

## Camden Airport, New South Wales

(Abridged version – full paper can be obtained from:  
<https://absa.asn.au/pub/aactt-full-bandings-reports/>)

**Aim:** Avian research at Camden Airport commenced in March 2007 at the request of the Environmental Officer for Bankstown Airport Authority. This research is part of an ongoing longitudinal study to document and monitor the avian faunas occupying the River Flat Forest adjacent to the Nepean River in the south-eastern sector of the Cumberland Plain, and forms part of a broader study of the avifaunas across the Cumberland Plain.

**Location:** 34° 02' 53" S; 150° 40' 48" E. Elevation 61 m asl. The banding sites are adjacent to the Nepean River along the edge of Camden Airport (Fig. 1), approximately two km WNW of Camden, New South Wales (NSW).

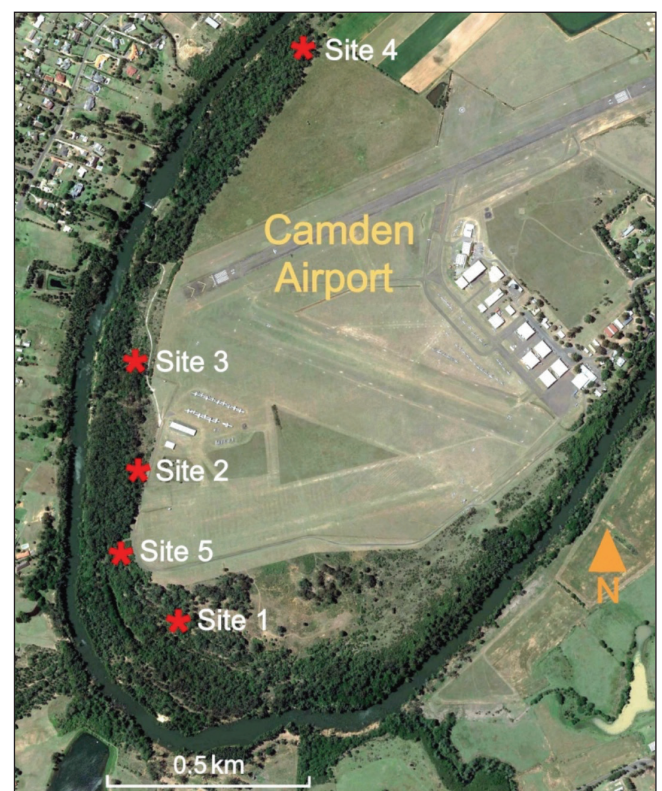
**Description:** Camden Airport (Fig. 1) is adjacent to the Nepean River and covers an area of 196 ha, with 54 ha designated as an Environmentally Significant Zone in the Camden Airport Draft Master Plan 2015 (Camden Airport Ltd. 2015). The River Flat Forest is an endangered ecological community listed under the *NSW Threatened Species Conservation Act 1995*. The soil is of sandy alluvial origin. Native vegetation within the study site is listed in Tozer (2003) as Unit 1 *Shale/Sandstone Transition Forest (Low Sandstone Influence)* and Unit 12 *Riparian Forest*.

Native canopy vegetation consists of Broad-leaved Apple *Angophora subvelutina*, Rough-barked Apple *A. floribunda*, River Peppermint *Eucalyptus elata*, Cabbage Gum *E. amplifolia*, Forest Red Gum *E. tereticornis*, Camden White Gum *E. benthamii*, Ribbon Gum *E. viminalis*, River Oak *Casuarina cunninghamiana* and White Cedar *Melia azedarach*. The understorey includes Coast Myal *Acacia binervia*, Sally Wattle *A. florabunda*, Green Wattle *A. decurrens*, Willow-leaved Hakea *Hakea salicifolia*, Plum-leaf Pomaderris *Pomaderris prunifolia*, Tick Bush *Kunzia ambigua* and Blackthorn *Bursaria spinosa*. Introduced species include African Olive *Olea europaea* ssp *cuspidata*, Large-leaf Privet *Ligustrum lucidum*, Narrow-leaf Privet *L. sinense* and Honey-locust, *Gleditsia triacanthos* (Benson and Howell 1990; Benson 1992; Howell *et al.* 1994; Thomas 2001; Tozer 2003).

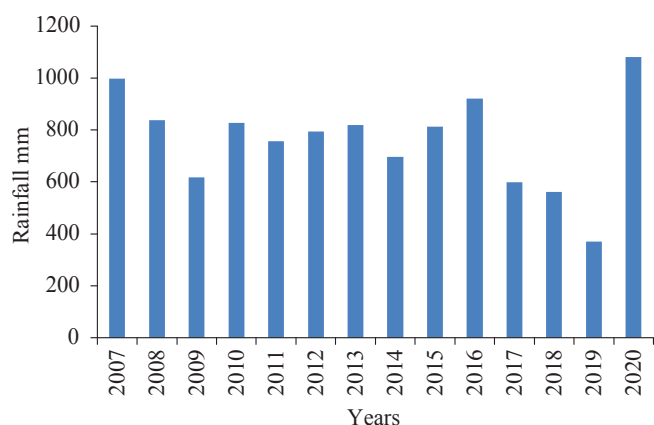
The River Flat Forest has been highly modified over many years. Most of the large eucalypts along the river bank were removed during World War II (Macarthur-Onslow 2013), and hence most of the eucalypts present now are secondary growth. Extraction of sand and soil from the woodland area and the Nepean River in the early 1980s further altered the vegetation and has severely modified the river, river bank structure and the topography of the woodland site (Hubble 2001). The woodland is currently heavily infested with a woody weed understorey which is slowly being removed from some sections of the riparian area. The Nepean River floods into the forest and airport area on an approximately twelve-year cycle. (WorleyParsons 2015).

**Status History:** Camden Airport is located in one of Australia's earliest farming areas. In 1812, 400 acres were granted by Governor Macquarie to the missionary sheep breeder, Rowland Hassall, who established the farming property "Macquarie Grove". The Macarthur-Onslow family acquired the land in 1916. An airstrip was constructed on the Macarthur-Onslow property in 1935 and operated as a private Flying School. In 1940 at the onset of WWII, the property was handed over to the Commonwealth for war time service (Macarthur-Onslow 2013). Camden Airport is currently owned by Sydney Airports Corporation.

**Previous Ornithological Records:** Few ornithological records exist for the site; one paper has been published on Bell Miners, *Manorina melanophrys* at the Australian Botanic Garden, Mount Annan and Camden Airport sites (Lambert and Leishman, 2020). During the period of the present study six reports on the banding study have been submitted to the Sydney Airport Corporation (Leishman and Leishman 2008, 2009, 2012, 2014, 2016 and 2019).



**Figure 1.** Satellite image of the Camden Airport, showing the location of the five banding sites used during this study (see Table 1 for details of sites).



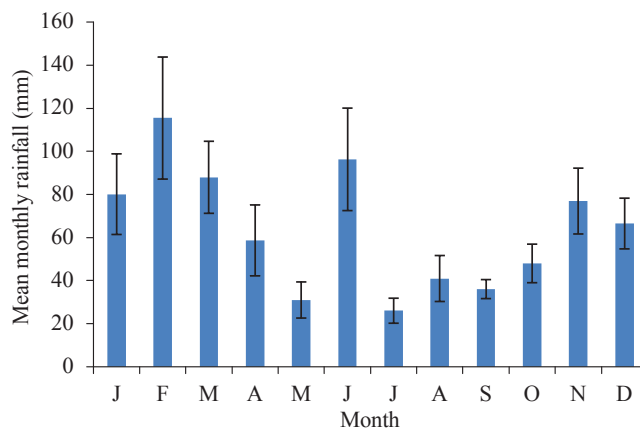
**Figure 2.** Yearly rainfall (mm) for Camden Airport 2007 to 2020, data from Camden Airport weather site.

**Duration of Project:** July 2007 – December 2020. Banding visits were carried out monthly, depending on suitable weather and availability of researchers.

**Meteorological Data:** Rainfall data for the period of the banding study have been taken from the automated Bureau of Meteorological Weather Site (No. 68192) located within Camden Airport.

The mean yearly rainfall at Camden Airport over the 14 year study period was 764 mm, (Fig. 2). Average rainfall for the years 1943 to 2020 was above this mean, being 789 mm. Three years (2017 to 2019) were dry, with only 67% of the usual mean rainfall being recorded. During the 14 months from July 2017 to August 2018, only 331 mm of rain were recorded, about 40% of the normal rainfall for that period. Camden Airport has experienced significant seasonal variation in monthly rainfall (Fig. 3). There has been a recent general trend towards drier conditions across south-eastern Australia from April to October, with a decline of around 12% in rainfall since the late 1990s (BOM 2020).

The summer of 2018–19 was Australia’s hottest on record. December and January were each the hottest on record, and



**Figure 3.** Mean monthly rainfall ( $\pm$  standard error) for the period 2007 to 2020.

February the fourth-hottest. It was also the hottest summer on record (1.35°C above the previous record) for NSW (BOM 2019).

## METHODS

Banding was conducted monthly (total visits = 30) when the banding was generally carried out on one day per month, weather permitting, in the River Flat Forest adjacent to the Nepean River. The number of banding days per year ranged from 8 to 14 (mean 11.3). On most occasions, seven or eight 12 m nets, mesh size 32 mm, were erected, giving a total average length of 90 m (range 84 – 96 m). These were open from sunrise for an average of 4.6 hours (range 3.5 – 5.5 hours). Banding was carried out at the five different sites displayed on Figure 1 and described in Table 1. Nets were erected in the same positions at a site during each banding session and all net sites were numbered with known co-ordinates. The capture sites for all individuals were recorded on banding data sheets and recapture cards. Birds were individually marked using bands supplied by the Australian Bird and Bat Banding Schemes (ABBBS).

Capture rates are presented as the number of birds trapped (both ‘new’ and recaptured) per 100 m of net erected per hour.

**Table 1**

Banding site details at Camden Airport, showing site number; location (lat/long); elevation; number of banding days at each site; total number of birds caught; birds/100m net/ hour; percentage of total catch at each site; and number of species caught at each site.

Site	Lat/Long	Elevation metres	Number banding days	Total birds caught	Birds/100m net/hour	% catch over all sites	No. different species caught	Comment
1	34° 02' 52.50"S 150° 40' 46.60"E	64	48	1627	8.12	33.44	36	
2	34° 02' 42.67"S 150° 40' 44.01"E	67	8	241	7.87	4.95	20	Only operated from Jul. 2008 to June 2009
3	34° 02' 32.62"S 150° 40' 42.76"E	64	58	2165	10.26	44.50	39	
4	34° 02' 06.33"S 150° 40' 58.56"E	67	7	368	13.85	7.56	21	Access closed after 7 visits in 2011
5	34° 02' 47.62"S 150° 40' 42.42"E	68	16	464	7.96	9.53	32	
<b>TOTALS</b>			<b>137</b>	<b>4865</b>	<b>9.36</b>	<b>100</b>	<b>52</b>	

Table 2

Banding site details at Camden Airport, showing site number; location (lat/long); elevation; number of banding days at each site; total number of birds caught; birds/100m net/ hour; percentage of total catch at each site; and number of species caught at each site.

SPECIES	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total birds caught	No. banded	Individuals retrapped		
																	No.	%	No. times
Common Bronzewing <i>Phaps chalcoptera</i>		0.04													1	1			
Bar-shouldered Dove <i>Geopelia humeralis</i>	0	0.11								0.02		0.05			7	7			
Australian King-Parrot <i>Alisterus scapularis</i>		0.04			0.03	0.06	0.02								5	5			
Crimson Rosella <i>Platycercus elegans</i>		0.00								0.02					1	1			
Eastern Rosella <i>Platycercus eximius</i>		0.04			0.06	0.06		0.07	0.03	0.02		0.03			11	11			
Shining Bronze-Cuckoo <i>Chalcites lucidus</i>				0.03									0.03		2	2			
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>						0.03							0.03		2	2			
Laughing Kookaburra <i>Dacelo novaeguineae</i>						0.03									1	1			
Sacred Kingfisher <i>Todiramphus sanctus</i>			0.03					0.04	0.03		0.05			0.02	7	6	1	16.7	1
White-throated Treecreeper <i>Cormobates leucophaeus</i>	0	0.04	0.03	0.03								0.03		0.09	9	6	3	50.0	3
Satin Bowerbird <i>Ptilonorhynchus violaceus</i>	0.3	0.25			0.18	0.34		0.20	0.10	0.12	0.10			0.02	57	51	4	7.8	6
Superb Fairy-wren <i>Malurus cyaneus</i>	0.4	0.72	0.77	0.97	1.97	0.57	1.12	0.38	0.68	0.38	0.25	0.26	0.25	0.42	331	188	80	42.6	143
Variiegated Fairy-wren <i>Malurus lamberti</i>						0.03	0.02	0.07	0.03						6	5	1	20.0	1
White-browed Scrubwren <i>Sericornis frontalis</i>	1	1.01	0.88	0.70	0.85	0.62	0.77	0.29	0.65	0.85	0.69	0.93	0.67	0.48	379	184	88	47.8	195
Brown Gerygone <i>Gerygone mouki</i>			0.05	0.06			0.19	0.04	0.03	0.09	0.10	0.34	0.03	0.16	44	36	4	11.1	8
Striated Thornbill <i>Acanthiza lineata</i>		0.04									0.02				2	2			
Yellow Thornbill <i>Acanthiza nana</i>			0.05	0.03			0.02				0.05	0.08	0.03	0.05	12	10	2	20.0	2
Brown Thornbill <i>Acanthiza pusilla</i>	0.2	0.43	0.44	0.32	0.35	0.14	0.12	0.18	0.26	0.21	0.17	0.13	0.20	0.25	125	81	28	34.6	44
Spotted Pardalote <i>Pardalotus punctatus</i>	0				0.03		0.02			0.02		0.03	0.03		6	6			
Eastern Spinebill <i>Acanthorhynchus tenuirostris</i>	0.2	0.14	0.13	0.32	0.21	0.28	0.12	0.58	0.26	0.19	0.07	0.57	0.28	0.21	134	108	20	18.5	26
Lewin's Honeyeater <i>Meliphaga lewinii</i>	0.3	0.50	0.23	0.18	0.32	0.40	0.16	0.40	0.10	0.28	0.17	0.28	0.34	0.28	146	85	28	32.9	61
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>			0.08	0.12			0.12	0.00	0.00		0.02	0.10	0.06	0.05	21	18	2	11.1	3
Bell Miner <i>Manorina melanophrys</i>	4	3.46	0.85	0.56	2.26	4.71	0.68	4.41	1.97	3.95	0.39	0.03		0.02	993	779	163	20.9	214
Little Wattlebird <i>Anthochaera lunulata</i>						0.03				0.02					2	2			
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>			0.03									0.05		0.16	10	10			
White-naped Honeyeater <i>Melithreptus lunatus</i>												0.03			1	1			
Eastern Whipbird <i>Psophodes olivaceus</i>			0.08	0.09	0.09	0.03	0.05	0.02	0.03		0.02	0.03	0.08		19	17	2	11.8	2
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>												0.07			3	3			
Crested Shrike-tit <i>Falcunculus frontatus</i>			0.05									0.03			3	3			
Golden Whistler <i>Pachycephala pectoralis</i>	0.2	0.14	0.28	0.41	0.44	0.43	0.26	0.22	0.26	0.33	0.22	0.39	0.45	0.39	167	99	32	32.3	68
Rufous Whistler <i>Pachycephala rufiventris</i>			0.13	0.06			0.12				0.07			0.16	22	17	5	29.4	5
Grey Shrike-thrush <i>Colluricincla harmonica</i>	0	0.14	0.03	0.06	0.09	0.03	0.09	0.04	0.10	0.09	0.12	0.03		0.07	34	25	7	28.0	9
Olive-backed Oriole <i>Oriolus sagittatus</i>	0.2	0.54	0.03		0.18	0.37	0.02	0.16	0.61	0.05	0.02	0.03	0.03		73	70	2	2.9	3
Grey Butcherbird <i>Cracticus torquatus</i>					0.06		0.02	0.02		0.05	0.05			0.02	9	9			
Pied Currawong <i>Strepera graculina</i>											0.02			0.02	2	2			
Spangled Drongo <i>Dicrurus bracteatus</i>						0.02									1	1			
Rufous Fantail <i>Rhipidura rufifrons</i>	0	0.04	0.05			0.03	0.02	0.02	0.03	0.02	0.17	0.08	0.11	0.12	28	26	1	3.8	2
Grey Fantail <i>Rhipidura albiscapa</i>	0.3	0.07	0.57	0.29	0.12	0.23	0.23	0.13	0.10	0.07	0.22	0.31	0.20	0.32	121	102	17	16.7	19
Willie Wagtail <i>Rhipidura leucophrys</i>		0.07			0.03		0.02				0.02		0.03		6	5	1	20.0	1
Restless Flycatcher <i>Myiagra inquieta</i>		0.07													2	2			
Black-faced Monarch <i>Monarcha melanopsis</i>				0.06			0.05					0.03		0.05	7	6	1		1
Rose Robin <i>Petroica rosea</i>		0.04		0.03		0.03		0.02	0.03						5	4	1	25.0	1
Eastern Yellow Robin <i>Eopsaltria australis</i>	0.8	1.08	0.77	0.88	1.50	0.57	0.75	0.60	0.55	0.59	0.29	0.78	0.73	0.83	393	189	90	47.6	204
Australian Reed-Warbler <i>Acrocephalus australis</i>			0.03												1	1			
Silvereye <i>Zosterops lateralis</i>	0.4	0.43	4.54	2.70	2.15		4.03	0.93	3.55	0.43	3.98	2.22	5.52	1.57	1220	1179	36	3.1	41
Red-whiskered Bulbul <i>Pycnonotus jocosus</i>			0.05				0.02					0.08		0.09	10	10			
Common Blackbird <i>Turdus merula</i>	0.3	0.22	0.21	0.12	0.24	0.09	0.07	0.07	0.06	0.09	0.15	0.41	0.03	0.12	78	67	7	10.4	11
Common Starling <i>Sturnus vulgaris</i>		0.07													2	2			
Mistletoebird <i>Dicaeum hirundinaceum</i>				0.03			0.02						0.03		3	3			
Double-barred Finch <i>Taeniopygia bichenovii</i>			0.26	0.03			0.12					0.05		0.07	21	19	2	10.5	2
Red-browed Finch <i>Neochmia temporalis</i>	0.2	0.47	1.37	1.29	2.38	0.51	0.82	0.16	0.10	0.26	0.17	0.44	0.03	0.48	319	274	37	13.5	45
Chestnut-breasted Manikin <i>Lonchura castaneothorax</i>					0.03										1	1			
Birds/100m net/hour	8.96	10.19	11.98	9.35	13.55	9.58	10.12	9.06	9.56	8.18	7.70	7.80	9.16	6.53	4865	3744	665	17.8	1121
Banding visits per year	7	8	11	8	9	9	11	11	8	10	11	11	10	13					
Mean number of birds per visit	42	35	42	40	51	38	39	37	37	35	29	27	33	22					
Number species per year	19	26	27	24	22	23	30	23	22	23	27	29	22	27					



Any bird caught after the day on which it was banded was designated a “re-trap”, irrespective of the number of times it was captured or the length of time between banding and recapture. The percentage recapture rate for each species was calculated as the proportion of re-trapped individuals as a function of the total number of individuals of that species banded. The number of times a bird was re-trapped was also recorded.

## RESULTS AND DISCUSSION

A total of 3,744 birds of 52 species (Table 2) was trapped and banded during the 14-year study period, with 665 being recaptured a total of 1,121 times, a recapture rate of 17.8%. The most numerous species in order of numbers captured were: Silvereye *Zosterops lateralis* (1,171), Bell Miner (993), White-browed Scrubwren *Sericornis frontalis* (378), Eastern Yellow Robin *Eopsaltria australis* (387), Superb Fairy-wren *Malurus cyaneus* (330), Red-browed Finch *Neochmia temporalis* (317), Golden Whistler *Pachycephala pectoralis* (164), and Lewin’s Honeyeater *Meliphaga lewinii* (143) (Tables 2 and 3).

The mean capture rate (numbers of birds/100 m net/hour) for all years of the study was 9.25 (range 6.53 – 13.55). The maximum capture rate on a single day was 73.8 and the minimum single-day capture rate was 1.4. Capture rates for three banding days of over 66.6 were the result of large numbers of Silvereyes being caught within the first hour. On these days nets were progressively closed as they were cleared of birds and as a result nets were only open for a total of two hours. The yearly capture rate varied considerably (Fig. 4), with the highest capture rate being in July (Fig. 5). Of the 52 species banded, 15 accounted for 94.7% of the total captures throughout the study (Table 3).

One hundred and eighteen species were captured, seen or heard at Camden Airport during the study (Table 2, Appendix).

### Recaptures

Over the study period, 28 of the 52 species banded were re-trapped (Table 4), with individuals of 25 species being re-trapped more than one year after their original banding date.

Most of the birds re-captured were members of resident species. The only exceptions were two Brown Gerygones *Gerygone mouki*, two Yellow-faced Honeyeaters *Lichenostomus*

*chrysops* (although the birds trapped were probably mainly resident individuals), twenty Golden Whistlers (a partial migrant), three Rufous Whistlers *Pachycephala rufiventris* (summer migrant), two Olive-backed Orioles *Oriolus sagittatus*, one Rufous Fantail *Rhipidura rufifrons* (summer migrant) and one Rose Robin *Petroica rosea* (winter migrant).

The intervals between banding and (last) recapture of individuals within the study period are recorded in Table 4. The three longest periods were: Golden Whistler, minimum age 11 years 4 months, Lewin’s Honeyeater, minimum age 9 years, 7 months, and Satin Bowerbird *Ptilonorhynchus violaceus*, minimum age 8 years 5 months.

### Monthly capture statistics

Eleven species were caught in all months of the year. Numbers caught per banding day had peaks in June to September (Table 6; Fig. 5). The prominent spike in July corresponded to the influx of migratory Silvereyes to the site feeding on the fruits of African Olive, which fruits from June to September (Cunio and Leishman 2006), and Narrow-leaf *Privet Ligustrum sinense* which fruits in late autumn and winter. These two plant species are major food resources for Silvereyes (Bucannan 1989; Leishman *et al.* 2020).

### Recoveries away from the Airport

Of the 3,695 birds banded, only two have been reported from outside the Airport:

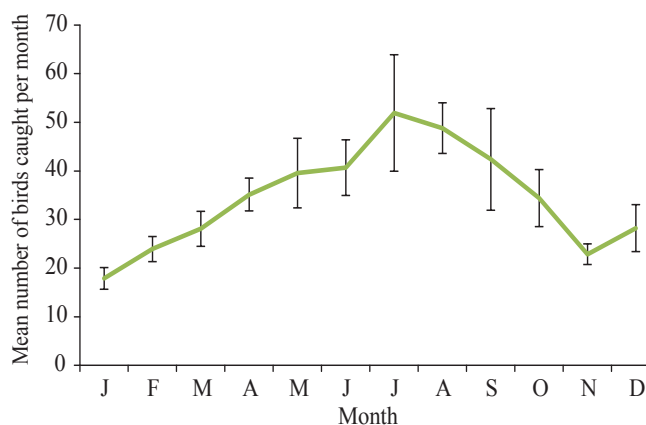
- A Satin Bowerbird was recovered dead in a backyard in Camden, New South Wales (2 km E), 48 months after banding.
- A Bell Miner was recovered more than 21 months after banding with a wing injury in John Street, Camden, NSW (2 km E). It was taken into veterinary care but later died.

### Movements within the River Flat Forest

Within-study area movements have been recorded for fifteen species, with the most numerous being those by Bell Miners, Lewin’s Honeyeaters and Eastern Spinebills, *Acanthorhynchus tenuirostris* (Table 5).



**Figure 4:** Yearly capture rate for all banding sites (2007-2020) at Camden Airport River Flat Forest.



**Figure 5:** Monthly mean capture rate for all sites ( $\pm$  standard error) all years.

Table 3

Fifteen most commonly caught species at Camden Airport from 2007 to 2020 showing the percentage of the total individuals trapped.

Species	% of total catch
Silvereye	25.08
Bell Miner	20.41
Eastern Yellow Robin	7.95
White-browed Scrubwren	7.79
Superb Fairy-wren	6.80
Red-browed Finch	6.56
Golden Whistler	3.43
Lewin's Honeyeater	3.00
Eastern Spinebill	2.75
Brown Thornbill	2.57
Grey Fantail	2.49
Common Blackbird	1.60
Olive-backed Oriole	1.50
Satin Bowerbird	1.17
Brown Gerygone	0.90
	<b>94.02</b>

#### Migratory species

Silvereyes were caught in ten months of the year. Capture rates showed a distinct increase in July, August and September when they were nearly double those of other months (Table 6). This reflected the presence of passage migrants and the availability of Narrow-leafed Privet and African Olive fruit. During winter the flocks consisted of a mixture of sub-species (*Z. l. cornwalli*, *Z. l. westernensis* and *Z. l. lateralis*).

The Black-faced Monarch *Monarcha melanopsis*, a summer breeding migrant to coastal south-east Australia from New Guinea, was captured on five occasions, two birds in March, two in November and one in December. The latter bird was recaptured in 2020, two years after banding.

Winter migrants included the Rose Robin, which was recorded in the study area from April to September and captured on several occasions (Table 6), and Swift Parrots *Lathamus discolor* which were sighted in August 2014 and September 2016.

The Rufous Whistler was captured between September and March, whilst the Golden Whistler was captured in all months (Table 6). The relative numbers of Rufous and Golden Whistlers at Camden Airport differed from those recorded at other sites within the Cumberland Plain. At North Ryde in a study conducted by S.G. Lane (Leishman 2012), Agnes Banks Nature Reserve (Farrell *et al.* 2012) and Scheyville National Park (T. Hunt, unpubl. data), Rufous Whistlers were caught in greater numbers than Golden Whistlers. However, similar banding studies near Campbelltown, NSW (Leishman 1994), at the Australian Botanic Gardens (Leishman *et al.* 2020) and at Camden Airport in the present investigation have recorded higher numbers of Golden than Rufous Whistlers. (Table 7). Hindwood and McGill (1958) state that the Rufous Whistler is primarily a bird of the shale forest areas in the County of Cumberland, whilst the Golden Whistler prefers the wetter coastal areas, but this is not reflected in the numbers at the Australian Botanic Gardens, Humewood/Beulah Forest and Camden Airport where numbers of captured Golden Whistlers exceeded those of Rufous Whistlers.

Table 4

Oldest individual of twenty-eight species retrapped at Camden Airport, calculated from time of initial capture to final recapture, with number of times recaptured, 2007 to 2020

Species	Age	No. times recaptured
Golden Whistler	11 yrs, 4 mths	6
Eastern Yellow Robin	10 yrs, 3 mths	7
Lewin's Honeyeater	9 yrs, 7 mths	4
White-browed Scrubwren	8 yrs, 6 mths	5
Satin Bowerbird	8 yrs, 5 mths	2
Brown Thornbill	7 yrs, 1 mth	1
Olive-backed Oriole	7 yrs, 1 mth	2
Superb Fairy-wren	6 yrs, 7 mths	5
Bell Miner	5 yrs, 8 mths	4
Grey Fantail	5 yrs, 3 mth	3
Rufous Fantail	5 yrs, 2 mth	2
Brown Gerygone	5 yrs, 1 mths	2
Grey Shrike-thrush	4 yrs, 5 mths	2
Yellow-faced Honeyeater	4 yrs	1
Rufous Whistler	3 yrs, 7 mths	1
Silvereye	3 yrs, 6 mths	3
Double-barred Finch	3 yrs, 6 mths	1
Common Blackbird	2 yrs, 6 mths	2
Eastern Spinebill	2 yrs, 5 mths	2
Yellow Thornbill	2 yrs, 2 mths	1
Black-faced Monarch	2 yrs	1
Willie Wagtail	1 yr, 11 mths	1
Rose Robin	1 yr, 10 mths	1
Red-browed Finch	1 yr, 11 mths	3
White-throated Treecreeper	1 yrs, 8 mth	1
Eastern Whippbird	8 mths	1
Variiegated Fairy-wren	2 mths	1
Sacred Kingfisher	1 mth	1

#### Threatened species

Three threatened species were recorded in the River Flat Forest during this study. The Swift Parrot was recorded in August 2014 and September 2016. This species is listed as *endangered* under both the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *NSW Threatened Species Conservation Act 1995* (TSCA). The other two species are listed as *vulnerable* under the NSW TSCA: they were the Square-tailed Kite *Lophoictinai isura*, which was recorded once in September 2016, and the Dusky Woodswallow *Artamus cyanopterus*, which was recorded during most visits early in this project.

#### Regionally Significant Species

Fourteen *Regionally Significant* species listed in the "Urban Bushland Biodiversity Survey, Western Sydney" (NPWS 1997) were recorded during this project: Brown Quail *Coturnix ypsilophora*, Peaceful Dove *Geopelia striata*, White-bellied Sea-Eagle *Haliaeetus leucogaster*, Whistling Kite *Haliastur sphenurus*, Grey Goshawk *Accipiter novaehollandiae*, Yellow-rumped Thornbill *Acanthiza chrysorrhoa*, Striated Pardalote *Pardalotus striatus*, White-bellied Cuckoo-shrike *Coracina*

Table 5

Movements of seventeen species within the River Flat Forest at Camden Airport from 2007 to 2020, showing sites of banding and recapture, distance moved and time between initial capture and final recapture. Numbers in parentheses show the number of times the individual was recaptured at both the banding and the recapture sites.

Species	Band No.	Site banded	Site recaptured	Distance moved	Time elapsed between banding and final recapture
White-throated Treecreeper	037-11019	3	5 (1)	0.5 km	8 mths
White-throated Treecreeper	037-11002	5	3 (1)	0.5 km	1 yr 7 mths
Grey Fantail	01A-02274	3	1 (1)	0.75km	2 yrs 1 mth
Rufous Fantail	01A-31014	3	5 (2)	0.5 km	5 yrs 1 mth
Eastern Yellow Robin	026-82238	3	5 (1)	0.5 km	3 mths
Eastern Yellow Robin	026-65621	3	5 (2)	0.5 km	3 yrs 11 mths
Eastern Yellow Robin	025-97108	4 (2)	3 (1)	1 km	6 yrs 7 mths
Golden Whistler	037-11003	5 (1)	3 (3)	0.5 km	1yr 5 mths
Golden Whistler	037-11003	5 (1)	3 (3)	0.5 km	1 yr 4 mths
Brown Thornbill	019-34341	1	3 (1)	0.75 km	7 yrs 1 mth
Superb Fairy-wren	01A-22026	3	5 (3)	0.5 km	7 mths
Silvereye	019-63748	1	3 (1)	0.75 km	3 mths
Silvereye	019-63742	1	3 (1)	0.75 km	1 yr 2 mths
Eastern Spinebill	01A-02898	3	1 (2)	0.75 km	10 mths
Eastern Spinebill	019-75173	3 (1)	1 (1)	0.75 km	1 yr 8 mths
Eastern Spinebill	019-63977	3	5 (1)	0.5 km	5 mths
Eastern Spinebill	019-63717	1	3 (1)	0.75 km	1 yr 6 mths
Lewin's Honeyeater	042-96963	3	1 (2)	0.75 km	6 mths
Lewin's Honeyeater	042-96808	1	3 (2)	0.75 km	4 yrs 1 mth
Lewin's Honeyeater	041-39067	1 (1)	3 (1)*	0.75 km	8 yrs 4 mths
Lewin's Honeyeater	041-39014	1	3 (4)	0.75 km	2 yrs 2 mths
Lewin's Honeyeater	041-38906	1 (3)	3 (2)	0.75 km	8 yrs 3 mths
Red-browed Finch	01A-31092	1	3 (3)	0.75 km	1 yr 10 mths
Red-browed Finch	01A-22010	3	5 (1)	0.5 km	4 mths
Red-browed Finch	019-74881	3	4 (1)	1 km	1 yr 9 mths
Satin Bowerbird	082-44284	4	1 (1)	1.5 km	8 mths
Common Blackbird	062-45693	3	5 (2)	0.5 km	5 mths
Bell Miner	041-38933	1	2 (2)	0.4 km	11 mths
Bell Miner	041-39025	1	2 (2)	0.4 km	10 mths
Bell Miner	041-39045	1	2 (3)	0.4 km	1 yr 6 mths
Bell Miner	041-84293	1 (1)	3 (1)	0.75 km	3 yrs 5 mths
Bell Miner	041-84370	1	3 (2)	0.75 km	5 yrs 1 mth
Bell Miner	041-84372	1	3 (1)	0.75 km	2 yrs 10 mths
Bell Miner	041-84433	1	3 (1)	0.75 km	4 mths
Bell Miner	041-84440	3	1 (2)	0.75 km	6 yrs 1 mth
Bell Miner	042-96731	1	3 (1)	0.75 km	9 mths
Bell Miner	042-96834	1	3 (1)	0.75 km	1 yr 9 mths
Bell Miner	042-96966	3 (2)	1 (1)*	0.75 km	2 yrs 2 mths
Bell Miner	042-96970	3	1 (2)	0.75 km	4 mths
Bell Miner	042-96997	1	3 (1)	0.75 km	2 yrs 1 mth
Bell Miner	043-04557	3	1 (1)	0.75 km	9 mths
Bell Miner	043-04600	3	1 (1)	0.75 km	7 mths

\*Returned to banding site

*papuensis*, Jacky Winter *Microeca fascinans*, Rufous Songlark *Cincloramphus mathewsi*, Bar-shouldered Dove *Geopelia humeralis*, Crested Shrike-tit *Falcunculus frontalis*, Restless Flycatcher *Myiagra inquieta* and Black-faced Monarch. The latter four of these species were banded during the investigation (Appendix; Table 2).

#### Introduced species

Several introduced species were recorded in the study area during this project: Spotted Dove *Streptopelia chinensis*, European Goldfinch *Carduelis carduelis*, Common Myna *Sturnus tristis*, Red-whiskered Bulbul *Pycnonotus jocosus*, Common Blackbird *Turdus merula* and Common Starling *Sturnus vulgaris*. The latter three species were the only introduced species banded, and the Red-whiskered Bulbul and Common Blackbird were caught throughout the study (Table 2).

#### Changes in avian community composition over time

The constituent species of the avian community at Camden Airport have shown fluctuations in numbers over the period of the study. Capture rates of several species have declined, namely those of the Superb Fairy-wren, Bell Miner, Olive-backed Oriole, Grey Fantail *Rhipidura albiscapa*, Eastern Yellow Robin and Red-browed Finch, whilst four other species have shown a general increase, namely the Brown Gerygone, Eastern Spinebill, Golden Whistler and Rufous Fantail (Table 2).

Superb Fairy-wrens were captured in all years and all months of the study. Capture rate was highest in 2011, but then declined to its lowest level in 2017 to 2019, with a slight increase in 2020. White-browed Scrubwrens were also captured in all months and years of the study. Peak capture rates were recorded in 2018 and the lowest capture rate in 2014. Brown

Table 6

Species caught and banded per month including recaptures at Camden Airport from 2007 to 2020; number of individuals caught per month; number of species caught per month; number of banding days per month; and mean numbers caught per banding visit. Species listed in order of numbers captured.

Species	J	F	M	A	M	J	J	A	S	O	N	D
Silvereye			24	63	93	181	283	261	214	80	19	2
Bell Miner	21	52	79	88	93	48	163	166	77	46	71	89
Eastern Yellow Robin	23	40	46	41	24	21	37	58	29	19	27	28
White-browed Scrubwren	16	32	46	34	42	27	24	45	30	29	40	14
Superb Fairy-wren	18	27	38	37	37	28	35	43	11	27	17	13
Red-browed Finch	18	22	44	66	50	14	8	19	20	23	17	18
Golden Whistler	12	11	14	24	12	6	16	14	13	14	20	11
Lewin's Honeyeater	7	10	8	12	8	20	14	27	10	7	10	13
Eastern Spinebill	3	2	11	33	13	7	11	16	11	10	9	8
Brown Thornbill	3	16	4	19	8	16	11	19	4	8	11	6
Grey Fantail	5	12	9	14	9	9	2	16	14	16	8	7
Common Blackbird	5	6	1	7	4	8	3	8	10	8	12	6
Olive-backed Oriole		2		19	19	8	3	10	1	4	5	2
Satin Bowerbird			1	8	7	5	6	11	1	8	9	1
Brown Gerygone	2	6	7	5	4	9	2	3	4			2
Grey Shrike-thrush	2	6	5	3	4	1	3		2	1	3	4
Rufous Fantail	3	7	1							3	9	5
Yellow-faced Honeyeater			2	2			1	1	5	6	4	
Double-barred Finch	1	1	5	3				4		4	2	1
Eastern Whipbird		2	2	2		3	1	3		1	3	2
Rufous Whistler	1		2	1					2	6	5	5
Yellow Thornbill	2								3	2	5	
Eastern Rosella			2	2	1	1			1	3		1
Scarlet Honeyeater										9		1
Red-whiskered Bulbul			1	1		1		2		2		3
White-throated Treecreeper			1	1		1			1	1	2	2
Grey Butcherbird			3	2	3			1				
Bar-shouldered Dove			3				1				2	1
Sacred Kingfisher	1	2	1							1	1	1
Variiegated Fairy-wren			1	1	1			1		1		1
Spotted Pardalote				1						2	2	1
Willie Wagtail		3			1			1	1			
Black-faced Monarch			2								3	2
Australian King-Parrot		2	1		1					1		
Rose Robin				3	1	1						
Black-faced Cucko-shrike											3	
Crested Shrike-tit			1			1				1		
Mistletoebird									1		1	1
Shining Bronze Cuckoo				1								1
Fantail Cuckoo				1						1		
Striated Thornbill								1	1			
Little Wattlebird			1						1			
Restless Flycatcher		2										
Common Starling												2
Pied Currawong					1	1						
Common Bronzewing						1						
Crimson Rosella								1				
Laughing Kookaburra											1	
White-naped Honeyeater										1		
Spangled Drongo		1										
Australian Reed-warbler												1
Chestnut-breasted Mannikin					1							
Totals caught per month	143	264	366	494	437	418	624	731	467	345	321	255
No. of species per month	18	22	31	29	24	24	19	24	25	32	29	31
No. of banding days (Total=137)	8	11	13	14	11	9	12	15	11	10	14	9
Mean No. per banding day	17.9	24.0	28.2	35.3	39.7	46.4	52.0	48.7	42.5	34.5	22.9	28.3

Local and migratory species  
Summer migrants  
Winter Migrants



**Table 7**

Number of Rufous Whistlers and Golden Whistlers captured at six long-term banding sites across the Cumberland Plain, NSW.

Site	Period of Study	Numbers captured	
		Rufous Whistler	Golden Whistler
North Ryde	23 years	90	48
Agnes Banks Nature Reserve	3.5 years	65	23
Scheyville National Park	60 years	588	510
Humewood/Beulah Forest	21 years	88	240
Australian Botanic Garden	33 years	130	507
Camden Airport	13 years	22	167

Thornbills *Acanthiza pusilla* were caught in relatively low numbers throughout the study, with the peak capture numbers being in 2008 and 2009 (Table 2).

Honeyeaters captured at Camden Airport, especially Eastern Spinebills and Lewin's Honeyeaters, exhibited wide variations in capture rates among years. Eastern Spinebills were caught in peak numbers in 2014 and 2018, whilst Lewin's Honeyeaters were caught in peak numbers in 2008, followed by a fluctuating decline in numbers (Table 2).

The Bell Miner was present in large numbers at the commencement of the study and was the second most common species caught throughout the study (Tables 2 and 3). Numbers in 2007 and 2008 were high, with this species being present in large numbers at banding sites 1 and 2. During 2009 and 2010, when banding was carried out at sites 3 and 4, numbers were lower, with large numbers again being caught during 2012, 2014 and 2016 when banding was conducted at sites 1 and 3. In February 2017 an unusual weight loss was recorded in the four Bell Miners that were recaptured (Leishman and Leishman 2017). In subsequent months, numbers of Bell Miners decreased, with no colony activity occurring in the banding area after August 2017. This species seems to be more influenced by food resources than habitat features such as specific vegetation or forest structure (Lambert and Leishman 2020). Only single Bell Miners were captured in 2018 and 2020. These two individuals were considered transient and no colonies have since been re-established within the River Flat Forest (Table 2).

Golden Whistler capture rate was low during the first three years of the investigation, but increased substantially in 2010 – 2012 and 2019. In contrast, capture rates for the Grey Shrike Thrush *Colluricincla harmonica* have remained relatively stable over the study period (Table 2).

The Olive-backed Oriole is a common species along the upper Nepean River. Peak years for capture were 2008 and 2015. Seventy birds were banded during the study, with only two birds being recaptured, one on two occasions (Table 2). Olive-backed Orioles were captured in 10 months of the year, with peak capture rates occurring in April and May (Table 6). The numbers of this species captured represented 1.95% (n=73) of the total number of birds captured at Camden Airport.

This is a much higher figure than at the Australian Botanic Garden, Mount Annan, where the numbers captured represented only 0.3% (n=45) of the total catch (Leishman *et al.* 2020).

The population of Grey Fantails comprised both regular residents and migrants and the species was captured in all months of the year. There was a high capture rate in 2009, with numbers decreasing to a low in 2016 and then increasing between 2017 and 2020.

The capture rate of Rufous Fantails was approximately one per year between 2007 and 2016, with none being caught in 2010 and 2011. However, over the four years 2017 to 2020 nineteen were captured. One bird was banded in December 2013 and recaptured in November 2018 and January 2019, possibly indicating local breeding. Rufous Fantails were captured from October to March. It is interesting that both Grey and Rufous Fantails' capture rates increased after the Bell Miners disappeared from the banding site. (Tables 2 and 6).

Eastern Yellow Robins were captured in all years and all months of the year and represented 7.95% of the total birds captured (Table 3). Peak capture rate was in 2011. There was a sharp decrease in captures in 2012 and again in 2017, with the catch rate fluctuating but exhibiting a general decline over this period (Table 2).

Silvereyes were the most numerous birds caught during the study and represented 25.1% of the total catch (Table 3). Yearly capture numbers varied considerably. Peak numbers occurred in 2009, 2013, 2017 and 2019, when collectively 197 individuals were caught. These high catch rates were during periods of high fruit load of the African Olive and Small-leaf Privet (Table 2). No Silvereyes were captured during 2012.

Red-browed Finch capture rates peaked in 2011 when banding was carried out at site 4 which was adjacent to an area where seeding grasses provided an abundant food resource. Lower capture rates were recorded after 2013 when site 4 was no longer in operation. (Table 2). Red-browed Finches were caught in all years and all months, with a peak in monthly captures in April and May (Table 6).

Areas of riparian woodland along the Nepean River have been gradually disappearing due to residential development, sand and soil mining activities and agricultural development, so it is important that what remains is preserved. Being within the boundary of Camden Airport, the ongoing prospect for this strip of woodland and its associated avian faunas is very positive.

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## APPENDIX

Species observed but not banded at Camden Airport 2007 to 2020, including the status of significant species. E = Endangered, V = Vulnerable, RS = Regionally Significant (NPWS 1997).

<b>RS</b> Brown Quail <i>Coturnix ypsilophora</i>	Long-billed Corella <i>Cacatua tenuirostris</i>
Australian Wood Duck <i>Chenonetta jubata</i>	Little Corella <i>Cacatua sanguinea</i>
Pacific Black Duck <i>Anas superciliosa</i>	Sulphur-crested Cockatoo <i>Cacatua galerita</i>
Australasian Grebe <i>Tachybaptus novaehollandiae</i>	Rainbow Lorikeet <i>Trichoglossus haematodus</i>
Spotted Dove <i>Streptopelia chinensis</i>	Musk Lorikeet <i>Glossopsitta concinna</i>
Brown Cuckoo-Dove <i>Macropygia amboinensis</i>	<b>E</b> Swift Parrot <i>Lathamus discolor</i>
Crested Pigeon <i>Ocyphaps lophotes</i>	Red-rumped Parrot <i>Psephotus haematonotus</i>
<b>RS</b> Peaceful Dove <i>Geopelia striata</i>	Eastern Koel <i>Eudynamis orientalis</i>
Wonga Pigeon <i>Leucosarcia picata</i>	Channel-billed Cuckoo <i>Scythrops novaehollandiae</i>
Little Pied Cormorant <i>Microcarbo melanoleucos</i>	Brush Cuckoo <i>Cacomantis variolosus</i>
Great Cormorant <i>Phalacrocorax carbo</i>	Rainbow Bee-eater <i>Merops ornatus</i>
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	Dollarbird <i>Eurystomus orientalis</i>
Australian Pelican <i>Pelecanus conspicillatus</i>	White-throated Gerygone <i>Gerygone albogularis</i>
White-necked Heron <i>Ardea pacifica</i>	<b>RS</b> Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>
Cattle Egret <i>Ardea ibis</i>	<b>RS</b> Striated Pardalote <i>Pardalotus striatus</i>
Australian White Ibis <i>Threskiornis molucca</i>	White-plumed Honeyeater <i>Lichenostomus penicillatus</i>
Black-shouldered Kite <i>Elanus axillaris</i>	Noisy Miner <i>Manorina melanocephala</i>
<b>V</b> Square-tailed Kite <i>Lophoictinia isura</i>	Red Wattlebird <i>Anthochaera carunculata</i>
Pacific Baza <i>Aviceda subcristata</i>	Noisy Friarbird <i>Philemon corniculatus</i>
<b>RS</b> White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	<b>RS</b> White-bellied Cuckoo-shrike <i>Coracina papuensis</i>
<b>RS</b> Whistling Kite <i>Haliastur sphenurus</i>	Australasian Figbird <i>Sphecotheres vieilloti</i>
Brown Goshawk <i>Accipiter fasciatus</i>	<b>V</b> Dusky Woodswallow <i>Artamus cyanopterus</i>
<b>RS</b> Grey Goshawk <i>Accipiter novaehollandiae</i>	Australian Magpie <i>Cracticus tibicen</i>
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>	Australian Raven <i>Corvus coronoides</i>
Swamp Harrier <i>Circus approximans</i>	Magpie Lark <i>Grallina cyanoleuca</i>
Wedge-tailed Eagle <i>Aquila audax</i>	<b>RS</b> Jacky Winter <i>Microeca fascinans</i>
Nankeen Kestrel <i>Falco cenchroides</i>	<b>RS</b> Rufous Songlark <i>Cincloramphus mathewsi</i>
Brown Falcon <i>Falco berigora</i>	Welcome Swallow <i>Hirundo neoxena</i>
Dusky Moorhen <i>Gallinula tenebrosa</i>	Fairy Martin <i>Petrochelidon ariel</i>
Masked Lapwing <i>Vanellus miles</i>	Tree Martin <i>Petrochelidon nigricans</i>
Yellow-tailed Black-Cockatoo <i>Calyptorhynchus funereus</i>	Common Myna <i>Sturnus tristis</i>
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	Australasian Pipit <i>Anthus novaeseelandiae</i>
Galah <i>Eolophus roseicapillus</i>	European Goldfinch <sup>1</sup> <i>Carduelis carduelis</i>