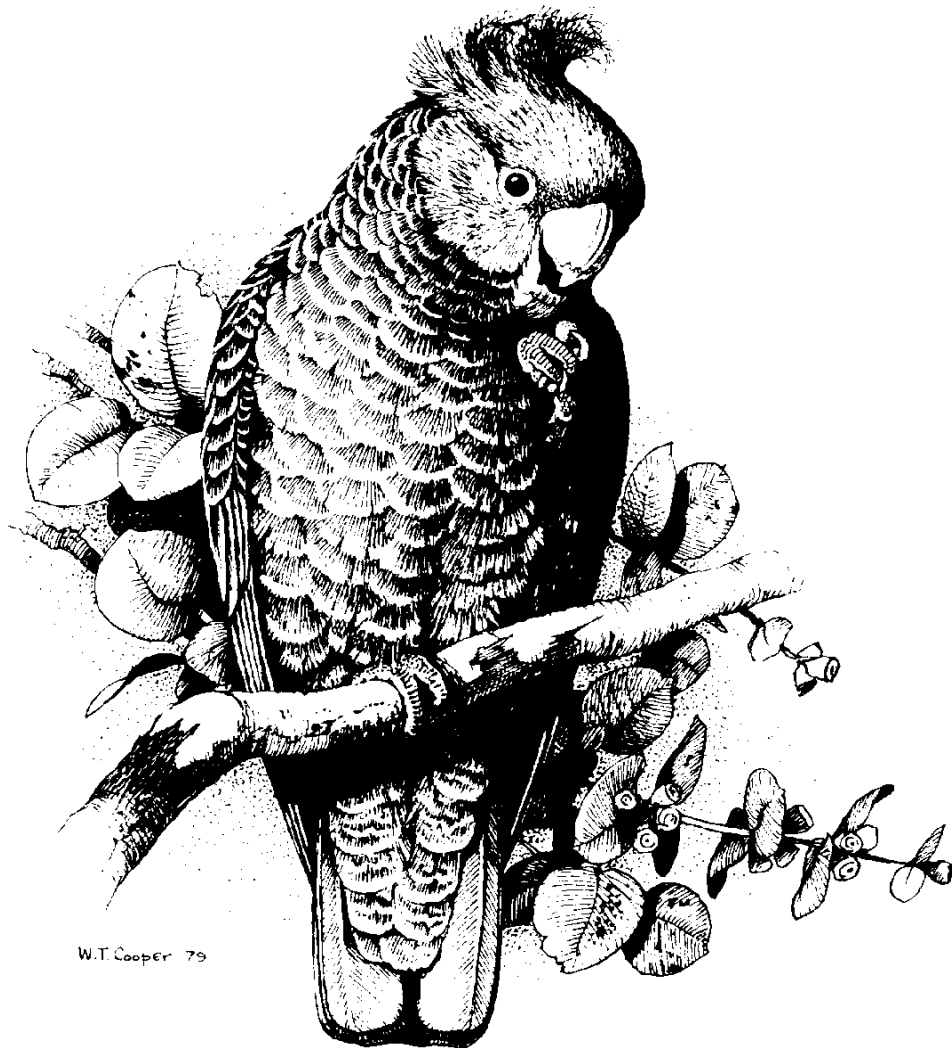


# canberra bird notes

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## ARTICLES

Canberra Bird Notes 48(1) (2023): 1-5

### THE EDEN PENGUIN PROJECT

CHRIS LLOYD

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It has been over two years since the pilot project to bring a penguin colony onshore at Eden kicked off with much community effort. The project came about because the community on the Eagle's Claw area of the headland had raised money last century to try and fence the existing colony from feral predators. Eagle's Claw proved impractical so the adjacent sea gutter of Wheelcove was chosen as a substitute site. After much community effort half a dozen specially designed burrows, a sound attraction system and camera traps were installed behind a brand new fence. The fence has given the local bandicoot population some added protection, if our camera traps are any indication.

The research suggested it might take up to five years to attract the birds to nest, but from the outset there were penguins in the bay and close to the site, so we were very hopeful. It took a little over six weeks before our cameras picked up a bird on the site, tantalizingly close to an 'Eden' Burrow (Fig. 1). Then the gremlins set in with a seemingly endless round of problems with our sound system and the solar array used to power it. Well-meaning amateurs, such as your scribe, spent hours going up and down the gully with new batteries, plugs and multimeters but to no avail; the system remained unreliable.

The COVID pandemic also took its toll with restrictions on movement and therefore maintenance and monitoring over the next year. Fortunately, Wendy Noble and the volunteer local committee kept things moving as much as was possible and by late 2021 we again started capturing images of penguins exploring the site. By the end of the year our best estimate was that 8-9 individuals had done some real-estate prospecting but none had bought into our prefabricated bungalows (Fig. 2).



Figure 1. Little Penguin prospecting 'real estate' at Wheelcove.





**Figure 2. Wheelcove habitat where Little Penguins have visited and some burrow locations (arrows)**



**Figure 3. Track and observation platform adjacent to Wheelcove.**

A track and observation platform have been built adjacent to Wheelcove by local service clubs and will provide the opportunity for interpretative signage of the penguin project behind the fence (Fig. 3).



While things were slow at Wheelcove the burrows which had been specifically designed for its conditions were going through some evolution of their own. The Fixit Sisters (@fixitsistersshed), who made the prototypes we installed, had begun to do some research and development, as well as a bit of publicity, which saw burrows installed on Lion Island in the Hawkesbury and Snapper Island in the Clyde River. The Lion burrows were ignored by the local colony but Snapper saw a breeding boom from the moment the burrows were installed in 2020 (Fig. 5). This has continued through to 2022 with birds hatched in the ‘Eden’ burrows now returning to the island to breed themselves.



**Figure 4. A 3D printed mould of the ‘Eden’ Little Penguin (seabird) burrow. It is what it will look like just in concrete rather than plastic.**

Having gained ‘proof of concept’, the ‘Eden’ burrow is heading for its fourth iteration with the Fixit Sisters now producing new more accurate moulds, replacing the plastic inspection tubes with concrete moulding and experimenting in 3D printing and engineered concrete formulations (Fig. 4). We may not yet have penguins breeding in Wheelcove but the project has produced significant success with a versatile artificial seabird burrow that may yet find many uses.

Back in Eden, 2022 was again a bit of a haphazard affair with power and sound unreliable until late in the season, when Wendy found a local sparkie who was prepared to go the extra yards to get things happening. The landscape has not been kind: one burrow was crushed in a large rock fall but in such a way that any chicks would have survived in the chamber. Local volunteers braved the ropes to help replace this one and reposition the other burrows, on the basis of our experience on Snapper. While down the gully we took the opportunity to start dealing with the blackberry infestation as well. It may all be a bit late for this season but 2023 should give us an uninterrupted opportunity to attract the birds to breed at the site.

The major development was discovered when we downloaded our cameras in the gully. Aside from a very camera-friendly marsupial, we caught at least a couple of pairs of penguins exploring the site over a number of weeks. In some of these images the birds were

carrying nesting material or showed other behaviours which indicated that they were serious about the real estate but too late in the season to make a deposit. We are now pretty confident that there will be some attempt at nesting this season and hopefully in our burrows.

Our next bit of capital works, presuming we can raise some money, is to build a small track into the cove so we can begin some serious bush regeneration on what was once a local garbage dump. Once this is established, we will have the room to install more burrows, should the penguin numbers warrant it.

Little Penguin breeding for the 2022 season has been something of a mixed bag on the East Coast. The colonies at Snapper Island, Manly and Lion Island had a slowdown in breeding around September, but things then picked up with Snapper Island on track for its best season in its three years of study.

Gabo Island breeding of Little Penguins in 2021 was reported at the Island Arc Conference at Phillip Island this year to have suffered a major collapse from the 7,000 pairs surveyed in 2012. This data has not yet been peer reviewed and further surveys are required to understand if the most recent data point is correct, or an anomaly caused by the timing of the latest sample. Barunguba/Montague Island's penguins have been in ongoing decline, possibly due to fur seals, and are subject to a three-year survey program to determine their status.



**Figure 5. 'Eden' burrow occupied by Little Penguin on Snapper Island.**

It is important to recall that the Wheelcove project was a pilot exercise in building mainland colonies for seabirds generally and Little Penguins in particular. It has already produced a collateral result in the form of the 'Eden Burrow', which may find many uses in the future. We have also learnt a lot about developing new and safe habitat for seabirds, and this learning will be useful if we ever get the opportunity to develop larger sites on the Far South Coast to bring seabird breeding back to the mainland.

The project has been almost entirely run using some labour from NPWS (Nicholas Carlisle and Wendy Noble), and local volunteers, including some from the now closed Marine Discovery Centre (a small tragedy in itself) and the Far South Coast Birdwatchers. Funding has come from local donations and some in-kind contributions from the LGA, NPWS and local business.

For those interested in following up Penguin and other seabird surveys, the 'Seabirds to Seascapes' is worth a look: [Seabirds to Seascapes / NSW Environment and Heritage](#)

*Accepted 10 March 2023*

**THE BREEDING SUCCESS AND DIET OF LITTLE EAGLES  
IN THE ACT AND NEARBY NSW  
IN A THIRD CONSECUTIVE WET YEAR, 2022**

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**Abstract:** 2022 was a wet year. September and November, when most Little Eagles in the ACT area lay eggs and hatch young, were notably wet. There were three confirmed pairs with nests in the ACT, a single male and a single female. All pairs laid eggs and one lost their eggs then re-laid a second clutch. The chicks in one nest died during periods of prolonged heavy rainfall and two pairs raised a chick to fledging. In NSW, three of four known pairs were confirmed to have laid eggs. Access was limited to the fourth pair's nesting area. All monitored pairs hatched eggs, but two pairs lost chicks. These losses all occurred during periods of high winds and heavy rain. All fledged chicks were singles and the overall breeding success was 50% per confirmed breeding pair. Rabbits were the main food item with 47% and rosellas were the most frequently recorded bird in prey remains. Over the six years of monitoring, the proportion of pairs that have laid eggs in wet years is higher than in dry years. However, fledging success has been low in wet years due to chicks dying. This has probably been an effect of storms on chick mortality and prey provision by adults.

## **1. Introduction**

This is an update report on the monitoring of Little Eagles breeding in the Australian Capital Territory (ACT) and nearby New South Wales (NSW) in 2022, following five similar annual reports (Rae *et al.* 2018, 2019, 2020, 2021a, 2022). The study, by the Little Eagle Research Group, is ongoing and the aim of the project is to describe the long-term reproductive success, population dynamics, diet and movement ecology of the Little Eagle, a species listed as vulnerable in the Australian Capital Territory (ACT) and New South Wales (NSW).

This was the third consecutive wet year in the study area after three dry years in 2017-2019 (Bureau of Meteorology 2023a). The year was wet with warm nights, and a number of low pressure systems crossed the area between August and November which brought damaging winds, thunderstorms, and heavy rainfall (BOM 2023b). The Little Eagle breeding season in the ACT begins in late July - early August and the first fledglings leave the nest in late November or early December. This was also the third year of prolific vegetation growth. Grasses and herbs grew tall over a thick understorey of previous years' mass of old stalks and stems, and there was vigorous shrub growth. European Rabbits (*Oryctolagus cuniculus*) were again abundant (Rae *et al.* 2022 and pers. obs.).



The breeding success and feeding behaviour of Little Eagles in 2022 are here briefly compared with those found in this study over the previous five years, and possible reasons for any differences or similarities are discussed.

## 2. Methods

To maintain continuity, fieldwork on the Little Eagle research followed the same methods as those established in previous years' reports (Rae *et al.* 2018, 2019, 2020, 2021a, 2022). The main procedures were: checking for occupancy of all nests and territories known in previous years, watches for eagle activity from vantage points, following up any sightings of eagles for possible nesting behaviour, monitoring the progress of each breeding attempt, and collecting food remains and cast pellets from below nests and perches. Prey remains were identified from diagnostic body parts and the pellets were stored for later analysis (Rae *et al.* 2021b).

The movements of four birds were also recorded remotely from data downloaded from GPS-trackers that had been fitted in previous years. These data complemented the field observations.

All weather records are those recorded at the Canberra Airport by the Bureau of Meteorology.

## 3. Results

### 3.1. Number of Little Eagle pairs and breeding success

There were three confirmed nesting pairs recorded in the ACT in 2022 and one pair that were not confirmed to have nested, although their activity indicated that they might have nested at an unknown site. One bird, a single female that was fitted with a GPS tracker three years ago, continued to frequent the same areas as in previous years without a mate or nest. She did not have a partner in any of the three previous years. Another tracked bird, a male, was single. He had bred in the past three years, then in 2022 when he returned to his 2021 nest site from migration to the Northern Territory, his partner of 2021 was not observed there and the nest was being used by a neighbouring pair. The male moved between two other previously known nesting areas, presumably looking for a partner, although he remained single. In nearby NSW, four previously known nesting areas were occupied by pairs, although one pair were not proved to have a nest as access was restricted. The total number of known pairs of Little Eagles found in the ACT and nearby NSW in 2022 was eight, fewer than in previous years, 2017-2021: 11, 13, 13, 14, and 10, respectively.

Six pairs with nests were monitored in the ACT and nearby NSW and all laid eggs. One pair in the ACT lost their eggs in September at the time of a storm. Both of that pair were carrying GPS-trackers and they were recorded moving to a neighbouring nesting area where they subsequently laid another clutch. Chicks then hatched from all six known clutches. Three broods died when the chicks were downy, one in the ACT and two in NSW, and there were again storms at the time of each failure. The three chicks that fledged were all singles and the overall fledging success per confirmed breeding pair was 50%.

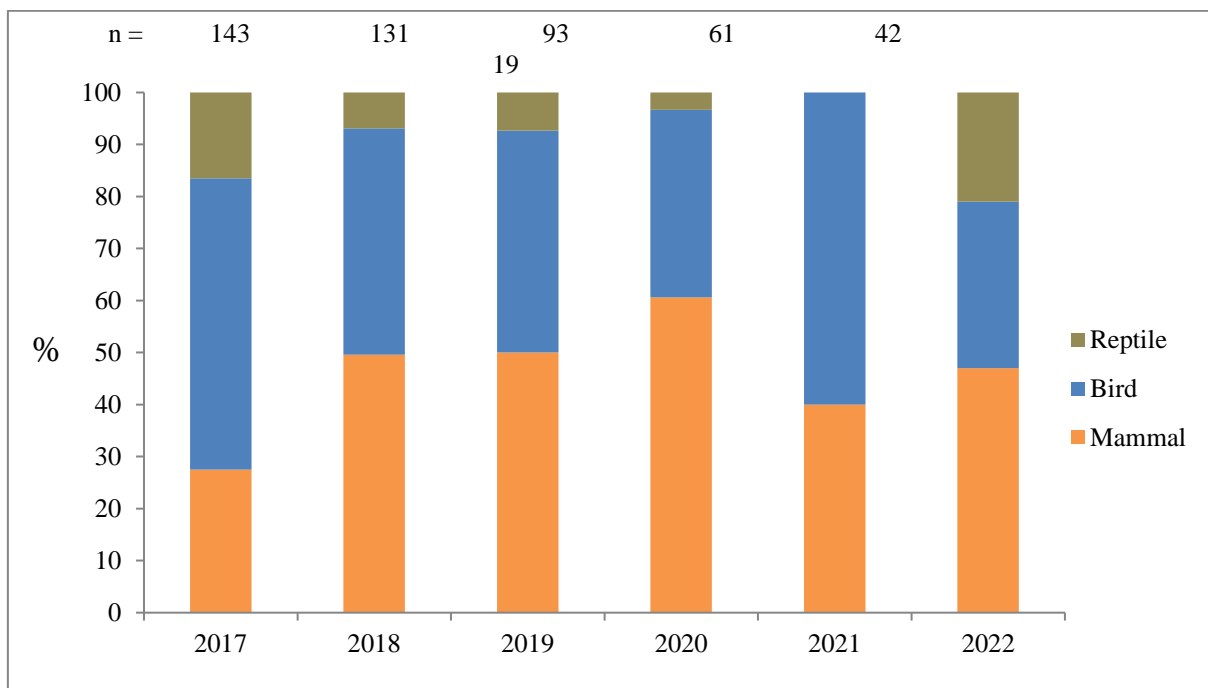
The nests were not monitored every day, so there were no accurate observation records of when the nesting attempts failed. However, the breeding attempt that failed on eggs was monitored remotely from data downloaded from the GPS-trackers fitted on both adults. These showed that the birds moved to their second nest site on 16 September, the first of

four days of gales with wind gusts every day over 50 km/h and up to 63 km/h, and 18.4 mm of rain (BOM 2022a). One nesting attempt that failed with downy chicks was last confirmed on 4 October and it had failed by the 15<sup>th</sup>. There had been 84.6 mm of rain over 5-9<sup>th</sup> with 35 mm on the 9<sup>th</sup>. Then there was a day of high winds gusting to 56 km/h and 12.8 mm of rain on the 14<sup>th</sup> (BOM 2022b). The two other nesting attempts failed in November when they held downy chicks. The chicks were last seen in the nests on the 10<sup>th</sup> and 11<sup>th</sup>. There were gale force winds on 12-15<sup>th</sup> with gusts from 50-65 km/h and 36.6 mm of rain, and another gale on 20-21<sup>st</sup> with winds gusting to 70 and 74 km/h (BOM 2022c).

In the previous years of study 2017-2021, the proportions of pairs that laid eggs were 73, 79, 77, 83 and 100%, hatching successes were 50, 73, 70, 100 and 88%, and the numbers of chicks fledged per pair were 0.36, 0.57, 0.46, 0.58, and 0.50. The first three years were classed as dry years and the latter three years as wet years (BOM), and there were significant differences in the laying and hatching successes between these conditions. Laying success was higher in the wet years, ANOVA:  $F = 9.30$ ,  $P = 0.039$ ,  $n = 3,3$ , and hatching success was also higher in the wet years, ANOVA:  $F = 8.71$ ,  $P = 0.042$ ,  $n = 3,3$ . There was no significant difference in the numbers of chicks fledged per pair between these periods, ANOVA:  $F = 0.91$ ,  $P = 0.393$ ,  $n = 3,3$ , in part due to failure to lay or hatch in dry years and to loss of chicks in wet years during periods of storms.

### 3.2. Diet

The remains of 19 food items and 26 pellets were collected. The number of food items found in 2022 was low compared with previous years 2017-2021: 110, 131, 96, 61, and 42, as was the number of pellets: 155, 326, 264, 128 and 49. These small items were difficult to find in tall vegetation that had grown over the past three years of high rainfall, compared with the relatively bare open ground where the remains were found in the dry years, 2017-2019. And there were fewer breeding attempts monitored in 2022 than in previous years.



**Figure 1. Proportions of food types in the diet of Little Eagles during the breeding seasons in the ACT and nearby NSW in 2017 - 2022.**

European Rabbits (*Oryctolagus cuniculus*) were the most common prey (9 items, 47%), followed by birds (6 items, 32%) and reptiles (4 items, 21%) (Fig. 1). Rabbits were the only mammal taken. The reptiles eaten were all Cunningham's Skink (*Tiliqua scincoides*) and all were found at the same nest site. One or both of the pair of eagles at that site might select to hunt for this species. Crimson Rosella (*Platycercus elegans*) was the most frequently taken bird (n = 3) and the other records were one each of Magpie-Lark (*Grallina cyanoleuca*), Noisy Friarbird (*Philemon corniculatus*), and Common Starling (*Sturnus vulgaris*). One of the rosellas, the Noisy Friarbird and the Common Starling were juveniles, therefore 50% of all bird remains found were of young naïve birds.

#### 4. Discussion

All monitored pairs of Little Eagles that were confirmed to have nests laid eggs and hatched chicks, which likely indicates ample food supply (Newton 1979). This was only the second year of the study when all known nesting pairs laid eggs, and one pair laid a replacement clutch after losing their first. Although fledging success was not so high, loss of eggs and chicks was again the main probable cause of breeding failure, as in previous wet years. There were frequent storms in August, September, October and November (BOM 2023b), and as previously discussed (Rae *et al.* 2022). Such storms could have caused the death of chicks from hypothermia or starvation, or reduced prey delivery to nestlings, as found with European Sparrowhawk (*Accipiter nisus*) (Newton 1986, Olsen and Olsen 1989, McDonald *et al.* 2004). Probable death of nestlings due to heavy rain has been recorded on camera for Rough-legged Buzzard (*Buteo lagopus*) (Pokrovsky *et al.* 2012). And in a study of Peregrine (*Falco peregrinus*) breeding success, the overall prey delivery was related to the frequency of wet weather rather than prey density (Robinson *et al.* 2017).

The accessibility of prey in 2022 and other wet years might have been restricted by vegetation growth and could possibly have caused a reduction in the number of pairs of breeding Little Eagles. Even if there were abundant prey such as rabbits, the main prey, accessibility to rabbits could be more important than their absolute abundance, as for the Bonelli's Eagle (*Hieraetus fasciatus*) for which rabbit is the main prey (Ontiveros *et al.* 2005). For Swainson's Hawk (*Buteo swainsoni*), a negative correlation between estimates of plant cover and foraging suggested that habitat differences such as vegetative cover were of greater importance than prey density in the selection of hunting sites (Bechard 1982). And Collopy and Bildstein (1987) reported that the hunting success and general distribution of Northern Harriers was lower in an area with dense vegetation than in an area with sparse vegetation.

The abundance and accessibility of prey was discussed in the previous report on Little Eagle breeding success in 2021, a wet year with prolific plant growth (Rae *et al.* 2022), and similar conditions prevailed in 2022. The tall plant growth probably created a formidable barrier to hunting eagles in 2021 and 2022, leading to fewer grassland animals such as rabbits being caught or accessible. So far, this study has data from six years, three dry years and three wet years. It seems that the eagles that did nest had access to enough prey to lay eggs, but inclement weather likely caused breeding failure.

The differences between years in the occupancy of nesting areas and productivity of Little Eagles illustrate the value of long-term study of the species' population ecology. As with the other five annual reports, this report summarises the season's results and any emerging



trends to date. Eventual full analysis of the data will provide a more robust assessment of dynamics, breeding, feeding, movement ecology of the local population and how they are affected by weather and other factors.

### Acknowledgements

We acknowledge the Ngunnawal People as the Traditional Custodians of the land on which this study is undertaken and pay our respects to Elders past, present and future. We are grateful to landowners and managers who allowed access to nest sites and hunting areas. This study was part of a wider study by the Little Eagle Research Group. Diana Tracy gave helpful comments on the draft.

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## **PIED BUTCHERBIRD (*CRACTICUS NIGROGULARIS*) IN THE ACT - ONCE A RARE VAGRANT, NOW A BREEDING RESIDENT**

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**Abstract:** *Pied Butcherbird* would seem to have been unknown in the Australian Capital Territory (ACT) until the first well documented sighting in 1988 at Mulligans Flat in the north of the ACT, with a further sighting in the same place in 1989. In 1992 the seminal ACT Atlas designated the species as a “very rare vagrant”, but with more sightings to 2013 it was recognised by the Canberra Ornithologists Group (COG) as a “rare non-breeding visitor”. In 2016 its status was updated by COG to “uncommon breeding visitor”. eBird data suggests that it was resident in the ACT from 2017 and possibly earlier. To December 2022, *Pied Butcherbird* has been reported at a cumulative total of 85 locations in the ACT, with breeding reported at eight of those locations. This paper describes the spread of the species in the ACT and its breeding efforts from 1988 to 2022.

### **1. Introduction**

The number of sightings of *Pied Butcherbird* increased from two in 1988 to 57 in calendar year 2022. Overall, the species was reported exactly 700 times during that period, with 70% (495) of those observations made between Jan 2018 and Dec 2022. However, the number of observations is not especially enlightening, since it also reflects greater observer effort following the strong take-up of eBird in the ACT. Instead, this article will focus on the increase in the number of locations where the species has been reported and on the widening geographic spread of these locations across the ACT. The article will also provide information on the breeding activity of *Pied Butcherbird* in the ACT.

eBird was the primary data source, supplemented by Canberra Ornithologists Group (COG) data reported in the *Canberra Bird Notes: Annual Bird Reports (ABR)* series. Unless otherwise cited, data were sourced from eBird.

### **2. Description**

The *Pied Butcherbird* is a robustly built black and white bird, somewhat larger than its relative the *Grey Butcherbird* (*Pied Butcherbird* 32-36 cm. *Grey Butcherbird* 24-30 cm) (Menkhorst 2017). In the field, the most readily seen feature is the black head and breast of the adult bird, sometimes described by birders as a ‘hangman’s hood’. The nape is white, further enhancing the hood effect (Fig 1). The sexes are difficult to distinguish in the field.

Immatures have the same plumage pattern as adults, but in light brown and white rather than black and white - except for the primaries, secondaries and wing coverts, which are a dusky black with white wing bars. The immatures also have a light brown nape rather than the white nape of the adult (Fig 2).

Juvenile *Pieds* are similar to immatures, but can be distinguished by their plain grey-brown bill and yellow gape (Fig 3).





**Figure 1. Adult birds. Left: Uriarra East Sep 2020 (S. Jarzynski). Centre: Hall Cemetery Oct 2020 (C. Bear). Right: Uriarra East Oct 2021 (C. Darwood).**



**Figure 2. Immature, with black-tipped pale bill. Sherwood Forest. 29 Sep 2020 (C. Darwood).**



**Figure 3. Juvenile, with yellow gape and plain grey-brown bill. Hall Cemetery ACT. 27 Oct 2020 (C. Bear).**

### 3. Distribution and habitat

Pied Butcherbird occurs across much of the Australian mainland but not in the driest deserts, south-west Western Australia or the south coast of NSW. The ACT is at the south-eastern edge of its historical range (Higgins *et al.* 2006, p. 518).

The species' preferred habitat is open eucalypt woodland, but it also favours farmland with remnant patches of native trees. In the ACT, Pied Butcherbirds have been reported in woodland Nature Reserves (NRs), on grazing land and on peri-urban land such as Horse Paddocks, parks and even playing fields.

### 4. When did Pied Butcherbird appear in the ACT and where has it been seen over time?

Logically, the species would seem to have moved into the ACT from the north and west of NSW, where it is common in suitable habitat. In the 1980s, the nearest regular records of the species were 100 km away at Boorowa, north-west of the ACT (J. Holland quoted in *Atlas* 1992, p. 204). The species was first reported in COG's Area of Interest (AoI) in 1990, but was likely present or visiting before then. Given the relative scarcity of birders in the AoI, this cannot be known.

The first well documented report of Pied Butcherbird in the ACT was at Mulligans Flat in 1988 (*ABR* 1989). For the next 24 years until Oct 2012, the species was reported at just seven more locations, nearly all represented by one record each. In seven of the years between 1988 and 2012 there were no reports at all (2002-6, 2008-09). After 2012, the number of locations for Pied Butcherbird increased markedly. To Dec 2022, the species has been reported at a cumulative total of 85 locations in the ACT. This is summarised in five-year periods in Table 1.

**Table 1. Growth in locations of Pied Butcherbird observations**

Years*	No. of locations where reported	Comments
Pre 2001	2	Mulligans Flat Feb 1988, Mar 1989 (both J. Bounds and B. Lepschi, <i>ABR</i> ). Scullin Apr 1996 (D. Landon, <i>ABR</i> ). Mulligans Flat Mar 2000 (J. Bounds, <i>ABR</i> )  First NSW AoI sighting Brooks Hills Reserve near Queanbeyan 1990 (R. Rehwinkel). Further AoI sightings to 2001 including Murrumbateman, Sutton, Gunning, Jerrawa (multiple observers, <i>ABR</i> )
2001-07	3	Mulligans Flat Aug 2001 (M. & C. Gilfedder). Tharwa Jul 2003 (S. Wilson, <i>ABR</i> ). Cooleman Ridge Apr 2007 (A. Smith).  Also, NSW AoI at Wamboin Oct 2006 (M. Lenz, <i>ABR</i> )
2008-12	3	Narrabundah Hill Feb 2010 (J. Casburn), Strathnairn Gallery Sep 2011 (J. Layton) and Goorooyaroo NR Oct 2012 (S. Holliday).  Also, NSW AoI at Wamboin Jan 2011 (D. McDonald).
2013-17	25	Multiple locations and records in the north and west of the ACT. First southern ACT locations: Birrigai at Tidbinbilla NR Jan 2013, Point Hut Sep 2013, and Boboyan Homestead in Namadgi NP Sep 2017.  Plus multiple locations in NSW AoI. First AoI breeding record Brooklands Rd Wallaroo Jul 2014 (S. Harris, <i>ABR</i> )
2018-22	67	Further locations in the north and west of the ACT and a further spread southwards. The most southerly ACT record Mt Clear Campground Oct 2021.  Also, multiple locations in NSW AoI, mainly north and west but also at five easterly locations including Bungendore area, Hoskinstown and the eastern edge of Lake George. To the south, a 2019 record at Michelago (S. Lauer, <i>Canberra Nature Map</i> ).
*Calendar years		

### 5. Pied Butcherbird breeding in the ACT

The breeding period of Pied Butcherbird throughout its Australian range is July to January, with eggs being laid July to December (but mainly September and October). Both sexes build the nest and feed the young. The incubation period is 19-20 days and the fledging period variously reported from 25 to 33 days (Higgins *et al.* pp. 521, 524).

Higgins *et al* also reported that the species is largely sedentary, occupying a territory year-round (p. 519). In northern Australia at least, the young stay with their parents for around 15 months until the start of, or even into the next breeding season (pp. 521, 524). Given their sedentary nature, it is therefore reasonable to assume that observations of adults with immatures in the ACT show that local breeding is occurring. Even if the presence of immatures is not considered to prove local breeding, then records of juveniles and nests occupied by chicks certainly should. Multiple local observations of immatures with adults,

of juveniles and of a nest with chicks show that breeding is occurring successfully in the ACT.

The first breeding record was in Apr 2016 at Miowera Pines Rd near Point Hut. The observer (Neumann, 2016) noted two juveniles and two adults). The next, including a photograph of a juvenile, was in Jan 2017 at Uriarra East/Stony Creek NR (S. Westin).

Nest-building, egg-incubation and feeding of nestlings and fledglings was followed (and photographed) by multiple birders at Uriarra East/Stony Creek NR from Aug to Oct 2020 (Figs 4, 5).

Unfortunately, few local eBirders add breeding codes to their records. Most of the evidence of local breeding was found by the author in photos uploaded to eBird Checklists.

Table 2 summarises breeding records at eight locations in the ACT.



**Figure 4. Nest under construction. Photos of adults carrying sticks, and adults on the nest were also taken. Stony Creek NR, 18 Aug 2020 (J. Hurrell).**

**Figure 5. The same nest, with four chicks being fed. Stony Creek NR, 25 Oct 2020 (J. Hurrell).**

**Table 2. ACT breeding records for Pied Butcherbird to Dec 2022.**

Breeding location	Months and years	Comment
Miowera Pines Rd near Point Hut	Apr 2016	Juveniles and adults
Uriarra Woodland	Aug, Oct-Nov 2016. Nov 2020	Immatures and adults
Uriarra East/Stony Creek NR*	Jan 2017. Feb & Sep 2018. Nov 2018. Feb-Apr & Oct-Dec 2019. Jan, Aug-Oct 2020. Jan-Feb 2021	Nestlings (Fig 5), juveniles. Immatures, adults
Bibaringa	Sep 2018	Immatures with adults
Hall Cemetery	Jan 2020	Juvenile (shown at Fig 3).
Mountain Creek Rd dam	Apr, Jun 2020, Feb 2022	Immatures and adults
Sherwood Forest	May 2020. Sep 2020	Juvenile, immatures, adults
Kama Nature Reserve	Jan 2022	Immature

\*These two locations share a boundary, with Butcherbirds seen to fly between the two sites. As there appears to be some inconsistency in the assigning of location for some sightings, the two locations have been combined in this table.



## 6. Now reported throughout the year in the ACT

The most recent *ABR* (2018/19) continued to give Pied Butcherbird the status of “visitor” to the ACT. However, the species was reported in the ACT in seven and eight months of the year in 2015 and 2016 respectively, in ten months in 2017 and every month of the year from 2018 to Dec 2022. This suggests that the species has been resident since perhaps 2017.

The locations where Pied Butcherbird is most often reported, all of which are along the Murrumbidgee River valley, have provided sightings in all or most months of the year (Table 3). Interestingly, Table 3 also hints at the timing of the expansion of the species between 2013 and 2022, in the Uriarra area in particular.

**Table 3. Top locations and years and months reported**

Location	Years reported	Months reported	No of records
Uriarra Village	2013-15*	Jan-Mar & Oct-Dec	27
Stony Creek NR	2015-22	All months	133
Uriarra East Reserve	2015-22	All months	112
Uriarra Woodland	2015-21	All months except Mar-May	36
Kama NR	2017-22	All months except March	39
Sherwood Forest	2020-22	All months except Jan & Mar	73
* Reported again in Jan 2020 and Jul 2021			

## 7. Conclusion

With only three sightings in the ACT to 1989, and the status of ‘rare vagrant’ in 1992 (*Atlas* p. 204), Pied Butcherbird was increasingly reported after 2010 and is breeding and resident.

It will be interesting to see how the future develops for Pied Butcherbird in the ACT and surrounding AoI. Will the species continue to spread to more locations in the ACT, consolidate its presence in the areas it currently occupies, or decline in the future? Will it continue to breed, breed in more locations or will breeding decline? And what of its future to the south of the ACT in NSW? Will the Pied Butcherbird continue to move southwards or will it be halted by geographic, climatic or other factors?

Whatever its future in our area, the rise of Pied Butcherbird in the ACT has occurred in just a few decades and has been reported with great interest by our local birders, and eBirders in particular.

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## DIET OF SUBURBAN LAUGHING KOOKABURRA (*DACELO NOVAEGUINEAE*) NESTLINGS

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**Abstract:** *Laughing Kookaburra populations in the ACT are in steady decline. In urban Belconnen, where the decline in kookaburra breeding success since the 1990s is associated with reduced availability of reliable nesting hollows, provision of a single additional nesting opportunity – a nestbox – can significantly increase the success of a breeding pair. However, factors other than nest-site availability may contribute to the decline at the population level. Habitat change caused by urbanisation may contribute to decreased availability of natural food leading to decreased body condition and survival of nestlings, and may contribute to juvenile mortality and failure to recruit successfully into the breeding population. Using a movement-detecting camera mounted inside a suburban nestbox, I obtained a continuous record of prey delivered to the nestlings from hatching to fledging. I found that the parents provisioned a highly diverse range of invertebrate and vertebrate prey, consistent with the findings of other studies in natural, peri-urban and suburban habitats, indicating that their suburban territory contained a wide range of different micro-habitats in which they were able to hunt successfully. The biomass of prey delivered by the parents appeared to keep pace with changes in the growing nestlings' energy requirements, and the proportion of large vertebrate prey, such as snakes, legless lizards, fish, rats and mice, may have offset some of the negative effects of sibling competition for food, thus ensuring that both of the nestlings received adequate nutrition. Conversely, the high proportion of rodents among the vertebrate prey, at a time when local suburban rodent populations were at pest levels, suggests that some of the rodent prey may have been affected by toxic levels of second-generation anti-coagulant rodenticides, the most readily available rodenticides in Canberra. Residues of second-generation anti-coagulant rodenticides are known to persist in the tissues of carnivorous birds in the ACT, suggesting that more consideration should be given to their possible role in the steady decline of the ACT's Laughing Kookaburra population.*

### 1. Introduction

The Laughing Kookaburra (*Dacelo novaeguineae*) is able to occupy a range of human-modified habitats, including suburbia, although its success there may be limited by the availability of suitable, reliable nesting hollows (Legge 2004).

King *et al.* (2021) documented declining kookaburra breeding success, associated with declining availability of suitable nest sites, in suburban Belconnen. They studied a pair of kookaburras that held a territory in their north-western Belconnen study area, despite a lack of reliable nest sites. The pair regularly attempted to breed there, succeeding only once in the first six years of a seven-year study. King *et al.* (2021) reasoned that, assuming other attributes of the site were suitable for sustaining a kookaburra population, increasing the availability of suitable nesting opportunities would increase the kookaburras' breeding success. They commenced a trial of a dedicated nestbox in a private garden in the core of the kookaburras' territory. Subsequently, the kookaburras have bred successfully in each of

three consecutive breeding seasons – producing a total of five fledglings (King *et al.* 2021; King *et al.* in prep.).

The nestbox trial has provided opportunities to examine ecological attributes of the kookaburras' territory, other than nest-site availability, that might also affect breeding success. In particular, it provides an opportunity to test the assumption that food availability is not a limiting factor there.

Habitat change caused by urbanisation, such as increased areas of impermeable surfaces, decreased native vegetation cover and introduction of exotics, may contribute to decreased availability of natural food, leading to decreased body condition and survival of nestlings (Serres and Liker 2015). The adequacy of food provisioning during the nestling period may also affect the fate of chicks long after fledging. Studies of more than 130 kookaburra nests in Canberra Nature Park during the 1990s found that underweight kookaburra fledglings were less likely to survive as juveniles or to recruit successfully into the breeding population (Legge 2002).

Kookaburras are generalist hunters of animals living on or near the ground. They will eat anything that they can overpower and are able to swallow whole. Previous studies report that arthropods (insects, spiders, millipedes) and small reptiles (mainly skinks) make up the vast majority of the diet, with other types of prey such as annelids (worms), molluscs (snails), crustaceans (crabs and crayfish), frogs and fish included where habitat is suitable, while adult and nestling birds, small mammals and snakes are rarely included in the diet (Parry 1970; Legge 2004). The relative proportions of the different types of prey in the diet reflect the frequency with which those items occur in the kookaburra's territory (Legge 2004).

I hypothesised that the range and quantity of prey fed to the nestlings in the trial nestbox would provide a useful measure of hunting-habitat richness and productivity in the suburban environment of the kookaburras' territory.

## **2. Record of activity in a kookaburra nest**

In the 2022-23 breeding season, I monitored and recorded activity inside a dedicated kookaburra nestbox located in a private garden on the edge of the Ginninderra Creek corridor in Evatt, ACT (described by King *et al.* 2021). With urbanisation of the area in the early 1970s, a broad corridor (average width 340 m) of the floodplain and adjacent lower slopes surrounding Ginninderra Creek was reserved as Urban Open Space, and extensively planted with native trees and shrubs. This corridor is now the primary habitat of a suburban breeding pair of kookaburras (King *et al.* 2021).

Previous observations of wild kookaburra nestlings have collected data by direct observation or by camera recordings in discrete samples of up to 3 hours duration. Each sample has been collected by climbing selected nest trees at intervals through the nestling period (*e.g.* Nathan *et al.* 2001; Legge 2002).

In the present study I aimed to collect a continuous record of activity in the nest throughout the breeding season; from nest inspection to laying, incubation and hatching of eggs, brooding and feeding of nestlings, and departure of fledglings. From 29 Jul 2022 (initial nest-site inspections by kookaburras) until the departure of fledglings on 21 Jan 2023, all



activity inside the nestbox was monitored and recorded by a movement-detecting camera (Reolink Go Plus).

The camera was mounted inside the box in a fixed position, focusing on the brood area at the rear of the box. In this position it was able to monitor all of the interior, except for the entrance opening and an area spanning about one-half of a kookaburra body-length inside the entrance. Continuous power was provided to the camera by an external powerbank (20,000mAh), which was accessible from the ground, and was swapped as necessary to maintain the camera's internal battery (7,800mAh) at full charge.

At each detection of movement inside the nestbox, the camera recorded a brief video file (duration  $21.6 \pm 11.6$  sec (mean  $\pm$  sd)) which was written to an internal memory card. Communication with the camera, including real-time monitoring, downloading of data, and adjustment of settings, was undertaken remotely via the 4G cellular network.

In the 2022-23 season, the kookaburras produced two clutches, each of three eggs, between 4 Oct 2022 (laying of first egg) and 21 Jan 2023 (departure of fledglings). The first clutch was lost to a combination of egg predation, nestling predation and hypothermia (King *et al.* in prep.). The second clutch (first egg laid on 20 Nov 2022), which resulted in two successful fledglings, is the subject of this paper.

### 3. Record of prey delivered to the nestlings

In the period from 16 Dec 2022 (first hatching) to 21 Jan 2023 (fledging), the movement-detecting camera recorded 17,742 events inside the nestbox; 1,134 events involved the delivery of prey items to the nestlings (Table 1).

**Table 1. Prey items delivered to kookaburra nestlings from 16 Dec 2022 (hatching of first nestling) to 21 Jan 2023 (departure of fledglings).**

Prey items	Daily mean $\pm$ sd	Daily minimum	Daily maximum	Total (36 days)	% all prey
Vertebrates	$6.25 \pm 4.77$	0	15	225	19.8
Other	$25.22 \pm 11.97$	3	52	909	80.2
All prey	$31.47 \pm 14.79$	5	67	1134	100

Nestling feeding began immediately after the first chick hatched. For the first few days after hatching, the nestlings required almost continuous brooding. During this period, the nestlings were typically fully concealed beneath the brooding parent when the other parent arrived with prey. The arriving parent would announce its arrival with a continuous guttural chuckle, which encouraged the nestlings to extend their heads from beneath the brooding parent's feathers, and to beg vigorously until the prey was transferred to one of them. Occasionally, the prey was passed to the brooding parent who fed it to a begging chick (Plate 1A).

Kookaburra nestlings are fiercely competitive; the youngest nestling is often killed by its siblings or dies from starvation as a result of being out-competed for food (Nathan *et al.* 2001; Legge 2002). In the present study, the second-hatched chick died of hypothermia on

day 1, when accidentally separated from the rest of the brood overnight. Fighting between the remaining siblings began on day 2, and the first-hatched chick established its dominance immediately. The incidence of fights decreased after day 4, but the dominance hierarchy persisted. When prey was offered, the subordinate chick typically gave way if the dominant chick was actively begging, and fed only after the dominant chick was satiated. If the prey was large (e.g. legless lizard, snake, fish, mammal – see below), a single feed was often sufficient to satiate the dominant chick, who would not beg again for an hour or more, thus allowing the subordinate chick to feed. On days when several large prey items were delivered, both nestlings apparently reached satiation, and sometimes both refused prey and continued to doze when visited by a parent.



**Plate 1. (A) Adult male kookaburra, while brooding 4 day-old nestlings, feeds one with a skink brought to the nest by the adult female; (B) Male kookaburra delivering a skink to 23 day-old nestlings; (C) 23 day-old kookaburra nestling swallowing a juvenile Olive Legless-lizard (*Delma inornata*); (D) 24 day-old kookaburra nestling swallowing a juvenile Eastern Brown Snake (*Pseudonaja textilis*).**

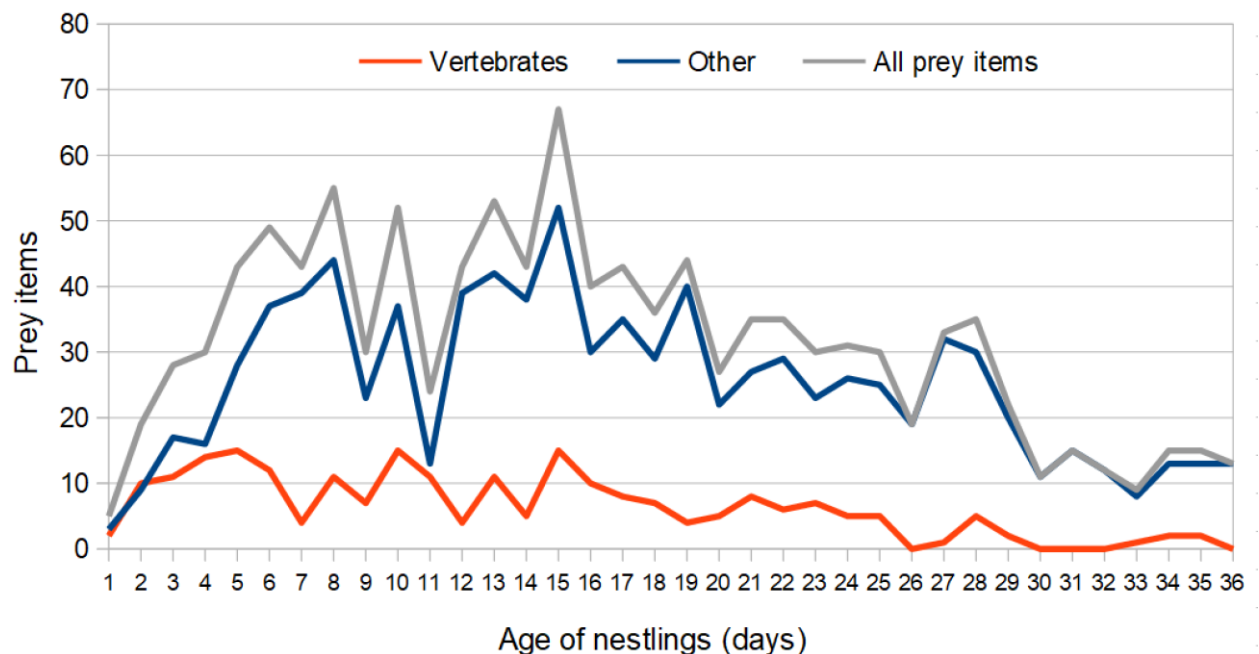
Identification of prey was limited by several factors.

The kookaburra's habit of 'tenderising' its prey by bashing or rubbing it against a branch damaged many small, soft-bodied or fragile items beyond recognition. This applied particularly to invertebrate prey items, the majority of which could not be identified reliably. Many other items were obscured, were delivered and/or swallowed too quickly, or were too small for identification. Taking account of these limitations, I divided the prey data into two

categories: ‘Vertebrates’ and ‘Other’, where ‘Other’ includes all invertebrate prey and all unidentifiable prey items.

Vertebrate prey items were more readily identified, and they are discussed in detail below.

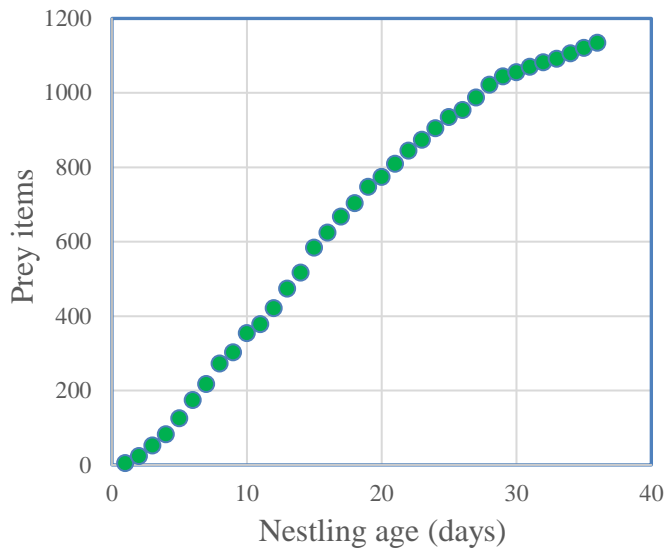
Over the course of the 36-day nestling period, the adults delivered 225 Vertebrate items and 909 Other items to the nestlings (Table 1). Prey was delivered throughout the day, beginning typically before sunrise (median 22.7 minutes; maximum 40.6 minutes), and continuing until after sunset (median 3.3 minutes; maximum 35.6 minutes). The rate at which prey items were delivered increased steadily over the first week after hatching, remained generally high until day 28, and declined over the final nestling week (Fig 1).



**Figure 1. Vertebrate and Other prey items in the diet of kookaburra nestlings on each day of the nestling period, 16 Dec 2022 – 21 Jan 2023.**

Evidence from other studies (Legge 2004) supports a conclusion that the observed changes in the rate of prey delivery over time were not indications of changes in availability or in the parents’ hunting success, but rather of changes in the energy demands of the growing chicks. Plotting the cumulative number of prey items delivered over the 36-day nestling period (Fig 2) produces an ‘S-shaped’ pattern that is a remarkably close match for Legge’s (2004) growth-rate data from 200 nestlings in which growth began slowly until day 5 and continued at a steady rate until about day 25, before slowing down again in the final days before fledging (see Fig 5.1 of Legge 2004).

Most prey items were delivered by the male parent (Table 2). Legge (2000 and 2004) also found, in a sample of more than 130 kookaburra nests in woodland around Canberra, that males delivered the most food. Noting that female kookaburras are 13% larger than males, and assuming that provisioning of young is generally costly, Legge (2004) reasoned that a female kookaburra must eat a greater amount of food during the day in order to maintain her own body condition, thereby reducing the proportion of her prey that she contributes to the young.



**Figure 2. Cumulative total of prey items delivered to kookaburra nestlings on each day of the nestling period, 16 Dec 2022 – 21 Jan 2023.**

In the present study, the female had already invested a great deal of energy in breeding activity even before the nestling period began, including the season’s first clutch, which was lost within days of hatching, and her further investment in the production of the second, successful clutch discussed here.

the next 15 nights. She typically arrived well before sunset, and remained with the nestlings until relieved by the male after sunrise the following morning.

The time available to the female for hunting was also limited by her commitment to incubation of the eggs and brooding and guarding of the nestlings. The female undertook 67% of incubation, and roosted with the nestlings for 23 nights – brooding continuously for the first 8 nights, and intermittently for

**Table 2. Daily rate of prey delivery by kookaburra parents to nestlings.**

Parent	Prey items per day		t *	df	P
	mean	sd			
Female	10.2	7.8	-4.69	35	<0.0001
Male	15.5	12.0			

\* Paired-samples t-test (Lowry 2023)

Alternatively, differences in hunting strategies may account for some of the difference between female and male rates of provisioning. For example, reptiles accounted for almost all of the difference in the provision of vertebrate prey items (Table 3), suggesting that the male may have hunted in different locations, or used different hunting techniques from those of the female. Further research would be required to test this alternative.



#### 4. Invertebrate prey

Factors limiting the identification of small, fragile prey items, discussed above, prevented a detailed analysis of the invertebrate component of the nestlings' diet. Even so, it appeared that the majority of prey items in the 'Other' category were invertebrates, and the diversity of those that were identifiable was consistent with observations from other studies in natural, peri-urban and suburban habitats (Parry 1970; Legge 2004; O'Connor 2005; King et al. 2021).

Identifiable invertebrate prey items included:

- earthworms
- snails
- slugs
- millipedes
- centipedes
- moths
- butterflies
- cockroaches
- beetles
- larvae (moth and beetle)
- cicadas
- spiders
- yabbies

The litter on the nestbox floor quickly accumulated a festering mess of discarded prey fragments, faecal matter and pellets of undigested material regurgitated by the nestlings and by the adult female during her overnight brooding sessions. Throughout the nestling period, the litter supported a heaving population of fly and beetle larvae feeding on this waste material (*cf* Legge 2004). Interestingly, the nestlings made very few attempts to capture this conspicuous potential prey. The adult female occasionally ate some, but was never seen to offer any to the nestlings.

#### 5. Vertebrate prey

Vertebrate prey comprised almost 20% of all prey items (Table 1). In other studies, the proportion of vertebrates in the kookaburra diet ranged from 10% (O'Connor 2005) to 35% (Parry 1970).

It is likely that the number of Vertebrate prey items was underestimated. Some very small vertebrates, and others, whose identifying characteristics had been lost due to damage, may have been classified as 'Other'. Alternatively, the proportion of vertebrate items recorded in the study may simply reflect the frequency with which those items occurred within the kookaburras' territory (Legge 2004).

Some vertebrate prey items were delivered on all but five days of the 36-day nestling period (Fig 1).

**Table 3. Number of Vertebrate prey by class delivered to kookaburra nestlings by female and male parents, 16 Dec 2022 – 21 Jan 2023.**

Parent	Vertebrate prey					
	Mammal	Bird	Reptile	Amphibian	Fish	Total
Female	14	0	51	2	6	73
Male	15	1	112	2	3	133
Unidentified	8	0	10	0	1	19
<b>Total</b>	37	1	173	4	10	225
<b>% total</b>	16.5	0.4	76.9	1.8	4.4	100

**Table 4. Vertebrate prey items in the diet of kookaburra nestlings, 16 Dec 2022 – 21 Jan 2023**

(identified to the lowest taxonomic level possible from video records)

Prey item	Number	%
<b>Rat</b> ( <i>Rattus rattus</i> )	6	2.68
<b>Mouse</b> ( <i>Mus musculus</i> )	31	13.78
<b>Bird</b> *	1	0.44
<b>Skink</b>	150	66.67
<b>Legless lizard</b> **	14	6.22
<b>Snake</b> ***	9	4.00
<b>Frog</b> ****	4	1.78
<b>Weatherloach</b> ( <i>Misgurnus anguillicaudatus</i> )	7	3.11
<b>Goldfish</b> ( <i>Carassius auratus</i> )	3	1.33
<b>Total</b>	225	100

\* single specimen tentatively identified as juvenile Dusky Moorhen (*Gallinula tenebrosa*)\*\* some specimens were identifiable as juvenile Olive Legless-lizard (*Delma inornata*)\*\*\* some specimens were identifiable as juvenile Eastern Brown Snake (*Pseudonaja textilis*)\*\*\*\* one specimen identified as Spotted Grass Frog (*Limnodynastes tasmaniensis*)

### 5.1. Reptiles

Consistent with the findings of other studies (Parry 1970; Legge 2004), reptiles comprised the majority (76.9%) of Vertebrate prey items in the nestlings' diet (Table 3).

#### Skinks

The clear majority of identifiable reptile prey items were skinks – two thirds of all vertebrate prey (Table 4). Skinks are common in the gardens and Urban Open Space immediately surrounding the nestbox, probably making them important in the hunting-energy budgets of the parent kookaburras. Skinks were often among the first prey items delivered in the morning and the last delivered at night. Most skinks were small to medium-sized specimens - up to 50 mm estimated snout-to-vent length (*cf* Blomberg and Shine (2000)), consistent with several small slender species in the subfamilies Eugongylineae and Sphenomorphinae, both of which are represented in the study area and elsewhere in the Ginninderra Creek corridor (Canberra Nature Map 2023a). The few larger, more robust specimens, while not definitively identifiable due to damage, may have been juvenile Blue-tongues (*Tiliqua* sp.).

A breeding population of Eastern Blue-tongues (*Tiliqua scincoides*) is established nearby (J. Arblaster 2023 pers. comm.). Kookaburras have been reported as preying on juvenile blue-tongues in suburban habitat elsewhere (O'Connor 2005).

It is likely that the number of skinks among the prey was underestimated. Few specimens were intact; most had been damaged by being tenderised by the adults before delivery (e.g. Plate 1B). It is likely that a significant number had been damaged beyond recognition and may have been assigned to the 'Other' category.

#### Legless lizards

The nestlings' diet included a remarkable number of legless lizards (Table 4); likely the Olive Legless-lizard (*Delma inornata*) which is widely distributed in Australia (ALA 2023) and is commonly recorded in suitable habitat in Canberra, unlike the Vulnerable-listed Striped Legless-lizard (*D. impar*), which is known only from a few isolated locations beyond the kookaburras' territory (ACT Government 2020; Canberra Nature Map 2023b; W. Osborne 2023 pers. comm.). Legless lizards are occasionally glimpsed in garden beds nearby the nestbox (J. Arblaster 2023 pers. comm.), but have not been identified to species. All legless lizards in the nestlings' diet appeared to be juveniles or sub-adults.

Legless lizards were among the most difficult prey for the nestlings to manage. Despite being thoroughly bashed by the adult kookaburras before being offered to the nestlings, most specimens remained highly animated, and vigorously resisted being swallowed by coiling their long tails around the head, neck and body of the nestling (Plate 1C). An adult legless lizard (*D. impar*) is said to have disabled a hunting Nankeen Kestrel (*Falco cenchroides*) in this way (W. Osborne 2023 pers. comm.).

#### Snakes

The long-held popular reputation of kookaburras as snake-killers overestimates the significance of snakes in their diet (Legge 2004). In the present study, juvenile snakes accounted for 4% of all vertebrate items in the nestlings' diet (Table 4). Not all specimens were identifiable to species, but four had head and body markings typical of juvenile Eastern Brown Snakes (*Pseudonaja textilis*) from the Canberra area (Canberra Nature Map 2023c; W. Osborne 2023 pers. comm.). It is not uncommon to see adult Eastern Brown Snakes in suburban parts of the kookaburras' territory (e.g. Canberra Nature Map 2015; Canberra Nature Map 2019).

As with other large prey (see also Mammals below), the capture of a snake was cause for great excitement. The adult kookaburras typically accompanied the tenderising of a captured snake and its delivery to the nestlings with continuous loud chuckling.

Juvenile snakes, while generally larger than legless lizards, were considerably more easily managed by the nestlings (Plate 1D). After being tenderised by an adult kookaburra, snakes were typically limp, in contrast to the vigorous writhing and thrashing of legless lizards, and put up little resistance to being swallowed.

## 5.2. Frogs and fish

The inclusion of four frogs and ten fish among the vertebrate prey (Table 3; Table 4), and the identification of ten Common Yabbies (*Cherax destructor*) among the invertebrate prey items (see Invertebrate prey above), is a reminder that the Laughing Kookaburra is the largest of the world's kingfishers, and is adapted for hunting in aquatic habitats (Higgins 1999). The kookaburras' territory contains a range of such habitats, including a 3 km stretch of Ginninderra Creek, and 14,300 m<sup>2</sup> of permanent ponds and ephemeral wetlands associated with water-quality management infrastructure (King *et al.* 2021). I have previously observed kookaburras attacking prey (presumably fish) at the surface of ponds in Ginninderra Creek by plunging from their perches in the overhanging branches of riparian exotic trees (eBird 2014; eBird 2015).

Of the four prey items identifiable as frogs, one specimen appeared to be a Spotted Grass Frog (*Limnodynastes tasmaniensis*); the others could not be identified. At least six species of frogs were present in the kookaburras' territory during the 2022-23 breeding season (Ginninderra Catchment Group 2022).



**Plate 2. (A) 20 day-old kookaburra nestling receiving a Goldfish (*Carassius auratus*) from adult female; (B) 34 day-old kookaburra nestling swallowing an Oriental Weatherloach (*Misgurnus anguillicaudatus*).**

The fish prey included three Goldfish (*Carassius auratus*) (Table 4; Plate 2A). Feral populations of goldfish are established in the ACT (ALA 2019), and mature wild-type goldfish have been recorded recently in Ginninderra Creek (Canberra Nature Map 2022a). Assuming they are breeding nearby, the small specimens caught by the kookaburras could be from a feral population. More likely, they were ornamental goldfish taken from a domestic garden pond somewhere in nearby suburbia.

Other fish were seven Oriental Weatherloaches (*Misgurnus anguillicaudatus*) (Table 4; Plate 2B). Feral weatherloach populations are well established in the ACT (ALA 2019). The species is established and breeding in Ginninderra Creek within the kookaburras' territory (ALA 2019; FeralFishScan 2023), and in nearby water-quality control wetlands (eBird 2021).



### 5.3. Birds

Birds are rare prey of kookaburras (Parry 1970; Legge 2004).

A single bird specimen was identified (Table 4). It was a uniformly-dark downy chick, consistent in size and form with that of the Dusky Moorhens (*Gallinula tenebrosa*) breeding nearby at the water-quality management ponds and ephemeral wetlands in Evatt and Melba, and at several other locations along Ginninderra Creek. When the moorhen chick was delivered, the kookaburra nestlings were 20 days old, and capable of swallowing most prey, including the chick, in a single gulp, providing only a brief glimpse to the camera before the prey disappeared.



**Plate 3. (A) Female kookaburra delivering a House Mouse (*Mus musculus*) to 7 day-old nestlings; (B) Male kookaburra brooding 8 day-old nestlings while one swallows a mouse; (C) 10 day-old kookaburra nestling swallowing a mouse; (D) 27 day-old kookaburra nestling swallowing a Black Rat (*Rattus rattus*).**

### 5.4. Mammals

Previous studies found small mammals to be rarely included in kookaburra diets (Parry 1970; Legge 2004). In the present study they comprised 16.5% of all vertebrate prey (Table 3). All mammals in the chicks' diet were feral rodents: 31 House Mice (*Mus musculus*) and 6 Black Rats (*Rattus rattus*) (Table 4; Plate 3). The capture of a mouse or a rat was typically accompanied by great excitement. The captor, holding the prey in its beak and chuckling loudly, would perch outside the nestbox, where the other parent would often join it in noisy

celebration. After tenderising the rodent, the captor would continue its urgent chuckling as it entered the nestbox and offered the prey to a nestling.

Rodents were present in the kookaburras' territory throughout the breeding season, and were offered to the nestlings almost immediately after hatching, before the nestlings were capable of managing such large prey (Plate 3A). (Indeed, the male parent, amidst great excitement, offered a mouse to a newly-laid egg on 20 Nov 2022).

Fourteen mice and three rats were offered to the nestlings in the first week, although the nestlings were unable to swallow rodent prey until day 8, when the dominant nestling successfully swallowed a mouse over an exhausting period of 48 minutes (Plate 3B). By day 10, the nestlings could swallow a mouse within a minute (Plate 3C) and, by day 27, they could swallow a juvenile rat in four or five gulps (Plate 3D).

## 6. Discussion

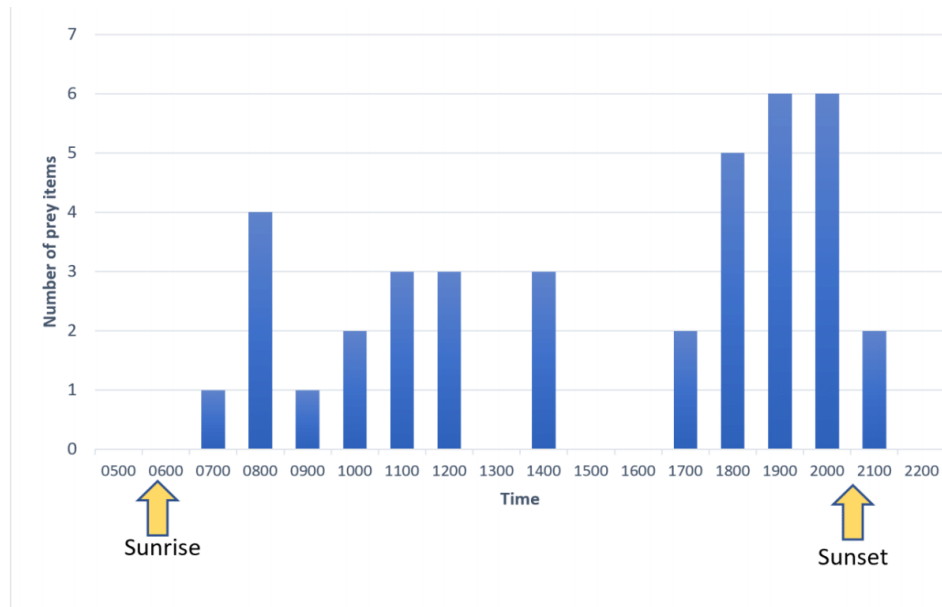
The results of the study provide a useful measure of the habitat richness and productivity of this suburban environment and of its suitability as kookaburra hunting habitat. The high diversity of prey types delivered to the chicks indicated that the parents' territory contained a wide range of different micro-habitats in which they were able to hunt successfully.

Prey availability was evidently not a limiting factor in their breeding success in the 2022-23 season. The parents' rate of food provisioning over the course of the nestling period appeared to keep pace with changes in the growing nestlings' energy requirements, consistent with the findings of previous studies of nestling growth-rates (Legge 2004).

The nestlings' diet contained a significant proportion of vertebrate prey items, including many larger items such as snakes, legless lizards, fish, rats and mice, which may be important in ensuring that both of the nestlings received adequate nutrition by offsetting some of the negative effects of sibling competition for food. At the time of writing (June 2023), five months after fledging, the juvenile kookaburras remain in the territory of their parents. They both appear healthy and their behaviour appears normal (J. Arblaster 2023 pers. comm.).

Longer-term monitoring would be necessary to determine whether the diversity and biomass of prey in the 2022-23 breeding season is typical for the study area. Weather throughout the three-year nestbox trial (2020 – 2022) was influenced by La Niña conditions. In each year, annual rainfall exceeded the 90<sup>th</sup> percentile of local 50-year records, and 2022 received the highest local rainfall on record (BOM 2023). It is likely that the abundance of prey in general was significantly influenced by those weather conditions. The high proportion of rodents, particularly mice, among the vertebrate prey is likely to have been directly influenced by above-average winter-spring rainfall (Singleton et al. 2005) in each year of the study.

The abundance of rodent prey within the kookaburras' territory, and therefore in their diet, may have posed dangers for them and for their nestlings.



**Figure 3: Rodent prey items by time of delivery to kookaburra nestlings, 16 Dec 2022 – 20 Jan 2023.**

In 2022-23, Black Rats, in particular, were prominent pests for Canberra householders and gardeners, some of whom are likely to have turned to rodenticides to combat rat incursions into their properties. The natural behaviour patterns of Black Rats and House Mice may include occasional daylight activity, but they are primarily nocturnal and usually confine their movements to areas where adequate cover is available (Whisson *et al.* 2007; Comas and Hut 2008), thus minimising their exposure to diurnal hunters. Conversely, after consuming anti-coagulant rodenticide baits, pest rodents change their behaviour, becoming more active in daylight, and spending more time in the open (Cox and Smith 1992). In 2022-23, rats in urban and peri-urban Canberra were frequently reported as appearing outdoors, in daylight, in a moribund condition - likely as a result of consuming anti-coagulant rodenticides (Mulvaney 2022). In such circumstances, they would be easy prey for carnivorous birds, including kookaburras.

Adult and juvenile rats, displaying such abnormal, disoriented behaviours in daylight, were reported from places within the kookaburras' territory in 2022-23 (Canberra Nature Map 2022b, Canberra Nature Map 2022c, T. Leach 2023 pers. comm.).

Most of the rodents fed to the nestlings were captured in broad daylight (Fig 3). Thirty-two of 37 rodents were delivered in the period from one hour after sunrise to one hour before sunset (median = 655 minutes after sunrise, 207 minutes before sunset), so it is likely that at least some of them had fallen prey to the kookaburras as a result of abnormal behaviour consistent with anti-coagulant poisoning.

The degree of risk to the kookaburras from anti-coagulant rodenticides varies with the type of toxin in the bait. 'First-generation' and 'second-generation' anti-coagulant rodenticides function in similar ways, but differ in chemical composition. Second-generation anti-coagulants are highly persistent in the environment, and pose a significantly greater risk of secondary poisoning in carnivorous birds, especially those that hunt in urban and peri-urban areas (Lohr 2018) and those that swallow prey whole (Lohr 2018; Thomas *et al.* 2011).

Residues of one or more second-generation anti-coagulant rodenticides have been found in the livers of a sample of dead birds in the ACT (75% of raptors, 81% of owls, and 100% of other carnivorous birds, including a kookaburra (Walker 2020)).

Further research would be required to determine if secondary poisoning by persistent rodenticides is a factor in the slow, steady decline of kookaburras in the ACT (Wilson 1999; King *et al.* 2021; COG 2020; COG 2023).

Alternatives to second-generation anti-coagulants are available, but consumers, unless motivated to seek them out, are less likely to use them. At the time of writing (June 2023), of 29 rodenticide products stocked by a popular Canberra retailer, 23 contain second-generation anti-coagulants, three contain first-generation anti-coagulants, and three contain no anti-coagulants, relying instead on the dehydrating action of sodium chloride.

In the absence of controls on the availability of the more persistent rodenticides, continuous targeted education of consumers should be encouraged.

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## DYNAMICS OF EURASIAN COOT POPULATIONS AND THEIR RESPONSE TO LA NIÑA EVENTS ON TWO CANBERRA URBAN PONDS

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**Abstract.** Populations of the Australian race of the Eurasian Coot (*Fulica atra australis*) can fluctuate widely. The birds track major rainfall over the interior and move there to re-filled ephemeral wetlands to breed and disperse again after breeding. Such changes in population sizes can also be observed in Canberra. We monitored Coot populations at monthly intervals on two larger stormwater ponds in suburban Canberra (Franklin Pond and West Belconnen Pond) between January 2016 and December 2022. Numbers varied over time, but not necessarily in the same way for the two ponds. However, in the second half of both 2016 and 2022 the Coots left both ponds (and the wider Canberra region). A La Niña weather pattern had brought significant rain to inland Australia in both years. 2022 was the third year of a rare three-year La Niña event. In the first months of 2023, Coots reappeared again at both ponds (and elsewhere in Canberra), and at West Belconnen Pond in larger numbers than ever reported before, indicating good breeding success in the interior. But 90 to 95% of all birds were young (subadult) Coots and only 5 to 10% adults (age classification based on the size of the frontal shield and bill colour). This would indicate that most adults had stayed in the interior to continue breeding. Three conditions for such a scenario, never documented before, would have to be met: (1) Ongoing good rainfalls well into 2023 ensured that wetlands remained filled; (2) That Coots are able to produce clutches at any time of year, as the literature indicates, and even local birds have been recorded hatching young over an extended period from early October to mid-April; and (3) Coots can be multibrooded as is typical for Coots in New Zealand and was also shown at a Canberra wetland. The breeding population of Coots in Canberra is increasing. Even during La Niña years with high rainfall over the interior some pairs no longer migrated out of Canberra but instead nested locally.



**Figure 1: Distribution of the Eurasian Coot in Australia (ebird map in Birds in Backyards 2023).**

### 1. Introduction

The Eurasian Coot (*Fulica atra australis*), Coot hereafter, is widely distributed across Australia, except for some areas in the North and the dry southern parts of South and Western Australia (Fig. 1). It is most abundant in southeastern/eastern Australia. However, numbers can fluctuate widely. The species responds to flooding and re-filling of ephemeral wetlands of the interior following good rainfall and moves to these areas for breeding and then disperses (Marchant and Higgins 1993; Cooper *et al.* 2014; Taylor and Kirwan 2020). These fluctuations



in numbers are also a feature of Coot populations in Canberra (Taylor and COG 1992; Lenz 2016), although its overall status locally is ‘very common, breeding resident’ (COG 2020).

We monitored Coot numbers on two urban stormwater ponds (Figs. 2 and 3); Yerrabi Pond in Gungahlin (*Julie Clark*) and West Belconnen Pond in Dunlop (*Michal Lenz*), at monthly intervals from 2016 to 2022. In this article we report our observations and pay special attention to the two La Niña events in 2016 and from 2020 to 2022. Further, counts from early 2023 and observations from other wetlands in the Canberra Region were also considered.

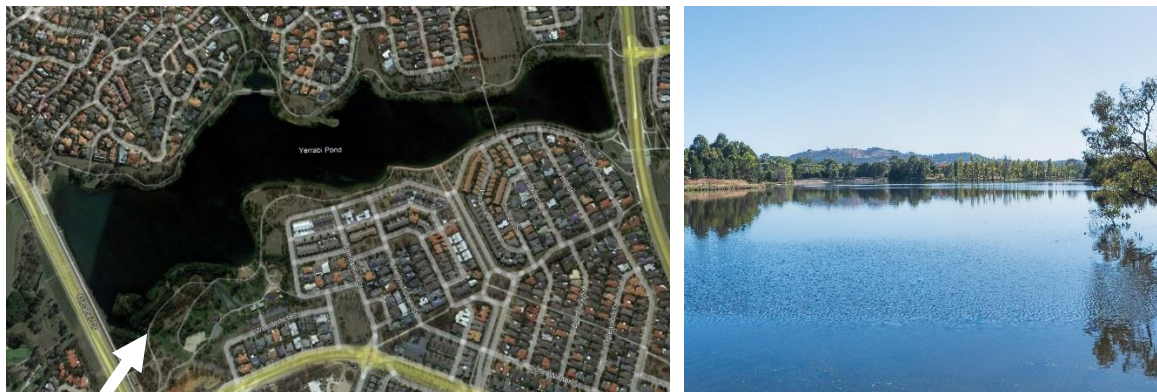
## 2. Sites

Yerrabi Pond (YP hereafter) ‘has extensive areas of open water, with limited macrophyte [*i.e.* reedy vegetation] zones around its margins. The pond has gross pollutant traps installed on its inlets to limit litter discharge’ (ACT Government n.d.; 2022). The situation is the same for West Belconnen Pond (WBP hereafter).

Both ponds, together with many others across Canberra, were constructed to maintain and improve the water quality of urban stormwater and runoff by removing pollutants and suspended sediments, and to mitigate flooding during storms (ACT Government n.d.; 2022).

### 2.1. Yerrabi Pond

The pond has an approximate area of 31 ha<sup>1</sup> (Fig. 2) and a maximum depth of 2.5 m. It is surrounded by a green belt of varying width and sealed paths. Houses border it to the north and south and major roads on the east and west sides. The site is a popular recreation area.



**Figure 2. Yerrabi Pond: (left) Google Earth view (3 March 2023); arrow indicates where the photo was taken (10 March 2023).**



**Figure 3. West Belconnen Pond: (left) Google Earth view. Arrow indicates where the photo was taken (3 March 2023 for both images).**

<sup>1</sup> All area values estimated with the polygon function available in Google Earth Pro.



Ribbongrass (*Vallisneria*), a plant of deeper water (Romanowsky 1998), on which many waterbirds, including Coots, readily feed, forms large stands in YP. Coots can get at the floating leaves without the need to dive. At various stretches of the shoreline, Coots also come on land to graze.

## 2.2. West Belconnen Pond

The pond has an area of approximately 10.5 ha (Fig. 3), *i.e.* only a third of that of YP. The three islands take up 0.65 ha. The pond is not as deep as YP. Along its southern edge it borders houses in the suburb of Dunlop (with a green belt as buffer). On all other sides it is surrounded by grassland and patches of planted trees. A path, partly sealed, surrounds the pond. The area is commonly used for recreational activities.

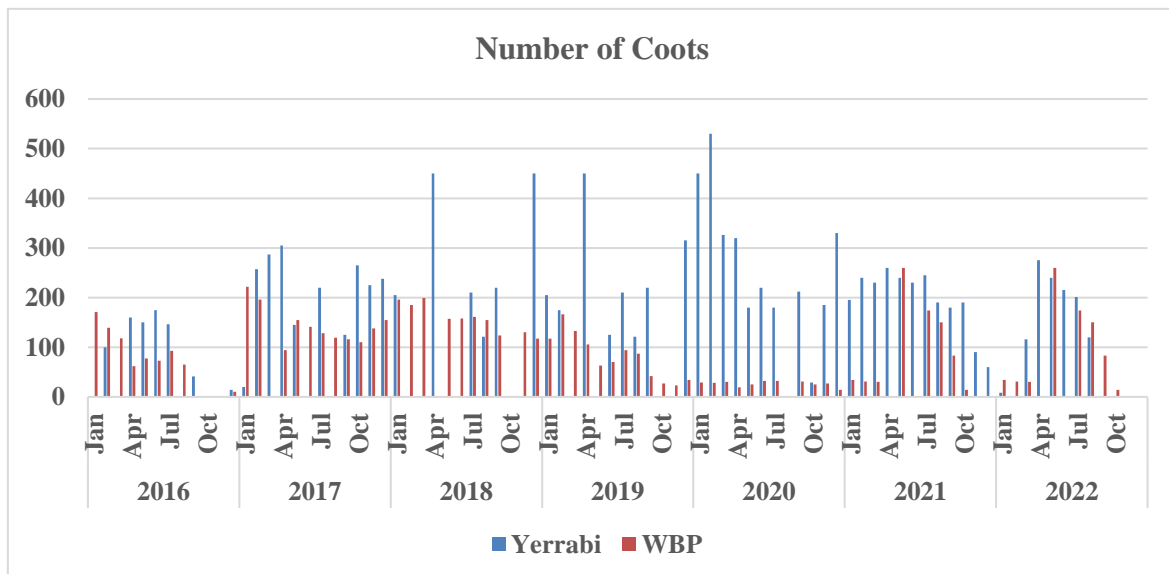
Ribbongrass is not prominent at WBP. Opportunities for grazing on land are also limited. Coots get their food mostly by diving for it.

## 3. Methods

We visited the sites as a rule once a month between January 2016 and December 2022 and aimed to count all Coots (and other waterbirds) as comprehensively as possible. If more than one visit per month was paid, the highest count was used.

There are some gaps in our counts. However, we did not rely on counts available from other observers for those missing months. Other observers may not have covered the entire area of the ponds, or may have estimated numbers, or may have noted Coots as ‘present’ only.

To compare the patterns of the monthly counts for both ponds, the counts were modelled using a generalised linear model assuming a Poisson error structure and a log-link function. The Akaike Information Criterion (AIC) (Akaike 1973) was used as the basis of model selection. The variation within a year was explored using harmonic functions with a cycle time of one year. The annual variation was modelled using natural cubic splines with knots being defined using the degrees-of-freedom argument to the fitting function to increase the complexity of the fitted response curve. All analyses were conducted in R 4.2.2 and followed recommended procedures for generalised linear models (Venables and Ripley 2002), natural splines and data collation and manipulation (Sarkar 2008; Wickham 2009).



**Figure 4. The number of Eurasian Coots recorded during monthly surveys at Yerrabi Pond (YP) and West Belconnen Pond (WBP) from 2016 to 2022.**

## 4. Results and Discussion

### 4.1. Patterns in the counts

The counts show wide fluctuations in Coot numbers at both ponds (Fig. 4). On average 197 Coots were observed at YP (range: 0 to 530), and 95 at WBP (range 1 to 260). Low counts at one pond are mainly matched with low counts at the other.

On two occasions Coots were absent from the ponds (and the wider Canberra Region), first between September to December 2016, and again from October to December 2022. At both times a La Niña weather system had provided good rainfall over wide parts of Australia. After these periods of absence, Coot numbers built up again quickly (Fig. 4, and Sect. 4.3).

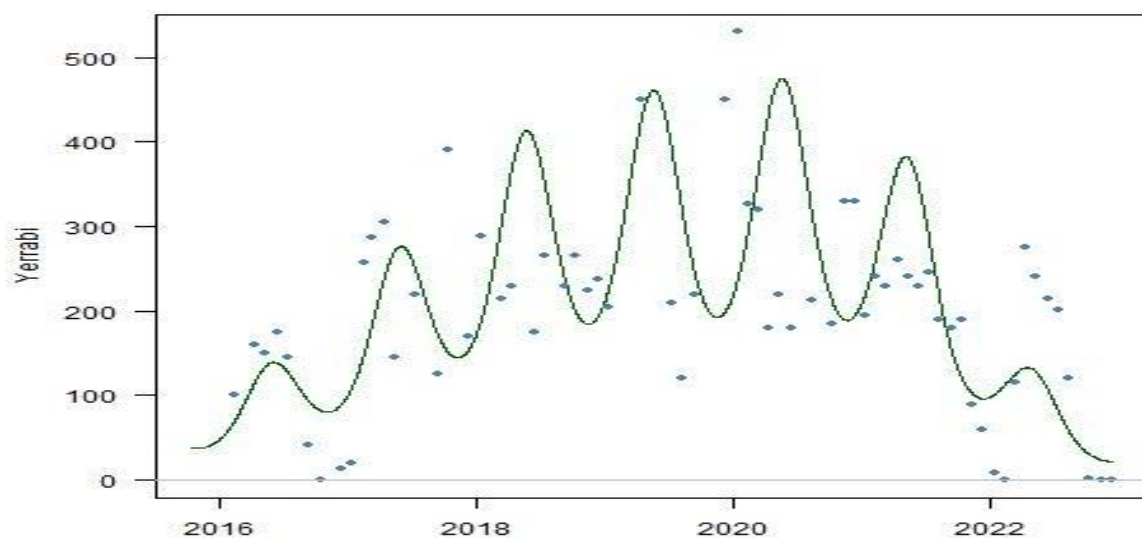
There was a very limited indication of a possible seasonal pattern for the observations, albeit with too much variability for a definite conclusion.

The question of how similar the long-term trends of the highly variable counts for both ponds are was addressed by fitting a generalized linear model to the observations where the assumed distribution of the counts follows a negative binomial distribution, *i.e.* there is more variation than expected for a Poisson distribution. The overall patterns at both ponds are distinct from each other in terms of the long-term trends and the within-year pattern as the time course plots based on the best fitting model show (Figs. 5 and 6).

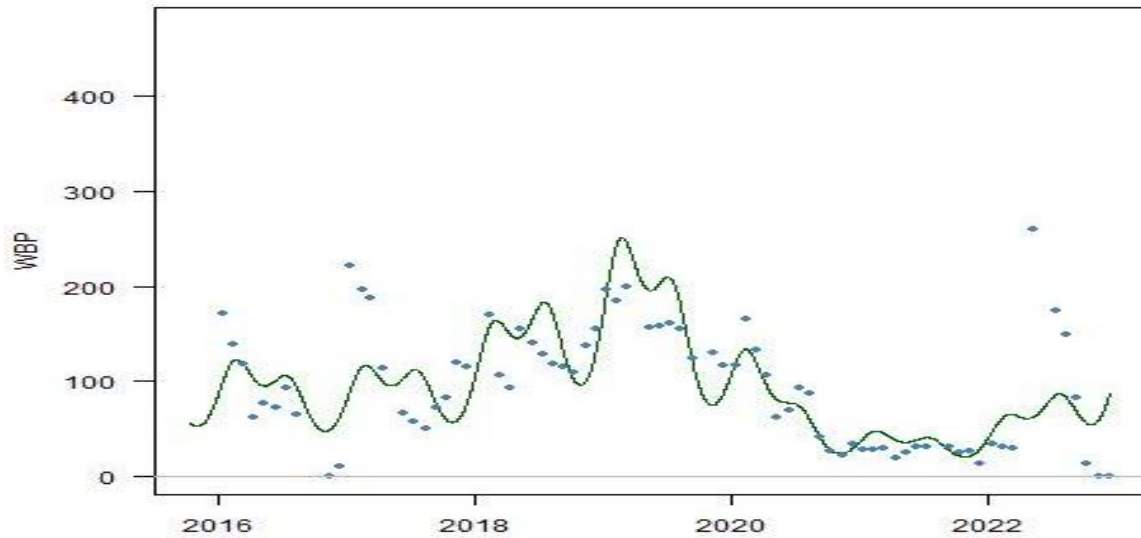
Interactions between pond characteristics, such as size and depth and differences in food supply (see Sect. 2), and weather factors (when to move, when to stay) may have shaped the observed patterns.

Given the known association between rainfall and Coot movements, local rainfall data (from Canberra Airport (BOM 2022)) were used to assess the association between observed Coot numbers and the following four observed rainfall measures: (1) the value from the month when monitoring took place, although at the time of the survey not all the monthly rain may have fallen, (2) the value from the previous month, (3) the two previous months, and (4) the three previous months.

The best model revealed that the cumulative rainfall from the three months preceding a count correlated best with the number of birds (Fig. 7).



**Figure 5. Time course plot of the Eurasian Coots recorded at Yerrabi Pond.**

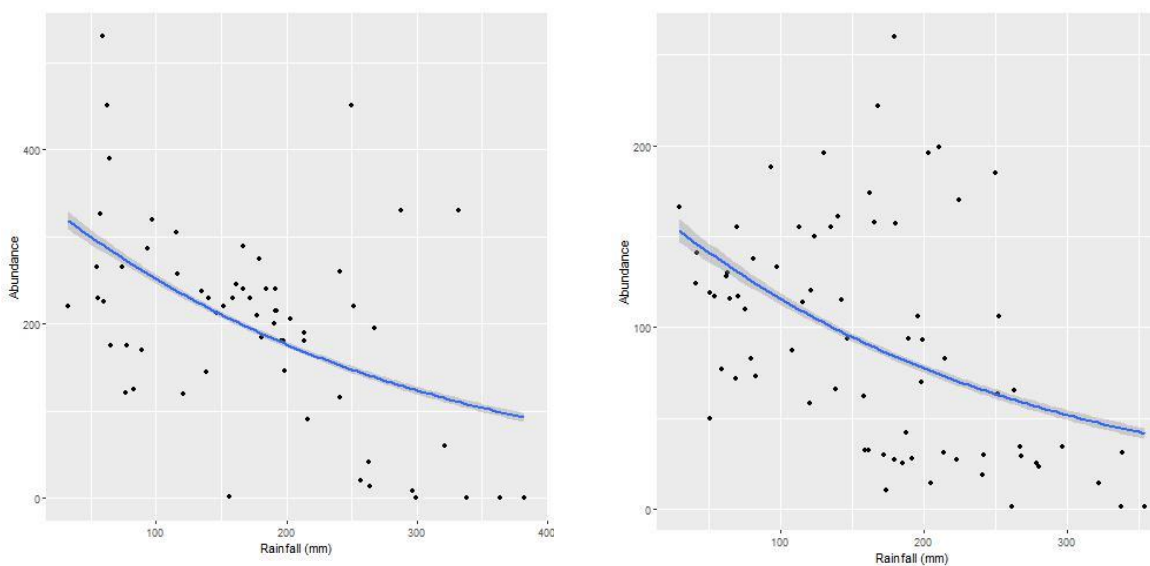


**Figure 6. Time course plot of the Eurasian Coots recorded at West Belconnen Pond.**

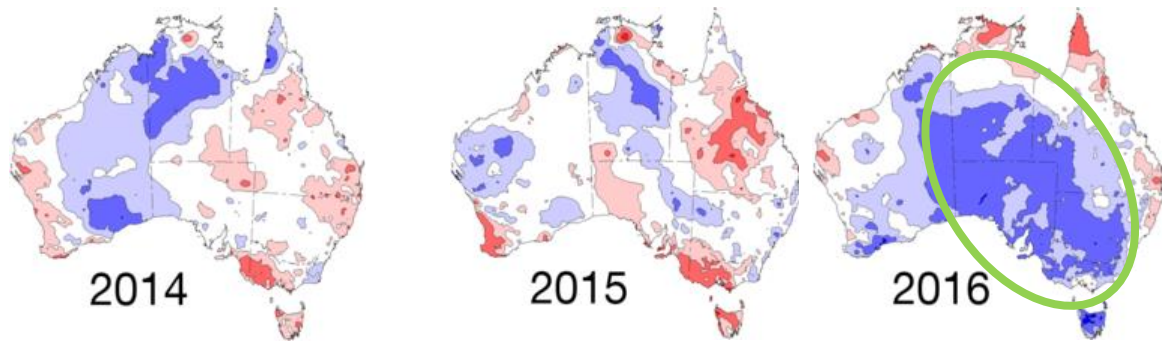
*4.2. The 2016 La Niña impact*

In 2014 and 2015 Australia experienced relatively low to average rainfalls, but in 2016 large parts of the continent recorded ‘above’ and ‘well above average’ rainfall, especially in winter and spring (BOM 2023a) (Fig. 8). The rain also restored local wetlands and partially filled Lake George and Lake Bathurst. Coots and ducks largely left our area, but other species such as Hoary-headed Grebes, Pied Stilts (Lenz 2016), Whiskered Terns (Butterfield 2017) and several species of rails (Clark 2016), rarely or not previously known to breed in the Canberra Region, were recorded nesting.

Importantly, a minimum of about 20 Coot broods were also reported on smaller wetlands in Canberra (Clark 2016, Lenz 2016). Before 2016 only a limited number of breeding records were available. Davey (1987) summarised breeding records of waterbirds for the ACT between 1974 to 1985. In that period broods of Coots were discovered on only five occasions, with a maximum of four pairs with young in January 1984 on Dairy Road, Fyshwick (Ross 1984).



**Figure 7. Scatter plots of Eurasian Coot numbers as a function of the rainfall from the three months preceding a count: (left) Yerrabi Pond; (right) West Belconnen Pond.**



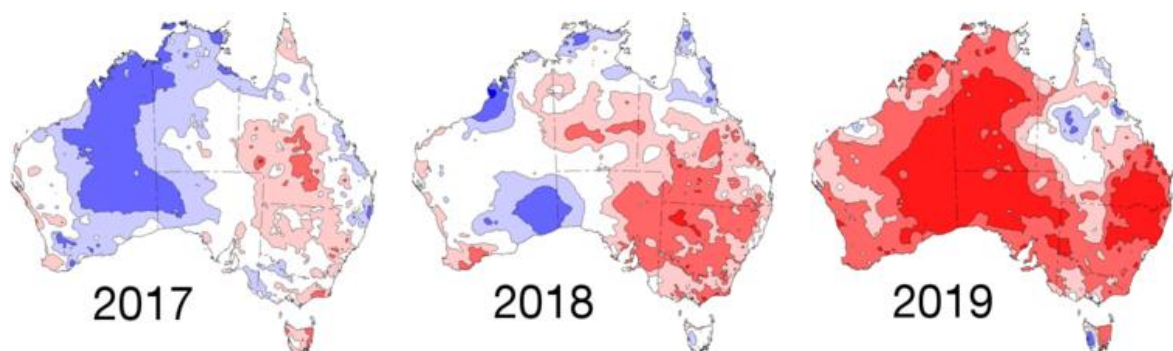
**Figure 8. Rainfall deciles for the years 2014 to 2016 (BOM 2023a).** The area of high rainfall due to La Niña in 2016 is circled. In the maps, the darker the blue, the more rainfall above the average; in white, areas with average rainfall, in red; areas with rainfall below the average.

With the construction of many stormwater ponds across Canberra, opportunities for Coots to breed had increased considerably even a few years before 2016, as already noticed for the Gungahlin area (Clark 2016).

#### 4.3. The 2020 to 2022 La Niña impact

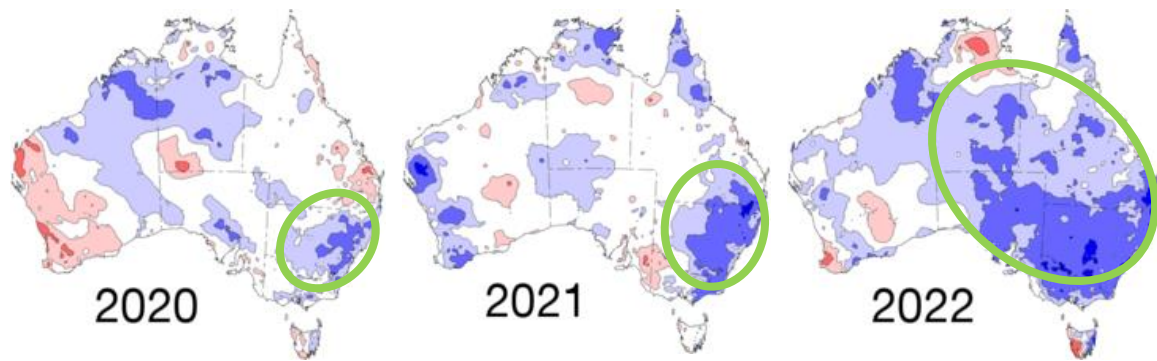
In the three years following the 2016 La Niña, severe drought conditions developed (Fig. 9) across much of eastern and inland Australia, including Queensland, New South Wales and Victoria, and extending into parts of South and Western Australia (BOM 2023a). Over that period local Coot numbers were relatively stable and high (Fig. 4).

From 2020 to 2022, a rare 3-year period of La Niña<sup>2</sup> weather brought good rainfall to increasing areas of Australia (Fig. 10). Rain in 2020, more limited to the SE, including the Canberra Region, restored local wetlands.



**Figure 9. Rainfall deciles for the years 2017 to 2019 showing increasing drought conditions from the SE across the continent (BOM 2023a, b).** For explanations of the meaning of the colours, see Fig.8.

<sup>2</sup> The 3-year La Niña event of 2020-2021 is only the fourth since 1903 (BOM 2023c).



**Figure 10. Rainfall deciles for the three consecutive La Niña years 2020-2023, a rare event (BOM 2023a, c).** For explanations of the meaning of the colours, see Fig. 8. The area of high rainfall due to La Niña is circled.

In 2021 the area with high rainfall was still mainly restricted to the SE but a much larger area received rain ‘very much above average’. Further substantial falls in 2022 extended to the N and NW of Australia through much of the interior (BOM 2023a) (Fig. 10).

Over that 3-year period the pattern of Coot numbers differed between the two ponds more than in other years (Fig. 4). Coot numbers fell and stayed low at WBP from September 2020 through to March 2022, with a monthly average of only 27 birds (Figs. 4 and 11). In contrast, at YP Coots were still present with on average 216 birds between September 2020 to October 2021. Numbers declined in following months to a low of a single bird in February 2022, but rose in March to more than 100 birds (Fig. 11). By May 2022 similar numbers of Coots (YP: 240 and WBP 260) were present on both ponds. Thereafter numbers declined in parallel at both ponds until they were (almost) absent by October.

The rises and falls in numbers between 2020 and 2022 would indicate notable movement of Coots in and out of our area. The ongoing rainfall may have prompted only part of the population to migrate, while others remained until later in 2022. It is also possible that young birds dispersing from inland breeding sites after gaining independence boosted local numbers at times. The age composition of Coots at the ponds was only checked in 2023.

It was not until early January 2023 that a few Coots returned after an absence of four months. Up to April 2023 numbers at both ponds stayed around 400 birds at both ponds, except that in March 2023 a new high of 750 Coots was recorded at WBP, three times the previous maximum. We can assume that such a large number was not sustainable. Indeed, there were signs that Coots often squabbled amongst themselves for food: when a bird surfaced with plant material in its beak, others tried to get it for themselves. By April the numbers had halved to around 375 and fell further to just above 100 birds in May (Fig. 11).

#### 4.4. Influx of Coots in 2023

After an absence of several months from the ponds and elsewhere in Canberra during the latter part of 2022, Coots appeared in large numbers on the ponds at the beginning of 2023. Between 22 Feb and 17 Mar 2023 groups of Coots of varying size were checked for their age composition by ML (adult *versus* young (subadult) birds), using binoculars or a telescope). The size and colour of the frontal shield and the colour of the beak were used to separate the two age classes (Table 1, Figs. 12 and 13). The size of the frontal shield changes with the breeding cycle in adults, *i.e.* it is at its largest during the breeding season (inflated) and smaller (deflated) at other times (Visser 1998; Wikipedia 2022).



**Figure 12. Breeding Eurasian Coots at ponds in Gungahlin (photos Julie Clark)**

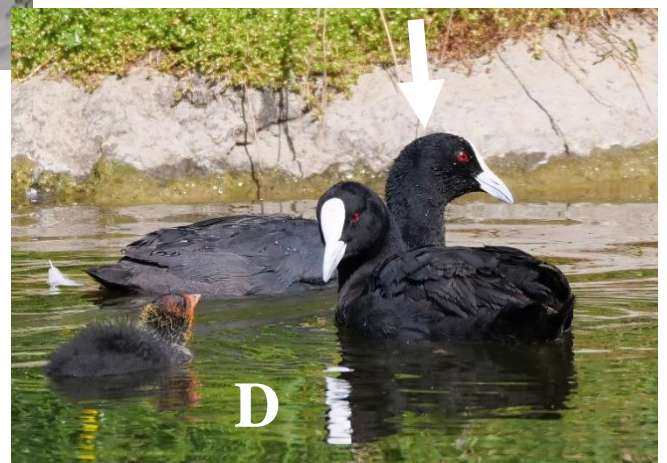


**A: Assumed male with large frontal shield, reaching the crown;**

**B, C: Assumed female with relatively smaller shield;**



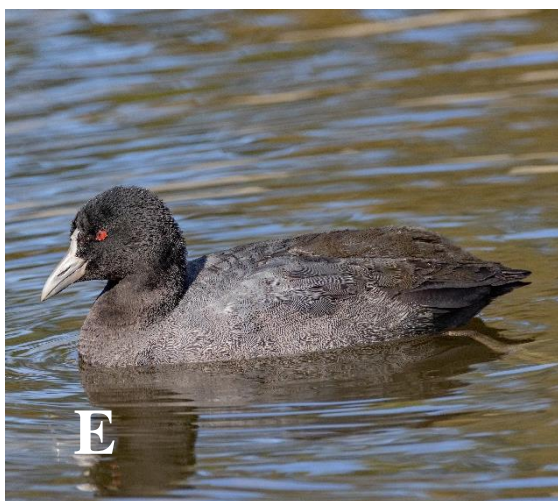
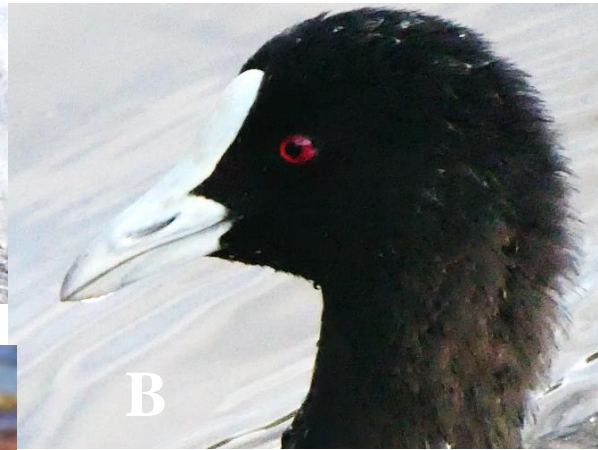
**D: Pair with female in foreground; the shield in adults is very noticeable even when in profile view (the male in the background; arrow: shield extending to near the top of the crown).**



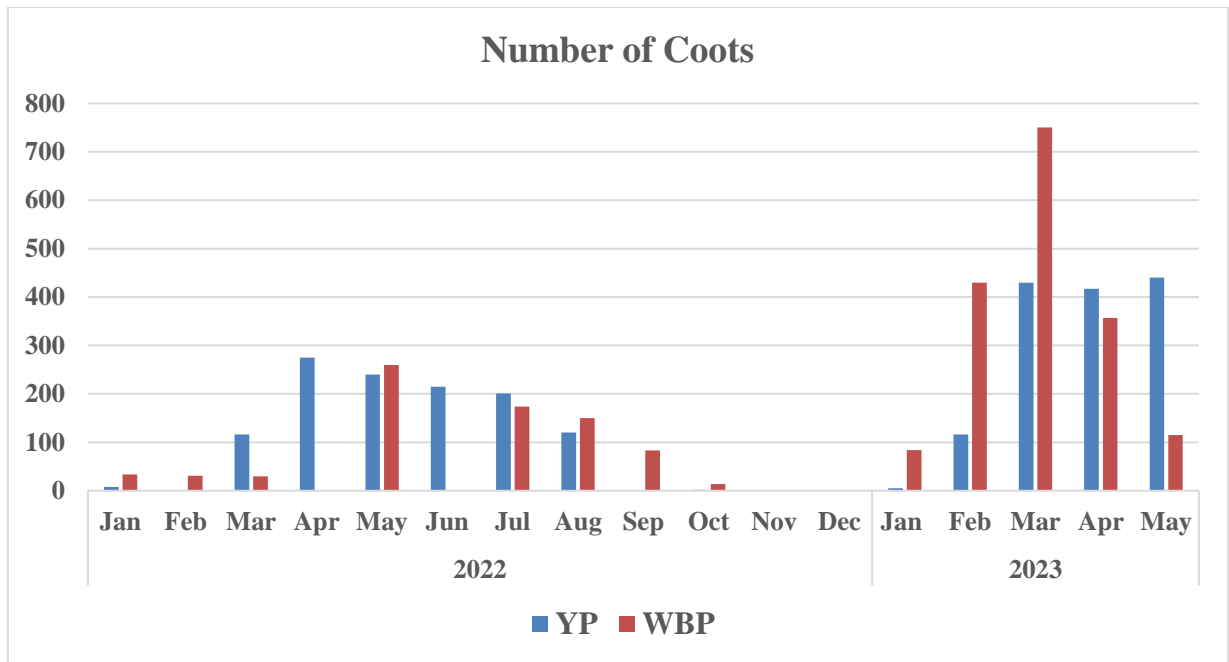


**Figure 13: Non-breeding adult and young (subadult) Eurasian Coots (photos Julie Clark, Michael Lenz).**

**A, B: Non-breeding adults from Franklin Pond, Gungahlin, on 3 and 13 March 2023, at the time of the influx of young birds (Michael Lenz).**



**C to F: Young (subadult) Coots, February to March 2023, Yerrabi Pond and West Belconnen Pond.**



**Figure 11. The number of Eurasian Coots recorded during monthly surveys at Yerrabi Pond (YP) and West Belconnen Pond (WBP) from January 2022 to May 2023.**

Overall, the high number of Coots appearing at the ponds from January 2023 onwards are a clear indication of good breeding success at wetlands of the interior. Most noticeable was that 90 to 95% of the birds were young (subadult) Coots and only 5 to 10% were adults (Table 2), based on size and colour of the frontal shield and the colour of the bill. In other words, the bulk of the birds were new arrivals and most adults had stayed behind to continue breeding.

**Table 1. Features used to separate adults and young (subadults) of the Australian race of the Eurasian Coot (Marchant and Higgins 1993; Richard Schodde, pers. commun.).**

Feature	Adult	Subadults
<b>Frontal shield</b>	white, wide and reaching to the crown (Fig. 12)	grey to white, small and narrow (Fig. 13)
<b>Bill</b>	white with blue-greyish tip (Fig. 12)	greyish (Fig. 13)

Coots which had reappeared at that time on other wetlands in the Canberra Region (*e.g.* Jerrabomberra Wetlands Reserve, Lake Ginninderra, Southern Morass) were also largely young birds, as field checks revealed (details not reported here).

*4.5. Extended breeding season for Coots in the interior during 2022/2023*

For the assumption that adult Coots had stayed on wetlands of the interior to continue breeding, three conditions have to be met:

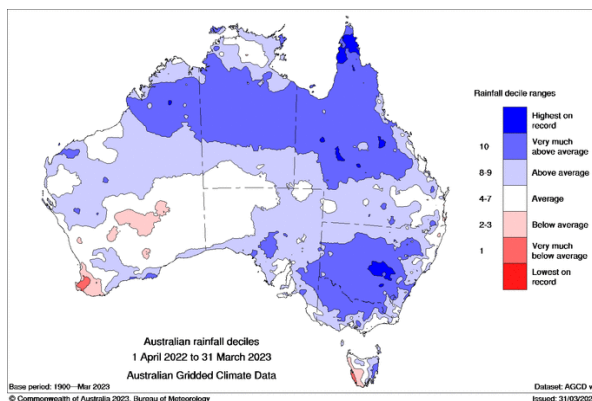
- (1) Ongoing rainfall to ensure that the wetlands remain filled;
- (2) Coots can initiate breeding at any time of year;
- (3) Coots can be multibrooded.

**Table 2. Totals and percentage of adult and young (subadult) Eurasian Coots in counts of samples of birds at Yerrabi Pond and West Belconnen Pond.**

No.	No. aged	No. samples	Sample range	Adults		Immatures	
				No.	%	No.	%
<b>Yerrabi Pond</b>							
<b>24 February 2023</b>							
320	185	13	5-36	18	<b>9.7</b>	167	<b>90.3</b>
<b>West Belconnen Pond</b>							
<b>22 February 2023</b>							
450	280	13	5-48	15	<b>5.4</b>	265	<b>94.6</b>
<b>02 March 2023 (use of telescope)</b>							
470	381	10	12-148	21	<b>4.5</b>	360	<b>95.5</b>
<b>11 March 2023</b>							
680	333	9	10-39	9	<b>2.7</b>	324	<b>97.3</b>
<b>17 March 2023</b>							
590	178	4	18-66	9	<b>5.1</b>	169	<b>94.9</b>

In support of this assumption the following comments are provided:

*(1) Ongoing rainfall*



Above average rainfall continued well into 2023 (Fig. 14), with many reports of inland flooding and above average falls (Costin 2022). In April 2023 Australia as a whole experienced rainfall 35.7% above average, the highest since 2006, encompassing most of WA, NT and SA, much of QLD, large parts of NSW and most of central and western VIC (BOM 2023d)

**Figure 14. Rainfall decile for April 2022 to 31 March 2023.** For explanations of the meaning of the colours, see Fig.8.

*(2) Length of the breeding season*

The core laying period in Australia falls between September and early January. However, Coots can initiate breeding under favourable conditions at any time of year (Marchant and Higgins 1993; Cooper *et al.* 2014). At ponds in Franklin, young hatched over an extended period between early October 2020 to mid April 2021 (Lenz 2021).

*(3) Breeding frequency*

According to Marchant and Higgins (1993), Coots raise only a single brood per year in Australia, although the species is able to produce a replacement clutch if the first brood fails. Coots self-colonized New Zealand from Australia in the 20<sup>th</sup> century. In New Zealand they quite regularly produce two broods per season (Mason 2013/2017). However, Coots can also be multibrooded in Australia, as recent observations from Canberra show (Table 3). Thirteen

pairs produced a total of 18 broods on a set of small ponds, with one pair even hatching young three times. Regular monitoring of the pairs over an extended period was necessary to document the repeated breeding (Lenz 2021).

**Table 3. Number of Eurasian Coot broods in the 2020/2021 season at the Gungaharra Creek Wildlife Corridor, Franklin (data from Lenz 2021).**

Number of pairs	Number of pairs with (%)			
	No brood	One brood	Two broods	Three broods
14	1	9	3	1
	7.1	64.3	21.4	7.1

Hence, the scenario that adult Coots stayed in the interior after they raised a first brood and continued breeding into 2023 is very realistic. No doubt, this has happened before, most likely during earlier extended La Niñas (see footnote 2), but we have provided the first evidence.

**5. Concluding comments**

The counts over seven years have demonstrated significant fluctuations in the populations, even well outside the La Niña periods (Fig. 6). The differences in the counts from both ponds, especially in 2020 to 2021 and again in early 2023, are probably the result of interactions between pond characteristics, such as the food supply, and weather factors, *i.e.* rainfall.

**Table 4. Records of breeding Coots at Yerrabi Pond and West Belconnen Pond.**

Pond	Date	Observation
<b>Yerrabi</b>	Feb 2016	possible brood
	Feb 2017	possible brood
	Mar 2017	2 & 3 small young
	Apr 2017	3 small young
	Nov 2020	3 small young
<b>West Belconnen</b>	Dec 2016	5 small young
	Jan 2017	2 & 2 small young, several imm.
	Nov 2020	4x small young
	Oct 2021	brood of 7 small young
	Nov 21	2 further sets of small young
	Dec 2021	1 small young

It is also notable that more pairs are now nesting in Canberra than ever recorded before. This can in part be explained by the increasing availability of artificial wetlands (stormwater ponds) with reedy vegetation providing suitable nesting habitat. This could mean that the standard double response to high rainfall, migration and breeding inland, is no longer followed by some birds. They breed locally without migrating. Two examples point to such a development.

YP and WBP are not very suitable breeding sites, having only limited reedy vegetation for nesting. Nevertheless, some pairs have raised young at both ponds, but only during La Niña



periods or immediately after them (Table 4), not in any other year. High rainfall triggered local nesting but no longer migration to wetlands of the interior.

The Coot population on the seven ponds of the Gungaharra Wildlife Corridor in the Canberra suburb of Franklin surveyed in 2020/2021 (Lenz 2021, see Table 3) was checked on 2 Jan 2023 (ML). The response to La Niña was mixed:

- on one pond all adult Coots had left;
- on one pond with usually the highest number of Coots, all adults had left; only a single immature bird was present, indicating an early brood, the pair having also departed after the young had reached independence;
- on five ponds adults with young were present (3x small young; 2x older young).

By mid January 2023 Coots had started to return to the abandoned ponds in Franklin.

Our work clearly indicates that the population dynamics and the interactions between local conditions and broader weather conditions, *i.e.* major rainfall during La Niña years, are complex and still only poorly understood.

### Acknowledgements

We are very grateful to Richard (Dick) Schodde for comments on differences between adult and young (subadult) Coots based on information from his *The Directory of Australian Birds* (Vol. 2, in prep.) and confirming that our age classification was correct. Geoffrey Dabb shared views and information on various Coot topics. Peter Christian provided comparative count data for 2023 from West Belconnen Pond. The manuscript has benefited greatly from comments by Kim Farley, Kevin Windle, Geoffrey Dabb and Leo Joseph.

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*Accepted 25 May 2023*

## **NOTES**

Canberra Bird Notes 48(1) (2023): 50

### **ANTING BEHAVIOUR IN NOISY MINER**

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On 6 Apr 2023, at around 08:30 h, I observed a Noisy Miner (*Manorina melanocephala*) in a suburban setting in Hughes. The bird was hopping around the base of a planted Yellow Box (*Eucalyptus melliodora*) and it picked up a bull ant (*Myrmecia*) from the ground. It held the ant in its beak and swiped it the length of the underside of the outermost flight feathers on one wing, then the other. It then dropped the ant and wiped its beak from side to side vigorously on a tree root. It then flew off.

Observers often loosely refer to ‘anting’ behaviour, especially in Australian Magpies and Magpie Larks, when what they are seeing is the bird sunbathing in order to kill feather parasites with ultraviolet radiation. This observation is of genuine anting behaviour, with the bird deliberately picking up an ant and swiping it on its plumage in order to have its feathers wiped with the fluids that the ant was giving off.

*Accepted 14 May 2023*

## ***COLUMNIST'S CORNER***

*Canberra Bird Notes* 48(1) (2023): 51-55

***About old books, some birds we find around Canberra, and their connection with Sir William Jardine, 7<sup>th</sup> Baronet of Applegarth FRS FRSE FLS FSA.***

A welcome development over the last few years has been the free availability online of early books and journals. So far as concerns birds, we have access to those famous volumes, notably expensive when published, of Gould, Audubon and Mathews. Also available, if you have an interest in the history of it all, are the less graphically-enhanced writings of Carl Linnaeus (1707-1778), Louis Vieillot (1748-1841), John Latham (1740-1837), William Swainson (1789-1855), Nicholas Vigors (1787-1840) and Thomas Horsfield (1773-1859). (The dates are given here to draw attention to the distance between now and the time of those writings.) Today you can scroll through those yellowing pages and trace the early development of hypotheses about the nature and relationships of Australia's birds.

You can also look at some interesting early pictures, and not just in productions like Gould's *Birds of Australia*. Most of the online sources offer a faithful scan of the whole volume. You can see how early illustrators, often without much to go on, gave their idea of what each bird looked like. Here we look at just one set of pictures from that time.

William Jardine (1800-1874), a Scottish naturalist and baronet, was responsible for several natural history books in the period 1825 to 1866. Most of this busy publishing was in a 40-volume series (1833-1866) entitled *The Naturalist's Library*. John Gould's early publishing was over a similar period, *The Birds of Australia* appearing in parts between 1840 and 1848, and the *Handbook* in 1865. Jardine's publishing, together with ornithologist Prideaux John Selby, included four volumes produced 1825 to 1843 under the title *Illustrations of Ornithology*, herein referred to as *Illustrations*.

In this work, the treatment of each species was based on a pair of images, being a hand-colored engraving and an uncoloured one. Among the artists involved in this project were Edward Lear and Jardine's daughter, Catherine. In the recent second edition of *Feather and Brush*, Penny Olsen refers to the Jardine/Selby series, at page 94. It is described as 'one of the most ornithologically important large-format hand-coloured books'.

The basis for Jardine and Selby's choice of species is not clear. Their discussion was directed to the specimen depicted. Some species are stated to be common and well known, some rare and represented by a single, perhaps thus far undescribed, specimen. Species from different regions and families are mixed together.

Like Gould's *Birds of Australia*, *Illustrations* came after, and drew on, the pioneering work on Australian birds of John Latham (published 1781 to 1821) and of Nicholas Vigors and Thomas Horsfield (published in 1827).

The pictures shown here are of species recorded around Canberra. One of the species in *Illustrations* is shown in Penny's book. Clearly enough it is our familiar Masked Lapwing, although the Jardine/Selby text raises some doubt about whether it was the same species that Latham had already described under the name *Tringa lobata*, as 'a native of New Holland'.



The illustration at *A.* is labelled ‘*Astur albus* White Goshawk’. The authors give consideration to whether this was really a species of its own, or ‘only a variety of some other’.

A more accurate examination of numerous specimens, and the testimony of persons and naturalists whose discrimination can be depended upon, have, however, removed every remaining doubt of its being a species entirely distinct.

Gould discussed the same issue, and came to the same conclusion, although he chose a different name for the species.

At *B.* is something you are more likely to come across. The English name will be familiar: ‘*Podiceps poliocephalus* Hoary-headed Grebe’. Jardine & Selby are credited with the first description, in *Illustrations*.

We have not met with this species in any collection, and can with confidence assert it to be undescribed. It is a native of New Holland, from whence we received a single specimen some years since, but without any notes regarding it.

The bird at *C.* has had some difficulty finding a settled English name, in view of the persistence of ‘Pacific Heron’, a name used by Latham but not geographically apt. The present ‘White-necked Heron’ carries some risk of confusion with the more common ‘White-fronted Heron’, given uncertainty on the part of some about what a ‘front’ is. Probably the opportunity has now passed to take up the name preferred in *Illustrations*: ‘Bulla-ra-gang Heron’. It is that name, say Jardine and Selby, used ‘by the natives in the country ... which we have chosen as a sort of English name’.

The grass-finch at *D.* (‘Temporal Finch’) was described as ‘a very common species in New Holland ... easily tamed and kept in confinement’. It was particularly common, perhaps not for very long, in the garden of Parramatta resident George Caley (1770-1829).

They frequently visited his garden during the winter, to feed on a species of grass-seed, in such numbers that above forty were killed at a shot.

The grass-finch at *E.* has a tenuous connection with Tasmania, although it does not occur there. In both *Illustrations* and by Gould it is called ‘Bicheno’s Finch’, being so named by Vigers & Horsfield ‘in honour of J. E. Bicheno, Esq., a gentleman earnestly devoted to the study of natural history, and deserving well the compliment paid to him by his brother naturalists’.

Bicheno became Colonial Secretary of Van Diemen’s Land (1843-1851), hence the naming for him of the town in Tasmania of that name. However, before taking up that appointment, Bicheno, along with Vigers and Horsfield, was one of a group assisting Jardine and Selby in the preparation of *Illustrations*.

The illustration at *F.* bears the name given by Latham, ‘Crimson-fronted Parakeet’.

This beautiful little species is very abundant in New Holland and the adjacent islands. It is met with in almost every collection, and since the discovery of the structure of the tongues in this group, and the consequent alteration of the food given to them, they are often met with in a state of confinement.

The illustration is accurately hand-coloured, as indicated by the recent photo of the species at *F2*. However, a dead specimen is of little use to indicate eye-colour. The species in life has a conspicuous orange iris (photos at *F2* and *F3*).

At G. is a strongly coloured version of an ibis by Edward Lear. In *Illustrations* this is given the unexpected English name ‘Lamellated Ibis’, a reference to the breast plumes.

The most curious character in this bird consists in the lamellated form of the feathers on the fore part of the neck and breast, ...

Gould used the name ‘Straw-necked Ibis’, and gave the legs as ‘blackish-brown’. The Lear illustration also raises a colour issue, not fully resolved even today. The unlikely colour of the legs in Lear’s drawing was defended in *Illustrations*:

We have since seen the specimen in the Edinburgh Museum, and refer it unhesitatingly as identical with our drawing. The legs are deep blood-red.

Seasonally, the legs of this species might be ‘blackish-brown’ or mainly pink. At G2 are the legs of a bird photographed in Canberra in December 2019. However, ‘blood-red’ does not fit either Lear’s drawing or the species in life.

The species illustrated at H. had created some difficulty for early writers on Australian birds. In *Illustrations* it is *Mimeta viridis*, the name used also by Gould in the *Handbook* (1965), as well as ‘New South Wales Oriole’. By then, Gould was able to write of the genus, ‘This form is merely an offshoot from *Oriolus* ...’

In *Illustrations*, Captain Phillip Parker King, son of Governor King, is quoted discussing whether the specimen belonged to the orioles or honeyeaters. The curious feature of the entry is the English name given, ‘Green Grakle’, which came from Latham, who had put the bird in the genus *Gracula*, with the mynahs.

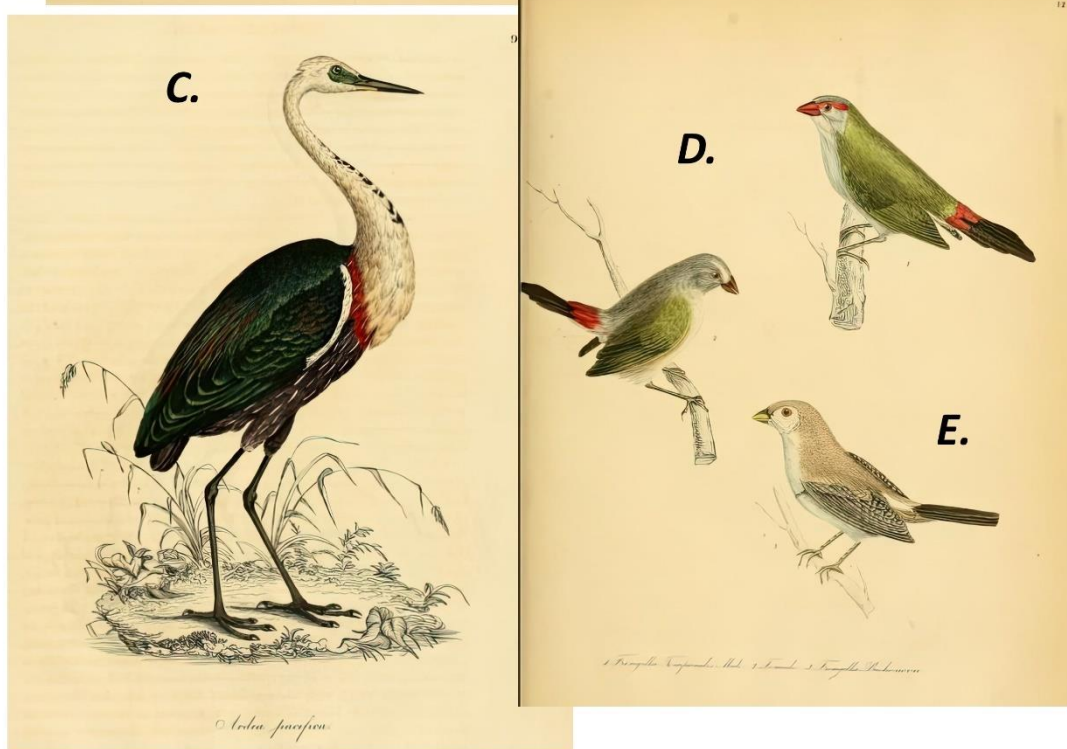
My remaining two examples from *Illustrations* (I. & J.) were labelled ‘Fly-catchers’ and placed in the genus *Muscicapa* as a way of associating them with known Old World species. At the time, William Swainson and John Gould were acknowledging some similarity of the group to the European Robin, but assigning it to a new genus, *Petroica*. The name ‘Robin’ was eventually adopted as the preferred English name, Gould being influenced by the name ‘the Colonists’ were using, as he had found on his visit to Australia in 1838-1840.

This pair of specimens also shows how the namers of the time were attracted to eponyms. They were presented as *Muscicapa Lathamii* Latham’s Fly-catcher and *Muscicapa Goodenovii* Goodenough’s Fly-catcher. The references to Latham are no longer current, but *goodenovii* survives in the scientific name of the Red-capped Robin. Samuel Goodenough (1743-1827) was Bishop of Carlisle and vice-president of the Royal Society when Joseph Banks presided. Mainly a botanist, he is also remembered in the plant genus *Goodenia*.

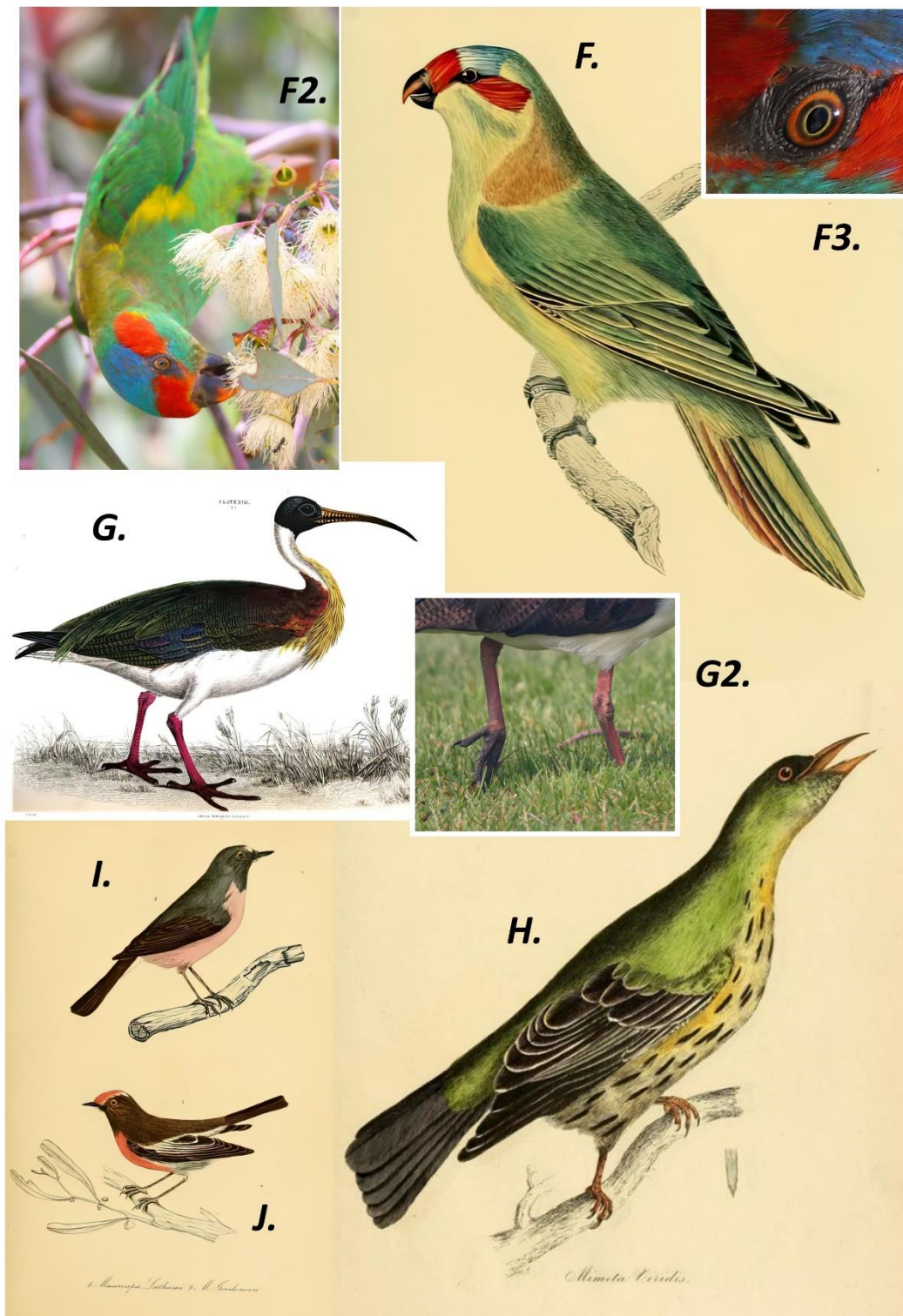
It seemed worth checking whether there was also a connection with Goodenough Island, in the east of Papua New Guinea. There is in a way. The island was named by Captain John Moresby in 1873 for Commodore James Goodenough, a grandson of the bishop.

The species shown, with current generally accepted names, are as follows:

A. Grey Goshawk *Accipiter novaehollandiae*; B. Hoary-headed Grebe *Poliiocephalus poliocephalus*; C. White-necked Heron *Ardea pacifica*; D. Red-browed Finch *Neochmia temporalis*; E. Double-barred Finch *Taeniopygia bichenovii*; F. Musk Lorikeet *Glossopsitta concinna*; G. Straw-necked Ibis *Threskiornis spinicollis*; H. live-backed Oriole *Oriolus sagittatus*; I. Pink Robin *Petroica rodinogaster*; J. Red-capped Robin *Petroica goodenovii*.



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***Birding in Cyberspace, Canberra Style: the artificial intelligence edition***

At present, it is hard to turn to any contemporary current affairs information source without seeing something about Artificial Intelligence (AI), particularly OpenAI's ChatGPT <https://openai.com/> and Google's Bard <https://bard.google.com/>. Your columnist has been using these tools for about six months, gaining some hands-on experience of their strengths and weaknesses. I thought that readers new to these resources might be interested in how AI is being used in birding and ornithology, and how the AI tools mentioned above can assist in exploring this topic.

Of course, we have all been using AI for some years. The mapping software in our phones and cars uses AI to get us from point A to point B. The virtual assistant who tries to help us when we call the Australian Taxation Office is AI. And we have been using AI in our phones for birding purposes for some years now: Merlin <https://merlin.allaboutbirds.org/> uses AI to identify the birds that we photograph, and BirdNET <https://birdnet.cornell.edu/> uses AI to identify bird species based on their vocalisations. And so on.

Perhaps a good way to start, if you are a new, every-day, non-expert (like me), user of the now readily available AI models ChatGPT and Bard, is to try out Microsoft's Bing app on your phone, or in the Edge web browser. Select the 'chat' option.

To initiate a conversation with the AI engine there (a 'chatbot') we type or dictate a prompt. The latest versions of these tools, particularly those on mobile phone apps, encourage users to interact with them as if we were having a conversation with a person. That said, the term 'prompt' has been used up to now for the information and requests that we input, expecting a suitable response from the AI tool.

I used the prompt 'How is AI being used in birding and ornithology?' ChatGPT provided a 347-word response (note that, in this case, I did not specify how many words, lines or pages I wanted the response to cover). The response read, 'AI is being increasingly used in birding and ornithology to enhance various aspects of research, conservation, and bird identification. Here are a few ways AI is being utilized in this field:' It then provided a paragraph on each of the following topics:

- Bird Identification
- Bird Behavior (*sic*) Analysis
- Bird Vocalizations (*sic*)
- Population Monitoring
- Habitat Monitoring
- Bird Conservation

and concluded that 'Overall, AI is proving to be a valuable tool in birding and ornithology, enabling more efficient and accurate data collection, species identification, behavior analysis, and conservation efforts.' That seems to be a reasonably accurate and comprehensive response to my question.

Want to check its sources? The Bing interface to ChatGPT provides them, so we can read further, including assessing the veracity of the sources that the model has been trained upon or, in the case of the Bing interface, information from a contemporaneous internet search as



well. (At the time of writing, OpenAI's direct interface with ChatGPT uses only the sources upon which it has been pre-trained, and they cover the period up to September 2021 only.)

I then prompted 'How will or might AI be used in the future in birding and ornithology?', with the response 'In the future, AI is likely to play an even more significant role in birding and ornithology. Here are some potential advancements and applications of AI in this field: What followed was a paragraph on each of these uses:

- Improved Bird Identification
- Automated Bird Monitoring
- Vocalization Analysis
- Conservation Planning
- Data Integration and Collaboration
- Augmented Reality and Birding Apps and
- Behavioral Studies

The model helpfully concluded that 'It's important to note that while AI has significant potential in birding and ornithology, human expertise and fieldwork will remain essential for accurate observation, data collection, and interpretation. AI should complement and support the work of researchers and birdwatchers rather than replace them.'

One of the uses to which I put ChatGPT is summarising. In my experience, it is able to produce quite accurate summaries of lengthy documents and, interestingly, of YouTube videos, podcasts (i.e. audio files), etc. Accordingly, I provided the prompt 'Summarise this podcast <https://www.scienceofbirds.com/podcast/artificial-intelligence-in-bird-research>'. It is a 52-minute podcast on the topic 'Artificial Intelligence in Bird Research' at the Science of Birds web portal. ChatGPT returned a 226-word summary. I then prompted it to provide a 100-word summary instead, and this is what it produced:

The podcast discusses the use of artificial intelligence (AI) in bird research. AI algorithms can analyze bird vocalizations, track migrations, and aid in conservation efforts. By identifying species and individual birds through vocalizations, researchers can monitor populations more effectively. AI algorithms can also predict migration patterns by analyzing satellite data and weather information. Drones and cameras powered by AI can monitor habitats, identify threats, and provide data for conservation efforts. AI fosters collaboration among researchers and enables the development of large-scale databases for studying bird behavior and conservation globally. Overall, AI enhances the speed, accuracy, and scale of bird research, benefiting understanding and conservation efforts.

We have all heard about how these AI tools can be used creatively. They can produce works of art, compose music, compose love letters, write film scripts, and so on. I prompted Bard to 'Compose a 5 line poem on the bird Australian magpie in the style of poet Judith Wright'. The response was, to me, atrocious:

Black magpie on the fence, caw, caw, caw, your song is dense.  
 You sing of freedom, joy, and all the things we long to enjoy.  
 But then you turn and bite, and leave us all feeling quite bereft.  
 Black magpie, you are a mystery.

I tried it in Bing/ChatGPT, with this result:

Along the road the magpies walk with hands in pockets, left and right.  
They tilt their heads, and stroll and talk.  
In their well-fitted black and white.  
They look like certain gentlemen who seem most nonchalant and wise.  
And yet they sing as blithe as light, as free as winds, as gay as skies.

Better than Bard's, though I think I'll stick with Judith Wright's own poetry!

Of course, as the mass media reported in May this year, there are many expert scientists in the AI field, and other prominent community members, who have expressed concern about the current and potential uses and misuses of AI. Some have called for a moratorium on further development until regulatory frameworks have been put in place, whereas others have argued forcefully that AI could cause another mass extinction event for our planet. Those who argue for better regulation are certainly on the right track, in your columnist's view, but those calling for a halt in the development of AI seem to be following in the footsteps of King Canute and the tide!

*T. alba*

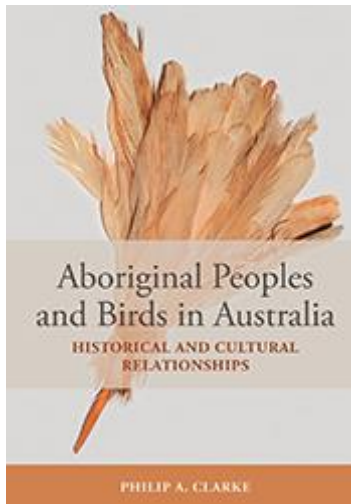
This column is available online at <http://canberrabirds.org.au/publications/canberra-bird-notes/>. There you can access the web sites mentioned here by clicking on the hyperlinks.  
To join (subscribe to) the *CanberraBirds* email discussion list, send an empty email message to [canberrabirds-subscribe@lists.canberrabirds.org.au](mailto:canberrabirds-subscribe@lists.canberrabirds.org.au).  
To unsubscribe, either permanently or temporarily, send an email message to [canberrabirds-unsubscribe@lists.canberrabirds.org.au](mailto:canberrabirds-unsubscribe@lists.canberrabirds.org.au). If you wish to re-subscribe after being unsubscribed temporarily, simply follow the 'subscribe' instructions above.  
The *CanberraBirds* list's searchable archive is at <http://bioacoustics.cse.unsw.edu.au/archives/html/canberrabirds>.

## **BOOK REVIEWS**

*Canberra Bird Notes* 48(1) (2023): 59-62

***Aboriginal Peoples and Birds in Australia: Historical and Cultural Relationships.*** By **Philip Clarke.** CSIRO Publishing. 2023. ISBN: 9781486315970. Softcover, 344 pp with bibliography and index. RRP Au\$59.99.

Reviewed by **DAVID MCDONALD**, Wamboin, NSW 2620 ([david@ dnmcdonald.id.au](mailto:david@dnmcdonald.id.au))



When I received the invitation to review this book, my first reaction was to wonder if the author is an Aboriginal person? This is because I have had a long career as a researcher, policy worker, and academic in the disciplines, not of ethnobiology, but of Aboriginal health and criminal justice. As a result, I am acutely aware of the challenges that non-Aboriginal people face in researching and writing about Aboriginal culture and related matters.

We researchers/academics have a long, and deeply blemished, history of taking knowledge from Aboriginal people, but not of properly acknowledging its source, and failing to adequately use what we have learned to contribute to the well-being of our Aboriginal informants. We have also been quite poor at collaborating with Aboriginal knowledge-holders, and

confirming that we have correctly understood information and insights that they were willing to share with us.

The author of this book, Philip Clarke, ‘is a consultant anthropologist working in native title and Aboriginal heritage. With a background in both science and anthropology, his research interests are focused on the ethnosciences, in particular Australian ethnobiology and ethnoastronomy’, to quote the book’s publisher. Apparently, he is not of Aboriginal descent.

The book demonstrates that its author is acutely aware of his responsibilities in discussing the topic of Aboriginal peoples and birds. Clarke explains why he wrote the book:

Across the world, it is widely recognised that indigenous systems of environmental knowledge, along with the associated practices of local communities, are critical in maintaining the biological and cultural diversity of the planet. The continuity and dynamism of this knowledge is threatened by ongoing globalisation, harsh government policies, capitalism and colonialism. Rapid environmental changes interfere with the relationships that indigenous communities have historically possessed with the landscape. According to an international group of ethnobiologists, ‘the foundations of these knowledge systems are compromised by ongoing suppression, misrepresentation, appropriation, assimilation, disconnection, and destruction of biocultural heritage’. It is largely in response to this situation that I wrote this book on Aboriginal relationships with birds (pp. 266, 268).

In his introduction, Associate Professor John J Bradley, Acting Head, Monash Indigenous Studies Centre, Monash University, points to the diverse values of this book. Reflecting on

the difficulties of conducting research in this domain, Bradley emphasises that ‘... such research opens up ways to reengage and understand the place of Indigenous knowledge in Australia. Therefore, such books as this one in regard to birds are an important contribution to such knowledge...’. Importantly, he goes on to emphasise that this book is not for non-Indigenous audiences only:

Increasingly, Australia wide, Indigenous peoples are reading such texts as this in an attempt to revivify cultural practice and knowledge as well as research for language and information relating to various species and country. Such knowledge too increasingly finds its way in Native Title conversations and more general discussions about the knowledge of ancestors. As such, documentation of the kind found in this book needs to be cognisant of such uses and employ ways of writing and documenting that breaks the colonial nexus that is all too often apparent in the archives in academic writing (p. v).

While I will not speak for Aboriginal readers, I found the book to be an excellent piece of work. The author writes very clearly. He provides quotations from the literature of diverse disciplines, not only anthropology and ethnobiology, to substantiate and illustrate the points he is making. He also refers in some detail (and very usefully) to insights that he gained from his own anthropological fieldwork over the decades.

The structure of the book works really well. It follows a consistent, predictable approach which helps the reader to both navigate the book and to assimilate the substantial amount of detail provided therein. In the introduction and first chapter, Clarke provides a useful overview of concepts and language that may not be familiar to all readers, such as Indigenous knowledges, Indigenous cultural knowledge, Indigenous and local knowledge, traditional ecological knowledge, etc. He also explains the taxonomy of the disciplines of ethnology, ethnobiology, and ethno-ornithology: useful scene-setting. Each chapter concludes with a couple of paragraphs that highlight the main points covered.

The bulk of the book is in six chapters, each dealing with a different aspect of Aboriginal peoples and birds. Following the introductory chapter, chapter 2 deals with ‘Birds as ancestors’, focussing upon Aboriginal myths (he discusses the use of the ‘myth’ construct, and uses it respectfully) and stresses the importance, to Aboriginal people, of birds as totemic beings.

Chapter 3 deals with ‘Birds as creators’, reflecting the fact that, across Australia, birds play prominent parts in creation myths. This is particularly so with respect to the Wedge-tailed Eagle, crows and ravens, and Emus and Brolgas. Indeed, ‘... it was almost universally believed across Aboriginal Australia that during the creation bird ancestors caused the property of fire to escape into Country, from where people could obtain it by using firesticks’ (p. 234). An underpinning theme of the chapter—indeed of the book as a whole—is the three-way, deep relationships between the people, the bird species, and the country.

Chapter 4 deals with ‘Birds and the spirit world’. The author deals separately with birds as spiritual beings and birds as totemic spirits. He explains that ‘... birds are seen as mediating the connections between the lived world of humans and the spirit world ... From an Aboriginal perspective, the observable display of birds’ innate intelligence makes them likely candidates as spirit beings. Western scientists have more recently begun to appreciate that birds possess cognitive and social abilities which earlier generations of researchers had thought were uniquely human’ (pp. 78-9).

Chapter 5 deals with the fascinating topic of ‘Bird nomenclature’. Clarke points out that ‘This book takes an ethnoecological approach to ethnoclassification, which strives to understand and explain ecology as it is experienced and imagined by Aboriginal people ... In Australia, the study of plant and animal classifications provides deep insights into Aboriginal views of the world ... [and] it is apparent that the common English definition of “bird” does not have an equivalent term in most of the better recorded Aboriginal languages’ (pp. 85-6). For example, in some places Emus and Cassowaries are not treated as birds, whereas bats and some flying insects are classified with the flying birds. Aboriginal bird nomenclature is an important aid—albeit a potentially tricky one—to understanding the pre-European distribution of Australian birds, including those that are locally extinct.

Chapter 6 deals with ‘Early hunting and gathering’. Clearly, the environmental knowledge that Aboriginal peoples had, and in many places still have, is incredibly wide and deep. Birds were a major source of food across most of Aboriginal Australia. The author presents detailed information on Aboriginal peoples’ foraging for birds, eggs and nestlings; collecting; stalking; swimming; Emu drives; hides; lures, calls and decoys; charms and rituals; snares and traps; netting of birds in flight; and the use of poisons to obtain birds for food.

Chapter 7 is ‘Birds working with people’. Considering the importance of birds to Aboriginal people as being the ancestral, creation entities that shaped the world as we see it now, it is not surprising that the book places emphasis on their perceptions and day-to-day experiences of birds working with people. Substantial examples are given of birds controlling sea incursions and floods, being used to forecast the weather and seasonal changes, providing intelligence as to what is happening on country, operating as ‘firestick farmers’, helping people to collect and find food, and contributing to amusements.

Chapter 8 is concerned with ‘Food and medicine from birds’, specifically the methods of cooking birds, and their use in health care/medicine, both preventive and remedial. Emu oil was particularly important in this regard and, of course, has long been used by non-Aboriginal people for medicinal purposes.

Chapter 9 is the penultimate one; it deals with ‘Material culture’. Clearly, birds contributed, and still do, in substantial ways to the material culture of Aboriginal peoples across the nation. This included the use of feather objects, sinews, skins, intestines, eggshells, bone, bills, claws, and oil. All parts of the bird’s body were useful for food or for making other material objects.

Chapter 10 is the final one, the book’s ‘Conclusion’. It essentially constitutes an eight-page summary of the whole book. The author highlights how the *structure* of Indigenous knowledges should be considered separately from their *content* and how, in many parts of the nation, much of the Indigenous knowledge content has been lost, but the structure of Indigenous knowledges is retained.

Bound into the book is a section comprising 32 pages of colour plates. At first glance, I thought these were merely illustrations, but on reading the captions to the photographs I realised that this is an important part of the book. The author uses the images as a basis for succinct summaries of many of the key points dealt with, in some detail, in the text of the book. It works really well as a pedagogical device.



This book is not for you if you are looking for detailed information specific to the settled south-eastern corner of the continent. This reflects the fact that most of the data that it uses, particular from anthropological and ethnobiological research, come from parts of Australia where traditional cultures are, or were, more intact than in our region. That said, however, a strength of the book is that it highlights the commonalities, the generalisations, that can be identified about Aboriginal peoples and birds across our diverse continent. I highly recommend this book to all those who wish to deepen their knowledge and understanding on the topic.

*Canberra Bird Notes* 48(1) (2023): 62-XXX

***Quail, Buttonquail and Plains-wanderer in Australia and New Zealand (2023). By Joseph M. Forshaw, illustrated by Frank Knight.*** CSIRO Publishing, Melbourne. May 2023, ISBN: 9781486312597, Hardback, 200 pp., RRP Au\$170.00.

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



This book is the latest in a long line of beautifully illustrated monographs by Joseph Forshaw, which began way back in 1969 with *Australian Parrots*. Most of the earlier works were illustrated by the late William T. Cooper, more recently Forshaw has worked with Frank Knight whose artistic credits include field guides on birds, mammals and frogs, and publications on prehistoric animals. The book discusses three disparate, but morphologically similar groups of birds, and covers all native species as well as two introduced ones. The inclusion of New Zealand is welcome, although it only

adds two species to the list of those covered, one of which is a barely surviving introduction, the other an extinct native.

The author states in the preface that the book was prepared as a comprehensive reference work, and as such is effectively an update of the information in HANZAB (Marchant and Higgins 1993), as noted by David Baker-Gabb in his thoughtful foreword. Forshaw mentions studies initiated by CSIRO Division of Wildlife Research chief Harry Frith, of Stubble Quail in particular, but including most other species. Frith was apparently working on a monograph, but his untimely death meant the project was never completed, and Forshaw has written the present volume with Frith's pioneering work in mind.

The book begins with a preface which discusses the rationale for the book and provides a summary of what is included in each section, followed by acknowledgements. Then comes a six-page introduction which discusses each group's characteristic features and classification. True quail are in the order Galliformes, which includes pheasants, partridges, guineafowl and other gamebirds as well as megapodes. Buttonquail and the Plains-wanderer both belong to the Charadriiformes, although they occupy different lineages. Buttonquail are in the suborder Lari, the same branch as gulls and pratincoles amongst others, although they are a discrete and very distinctive family of their own. The Plains-wanderer is included in the suborder Charadrii with sandpipers and relatives, although it is quite unique, and is placed in its own single-species family, with its closest living relatives thought to be the South American seedsnipes. Also in the introduction is a section on status and conservation

which is an overview of these issues, with a focus on introductions, hunting and species of conservation concern.

The bulk of the book consists of detailed accounts of each species. These vary in length from five pages for the extinct endemic New Zealand Quail and the Bobwhite (introduced not very successfully to New Zealand) to twenty-five for the Stubble Quail, a species of commercial interest and the subject of extensive studies in the 1960s and '70s. The unique Plains-wanderer gets sixteen pages, in part a reflection of the considerable effort that has gone into researching the species for conservation purposes. Each account contains a description of physical attributes with details of plumage and soft parts including any sexual and age-related differences. Then follow sections on distribution (including a map), subspecies (where relevant), general notes, habitats and status, movements (including banding data), habits, calls, diet and feeding, breeding, eggs (including a photograph of at least one clutch from a museum collection), and aviary notes. The sections on movements, diet and feeding, and eggs often contain data presented in tables, where this is extensive enough to warrant it. This is particularly evident in the account of the well-studied Stubble Quail. The general notes section includes historical observations and more recent field notes, and for me was perhaps the most interesting reading. Much of the material here (as well as other sections) involves direct quotes from many observers across the years. We can be thankful that T.H. Potts published his first-hand knowledge of the New Zealand Quail in the 1870s, some of which you can read here. Forshaw has incorporated a tremendous amount of information into these species accounts, based on both published and unpublished information, and including records gleaned from online sources such as eBird. Many of the aviary notes include his own, apparently previously unpublished, data. For some species much of what we know about breeding, displays and other behaviour, and age-related plumage changes comes from observations of captive birds.

The book is as up to date as can be expected, including for example the first ACT record of the Red-backed Buttonquail from March 2022. Quite a few of the species covered are poorly known, with the most enigmatic of all undoubtedly the Buff-breasted Buttonquail. Forshaw considers that there have been no unequivocal (photographic or specimen) records since the 1920s, based in part on the work of Patrick Webster who has recorded only Painted Buttonquail at supposed Buff-breasted sites (Webster 2022), and that many (though not all) sight records from recent decades may be based on incorrect identifications. This research has apparently been controversial in some quarters, although other observers have taken the step of withdrawing historical records they consider they can no longer be certain of (Leseberg and Watson 2022). The historical accounts of this species make very interesting reading. Evidently it was not quite so hard to find in the past.

The text is nicely enhanced by Frank Knight's paintings. Each species account has field-guide type illustrations of adults of each sex, a bird in flight, and of downy young. The latter are often overlooked so their inclusion here is welcome. For each species there is also a more artistic full-page painting of a pair of adult birds in typical habitat. Other illustrations include an early nineteenth century drawing of a male King Quail attributed to then Governor William Bligh, and another from the same era depicting a Painted Buttonquail by the 'Port Jackson Painter'. The extensive Plains-wanderer section is enlivened by a series of four photos, taken in 1938, of a nest found by T. G. Souter on the Eyre Peninsula. Similar historical illustrations would have been valuable for other species.

The species accounts are followed by a general map of Australia (in the review copy this appeared to be missing most state borders and Melville Island was misspelt), and an extensive and very useful gazetteer. There are nine pages of references containing over four hundred entries, reflecting how thorough Forshaw has been in collating what is known about these birds. The volume concludes with a couple of short indexes.

The book is in oblong format, particularly effective for presentation of the full-page plates. The quality is reflected in the price: at \$170 it isn't cheap, and this could put off some potential readers. It is also available as an eBook which may be a less expensive option; details are on the publisher's website. Overall, this is another very fine and comprehensive publication from Joseph Forshaw, and anyone with an interest in these birds will profit greatly from reading it.

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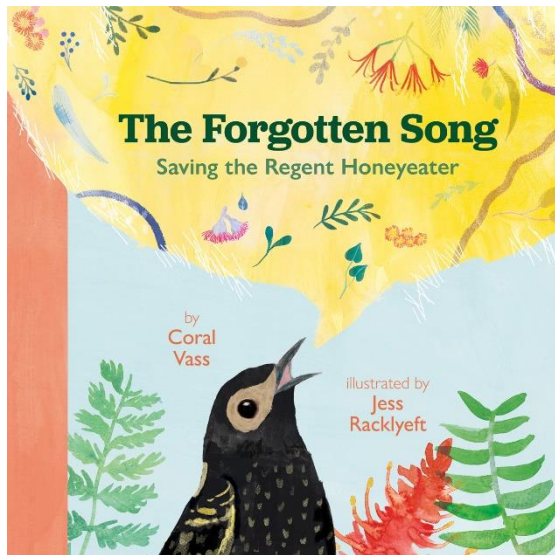
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Canberra Bird Notes 47(2) (2022): 65-66

**CSIRO Publishing has released two more books aimed at primary school children.**

Both reviewed by JANETTE LENZ, Lyneham, ACT 2604 ([lenz.michael.janette@gmail.com](mailto:lenz.michael.janette@gmail.com))

**The Forgotten Song – Saving the Regent Honeyeater. By Coral Vass, Illustrated by Jess Racklyeft.** CSIRO Publishing April 2023 ISBN: 978148631403 hardback, 32pp, RRP Au\$24.99. Also available as an eBook.



The endangered Regent Honeyeater is a species often followed by local bird-watchers as Capertee Valley in NSW is a well-known site for both resident and released birds.

This book, for children aged 5-9, gives an easily accessible understanding of why the birds' numbers diminished so much and what is being done to help.

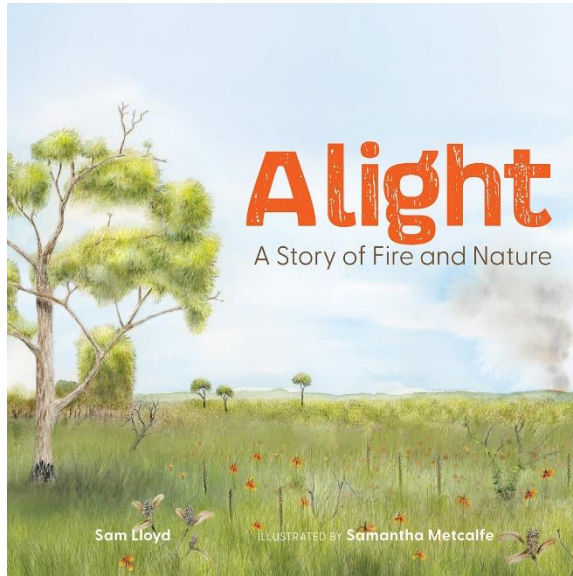
Simply, Honeyeater numbers had fallen so low that new males could not find older males and learn the mating song: "Regent's father had learnt the song from his father. Who learnt it from his father too. Soon it would be Regent's turn to sing their ancient song."

But with the encroaching urban environment, there is no other male around to teach him. Regent tries to mimic other birds, but only when he hears a "sweet song coming from the box a ranger has placed in a tree"], does he "bob his head up and down and whistle and warble the melody" to attract the "most beautiful bird Regent had ever seen".

The clearly written text and delightful illustrations, which collage older photographs and paintings among Racklyeft's own vibrant watercolours, are augmented in the last pages by details of the Regent Honeyeater. Included is a Glossary and a timeline to 2020 on the history and recent efforts to teach captive birds their species' song before they are released into the wild. The 25x25cm. size and hard- cover format are ideal for primary school students. Teacher Notes are also available free to download from the CSIRO Publishing website.

A recommended book for thoughtful children.

***Alight – a Story of Fire and Nature.* By Sam Lloyd, Illustrated by Samantha Metcalfe**  
CSIRO Publishing June 2023 ISBN: 9781486315468 hardback, 32pp RRP Au\$24.99. Also available as an eBook



Fire is a natural part of the Australian bush and many plants and whole eco-systems rely on processes of adaptation.

A serious subject, and one which all young Australians should understand, whether they live in the country or the towns and cities.

The book blends non-fiction facts of fire and its place in Australia's natural systems with a story of 5 main 'characters': Old Eucalypt; Wallum Banksia; Christmas bells; Wallum Sedge Frog and Antechinus. Each reacts to a planned ('prescribed') fire according to their own survival strategy. After the following rains, other animals and plants

appear. They also rely on the revival of burnt areas.

The illustrations are layered, just like the text, and will appeal to young readers who will find more and more in each page's accurate tapestry. The recommended age is 6-9 years.

A more detailed explanation and discussion is at the end of the book. Teacher Notes are also available free to download from the CSIRO Publishing website.

This book has a lightness that informs, rather than frightening young children, who will gain an appreciation of the complexity of fire in the Australian environment.



## **RARITIES PANEL NEWS**

Perhaps the most “unusual” of the unusual species recorded here was the Comb-crested Jacana, recorded by Rainer Rehwinkel at Rowes Lagoon on 29 January 23, and subsequently by many. A tropical species which rarely ventures further south than NE NSW, it was quite a surprising find, but unmistakable with its red comb, broad black breastband and black underwings. One Panellist thought the bird may have been a female, given its relatively large size.

Somewhat less unexpected was the immature Spangled Drongo in the ANBG in May. It was photographed by Simon Pelling and recorded on ebird checklist S135784068, and subsequently recorded by many over the next three days. It seems there were many south coast records of this species during their reverse migration in autumn.

The vagrant Purple-crowned Lorikeets turned up again in the ACT in February after a period of some years, this time obligingly in the grounds of a café and were much recorded and photographed over a few days. There have been consistent records over the years from the southern Riverina, possibly the source of our birds. The Pale-headed Rosella was observed and photographed over a few days, in company with Crimson and Easterns, in a back yard in Fraser and was deemed by the Panel to be an escapee.

Then came the honeyeaters. The Spiny-cheeked is a bird of inland Australia and this one on the Mulligans Flat border track was thought to be a dispersing juvenile, with its yellow cheek stripe.

After the Blue-faced Honeyeater breeding event in Acton Park in October 2022, this species is being recorded with increasing frequency in our area, and recorded breeding, so will no longer be classed as an “unusual” bird according to the Panel’s definition of fewer than 10 records of distinct individuals or groups over a reasonable timeframe in the previous ten years. Similarly the Brush Bronzewing has rebounded nicely (or is perhaps being recorded more consistently) and no longer qualifies as an “unusual”.

### **ENDORSED LIST 102, JUNE 2023**

**Comb-crested Jacana** *Irediparra gallinacea*

1; 29 Jan 23; Rainer Rehwinkel; Rowes Lagoon

**Purple-crowned Lorikeet** *Glossopsitta porphyrocephala*

1-2; 10-12 Feb 23; Shorty Westlin *et al.*; Bowen Park

**Pale-headed Rosella** *Platycercus adscitus*

1; 11 May 23; Jeffrey Nixon; Fraser – escapee

**Spiny-cheeked Honeyeater** *Acanthagenys ruficularis*

1; 19 Mar 23; Cedric Bear; Mulligans Flat

**Spangled Drongo** *Dicrurus bracteatus*

1; 2 May 23; Simon Pelling; Australian National Botanic Gardens

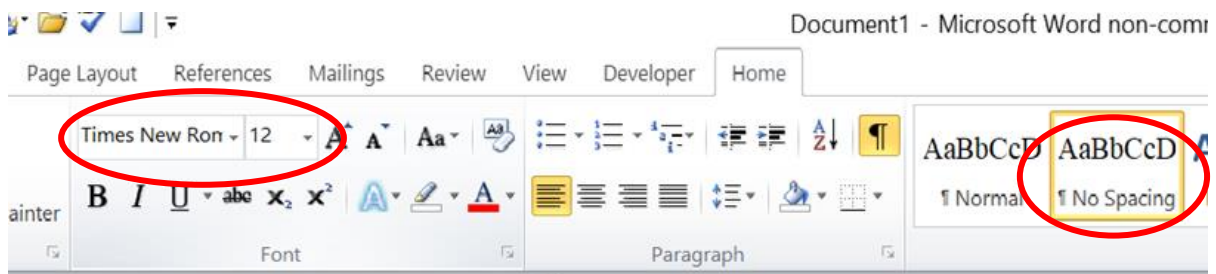
*Barbara Allan allanbm@bigpond.net.au*

## 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. Major articles of up to 5000 words are welcome on matters relating to the biology, 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](mailto:CBN@canberrabirds.org.au) or [michael.lenz.birds@gmail.com](mailto: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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