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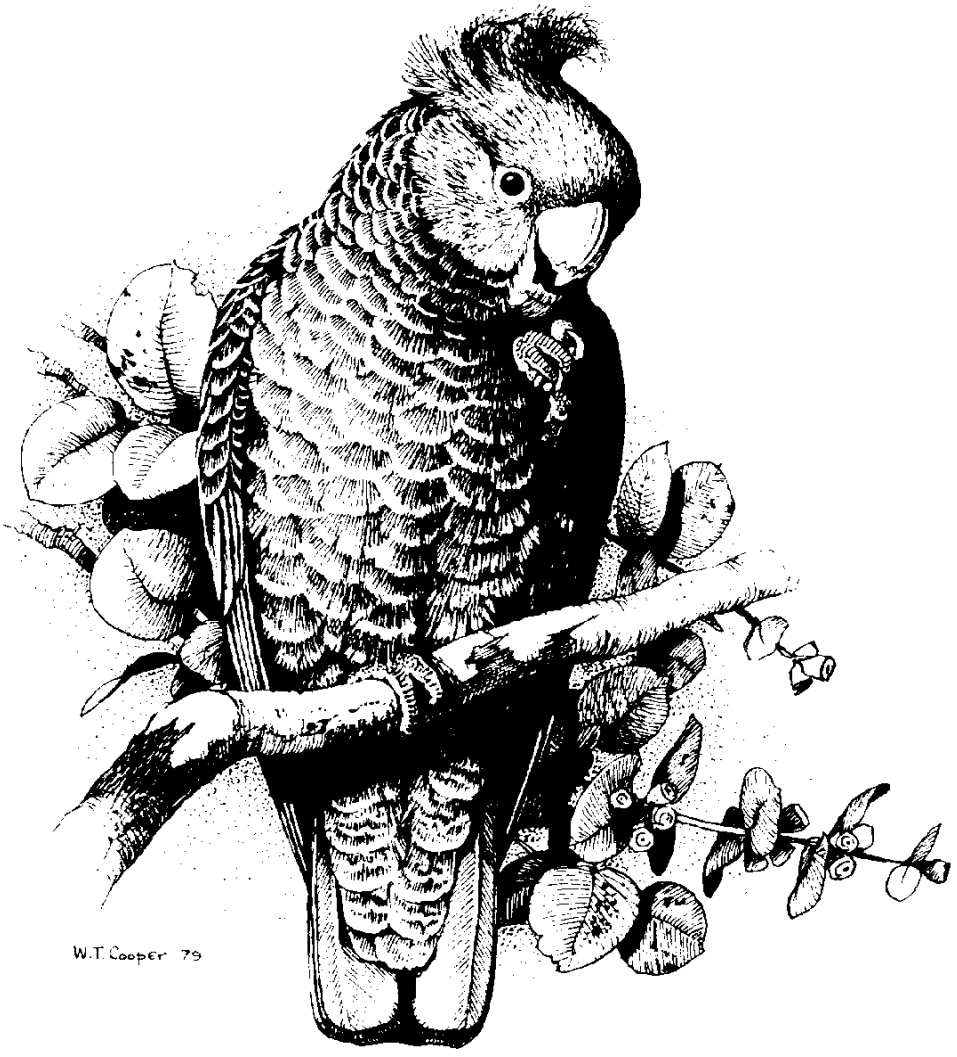

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ARTICLES

Canberra Bird Notes 44(2) (2018): 109-121

BROWN TREECREEPER (*CLIMACTERIS PICUMNUS*), ITS OCCURRENCE AND STATUS IN THE ACT, AND DEPENDENCE ON MATURE, HOLLOW-BEARING EUCALYPTS[1]

(Additional material to support nomination of loss of hollow-bearing eucalypts as a threatening process, for ACT Scientific Committee[2] – 24 August 2017)

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Abstract. *This paper was submitted to the ACT Scientific Committee, as part of documentation to support a nomination to the Committee (and ACT Government) of the threatening process, 'Loss of Hollow-bearing Trees'. The nomination was lodged in 2016 by several community groups, (including COG), led by the Conservation Council ACT Region. The Scientific Committee considered the nomination and supplementary information provided by the nominators, including studies on Superb Parrot breeding in the ACT from COG, and other research on large, mature native trees within the ACT and region, and assessed this against its eligibility criteria. The Committee agreed to broaden the threatening process from the loss of hollow-bearing trees to the key threatening process of 'Loss of mature native trees (including hollow-bearing trees) and a lack of recruitment'. The nomination was successful and a declaration made in an instrument under the ACT's Nature Conservation Act 2014, taking effect on 27 September 2019. An Action Plan will be required. It is not known at this time, how this will be implemented and operate in practice. Due to limited time available, only readily available bird data and bird survey records (principally from COG databases) and other relevant references were sourced for the paper.*

Key points

The Brown Treecreeper (*Climacteris picumnus*) [hereafter BT], is dependent on mature, native hollow-bearing eucalypts and their products (such as fallen limbs, coarse woody debris) for a range of ecological needs, nesting, roosting, feeding and for refuge from predators.

BTs utilise paddock trees to disperse to other territories; without such connectivity, recruitment of juvenile birds, females in particular, is disrupted. Studies indicate that they

[1] This document is a slightly modified version of the original report.

[2] Note: The ACT Scientific Committee is a statutory, expert body appointed by the Minister for the Environment under the *Nature Conservation Act 2014*, and has a significant role in advising the ACT Minister for the Environment and the Conservator of Flora and Fauna in relation to nature conservation, including making recommendations to the Minister on the listing of threatened species and providing advice to the Conservator during development of draft action plans.

survive in fragmented landscapes, provided there are sufficient patches of large eucalypts, paddock trees and uncleared dead and fallen timber.

Expansion of urban development in and around BT habitat in the ACT, including Molonglo (Kama NR) and Gungahlin (Mulligans Flat NR/Goorooyarroo NR), puts further pressure on those areas that contain mature tree habitat for the species. BTs have been lost from many areas/sites on the lowlands, they are largely gone from peri-urban Canberra, and have disappeared from the large woodland reserves (Mulligans Flat/Goorooyarroo). They are being pushed out further and further as habitat and mature tree loss continues.

There has, in recent years, been a loss of four breeding groups of BTs in and around the Kama NR in Central Molonglo. This is near what is now the expanding suburbs of Molonglo, which could eventually extend west to Uriarra Crossing on the Murrumbidgee River.

Lands protected in the ACT reserve system have lost their BT populations, except in Namadgi NP and Googong, distant from urban Canberra. Although BTs are apparently gone from ACT urban reserves and much of peri-urban ACT (rural lands and reserves on the urban boundary), populations are believed to still exist to the south and west of Canberra, around and to the south of Tharwa, in Namadgi NP and on the Monaro, and the Murrumbidgee River corridor.

As canvassed in the nomination, mature hollow-bearing eucalypts have been and continue to be systematically removed from the landscape in the ACT (largely for urban or infrastructure development), not only from peri-urban Canberra, but also from rural areas distant from existing suburbs. The removal of trees for the solar farm at Williamsdale is close to the Murrumbidgee River corridor south of Canberra, in the general vicinity where populations/groups of BTs are believed to still persist. For example, there are recent records (2016) of BTs at a popular, roadside birding site off the Monaro Highway (along Kelly Road) only a few kilometres south of Williamsdale.

The ACT Government, through the Land Development Agency, has purchased as a future land bank a number of rural properties across a large area west of Mt Stromlo/west of the current Molonglo urban development as far as Uriarra Crossing on the Murrumbidgee River, as well as some properties west of the Murrumbidgee River adjacent to Point Hut Crossing in Tuggeranong. Like much of the rural land remaining around the ACT, this consists of scattered paddock trees and some remnant patches, which may not have formal protection. If these areas are developed and more mature trees lost, this is likely to push out any BT groups which may be holding on in some places.

It is uncertain if BTs might re-colonise some sites within and around Canberra where they once occurred, although there are many reserved areas (mostly of forest vegetation type). There are a number of ACT Government habitat restoration programs already undertaken (Belconnen Hills, Greater Goorooyarroo) or in train (*e.g.* ACT Government Natural Resource Management (NRM) bird hotspots program focussed on Molonglo, Tharwa/Naas and Googong), which may include plantings of native trees and shrubs and the introduction of coarse woody debris. Over time, this may improve the habitat complexity and productivity of some sites and assist as movement corridors, but is unlikely to replace original habitats. The continuing removal of significant numbers of mature hollow-bearing eucalypts across the ACT, not only from the peri-urban but also from rural areas, potentially places limits or

constraints on the possibility of BT groups surviving or of birds moving around the landscape and re-establishing populations where they once occurred.

The following provides more details.

Background and overview

The BT is listed as vulnerable in NSW, as well as vulnerable in the ACT. The Canberra Ornithologists Group (COG) submitted the nomination to have this species declared vulnerable in the ACT, and this was declared by the ACT Government in 1997. That nomination provided information about the species' decline in abundance and disappearance from local sites.

In the ACT, BTs have declined over the years of COG's records, primarily due to continuing loss and fragmentation of habitat, woodlands and open forest. Their preferred habitat is not well represented in reserves such as Canberra Nature Park, and the rich grassy woodlands on the fertile soils of Canberra's limestone plains (primarily Yellow Box/Blakely's Red Gum woodlands – an endangered ecological community) have largely been cleared for housing and urban infrastructure.

The area of interest over which the Canberra Ornithologists Group has observed and recorded birds for over 70 years extends well beyond the ACT, to Yass and Goulburn to the north, and to Adaminaby and the Deua area to the south.

Historically in the Canberra region, BTs were regarded as widespread in suitable habitat of open forests, woodlands, and partly cleared country, with small parties sighted regularly in some areas over periods of years. For example, they were recorded regularly on the wooded eastern slopes of Mts Ainslie/Majura and the Campbell Park area, and were common until the 1960s in the Caswell Drive area on the western slopes of Black Mountain – groups of BTs no longer occur at those sites.

In a survey by Lamm and Calaby (1950), of part of the Murrumbidgee River corridor in the late 1940s, Brown Treecreepers were recorded on 94% of their visits. Forty years later in the early 1980s, COG ran a survey of the whole river corridor in the ACT and classified the BT as a 'rare visitor', with only two records during the survey period.

The 1966 publication, *A Field List of the Birds of Canberra and District*, published by ACT Branch RAOU, (later called Canberra Ornithologists Group) described the species as 'regular in small numbers' in 'savanna woodland'. The third edition of the Field List in 1985, published by the Canberra Ornithologists Group, described the Brown Treecreeper as 'uncommon'.

The latest list of 'Birds of the Capital Region', published on COG's website, lists the species' occurrence in the COG area of interest as 'Uncommon breeding species in dry woodlands. On the tablelands it is being pushed out further by development'.

A three-year study and collection of data, *Birds of the Australian Capital Territory – an Atlas*, by the Canberra Ornithologists Group over 1986-1989, concluded that the BT was a 'common breeding resident' (M. Taylor and Canberra Ornithologists Group 1992). This publication indicated:

- the species was found in 'relatively undisturbed areas of woodland and dry open forest below 1000 metres …'
- 'They are most common in the Clear Range and along the Lower Naas River, but other permanent populations exist at Mulligans Flat, Burbong and Campbell Park. This last population is of particular interest as it is located in an isolated remnant of Yellow Box and Blakely's Red Gum woodland, once a common and widespread habitat in the ACT. These birds, less than 4km from the centre of Canberra, are possibly the survivors of a much greater population.'
- 'Brown Treecreepers are threatened at Campbell Park and elsewhere by the removal of dead timber for use as firewood. Not only is fallen timber an important substrate, but Brown Treecreepers nest in hollows and spouts of dead trees and stumps.'

Shortly after the BT was declared a 'vulnerable' species in the ACT, Wilson (1999) recorded:

- 'The Brown Treecreeper has disappeared from some places where it was previously found. The spread of housing has also involved destruction of habitat, and this bird is not generally found in populated areas.'
- 'Uncommon breeding species in dry woodlands. On the tablelands it is being pushed further out by development.'

COG conducts a long-term monitoring survey of birds (142 monitoring points over 15 locations) in grassy woodlands in peri-urban ACT in reserves and some rural leasehold sites. A statistical analysis of data collected to 2005 (Bounds *et al*. 2007), gave a summary trend for the BT as, 'low variable occupancy rate, highest in 1999, steep decrease the following year, increasing to peak at end 2002. Overall, fairly steady since 2001, but long-term trend unclear due to very low numbers.' Subsequent analyses of the woodland survey data have been unable to determine a statistical trend for the BT, due to the low occupancy rate (insufficient records for analysis).

In peri-urban Canberra, BTs are now regarded as very rare. The population at Campbell Park, once the local hotspot for this species, is gone. Groups of BTs became locally extinct at the large reserves of Mulligans Flat and Goorooyarroo in northern Canberra in 2000 and 2005 respectively. These last two sites represent the largest remnant of lowland grassy woodland in the ACT reserve system.

In the Jerrabomberra Valley in central Canberra, a small group of BTs remaining in woodland on leaseholds in and around the 'Woden' property off the Monaro Highway was last recorded by COG in 2006. COG has not recorded the species at the nearby Callum Brae NR (a grassy woodland site), since regular bird surveys by COG commenced there in 1998 when the land was under leasehold. The Jerrabomberra Valley has industrial development (commercial offices, light industries, airport, ACT Corrections Centre, other broad-acre facilities) as well as some rural leasehold land.

In the last decade, breeding groups of BTs in peri-urban Canberra have been reported at the Newline quarry woodland south of the Canberra airport, and the Kama NR in the Molonglo Valley. However, there have been no sightings in recent years at those two sites (See under headings below for more details regarding those sites.)

COG Annual Bird Report and Annual Blitz 2015/16

The Canberra Ornithologists Group publishes an annual report of the status of birds in the ACT region. To assess changes in abundance, a sound approach is to compare data on reporting rates from the present with comparable historical reporting rates. Fig. 1 shows the reporting rates for the BT since 1993.

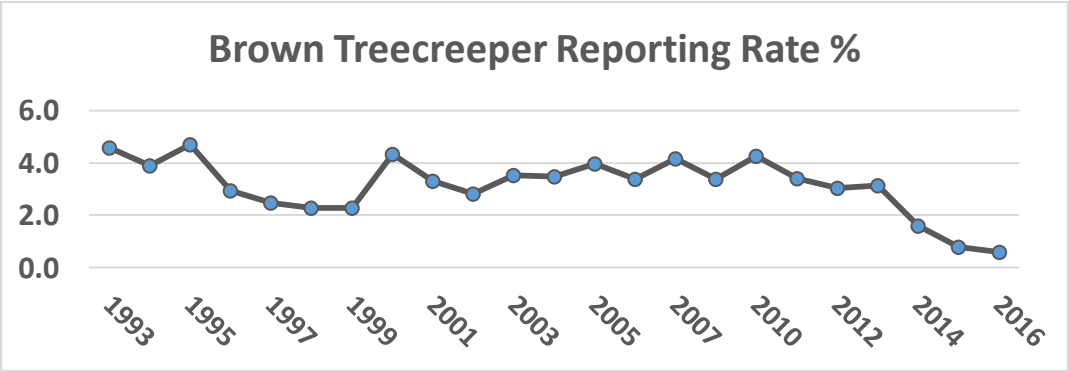

Figure 1. The reporting rates for the Brown Treecreeper since 1993.

The COG report for the year 2015/16 indicates that the BT is a 'rare breeding resident'. The reporting rate and abundance for the species in that report are the lowest figures since the data series commenced in 1987. There are only 69 records for that year, well below the 2012 peak of 137, the ten-year average (94) and the thirty-year average (81). Sites noted in that report are well to the north and south of the settled/urban Canberra area, the Nelanglo Travelling Stock Reserve (TSR) near Gundaroo in NSW and Old Boboyan Road in Namadgi National Park.

An annual survey/inventory of birds in the ACT (within the ACT's borders), the COG Annual Blitz, has been conducted for twelve years in late October over a weekend. The latest Blitz report (Allan 2017) has only two records of BTs in the south of the Territory, with a maximum of 4 birds at one location. The reporting rate for this species was the lowest ever in a Blitz survey.

Current occurrence of Brown Treecreeper

It is known from various bird surveys and other reports to COG and E-Bird, that there are remaining populations of BTs to the south of Canberra urban area, for example, in the wooded foot slopes of Namadgi NP, in the Naas Valley, along the Murrumbidgee River corridor south and into the Monaro area of NSW from Williamsdale to Bredbo environs (private properties, TSRs, Scottsdale Reserve), and possibly still around the Tharwa environs (private properties, Gigerline NR on the Murrumbidgee River) with some records over the last decade.

There are believed to be populations of BTs to the west of the Murrumbidgee River in some remnants on Mountain Creek Road in NSW, and in the Wee Jasper Valley. East of Canberra there are recent records in the Wamboin area and Cuumbeun NR near Queanbeyan. There are recent records in Googong Reserve, London Bridge area, south of Queanbeyan.

To the north of urban Canberra in NSW, much of the landscape has been cleared and fragmented and mature eucalypts lost. The only known population of BTs occurs at Nelanglo TSR, a reasonably sized wooded block surrounded by mostly cleared grazing land north of Gundaroo. Some small groups of BTs north of the ACT are known to have disappeared (*e.g.* Namina TSR near Murrumbateman, NSW). There have been occasional reports in the last decade of a single BT at the Hall TSR, just outside northern urban Canberra.

Threats in the ACT Region

In the first Action Plan, Number 18, produced for the BT by the ACT Government, following its declaration as a threatened species in 1997, the threats to the species were described as:

> Since European settlement in the ACT region several major environmental changes have occurred that are likely to have seriously disadvantaged *C. picumnus.* These are:
>
> - clearing of once widespread native open forest and woodland, particularly box woodlands;
> - urban development – rapid spread of urban areas puts increasing pressure on remnant woodland patches; and
> - fragmentation, separation and degradation of remaining viable habitat patches.

That Action Plan listed a number of other threats to the species' woodland habitats including clearing of both living and dead trees, removal of fallen timber and litter for fire-fuel hazard reduction, inappropriate fire regimes, predation by feral animals or uncontrolled domestic animals, invasive pasture grasses/weeds and competition for hollows from introduced species such as Common Starlings (*Sturnus vulgaris*). [Evidence was cited of Common Starlings evicting Brown Treecreepers from nesting hollows.].

Nearly twenty years after the publication of that Action Plan, those threats continue, particularly with rapid urban spread into Gungahlin and Molonglo. It is known, for example, that timber has been regularly taken (illegally) from Campbell Park woodlands, which used to be the local hotspot for the species.

Habitat and ecological requirements

The BT is dependent on suitable hollows in eucalypts, particularly in mature trees, but also in standing dead trees, and the products of mature eucalypts, particularly fallen (hollow) limbs, woody debris and stumps. The BT requires these for:

- nesting (in hollows)
- foraging (on trunks and branches)
- roosting at night (in hollows, crevices)
- refuge for resting during the day and to escape and find safety from predators (in hollows, crevices).

Higgins *et al.* (2001) in HANZAB have provided comprehensive information about the Brown Treecreeper, including from studies on the south-west slopes of NSW of the species' movements, by Drs Veronica and Erik Doerr (CSIRO, Canberra). The following summary is taken from that publication's sections on habitat, movements, food, social organisation and social behaviour, and is based on contributions written by those researchers.

Brown Treecreepers:

- Are mostly found in woodlands dominated by eucalypts … with open grassy understorey
- Are also found in semi-cleared pasture, in grasslands with scattered trees, in shelter belts fringing cleared lands
- Have a preference for rough-barked trees, such as boxes and stringybarks
- Are territorial year round, some birds disperse locally after breeding; adults may also move locally after divorce or loss of mate
- Vagrants may occur up to 100km from normal range
- Most young females and possibly some males start to disperse from the natal territory by the next breeding season to search for breeding positions in other groups of Brown Treecreepers
- Both sexes of young birds make forays out of the natal territory, but females make longer and more frequent forays out of the natal territory to search for breeding vacancies; males tend to fill breeding vacancies 1-2 territories away, while females tend to settle anywhere from 1-10 territories away, rarely up to 35-40 territories away
- Are almost entirely insectivorous, mainly ants and beetles, occasionally nectar
- Are both terrestrial and arboreal for foraging, in about equal proportions; forage mainly by gleaning but also by probing
- Forage in pairs or small social groups (3-8 birds), on bare or sparsely vegetated ground, in leaf litter, in crevices and holes on trunks and larger limbs of trees (dead and live), amongst coils of loose bark, on and around fallen logs and under bark of logs.

A main response by BTs to the threat of predation is to flee to a nearby hollow, such as a hollow fallen log. Birds being observed in the field will suddenly disappear, for example, when other birds' alarm calls are made. Fleeing to hollows in trees or logs was observed in the reintroduction study of this species at Mulligans Flat/Goorooyarroo Nature Reserves.

BTs require vegetation structures for connectivity between patches, for example, to disperse to other territories; paddock trees will be used where there is no shrub/mid canopy structure for cover.

Habitat fragmentation is a major contributor to the decline of BTs. Fragmentation of habitat can disrupt the recruitment of juvenile females, resulting in some (isolated) groups in habitat fragments lacking a breeding female. The last bird remaining in an isolated territory is often a male; this was observed locally at Goorooyarroo NR. A second problem is reduced genetic flow between (isolated) populations.

BTs have been shown in various studies known to the author *(e.g.* Fenner School, ANU) to survive in fragmented farming landscapes, provided there are sufficient patches of large eucalypts, connectivity corridors *(e.g.* paddock trees or other vegetation structure), and dead and fallen timber is not cleared away.

Experimental reintroduction at Mulligans Flat/Goorooyarroo Reserves

BTs became locally extinct in 2000 at Mulligans Flat and 2005 at Goorooyarroo. An experimental reintroduction of BTs in spring 2009 at these large grassy woodland reserves failed. While that study concluded that a number of factors probably influenced the failure, it noted there was high mortality from predators in the first months. The study noted that the birds were hard released [3] and may have been more vulnerable as they did not have knowledge of the territory or, importantly, of suitable refuges/bolt holes/hiding places. Natural hollows at those reserves were not considered abundant/sufficient, so a large number of nesting boxes and refuge tubes were installed next to logs as part of the experiment to substitute for natural hollows, but the artificial structures were not known to be used by the birds.

Newline Quarry Woodland

The woodland patch of Yellow Box/Red Gum known as Newline is just south of the Canberra Airport on Pialligo Avenue towards Queanbeyan. This site consists of a number of fenced paddocks of varying eucalypt tree density and varying understorey quality, with invasive weeds over much of the site. The front paddocks abutting Pialligo Avenue have a high density of very old eucalypts and are known to ACT birdwatchers as a very good patch for woodland birds, especially in the spring.

This woodland is noted in the ACT's Lowland Woodland Strategy (Action Plan 27) as an important bird habitat, particularly for the threatened BT. The woodland is also noted in Action Plan 27 as an important corridor link between the Majura Valley and the Jerrabomberra Valley, although this is not necessarily a functional/ecological link for some bird species.

COG established nine bird-monitoring sites at Newline in 2000, as part of its long-term woodland bird-monitoring survey; these sites are across all the paddocks, down to the southern end near the quarry. There is an extensive bird list and the migratory Swift Parrot (vulnerable in the ACT; endangered under Commonwealth and NSW legislation) has been recorded there.

Over the years, a small group of BTs has been a feature species at this site, generally found in the front paddocks on most surveys/visits. This has been one of the very few remaining, breeding groups of BTs close to the urban area, but COG has not recorded them in its surveys since 2012.

The majority of the woodland site (the northern part) is within an area owned by the Commonwealth under the jurisdiction of the Department of Defence. A smaller portion of land at the southern end of the woodland is understood to be under the control of the ACT Government. Some years ago, COG became aware that the Commonwealth Department of Defence may dispose of the site, therefore raising concerns about the long-term future of this important site to the birds of the ACT. Discussions have occurred with both the ACT Government and Defence with the aim of having this habitat and corridor link under conservation management and better protection, but this has not happened to date.

[3] Hard release: Birds are brought from capture area, in this case the SW slopes of NSW, and immediately released, without a settling-in period.

In 2004, the ACT Government made an election policy commitment, as part of a package of initiatives to protect grassy ecosystems; this is documented in the Australian Labor Party's ACT Campaign 2004 documents as:

> The Newline Quarry Woodland, situated just south of Canberra Airport is an area of around 50 ha that is recognised for its important bird habitat. Although parts of the land are of variable environmental value, endangered species such as the White-winged Triller are often spotted in the vicinity. The area provides connectivity between the Majura Valley and Callum Brae Woodlands. The Commonwealth owns part of the land, while other parts are owned by the ACT. Given that the area is of variable quality and that there are multiple landowners involved, the Labor Party will undertake a detailed study of the area, with a view to protecting the important habitat and connectivity values.

The Newline site, which also has some ongoing industrial uses and a builders' waste dump on one edge, should be managed under conservation management principles to ensure that its large eucalypts are protected. It remains a viable habitat for threatened species and is enhanced to improve its connectivity/wildlife corridor values. Although it seems that the group of BTs may not currently occupy the Newline site, it is possible that birds might move from/through the Majura Field Firing Range site (further north) where they have been recorded by COG in the past. This area is part of a wooded corridor (outlined in Action Plan 27) which extends to Mulligans Flat/Goorooyarroo and west around the ACT's northern border. Critically, the Newline woodland with its old hollow eucalypts is not currently being actively managed for woodland bird conservation and is also not protected in perpetuity.

Kama NR and the Molonglo Valley

The Kama NR is in the central Molonglo Valley, a site with high-quality Yellow Box-Red Gum woodland and many large mature eucalypts. The site is on a south-facing slope with deep soils, adjacent to the Molonglo River and surrounded to the north by rural leaseholds and the suburbs of Belconnen further north. Kama itself is a narrow plot, around 800-900 metres in width. The site had lost much of its shrub layer (due to grazing activities), but restoration plantings have been done there in recent years. Prior to becoming a nature reserve in early 2009 (part of Molonglo development offsets conditions), the block was known as agistment block 1419 owned by the ACT Government.

In 2005, COG set up bird-monitoring sites in what was then the agistment block; these sites have been surveyed quarterly since then, as part of a long-term COG bird-monitoring project in the ACT's grassy woodlands. COG has records of BTs at the site going back to 1989, when COG undertook a three-year Atlas survey, a census of birds. However, no records of observations on the population are known over the sixteen-year period between December 1989 and September 2005.

In 2006, Mr Chris Davey, a member of COG and former CSIRO researcher, set up a research study of the BT population at Kama (see Davey 2019, this issue); this species was chosen because it is a listed threatened species in the ACT and because it is regarded as a model species that can be used to examine the threatening processes responsible for the demise of other ground-feeding woodland bird species. As many birds as possible were banded so they could be individually identified in the field, as part of this study over the period 2006 to 2010, approved by the ACT Government and the Australian Bird and Bat Banding Scheme.

Eighteen birds were banded over the study period. At that time, this was believed to be the largest known BT population within the ACT.

Initially, Mr Davey found a total of ten birds in four distinct groups of Brown Treecreepers, three within Kama and one adjacent to the western boundary, with each group consisting of a pair and a male helper. There was an interchange of female young between one of the inside groups and the outside group. Birds were observed throughout the Kama block and also using areas outside both the eastern and western boundaries, each group being confined to a specific area, with different areas used each winter. BTs were also discovered by Mr Davey at a property on the western side of the Molonglo River off the Uriarra Road (Piney Creek), but this site was not part of the Kama study. It is noted that COG has records of BTs at another property off the nearby Cotter Road west of Mt Stromlo, up to 2015.

At Kama, there were successful breeding seasons in 2005-06 and 2006-07. The population started to decline from June 2007. There was a poor breeding season in 2008-09 with no new birds produced, and by April 2009 only four adult birds remained, and an unbanded bird which moved in temporarily from outside the study area. Grazing stock, which had been intermittently present, were eventually permanently removed from the block in September 2008. Since that time, grass biomass has thickened and may not be optimal for BTs foraging on the ground.

Mr Davey concluded that the BTs at Kama were not a closed population, with four new birds appearing at various times and all female, one of which was known to have successfully bred. These immigrant females were all first seen in the two most north-western territories at Kama, most likely having come from territories discovered at sites to the north-west of Kama.

Mr Davey also noted that the area surrounding the Kama agistment block (mainly grazing leaseholds with scattered or groups of trees, known generally as the Central Molonglo) is a critical element of the endangered woodland community due to the presence of breeding hollows and the amount of fallen timber. That area was also used for breeding by one group of BTs and for feeding by two other groups. BTs were observed using areas up to 380 metres from the Kama boundary fence. The group breeding outside Kama was an integral part of the population and acted as a source of individuals for the breeding groups within Kama. However, little was known about the actual dispersal of female BTs.

Mr Davey suggested that, on the information at the time of his study, there was the possibility of other locations in the Molonglo Valley supporting isolated, possibly breeding pairs of BTs. The latest COG surveys indicate that the BT population no longer persists in Kama NR.

It should be noted that works for urban development and the (Molonglo) River Park commenced in the Molonglo Valley (known as Molonglo East) from the northern boundary of Weston Creek from around 2011, with the first suburbs of Coombs and Wright, and new suburbs are now moving further west and north with additional stages of development. This has meant the clearance of a large area of rural land, including the loss of many mature eucalypts across the development area, possibly compromising movement corridors.

Eventually, houses will abut the southern boundary of Kama Nature Reserve. An urban buffer zone from the Kama boundary was recommended by environmental experts for fire management and to protect the site from urban-edge effects. This buffer is important because

Kama is a narrow reserve with little core resilience and will be impacted significantly by urban-edge effects. A buffer area, required under the Commonwealth's EPBC Act approval of the Molonglo development, has not been determined, notwithstanding the lapse of several years (this buffer would also protect some mature eucalypt trees outside Kama), and a management plan for the Molonglo river corridor reserve and offset sites has not been made public. It is understood that a recent application has been made for an EIS exemption for the Molonglo Valley Stage 3 urban development, the documents for which, apparently, do not provide for a buffer for Kama and also expand the development boundaries.

In a report, consultants O'Sullivan and Beitzel (2006) concluded that the current development model for East and Central Molonglo would in all probability result in the local extinction of the BT.

The central Molonglo area north of Kama NR has no formal legislative protection, although the ACT Government announced that this would be conserved, not developed. That area also has an important breeding site for Superb Parrots.

Figure 2. Brown Treecreeper breeding site at Kama NR, Yellow Box (*Eucalyptus melliodora*) nearest tree on left. This kind of landscape, with scattered, mature eucalypt trees is typical in the Molonglo Valley. Much of this habitat has already been cleared for housing.

PhD study on landscape use by birds in future urban and peri-urban Canberra

A PhD study by Karen Ikin from 2008-2010, focussed on patterns of landscape use by birds in urban and future urban Canberra, with a view to providing sound whole-of-landscape scientific evidence on which to base planning, management and conservation priorities. This study examined (as one component of the research) bird-habitat relationships in the Molonglo Valley (the area planned for future urban development), and as another component, bird-community dynamics on urban edges. The BT was recorded in the study in urban fringe and future urban areas.

Dr Ikin's study concluded that:

- Large eucalypts had a consistently positive relationship with bird diversity
- Woodland sites with the highest tree cover supported the largest number of bird species overall
- In surburban pocket parks, large trees were acting as keystone structures (shelter, resources, or goods and services for other species), and
- The overall findings provided critical support for the protection of scattered trees in any modified landscapes where they occur, *e.g.* urban, peri-urban and rural.

The study also concluded, 'the presence of structural features such as logs, shrubs, hollows, eucalypt regeneration, and leaf litter in the Molonglo Valley had a positive effect on the probability of recording eight of the ten declining ACT woodland species investigated.'

Dr Ikin's research made three main recommendations relating to trees in the urban and peri-urban/reserve environment:

(1) Retain eucalypt woodlands

(2) Preserve large, scattered trees, and

(3) Encourage replacement of trees through regeneration.

Acknowledgement

This material has been prepared by Ms Jenny Bounds, Conservation Officer, Canberra Ornithologists Group. The information is largely based on COG's records of birds observed in the ACT and recorded in its databases, the Annual Bird Reports published by COG in its journal Canberra Bird Notes, information from the COG long-term woodland bird-monitoring project in grassy woodlands in fifteen locations, and other relevant sources.

Ms Bounds has a special interest in woodland birds and experience over many years in bird survey projects in ACT and NSW. Ms Bounds has been a member of the COG Committee for some years, is a member of the Board of the Conservation Council and Chair of their Biodiversity Working Group, and is on the Management Committee of the Woodlands and Wetlands Trust. She has drafted several nominations of bird species now listed as threatened in the ACT, including Little Eagle, Glossy Black-Cockatoo and Scarlet Robin.

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DEMISE OF BROWN TREECREEPERS IN THE CENTRAL MOLONGLO VALLEY, ACT

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Abstract*. In the ACT the threatened Brown Treecreeper* (Climacteris picumnus victoriae) *has continued to decline. This decline has been shown in general observations and woodland surveys conducted by members of the Canberra Ornithologists Group. Over a ten-year period an example of this decline is documented from Kama Nature Reserve and the surrounding central Molonglo Valley. Possible reasons are discussed but general conclusions are that it may well be the result of a set of events started over 100 years ago with the clearing and fragmentation of our local woodlands, with the small pockets of surviving birds not resilient enough to overcome stochastic events that are hard or impossible to manage.*

1. Background

The Canberra Ornithologists Group (COG) has been involved in surveying the birds of the endangered Yellow Box-Red Gum (*Eucalyptus melliodora-E.blakelyi*) Grassy Woodland community since 1998. The survey, originally funded by the ACT Government through Environment ACT, has continued to expand as additional sites become available. In September 2005 the Kama Agistment Block #1419 was included in the survey for the first time and, as survey protocol dictates, has been surveyed once each season since then. Results from the Kama site were first included in the analysis of woodland birds in the ACT by Bounds *et al.* (2007). Amongst the threatened bird species recorded on the site was the Brown Treecreeper (*Climacteris picumnus victoriae*), and the site coordinator (Chris Davey) initiated a more detailed survey on this species. The Brown Treecreeper was chosen for further study because it is listed as a vulnerable species in NSW and the ACT and regarded as a model species that can be used to examine the threatening processes responsible for the demise of other ground-feeding woodland bird species. The study of the Brown Treecreeper is an unfunded, private project, approved by Environment ACT at the end of January 2006, with banding approval given by the Australian Bird and Bat Banding Scheme at the same time. In early 2009 due to reports of further Brown Treecreepers in the Central Molonglo area the project was expanded primarily to determine whether any of the birds banded at Kama had moved elsewhere within the Valley.

Unless indicated otherwise, all observations reported here were made by the author.

Kama Agistment Block # 1419 was declared a nature reserve as part of the Canberra Nature Park complex in early 2008. For this report the area is referred to as Kama South Nature Reserve (KSNR), see Figure 1. As part of the change in management all stock were removed between 26 Mar and 21 Apr 2008. Prior to the change up to 60 cattle were frequently recorded grazing the area.

Brown Treecreepers were first recorded from KSNR on 24 Sep 1989 during surveys conducted for the *Atlas of Birds of the ACT* (Taylor and COG 1992). Birds were again reported during a second visit on 3 Dec 1989. Unfortunately on neither occasion was

abundance recorded. On 18 Feb 1990 two Brown Treecreepers were reported from the nearby Pinnacle Nature Reserve and last reported there on 17 and 19 Mar 1999 (M. Clayton *pers. comm.*). Since then there have been no further reports of Brown Treecreepers within the Pinnacle Nature Reserve despite many frequent visits to the area by various members of the Canberra Ornithologists Group.

At KSNR Brown Treecreepers were reported again in September 2005. Although likely, it is unknown whether the birds were present during the intervening period, as there are no reports of bird surveys at KSNR between December 1989 and September 2005 in the COG database. During November 2008 a general survey of birds in the Central Molonglo Valley reported a single Brown Treecreeper on the Piney Creek property (see Fig. 1) with no other Brown Treecreepers reported from the survey, (Stagoll *et al*. 2010). On 9 January 2009 two adults and two young were located on Pine Ridge (see Figure 1). On 21 Jan 2009 two adult birds were located at Land's End, a property immediately adjacent to KSNR . On the same day two adult birds were located on 'Yealambidgie', a property adjacent and to the west of Land's End. During a survey conducted by COG in spring 2011 for Superb Parrots (*Polytelis swainsonii*), in an area from Wagtail Park in the west to Coulter Drive in the east, a single Brown Treecreeper was recorded on 28 Sep 2011 at Wagtail Park (C. Davey 2013).

Figure 1. Location of Brown Treecreeper sites in Central Molonglo. 1. Kama South Nature Reserve (hatched), 2. Piney Creek, 3. Pine Ridge, 4. Wagtail Park, 5. Yealambidgie, 6. Land's End.

In summary, up to spring 2011 there were six groups or isolated single birds known to be resident within Central Molonglo (see Fig. 1).

The aim of the study was to document the distribution and abundance of the Brown Treecreeper in Central Molonglo and to observe any changes associated with urban development in the area.

2. Methods

2.1. Habitat description

Central Molonglo is an area covered by grazing rural leases of 'improved' pastures and scattered Yellow Box-Red Gum woodland.

Surrounded by rural leases, KSNR is part of a vegetation corridor through to Black Mountain. KSNR is situated on a south-facing slope adjacent to the Molonglo River. The Reserve contains three basic vegetation types: the Molonglo Riparian habitat at 490 m ASL; then from approximately 500 m to 570m, heading north, open, virtually treeless grassland; from 570 m up to 600 m. Yellow Box-Red Gum woodland blends into stands of Scribbly Gum (*E. rossi*). The Brown Treecreepers were virtually restricted to the Yellow Box-Red Gum woodland between 570 m and 600 m. The woodland has been highly modified by past grazing but there still remains an abundance of fallen timber. For a description of the Reserve see: https://www.environment.act.gov.au/__data/assets/pdf_file/0005/906377/Kama-Nature-Reserve-Self12.pdf

2.2. Weather

Rainfall records covering the period 2003 to 2010 were obtained from the old Canberra Airport (Station No. 70014) and from the new Canberra Airport (Station No. 70351) between 2010 and 2015. The long-term rainfall average was obtained from Station No. 70014 and covered the period 1939 to 2010. Rainfall records were plotted as average spring records, *i.e.* September-November (see Fig. 2) to highlight rainfall during the main nesting season and then plotted as average spring and summer, *i.e.* September to February (see Fig. 3) to highlight rainfall during the breeding and young survival period.

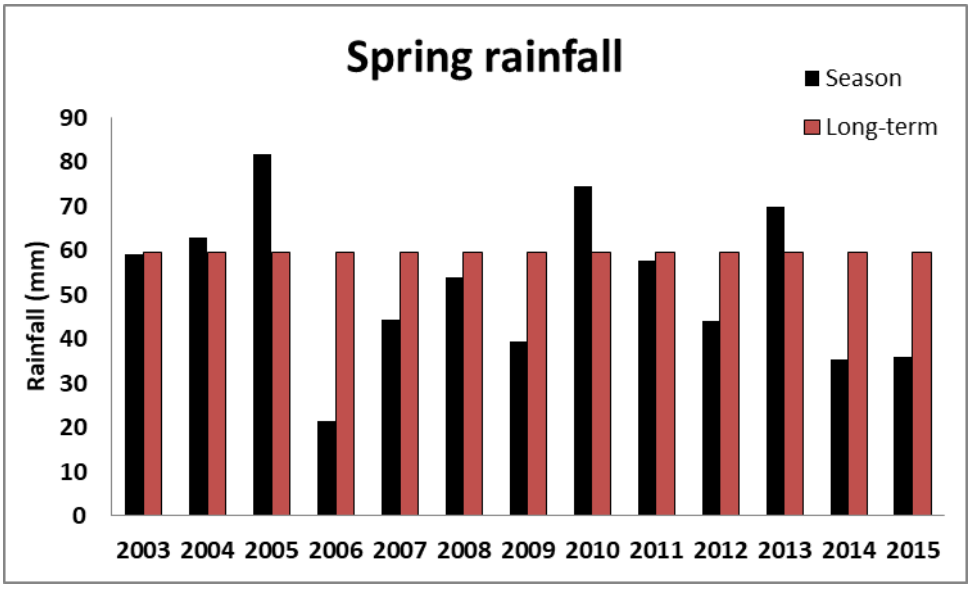

Figure 2. Average annual spring rainfall compared with average long-term spring rainfall.

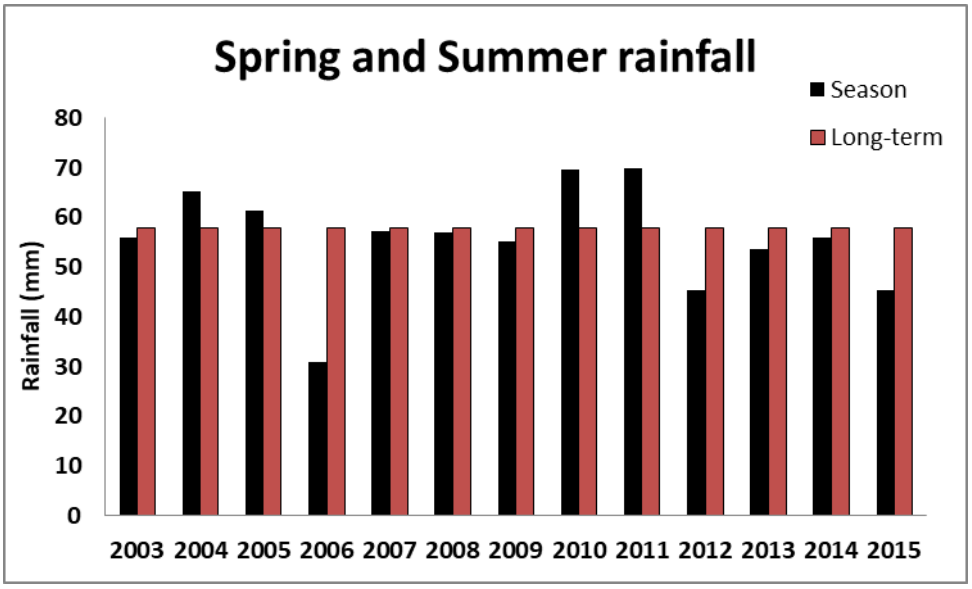

Figure 3. Average annual combined spring and summer rainfall compared with combined average long-term spring and summer rainfall.

The spring of 2005 was notable for very good rainfall in the Canberra region during the critical nesting months, although poor summer rains resulted in a spring/summer period of near average conditions. From the period 2006 through to 2015 for only 2 years (2010 and 2013) was the spring rainfall above average. Above-average rain during the summer months raised the average to near long-term averages for most years apart from 2006 and 2012 to 2015 (see Fig. 3). Throughout this period the rainfall was below average during the spring or summer over the critical nesting and rearing periods, and the good season of 2005 may have sustained populations through the poor season of 2006.

Table 1. Number of visits to known locations of Brown Treecreepers within Central Molonglo.

Year	KSNR	Piney Creek	Pine Ridge	Wagtail Park	Yealambidgie	Land's End
2005-06	16					
2006-07	34					
2007-08	31					
2008-09	17	2	4		4	2
2009-10	18	1	2		7	7
2010-11	23	1			5	3
2011-12	13			3	2	3
2012-13	19			2		
2013-14	8				1	1
2014-15	8					
2015-16	3					

2.3. Survey effort

Between October 2005 and March 2013 there were regular visits to KSNR, initially to determine the abundance and distribution of the birds and to band individuals. From then on, although there were visits throughout the year, mist-netting and banding of recruits was

concentrated during the late spring and early summer months. Visits became less regular from 2013-14 onwards. Additional surveys were carried out over the wider Central Molonglo area from early 2009 onwards (Table 1). Visits no longer occurred in those areas after two visits had determined that birds were no longer present.

2.4. Banding and observations

Observations of the birds within KSNR commenced in October 2005, with all individuals colour-banded from April 2006 onwards. Individuals from Land's End were banded by early April 2009. The social group at Pine Ridge was banded by February 2009. The single birds at Piney Creek and Wagtail Park were not banded, nor were the birds at Yealambidgie.

2.5. Feeding behaviour

Feeding activity patterns pre and post stock-removal were compared at similar times of the year. Between February 2007 and November 2007, before stock removal, there were 36 surveys of feeding activity. Stock was removed from KSNR between March and April 2008. Between February 2010 and November 2010, that is three years after stock removal, there were 16 surveys of feeding activity.

Individual birds were chosen at random and observed at a distance over a 20-minute period. The time spent on the ground (%) and the area covered over 20 minutes was noted. The time feeding on the ground in relation to other activities was assessed with a stop-watch. The area covered was measured with a GPS unit after the 20-minute period by walking round the perimeter of the area covered. On those occasions when a bird was not in view during the entire 20 minutes, the area covered was not measured, and when total activity was assessed for less than 15 minutes observations were rejected.

3. Results

3.1. Fate of social groups

Piney Creek. The individual recorded on November 2008 was resighted in December 2008. This bird was a male and despite an intensive search of the area no other individuals were recorded. In spring 2009 and again in winter 2010 the area was revisited but no Brown Treecreepers were detected .

Pine Ridge. On 9 Jan 2009 four birds were located in a small area known as the Crystal's Paddock. By 12 Apr 2009 the group of an adult male, adult female and two young of the year had been banded. On a return visit to the area in October and December 2009, despite an intensive search of the surrounding area, no Brown Treecreepers were located.

Yealambidgie. On 21 Jan 2009 two adult birds were located in a small clump of trees in an open paddock. This pair remained in the area, bred in a Yellow Box hollow and produced two young first seen in January 2010 and last seen in April 2010. This pair bred again the next season in the same hollow producing four young, which disappeared one by one until the last was seen in February 2011. The female disappeared at the same time, and the male was last seen in October 2011.

Land's End. On 21 Jan 2009 two adult birds were first recorded in a clump of trees next to a dam. This pair was not seen to breed but was joined by a female in December 2009. This female had been banded in KSNR and remained with the pair until February 2010, then

returned to KSNR and was last seen in August 2010. One of the adult pair disappeared in September and the other in October 2011, having remained in a similar area throughout this period.

Wagtail Park. The individual reported on 28 Sep 2011 was a male, seen alone and reported again on 2 Nov and 29 Nov 2011. A detailed search of the area in spring 2012 and again in winter 2013 was unable to detect any Brown Treecreepers.

KSNR. After an initial inspection of the area in September 2005, it was confirmed that Brown Treecreepers were still resident within the area. By the end of January 2006 permission had been obtained from Environment ACT and the Bird and Bat Banding Scheme for a banding study of Brown Treecreepers in the area then known as Kama Agistment Block # 1419. By April 2006 all birds had been individually colour-banded, and by June 2006 the population consisted of seven adult males, three adult females, and three young hatched during the spring of 2005.

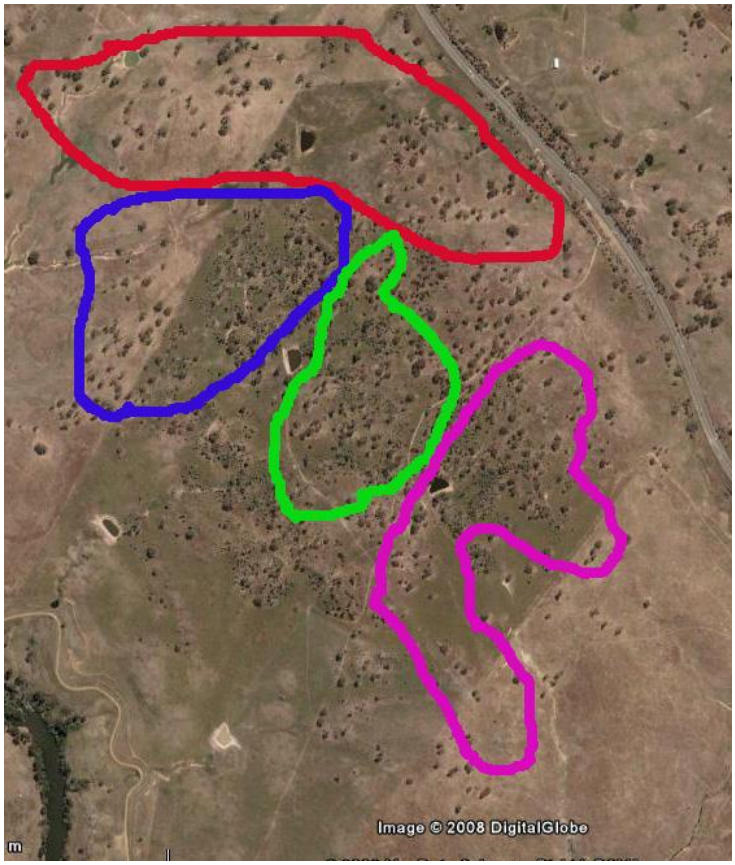

Figure 4. Distribution of four social groups at KSNR during 2007-08.
Note that the different colours demarking the distribution of the four Brown Treecreeper groups are difficult to distinguish in b/w print. Please view Fig. 4 in full colour in the electronic version of this issue of the Canberra Bird Notes at http://canberrabirds.org.au/publications/canberra-bird-notes/

3.2. Social groups and breeding success at KSNR

From behavioural observations starting in February 2006 it was determined that there were two social groups. One group consisted of five adult males, two adult females and an immature female, whilst the second consisted of two adult males, one adult female and an immature male and female, each group having successfully bred in spring 2005 and produced

a brood of at least two, a male and a female. Three individuals survived to September 2006 (Table 2).

In the 2006-07 season, each group again produced a brood: the first a brood of three and the second of four. Three of the young survived to September 2007. In the 2007-08 season, the two social groups had split into four groups (see Fig. 4). For this season a single brood of a female and sex unknown only were produced, but only the female survived until September 2008. During the 2008-09 breeding season a single brood of three was produced but none survived to September 2009. After September 2008 the remaining seven birds behaved as one social group, which was found throughout the area.

In the 2009-10 breeding season a single brood of two males and two females was produced, but only one female survived to September 2010. During the 2010-11 breeding season a single brood of one male and one female was produced, and both survived until September 2011. In the 2011-12 breeding season a single brood of three was produced, none of which survived to September 2012. No successful breeding occurred from the 2012 breeding season onwards.

Table 2. Productivity at Kama South Nature Reserve, 2005-2012.

Breeding season	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**Total**
No. breeding females	5	5	3	2	2	2	2	1	
No. young produced	3+	7	2	3	4	2	3	0	24+
No. young alive September post fledging	3	3	1	0	1	2	0	0	10
No. young alive September 12 month post fledging	3	1	1	0	0	1	0	0	6

Clutches were produced each year from 2005 to 2011 but survival was poor: only 10 of the 24+ young (42%) survived to the start of the following breeding season, that is to September the following year, when potentially old enough to contribute to the breeding population, and only 6 (25%) survived two years later. Doerr *et al.* (2006) estimated that there was a 58% survival rate from fledging to independence at four weeks of age. Although survival to four weeks of age was not measured at KSNR, a survival rate of 42% to the start of the next breeding season suggests a similar rate post fledging and to the following September.

The number of Brown Treecreepers in KSNR therefore declined from a maximum of 13 individuals to none. The last remaining bird, a male, was reported on 29 Sep 2014 and, to my knowledge, none has been seen there since.

3.3. Age structure of population at KSNR

A breakdown of the age structure of the population at Kama south from April 2006 to September 2015 is given in Table 3. Assuming Brown Treecreepers breed in the season after their birth, September, the start of spring, was chosen as representing the number of birds entering the breeding population for each year.

Table 3. Age structure of the Brown Treecreeper population at KSNR, April 2006 to September 2015. Note: If a bird was reported during a month it was regarded as living all of that month.

Male/female	Apr-06	Sep-06	Sep-07	Sep-08	Sep-09	Sep-10	Sep-11	Sep-12	Sep-13	Sep-14	Sep-15
Adult male pre 2005	7	5	3	3	1	1	1	1	1	1	0
Adult female pre 2005	3	3	2	1	1	1	1	1	0	0	0
Male 2005	1	1	1	1	0	0	0	0	0	0	0
Female 2005	2	2	1	0	0	0	0	0	0	0	0
Male 2006			3	1	1	1	0	0	0	0	0
Female 2006			0	0	0	0	0	0	0	0	0
Male 2007				0	0	0	0	0	0	0	0
Female 2007				1	1	0	0	0	0	0	0
Male 2008					0	0	0	0	0	0	0
Female 2008					0	0	0	0	0	0	0
Male 2009						0	0	0	0	0	0
Female 2009						1	0	0	0	0	0
Male 2010							1	1	1	1	0
Female 2010							1	0	0	0	0
Male 2011								0	0	0	0
Female 2011								0	0	0	0
Male 2012									0	0	0
Female 2012									0	0	0
Male 2013										0	0
Female 2013										0	0
Male 2014											0
Female 2014											0
Total male	8	6	7	5	2	2	2	2	2	2	0
Total female	5	5	3	2	2	2	2	1	0	0	0
Total alive	13	11	10	7	4	4	4	3	2	2	0

Apart from a male and female from the original population, survival of the adult population was poor, in particular from September 2008 onwards. In September 2006 there were seven adult males and three adult females with three young of the previous year. By September 2009 there were two adult males and two adult females, and by 2013 only two males remained, a father and a son, neither of which were present in September 2015. The 2008 breeding season was of particular concern: only two females were present, and only one of them had any previous breeding experience.

3.4. Movements

Despite intensive searches throughout most of the Central Molonglo, no marked birds were found outside their natal territory except for a single female that moved between adjacent social groups, see above. In addition, no unmarked birds appeared that could have been part of an unknown social group.

From April 2015 to the present, despite regular visits to KSNR and to Land's End, Yealambidgie and Pine Ridge by the author, during woodland surveys and projects associated with the Superb Parrot, there have been no further reports of Brown Treecreepers in the area.

The only exception has been of an *ad hoc* sighting of a single bird near Shepherd's Lookout on 2 Oct 2018 (R. Williams *pers. comm*.) and sightings of a Brown Treecreeper at the Uriarra Travelling Stock Reserve on 2 May and 18 May 2018 (A. Smith *pers. comm*.). Both sites are just outside the survey area.

3.5. Changes in vegetation and feeding behaviour with removal of cattle

Although not measured, from visual observations there have been noticeable changes between the time when stock were present in October 2005 and 10 years later. Particularly noticeable were the differences in the herb layer, which became denser and taller (see Figures 5 and 6). Another major visible difference has been the increase in sapling growth, in particular Blakeley's Red Gum and a loss of canopy cover due to leaf loss. Over the period there was no apparent loss of coarse wood debris.
On average treecreepers spent 31% (n=36) of time feeding on the ground when cattle were present compared with 18.8% (n=16) after the removal of stock. The average foraging area covered when stock was present was 0.54 ha (n=30), compared with 0.26 ha (n=11) with stock removed.

Figure 5. (*left*) Image taken from a COG woodland census site K4 on 14 Oct 2005.
Figure 6. (*right*) Image of same site as Figure 5 taken on 14 Oct 2015.

3.6. Other observations

There were 2022 records of Brown Treecreeper in the COG General Observations Database between September 1986 and 30 Jun 2018. For the purpose of recording, the COG area is divided into a grid of 780 cells, each of 2.5 minutes of latitude and longitude (3.5x4.5 km). Brown Treecreepers have been reported from 187 cells. For a map of the COG cells see Canberra Ornithologists Group (2019), p. 104.

Most cells contain only a few records, but eleven contain more than 40 records indicating that the Brown Treecreeper was commonly reported from those areas. Although it needs to be confirmed, it is most likely that Brown Treecreepers are no longer present in cells H15, I13, J19, L13, M13, M14 and N14. In the period July 2017-June 2018 Brown Treecreepers were reported from 12 cells only, with breeding at only four sites (Canberra Ornithologists Group 2019).
Of the 15 COG woodland sites, four have never recorded Brown Treecreepers, whilst of the remaining eleven none has Brown Treecreepers now (see Table 7).

Table 7. Details of last known sighting of Brown Treecreeper at 15 COG woodland sites and one Travelling Stock Reserve.

Woodland site	Start of survey	Last known present	Elapsed time (years)
Mulligans Flat NR	1995	2000	5
Goorooyarroo North NR	1998	NA	
Goorooyarroo South NR	2004	2005	1
Mt Majura	1998	2002	4
Majura Field Firing Range	1998	2008	10
Castle Hill	1998	2017	19
Red Hill	1998	NA	
Symonston & Callum Brae	1998	2001	3
Newline	2000	2012	12
Hall/Gold Creek	2000	NA	
Tuggeranong Hill	2000	NA	
Campbell Park	2003	2006	3
Naas Valley	2005	2012	7
Kama	2005	2014	9
Jerrabomberra West NR	2006	2007	1
Nelangloo TSR (NSW)	2007	Still present	

The elapsed time between the initial survey and when birds were last recorded varied from one year to 19 years. Birds were reported regularly at Castle Hill between 1998 and 2013 but since then a single bird has been seen on four occasions only, with the last sighting in 2017. At Newline two birds were regularly reported until 2012 but none since then. Nelanglo TSR (near Gundaroo north of the ACT) has been regularly surveyed since 2007. Although not part of the ACT Woodland survey, four sites there have been surveyed since 2007. Initially, there were three social groups present, then two groups from October 2016 to June 2017, and since then only one group of 4 birds.

4. Discussion

Over a 10-year period starting September 2005 the Brown Treecreeper has disappeared from six sites within Central Molonglo. Surveys conducted specifically for the Brown Treecreeper and additional surveys in association with survey work on the Superb Parrot (*Polytelis swainsonii*) by the author in Central Molonglo have been unable to find any further populations there.

Records collected during the period September 1986 to 31 Aug 1989 for the *Atlas of Birds of the ACT* (Taylor and COG 1992) show that the Yellow Box-Red Gum woodland at Campbell Park was regarded as the 'HotSpot' for Brown Treecreepers. The birds no longer occur in the area.

Surveys conducted in association with the COG woodland surveys have shown that over a similar period the Brown Treecreeper has disappeared from 11 woodland survey sites in the ACT. Brown Treecreepers at a travelling stock route site surveyed since January 2007 near Gundaroo NSW have decreased from three social groups to one group of four birds in that time (M. Lenz and A.O. Nichols *pers. comm.*). Reports from other sites within the ACT and

surrounding NSW from which long-term records have been collected suggest that the birds are no longer present.

Despite this, a project run by Greening Australia aims to monitor any changes in abundance of birds on private properties in the Bredbo area south of Canberra. The project, now running for 10 years, compares birds in areas that have been replanted and those that have not. To date this continuing project has not detected any apparent decline in the abundance of Brown Treecreepers, (N. Taws *pers. comm.)*.

It is difficult to speculate why populations have declined or disappeared outside Central Molonglo because of the lack of detailed knowledge of the threatening processes or of the structure and composition of these populations. For instance, without knowing past population fluctuations and recovery, their numbers, distribution and breeding success it is not possible to compare with the 10-year period reported here. It is possible, however, to identify some factors that are unlikely to have caused the present demise of the Central Molonglo populations.

Over the survey period, Brown Treecreepers disappeared from six sites in Central Molonglo. It is unlikely that missing birds dispersed between sites or to other areas in the Molonglo Valley, so they either died or moved outside the area. In Central Molonglo two sites contained single birds only, both males. These birds could have died of old age or a multitude of factors affecting small populations. In the other four sites there was only one individual that moved between groups - a young female which moved 0.8 km, although the average distance between these sites is only 1.7 km (minimum distance 0.8 km, maximum distance 3.0 km). Brown Treecreeper females disperse from the natal territory and males remain as helpers (Higgins *et al.* 2001). Therefore, as a population declines it is more likely that the sex ratio will favour males. This was the case at KSNR and possibly with the single males at Piney Creek and Wagtail Park.

The site at Pine Ridge held an adult pair and two young of the year. All birds were banded. Unfortunately the landowner removed some fallen timber and partially cleared the site, altering the structure of the habitat. In addition an Australian Hobby (*Falco longipennis*) bred there, and both factors may have led to the extinction of this group. These factors might not have affected the group had the population been larger.

Why birds disappeared from KSNR, Yealambidgie and Land's End is not known. Brown Treecreepers at the three sites were captured and banded. This is unlikely to have led to the demise of the various groups at these sites, because birds also disappeared at other sites, such as the COG woodland sites, over a similar period where no banding occurred. There was no direct mortality due to the handling and banding process so it is unlikely that the social dynamics of the groups were altered.

A potentially important consequence of reduced populations for a cooperative breeder such as the Brown Treecreeper is a reduction in the number of helpers available to feed the young. This would have happened at KSNR and may well have led to a decline in reproductive success.

All nesting events at KSNR were monitored. Height of nesting sites varied from hollows in fallen branches to sites high in tree trunks. Although not measured, the outside diameter of nest hollows varied but generally would have suited those preferred by the Common Starling (*Sturnus vulgaris*). The nesting site usually changed from year to year but on a few occasions the same site was used. Likely direct or indirect nest competitors included Crimson and Eastern Rosella (*Platycercus elegans, P. eximius*), possibly Superb Parrot (*Polytelis swainsonii*) although they are not known to breed in KSNR, Red-rumped Parrot (*Psephotus*

haematonotu), Sacred Kingfisher (*Todiramphus sanctus*), Dollarbird (*Eurystomus orientalis*), White-throated Treecreeper (*Cormobates leucophaea*), Common Starling and Common Myna (*S. tristis*). No interactions between Brown Treecreepers and nesting competitors were observed; nor were any interactions between Noisy Miner (*Manorina melanocephala*) or Common Myna, both of which are uncommon in the Reserve.

The removal of stock and the periodic culling of the Eastern Grey Kangaroo *Macropus giganteus* population from KSNR without doubt led to changes in the structure of the vegetation, with an increase in the density and height of the herb layer and an increase in eucalypt regeneration. Over the 10-year period at KSNR there was no sign of any timber removal, and from images taken at each of the nine COG woodland survey sub-sites, although not measured, the loss of leaves leading to a decrease in canopy cover was obvious. It would be easy to assume that these changes in the vegetation structure at KSNR have had an effect on population numbers. The other five sites were all on private land with no apparent changes in grazing management, and again, except at Pine Ridge, with no obvious removal of timber. On all five properties the 'improved pastures' were maintained at a much shorter height than at KSNR. Despite these changes all groups disappeared. At KSNR there was a change in the feeding behaviour of the birds after stock removal: the area covered on average over a 20-minute period decreased, as did the time spent feeding on the ground. Ants are a major food source for the Brown Treecreeper (Higgins *et al.*, 2001). Although not tested, it is possible that the increase in the herb layer altered the behaviour of ants by increasing their abundance on tree trunks, branches or in the canopy layer and reducing their availability on the ground.

The amount of time spent feeding on the ground before the removal of stock (36%) is between the value of 30% in coarse woody debris sites described by Bennett *et al*. (2013), and below that (50%) of Antos and Bennett (2006), whilst the amount of time spent by reintroduced Brown Treecreepers (19%) is the same as after stock removal at KSNR, when neither population survived. This would suggest that the removal of stock was not beneficial to the Brown Treecreeper group at KSNR. A major activity taken to protect eucalypt woodland has been to reduce disturbance such as grazing, yet Doerr *et al*. (2006) suggest that this may contribute to a further decline in Brown Treecreepers.

The urban expansion of Canberra can significantly alter the fringe habitats for many woodland species. Using data from the COG woodland sites, Rayner *et al.* (2014) have shown that the Brown Treecreeper exhibited a negative response to both urban proximity and change. This is not an explanation for the demise of the Brown Treecreeper in Central Molonglo because over the 10 years of observations there has been no change in the distance of the urban interface to KSNR. The nearest urban edge is at Hawker, one km from KSNR.

South-eastern Australia experienced its worst drought on record from 2001-2009 (van Djik *et al*. 2013) and one factor that would have affected all groups was the below-average rainfall over the survey period, in particular during the spring. Between 2006 and 2015 above-average spring rainfall occurred only in 2010 and 2013, although higher summer rainfall was close to average over the spring/summer period. The survival of young varied between breeding seasons but overall fledging survival to the start of the next breeding season was 42%, with half of them (25%) still alive 12 months later. So it would appear that although young were produced every year survival was poor especially up to the start of the next breeding season. Without a period of above-average spring rainfall for comparison it is not possible to determine the effects of low spring rainfall.

The population at KSNR was in trouble particularly during the breeding season of 2008-09, when only two females were present, one with no breeding experience, and again in 2012

when only a single female was present. The result of a poor 2008-09 season with no successful breeding set the pattern for the demise of the Brown Treecreeper in Central Molonglo. Although birds bred elsewhere in the Central Molonglo at Pine Ridge and Yealambidgie, the lack of survival and dispersal did not allow for outside birds to join the KSNR group, even though there were available males.

O'Sullivan and Beitzel (2006) concluded that the current development model for East and Central Molonglo would in all probability result in the local extinction of the Brown Treecreeper. This appears to have already occurred even before the start of any major development in Central Molonglo.

The most recent Annual Report from COG, covering the period July 2017-June 2018, states that for the Brown Treecreeper, despite a small increase in the number of records and the reporting rate, this does not reverse the overall picture of slow decline of this species in the COG area of interest. The species was reported from only 6.4% of 780 cells each of 3.5 x 4.5 km. There were only four breeding records over the reporting period (Canberra Ornithologists Group 2019).

Despite the creation of reserves and improvements in woodland management, the Brown Treecreeper, along with other woodland species, continues to decline in the ACT. Management intervention such as revegetation, grazing exclusion, the creation of the area as a Reserve and weed control, all of which have occurred or are occurring at KSNR, has not prevented the decline and subsequent disappearance of the Brown Treecreeper from the area. The decline may well be the result of a set of events started over 100 years ago with the clearing and fragmentation of our local woodlands, and today the small pockets of surviving birds are not resilient enough to overcome stochastic events that are hard or impossible to manage.

Acknowledgements

Many thanks for access to properties: Mark and Meg Hartmann- 'Yealambidgie', Ockie Wallace- 'Land's End', Jenny Campbell- 'Pine Ridge', Graeme Trevaskis- 'Wagtail Park' and Gordon Hughes- 'Spring Valley' and 'Piney Creek'. Also, thanks to Peter Fullagar for preparing Figure 1 and to Kevin Windle for tidying up the grammar and making the article readable.

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Brown Treecreeper (*Julian Robinson)*)

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CENSUS OF SULPHUR-CRESTED COCKATOOS AND LITTLE CORELLAS IN CANBERRA DURING WINTER 2018

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Abstract. *This paper provides an overview of a collective effort to locate and survey Sulphur-crested Cockatoos* (Cacatua galerita) *and Little Corellas* (Cacatua sanguinea) *at their overnight roosts across Canberra in July 2018. A total of 5555 Sulphur-crested Cockatoos and 1000 Little Corellas were counted across the sites in the survey.*

Background

This project was born out of personal interest stemming from a few years of regular counts at a significant mixed-species roost site in Fadden (Sulphur-crested Cockatoo *(Cacatua galerita)*, Little Corellas (*Cacatua sanguinea*), Australian White Ibis (*Threskiornis molucca*), and Straw-necked Ibis (*Threskiornis spinicollis*)). This site covers about 2.5 ha, and has recorded counts of up to 775 Sulphur-crested Cockatoos (7 May 2017), and 900 Little Corellas (7 Jun 2017). Both species predominantly share a 0.5 ha core stand of eucalypts within the site. Significant seasonal fluctuations in numbers has become apparent over the years, with an autumn-winter peak dropping down to a low of 2-20 Little Corellas and 10-40 Sulphur-crested Cockatoos by November. I was curious as to what this reflected - could the birds be moving between other roosts in the region? Perhaps some were moving out of the region entirely over spring-summer, given the low number of Little Corella breeding records? Where are other roosts across Canberra, how many are there, and are they all this large? I decided to reach out to COG members for their help in learning a little more about these common species.

Method

Calls for overnight roost site locations were advertised through COG's email discussion list (chatline) and the Gang-gang newsletter, as well as directly to contacts, initially for all species in July 2017. This request was eventually narrowed down to focus solely on Sulphur-crested Cockatoos and Little Corella roost records, as a complete picture is not as easily obtainable for many other species, and to increase the response rate as the initial request had been too open-ended. The required details were also cut down.

The survey was scheduled for the weekend of 7-8 Jul 2018. This was chosen as it was around the peak period for bird numbers based on monitoring at my Fadden roost site. The survey would include the Friday evening and Monday morning as the counts would reflect the same birds as Saturday morning and Sunday night respectively. Although such a survey should be carried out in each quarter to get a full understanding of seasonal movements, that proved unrealistic due to the number of sites and the volunteer effort required. Birds were counted as they arrived in the evening, departed in the morning, or after they were settled in the roost trees.

Results

All confirmed urban sites at the time were covered by volunteers over the weekend. Only two sites could not be surveyed due to unforeseen circumstances and were followed up in the following days – no birds were recorded roosting at either site.

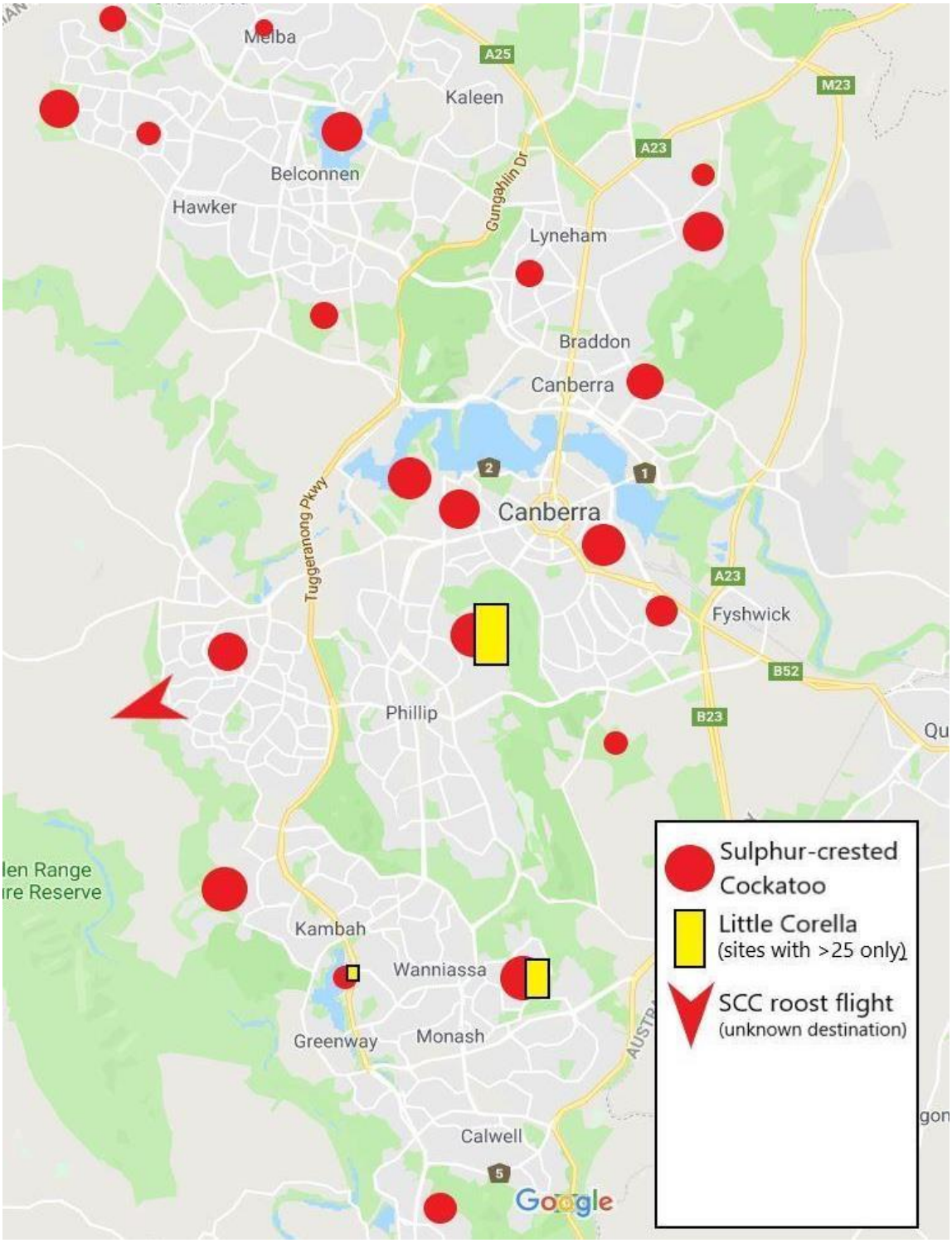
5555 Sulphur-crested Cockatoos (Table 1) and 1000 Little Corellas were counted across the sites in the survey.

The Little Corellas were recorded from two main sites: 600 at the Federal Golf Course (in Garran) and 340 in Fadden. These were also the third and second largest Sulphur-crested Cockatoo sites respectively. Another five sites recorded small numbers. All known roost sites are shared with Sulphur-crested Cockatoos.

Table 1. Locations with records of ≥200 Sulphur-crested Cockatoo over the survey weekend.

Location	Number of birds
Urambi Village/Murrumbidgee Golf Course, Kambah	450
Fadden	440
Federal Golf Course, Garran	400
Telopea Park	400
Royal Canberra Golf Course, Yarralumla	400
Hackett Oval	400
Rivett - Westbound dusk flight	395
Diddams Cl, Lake Ginninderra	350
Belconnen Golf Course	346
Yarralumla	300
Holder shops	300
Australian War Memorial	250
Total from the other smaller roost sites	1124
Total	5555

Figure 1. Map of roost sites and counts. Point sizes provide a rough indication of relative numbers of roosting birds.



Quite a number of reported roosts had no cockatoos present over the survey weekend. Most surprising of these was the ANU site, where I had previously regularly observed high numbers roosting (even earlier that year). Michael Lenz surveyed the site and found evidence of prior use, but concluded it had not been used for some time. Another case was the Waramanga site, where I counted 123 in February, a fairly high count for that time of year.

There were no birds present on the census date. Belconnen also had a high proportion of sites without any birds.

This was of particular interest as I had been under the impression that cockatoos were extremely loyal to their roost sites. Anecdotal reports from local residents in Fadden, as well as those Susan Robertson spoke to in Yarralumla, indicated that the cockatoo roosts had been there for as long as they remembered, some claiming over 10 years. Even more remarkable was a list of five roost sites included in the COG Atlas (Taylor and Canberra Ornithologists Group 1992). The four of these that were followed up (Australian War Memorial, Telopea Park, Royal Canberra Golf Course and the ANU) are all still active some 25 years after the atlas was published. Uriarra Crossing was also listed but has not been followed up.

The residents near the Mt Rogers site, which recorded no birds during the roost census, suggested that their winter disappearance may be a usual occurrence and that the birds might return in spring. Indeed, they reported in December that the birds had once again returned to the park. What this suggests to me is that some spring-summer cockatoo roosts cease over autumn and winter as birds leave to join larger roosts in their area. In turn, the number of birds at these larger autumn-winter roosts will decline over spring-summer as some birds leave to form new spring/summer roosts, perhaps closer to their breeding sites. This would explain the seasonal variations in numbers that I had seen in Fadden, along with the presence of seasonal roost sites used only in spring and summer.

A number of locations were surveyed separately by different observers, sometimes on the same evening. These obtained comparable results, suggesting observer differences are insignificant. However, another interesting case study was the Hackett site, where Bev Hogg was kind enough to provide data including the days either side of the survey. Over the survey period, she managed three counts of 350-400+ birds, falling to 200 by the end of the weekend (two counts). During the week leading up to the survey, there were three counts of just 100 birds each, increasing to two counts of about 150 each in the immediate lead-up to the survey. This highlights how important it is to conduct such a survey across Canberra simultaneously, as numbers can vary significantly in a matter of days.

Cockatoos appeared partial to golf courses and Southern Blue Gums (*Eucalyptus bicostata*), although they were also reported roosting in other eucalypts including Apple Box (*Eucalyptus bridegsiana*), Argyle Apple (*Eucalyptus cinerea*), Blakely's Red Gum (*Eucalyptus blakelyi*), and Yellow Box (*Eucalyptus melliodora*). No roost sites were reported in Gungahlin. Belconnen had a high proportion of smaller sites.

As for the ACT population, it seems the team managed to get a good estimate for the Little Corella, with the counts reflecting their strongholds between Phillip and the Monaro Hwy, and Erindale in Tuggeranong, unless there is a cross-border population that is also coming in from Queanbeyan.

For the Sulphur-crested Cockatoos, there are highly likely to be several roosts in relatively inaccessible portions of the Bullen Range and Namadgi (as evidenced by the evening roost flight W from Rivett). Even within the urban area, there are likely to be a number of smaller undetected roosts. For example, the author located a previously undetected one in Narrabundah, which had 160 birds during the roost census, only a week before the census. Keeping in mind that the accumulated error margins for the Sulphur-crested Cockatoo counts will be quite large, the estimated total ACT urban population comes to around 6000,

disregarding birds predominantly based in the surrounding parts of Namadgi and rural regions.

Acknowledgement

I would like to acknowledge the assistance of all those contributors who advised me of roost sites and assisted me with surveys. Unfortunately, due to time constraints I cannot delve further into this data or carry out further investigations, but if anyone is keen to take this further at some point I will be happy to provide additional details.

Table 2. Names of Census Surveyors.

B. Allan	A. Hall	A. Milton
L. Battison	S. Henderson	V. McDonough
K. Callaway	B. Hogg	M. Mulvaney
R. Callaway	J. Holland	N. Rivers
H. Cross	B. Jaques	M. Robbins
G. Dabb	M. James	S. Robertson
C. Davey	D. King	N. Taws
G. Fieg	S. Lashko	T. Tyrell
S. Fieg	M. Lenz	L. Wenger
J. Fogerty	M. Mears	S. Westlin

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OBSERVATIONS OF IBIS ROOSTS AND MOVEMENTS IN TUGGERANONG 2015 - 2018

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***Abstrac**t. This paper provides an overview of three years of monitoring the roosting movements of Australian White Ibis (Threskiornis molucca) in the Tuggeranong region. It includes counts from three roosts in Hume, Fadden, and Lake Tuggeranong, along with various points along their roost flight. The maximum number of ibis observed along the flyway was 800 - 1000 birds. These observations indicate that the ACT White Ibis population may be much larger than previously assumed.*

Roost sites and flyways

A significant mixed-species roost site for Australian White Ibis (*Threskiornis molucca*), Straw-necked Ibis (*Threskiornis spinicollis*), Sulphur-crested Cockatoo (*Cacatua galerita*), and Little Corella (*Cacatua sanguinea*) is located at Hannah Community Park (HCP) in Fadden. This site covers about 2.5 ha, and the ibis use a 150 m long row of large established pines along the northern edge, as well a single large half-dead eucalypt on the western edge (circled red in Fig. 1). The cockatoos mainly use an adjacent stand of eucalypts (circled yellow in Fig 1.), so do not appear to compete for space.

This is just one of a network of roosts that the ibis use over the year in Tuggeranong. Another roost is located on the three islands at the northern end of Lake Tuggeranong (LT), mainly the central island, and when present in large numbers, the southern island as well. I was alerted to an additional roost by Sandra Henderson in Feb 2017, in the woodland adjoining Couranga Crescent Wetlands in Hume. She had first noticed use of this site in Dec 2016. eBird records show that the roost was active at least from Dec 2016 to the end of Mar 2017, and again from Oct to Dec 2017. Sandra Henderson has confirmed from her regular visits that the site is only used over the warmer months. The birds at this site roost in large eucalypts, both dead and alive. Observations and counts over the study period are summarised in Table 1.

Observations

The birds can be seen travelling between the Mugga Lane Tip and their overnight roosts in the morning and around sunset in large skeins (flocks in V-formation). I have observations from Oct 2014 to Feb 2019 of the flocks from various points along their 'flyway' (excluding the Hume arm), including regular, weekly to fortnightly observations from Dec 2015 to Jul 2018. The ibis roost sites (★ in Fig. 1.), main flight observation points separate from roost sites (✷ in Fig. 1.) and their afternoon flight movement (→ in Fig. 1.) is depicted in Figure 1. Flight distances from the tip are approximately 7.3 km to LT and 3 km to HCP. While there are sometimes a few Straw-necked Ibis amongst the Australian White Ibis skeins and they do share the roost sites, they usually act independently, with different movements, for which I

have not detected any trends. As such, the following will focus solely on the Australian White Ibis.

Figure 1. Map of flight paths and roost sites. See text for symbols.

Some notable counts have been obtained over the survey period. Of these, the two highest counts were 785-840 Australian White Ibis moving along the flyway over HCP on 25 Aug 2017 (author). This was surpassed by a count of 900-1000+ birds by Liam Manderson over the Macarthur section of the flyway on 14 Aug 2018. Such a large population of Australian White Ibis in Tuggeranong alone highlights the significant size of the ACT population, despite being much less prominent than in other cities like Sydney. I have noted largest single skeins of 135 birds 15 Jul 2017, and ~142 birds on 2 Jul 2016.

The general trend is that HCP and LT are used interchangeably or as a combination in autumn to spring, and Hume over summer. In some years, small numbers continue to use the HCP-LT roosts in summer, while they completely cease visiting these in other years. HCP is more likely to be used in the autumn/spring transition periods and LT in the coldest months, but this is not a hard and fast rule.

While no obvious reason for their seasonal movements has been detected, Dr Heather McGinness (CSIRO) who has been studying the movements of ibis, has suggested to me that it may be a matter of the pines at HCP and LT offering sufficiently better shelter in the cold winter to make the distance from their feeding grounds at the tip worth covering. I have noted poor weather (including cold, wind, or hail) on a number of occasions when I have observed ibis using the HCP-LT flyway in the transition period (around the time when birds switch to/from using Hume) either side of summer, although this may have been coincidental.

Table 1. Summary of observations. LT refers to Lake Tuggeranong, HCP refers to Hannah Community Park in Fadden.

Date	**Roost counts/locations**
incomplete data Summer 2014-15	Up to 45 birds were recorded using HCP.
End Dec 2015 to start Jun 2016	Both HCP and LT being used, but larger proportion using LT. Initially about 150 birds in total, increasing to 300 by March, 400 by April, 250 in May
Mid-Jun to mid-Aug 2016	Birds no longer stopping at HCP and continuing to LT. Counts ranged from 275 to 405, with the peak in early July
Late Aug 2016	Counts of 225-375, with HCP again being used although by fewer birds than LT
Early Sep 2016	Sudden drop in numbers to 50-60 ibis. Both HCP and LT still being used but HCP now the main roost
Late Sep 2016 - end of Nov 2016	5-50 ibis now roosting solely at HCP and not continuing to LT.
Dec 2016 - mid-March 2017	Ibis ceased using the flyway. Unknown to me, up to 310 ibis had been roosting in Hume during this time.
Late March 2017	Ibis returned to the flyway, with up to 200 birds predominantly using HCP, but also LT. Up to 200 birds also still using Hume.

Table 1 continued

Date	Roost counts/locations
Late March 2017	Ibis returned to the flyway, with up to 200 birds predominantly using HCP, but also LT. Up to 200 birds also still using Hume.
April to mid-May 2017	150-250 bird using HCP and LT, with slightly more at HCP. No further roosting reports from Hume.
Late May to early-Aug 2017	Birds no longer stopping at HCP and continuing to LT roost. 200 in May increasing to 450 in late June, and 500-600 in mid-June to mid-August
Late-Aug 2017	My highest count of 800 birds using both HCP and LT.
Sep 2017	Counts of 400-460 using mainly LT, but also sometimes HCP in small numbers. Rapid decline by 62% in 9 days to 175 birds at the end of the month.
Start of Oct to mid-December	Hume roost again active, with up to 440 birds. Tuggeranong flyway once again inactive.
Mid-Nov to end of Dec 2017	Hume roost still active with up to 360 birds. Up to 100 ibis returned to the flyway using mainly LT, numbers greatest on a day with a bad hailstorm
Jan to early Jun 2018	No further roosting activity reported at Hume although it may have continued a little longer. Counts of 50-175 ibis using the flyway, some days HCP was the main roost site but LT took this title more frequently
Mid-Jun to mid-Jul 2018	Marked increase in numbers to 350, then 600 using mainly LT
incomplete data Summer 2018-19	This summer up to 120 ibis using LT. Not known if Hume is active.

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eBird Australia, 2019, *eBird Range Map--Australian White Ibis (Threskiornis molucca)*, accessed 18 Feb 2019 at https://ebird.org/australia/map/ausibi1

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PRELIMINARY RESULTS FROM STUDY OF LITTLE EAGLES IN THE ACT AND NEARBY NSW IN 2018–2019

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Abstract. *There was a minimum of nine nesting pairs of Little Eagles* (Hieraaetus morphnoides) *in the ACT in the 2018/19 breeding season. Seven pairs laid eggs and five pairs successfully fledged a chick each. Two pairs were seen attending nests but were not known to have laid eggs. Four additional breeding pairs were monitored in nearby NSW; single chicks were successfully reared by three of these and one nesting attempt failed. The main prey type was rabbits (61%), then small/medium-sized birds (32%) and lizards (7%). More rabbits and fewer birds and reptiles were eaten in 2018–19 than in 2017–18. Samples of birds' movements were followed with GPS-satellite transmitters. Adult males ranged mostly within 2-5 km of their nest sites and they left their breeding areas in early March. By April one had flown 2000 km to northern Queensland, one 450 km to Melbourne and another had ranged between 50 km west of the ACT and 100 km to the east. Juvenile eagles stayed mostly within 2 km of their nest sites before they left the area in early March. By April, one juvenile had dispersed 2000 km to Northern Queensland and another 450 km to south-east Victoria, via Yorke Peninsula in South Australia. A juvenile reared in the ACT in 2017 flew to south-east Queensland in its first winter, then to south-east Victoria via South Australia in the following spring and summer.*

Introduction

This is a preliminary report on the second year of a long-term study of the Little Eagle (*Hieraaetus morphnoides*) by the Little Eagle Research Group. The overall aim of this study is to describe the population ecology of the Little Eagle, which is listed as vulnerable in the Australian Capital Territory (ACT) and New South Wales (NSW). This includes collecting information on the bird's population status, breeding success, diet, dispersion and habitat-use as described for a pilot study in 2017–2018 by Rae *et al*. (2018).

The study in 2018–19 expanded on information gained in the previous year and a larger part of this year's study was tracking of the birds' movements with GPS-satellite transmitters. This can provide information on nation-wide as well as local movements and habitat-use, which can elucidate the dispersion of the local population of Little Eagles and how they are related to the national population.

We here summarise these data from the 2018–19 breeding season in the ACT and nearby NSW and where applicable give brief comparisons with those from 2017–2018.

Methods

Nests in the ACT and surrounding NSW, used by Little Eagles in 2017, and localities around them were checked for occupancy in 2018. Otherwise, all methods were as done in the previous year's study (Rae *et al*. 2018, following the methods of Hardey *et al*. 2013). Pair or nest location was mainly ascertained by watching for eagles from vantage points from late July to February and following up any observations of eagles for possible nests.

To establish occupancy and breeding success of a pair, each potential nest site was visited on at least four occasions. All known eyries were checked for freshly added nesting material, the presence of an incubating bird, or any Little Eagles overhead on approach. Incubating or brooding birds were accepted as evidence of eggs or chicks in the nest. The number of young fledged was counted by watching each nest from a distance far enough to watch adult birds land on the nest and feed the young. Young were considered to have fledged once they left the nest for their first flight. The main data recorded were: the home range occupied by a pair of Little Eagles (Hayhow *et al.* 2017), the nesting territory where there was a territorial pair attending a nest (Steenhof *et al.* 2017), whether eggs were laid or young hatched, and number of young reared. The locations of apparently lone eagles were also noted.

The remains of prey items were collected from below nests and perches used by eagles within groups of trees used for nesting. All remains found of any prey were collected during every nest site visit, bagged individually and recorded in batches by date, to remove errors of counting prey items more than once, and the minimum number of items per batch was calculated from distinguishable parts, *e.g.* wing or tail feathers, heads or feet (following Watson *et al.* 1987, Watson *et al.* 1993). These items were collected from August 2018 when the birds began to spend time at or near their nest sites, until March 2019 when the fledglings left their natal sites. Pellets ejected by Little Eagles were also collected, dried and stored like the prey remains for later comparative analysis. Collection of prey remains and pellets both provide samples of an eagle's whole diet, and each has biases (Watson *et al.* 1987), therefore each set will be fully analysed later in the study. The results presented here are only a preliminary summary of the composition of the prey remains. The proportions of foods eaten in 2018–19 were compared with those in 2017–18.

Eagle movements were monitored by attaching small GPS-satellite transmitters (22 g) to a sample of birds. The transmitters are backpack type, attached to the birds with a Teflon ribbon harness (Animal ethics permit CEAE 16-22, University of Canberra). The systems are ongoing and are programmed to take nine fixes per day, 1-2 h apart during daylight hours, with an additional midnight fix to record roosting location information. Data are recorded on location, speed, altitude and the time of recording. Free-flying birds were caught in a Bal-Chatri trap with a Common Myna (*Acridotheres tristis*), protected by the trap, as a lure, and chicks were lowered from their nests to be processed safely on the ground. Birds were marked with an individual combination of bands from the Australian Bird and Bat Banding Scheme and coloured alpha-numeric bands. Birds were also photographed for recognition by plumage characteristics.

The movements of a fledgling fitted with a transmitter in 2017 are still being followed.
Full analysis of movements is not yet done. The GPS transmitters are expected to collect data for up to three years and full analysis will be done at the end of transmissions. Habitat-use has also not been analysed yet, because such information is largely dependent upon the results from the tracking and this is programmed as part of the longer-term study. In this paper, we only present a sample of the information gained.

Results

Number of Little Eagle pairs and breeding success

Nine pairs of Little Eagles were confirmed attending nests in the ACT in 2018–19, the same as in 2017–18 (Rae *et al.* 2018). However, it is considered that not all breeding sites were found as other eagles were observed in potential breeding habitat, some carrying food, several kilometres from any known nests. Four breeding pairs were monitored in nearby NSW (within 30 km of the ACT border).

Seven of the nine nesting pairs in the ACT were confirmed to have laid eggs and five pairs successfully reared a chick each. One nest was blown out of its tree and one pair lost their egg to a Pied Currawong (*Strepera graculina*). Three of the NSW pairs successfully reared a chick each. The other pair failed to hatch an egg. Therefore, breeding success was 0.55 chicks fledged per pair in the ACT, 0.75 in NSW, 0.61 overall; or 0.71 chicks per pair that laid eggs in the ACT, 0.75 in NSW and 0.73 overall.

Nine territories in the ACT were monitored in both 2017–18 and 2018–19, two were unoccupied in 2018–2019; two new nesting territories were found in 2018, and a chick was reared in one of those. Of the four territories where chicks were reared in 2017, chicks were reared in three in 2018. Of the five territories where no chicks were reared in 2017, a chick was reared in one in 2018. In two of the seven territories occupied in both years, nests used were different in 2018: the eagles had moved to new nest sites closer to the same urban edges than the nests used in 2017 (distance from urban edge: 0.9 from 1.0 km and 0.9 from 1.4 km).

Diet

The remains of 131 individual prey items were collected, and all were identified to species except six passerines. 326 pellets were collected to be analysed later. Of the prey remains (Table 1), the main foods eaten were mammals (49.6%), birds (43.4%) and reptiles (7.0%). The mammals were mostly young Rabbits (*Oryctolagus cuniculus*) (63) and two Brown Hare (*Lepus europaeus*) leverets. The main bird species eaten were Eastern Rosella (*Platycercus eximius*) (15), Crimson Rosella (*P. elegans*) (7), Starling (*Sturnus vulgaris*) (5) and Magpie-lark (*Grallina cyanoleuca*) (5). All reptiles were lizards, and Eastern Blue-tongue (*Tiliqua scincoides*) was the most frequently taken species (5).

Table 1. Numbers and proportions of food types in the diet of Little Eagles in the ACT and nearby NSW in 2017/18 (N = 109) and 2018/19 (N = 131).

Year	Mammals		Birds		Reptiles	
	n	%	n	%	n	%
2017/18	30	27.5	61	56.0	18	16.5
2018/19	65	49.6	57	43.5	9	6.9

Over both years, 2017 and 2018, rabbits (39.6%) and birds (42.2%) were the most eaten items (n = 240), and there were significantly more rabbits and fewer birds and lizards eaten in 2018 than in 2017 (Fisher exact test, $\chi^2 = 14.1$, df = 2, P <0.001, Table 1). The proportion of rabbits was 25% more than expected for 2018. There were also variations in the proportions of prey types between territories and in four territories where food was counted in both years; there were higher proportions of rabbits to birds in the diets in 2018, significantly so in territory 4 (Fisher-exact test, $\chi^2 = 4.85$, df = 2, P = 0.04, Table 2).

Table 2. Proportions of rabbits in the diets of Little Eagles in four territories in the ACT and nearby NSW in 2017/18 and 2018/19.

Territory	Percentage of rabbits in diet		Sample sizes
	2017/18	2018/19	n
1	8	11	19, 19
2	15	32	21, 24
3	5	27	17, 9
4	14	60	11, 9

Movements

Four adult males were caught and fitted with GPS transmitters, one juvenile was fitted with a transmitter on fledging, and two were trapped and fitted several weeks after fledging when fully free-flying and hunting for themselves.

Until the end of the breeding season, the adult males ranged mostly within 2-5 km of their nest sites, although they all occasionally made trips in excess of 10 km. The farthest distance recorded was a return trip of just over 40 km out and back from its nest area, by one bird once. The tracker on one adult stopped transmitting in December 2018. The other three adults left their breeding areas in early March. By April when data were last downloaded prior to writing, in approximate measurements, one had flown 2000 km to northern Queensland, one 450 km to Melbourne and another had ranged 50 km west of the ACT and 100 km to the east (Fig. 1).

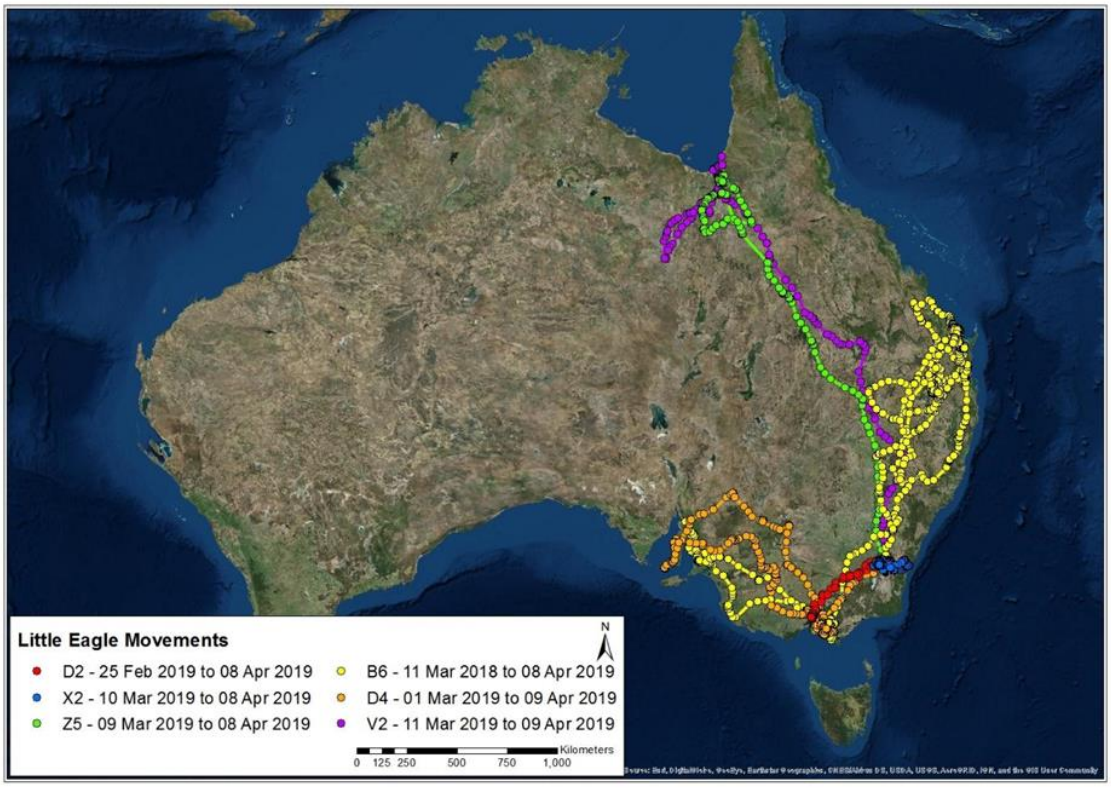

Figure 1. Flight paths of Little Eagles that dispersed from the ACT post breeding season: three adult males (D2, X2 and Z5) and three young birds (B6, D4 and V2). B6 was tagged in the 2017-2018 breeding season, the others in the 2018-2019 season.

The juveniles stayed mostly within 2 km of their nest sites, each flying progressively farther from their nest site with time, before two of them left the ACT area in early March. The other young bird had been moving locally around its nest site for four weeks before the signal from its transmitter showed that it was inactive. The remains of the bird and the transmitter were found below a roost branch (3 m high) in a low tree. Tooth holes in the transmitter and bitten-off feathers suggest that it was possibly killed by a cat. By April, one young female had dispersed 2000 km to Northern Queensland and a young male 450 km to south-east Victoria, via Yorke Peninsula in South Australia, 800 km to the west (Fig. 1). The adult male and young female which flew to northern Queensland were in close proximity, less than 10 km apart at times, but they were not from the same nest site.

The young bird fitted with a transmitter in 2017 remained close to its nest, flying progressively greater distances until March 2018 when it left the ACT and flew north. It spent seven months in the south-east Queensland area, mostly near Bundaberg where the landscape is dominated by sugar-cane plantations. It then flew south in October, passed 100+ km west of the ACT, on to Victoria, then South Australia, 1000 km from the ACT, where it stayed for the summer, before flying back to south-east Victoria where it was last recorded in late April (Fig 1).

Discussion

The minimum number of breeding Little Eagles in the ACT and nearby NSW in 2018–19 and their breeding success were similar to those in 2017–18. The causes for the two breeding failures in the ACT in 2018 were both natural, and there was no evidence of any decline or increase in the population. Annual re-use rate of nests by Little Eagles elsewhere varies between 0 and 100% in different parts of Australia (Marchant and Higgins 1993), therefore the 71% re-use in this study between two years seems relatively high. Although there was variation in the nesting territory areas occupied between years, the reasons are unknown. It could, for example, be a change in individual eagles or an effect of different prey distribution or abundance, as has been observed in other eagles (e.g. Watson *et al*. 2012).

The lower proportion of birds in the diet in 2018–19 might have been because there were fewer birds in general breeding in the ACT area in spring 2018 (Holland 2018). An example of this was a high proportion (27%, n = 55) of vacant territories in Tawny Frogmouths (*Podargus strigoides*) (*pers obs.* S. Rae). Such low numbers could have been an effect of low rainfall; spring 2017 was also dry (BOM 2018, 2019). Therefore, a low availability of prey for Little Eagles could have affected their breeding numbers and success in both years, as food supply is one of the main effects on bird reproduction (Lack 1954) and in raptors much of the variation in breeding success is associated with variations in food supply (Newton 1979).

The 2–5 km range of the adult males while breeding was consistent with that of a single male in a previous study in the west of the ACT (Brawata and Gruber 2016, 2018). It is also consistent with the spacing between Little Eagle nests in the ACT (Rae *et al*. 2018) and New England (Debus and Ley 2009). The wider national dispersion of the birds outside the breeding season by young and adults extended over most of the known range of the species in the eastern half of Australia (Marchant and Higgins 1993), and two of the birds' movements were of similar distances north to that recorded for an adult male from the ACT in 2017 (Brawata *et al.* 2019). Therefore, the local breeding population of the Little Eagle cannot be considered in isolation from the national population.

The study is ongoing and proposed collection of long-term data will be important in testing hypotheses based on these preliminary findings, and those of Rae *et al*. (2018), concerning the breeding behaviour, habitat use and movements of Little Eagles in the ACT and nearby NSW area.

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NOTES ON BREEDING OF MASKED AND WHITE-BROWED WOODSWALLOWS IN THE 2018/19 SEASON IN THE COG AREA OF INTEREST (AoI)

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Abstract: *Many Masked and White-browed Woodswallows* (Artamus personatus, A. superciliosus) *appeared in COG's AoI from mid September 2018 onwards. Some of the birds settled and commenced breeding. At a couple of sites in the ACT, near Gundaroo and chiefly around Lake Bathurst and Lake George several colonies were located. Masked Woodswallows were present at two sites, with confirmed nesting in two cases, including young in a nest, a rare event in COG's AoI. All pairs aborted breeding and left between late December 2018 and early January 2019. Originally about 58 pairs of White-browed Woodswallows were present at these colonies. From 35 pairs with adequate information 20 (57%) raised young. All other pairs aborted. The main reason for this may be insufficient supplies of insect prey as a result of a prolonged and widespread drought.*

1. Introduction

In the spring of 2018 from mid September onwards a number of flocks of Masked Woodswallows (*Artamus personatus*) [MW hereafter] and White-browed Woodswallows (*A. superciliosus*) [WbW hereafter] were sighted in Canberra and the surrounding country. The flocks often comprised both species in varying ratios, although more commonly they consisted only of WbWs. Most flocks passed over our area, but some, even large flocks, settled for periods and were observed feeding in paddocks. Most notable were the observations in mid November from the Hoskinstown Plain of about 500 birds with MW to WbW in the ratio of 1:4 (Martin Butterfield, COG chatline, 18 Nov 2018).

Such an influx of these species into our area indicates very dry conditions in their normal inland breeding range. Drought triggers movement to the East as birds search for areas more suitable for breeding (Higgins *et al*. 2006; Joseph 2009). In some years when these species were present in COG's AoI, birds settled quite soon after arrival and commenced nesting; in other years they have taken their time before deciding to nest (Lenz 1982; Taylor and Canberra Ornithologists Group 1992; Dabb 1999). In spring 2018 the only indication of possible breeding activity was a number of observations from the Hoskinstown Plain of pairs copulating (Martin Butterfield, COG chatline, 18 Nov 2018) and a similar observation from Mt. Ainslie by the author on 20 Nov. However, on that day at Mt. Ainslie another pair was building its nest and a female was located already incubating. Jack Holland in his monthly summary column of sightings in COG's AoI (Gang-Gang newsletter, December 2018) reported no additional indications of breeding by the end of November, except that at some sites birds seemed to settle.

From the end of November onwards I encountered MW and mostly WbW in several areas, mostly to the East of Lake George and around Lake Bathurst. This article summarises these observations.

2. Observations

The following observations are my own, unless stated otherwise. I did not search purposely for these species, but encounters were restricted to areas I tend to visit more regularly. In all likelihood, they formed only a fraction of the birds present in COG's AoI (see Sect. 3, Discussion).

2.1. Mt Ainslie, lower eastern slopes

20. Nov: 5 Pairs [P hereafter] WbWs

2 P at Campbell Park proper, near the dam: 1 P nest building, 1 P seen copulating; 3 P about 700 m to the N, just past the triangular dam, including 1 ♀ sitting on nest.

07 Dec: 3 P WbWs

Birds at Campbell Park no longer present; at northern site nest with young for 2 P located, 3rd P warning, but not searched for nest.

26 Dec: 4 P WbWs

1 P with fledgling; 2 other P also likely to have fledglings; 4th P present. On subsequent days this group of WbWs has been visited by several observers and photos of parents and young were taken and reported to the chatline and documented in eBird.

21 Jan: 1 P WbW

1 P with 2 young still present, many grasshoppers in area (Steve Holliday, *pers. commun.*).

2.2. West Belconnen Pond

13 Nov: 1 P WbW

P in small stand of trees to the W of pond.

27 Nov: 1 P WbW

♂ carrying nest material/food (?) into lower part of a dead eucalypt. ♀ not sighted, possibly already incubating.

04 Dec: 1 P WbW

Nest in lower part of the dead eucalypt, 2 eggs (circumstances allowed brief access to the area).

27 Dec: no sign of birds

2.3. Nelanglo (TSR 48), N of Gundaroo

07 Nov: First record of woodswallows for the season

1 ♂ MW, 2♂, 1♀ WbW feeding on ground.

28 Nov: 3 P WbW

P often squabbling with each other, but no indications of having nests.

12 Dec: 6 P WbW

P spread out; 1 P with nest in denser part of eucalypt sapling, incubating; 1 P nest building; 1 ♂ displaying.

20 Dec: 6 P WbW

1 P carrying food; nests seen on 12 Dec no longer there.

30 Dec: 1 P WbW

Only the ♂ seen. All other birds had left the site.

07 Jan: 1 P WbW

P with 1 fledgling high up in a tall eucalypt. Adults seemed to have difficulty finding food. They often left the area, but within 30 min they were not seen bringing food to the young, although they landed close to the young several times in that period.

Figure 1: Location of sites with Masked and White-browed Woodswallows: Lake Bathurst area (1-7) and East side of Lake George (A-D).

2.4. Lake Bathurst

2.4.1. Site 1, Lumley Rd (South side of lake) [see Fig.1]

04 Jan: 3 P WbW

In roadside Snow Gums (*Eucalyptus pauciflora*), 1 large fledgling present.

10 Jan: 3 P WbW

At least 2 P with large fledglings.

2.4.2. Site 2, Lumley Rd (Southeast of Southern Morass) [see Fig.1]

04 Jan: 3 P WbW

In stand of Radiata Pine (*Pinus radiata*); 1 ♀ carrying food into a pine; all other birds also entered specific areas in pines, the likely nest sites.

10 Jan: 1 P WbW

All birds except 1 P had left; this P entering specific area of a pine and intensely warning when approached. In over 20 min birds failed to capture any food close to site, eventually flying off much further.

2.4.3. Site 3, Lumley Rd (Southeast of Southern Morass) [see Fig. 1]

04 Jan: 2 P WbW

In row of pines; site not accessible, details of movement of birds difficult to see.

10 Jan: 2 P WbW

1 P with 2 fledglings on the ground among pine litter; 2nd P warning and entering a specific area of a pine.

Figure 2. Examples of nest sites of Masked and White-browed Woodswallows in 2018/19: Snow Gums, Site 5 (*left*) and a Radiata Pine windbreak, Site 6 (*right*) at Lake Bathurst.

2.4.4. Site 4, Lumley Rd (northern end of Southern Morass) [see Fig.1]

04 Jan: 7 P WbW

Flock feeding around several hawthorn bushes and on the ground; 4 or more large fledglings. These bushes and some native tree plantings probably were the nest sites.

10 Jan: all birds had left

2.4.5. Site 5, Lumley Rd (southern end of Northern Morass) [see Figs.1 and 2]

04 Jan: 5 P WbW

In line of roadside Snow Gums; 1 nest in hollow long stump with a wide slit on one side, nest ca. 50 cm down from top; 2 advanced young visible through the slit.

10 Jan: all birds had left

The nest in the stump was empty, possibly predated; unlikely that young would have been ready to move from site since the previous visit 6 days before.

2.4.6. Site 6, Lumley Rd (Northwest side of northern Morass) [see Figs.1 and 2]

04 Jan: 3 P MW, 8 P WbW

In a section of a long Radiata Pine windbreak; each P visiting specific areas inside the pine trees, the likely nest sites; no signs of fledglings.

10 Jan: only 2 P WbW

All MW and most of the WbW had left the site; 1 P WbW with 1 small fledgling; 2nd P kept flying into a specific area in a pine, the likely nest site.

2.4.7. Site 7, Glenoval Rd (North of West Basin of lake) [see Fig.1]

04 Jan: 1 P WbW

At end of a line of Radiata Pine; P very agitated, possibly a fledgling in the pines.

10 Jan: 2 P WbW

1 P with a fully-grown fledgling; 2nd P present, but status uncertain.

2.5. Lake George, East

2.5.1. Site A, Taylors Creek Rd, private property in 'Taylors Creek' [see Figs. 1 and 3]

04 Jan: 1 P WbW

Nest on a gate post close to a row of Radiata Pine. The post had fitted to its top a short section of hollow pipe (6.5 cm high and 9.5 cm wide), providing a snug fit for the nest. With the onset of hot weather in December the property owner attached a sunshade to the post to give protection for the very exposed nest (see Fig. 3). The birds were not disturbed by the nest site modification. Two young fledged on 3 Jan 2019 (Heroides Acuna, *pers. comm.*).

Figure 3. Nest site of the pair of White-browed Woodswallows at Site A in the top of a gate post (*left*). A short section of hollow pipe at the top of the post served as nest site (*right*). As hot weather set in, the property owner attached a sun shade for the breeding birds. [Photo on *right* courtesy of *Heroides Acuna*].

2.5.2. Site B, Taylors Creek Rd, property 0.7 km south of junction Taylors Creek Rd/Western Leg Rd [see Fig. 1]

04 Jan: 3 P WbW

In a row of Radiata Pine, birds in various parts of pines, possible nest sites. Area not accessible.

10 Jan: 3 P WbW

Pairs at specific areas of pine trees, not possible to obtain more information. Breeding is assumed since birds have stayed at site.

01 Feb: 3 P WbW

Each pair with 2 fully developed fledglings; birds gathered in tops of a couple of pine trees. Young were still fed by adults, but they appeared ready to depart the site at any time.

2.5.3. Site C, Taylors Creek Rd/Western Leg Rd, row of tall and a few medium-sized Radiata Pine, area accessible only from roadside [see Figs. 1 and 7]

18 Nov: 40 MW, 30 WbW (estimate)

1 P MW copulating, most birds of both species in pairs and often squabbling in the trees, most likely selecting and defending nest sites.

30 Nov: 30 MW, 70 WbW (estimate)

Changes in numbers for both species; but no real indication that birds have started nesting.

10 Dec: 7 P MW, 10 P WbW

Three nests with birds sitting in them located: 2 P MW (Fig. 4) and1 P WbW (Fig. 4). Individuals of both species repeatedly swooped at an Australian Magpie (*Gymnorhina tibicen*) walking on the ground.

19 Dec: 3 P MW, 5 P WbW

P delivering food to nests: 1 P MW and 2 P WbW.

Figure 4. Female Masked Woodswallow on nest in Radiata Pine (*left*). White-browed Woodswallow nest in Radiata Pine (*right*). All located Woodswallow nests in pines were built against cones (Site C).

04 Jan: all MW had left; 5 P WbW

2 P feeding young on ground; another P seen carrying food to nest.

10 Jan: 5 P WbW

4 P seen with young.

2.5.4. Site D, Western Leg Rd, property 1.3 km to West of Site C [see Fig. 1]

4 Jan: 3 to 4 P WbW

Along a line of eucalypts, area not accessible.

10 Jan: all birds had left site

3. Discussion

Both species of woodswallow are examples of the boom and bust phenomenon of many species of Australia's interior (Joseph 2009). They are classified in COG's AoI as breeding summer migrants, with the MW as rare and the WbW as uncommon (Canberra Ornithologists Group 2019a, b). These species come to our area chiefly when inland Australia experiences drought conditions and the birds are forced to search for breeding opportunities east of the Great Dividing Range. The peaks and troughs in their appearance from 1985 to 2018 in our area largely correspond with each other (see Figs. 5 and 6). They failed to turn up in our area in 12 years of that period (Canberra Ornithologists Group 2018).

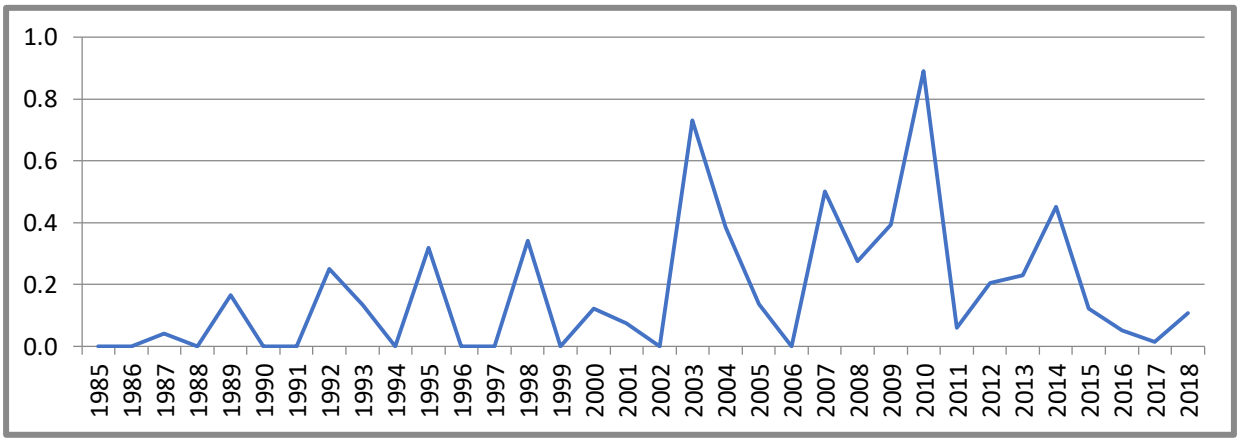

Figure 5. Reporting Rate (%) for Masked Woodswallow in COG's AoI from mid 1985 to mid 2018 (Graph courtesy of *Paul Fennell*).

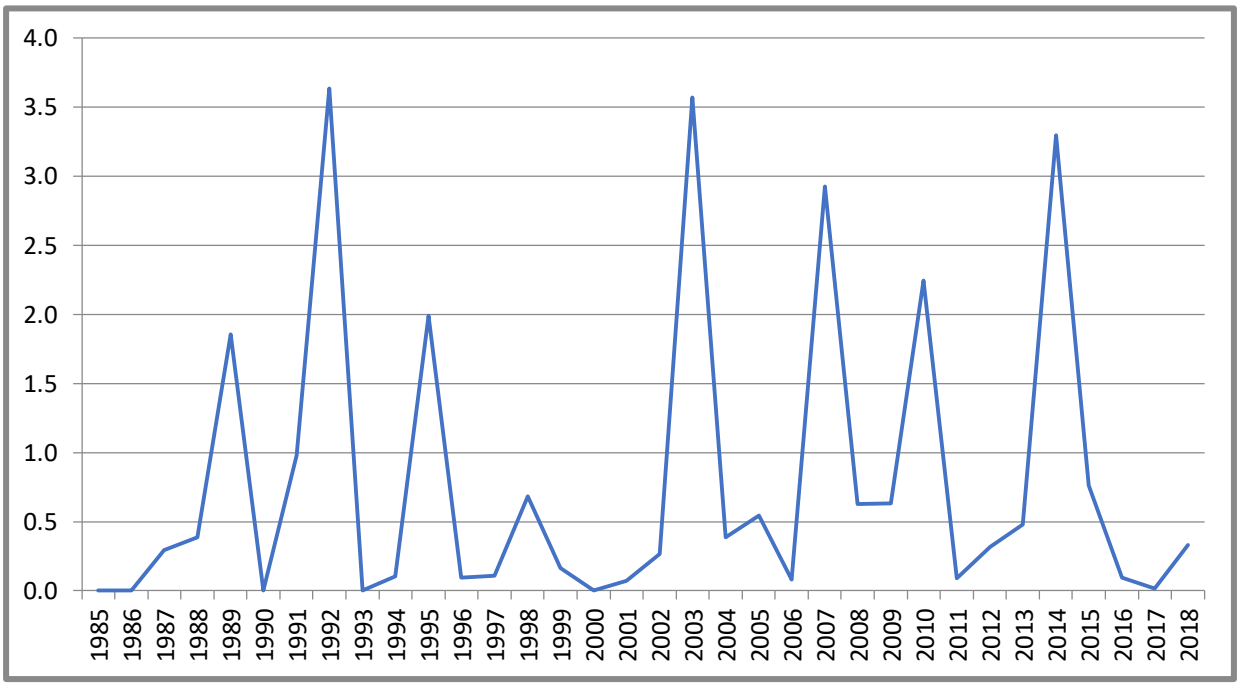

Figure 6. Reporting Rate (%) for White-browed Woodswallow in COG's AoI from mid 1985 to mid 2018 (Graph courtesy of *Paul Fennell*).

3.1. Masked Woodswallow

The COG database holds only six breeding records for the MW (Canberra Ornithologists Group 2019a), ranging from just 'display' (1), to 'nest building' (2), 'on nest' (1), 'nest with young' (1) and 'dependent young' (1).

At Sites 6 and C several pairs of MW formed part of the congregation of woodswallows. From the behaviour of the final three pairs each at both sites, *i.e.* flying into specific areas in pine trees and defending these sites against other woodswallows, I had assumed that all pairs were nesting, although only at Site C were pairs seen on nests (Fig. 4) and in at least one case the nest contained young. The repeated swooping of an Australian Magpie on the ground near nesting trees on 10 Dec at Site C also indicated nest defence (Higgins *et al.* 2006). However, all pairs, irrespective of breeding status, left the area after 19 Dec (follow-up visit 4 Jan) at Site C (see Fig. 7) and after 4 Jan (follow-up visit 10 Jan) at Site 6.

It seemed unlikely that any pair had produced fledglings that were developed enough and ready to leave with their parents within the time frame of my visits. It has been reported from NW Victoria that birds abandoned active nests when the local breeding flocks suddenly left (Higgins *et al.* 2006). Events at both local sites indicated similar behaviour.

There may be several reasons for early abandonment of breeding sites. The MW is chiefly a species of the open sclerophyll woodlands and forests in arid and semi-arid zones (Higgins *et. al.* 2006). It appears in our area in much lower numbers than its congener the WbW and it breeds only rarely in this eastern region. Our area may meet its ecological requirements for breeding only to a limited extent.

Importantly, this season local insect numbers have been very low due to the widespread and severe drought (see below Sect. 3.2.). Hence, food limitations may have played the key role in desertion. It was most likely for the same reason that WbW numbers also declined over time at several of the sites (see *e.g.* Fig. 7 and Sect. 3.2.).

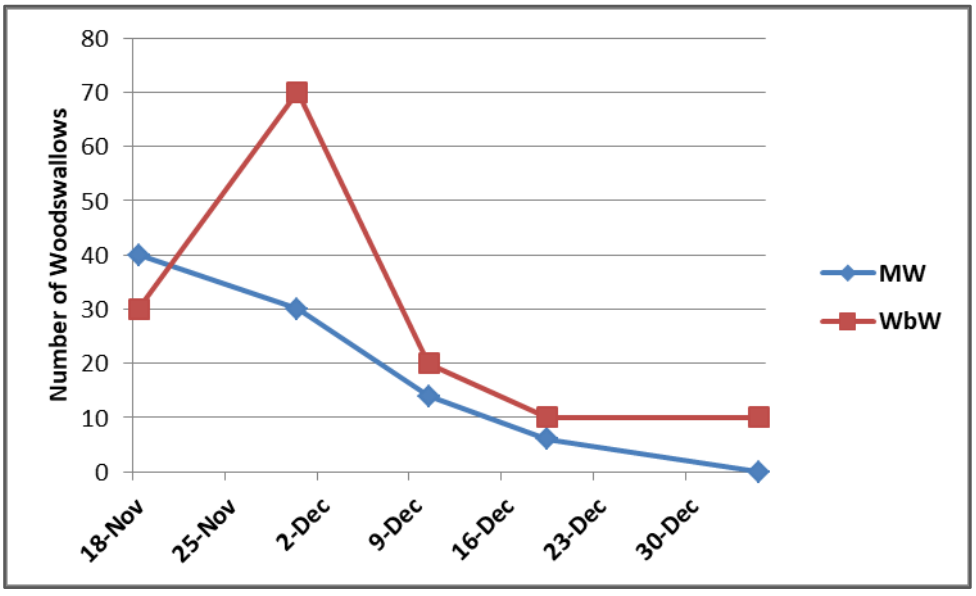

Figure 7. Dynamics (number of adults) of Masked (MW) and White-browed Woodswallow (WbW) at site C in the 2018/19 season.

Rainstorms may then have provided the final trigger for woodswallows to move. Rainfall records from Taylors Creek on the East side of Lake George (Sue Corrigan, *pers. comm.*) indicate that heavier rain storms occurred at the end of November, the middle of December and in early January [30 Nov (24 mm), 13 and 14 Dec (combined 49 mm), 5 Jan (16 mm), 8 Jan (9 mm)]. Desertion of breeding sites by both species did coincide with some of these rainfall events.

3.2. White-browed Woodswallow

This species is far more likely to breed in our area than the MW. The COG data base contains 126 WbW breeding records, although not all records may necessarily be independent of each other. Often more birds arrive than eventually settle to breed (Dabb 1999, 2003). During the 2014/15 influx (see Fig. 6), at two sites, Campbell Park and Nelanglo, the number of pairs remained largely stable over the entire nesting period. Birds left only when the young were able to travel (A.O. Nicholls, *pers. commun.*; own observations).

Interestingly, at Nelanglo on 23 Nov 2014, in a group of 15 WbW a pair was copulating, but also still feeding two fully grown young from an earlier brood elsewhere. This observation points again to the highly nomadic and opportunistic breeding strategy of this species (Higgins *et al.* 2006).

In 2018/19 about 58 pairs were present originally at these colonies. At eight of the 11 sites with adequate records, 35 pairs had settled and were assumed to have started nesting. Of those 20 pairs (57%) appeared to have stayed through the full breeding cycle. All other pairs aborted earlier.

While there could be several reasons for birds departing early, especially in these highly nomadic species, in the 2018/19 breeding season, a lack of insect food for rearing young may have been the key factor. Two observations (Nelanglo and Site 2), given above, indicate that WbW parents had difficulty finding insects to feed their young, or that foraging may have required more time and effort than I had ever noticed in other years.

A number of statements and comments on the COG chatline and direct communications to the author indicated that the prolonged and severe drought greatly reduced insect numbers in our area. A few examples follow:

Suzi Bond (21 Jan 2019, *pers. comm.*)

> My impression is that the overall butterfly abundance across the ACT is lower than for other years. Migrant butterflies (and the Bogong Moth) have had a rather poor season in Canberra this spring/summer. I suspect this is because many of our migrants breed inland before migrating here, and these areas have experienced winter/early spring drought conditions during the larval growth period (when the larvae rely on food plant availability and quality to build up their numbers).
>
> Butterfly abundance has also been particularly low in suburban Canberra and Canberra Nature Park compared to montane sites in Namadgi NP and Tidbinbilla NR…

David Rees (COG chatline, 28 Dec 2018)

> It's been fairly miserable for butterflies locally this spring/summer, esp. away from the more humid habitats in the mountains. Some fast breeding species can take advantage of rain events as they happen but for species with annual cycles the current conditions are not

> good. Will be the same for other insects, with these visible species as a proxy. Less insects means many birds have trouble finding food.

Wayne Gregson (COG chatline, 28 Dec 2018)

> – yesterday evening I finished off my walk around Narrabundah Hill fairly late and using my headlamp. Normally the light attracts heaps of insects but last night there were virtually none. Nor was the light picking up the eyes of spiders on the ground as it normally does. Perhaps the apparent lack of insects is connected with the absence of birds?

Martin Butterfield (COG chatline 16 Jan 2019)

> There is a lot of *Bursaria spinosa* [Australian Blackthorn] in flower out this way [Hoskinstown Plain]. That is usually a hive of diverse insect activity. This year just a few ants. We have a couple of beds of large daisies which are usually covered in beetles and bugs. This year hardly any insects. An outcome of a drought I suspect.

In this context it is interesting that one family of WbW was still observed at Campbell Park at the end of January. By then grasshoppers of various sizes were abundant (Steve Holliday, *pers. comm.*). Grasshoppers are an important food source for woodswallows (Higgins *et al.* 2066).

The Nelanglo site also provides indications that other insectivorous species may have been similarly affected by lack of insects, resulting in reduced breeding success. In 2018/19 three pairs of Dusky Woodswallows (*Artamus cyanopterus*) had settled at the site (five pairs in the previous season) by late September. Their breeding success appeared rather limited. It was not until 30 Dec that just one fledgling was noted, and by 28 Jan 2019 two pairs were feeding one and two young respectively. Three White-winged Trillers (*Lalage tricolor*) established territories by 21 Nov; a month later all trillers had left. It seemed males had also failed to attract any females to the site. It is only the second time since 2008/09 that trillers have failed to nest at the site (Lenz and Nicholls 2017). Rufous Whistlers (*Pachycephala rufiventris*) were present at less than half the number of the previous season (4 compared to 10). An influx of another four males occurred in late December; probably birds that had failed to breed elsewhere. Females were recorded only once in November. It appeared that just one young was produced this season.

Apart from the woodswallow sites included in this article, I am aware of two other colonies of eight and up to 12 pairs of WbW respectively south of Tharwa (Kym Bradley, *pers. comm.*). However, the site that held the largest flock at an earlier stage of the woodswallow influx, the Hoskinstown Plain, had no woodswallows of either species present on 23 Dec (Martin Butterfield, COG chatline, 23 Dec 2018).

The WbW is very adaptable in its choice of nest sites (Dabb 1999, 2003; Higgins *et al*. 2006). The few examples given here illustrate this as well (see Figs. 2 to 4 and the text), ranging from stands of Snow Gum and Radiata Pine to hollow logs and gate posts. Looking at the wider landscape in which the sites at Lake Bathurst and Lake George were located (see Fig. 1) and elsewhere in COG's AoI, this also means it is very likely that many more colonies were present on private properties and along country roads.

Acknowledgements

My thanks go to Sue Corrigan, Heroides Acuna and Joy Allenby-Acuna (Taylors Creek) for sharing information on rainfall and woodswallows and access to a site. Kym Bradley and Martin Butterfield provided comments on woodswallows, Suzi Bond and Steve Holliday readily informed me on the status of insects on request. Paul Fennell kindly prepared the graphs in Figs. 5 and 6. The manuscript has greatly benefited from comments provided by Kevin Windle, Jack Holland, A.O. (Nick) Nicholls and Geoffrey Dabb.

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EMMA AND OTHER WEDGE-TAILED EAGLES IN THE ACT IN 2018

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The world's eagles fall into two groups: (1) the 'true' or booted eagles have feathered legs (feathered tarsi) down to their toes, and are represented in Australia by the Wedge-tailed Eagle (*Aquila audax*), and the smaller Little Eagle (*Hieraaetus morphnoides*), both of which breed in the Australian Capital Territory; (2) the 'sea-eagles' have bare legs (tarsi), are more closely related to the *Milvus* and *Haliastur* kites, and are represented in Australia by the White-bellied Sea-Eagle (*Haliaeetus leucogaster*), which occurs regularly in the ACT but has yet to be confirmed breeding there. Sea-Eagles are slightly smaller than Wedge-tailed Eagles and may compete with them for suitable nest sites (Olsen 2014).

In August 2018 we satellite-tagged and colour-banded a breeding female Wedge-tailed Eagle in the northwest ACT (see Fig. 1). We collected prey remains and egested pellets from roosts used by the adult pair, and from under their nest. Prey included European Rabbits (*Oryctolagus cuniculus*), Eastern Grey Kangaroo (*Macropus giganteus*), Black Wallaby (*Wallabia bicolor*), Common Wombat (*Vombatus ursinus*), Sheep (*Ovis aries*) (Fig. 2), Red Fox (*Vulpes vulpes*), Sulphur-crested Cockatoo (*Cacatua galerit*a) (Fig. 3), Crimson Rosella (*Platycercus elegans*), Australian Magpies (*Gymnorhina tibicen*), and raven (*Corvus sp*). (Table 1). The prey remains of large mammals such as Grey Kangaroo, Wombat and Sheep appeared to be from carrion brought into the nest in pieces (Fig. 4). The Grey Kangaroo and Wombat were probably road kills, likely related to the eagle territory overlapping busy roads (Fig. 1) where the pair accessed carrion. This also showed that ACT Wedge-tailed Eagles commonly feed on carrion during August-October when air temperatures are low and dead Sheep, Wombats, or macropods are refrigerated and edible for several days after they are killed, so carrion can be fed to nestlings.

Table 1. Prey found at Emma's nest.

Prey species	Number of times a prey species was found at Emma's nest
European Rabbit	4
Eastern Grey Kangaroo	7
Black Wallaby	2
Common Wombat	2
Sheep	13
Red Fox	3
Sulphur-crested Cockatoo	4
Crimson Rosella	1
Australian Magpie	2
Raven	1

Figure 1. Emma foraged over a large area west of Belconnen (red circle).

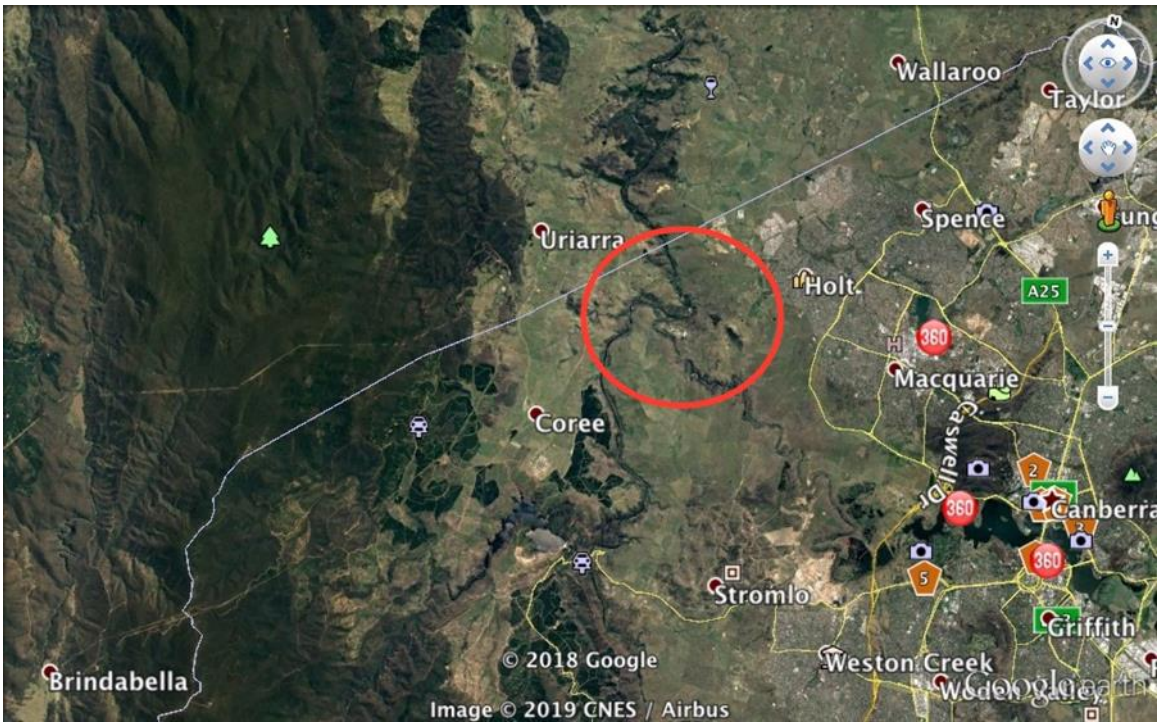

Figure 2. Satellite-tagged female Wedge-tailed Eagle on her nest. Note piece of sheep in front of her ***(Photos unless indicated otherwise by Jerry Olsen).***

Figure 3. Emma carrying a Sulphur-crested Cockatoo to her nestling (*Roger Williams*).

Figure 4. Emma carrying a stripped piece of meat to her nestling.

Figure 5 – Emma's young in the nest before fledging.

Figure 6 – Emma's fledged young on 4 Feb 2019 (*Roger Williams*).

Prey remains at Emma's nest differed from prey at ACT Wedge-tailed Eagle nests in a larger study (Olsen *et al*. 2010), where breeding pairs took (by number): 55.2% mammals, including European Rabbits (19.3%), Eastern Grey Kangaroos (24.6%), Sheep (3.9%), Fox (2.4%), as well as birds (39.4%) including Sulphur-crested Cockatoos (2%). The higher proportion of Sheep, including lamb remains, collected at Emma's nest was likely because the nest was adjacent to a sheep property. We spoke to the landowner who was aware of the eagles, and he told us the eagles fed on dead lamb and sheep carcasses that he discarded in a 'dump' which the eagles visited. He saw no sheep predation by the eagles. This distinction is important because some Wedge-tailed Eagles are falsely accused of killing lambs, and there was a recent high-profile prosecution for poisoning eagles in Victoria (ABC News 2018).

Emma also foraged over ground planned for the Ginninderry housing development. A Little Eagle nest site has been lost from this area, leaving a single Little Eagle pair at nearby Land's End (Olsen 2018). As the Ginninderry project progresses, part of Emma's territory will be affected by the development and may be abandoned, or, to make up for lost foraging habitat, these eagles may usurp part of the adjoining Land's End Little Eagle home range and further reduce the number of successfully breeding Little Eagle pairs in the ACT.

In 2016, 2017 and 2018 we checked, each year, the same 9 Wedge-tailed Eagle territories near Canberra. In 2016 they fledged a total of 11 young; in 2017 they also fledged a total of 11 young, so they fledged 1.22 young per territory per year, with 100% of territories successful in both years - high productivity for this species (Olsen 2014). In 2018 the nine territories fledged a total of 10 young, *i.e.* 1.11 young per territory, with 100% of territories successful (Table 2). This high breeding success of ACT Wedge-tailed Eagles, 1.19 young per territory per year, may adversely affect Little Eagles, which have low breeding numbers and poor success in comparison to ACT Wedge-tailed Eagles (Olsen 2018).

Table 2 Productivity at 9 Wedge-tailed Eagle territories near Canberra in 2016, 2017 and 2018.

Eagle territory	Number of young fledged		
	2016	2017	2018
#1	1	1	1
#2	1	1	1
#3	1	1	1
#4	1	1	1
#5	1	1	1
#6	1	1	1
#7	2	2	1
#8	2	2	2
#9	1	1	1
Totals	11	11	10

Wedge-tailed Eagles are said to have lower productivity in low rainfall years compared to high rainfall years (Robertson 1987). In Canberra, 2017 and 2018 were low rainfall years. Figures for 2016, 2017, and 2018 were: 908.4 mm in 2016 (28% above the long-term average, and the wettest year for Canberra since 2010); 486.0 mm in 2017 (around 78% of the long-term average); 472.0 mm in 2018 (around 76% of the long-term average) (source: Australian Government, Bureau of Meteorology). However, all nests, including Emma's,

fledged young in each year of the three years. This may mean that the low breeding success during drought years found by Robertson (1987) may apply to arid regions but not moderate, less arid regions such as the ACT. Emma did not leave her home range over winter, unlike the individuals of two other local species, which were also satellite-tagged: an adult Swamp Harrier *Circus approximans* (Olsen *et al*. 2018) and a Little Eagle (Olsen and Trost 2018).

Emma's nestling (Fig. 5) fledged on 25 Oct 2018 and was seen in the vicinity for several months (Fig. 6). Hopefully the pair will fledge young again in 2019. We will monitor her nest and the nests of other ACT eagles and report trends.

Acknowledgements

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THE CANBERRA BIRD BLITZ 2018

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Abstract. *This paper describes the conduct and outcomes of the Canberra Ornithologists Group's fourteenth "bird blitz", held on 27-28 October 2018, and provides comparisons with the thirteen previous blitzes. In 2018, 370 datasheets were submitted, from 99 grid cells; 169 bird species were recorded, 64 of them breeding. Highlights included the first blitz records of the Red-necked Avocet and the Azure Kingfisher.*

Introduction

On the last weekend in October 2018 (Saturday 27 and Sunday 28), the Canberra Ornithologists Group (COG) held its fourteenth annual "bird blitz". In this exercise, we aim to record all species of wild bird present in the ACT over that weekend, to obtain a broad indication of their abundance, and to record breeding status. To achieve this, we set out to conduct a minimum of one 20-minute 2-hectare survey within each of the 165 grid cells covering the ACT (a 2.5-minute grid on lines of latitude and longitude, so each cell measures approximately 3.5 km by 4.5 km). A subsidiary aim of this exercise is to encourage more of our members to get out, survey and submit records.

The data collected are entered into eBird and the COG Atlas databases, and subsequently contributed to the BirdLife Australia Atlas database. They are available for scientific purposes and as an input to Canberra land-use planning.

Conduct of the blitz

Participants register for their preferred locations or grid cells, on a first-in, best-dressed basis. In the allocation process, some site preference is given to members who survey given sites on a regular basis. More tardy volunteers are cajoled by the organiser into surveying the remaining sites. Less experienced birders may accompany more experienced birders who indicate a willingness to take them along. And as a modest inducement to participants, a variety of prizes are on offer, courtesy of our members. One difference in the conduct of the 2018 blitz was the number of eBird participants who may or may not have realised their records were contributing to the blitz outcome.

Participants are allowed to choose their preferred methodology from the three BirdLife Australia Atlas options: a 20-minute/2-ha survey; within 500 m of a central point, for >20 mins; or within 5 km of a central point, for >20 mins. Incidental records are also welcomed, as are the various options from eBird.

Results and discussion

Operational issues

The Saturday weather was warm and a little windy, while Sunday was perfect early. However the drier than usual autumn and winter clearly had an effect. Most trails in Namadgi National Park were accessible. Unlike 2013, we did not conduct training classes to assist newcomers.

Level of participation and coverage

At least 84 named COG members, eBirders and friends took part in the 2018 blitz (a list of known participants is at Table 1). It is highly likely that some at least of the eBirders were unaware their records would be incorporated in the blitz analysis, but they are publicly available and moderated records and so it would be foolish to ignore them. As noted before, the number of participants probably equates to well over 100 if the unnamed companions are taken into consideration. Twelve of the named individuals participated for the first time. Congratulations must go to the individuals who have supported the blitz each year since its inception: Matthew Frawley, Stuart Harris, Shirley Kral, Bruce Lindenmayer, Gail Neumann and Philip Veerman, as well as the author.

Table 1. Known blitz participants in 2018.

Barbara Allan	Paul Fennell	David McDonald
Ash Allnutt	Lindsay Hansch	Ian McMahon
Geoff Alves	John Harris	Megan Mears
Ian Anderson	Stuart Harris	Peter Milburn
David Baldwin	Sandra Henderson	Colin Minihan
Lia Battisson	Jack Holland	Martyn Moffat
Cedric Bear	Steve Holliday	Kate Murphy
Sue Beatty	Julie Hotchin	Gail Neumann
Linda Beveridge	Bron King	Pullen
Con Boekel	Daryl King	Lucy Randall
Timothee Bonnet	Sharon Koh	Lachlan Read
Jenny Bounds	Korodaj	Steve Read
John Brannan	Shirley Kral	Fiona Richardson
Mikayla Burke	David Landon	Margaret Robertson
Martin Butterfield	Kim Larmour	Susan Robertson
Ryu Callaway	Sue Lashko	Julian Robinson
Jean Casburn	Christine Ledger	David Rosalky
Brian Chauncy	Michael Lenz	Warren Rowland
Julie Clark	Bruce Lindenmayer	Krista Schmeling
Alan Cowan	Joan Lipscombe	Tod Spencer
Helen Cross	Trevor Lipscombe	Nicki Taws
Roger Curnow	Noel Luff	Philip Veerman
Geoffrey Dabb	Rod Mackay	Kathy Walter
Christine Darwood	Alison Mackerras	Shorty Westlin
Chris Davey	Michael Maconachie	Tony Willis
David Dedenczuk	Liam Manderson	Kevin Windle
Alistair Drake	David McCarthy	Patrick Wyllie
Carmel Drake	Duncan McCaskill	Marnix Zwankhuisen

Datasheets were received from 99 grid cells, or 60% of the possibles. Our best coverage was in 2007, when we managed 122 grid cells. Observers clearly prefer surveying areas where they can be assured of seeing good numbers of bird species – an understandable but, for blitz purposes, somewhat regrettable choice. Jerrabomberra Wetlands and most other nature reserves were particularly favoured. Nevertheless the grid cells surveyed covered most habitat types, so I believe we have a representative sample of ACT avifauna for the weekend. Map 1 shows the grid cells covered, while the table below indicates the comparisons between blitz years.

Figure 1. Number of participants and grid cells

Datasheets submitted

In the 2018 blitz, a total of 370 eligible survey records ("datasheets") were received, 103 in hard copy, and the remainder via eBird. Numbers have fluctuated over the 14 years of the blitz from a previous high of 359 in 2013 to a low of 242 in 2006. The actual number each year appears to have more to do with the types of surveys undertaken, and the relative proportion of lengthy surveys. It is at times a difficult trade-off for our blitzers between covering many grid cells and hence generally adopting the "20-minute, two-hectare" survey, and covering fewer areas but doing so more intensively over a longer period with a "within 500m" survey. The situation is further muddied now with eBird contributions able to avoid this classification. A considerable number of blitz 2018 records were "incidental" records rather than complete surveys.

Type of survey

As usual, participants were given the option of choosing their survey type to best fit the grid cell or location they were surveying and to allow for personal preference and time or other constraints. Without closer analysis, it is impossible to be definitive about the effects of survey type on outcomes. In the case of the blitz, which is essentially a citizen science exercise involving observers of differing levels of expertise, it is likely that the time spent at each site has a greater bearing on the numbers of species recorded, or the breeding status.

Species recorded

As Fig. 2 and Table 2 show, 169 bird species were recorded over the two blitz days in 2018. When all blitz years are considered together, 220 species have been recorded, while 123

species have been recorded every year. By way of comparison, the species total for all of the financial year 2017-18 and the whole of COG's Area of Interest, as recorded in the Annual Bird Report, was 251 from 329 grid cells (COG 2019). There have been blitz breeding records every year for only 27 species; while 140 species have been recorded as breeding at least once in the blitz.

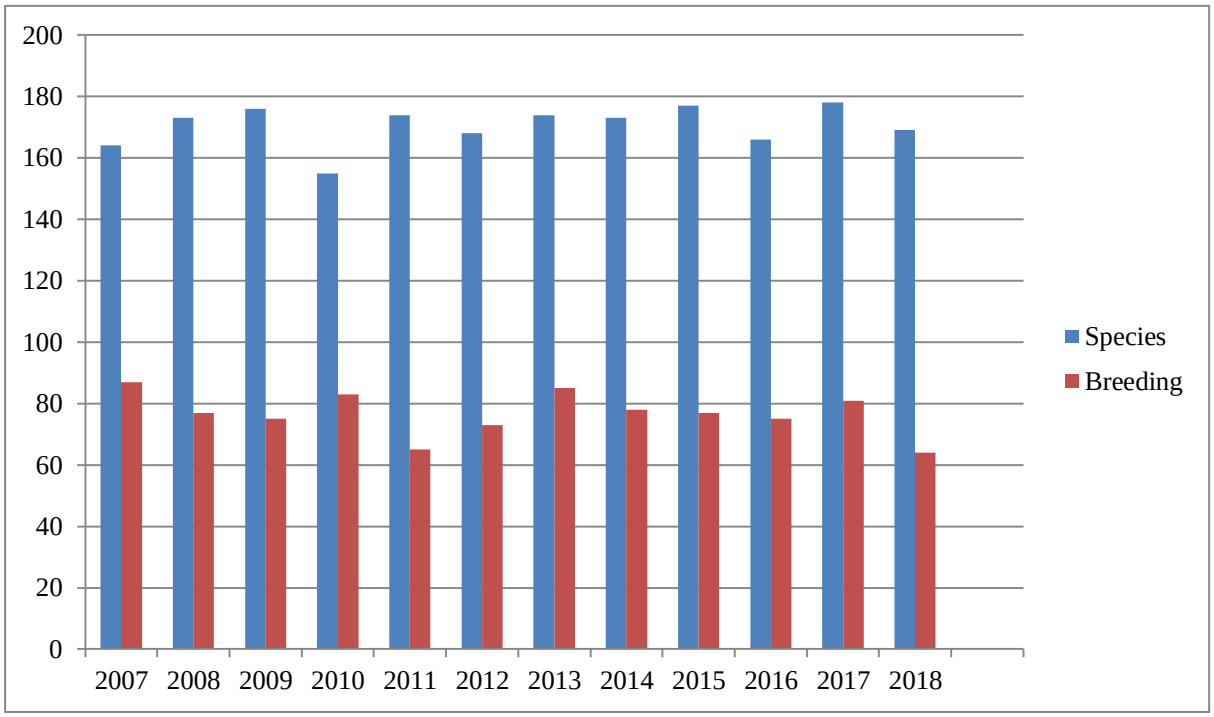
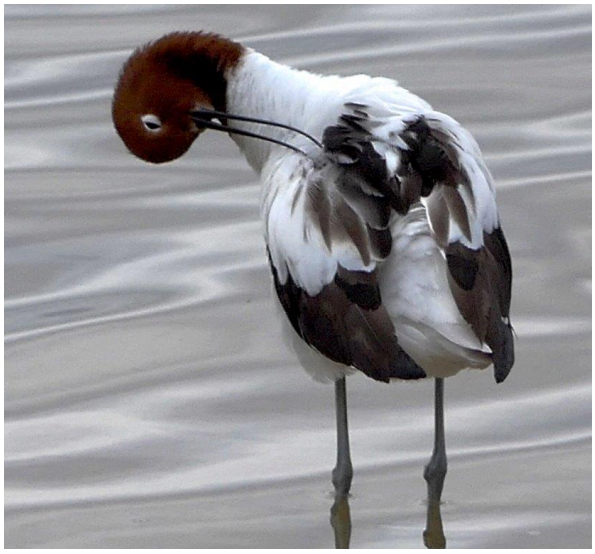


Figure 2. Number of species recorded, and recorded breeding.

Highlights of the 2018 blitz



Two species were recorded during the blitz for the first time. Neither, it must be said, was a complete surprise. Six Red-necked Avocets (*Recurvirostra novaehollandiae*) [see photo on left by ***Steve Wallace***] were recorded at Jerrabomberra Wetlands, and an Azure Kingfisher (*Ceyx azureus*) at the Cotter Reserve. The White-cheeked Honeyeater (*Phylidonyris niger*) – or White-cheeked New Holland hybrid – or descendants thereof – continues to be recorded from Jerrabomberra Wetlands, and another Scarlet Honeyeater was recorded in the city.

The Pied Butcherbird (*Cracticus nigrogularis*) appears to have established itself in Canberra and is now being regularly recorded. After an absence of four blitz years, a Buff-banded Rail (*Gallirallus philippensis*) at North Watson was welcome. Up to four Cattle Egret were seen at the Jerrabomberra Wetlands. It was another irruptive woodswallow year, with both Masked and White-browed being quite widely recorded.

Species most commonly recorded

The Australian Magpie (with 226 records, involving 1000 individuals) remained in its usual preeminent position as "most common" species. It was followed by the Red Wattlebird (214), Pied Currawong (213), Crimson Rosella (206), Grey Fantail (191), Sulphur-crested Cockatoo (187), Magpie-lark (182), Australian Raven (176), Galah (171), Yellow-faced Honeyeater (167) and Superb Fairy-wren (143) (see Collage below).

Photos and Collage of the most commonly recorded species during the 14th blitz (Geoffrey Dabb).

No surprises here. All of these species featured in last year's top eleven, albeit in a slightly different order. Apart from being widespread, they are all readily identifiable.

Species recorded only once in blitz 2018

While it was gratifying to record some species which are often overlooked or which are simply not always present in the ACT, it was sobering to note that there were only single individuals recorded of 12 species. Again the Southern Whiteface (*Aphelocephala leucopsis*) was hard to find, with only one record from Goorooyarroo. Two separate observers detected a White-bellied Sea-Eagle (*Haliaeetus leucogaster*) along the Murrumbidgee, and one Spotted Quail-thrush (*Cinclosoma punctatum*) was recorded in Namadgi.

Species not recorded in blitz 2018

Fifty-one species which had been recorded in previous blitzes were not recorded in 2018. Inevitably, species known to be present in the ACT over the blitz weekend sometimes fail to be recorded. "Resident" crakes, rails and button-quails can be elusive, as was the case in 2018 with Spotless Crake (*Porzana tabuensis*) and Painted Button-quail (*Turnix varius*). Other species with quite restricted distribution in the ACT, such as Yellow-tufted Honeyeater (*Lichenostomus melanops*) were not recorded in 2018. Several of our occasional visitors did not visit over the blitz weekend, including Great Crested Grebe (*Podiceps cristatus*) and Channel-billed Cuckoo (*Scythrops novaehollandiae*). Oddly, the Great Egret (*Ardea alba*) was not recorded and nor were any owls. The lone Apostlebird (*Struthidea cinerea*) appears to have disappeared from North Watson.

The results for our high-country specialists were varied, as usual. We failed to record Pilotbird (*Pycnoptilus floccosus*), Cicadabird (*Coracina tenuirostris*) and Olive Whistler (*Pachycephala olivacea*). There are possible non-worrying explanations for our missing this group of birds. Some are migrants and may simply not have returned by the last weekend in October. Our survey did not coincide with the efforts of a banding team, responsible for previous good returns. We did not have as many observers in the high country and they did not spend as long there as in some years. But it does appear that the 2003 fires are possibly a continuing influence here.

Most worryingly, however, was the lack of records of three of our listed "vulnerable" species. For the first time in the blitz, the Brown Treecreeper (*Climacteris picumnus*) was not recorded, while the Hooded Robin (*Melanodryas cucullata*) was missed for a second time. The Glossy Black-Cockatoo (*Calyptorhynchus lathami*) has not been recorded in the blitz since 2008.

Breeding

As Table 2 and Fig. 2 show, in the 2018 blitz only 64 species of bird were recorded as "breeding" – that is a generous interpretation, including the widest parameters recorded such as "display" and "inspecting hollow". The highest breeding we have recorded in the blitz was 87 species in 2007 and the previous lowest, 65 species in 2011. Only 27 species have been recorded breeding every year in the blitz, while 140 have been recorded as breeding at least once over the fourteen blitzes. This poor breeding result in 2018 may have been weather-affected, with anecdotal accounts of later than usual breeding, especially of waterbirds after good rain in November.

As usual, the species most commonly recorded as breeding were either relatively large and/or conspicuous ones, namely Australian Magpie (*Cracticus tibicen*), Common Starling (*Sturnus vulgaris*), Magpie-lark (*Grallina cyanoleuca*), Pied Currawong (*Strepera graculina*), Crimson Rosella (*Platycercus elegans*), Australian Wood Duck (*Chenonetta jubata*), White-winged Chough (*Corcorax melanorhamphos*), Black Swan (*Cygnus atratus*) and Willie Wagtail (*Rhipidura leucophrys*).

Arguably the most pleasing breeding record was that of the Jacky Winter (*Microeca fascinans*), with a nest with young in Namadgi – only the second blitz breeding record for this species. The oddest breeding location had to be that of a Pacific Black Duck (*Anas superciliosa*), who chose the Charnwood Community Garden for her nest, and reportedly successfully reared a brood there. Disappointingly, for the first time there were no breeding

records for two extremely common species, the Superb Fairy-wren (*Malurus* cyaneus) and the Buff-rumped Thornbill (*Acanthiza reguloides*). The annual report, however, shows that this was hopefully an anomalous result.

ACT-listed vulnerable and endangered species

If we exclude the Swift Parrot, which is unlikely to be here in late October, and the Australian Painted Snipe and Regent Honeyeater, which are seriously rare in the ACT, of the bird species listed as vulnerable or endangered in the ACT, three were not recorded: the Hooded Robin, the Brown Treecreeper and the Glossy Black-Cockatoo.

As usual, the most widely recorded of the "vulnerables" was the White-winged Triller (*Lalage tricolor*), particularly from urban or semi-urban nature reserves, and mostly in low numbers. There were 15 triller records, of 1-9 birds, from 10 widespread grid cells. The triller reporting rate of 4.0% was 42% down on the previous 10-year blitz average. There were 11 records of 1-2 individuals of the Scarlet Robin (*Petroica boodang*) from 9 widespread grid cells. Its reporting rate of 3.0% was 56% below its 10-year blitz average. No breeding was recorded this blitz. The Superb Parrot (*Polytelis swainsonii*) appears to be holding its own. There were 12 records of 1-13 birds from eight grid cells, all in north and north-west Canberra. Its reporting rate of 3.2% was down 10% on the previous 10 blitz years. There were 10 Varied Sittella (*Daphoenositta chrysoptera*) records of 1-5 birds mainly from nature reserves in 10 grid cells, at a reporting rate of 2.7%, slightly above the 10-year average and, encouragingly, there was one breeding record, of "carrying food" at Bluetts Block.

The picture for the other vulnerables is less positive. As noted above, the Brown Treecreeper was not recorded for the first time in the blitz. The Little Eagle (*Hieraaetus morphnoides*) was recorded three times, all single birds, from three grid cells. Its reporting rate of 0.8% is 47% down on the 10-year blitz average. There was one breeding record, however, with a bird recorded on a nest in Campbell Park. The Hooded Robin was again not recorded.

Photos and Collage of the vulnerable and endangered species in the ACT (*Geoffrey Dabb*)

A case study: Tawny Frogmouth

Of all the relatively common ACT nightbirds, only the Tawny Frogmouth (*Podargus strigoides*) [See photo on left by ***Barbara Allan***] shows an increased reporting rate over the average of the previous ten blitz years. At a reporting rate of 3.5%, it is up just over 100%. This may be attributable to blitzers being familiar with the locations of breeding froggies and obligingly "ticking them off" for the blitz, but it is nevertheless encouraging when other results are considered. Of the 13 records of 27 birds from nine grid cells, nine were breeding records.

Trends

While the number of records and reporting rate of the majority of species fluctuate, in some cases markedly from year to year, after fourteen blitzes, trends are emerging for certain species, trends which are for the most part also reflected in COG's Annual Bird Reports. I have chosen the reporting rate as the most helpful indicator of trends and have highlighted only those species with sufficient records to make sense of possible movements.

Many of the ducks and other waterbirds are doing very well, perhaps thanks to the increasing number of urban wetlands being created throughout Canberra. The reporting rate of most ducks was generally positive. The Australian Wood Duck at 27.5% was up 23% on the 10-year blitz average; the Hardhead (*Aythya australis*) reporting rate was up 61%; the Grey Teal (*Anas gracilis*) at 13.7%, up 73%. The Dusky Moorhen (*Gallinula tenebrosa*) at 11.6% was up 20%; while the Black-fronted Dotterel (*Elseyornis melanop*s) reporting rate of 3.2% was up 16%.

Most of the raptors fared less well. Even the most commonly recorded Nankeen Kestrel (*Falco cenchroides*) with a reporting rate of 9.7% was down 6%; the Collared Sparrowhawk (*Accipiter cirrocephalus*) and the Brown Falcon (*Falco berigora*) were both down 48%. Amongst the parrots, the Rainbow Lorikeet (*Trichoglossus haematodus*) increased the most (up 113%). All the cuckoos declined, the greatest drop being that of the Shining Bronze-Cuckoo (*Chalcites lucidus*), down 61%. Amongst the honeyeaters, the Red Wattlebird (*Anthochaera carunculata*) at a reporting rate of 57.7% continued its seemingly inexorable rise, up 14% on the 10-year blitz average, while the Noisy Miner (*Manorina melanocephala*) continues doing unfortunately well, with a recording rate of 20.8%, up 11%.

Other "pest" species including the Australian White Ibis (*Threskiornis molucca*) and the Spotted Dove (*Streptopelia chinensis*) showed serious increases (54% and 313%

respectively), though the Common Starling and the Common Myna (*Sturnus tristis*) both fell slightly.

The small woodland birds were generally speaking not faring well. While all robins showed declines, one of the worst performers in blitz 14 was the Flame Robin (*Petroica phoenicea*), with a reporting rate of just 1.9%, down 66% on the 10-year blitz average. There were a few bright spots, however, with the White-throated Gerygone (*Gerygone olivacea*) up 22% and the Weebill (*Sericornis brevirostris*) up 8% - perhaps thanks in both cases to a loud and distinctive call preventing them from being overlooked.

Conclusions and lessons for the future

Blitz 2018, like its predecessors, has increased significantly the amount of data about Canberra's birds. Several of the grid cells surveyed would in all probability not have been covered but for the targeted effort of the blitz. The blitz data are made available to the managers of Canberra's national park and nature reserves. A lesson to be drawn from the blitz is that, when prompted, more of our members will get out, survey and submit datasheets and perhaps revisit favoured spots.

There is, inevitably, an element of "luck of the day" in terms of the results but the long-term trends are already being highlighted. The blitz breeding observations are particularly useful in fleshing out a more detailed overall picture of bird breeding in Canberra. And given the tendency of our vulnerable species to be patchily distributed, the additional blitz information about where they are and in what numbers is highly valuable.

Acknowledgements

First and foremost, thanks must go to all COG members who participated in the 2018 blitz, and particularly to those who put in two full days of birding in remote sites. The assistance of staff at Namadgi National Park in providing advice, and access to areas behind locked gates, is greatly appreciated. Thanks also go to Jaron Bailey for extracting and manipulating blitz data from the COG databases and from eBird, to Nicki Taws for provision of the map, and to Geoffrey Dabb for photographs. And sincere thanks too to all those COG members who donated prizes.

References

Canberra Ornithologists Group (2019) Annual Bird Report: 1 July 2017 to 30 June 2018. *Canberra Bird Notes* 44.

[See Map1 and Table 2 on following pages.]

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Map 1. Blitz coverage 2018

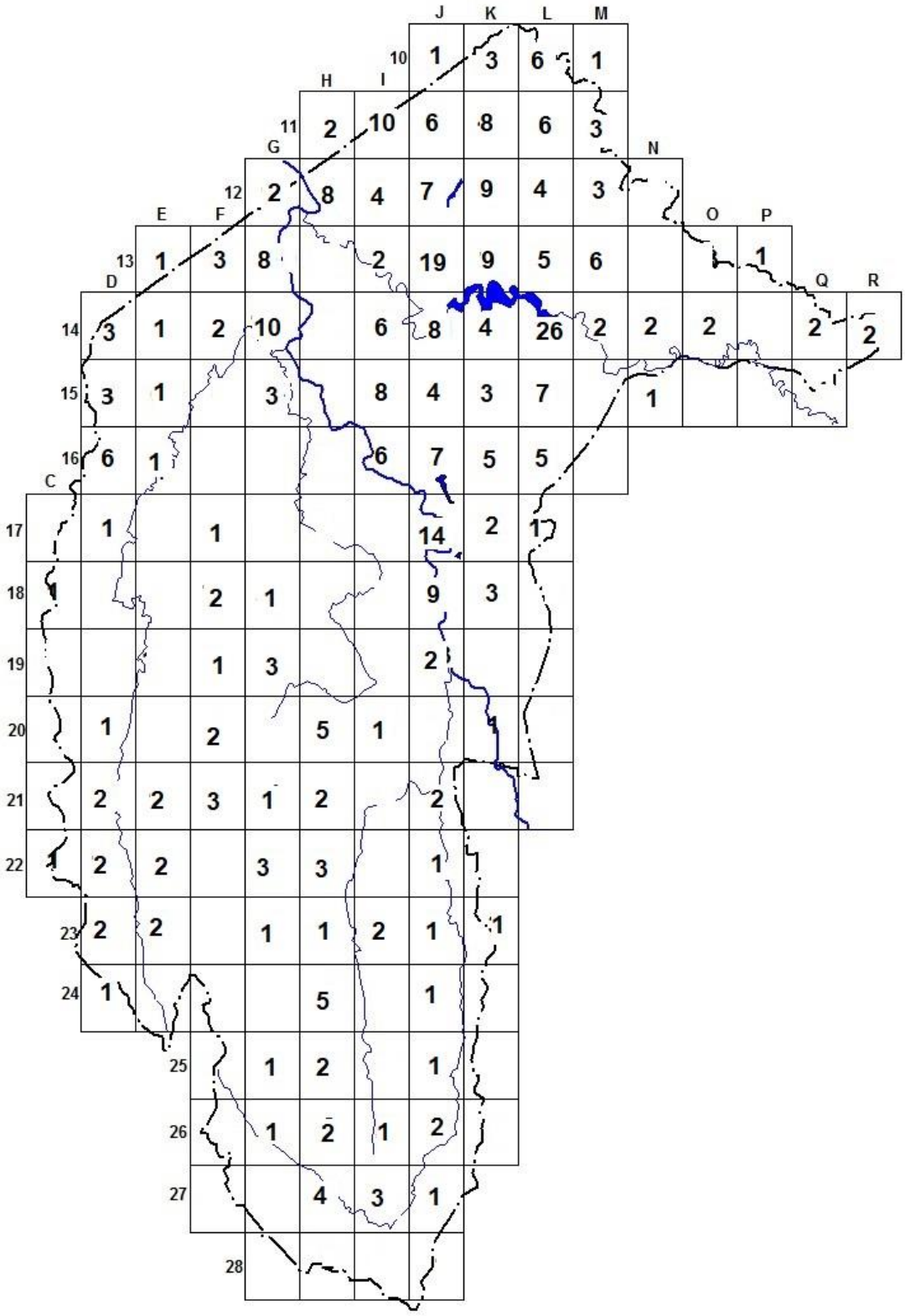

Table 2. Species recorded during the 2005 - 2018 blitzes.
[X=present;*=breeding]

Common name	05	06	07	08	09	10	11	12	13	14	15	16	17	18
Emu	X		X	X			X	X				X	X	
Stubble Quail		X			X		X		X	X	X	X	X	
Brown Quail		X	X	X	X		X	X	X	X	X	X	X	X
Indian Peafowl	Xx			X		X			X	X	X	X	X	X
Magpie Goose				X	X						X			
Musk Duck	X*	X*		X*	X*		X	X		X	X		X	
Freckled Duck								X	X	X	X		X	X
Black Swan	X*	X	x	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Australian Shelduck											X*	X*		
Australian Wood Duck	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Pink-eared Duck		X	X		X			X	X	X	X	X	X	X
Australasian Shoveler	X	X*	X	X*	X	X*	X*	X	X*	X	X*	X	X	X
Grey Teal	X*	X	X*	X*	X	X*	X	X*	X	X	X*	X*	X*	X
Chestnut Teal	X	X	X*	X	X	X	X	X	X	X	X	X	X	X
Northern Mallard and hybrids	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pacific Black Duck	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Hardhead	X	X	X*	X	X	X	X	X	X	X	X	X	X*	X
Blue-billed Duck	X	X		X	X		X			X	X		X	
Australas. Grebe	X*	X	X*	X*	X	X*	X*	X*	X*	X*	X	X*	X*	X
Hoary-headed Grebe	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Great Crested Grebe	X									X		X		
Rock Dove	X	X	X	X	X	X	X	X	X*	X*	X	X*	X	X
Spotted Dove				X	X	X	X	X*	X*	X*	X	X	X	X
Common Bronzew.	X	X	X	X*	X	X*	X	X	X	X	X	X	X	X
Brush Bronzew.					X									
Crested Pigeon	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Peaceful Dove	X	X		X	X		X		X	X		X		
Wonga Pigeon	X			X				X			X		X	X
Tawny Frogmouth	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Australian Owlet-nightjar				X			X	X	X	X	X	X		
Australas. Darter	X	X*	X*	X*	X*	X*	X*	X	X	X*	X*	X*	X*	X
Little Pied Cormorant	X	X	X*	X*	X*	X*	X*	X	X	X	X	X	X	X
Great Cormorant	X	X	X	X	X	X	X	X	X	X	X	X*	X	X
Little Black Cormorant	X	X	X	X	X	X*	X	X	X	X	X	X	X	X
Pied Cormorant			X	X	X		X		X	X	X	X	X	X
Australian Pelican	X	X		X	X	X	X	X	X	X	X	X	X	X
White-necked Heron		X	X		X		X	X	X	X	X	X	X	X
Eastern Great Egret		X	X	X	X	X	X	X	X	X	X		X	
Intermed. Egret				X		X	X	X		X	X		X	
Cattle Egret		X					X	X	X	X	X	X	X	X
White-f. Heron	X*	X*	X*	X	X	X*	X*	X	X	X	X*	X	X	X
Little Egret				X			X							
Nankeen Night Heron	X	X	X	X	X	X	X	X	X	X	X		X	X
Glossy Ibis		X	X				X				X			
Australian White Ibis	X	X	X*	X*	X*	X*	X	X	X	X*	X	X	X	X
Straw-necked Ibis		X	X	X	X		X		X	X	X		X	X
Royal Spoonbill		X	X	X	X	X			X	X	X	X	X	X
Black-sch. Kite	X	X	X	X	X		X	X	X	X	X	X	X	X
White-bel. Sea-Eagle			X	X			X		X	X	X			X
Whistling Kite	X	X	X*	X	X		X*	X	X	X	X	X	X	X
Brown Goshawk	X*	X*	X*	X*	X*	X*	X	X	X	X	X*	X*	X*	X
Collared Sparrowh..	X	X	X*	X	X	X	X	X	X	X	X	X	X*	X

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Spotted Harrier								X	X	X			X	
Swamp Harrier	X	X	X	X		X	X	X	X*	X	X	X	X	X
Wedge-t. Eagle	X	X	X	X	X*	X*	X	X*	X	X*	X	X*	X	X*
Little Eagle	X	X	X	X*	X*	X*	X	X	X*	X*	X*	X*	X	X*
Nankeen Kestrel	X*	X*	X*	X*	X	X	X*	X*	X*	X*	X	X*	X*	X
Brown Falcon	X	X	X*	X	X	X	X	X*	X	X	X	X	X	X
Australian Hobby	X	X	X*	X*	X*	X*	X	X	X*	X	X	X	X	X
Peregrine Falcon	X	X	X	X	X	X*	X*	X	X	X*	X*	X	X*	X*
Brolga											X			
Purple Swamphen	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Buff-banded Rail		X		X	X				X					X
Lewin's Rail								X						
Baillon's Crake				X	X		X		X	X			X	X
Austr Spotted Crake			X		X	X	X		X	X	X		X	X
Spotless Crake								X		X			X	
Black-tail Native-hen					X		X	X						
Dusky Moorhen	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Eurasian Coot	X*	X	X*	X*	X*	X*	X*	X	X	X*	X*	X*	X*	X*
Pied Stilt			X		X				X		X		X	
Bush Stone-curlew										X	X	X	X	X
Red-neck. Avocet														X
Black-fr. Dotterel	X	X	X	X	X	X*	X	X*	X*	X	X*	X	X	X
Red-kneed Dotterel		X	X	X	X				X*	X	X*		X	X
Banded Lapwing					X									
Masked Lapwing	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Australian Painted Snipe							X	X						
Latham's Snipe	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Pectoral Sandpiper									X					
Bar-tailed Godwit			X											
Sharp-tail. Sandpiper	X		X		X		X		X	X			X	X
Painted Button-quail	X			X	X	X	X	X						
Caspian Tern														
Whiskered Tern				X	X									
Silver Gull	X*	X*	X*	X	X	X	X	X	X	X	X*	X*	X	X
Glossy Black-Cockatoo	X	X		X										
Yellow-t. Black-Cockatoo	X	X	X	X*	X	X	X	X	X*	X*	X*	X	X	X
Gang-gang Cockatoo	X	X	X	X	X*	X	X*	X	X	X*	X	X*	X*	X*
Major M's Cockatoo			X											
Galah	X*	X*	X*	X*	X*	X*	X	X*	X*	X*	X*	X*	X*	X*
Long-billed Corella				X		X	X		X	X*	X	X*	X	X
Little Corella	X*	X*	X*	X*	X	X	X	X*	X*	X*	X	X*	X*	X*
Sulphur-crested Cockatoo	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Cockatiel					X									
Musk Lorikeet													X	
Rainbow Lorikeet	X	X	X	X*	X	X	X	X	X	X	X	X	X*	X*
Australian King-Parrot	X	X	X	X*	X	X*	X*	X*	X*	X*	X	X	X*	X*
Superb Parrot	X	X*	X*	X	X*	X*	X	X	X	X	X	X	X	X
Crimson Rosella	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Eastern Rosella	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Red-rumped Parrot	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Blue-winged Parrot											X			
Turquoise Parrot					X									
Eastern Koel			X	X		X*		X	X	X	X	X	X	X

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Channel-bill Cuckoo						X								
Horsfield's Bronze-Cuckoo	X	X*	X	X	X*	X	X	X	X	X	X	X	X*	X
Black-ear. Cuckoo											X			
Shining Br. Cuckoo	X*	X*	X	X	X	X	X	X	X*	X	X*	X	X	X
Pallid Cuckoo	X	X	X	X	X	X	X	X*	X	X	X*	X	X	X
Fan-tailed Cuckoo	X	X	X*	X	X	X	X	X	X	X*	X*	X	X*	X*
Brush Cuckoo	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Powerful Owl					X						X			
Southern Boobook	X			X		X		X	X	X	X	X	X	
Eastern Barn Owl							X							
Laughing Kookab.	X*	X*	X	X	X*	X	X	X	X*	X	X*	X*	X*	X*
Azure Kingfisher														X
Red-back. Kingfisher			X	X										
Sacred Kingfisher	X*	X*	X*	X	X*	X*	X	X*	X*	X*	X*	X*	X*	X*
Rainbow Bee-eater	X	X	X*	X*	X	X*	X*	X	X*	X*	X	X	X*	X*
Dollarbird	X	X	X*	X	X*	X*	X	X*	X	X*	X	X	X*	X*
Superb Lyrebird	X	X	X	X	X	X	X	X	X	X	X	X	X	X
White-thr. Treecreep.	X	X*	X*	X*	X*	X*	X*	X*	X*	X	X	X	X	X
Red-brow Treecreeper	X	X	X		X	X			X			X		X
Brown Treecreep.	X	X	X*	X*	X*	X	X	X*	X	X	X	X	X	
Satin Bowerbird	X	X	X	X*	X*	X	X	X	X*	X*	X*	X*	X*	X
Superb Fairy-wren	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X
Pilotbird	X				X	X	X		X*				X	
White-br .Scrubwren	X*	X*	X*	X*	X*	X	X*	X	X*	X*	X*	X*	X*	X*
Chestnut-r. Heathwren						X		X					X	
Speckled Warbler	X*	X	X*	X*	X*	X*	X*	X	X	X	X*	X	X*	X*
Weebill	X*	X	X*	X*	X	X*	X*	X	X*	X	X*	X*	X*	X*
Western Gerygone	X	X	X	X	X	X	X	X	X	X*	X	X*	X	X*

Table 2 continued

Common name	05	06	07	08	09	10	11	12	13	14	15	16	17	18
White-thr. Gerygone	X*	X	X*	X	X	X*	X	X*	X*	X*	X*	X	X*	X
Striated Thornbill	X*	X*	X*	X	X*	X*	X*	X*	X*	X*	X*	X*	X*	X
Yellow Thornbill	X	X	X	X	X*	X*	X	X	X	X	X	X*	X	X
Yellow-r. Thornbill	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Buff-r. Thornbill	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X
Brown Thornbill	X	X*	X*	X	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Southern Whiteface	X	X*	X	X	X	X	X	X		X		X*	X	X
Spotted Pardalote	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X	X*
Striated Pardalote	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Eastern Spinebill	X*	X*	X	X	X	X	X	X	X*	X*	X	X	X	X
Lewin's Honeyeater												X		
Yellow-f. Honeyeater	X	X*	X	X*	X*	X	X	X	X*	X	X	X	X	X
Scarlet Honeyeater													X	X
White-ear. Honeyeater	X*	X	X*	X*	X*	X	X	X	X*	X	X*	X	X*	X
Yellow-tuf. Honeyeater	X						X		X	X	X	X*		
Fuscous Honeyeater	X*	X	X*	X*	X	X*	X	X*	X	X*	X*	X	X*	X*
White-plu. Honeyeater	X*	X*	X*	X*	X*	X*	X	X*	X*	X*	X	X	X	X*
Noisy Miner	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Red Wattlebird	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
White-fr. Chat					X	X	X	X			X	X*	X	X
Crescent Honeyeater				X	X	X	X		X*		X	X	X	X
New Holl. Honeyeater	X	X*	X*	X	X	X	X	X	X	X	X*	X	X	X
White-cheeked Honeyeater													X	X
Brown-headed Honeyeater	X	X	X	X*	X	X	X*	X*	X	X	X	X*	X*	X
White-naped Honeyeater	X	X	X	X*	X*	X	X	X*	X*	X*	X*	X	X*	X*
Noisy Friarbird	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X	X*	X*

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Painted Honeyeater										X				
Spotted Quail-thrush	X	X	X	X	X	X	X	X	X	X	X		X	X
Eastern Whipbird		X	X	X	X	X	X	X	X	X	X	X	X	X
Varied Sittella	X*	X*	X*	X	X*	X*	X	X*	X*	X*	X*	X*	X	X*
Black-f. Cuckoo-shrike	X	X*	X*	X*	X*	X*	X*	X*	X*	X	X*	X*	X*	X*
Cicadabird				X	X	X		X	X		X	X		
White-w. Triller	X*	X*	X*	X	X	X	X	X*	X*	X*	X*	X	X	X
Crested Shrike-tit	X	X*	X	X	X	X	X	X	X	X	X*	X	X*	X
Olive Whistler							X							
Golden Whistler	X	X	X	X	X	X	X	X	X*	X	X	X	X	X
Rufous Whistler	X*	X*	X*	X*	X	X*	X	X	X*	X*	X*	X	X*	X
Grey Shrike-thr.	X	X*	X*	X*	X	X*	X	X	X	X	X	X*	X	X
Olive-b. Oriole	X	X	X*	X*	X	X*	X	X	X*	X*	X*	X	X*	X
Masked Woodsw.		X	X	X	X		X	X	X					X
White-br. Woodsw.		X*	X*	X	X		X	X	X	X			X*	X
Dusky Woodsw.	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Grey Butcherb.	X*	X*	X	X	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Pied Butcherb.d										X		X	X	X
Australian Magpie	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Pied Currawong	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Grey Currawong	X	X	X*	X*	X*	X*	X	X*	X*	X*	X*	X*	X*	X*
Rufous Fantail	X		X	X	X	X	X		X			X	X	X
Grey Fantail	X*	X*	X	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X
Willie Wagtail	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Australian Raven	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Little Raven	X*	X	X*	X*	X*	X*	X*	X*	X	X	X*	X*	X*	X*
Leaden Flycatcher	X*	X*	X*	X*	X	X*	X*	X*	X*	X*	X*	X*	X*	X*

Table 2 continued

Common name	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Satin Flycatcher	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Restless Flycatcher	X	X	X		X		X	X	X	X		X	X	X
Magpie-lark	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
White-w. Chough	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Apostlebird												X	X	
Jacky Winter	X	X*	X	X	X	X	X	X	X	X	X	X	X	X*
Scarlet Robin	X*	X*	X	X*	X*	X	X*	X	X*	X*	X	X*	X	X
Red-cap. Robin	X	X*	X*	X	X	X*	X	X	X	X	X	X	X	
Flame Robin	X	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Rose Robin	X	X	X	X	X	X	X		X	X	X	X		X
Hooded Robin	X*	X*	X*	X	X*	X	X*	X	X*	X	X		X	
Eastern Yellow Robin	X*	X*		X	X	X	X	X*	X*	X*	X	X*	X*	X*
Eurasian Skylark	X	X	X	X*	X	X	X	X*	X	X	X	X	X	X
Golden-h. Cisticola	X	X	X	X	X	X*	X	X*	X	X*	X	X	X	X
Australian Reed-W.	X*	X	X	X	X*	X*	X*	X*	X*	X*	X	X	X*	X
Little Grassbird	X	X	X	X	X*	X	X	X	X	X	X	X	X	X
Rufous Songlark	X	X	X	X	X	X	X*	X*	X	X	X	X	X	X
Brown Songlark	X*	X	X*	X	X		X	X					X	
Silvereye	X	X	X*	X	X	X*	X	X*	X*	X	X*	X	X	X
Welcome Swallow	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Fairy Martin	X	X	X*	X*	X*	X*	X*	X*	X*	X	X*	X*	X*	X*
Tree Martin	X*	X*	X*	X*	X*	X*	X	X*	X*	X*	X*	X*	X*	X
Bassian Thrush	X	X		X	X			X	X*		X			X
Common Blackbird	X*	X	X*	X	X	X	X*	X*	X*	X	X*	X	X*	X
Common Starling	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Common Myna	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Mistletoeb.	X*	X	X	X	X*	X*	X	X*	X	X	X	X	X*	X
Double-b. Finch	X	X*	X*	X*	X	X	X*	X	X	X	X	X*	X	X
Red-brow. Finch	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X	X*	X*	X*

Table 2 continued

Common name	05	06	07	08	09	10	11	12	13	14	15	16	17	18
Diamond Firetail	X	X	X	X	X	X	X	X	X	X	X	X	X*	X
House Sparrow	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*
Australas Pipit	X	X	X*	X*	X*	X*	X*	X	X*	X*	X	X*	X*	X
European Goldfinch	X	X*	X	X	X	X	X	X	X	X	X	X	X	X
Common Greenfinch	X				X	X	X	X	X*	X	X	X	X	X

Notes

Domestic ducks and geese, which frequent the lakes, have been excluded, as have domestic chickens even when recorded far from civilisation. The peafowl have been included as they appear to be a naturally reproducing "wild" population, in suburbia. The "mallards" group has been lumped as their exact identity cannot be assured – it probably includes crosses with domestic as well as wild birds. The Emu, Brolga and Magpie Geese are – or were - probably part of the semi-captive population at Tidbinbilla Nature Reserve. The Bush Stone-curlews are included as, though initially introduced to the Sanctuary at Mulligans Flat Nature Reserve, they are free to roam.

NOTES

Canberra Bird Notes 44(2) (2019): 188-189

PIED HONEYEATER

AN UNKNOWN SIGHTING THAT BECAME A RARE FIND
WITH THE BENEFIT OF PHOTOS

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On Sunday 10 Feb 2019 I drove to Old Boboyan Road to photograph Brown Treecreepers (*Climacteris picumnus*) with stops along the way. On my return trip I debated if I should make another stop at Apollo/Naas Roads or just continue home.

Driving slowly up the hill to Apollo Road I spotted a Southern Whiteface (*Aphelocephala leucopsis*) and as I approached a group of them took off and flew across the road. I counted seven and decided to stop for a closer look.

I walked down the hill a short distance and started seeing some nice birds including a female Hooded Robin (*Melanodryas cucullata*). I also spotted a male and female White-winged Triller (*Lalage tricolor*) and not long after I glimpsed two birds flying across the road to a bush. I went over to investigate. The birds were hidden in the bush but I took a couple of quick shots and checked them on the back screen of my camera. I could not see the head but from the plumage and size I suspected odd-looking White-winged Trillers. After a short time I noted the birds diving out of the bush to the ground catching insects and returning to the bush. I watched this behaviour for five or so minutes and took more quick shots when they were on the ground to look at later on my computer but the behaviour re-enforced my thoughts of trillers.

At home I downloaded my photos to my laptop but started first on working on the “rare” birds I have on my eBird lists to justify them. With a lot of photos to go through I ran out of time and left to check the rest for a later date.

Monday morning I woke up feeling off colour so took the day off and started to look at my unidentified birds. It was at this point that I noticed on the screen the birds had a curved beak. I went through my *Australian Bird Guide* from cover to cover twice and the only bird I could match with the two mystery birds was the Pied Honeyeater (*Certhionyx variegatus*). However, I discounted this as not possible. I quickly posted a photograph to ABID (Australian Bird Identification Facebook group) and immediately received a response from Liam Murphy that they were indeed Pied Honeyeaters. Well, the excitement really hit me and I sent a quick text and then posted the find to the chat line to alert the local birders and then added them to my eBird list, I also posted on relevant Facebook groups.

I have but one regret to this sighting: had I known what the birds were when I was in the field, more birders would have had a chance to see them. By the next day, when others went out, it appeared they had left the area.

According to Birdline this is the second sighting in COG AOI (Area of Interest). On the 4 March I received an email from Barbara Allan that the COG Rarities Panel had endorsed my record of two immature Pied Honeyeaters and that it was the second endorsement in the COG AOI with the first being in 2002 at Hoskinstown.

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OLIVE-BACKED ORIOLE AND OTHER SPECIES AT MY BIRDBATHS IN SYMONSTON

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Late in 2011 I started to photograph the small birds around my house. Downloading the photos on my computer I see that I have a few different species, with one creating great interest for me. After a visit to my sister-in-law to borrow her bird guide, I discovered that the bird was a Spotted Pardalote (*Pardalotus punctatus*).

In mid-2011 I had set up birdbaths around my home and straight away they were attracting a lot of birds, getting me very excited. Early in 2012 I sighted a different bird and after checking my guide and getting confirmation on a Bird forum I had my first Olive-backed Oriole (*Oriolus sagittatus*) record (see photos below). At this point I asked my neighbour to keep an eye out for them while I was at work, *and from the start of 2014 to the present together we have recorded them for every month of all years with most sightings in winter*.

On Sunday 14 Oct 2018 I decided to set up my camera on my deck and connect it to my laptop so I could record birds from my dining table. Starting early morning and until late afternoon, a male would arrive for a drink closely followed by a female. This occurred about every hour through the day.

In July, 2012 while photographing the Olive-Backed Oriole I noticed one was catching honey bees so I took as many shots at 8 frames per second as I could, and while most pics were a bit blurry I noticed that the bird would grab the bee from the rear as if it was removing the sting and then quickly grab the bee again before it fell and eat it. HANZAB (2006) does not mention bees as a food source for them.

Since I began observing the birds at my home I have recorded 38 species attending my birdbaths either to have a drink and/or to bathe. By far my favourite was the brief visit of a Regent Honeyeater (*Anthochaera phrygia*) on 26 Mar 2019.

***Top left*: Yellow Thornbill; *top right*: juvenile Sacred Kingfisher; *below left*: Silvereye and juvenile White-naped Honeyeater; *below right*: Regent Honeyeater.**

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BROWN TREECREEPERS RAISE TWO BROODS IN A FENCE POST

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In the 2018/2019 breeding season a group of three Brown Treecreepers (*Climacteris picumnus*) in the southern ACT selected a strainer fence post as their nest site (Fig. 1). The post stood 120 cm above the ground and had a diameter of 30.5 cm. The central nest hollow was 47 cm deep and its opening 7.6 cm wide. The nest was discovered on 19 Sep 2018.

Nests in fence posts have been reported before (Doerr and Doerr 2001). Such nests provide a rare opportunity to monitor the broods. The nest content could be seen from the top, although the base with the nest was somewhat off centre. The adults were surprisingly tame and allowed close approach. Nevertheless, the disturbance of the nest site was kept to a minimum, and visits did not necessarily capture all key aspects of the nesting cycles.

Figure 1. Two adult (a male on right) Brown Treecreepers at their nest site – the strainer post (*Kym Bradley*).

On 19 Sep the clutch contained four eggs. Three young hatched around 6 Oct, they fledged 23 days later on 29 Oct. The nestling period is within the range of 21-26 days given by Doerr and Doerr (2001). The young stayed with the group for about 40 days.

To my surprise an adult was again entering the fence post on 3 Nov. Inspection revealed that the female had laid a second clutch of two eggs only 5 days after the first brood fledged. I was not able to confirm later whether this was the complete clutch. Two quite well developed

nestlings were found on 29 Nov. The young fledged somewhere between late November and early December. One of the fledglings had a deformed bill (tip of upper mandible crossing over lower mandible, see Fig. 2).

Figure 2. The two fledglings of the second brood. Bird with the deformed mandible on left (*Kym Bradley*).

The species is normally single-brooded but is able to raise two broods in a season and has the capacity to re-lay after nest failures. To date no other observations of double-broods in Brown Treecreepers have been reported in COG's Area of Interest.

Red-rumped Parrots (*Pasephotus haematonotus*) tried repeatedly to claim the nest site, but the treecreepers prevailed. Currently (end of June 2019) both species are again showing interest in this fence-post cavity.

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PIED CURRAWONG NESTING AT A BUILDING

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Returning on 28 Oct 2018 from a COG "Blitz" survey on Mt Ainslie, my path to the parked car took me past the back of some Duffy Street houses in Ainslie, bordering the reserve. From one block I heard begging Pied Currawongs (*Strepera graculina*). However, the calls did not appear to come from any of the larger trees around the house. Then I noticed an adult flying out from the inside of the left of two gables of the house (Fig. 1, on left, see arrow). The gable contained a nest with two young (Fig. 2 below, see arrow).

The gables are not accessible from the interior of the building, they are merely decorative. The occupied gable contained remains of another two nests (one in each corner) with the active nest in the middle; the other gable also had one old nest near one of its sloping sides. This may indicate that these gables have been used by Pied Currawongs (by the same pair?) over four years as nest sites. They provide a solid base and a roof for the nest, hence good protection from the elements, and most likely also from potential predators. Notably, around this block, including the edge of the Mt Ainslie reserve, are suitable nest trees for the currawong.

Higgins *et al*. (2006) comment that the species only rarely uses artificial structures as nest sites and mention only one case of a pair nesting on top of a pylon. Recently Fulton (2018) reported that a pair of Pied Currawong nested successfully in an underground carpark, open on two sides, in a suburban shopping centre in Brisbane, and had probably done so for two years.

In Canberra the Pied Currawong has adapted very well to urban life (Lenz 1990a,b; Veerman 2006; Hermes 2017) and is now a common all-year resident. There are a number of indications that it has become also more flexible in its choice of nest sites: using exotic trees (pines and deciduous trees) in addition to eucalypts (Rowley 1984), commencing breeding in deciduous trees well before the foliage provides protection from view, and at times nesting as low as 4m above the ground. Using an artificial structure for breeding, and a fairly enclosed one at that, in preference to available and suitable trees in Ainslie, is another indication that this species is becoming more and more integrated into the suburban environment

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COLUMNIST'S CORNER

Canberra Bird Notes 44(2) (2019): 196-198

Distinguishing flocks: not every mixed feeding flock is an MFF

Let's start with *Wikipedia*:

"A mixed-species feeding flock, also termed a mixed-species foraging flock, mixed hunting party or informally bird wave, is a flock of usually insectivorous birds of different species that join each other and move together while foraging."

The mention of a 'bird wave' recalls the talk to COG in September 2017 by Rahula Perera, a Sri Lankan ornithologist. He spoke about the foraging flocks of the Sinharaja rain forest. The 'Sinharaja Bird Wave' has had no lack of publicity in the tourist literature. It is claimed to be 'the biggest, the best for viewing and longest studied bird wave in the world'. However, a typical Sinharaja flock is not all *that* big. 'On an average, there could be about 12 different species of birds, with some flocks recording as much as 30-40 different birds.'

In an article in *Emu* in 1987 about mixed flocks in New Guinea, Jared Diamond placed in a separate category from the usual mixed foraging flock 'the much larger and much less common "bird wave" a flock of dozens of forest bird species and up to nearly 100 individuals'. Subsequently, referring to that larger kind of occurrence, Eric Sedgwick recalled an experience in 1979 in open woodland in the north of Western Australia. He used the heading 'An Australian Bird Wave'. The vanguard was scores of trillers and woodswallows, followed by lorikeets and finches, 'a considerable aggregate, hundreds if not thousands'.

In view of the use of 'bird wave' to describe large flocks of quite large conspicuous birds, it seems better to avoid that expression when referring to the smaller mixed flocks of non-tropical Australia.

For temperate Australia, a much-cited, relatively early piece of work on mixed flocks was undertaken by Harry Bell at Black Mountain, ACT. From March 1974 to April 1975, he recorded 'flocks' that met this definition: 'At least one bird of a species present had to be within five metres of another species for two minutes and move in the same general direction as it for at least ten metres'.

That is the kind of definition used in several later studies. Sometimes a different minimum species number or distance is used. Neil Hermes conducted a 15-week count at Black Mountain in April-August 1977. He used: 'four or more different species occurring within 50 metres of one another and moving together'.

In 1989 Hugh Possingham contributed a record to *Canberra Bird Notes* of his observation of a single 'mixed feeding flock' in open woodland at O'Malley, ACT. He referred to Harry Bell's work as documenting a 'relatively stable' kind of mixed feeding flock, and to his own observation, by contrast, as relating to birds gathered to exploit a particular food source. In this case the food source was pale green grubs. More than 50 individual birds were involved. (Surprisingly, there were 8 cuckoos - 4 species including a Black-eared Cuckoo.)

Hugh Possingham's flock is a good example of what has been called a 'feeding aggregation'. 'Mixed-species foraging flocks' are 'different from feeding aggregations, which are congregations of several species of bird at areas of high food availability' (*Wikipedia*).

For the first kind of flock, the description 'relatively stable' needs the qualification, because such flocks might be 'relatively' short-lived, and change composition. It is the 'moving together' requirement that is generally used as the element linking members of different species so as to constitute a recordable flock whether 'mixed species foraging' or 'feeding aggregation'.

The necessary linking element, described as a 'positive response towards each other', was described more broadly in a report of one long-running survey, this one in northern Australia: '... the species were clearly interacting in a positive manner to each other via a feeding, feeding and vigilance, or feeding and flocking association. Other functional indicators of the formation of mixed flocks included bird species foraging in atypical vegetation strata together, birds feeding due to the actions of other species (*i.e.* flushing invertebrates) or species moving together as a loose flock' (Vanderduys 2012). (Between 2004 and 2010 that study recorded 335 flocks, with those flocks containing between 2 and 237 individuals.)

Where we are heading in this discussion is towards yet another distinction, one relevant to Canberra woodlands.

The definition 'two or more individuals with a positive response to each other' is of a technical nature. It is a guide adopted for easy application when identifying and counting groups of birds. Clearly, it will capture a wide variety of groups. It can refer to just two individuals together, to a 'bird wave', and to birds in a 'feeding aggregation', and has been applied in some surveys, including that of Harry Bell at Black Mountain, to include gatherings of birds in the nesting season within overlapping foraging territories.

That definition gives us what might be called a 'technical mixed feeding flock'. However, what people report in Canberra woodlands in early autumn and winter has distinct characteristics. These were described in a *CBN* article by Steve Wilson in March 1987: '… the chief feature of winter bird watching in Canberra is the frequent sightings of mixed flocks of several species of small birds. … Constant factors are that they are made up by small birds only and they move through an area, very actively seeking food.'

This is what Canberra observers call an 'MFF', a more appropriate label if the first 'F' is taken to mean 'foraging' rather than 'feeding'. For the noun, 'flock' is convenient but not always appropriate. Note Neil Hermes definition for winter 'flocks' at Black Mountain: 'four or more species occurring within 50 metres of one another'.

Such a group falls within the technical definition, but also has the following features. The core is small insectivorous birds of woodland or forest, typically thornbills or weebills, usually with pardalotes. As such a group occurs in the non-breeding season, it consists mainly of roaming non-breeding birds. It is highly mobile, typically moving out of sight of the observer within a few minutes. Such an 'MFF' does not include that common winter sight around Canberra, a mixed flock of cockatoos feeding together on the ground (certainly a technical mixed feeding flock).

Such small-bird behaviour can be found in other parts of the world where there is a strongly marked non-breeding period. 'In the winter woods, you may suddenly find yourself surrounded by a slow-moving gang of birds, a hunting party of several small species foraging for food together' (*Washington Post* 2011).

Unless you are working to a different specification, to be worth reporting or mentioning as such an MFF in Canberra the group should contain at least 5 different species. That is a typical number. There might be many more: see *Canberra Bird Notes* 27(2) – a report of 18 species together, more than 100 birds (Cook 2002).

At this point a less experienced columnist might be tempted to suggest a new distinctive name for those local non-breeding mixed foraging groups. This columnist knows better. People will just call them MFFs. One hopes people will know what that means.

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Stentoreus

Canberra Bird Notes 44(2) (2019): 199-201

Birding in Cyberspace, Canberra Style

The online world contains a bewildering array of citizen science and related initiatives to which you can submit your birding observations, including photos and sound recordings, retrieve data; interact with other birders; etc. Undoubtedly the best known is eBird Australia https://ebird.org/australia/home (over 90% of the records in COG's database for the 2017-18 year came from that source), with Birdlife Australia's Birdata (previously known as the Ongoing Atlas) https://birdata.birdlife.org.au/, QuestaGame https://questagame.com/ and Canberra Nature Map https://canberra.naturemapr.org/ also being prominent. Much of the Australian data from these, and many other sources, eventually end up in the Atlas of Living Australia (ALA) https://www.ala.org.au/. But what about **iNaturalist**? This resource operates both online and through a smartphone app, see https://www.inaturalist.org/ for details. It is one of the sources used by ALA. At the time of writing, iNaturalist reports that it has 1,464,119 people registered to contribute observations, and has received 20,662,594 observations covering 215,704 species! (These are species of any form of living organism, not just birds.) The ALA describes iNaturalist as follows https://collections.ala.org.au/public/show/dr1411:

> *From hikers to hunters, birders to beach-combers, the world is filled with naturalists, and many of us record what we find. What if all those observations could be shared online? You might discover someone who finds beautiful wildflowers at your favorite (sic) birding spot, or learn about the birds you see on the way to work. If enough people recorded their observations, it would be like a living record of life on Earth that scientists and land managers could use to monitor changes in biodiversity, and that anyone could use to learn more about nature.*
>
> *That's the vision behind iNaturalist.org. So if you like recording your findings from the outdoors, or if you just like learning about life, join us!*

In May this year ALA wrote https://www.ala.org.au/blogs-news/ala-inaturalist-collaboration/:

> *Some ALA users will be familiar with iNaturalist, the global online community for naturalists. By becoming a member of the iNaturalist Network, the ALA will have its own local node called iNaturalist Australia.*
>
> *Over the next few months, we'll be working with iNaturalist to implement iNaturalist Australia. Already, all data collected and shared with iNaturalist can be viewed in the ALA. The collaboration will focus on using the iNaturalist platform for individual sightings in the ALA, leading to better species identification and data quality, as well as providing access to the largest biodiversity-loving community on the planet.*

ALA currently has 94,018 iNaturalist bird records, so it is not as significant a resource (numerically speaking) as some others. Nonetheless, you may care to check it out.

Staying with the ALA for a moment, have you caught up yet with their **DigiVol** initiative? Last October's issue of their regular blog highlighted this https://www.ala.org.au/blogs-news/digivol-one-million-tasks/:

> *On Thursday 23 August 2018 at 8:48pm we completed our one millionth task. That day we had 12 projects active from around the world. This included insects from the*

> *Australian National Insect Collection, handwritten notes from City of Parramatta Council, Natural History Museum of Utah, Harvard University and South African National Biodiversity Institute. There were herbarium specimens from Royal Botanic Gardens Kew, Royal Botanic Garden Edinburgh and The New York Botanical Garden, camera trap images from ACT Parks and Conservation Service and NSW Farmers Association as well as many more insect, shell and mineral specimens from the Australian Museum.*

Some of the projects are local, such as the 'Secret Life of Critters at Mulligans Flat', in which volunteers view camera trap images and identify what wildlife can be seen there, and the 'Superb parrots in the ACT – breeding success and hollow competition' project which also entails capturing records from images (though this project appears to have concluded). Highly recommended, and very satisfying knowing that you are making important contributions to conservation science through volunteering to contribute through projects such as these.

Some long-time birders will recall, perhaps fondly, **trip reports**. We would see them in birding magazines, and even in letters (remember them?) from birding friends and colleagues. They were great ways of sharing information about birding locations and observations, as well as details on such things as access to the sites, and anecdotes about birding and related experiences. The advent of the internet meant that we had new ways of distributing and publicly archiving our trip reports. Birding-aus http://birding-aus.org/ and http://bioacoustics.cse.unsw.edu.au/archives/html/birding-aus/, the national equivalent of COG's CanberraBirds email-based announcement and discussion list, used to regularly contain trip reports, many of which your columnist found fascinating and useful, but my impression is that this happens far less frequently now than in the past.

All is not lost, however! **Cloudbirders** https://www.cloudbirders.com/ seeks to fill the gap, labelling itself as 'The world's bird trip report portal'. It has a sophisticated filtering facility to enable you to find reports of interest. It even has the option of filtering out trip reports submitted by commercial birding tour companies! At the time of writing, Cloudbirders had 481 reports on trips in Australia, averaging 17 days in length, with the maximum number of bird species seen on a single trip being 559, and the average number of species on a single trip 251.

Also interesting is the Victorian professional bird guide Tim Dolby's trip reports website https://timothydolby.com/tim-dolbys-bird-trip-reports/. Other birding tour companies publish their Australian trip reports online, including BirdQuest http://www.birdquest-tours.com/tripreports and Follow That Bird http://www.followthatbird.com.au/tripreports.htm , and of course COG maintains its own archive of trip reports, mostly one day, and long weekend, field trips, at http://canberrabirds.org.au/past-events/.

T. Javanica

This column is available online at http://canberrabirds.org.au/publications/canberra-bird-notes/. There you can access the web sites mentioned here by clicking on the hyperlinks.

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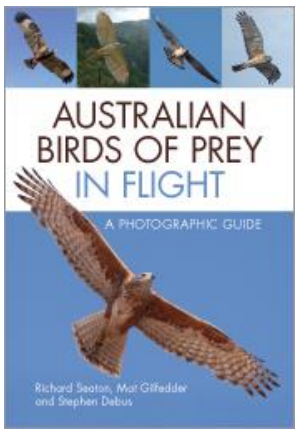
The *CanberraBirds* list's searchable archive is at http://bioacoustics.cse.unsw.edu.au/archives/html/canberrabirds.

BOOK REVIEWS

Canberra Bird Notes 44(2) (2019): 202-203

***Australian Birds of Prey in Flight: A Photographic Guide*. By Richard Seaton, Mat Gilfedder and Stephen Debus.** CSIRO Publishing, Clayton South, Victoria, February 2019. ISBN: 9781486308668, Paperback, 144 pages, RRP AU $39.99.

Reviewed by STEVE HOLLIDAY, Ainslie, ACT 2602 (pruesteve@iinet.net.au)



My first impression on flipping through this new photographic field guide was that it was aimed largely at photographers wanting to identify bird of prey images they had captured. No doubt this will be part of its appeal, but on closer inspection I think there is more to this book. In the introduction the authors are at pains to point out that photos can sometimes be misleading and cannot outweigh the value of careful direct observation in learning to identify birds of prey.

Raptors have always been a rather challenging group to identify, especially for beginners. A dedicated field guide to the Australian species already exists (Debus 2012) by one of the authors of the book under review; in the introduction to this new book it is noted that it is intended to complement the existing one. As the title says, the book is only about flight identification; those wishing to identify perched birds of prey will need to use another reference.

Immediately after the title page there is a two-page photographic spread of all species covered; then follows a short but informative introduction which discusses the purpose of the book and its layout, along with some general comments about raptor identification (note that the authors use the terms ‘raptor’ and ‘bird of prey’ interchangeably). The bulk of the book consists of four pages of photos and text for each of the 24 species resident in Australia plus two rare visitors that have been recorded more regularly in recent years (Oriental Honey-Buzzard and Eurasian Hobby). The first two pages have three or more photos of the relevant species superimposed over a shot of some typical habitat. Where these show distinctive plumages for immature or juvenile birds they are labelled as such. The third page contains 6 images of the species in different flight positions against a plain background. The fourth page is a concise written summary of information related to identification, including age and sex-related differences where these exist. There is also a distribution map.

Individual species sections are followed by 16 pages of species comparisons – two similar species to a page with photos aligned for direct comparison. The book concludes with a photographic acknowledgement section (there are nearly 50 different contributors) and an index. There is no bibliography although the authors recommend a few other books for further information in the introduction.

Overall the book is nicely presented and small enough to be easily carried in the field. It really is a bare-bones identification guide; those seeking more detailed information could try Debus’s earlier book, which contains a lot more data on the biology of each species. The single-page text summaries for each species are well thought out and very concise, but the book’s success really depends on the photos, and on the whole I think these serve their

purpose well. The two-page spread (pages iv and v) showing all species in similar poses gives an excellent overview and is ideal for comparing size and shape when trying to narrow down an identification.

The question arises as to whether this adds anything to existing field guides such as Menkhorst *et. al.* (2017). I think it does – the approach taken is quite different and as such the book is a useful additional source for identifying Australian birds of prey. I have very rarely used photographic guides in the field (Chandler 2009 is an exception) and find more general photographic guides to Australian birds I have seen to be of rather limited use compared to those illustrated with paintings. However I think most birders would find this new book, with its large number of photos of each species, of value.

References

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Menkhorst, P., Rogers, D., Clarke, R. Davies, J., Marsack, P. and Franklin, K. (2017) *The Australian Bird Guide.* CSIRO Publishing, Melbourne.

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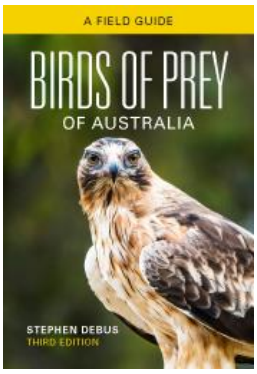
***Birds of Prey of Australia – A Field Guide.* (3rd edition). By Stephen Debus.** CSIRO Publishing, Clayton South, Victoria, July 2019, ISBN: 9781486311118, Paperback, 224 pages, RRP AU$ $ 44.99.

Reviewed by HARVEY PERKINS, Kambah, ACT 2902 (hdpphd@gmail.com)



My first thought on hearing of the publication of a third edition of this guide was, Why? How will it differ to warrant another update, especially in light of the publication just months earlier of what is being called a 'companion' guide to identifying Australian birds of prey in flight?

The first edition of this book was published by Oxford University Press in July 1998 (Debus 1998) and filled a significant niche in Australian bird literature (notwithstanding a small guide self-published by Gordon Beruldsen (1995). Debus's guide was a tidy, authoritative volume, based heavily on the *Handbook of Australian and New Zealand Birds* (HANZAB) (Marchant and Higgins 1993) for both text and illustrations. Unfortunately, it didn't fit the modern concept of a field guide in that, amongst other things, the illustrations were grouped in four batches of plates through the book and thus were not on facing pages to the field descriptions (apparently a format imposed upon the author by the publisher). Nor were there any distribution maps. In December 2001 the book was reprinted by JB Press of Adelaide (Debus 2001), but with a slightly changed cover featuring a Grey Falcon rather than the original Peregrine.

The second edition, from CSIRO Publishing in 2012 (Debus 2012), was a significant improvement, with new information and revised text based on significant new knowledge enabled, particularly, through DNA studies and digital photography. Twenty-six species were again covered, but the Eastern Marsh-Harrier was replaced with Oriental Honey-Buzzard. But most obviously, the book followed an improved format, now being divided into field guide and handbook components. These were separated by a section with split-underside illustrations showcasing the differences between similar species pairs, and a selection of photographs of birds in flight. Distribution maps were also included, though only for 6 of the 26 species covered in the field guide section, on the basis that the others essentially have nation-wide distributions.

And the third edition? Well it is an incremental but wholly worthwhile advance on the previous edition.

The same 26 species are covered in the field guide section (osprey, 19 accipitrids and 6 falconids), though there is some juggling of the species included under the brief section covering six vagrant species. Old unconfirmed reports for three species have been deleted and replaced with more recently recorded peripheral species, being the Chinese Sparrowhawk, Eurasian Hobby and Oriental Hobby.

The two essentially extralimital species (Oriental Honey-Buzzard and Gurney's Eagle) are again included in the field guide section, but not the handbook section. Presumably this is

because their scarce occurrence and limited distribution in Australia does not warrant or allow detailed distributional, behavioural, breeding or conservation commentary.

The most tangible, if less obvious, improvement in the third edition is the significant revision and updating of species texts and handbook information. This has been enabled by further published research over recent years, particularly on conservation-sensitive and/or lesser known Australian species, including Red Goshawk, Black-breasted Buzzard, Pacific Baza, Brahminy Kite, and Black and Grey Falcons. DNA taxonomic research in particular has surged and refined the understanding of relationships. This has resulted in the Osprey resuming its position as a single, global, monotypic species, *Pandion haliaetus*, with our local Australasian version (*cristatus*) being reduced once more to sub-specific status. The enigmatic Red Goshawk is now also understood to ally with the goshawks and harriers and has been moved to occupy a position between them in this edition.

Distribution maps are now included for all but one species. These are clear, two-toned maps based on eBird records and are a welcome addition. Gurney's Eagle still remains mapless as its occurrence potential is highly restricted to the Torres Strait islands and northern Cape York Peninsula.

The split-diagrams for difficult species pairs remain unchanged and just as useful. The gallery of birds in flight, however, has been updated and increased from 40 to 48 photographs to further highlight differences in sex, age and morphs. Another nice touch is the reinstatement of the original line drawings from HANZAB, often of behavioural or flight-style aspects, after being dropped from the second edition.

It must be noted that Debus is also an author of the recently published *Australian Birds of Prey in Flight – a photographic guide* (Seaton *et al.* 2019) (see book review by Steve Holliday (2019) in this edition of *Canberra Bird Notes*). The timing is not entirely coincidental, and each book claims to complement the other. To my mind, there is considerable overlap in the ID aspects of the books, and the more comprehensive Debus guide would probably suffice for most people's in-flight ID needs. That said, the in-flight photographic guide certainly provides many more photos, including non-standard angles that would certainly help when comparing to a reader's own photographs, as well as other useful pointers. And, it should not be overlooked that it is a very attractive book.

So… do you buy the third edition?

If you already have the new birds in flight guide – get this one too! Unless you really do just want a quick reference to identify your own photos of a raptor in flight (in which case you might as well just jump on the internet), the extra depth of information is well worth having.

If you have a copy of the first edition of Debus's field guide, it is definitely worth upgrading to the third edition, not only for the updated information but for the vastly improved format. If you have the second edition, the need to update is a little more equivocal. If you have a keen interest in raptors you will benefit from the additional and updated information from recent research on several species. But then if that is the case you might well be up on the literature anyway. If you have neither, the third is easily the best of the three editions and I cannot imagine anyone not being very happy with their purchase.

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Canberra Bird Notes 44(2) (2019): 2007

RARITIES PANEL NEWS

A modest list this time, perhaps a result of the very hot summer having deterred birds and birders alike from venturing out. Of the honeyeaters endorsed below, the Pied was certainly the more unusual record, this time of two females. Photographs helped the endorsement process immeasurably, once the approximate size of the birds was ascertained. The deeply curved bill and pale borders to the median coverts, giving a chequered pattern, are very characteristic of Pied Honeyeaters. Their size, and the fact that they were feeding on the ground, ruled out the smaller Black Honeyeater, which is recorded somewhat more frequently in our area. The only previously endorsed record of this inland species came from Hoskinstown in October 2002.

The Spiny-cheeked Honeyeater, on the other hand, while "rare" in our area is recorded slightly more frequently, most recently in 2010-11. While the Panel rarely endorses records based on call alone, it did so on this occasion, given a good description of the call and the observer's familiarity with honeyeater calls.

The Black-faced Monarch is no longer on the "unusuals" list, thanks perhaps to a spate of records in the 1990s. However the Panel was pleased to adjudicate on this record of an adult bird, the record being comprehensive and supported by a clear recording of the bird's characteristic call. Though a coastal species, it can be occasionally found in the wetter areas of our region, particularly Tallaganda.

The Panel was unable to endorse several records of the Australasian Figbird, based solely on calls. It has also assisted several members of the general public with their photographs of species with which they were unfamiliar – including a Crested Pigeon!

ENDORSED LIST 94, JUNE 2019

Pied Honeyeater*Certhionyx variegatus*
2; 10 Feb 2019; Shorty Westlin; Naas Rd at Apollo Rd; eBird S52544582

Spiny-cheeked Honeyeater *Acanthagenys rufogularis*
1; 24 Dec 2018; Rainer Rehwinkel; Mt Majura NR; eBird S51011644

Black-faced Monarch *Monarcha melanopsis*
1; 2 Dec 2018; Kim Larmour, Warks Rd at Blundells Creek Rd; eBird S50357182

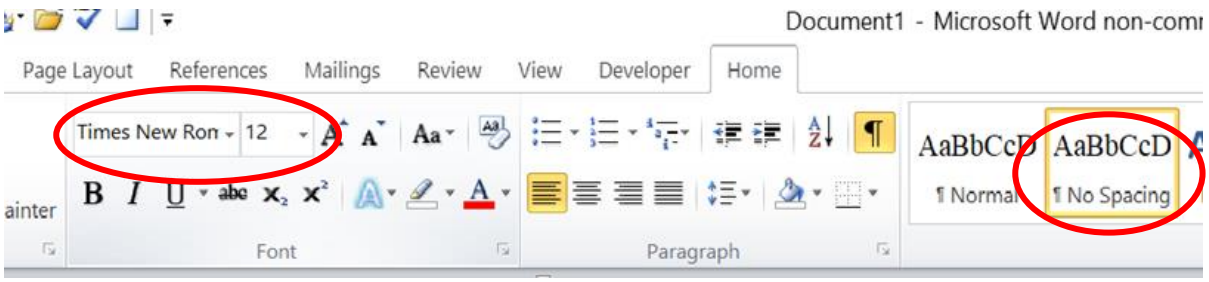
Barbara Allan *(allanbm@bigpond.net.au)*

Canberra Bird Notes

Canberra Bird Notes is published three times a year by the Canberra Ornithologists Group Inc. and is edited by Michael Lenz and Kevin Windle. Paul Fennell edits the first issue/year, the Annual Bird Report. Major articles of up to 5000 words are welcome on matters relating to the status, distribution, behaviour or identification of birds in the Australian Capital Territory and surrounding region. Please discuss any proposed major contribution in advance. Shorter notes, book reviews and other contributions are also encouraged. All contributions should be sent to one of those email addresses:

CBN@canberrabirds.org.au or michael.lenz.birds@gmail.com

Please submit contributions in *Times New Roman, with 12-point Font Size and 'No Spacing'* (see illustration below):



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