorded for Eastern Spinebill *Acanthorhynchus tenuirostris*

(Farrell and Hardy 1993). Different susceptibilities to trapping would not seem to be a factor with Scarlet Honeyeaters, as both sexes feed on the same blossoms, and there is no evidence that females fly or feed higher than males. The wide variety of factors influencing sex ratio in birds was reviewed by Clutton-Brock (1986), and in a recent review of the effects of sexual size dimorphism and biased sex ratios, Stamps (1993) stated that age structure and maturation patterns (for which no data are available for Scarlet Honeyeaters) were essential for studies of taxa with asymptotic growth after maturity.

ACKNOWLEDGMENTS

The Australian Bird and Bat Banding Scheme supplied bands for this study. I am very grateful to Tessa Blaber for assistance in the field and to Geoff Smith for commenting on an earlier draft of the manuscript.

REFERENCES

Agnew, N. V. I. (1921). The birds of Peel Island. *Emu* **13**: 93–97.

Blakers, M., Davies, S. J. J. F. and Reilly, P. N. (1984). 'The Atlas of Australian Birds'. (Melbourne University Press: Melbourne.)

Clutton-Brock, T. H. (1986). Sex ratio variation in birds *Ibis* **128**: 317–329.

Farrell, J. R. and Hardy, J. W. (1993). Survival, seasonal abundance, sex ratio and diet of Eastern Spinebills *Acanthorhynchus tenuirostris* in the Blue Mountains, New South Wales. *Corella* **17**: 33–40.

Forbes, H. O. (1885). 'A naturalists wanderings in the eastern archipelago, a narrative of travel and exploration from 1878 to 1883'. (Harper and Brothers: New York.)

Ford, H. A. and Paton, D. C. (1985). Habitat selection in Australian honeyeaters, with special reference to nectar productivity. In 'Habitat selection in birds' (Ed. M.L. Cody). (Academic Press: New York.).

Keast, A. (1968). Seasonal movements in the Australian honeyeaters (Meliphagidae) and their ecological significance. *Emu* **67**: 159–209.

Keast, A. (1984). The origins of adaptive zone utilizations and adaptive radiations, as illustrated by the Australian Meliphagidae. *16th International Ornithological Congress* 71–82.

Longmore, W. (1991). 'Honeyeaters and their allies of Australia'. (Angus and Robertson: Sydney.)

Lord, E. A. R. (1956). The birds of Murphy's Creek district, southern Queensland. *Emu* **56**: 100–128.

Lowe, W. (1989). 'The Australian Bird Banders Manual'. (Australian Bird and Bat Banding Schemes. A PWS: Canberra.)

Ripley, S. D. (1959). Competition between sunbird and honeyeater species in the Moluccan Islands. *Amer. Nat.* **93**: 127–132.

Robertson, J. S. and Woodall, P. F. (1983). The status and movement of honeyeaters at Wellington Point, south-east Queensland. *Sunbird* **13**: 1–14.

Stamps, J. A. (1993). Sexual size dimorphism in species with asymptotic growth after maturity. *Biol. J. Linn. Soc.* **50**: 123–146.

Underhill, L. G. and Oatley, T. B. (1989). Measured effort sites — a potential SAFRING project. *SAFRING News* **18**: 47–48.

White, C. M. N. and Bruce, M. D. (1986). 'The birds of Wallacea (Sulawesi, The Moluccas and Lesser Sunda Islands, Indonesia): an annotated checklist. (BOU: London.)

Wolstenholme, H. (1930). Triple nesting of the Scarlet Honeyeater. *Emu* **29**: 264-266.