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**Front Cover:** Male Red-necked Phalarope in breeding plumage, Barrow, Alaska (R. Noske)

# CONTENTS

# Little Corellas *Cacatua sanguinea* feeding on fruits of the Grey Mangrove *Avicennia marina*

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## Abstract

A flock of Little Corellas was observed feeding on the propagules (fruits) of Grey Mangroves *Avicennia marina* that had washed up on Kakadu Beach, Bribie Island, in June-July 2022. They appeared to eat the seed encased by the large cotyledons covering the fruit. These observations constitute the first known record of this novel, natural food source being used by Little Corellas, which traditionally feed on the small seeds of native and introduced grasses.

## Introduction

Originally a species of arid and semi-arid parts of Australia, the Little Corella *Cacatua sanguinea* has undergone a massive range expansion since at least the 1950s, due to forest clearing and conversion of tall native grasslands to short pasture, and provision of water (Ford 1985; Higgins 1999; Cooper *et al.* 2016). During the 20 years between the first (1977-1981) and second (1998-2002) national Atlases of Australian birds, there was a 73% increase in reporting rates (Barrett *et al.* 2003).

In addition, populations have established in each of the eastern state capital cities, possibly originating from aviary escapees or deliberately released birds (Burgin & Saunders 2007; Cooper *et al*. 2016). Although the species traditionally feeds on the seeds of native and introduced grasses, supplemented by shoots, roots, and insects and their larvae (Higgins 1999), urban birds have been found to consume tree seeds more frequently, and the seeds, flowers and leaves of herbaceous plants less frequently than their non-urban counterparts (Temby 2010; Polly & Lill 2020; Spennemann 2023).

In Southeast Queensland, Little Corellas were first reported from Kogan and Jandowae on the Western Downs in 1958 and 1966, respectively, when severe droughts affected inland areas (Nielsen 1969). Early records from coastal Southeast Queensland include small numbers in Belmont and Indooroopilly in 1984 and 1985, respectively, and 43 birds at Hope Island, Gold Coast in 1985 (Palliser 1985; Niland 1986). It was first noted on the Redcliffe Peninsula in 1990 (Bielewicz & Beilewicz 1996).

## Observations and Discussion

On 12 June 2022, the first author observed a flock of 96 Little Corellas flying across Pumicestone Passage to the shorebird high tide roost and refuge area at Kakadu Beach (27°02’57”S, 153°08’03”E), Bribie Island. After landing on the beach, the birds were watched with the aid of a Swarovski 25 x 50 scope as they proceeded to feed on the fruits (or more precisely, propagules) of Grey Mangroves *Avicennia marina* that had washed up in large numbers there (Plate 1). They seemed particular about which fruit they processed, often discarding those that were presumably spoilt or unripe. The fruits were held in one foot while

the bill tore away the cotyledons to access the large seed (Plates 2, 3). Only a minute or less was needed to access each seed, before picking up the next fruit. Although tiny insects often infest the cotyledons of Grey Mangrove fruits (N. Duke, *in litt.*), it is unlikely that the corellas were targeting them as food, as fruits inspected outside the roost were largely free of insects and observations indicated the birds were devouring the seed.

Since the first observation, the corellas were photographed foraging in the tidewrack on Kakadu Beach on 25 June, 1 July, 12 July and 17 July 2022 (T. Burgess, pers. comm.). By the last day the birds were apparently picking out and chewing over partially eaten fruits as there were no fresh ones arriving with the high tides.

The fruit of Grey Mangroves is a flattened, roundish green capsule (20-25 mm in diameter) that consists of two large, fleshy cotyledons surrounding a single dark green seed, which often germinates on the tree, falls and disperses with the tides (Duke *et. al.* 1984; Duke 1990). During the fruiting season, the high tides wash up considerable numbers of these fruits which become trapped in the sea grass and tidewrack, making them easily accessible to crabs, sea turtles, and other seed predators (N. Duke, pers. comm.). In Moreton Bay, Grey Mangroves flower in late summer, and shed their mature fruits mostly from June to August (Davie 1982), which accords with their appearance in the tidewrack at Kakadu Beach during the period of our observations.

The Little Corella has been shown to readily adapt to foraging in new environments and exploiting novel food sources in urban Melbourne (Polly & Lill 2020). Studies of the closely related Tanimbar Corella *C. goffiniana,* both in captivity and on its native Indonesian island, demonstrate that it has sophistocated cognitive skills, learning how to use a range of new tools to exploit food sources (Auersperg *et. al*. 2012; O'Hara *et. al*. 2019, 2021). Our observations of Little Corellas on Bribie Island suggest that this flock has learned to exploit a novel food resource (mangrove fruits) in a habitat very different from the species' traditional habitat. Although the flock seen on the first day of observations arrived from the mainland, the species is known to be a very common breeding resident on the island, where it is presumed to have become established from aviary escapees (Ford 2013).

**Plate 1.** Part of flock of Little Corellas foraging in tidewrack, Bribie Island, 25 June 2022 (T. Burgess)

**Plate 2.** Little Corellas feeding on Grey Mangrove fruits, Bribie Island, 23 June 2022 (Terry Burgess)

## Acknowledgements

We thank Terry Burgess and Greg Harrison for additional information and photographs. Heather Janetski (Qld Museum), Greg Czechura, Jan Nargar and Norman Duke kindly commented on an earlier version of this manuscript.

**Plate 3.** Little Corella feeding on Grey Mangrove fruit, Bribie Island (Greg Harrison)

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# First record of New Caledonian Storm-petrel *Fregatta lineata* for Australia

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## Abstract

This note establishes that the first Australian record of the New Caledonian Storm-petrel *Fregatta lineata* was of a beach-washed specimen found in 1973, rather than sightings in 2010 as claimed in recent literature. The confusion has arisen from misidentification of the 1973 specimen, which was originally identified as a Black-bellied Storm-petrel *F. tropica*.

## Introduction

Until recently the taxonomy, distribution and status of the New Caledonian Storm-petrel *Fregatta lineata* were little-known (Bretagnolle *et al.* 2022). The species was first described in 1848 from a specimen collected in Samoa in 1839 (Peale 1848) but was not seen in the field until 2008 off southern New Caledonia. Initially identified as a New Zealand Storm-petrel *F. maoriana*, this bird and others seen subsequently in the same area were later thought potentially to be New Caledonian Storm-petrels (Collins 2013). In the field, *F. lineata* appears larger, longer-winged and longer-legged than *F. maoriana*, and has denser and bolder belly streaking (Collins 2013; front cover, Plates 1, 4). The white underwing panel of *F. lineata* is narrower than and not as clean-looking as *F. maoriana*, and its white rump patch is narrower and rounder (Bretagnolle *et al*. 2022; Walbridge *et al.* 2023).

The New Caledonian Storm-petrel is not known historically from Australian waters. Individuals of what was described as a "lost" species were first detected in Australia in 2010 (Menkhorst *et al.* 2017). Since 2011, however, the species has been recorded on numerous occasions off the Queensland and New South Wales coasts, with more than 170 individuals sighted during both inshore day trips and offshore Seamount trips from Southport, Gold Coast, South-east Queensland (Haass & Stephenson 2022; Walbridge *et al.* 2023). In April 2014, one individual was captured and it remains the only live bird to have been examined and measured in the hand (Walbridge *et al.* 2023).

## Earliest record

On 22 July 22 1973, I was conducting a patrol for beach-washed seabirds on North Stradbroke Island, south-east Queensland, with Chris Corben and Anita Smyth. Twelve kilometres south of Point Lookout on the ocean beach at low tide, I picked up a dead storm-petrel at the high tide mark. My notes at the time record it as having a diffuse sooty black line running along the mid-line of the white belly. We concluded it was a Black-bellied Storm-petrel *F. tropica*, though little was known about the status and distribution of this species in Australian waters at the time. The finding was published as the first record of Black-bellied Storm-Petrel for Queensland (Roberts 1973), although Storr (1973) had listed the species for the state on the basis of two museum specimens of uncertain provenance. It is now known to be a regular winter visitor to waters off the east Australian coast; in 2017 for instance, a total of 21 Black-bellied

Storm-petrels were seen during offshore sea-birding excursions off Southport between May and September (Walbridge 2019).

The North Stradbroke Island specimen was deposited in the Queensland Museum (QM 14391; Plate 2). However, during a visit to the Queensland Museum by V. Bretagnolle, the 1973 specimen was re-identified as a New Caledonian Storm-petrel and a photograph of the specimen was published (Bretagnolle *et al.* 2022); other observers agree with this identification. Bretagnolle *et al.* (2022) state that the museum visit took place in 2017 but in fact it was in January 2015 (P. Walbridge *et al.* 2023).

**Plate 1.** Left, New Caledonian Storm-petrel, Britannia Seamount, April 2014 (Brian Russell); right, New Zealand Storm-petrel, Hauraki Gulf, North Island, New Zealand, December 2010 (Raja W. Stephenson)


**Plate 2.** First Australian specimen of New Caledonian Storm-petrel, obtained in Queensland in July 1973 (David Stewart)

This note corrects the record on the first reported Black-bellied Storm-petrel for Queensland (Roberts 1973); this bird is now known to be a New Caledonian Storm-petrel. The first sightings of the New Caledonian Storm-petrel in Australian waters were made in 2010 off Port Stephens, then Ulladulla, New South Wales, followed in June 2011 with the first Southport bird (Menkhorst *et al.* 2017; Haass & Stephenson 2022; Walbridge *et al.* 2023). While the 2010 sightings remain the first known live sightings of the New Caledonian Storm-petrel in Australia, the first Australian record, and sole Australian specimen record to date, was obtained on North Stradbroke Island in July 1973. This is somewhat later than most records from Southport pelagic excursions, which cover all months between October and May, i.e. Austral spring and autumn (Palliser 2023; Walbridge *et al.* 2023).

The morphological differences between the four *Fregatta* Storm-petrels occurring in Australian waters are subtle, and care should be taken with their identification. Off Southport, the commonest species is the Black-bellied Storm-petrel (see above; Walbridge 2019), which lacks the streaks on the belly of the New Zealand and New Caledonian Storm-petrels, and often (but not always) has a black belly stripe (Plate 3). However, the White-bellied Storm-petrel *F. grallaria* (Plate 3) has also been recorded on sea mounts further out to sea. This species can be distinguished from the Black-bellied Storm-petrel by its sharply demarcated black bib, more extensive white on the underwing coverts, and shorter legs (N. Haass, *in litt.*).

**Plate 3.** Left, Black-bellied Storm-petrel, off Southport, South-east Qld, August 2014; right, pale morph White-bellied Storm-petrel *Fregatta grallaria,* Britannia Seamount, off South-east Qld/North-east NSW, March 2015 (Raja W. Stephenson).

## Acknowledgements

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**Plate 4.** New Caledonian Storm-petrel, 2 April 2023, Britannia Seamount (Paul Walbridge).

# Probable fungus on bower decorations of the Golden Bowerbird

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## Abstract

The Golden Bowerbird *Prionodura newtoniana* is endemic to the montane rainforests of the Wet Tropics, where it occurs above 700m above sea level. Males build a maypole type bower, typically adorned with "Old Man's Beard" lichen *Usnea sp*. At one bower we found an unusual, reddish-coloured substance attached to the lichen, which appears to be *Phaeotremella foliacea,* a known fungal parasite of *Usnea* lichen. We provide photographs of the fungus, and review ornithomycological associations with bowerbirds.

## Observations

In September 2019 we located a Golden Bowerbird bower on Mt Lewis (16.60°S, 145.28°E; 1,039 m asl). On 7 August 2022, we noted that the north-western side of the bower had an almost spherical, bright reddish-coloured gelatinous-looking substance attached to "Old Man's Beard" lichen *Usnea sp.*, the most common material used by this species to decorate its bowers (Frith & Frith 2004, 2008; Higgins *et al.* 2006). The material was ca. 5 cm in diameter. More of the material was present on the south-eastern side, where it was more widely spread, giving the impression it had been present for a longer period and had possibly disintegrated or been trampled upon.

By 13 August 2022 the bower had new reddish amorphous material on its south-western side (Plate 1). It measured ca. 4 x 2 cm and was incorporated into the root-like parts of the thallus of the lichen. The thallus was quite fresh compared to most of the other thallus material which was aged and can be seen in the background. On 2 October 2022, we noted three small spheres of similar reddish-coloured material, each measuring ca. 4 mm diameter (Plate 2). By 25 November, however, there was no presumed *Phaeotremella* fungus on the well-decorated bower, with a male in attendance, and by 7 March the bower lacked decorations.

A small fragment of the material was collected on 13 August, and mounted on a glass slide, stained with Congo Red and examined under a compound microscope. It was an amorphous, gelatinous substance containing hyphae with obvious clamp-connections indicating a fungal origin (Plate 3). No spores were located but there was a remnant of one basidium (the structure on which spores develop) which appeared to be septate – a cross-wall on a fungal thread. Based on gross morphology and microscopy, we believed the material to be the fruiting body of the fungus *Phaeotremella foliacea*, though a molecular analysis has not been undertaken.

*P. foliacea* is a known mycoparasite (a fungus that parasitises other fungi) (Spirin *et al.* 2018). Lichens are formed from a symbiotic relationship between a fungus and one or more algae species, and it is highly likely the *P. foliacea* was parasitising the fungal or algal component of the lichen (Plate 4).

**Plate 1.** Left, probable *Phaeotremella* fungus on lichen in the bower of a Golden Bowerbird; right, close-up, 13 August 2022 (Doug Herrington)

**Plate 2.** Probable *Phaeotremella* fungus growing on a Golden Bowerbird bower on 2 October 2022, showing variation in opaqueness (Doug Herrington)

**Plate 3.** Evidence of a fungal origin – a "clamp-connection" in the *Phaeotremella* specimen at 1000x magnification. (Barry Muir)

## Discussion

Apart from grey-green lichens (*Usnea sp*.), decorations in the bowers of Golden Bowerbirds may include the creamy-white flowers of jasmine, orchids and Silky Oaks, the creamy-white fruits of *Melicope* sp., and small green fruits (Chisolm & Chaffer 1956; Warham 1962; Higgins *et al* 2006; Frith & Frith, 2004, 2008). These bowers can persist for up to 20 years, possibly due to "sticks becoming fused together by…the action of a fungus ubiquitous in the sub-canopy…" (Frith & Frith 2004). Frith & Frith (2004) also refer to a clear, sticky, jelly-like tree exudate in the bower of a Golden Bowerbird. It is possible that this exudate refers to the same material we observed, i.e., *Phaeotremella* fungus, given that the latter varied in opaqueness, as shown in the right-hand photograph of Plate 2 in which some parts are much clearer than the rest of the mass and compared to other photographs.

Bowers of the "maypole" bower-building bowerbird species of New Guinea can also persist for up to 20 years, but there has been no suggestion that fungal elements bind their twigs together (Frith & Frith 2004, 2008). The Streaked Bowerbird *Amblyornis subalaris* and Vogelkop Bowerbird *A. inornatus* decorate their bowers with various fungi but these do not appear to be associated with lichen. The bowers of Macgregor's *A. macgregoriae,* Streaked, and Vogelkop Bowerbirds are also sometimes adorned with a "tree resin". In the latter species it has been described as "…amber-like resin of pandanus trees…" (Frith & Frith 2008). It is possible that this resin is referrable to the clear, jelly-like tree exudate on bowers of Golden Bowerbirds as described by Frith & Frith (2004), as well as the material we have observed, albeit the latter being mostly reddish in colour.

Male Golden Bowerbirds may store small, red wild pepper fruits (*Piper novae-hollandiae*) near their bower for later consumption (Frith & Frith 2004, 2008), but there are no records of these or any other amber or red objects on bowers as decorations. We found the *P. foliacea* fungus on only two more visits over 47 days of intermittent observation of the studied bower, but failed to find it on five other bowers on Mt. Lewis and elsewhere during the same period.

This is the first record of the reddish-coloured fungus (probably *P. foliacea*) on a Golden Bowerbird bower to our knowledge. The most likely explanation for its presence is that the male was visiting sources of *Usnea* that were host to *P. foliacea,* and inadvertently carried the fungus or its spores to the bower. We urge others to check for the presence of the fungus on bowers.

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**Plate 4** Male Golden Bowerbird at a bower (Doug Herrington)

# A review of records of Red-necked Phalaropes in Queensland, including northern Cape York Peninsula

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## Abstract

The Red-necked Phalarope breeds in the Arctic and Sub-Arctic region and migrates south to equatorial waters to feed at sea during its non-breeding phase. Of the 13 records of this species in Queensland, four were located at Lake Moondarra, Mt. Isa, and two at sea off Weipa in the Gulf of Carpentaria. We report up to three birds seen in three locations at the northern tip of Cape York over 13 days and suggest that their appearance was related to an extreme weather event. We urge birders visiting Queensland in summer to familiarise themselves with the appearance and habits of this species to ensure that it is not overlooked.

## Introduction

The Red-necked Phalarope *Phalaropus lobatus* breeds in the Arctic and Sub-Arctic regions, including Canada, Alaska, Siberia, Scandinavia, Europe and Greenland. After breeding, birds move to pelagic feeding grounds off the Peruvian coast (from North America), the Arabian Sea off Oman and South Yemen (from Europe and West Siberia), the Celebes Sea off southern Philippines, and south to the Moluccas, and east to the Bismarck Archipeligo off northern Papua-New Guinea (from East Siberia) (Saunders & de Rebeira 1987; Rubega *et al.* 2020).

The first record of this species in Australia was in 1962 at Werribee, Victoria (Saunders & de Rebeira 1987). Since then, it has been recorded reasonably frequently in all mainland states and territories other than Queensland where the first was noted in 1986 (Atlas of Living Australia 2023; Birdata 2023; eBird 2023). Here we document our observations of Red-necked Phalaropes at the tip of Cape York in 2014, and collate other Queensland records of the species from the literature and standard databases (Higgins & Davies 1996; Atlas of Living Australia 2023; Birdata 2023; eBird 2023). We also searched the "Birding Aus" archives website (Forsyth 2003) and "Cairns Birders Newsletter" (Phillips 2019).

## Observations

On 31 January 2014, the first author (RR) was conducting a bird survey at the Bamaga Water Treatment Plant (Bamaga WTP; 10.90°S, 142.39°E), when he noted a small grey and white shorebird which he had not seen previously. The bird was confiding, allowing observations and photographs at close range over 30 min (Plate 1). It was sitting high on the surface of the water near the edge of the pond, and swimming, moving erratically and thrusting its bill rapidly into the water in the "pump action" typical of phalaropes (Geering *et al* 2007; Hollands & Minton 2012). The bill was thin, straight and approximately the same length as the head, and there was a distinct black stripe through the eye which curved downwards. The crown had a broad grey stripe which continued as a tapering line down the hind neck. The back was darker grey with white edges on the feathers. It flew about 10-15 m twice, showing the white wing bar as it landed on the water again. While flying it uttered a short, reasonably high pitched "tserp".

On 1 February, a second bird was noted at Lake Wicheura (10.77°S, 142.56°E), a "perched lake" on the east coast 23.6 km ENE of the bird still present at Bamaga that day. It was standing on the mud on the water's edge with two Black-fronted Dotterels *Elseyornis melanops* which flushed whilst the Phalarope remained. RR was able to creep to within 4 m of the bird, noting its black legs and feet and watching it feed off surface insects in the mud. During a short flight, its white wing bar was noted. Upon landing on the water, it began swimming erratically and feeding but soon made a longer flight across the lake, during which it called every 2-3 seconds.

On 4 February two individuals were observed at Bamaga WTP, and immediately afterwards, a third bird was seen 5.9 km away, at Umagico Water Treatment Plant (10.90°S, 142.34°E). At least one bird was seen each day until 12 February, including one sighting of three individuals together (Table 1), but thorough searching after this time failed to find further birds. There were no noticeable plumage differences between individuals.

Excluding the above sightings, we found nine records of Red-necked Phalaropes in Queensland from 1986 to 2014, and three since 2014 (Table 2). All records pertain to single birds except our record of three in the Bamaga area, and two birds from Ayr (Plate 3), 88 km south of Townsville, during January-February 2014. There were no Queensland records of the species in either of the national atlases despite there being records from all other mainland states and territories (Blakers *et al* 1984; Barrett *et al.* 2003).

## Discussion

There have been relatively few sightings of Red-necked Phalaropes in Queensland compared to other states and territories of Australia. All of the 13 known Queensland sightings took place from October to April and four were located at Lake Moondarra, Mount Isa. Apart from the two records from Weipa, which involved birds seen at sea (Plate 2), all sightings were of birds in freshwater wetlands, as is typical of records in other parts of Australia (Higgins & Davies 1996; Saunders & de Rebiera 1987).

**Table 1.** Counts of Red-necked Phalaropes at three sites on northern Cape York Peninsula in 2014. WTP, Water Treatment Plant; –, not surveyed.

| Date | Bamaga WTP | Umagico WTP | Lake Wicheura |
|---|---|---|---|
| 31 January | 1 | – | – |
| 1 February | 1 | – | 1 |
| 2 February | 1 | – | – |
| 3 February | 2 | – | – |
| 4 February | 2 | 1 | – |
| 5 February | 2 | 0 | – |
| 6 February | 3 | 0 | – |
| 7 February | 1 | 0 | – |
| 8 February | 1 | 1 | 0 |
| 9 February | 1 | – | – |
| 10 February | 0 | 1 | – |
| 11 February | – | 1 | – |
| 12 February | 0 | 1 | – |

**Plate 1.** Red-necked Phalarope at Bamaga WTP, 31 January 2014 (Rob Reed)

**Table 2.** Records of Red-necked Phalarope in Queensland

| Year | Date | Location | Source* | Details |
|---|---|---|---|---|
| 1986 | 3 December | Lake Moondarra, Mt. Isa | ALA, Redhead (1988) | |
| 1988 | 8-22 October | Helidon, Southeast Qld | ALA, Britton (1990) | |
| 1991 | 25 December | Lake Moondarra, Mt. Isa | ALA, Britton (1992) | |
| 1994 | 25 January | Swan Bay, North Stradbroke Is. | ALA | |
| 2003 | 23-29 November | Lake Moondara, Mt. Isa | Forsyth (2003), eB, ALA | |
| 2010 | 11 February | Weipa | B. Bright (pers.com.), Bd, ALA | 23 km offshore |
| 2012 | 3 December | Bowra Station, Cunnumulla | eB, Bd,ALA | BQRAC (2019) #169 |
| 2013 | 22 October | Rinyirru (Lakefield) Nat. Park | eB, ALA | |
| 2014 | 3-12 January | Ayr | eB, Bd, ALA | 2 birds over 9 days |
| 2014 | 31 January to 12 February | Bamaga | Authors (eB) | 3 birds over 13 days |
| 2018 | 16 November | Lake Moondarra, Mt Isa | Whitehead (2018) | |
| 2019 | 21 April | Karumba wetlands | Phillips (2019) | |
| 2023 | 13 March | Weipa | B. Bright (pers.com.) | 42 km offshore |

*ALA, Atlas of Living Australia; Bd, Birdata; eB, eBird

Most sightings of the Red-necked Phalarope in northern Australia appear to be linked to cyclonic or other severe weather events. The first records in the Northern Territory were in January 1974, soon after the passage of tropical cyclone Fiona-Gwenda (McKean *et al* 1975; McCrie & Noske 2015). From 5 to 8 February 2014, up to 16 birds were noted in Darwin, an influx that was possibly related to severe weather in Indonesian waters following catastrophic cyclone Haiyan, which struck the Philippines in November 2013 (McCrie & Noske 2015). Perhaps not coincidentally, the Darwin records fall within the period of the authors' sightings at the tip of Cape York (Table 1). Between 10 and 23 January 2014, "Tropical Low 05U" formed within the monsoon trough in the Arafura Sea, and cyclone warnings were issued for parts of the NT and WA coasts. Rainfall totals for both Darwin and the tip of Cape York in that month were well above average for both regions (BoM 2014a, 2014b). We suspect that this monsoon trough originated in the Arafura, Banda and Timor Seas, where Red-necked Phalaropes occur regularly, resulting in their southward displacement to the Top End of the NT and Cape York.

**Plate 2:** Red-necked Phalarope off Weipa coast on 13 March 2023 (Ben Bright)

The two pelagic sightings in the Gulf of Carpentaria were 13 years apart, and made by a pilot boat operator and professional fishing guide who was resident in Weipa for 20 years. There have been few other pelagic sightings near the Australian mainland. However, on 27 October 2000, two groups of 70 and 33 individuals, respectively, were reported 20 minutes apart, about 55 km NNW of Onslow, Western Australia (Birdata 2023). There have been no sightings on pelagic birding tours in South-east Queensland since the first such tour was conducted in the late 1970s (P. Walbridge pers. comm., G. Roberts pers. comm.).

Cape York was rarely visited by birders during the wet season until 1986 when Klaus Uhlenhut became a full-time resident from April 1986 to February 1988, and much later, conducted "Cape York Bird Week" in the first week of January from 1990 to 2015 (K. Uhlenhut, pers. comm.). The first author resided in the area from 2008 to 2015, and subsequently, both authors have visited for a week each year in the months of December or

January. Thus observers have been resident during the wet season for only nine of the last 36 years. This lack of observers may explain why Red-necked Phalaropes have not been seen until relatively recently. Like others (e.g. Saunders & de Rebeira 1987) we suspect that the species has been overlooked in the past in Queensland.

We urge all birdwatchers to maintain a vigil for this species on both land and sea, and to submit records to appropriate databases and rarities committees (e.g., BARC, BQRAC) so that its status in Queensland may be clarified. The only species with which the Red-necked Phalarope is likely to be confused is the Red Phalarope *P. fulicarius* which is a very rare visitor to Australia with only one record from Queensland at Lake Mitchell in 2003 (BARC 2023). However, the former has broad white streaks on its grey upperparts whereas the latter is all light grey (Higgins & Davies 1996; Hollands & Minton 2012; Rubega *et al* 2020; Danny Rogers pers. comm.). In addition, the bill of the Red-necked Phalarope is fine, straight and tapering whereas that of the Red Phalarope is stouter and slightly shorter (Higgins & Davies 1996; Hollands & Minton 2012; Rubega *et al* 2020).

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**Plate 3:** Two Red-necked Phalaropes at Ayr on 3 January 2014 (Roger Mortlock)

# Predation of nestling Weebills by the Torresian Crow and Square-tailed Kite

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## Abstract

Nest predation is the major cause of nest failure in birds, but is rarely witnessed by human observers without the aid of cameras. I describe direct observations of the predation of two nests of the Weebill *Smicrornis brevirostris,* one involving a Torresian Crow *Corvus orru* and the other, a Square-tailed Kite *Lophoictinia isura*. This adds to the single previous documented record of Weebill nest predation, which involved a Pied Butcherbird *Cracticus nigrogularis*.

## Introduction

Nest predation is the major cause of nest failure in birds, both globally and within Australia (Ricklefs 1969; Martin 1993; Ford *et al.* 2001; Remeš *et al.* 2012; Guppy *et al.* 2017). Moreover, nest predation has been implicated in the long-term decline of several Australian bird species (Ford *et al.* 2009). While a large number and variety of nest predators has been reported, their relative or absolute role in nesting ecology is poorly understood (Major & Gowing 1994; Fulton & Ford 2001; Debus 2006; Fulton 2018). Data on predator identity mainly derives from four lines of evidence: direct observations, artificial nest experiments, analyses of stomach contents, and the deployment of cameras at natural nests (Fulton 2018). Direct observations of nest predation provide the most reliable and informative data on predator identity, but they are extremely rare and normally require large investments of time (Guppy *et al.* 2014).

The Weebill *Smicrornis brevirostris* is the most widely distributed member of the Australasian Warbler family (Acanthizidae), yet no detailed studies have been conducted on its breeding biology. Its domed nests are typically well concealed among foliage, though some have little or no cover (Plate 1). While studying a population of this species in Durikai State Forest, 39 km west of Warwick, southeast Queensland, I inadvertently recorded a case of nest predation by a Torresian Crow *Corvus orru*. In this paper, I describe this event, as well as an instance of a Square-tailed Kite *Lophoictinia isura* robbing a Weebill nest.

## Observations

On 11 September 2021 I discovered an active nest of Weebills near the boundary between Durikai State Forest and a wide railway corridor (28°11’40”S, 151°36’42”E; 512 m asl). The vegetation at this site was eucalypt woodland, dominated by Tumbledown Gum *Eucalyptus dealbata* and Narrow-leaved Ironbark *E. crebra*. The nest was situated among dense foliage ~1 m from the top of an 18 m-high Yellow Box *E. melliodora*, which was sparsely flowering. I set up a video-recording camera (Sony Handycam HDR-CX130) on a tripod ~10 m from the base of the nest tree to record behaviour at the nest, and started the video at 11:46 hrs. The video recorded for 140 min, stopping at 14:06 hrs, and the camera was retrieved later that afternoon. The video was subsequently downloaded as an MPG file (VLC) for analysis.

**Plate 1.** Two nests of Weebills at Durikai State Forest, showing variation in concealment (R. Noske)

During the 15 min prior to my starting the video, the behaviour of the Weebills indicated that they were brooding young nestlings. Birds were twice seen entering and remaining in the nest for over 1 min, but the area around the nest was too densely-foliaged to determine if the birds were carrying prey. In addition, strong winds persisted throughout the recording, with gusts blowing the nest area off the screen for ~70% of the video duration. Two minutes after the start, a Noisy Friarbird *Philemon corniculatus* arrived just below the nest, climbed rapidly upwards and immediately began to tug violently at the top of the nest. After 22 s, the Friarbird flew off with a small wad of whitish downy material.

After 2.1 h, an adult Torresian Crow flew into the top of the clump of foliage containing the nest, and after 65 s, flew off with the whole nest in its bill, as shown in a series of screenshots over 1 s (Plates 2, 3). An object next to the head of the Crow (Plate 2) seems likely to be one of the Weebills attempting to defend its nest. The Weebill(s) returned to the site and hopped around the remnants (~1 $cm^3$) of the nest 5.7 and 8.0 min after the event, and at least one more time before the video finished. A White-naped Honeyeater *Melithreptus lunatus* landed below the nest 20.3 min after the event, and after climbing to the nest remnants, flew off 12 s later, possibly with some nest material. The Weebills were last seen circling (11 s) the nest remnants 46 min before the video stopped, but additional visits may have been missed due to the effect of the strong winds on visibility of the nest area.

In 2005, I witnessed predation of a Weebill nest by a Square-tailed Kite in the Top End of the Northern Territory. On 20 July, while conducting a bird survey on Coomalie Farm (13°00’31”S, 131°10’00”E; 37 m asl), 70 km SSE of Darwin, I watched the Kite descend into the uppermost foliage of a 3.7 m-high Ironwood *Erythrophleum chlorostachys* sapling, whereupon it reached down and began ripping apart the nest of a pair of Weebills that I had discovered earlier that day. Soon the Kite flew off, possibly with a portion of the nest, and when I inspected the nest site immediately afterwards, I noted that the nest had been ripped open and was empty.

**Plate 2**. Video screenshot showing Torresian Crow flying with Weebill nest in bill. Object to left of Crow and behind nest is apparently Weebill harassing Crow in defence of its nest (R. Noske).

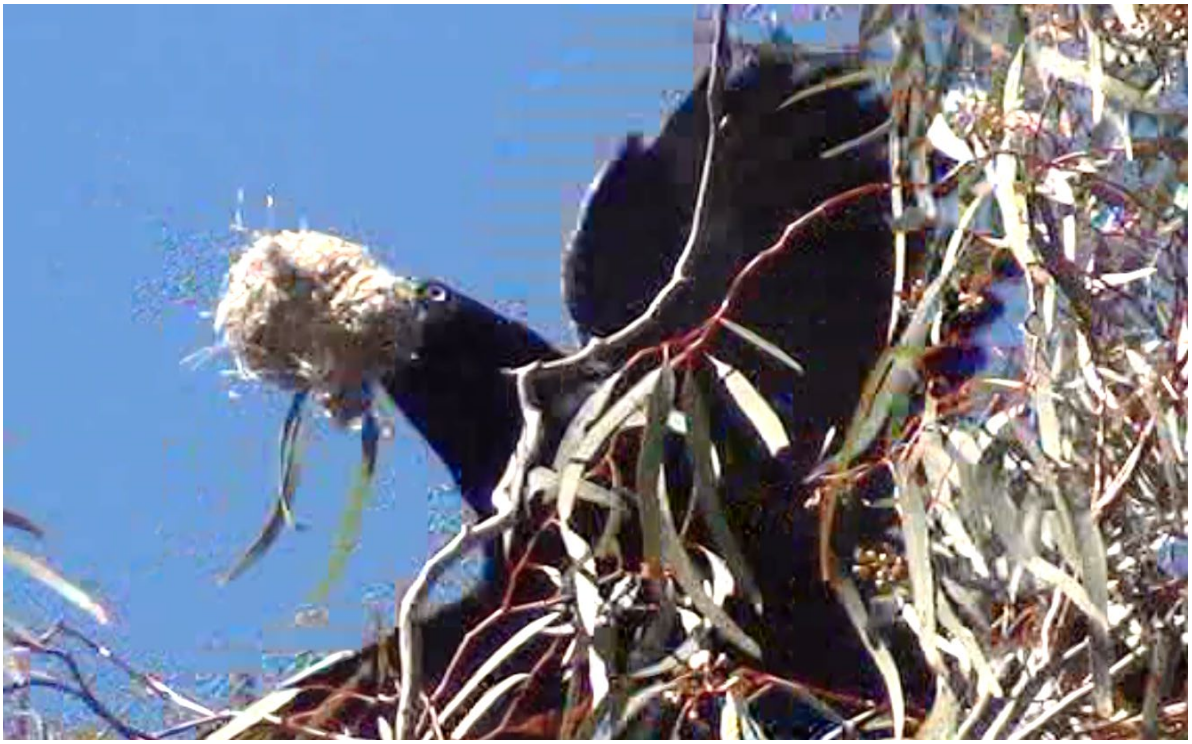

**Plate 3**. Video screenshot of Torresian Crow flying with Weebill nest in bill (R. Noske)

## Discussion

There are no known documented records of predation of Weebill nests in the literature, but the BirdLife Australia Nest Record Scheme contains an observation of a Pied Butcherbird *Cracticus nigrogularis* taking a nestling (Higgins & Peter 2002). Pied Butcherbirds are

renowned as predators of adult and nestling birds (Higgins *et al.* 2006), but my observation appears to constitute the second documented record of a passerine being depredated by the Torresian Crow. The latter species is omnivorous, feeding mainly on invertebrates and plant material, especially seeds, which comprised 43% and 31% by volume, respectively, of over 7,000 items found in the stomachs of 147 specimens collected at Jandowae, Southeast Queensland (Rowley & Vestjens 1973). The remaining 26% comprised the unidentified remains of vertebrates, mostly mammals. Nevertheless, Torresian Crows have been reported preying on the eggs and young of a cormorant *Phalacrocorax* sp., the eggs of Cattle Egrets *Ardea ibis* and an Australian Pelican *Pelecanus conspicillatus*, and a nestling Noisy Miner *Manorina melanocephala* (Rose 1999; Higgins *et al.* 2006). The adult Weebill is demonstrably smaller (nominate subspecies, 5.5-7.8 g; Higgins & Peter 2002) than any of the abovementioned species.

Although the Australian Raven *C. coronoides* co-occurs with the Torresian Crow in Durikai SF, the many calls heard during replay of the video left no doubt that the nest predator belonged to the former species. It is possible that the Crow was made aware of the nest by the Noisy Friarbird which stole nest material, though the latter incident took place 2 h before the nest was depredated. The theft of nest material by honeyeaters is common, but poorly documented, though Noisy Friarbirds have been reported stealing nest material from active nests of Regent Honeyeaters *Xanthomyza phrygia* and White-naped Honeyeaters (Ley *et al.* 1997).

In contrast to the Torresian Crow, the Square-tailed Kite is renowned as a predator of nestling birds of many species (Marchant & Higgins 1994; Debus 2017), including species as large as the Crested Pigeon *Ocyphaps lophotes* (Lutter *et al.* 2004) and Noisy Friarbird (Cameron 1976). Near Bundaberg, coastal southeast Queensland, 46% of the 240 items in pellets under a nest were small birds, mostly nestlings and fledglings, including passerines, and 36% were birds' eggs (Barnes *et al.* 2001). Studies in northern coastal New South Wales found nestling birds in 76-100% of pellets examined (Brown *et al.* 2000; Griffiths *et al.* 2002; Lutter *et al.* 2004). Discarded nests of a Silvereye, Grey Fantail *Rhipidura albiscapa*, Varied Sittella *Daphaenositta chrysoptera* and small honeyeaters have also been found under Kites' nests (Brown *et al.* 2000; Griffiths *et al.* 2002; Lutter *et al.* 2003; Robinson *et al.* 2016). All of the above refer to species with open cup-shaped nests, although Cameron (1992) found a wrecked domed nest of an Inland Thornbill *Acanthiza apicalis* under a nest of a Square-tailed Kite. These records suggest that Kites often bring both nests and their contents to the nest, rather than tearing open the nests to extract the chicks.

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# Breeding behaviour and nestling diet of Blue-winged Kookaburras *Dacelo leachii* on Magnetic Island, North Queensland

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## Abstract

The breeding biology of the Blue-winged Kookaburra *Dacelo leachii* has been well-studied in the Northern Territory (NT) but levels of provisioning to their young across the nestling period have not been documented and there is little relevant information from Queensland. We monitored the complete nest cycle of a pair of Kookaburras on Magnetic Island, North Queensland. Consistent with NT data, incubation and nestling periods were ~25 days and 39 ± 2 days, respectively. Tapping sounds indicated that four eggs hatched. The nestlings were fed relatively evenly throughout daylight hours, in contrast with the NT where they were rarely fed in the afternoon. The provisioning rate peaked during the middle (Days 17–25) of the nestling period. Of 273 nestling food items, 48.4% by number, and 74.9% by estimated volume, comprised reptiles, while 75 items (10.4% by volume) comprised arthropods. The male provided more prey items than the female, especially arthropods, but there was no difference in the daily volume of prey they delivered. Of the three fledglings, one disappeared within a few days of fledging, two remained with the parents for at least six months and one was seen with them 10 months post-fledging. As most Kookaburras in the NT breed in groups with helpers, further studies of the social organisation, breeding behaviour and fledging success of the species in a range of sites in Queensland would be useful.

## Introduction

The Blue-winged Kookaburra (BWK) *Dacelo leachii* is a very large kingfisher (38-41 cm), slightly smaller than its closest relative the Laughing Kookaburra *D. novaeguineae* (LAK), with which its range overlaps in eastern Queensland (Higgins 1999; Andersen *et al*. 2018). The sex of adult BWKs is easily identified by the colours of tail feathers (Plate 1). They defend year-round territories and territorial and breeding behaviours include displays of 'hole-showing', where one clings to the edge of a tree hollow (or similar site) and calls (Higgins 1999). Early notes on clutch size, nest sites and breeding season of the BWK in Queensland were made by collectors and observers in the late 19$^{th}$ and early 20$^{th}$ centuries (e.g. North 1901; MacGillivray 1914; Harvey & Harvey 1919), augmented by Thomson (1935) and Lavery *et al*. (1986). The breeding biology and behaviour of the BWK are reasonably well-known from a long-term study in Kakadu National Park (NP) in the Top End of the Northern Territory (Curl 2005), but rates of provisioning of young across the nestling period have not been documented, and there is no detailed information about its breeding behaviour in Queensland. Given differences in climate and habitats, and the presence of sympatric LAKs, BWK populations in eastern Queensland are likely to differ from the Northern Territory (NT) population in some aspects of their ecology and breeding biology.

**Plate 1.** Male (left) and female (right) Blue-winged Kookaburra (Susan Chisholm and Vincent Bugeja)

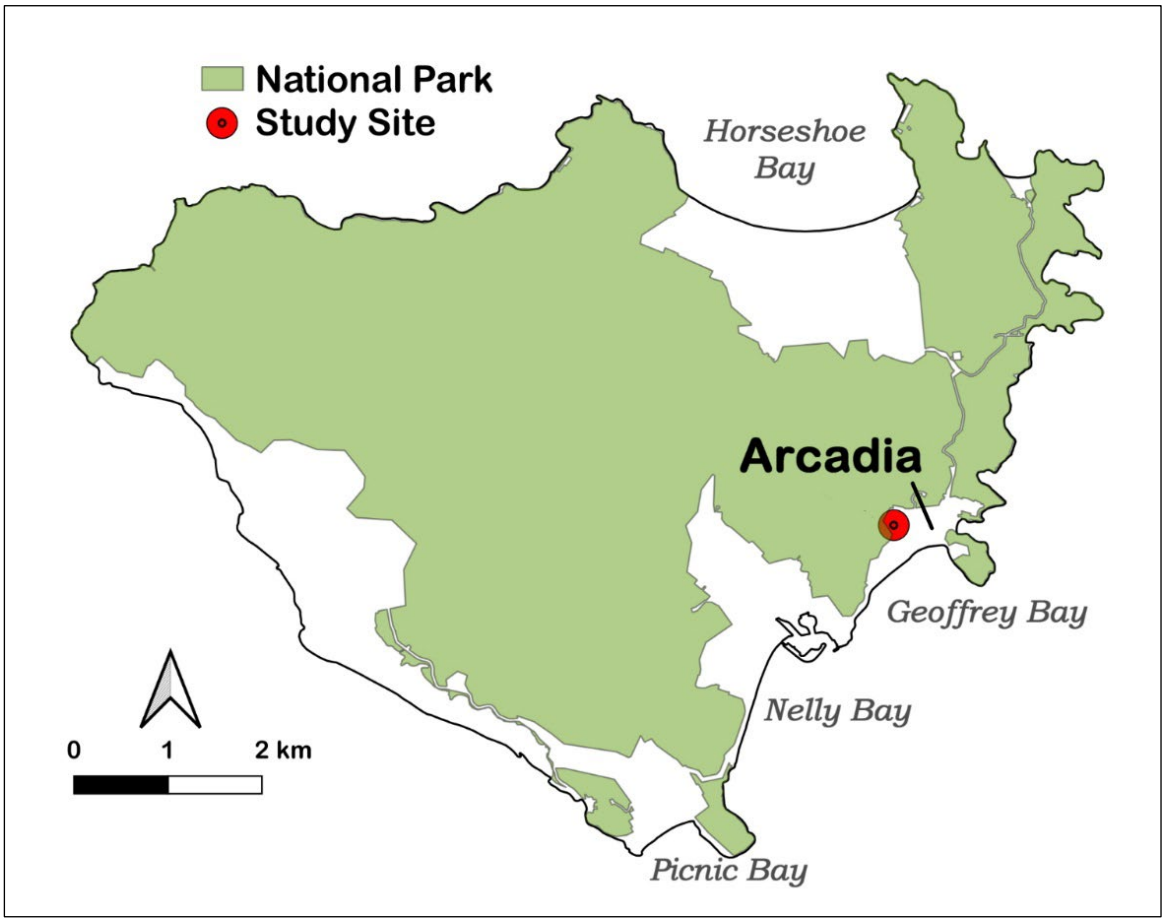



**Figure 1.** Location of study site in the village of Arcadia, Magnetic Island, North Queensland. The regional city of Townsville lies 8 km to the southwest of Picnic Bay.

## Study area and methods

The study site was an 802 $m^2$ block within a recent (~seven years) 5.5 ha residential subdivision in the village of Arcadia, Magnetic Island (19°9'S, 146°51'E; Fig. 1). Magnetic Island is a large (~5,100 ha) continental island within the Great Barrier Reef, located ~8 km offshore from the regional city of Townsville, North Queensland. The climate is monsoon-tropical with seasonal summer rainfall to 1,100 mm (BoM 2019). In the 1980s the resident human population of ~2,500 was concentrated on small lowland plains behind the four main bays (Porter 1983; ABS 1988). The BWK is a common breeding resident on the island, although less common there than the LAK (Wieneke 1988).

We resided in Arcadia from August 1985 to October 1988 and made opportunistic observations of both kookaburra species. A pair of BWKs was observed on our house block in all months, except after October 1987, when a group of three was recorded twice, in non-breeding seasons. In 1987–1988 we monitored breeding by a BWK pair close to the house, and in this paper summarise our observations of the provisioning and diet of nestlings, as well as an estimate of the incubation period. Observations of interactions with sympatric LAKs will be presented elsewhere.

The subdivision was in mixed *Corymbia* woodland (Class II-9, Sandercoe 1990; Regional Ecosystem 11.3.9, Queensland Government 2023) on a small coastal plain (20 m above sea level), with weathered gravelly soils on clay. By 1987 houses had been built on about 20 of the 60 blocks in the subdivision and most vacant land retained some original vegetation. Fragments of vine thicket occurred on a creek gully 50 m to the south, as well as on the focal and adjacent blocks. The ephemeral Petersen Creek, 110 m east of the site, was lined with large Weeping Paperbarks *Melaleuca leucadendra*, native figs and palms. The front garden was planted with native flowering shrubs, but the rest of the house block was left in its natural state, including twelve mature eucalypts.

From 30 October 1987 to 9 January 1988 a BWK pair nested in a tree hollow ~5 m from the (highset) house deck. We observed the birds from ~15 m to minimise disturbance, using a Tasco 853TR 15x–90x end-view telescope with tripod (usually set at 30x) and 7x20 binoculars. We did not record our periods of observation, but while the nest was occupied we moved all possible daily activities to the deck and avoided joint absences. Over 38 days of nestling feeding we were both absent on two days (Day 10 and Day 11) and on three days of heavy rain (Days 32–34) we went outside only if BWK calls were heard. We noted the food items and times of deliveries to the nest, sex of the parent bird, perches used, and interactions with other species. As the hatching order of chicks was unknown, 'first', 'second' and 'third' refer to fledging order. Reptiles were identified using Cogger (1983) and with advice from Queensland National Parks and Wildlife Service and experienced residents.

To estimate the size of prey items we kept a paper template on the outdoor table with dimensions of the body, tail and bill length of male and female adult BWKs. To assess the relative importance of each prey type (e.g. arthropods, frogs, reptiles) brought to the nest by the two parents, we used estimates of prey body length as a proxy for volume (Legge 1999) or mean body length for items that were identified to species (including tail for reptiles, if present). A nominal length of 25 mm, the length of the smallest item identified to species, was attributed to unidentified prey. In describing the size of prey we class items <10 cm as 'small', 10–49 cm as 'medium' and 50+ cm as 'large'. To investigate variation in provisioning contributions we calculated the mean number of prey delivered per day, and its total estimated length. The

nestling period was divided into five 7-day stages: (1) Days 1–7; (2), Days 8–9 and 12–16; (3), Days 17–23; (4), Days 24–30; and (5), Days 31–37. There were no observations on Days 10–11, and observations on Day 38 were combined with Day 37 for analyses. Although we did not feed the birds, the parents occasionally delivered 'barbeque food'. Despite following the birds on foot and by car, and advertising in the weekly community newsletter for information, we failed to locate the source of this unnatural food.

Statistical tests were conducted in Microsoft Excel. We conducted two-way analysis of variance (ANOVA) to compare the mean number of daily prey items and the mean daily total estimated length of prey provisioned per nestling stage by each parent. To reduce the effect of variability in daily records, data were square-root transformed before analysis. Following ANOVA, two-tailed t-tests (for equal or unequal variance as appropriate) were used for post-hoc tests between pairs of nestling stages. Chi-squared tests for goodness of fit were used to compare the numbers of each prey type provided by the male and female across all stages of the nestling period, and the numbers each contributed of the two main prey types ('arthropods' and 'reptiles') during the peak provisioning stage. Due to the small numbers of amphibian prey, they were combined with 'reptiles'. To identify important factors contributing to the Chi-squared results, we calculated standardised residuals and considered values of >|2| as significant.

Additional breeding records of BWK were provided by the Royal Australasian Ornithologists Union (now BirdLife Australia) Nest Record Scheme (NRS). Nomenclature follows the International Ornithological Congress (Birds Queensland 2021) for birds, and Jackes (2010) for plants. Queensland bioregions are as defined by the Queensland Government (2022). Sunrise and sunset times at Arcadia were obtained from Geoscience Australia (2022).

## Results

*Nest site, perches and stages of nesting*

The nest hollow (Plate 2) faced a clearing to the east and was 9 m from the ground in a branch of a Pink Bloodwood *Corymbia intermedia* that was ~20 m high (dbh, 23.1 cm). The male and female engaged in hole-showing behaviour during October, often flying between three perches (N1-N3, Plate 2) 3-4 m from the nest hollow, usually in the sequence N3-N2-N1. The male was seen feeding the female a number of times from 20 to 29 October, most frequently on a dead branch on the adjacent tree (S1, 7 m from the nest hollow; Plate 2). Perches N1 and N2 were used most often when the parents were changing-over during incubation, and when delivering food to the young, while S1 was frequently used after exiting from the nest. Food was only occasionally brought to the nest directly from other trees.

The period from the first sign of incubation to the first sound of intense tapping from the nest (presumed to be a chick hatching out of its egg) was 25 days (Table 1). The period from the first 'tapping' to the last was ten days and the time from hatching to fledging was estimated as ~37–41 days. The first young to fledge (Plate 3) dropped almost to the ground then flew up to a branch above S1, and was fed from S1 by both parents. It was larger than the second, which fledged two days later, while the third – which fledged five days after the first – was much smaller than either and disappeared several days after fledging.

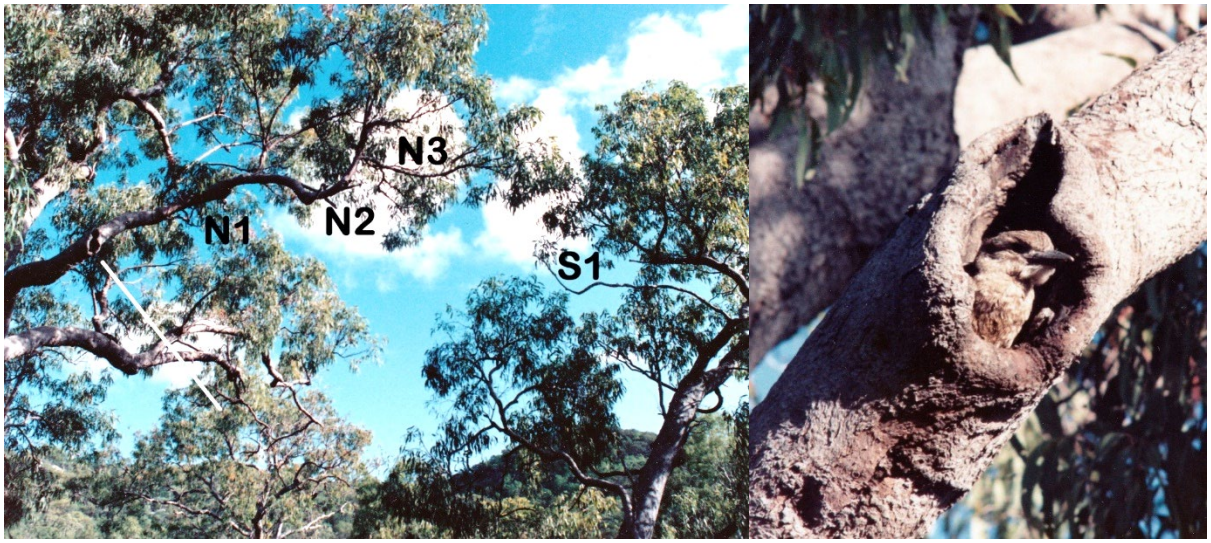



**Plate 2.** Left, nest hollow of Blue-winged Kookaburras, and perches on nest tree (N1, N2 and N3) and adjacent tree (S1). Right, largest chick at front of nest hole two days before fledging (E. Scambler).

During incubation and brooding the male was seen to roost in the canopy of the nest tree but after all young had fledged the nest tree was no longer used as a roost. Both adults were seen feeding two young near the house until 24 January, about three weeks after fledging. The group then foraged elsewhere, returning periodically to chorus on trees near the house. The adults regularly called with hole-showing at the nest hollow, joined in this display by two immature birds on 4 July and one on 25 July.

*Provisioning of nestlings and diet*

Food provisioning was recorded on 38 days, from 28 November 1987 to 4 January 1988. Of the 273 food items recorded, 132 (48.4%) comprised reptiles, though this group accounted for c.75% of food by volume (Table 2). In addition to ten Blue-tongued Skinks *Tiliqua scincoides* we recorded two large skinks with pink tongues and longer tails which were probably Pink-tongued Skinks *Cyclodomorphus gerrardii* (Appendix 1). No mammal prey were recorded, and although many small birds were nesting within the BWK territory at the time, none of the prey items were identified as nestling birds. Almost two-thirds (64%) of the prey items were small, 10% were large and 26% were medium-sized. The smallest prey identified was ~25 mm (a robber fly, Asilidae) and the largest was a snake or legless lizard of ~90 cm. The first large prey items were delivered in Stage 2 of the nestling period, on Days 8 and 12. Of the 23 large items delivered by a known sex, 11 were brought by the male and 12 by the female, and the latter brought the two largest.

The quantity of prey varied significantly over the nestling period (ANOVA, F=3.739, df=4, n=259, p=0.009), as did the volume of prey (F=5.392, df=4, n=259, p=0.001). Provisioning peaked during Stage 3 and the first two days of Stage 4 (Days 17-25 of the nestling period) (Fig. 2), although on Day 37 (the day before the first young fledged), 19 items totalling ~223 cm in length were provided, mostly (79%) by the male. Of 259 prey items where the parent delivering food was sexed, the male provided 157 (61%), exceeding the mean numbers of daily prey contributed by the female in all stages except Stage 2, when their contributions were equal (Fig. 3a). Across all nestling stages, the male provided significantly more prey items per day than the female (2-factor ANOVA, F=5.895, df=1, n=259, p=0.018). The male contributed significantly more arthropods than the female ($\chi^2$=18.80, df=3, n=236, p=0.0003).

**Table 1.** Summary of nesting and subsequent observations of Blue-winged Kookaburra pair and young at Arcadia, Magnetic Island, 1987–1988. F, female; M, male.

| Date | Activity |
|---|---|
| *1987* | |
| 12–19 Oct | Regular hole-showing |
| 21 Oct | M excavating in hole, dust pouring out |
| 20–29 Oct | M feeding F on various perches, mostly on perch S1 |
| 30 Oct | From 16:00 hrs, M and F alternated in the hole |
| 2 Nov | F fed in the hole by M. Both incubating by day. M roosting in canopy of nest tree |
| 23 Nov | Loud tapping in hole: 10:30, 12:00, 17:00 hrs |
| 25 Nov | Loud tapping in hole: 12:00 hrs |
| 27 Nov | Loud tapping in hole: "all day" |
| 28 Nov | Loud tapping in hole: 07:00 hrs; M took tiny skink into hole: 14:30 hrs |
| 29 Nov | Loud tapping in hole: noon |
| 30 Nov | Loud tapping in hole: 06:45-08:40 hrs |
| 2 Dec | Loud tapping in hole: 06:30-07:00 hrs |
| 13 Dec | Food-begging calls of young audible |
| 21 Dec | Food-begging calls much louder |
| *1988* | |
| 2 Jan | Young #1 fed at front of hole: 07:35 hrs |
| 4 Jan | Young #1 fledged: 07:50 hrs; Young #2 showing in front of hole |
| 6 Jan | Two young in nest tree canopy (06:45 and 19:45 hrs) |
| 9 Jan | Third (very small) young fledged (09:25 hrs); seen only for next few days |

Although the male contributed 55% of the prey volume over the entire nestling period, there was no significant difference between the sexes in terms of the volume of prey delivered per day (2-factor ANOVA, $F=1.766$, $df=1$, $n=259$, $p=0.189$). Unlike that of the female, the male's contribution to daily prey volume increased progressively from Stage 1 to Stage 5 (Fig. 3b). However, the female provided 64% of the volume of prey (Fig. 3b) during Stage 3, when she provided significantly more reptiles and fewer arthropods than the male ($\chi^2=15.63$, $df=1$, $n=60$, $p<0.0001$).

**Table 2.** Number and types of 273 food items delivered to nest by Blue-winged Kookaburra pair on Magnetic Island, north Queensland. F, female; M, male; U, sex unidentified.

| Food type | F | M | U | Total | % by no. | % est. volume |
|---|---|---|---|---|---|---|
| Arthropods | 14 | 57 | 4 | 75 | 27.5 | 10.4 |
| Reptiles | 60 | 66 | 6 | 132 | 48.4 | 74.9 |
| Frogs | 1 | 4 | 0 | 5 | 1.8 | 1.2 |
| Barbeque | 13 | 21 | 1 | 35 | 12.8 | 12.0 |
| Not identified | 14 | 9 | 3 | 26 | 9.5 | 1.6 |
| **Total** | **102** | **157** | **14** | **273** | **100** | **100** |

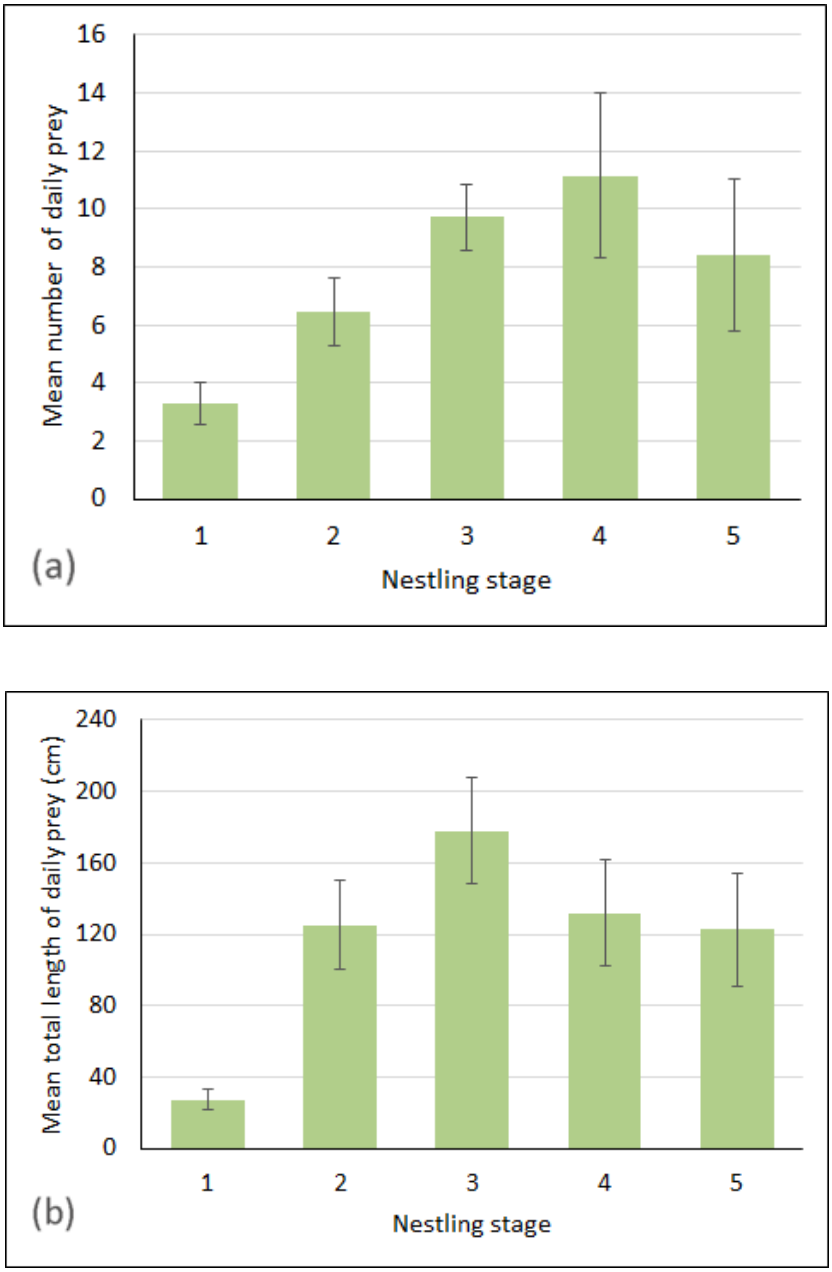
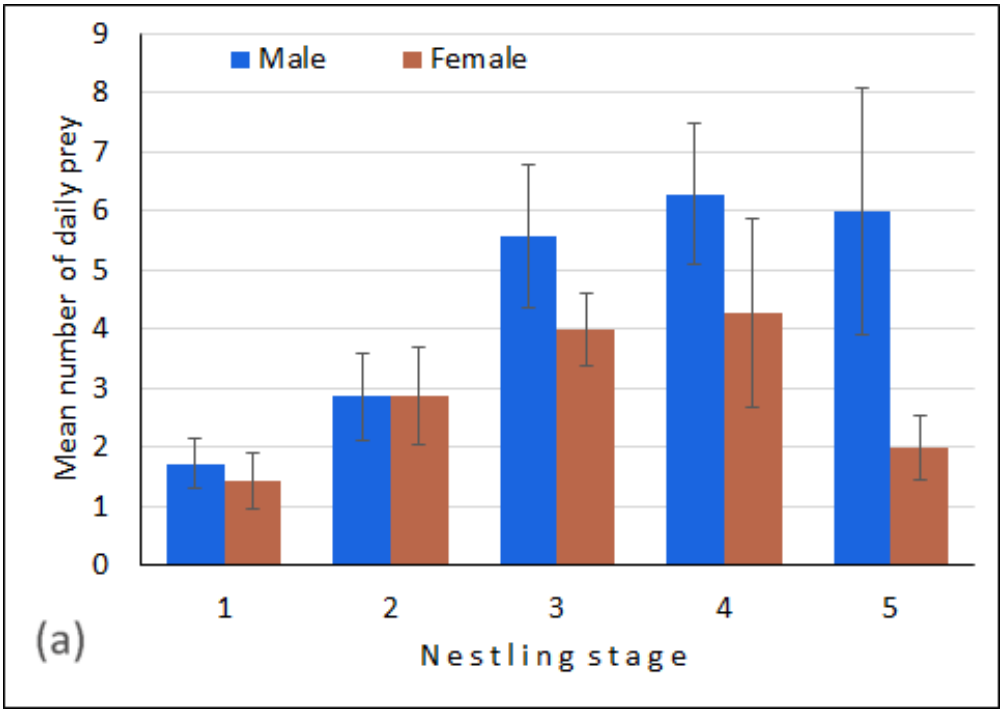



**Figure 2.** (a) Mean numbers of daily prey per nestling stage, ±SE (n=273); (b) Mean estimated total length (cm) of daily prey per nestling stage, ±SE. Stage 1, Days 1–7; Stage 2, Days 8–9 and 12–16; Stage 3, Days 17–23; Stage 4, Days 24–30; Stage 5, Days 31–37. There were no data for Days 10–11 and data for Days 37–38 were combined.

Between 22 December and 3 January the male (three times) and the female (twice) took food into the nest but emerged with the food and ate it themselves, while the nestlings made food-begging calls. These "failed feeds" (Legge 1999, p. 53) comprised 2% of the total number of provisioning visits for each parent. The parents were also seen eating food delivered to, but dropped by, the fledglings. On the third day after fledging, a fledgling was provisioned with a legless lizard or snake ~70 cm long (head first). Half the length (~35 cm) was swallowed immediately but after 17 min, 15 cm remained and wrapped around the fledgling's head and beak, and the young tried to 'bash' it. After 31 min, 5 cm still remained. The whole reptile took 60 min to swallow.



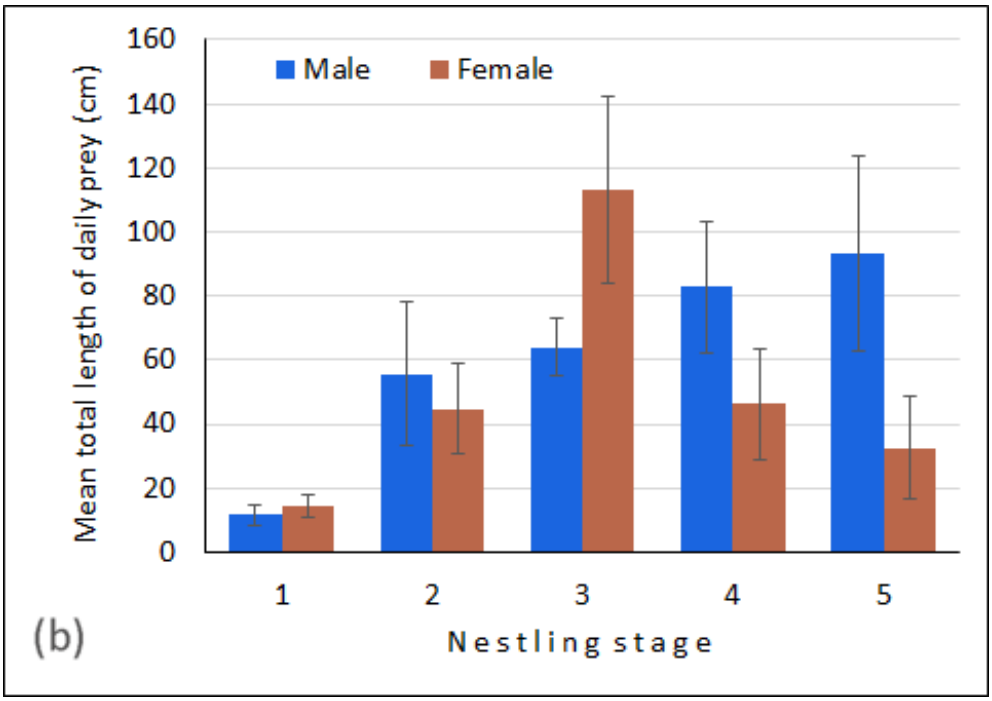




**Figure 3.** Food items delivered by each parent in each nestling stage (n=259). (a) mean [± SE] numbers of daily prey; (b) mean [± SE] estimated total length of daily prey (cm). Stages as in Figure 2. Excludes 14 food items where the parent was unidentified.

On four occasions between Day 14 and Day 37 post-hatching, one of the parents delivered 3-5 barbeque items in quick succession, 2–5 min apart. We received no response to our advertised appeal for information about supplementary feeding of BWKs in Arcadia. We saw only Laughing Kookaburras being fed near the beach front, some 560 m from the nest site. BWKs did not solicit food from us at any time during our three years' residence. All food

deliveries were recorded after sunrise (05:26–05:40 hrs). Of 14 deliveries after sunset (18:35–18:55 hrs), 11 were made by the female and one by the male, while in two the parent was not identified. However, the presumed male was seen foraging under a streetlight 160 m from the nest tree after 20:00 hrs. Provisioning continued throughout daylight hours with a peak between 18:00 and 19:00 hrs, and a smaller peak between 07:00 and 09:00 hrs (Fig. 4). There was no significant difference between the sexes in time of day of provisioning visits to the nest ($\chi^2$=4.373; df=6; n=259; p=0.63). Despite our continued surveillance, the last provisioning of nestlings was seen 30 min after the first young fledged.

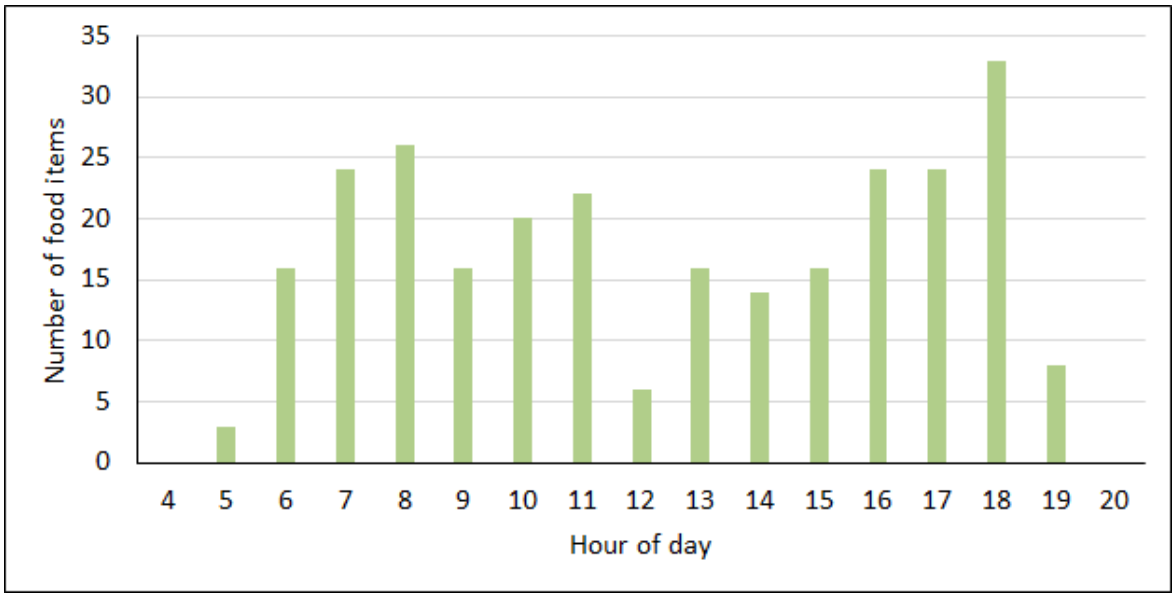



**Figure 4.** Time of food deliveries at Blue-winged Kookaburra nest at Arcadia, Magnetic Island (n=269). Excludes four feeding observations with time recorded as 'morning'.

*Interspecific interactions*

A Brushtail Possum *Trichosurus vulpecula* occupied the nest hollow during September and early October 1987, descending the tree after dusk to forage each evening. BWK hole-showing intensified from 12 October and on 19 October, the possum was heard hissing continually during the day. The next day a possum (presumably the same) was seen denning in a dead tree ~20m away. This cavity was open on both sides and after two days the possum moved elsewhere. While nesting, the BWK pair swooped on domestic cats (four times), Pheasant Coucals *Centropus phasianinus* (twice) and nesting Bush Stone-curlews *Burhinus grallarius* (twice). All attacked animals were on the ground within 50 m of the nest tree.

Recently-fledged young and adults were dive-bombed by Pied Currawongs *Strepera graculina*, a Forest Kingfisher *Todiramphus macleayii*, Helmeted Friarbirds *Philemon buceroides* and Black-faced Cuckooshrikes *Coracina novaehollandiae*, the last persistently for over a week. The female BWK once reciprocated by swooping at the Cuckooshrikes with a two-syllable squawk and the male once chased away a Pied Currawong perched on the dead tree. The BWKs evaded contact in flight, but while perched, they gave half-pecks or snapped the bill at their assailants. However, when the male BWK began chorusing on the dead tree on one occasion, a Helmeted Friarbird swooped and contacted him; the BWK flew to a nearby tree and gave a short call. The BWK pair showed no signs of disturbance or flight initiation (Weston *et al*. 2012) due to our presence on the house deck.

## Discussion

*Clutch size, fledging rate and interspecific interactions*

Assuming that the consistent, loud 'tapping' sounds we heard from the nest were chicks pipping the egg (Hindwood 1947, p. 120), and that it can take up to 48 hours for BWK chicks to exit the egg (Higgins 1999), then four, not three eggs, were presumably laid and hatched in the Arcadia nest, although only three young fledged. The species lays up to five eggs, although clutches of five are rare (Higgins 1999). In the NT, non-supplemented groups laid two or three eggs, and the mean clutch size was 2.35 (n=26) (Curl 2005), but elsewhere the latter was 2.8 (n=26; Higgins 1999). If there was a fourth nestling in Arcadia it might have been killed by siblings, but the more common cause of BWK chick loss is starvation from its siblings' domination of food supplies (Curl 2005, p. 226).

Of more than 90,000 records contributed to the NRS to 1999 (Robin 2001) only eight concerned the BWK. Excluding this study, there were two records from Queensland, three from the NT and two from Western Australia. Eggs were recorded in September (three nests), November (one nest) and January (one nest). Clutch size was known for three nests (C3 x 2, C2 x 1), and at least one nestling was sighted in five nests, one of which (on Thursday Island) fledged two of three nestlings. Combining the Thursday Island data with this study, five nestlings fledged from a presumed total of seven eggs (71%), which is higher than the mean fledging rate for eggs in 45 breeding attempts covering favourable and difficult seasons in the NT (~55%: Curl 2005, p. 197). The possible laying of four eggs, fledging of three nestlings and survival of two fledglings imply a high level of resources in the Arcadia pair's territory.

BWKs in Kakadu NP, NT, and LAKs in Victoria, may be deterred from nesting in traditional hollows taken over by possums or bees (Parry 1973; Curl 2005), but in this study the possum was presumably expelled due to continuous harassment by the BWKs. As in Kakadu NP, nesting BWKs at Arcadia made a few antagonistic gestures to perceived predators on the ground. The pair tolerated considerable harassment by smaller birds, but mobbing kookaburras can be risky. Poiani & Yorke (1989) observed a LAK catch and beat to death one of a group of mobbing Bell Miners *Manorina melanophrys*.

*Provisioning of nestlings and diet*

Our estimates of incubation and nestling periods at Arcadia were similar to those of Curl (2005) in Kakadu NP. The significantly higher number of provisioning visits by the male BWK at Arcadia is consistent with results from Kakadu NP (Curl 2005, p. 181). However, our study is the first to report details of (1) the number and volume of prey items delivered to the young in each of five nestling period stages; (2) the size of prey delivered each day by each parent; and (3) the incidence of failed provisioning attempts by BWKs attending nests. The pattern of provisioning at Arcadia across three nestling stages was consistent with that for LAKs in the ACT, which corresponded with growth phases of the young (Legge 1999). The growth stages of BWK young in the NT (Curl 2005, pp. 236) were similar to those for LAKs (Higgins 1999), so provisioning rates at BWK nests at different stages would be expected to be similar. Curl (2005, p. 238) noted that there was "still a high food supply" to one nest on Day 21, as occurred in this study, but also that the provisioning rate declined in the three days before fledging. The high provisioning rate at the Arcadia nest on Day 37 was therefore unusual (see below).

In contrast to the pair of BWKs at Arcadia, male parents in unassisted pairs of LAKs in the ACT fed longer prey to nestlings than female parents at peak nestling growth stages (Legge 1999, pp. 52-53). The lack of significant differences between the Arcadia parents in this respect was apparently mainly due to the male's delivery of many arthropods at the peak of provisioning (Stage 3), whereas the female delivered more reptiles and thus exceeded the male's overall contribution in that stage. Multiple feeding visits to nests are energetically costly, and as female BWKs are larger than males, with concomitant higher maintenance demands, the Arcadia female may have concentrated on prey with a high value-for-effort (e.g. Legge 1999, p. 55). The proportion of failed feeding attempts by the BWK female (2%) is the same as for LAK female parents and LAK male helpers aged 2 or more years (Legge 1999, p 53). However, the proportion of failed feedings by male parent LAKs was lower (0.3%) than that of the BWK male (2%). Although the reason for these failures is unknown, their incidence further indicates that the level of food supplies in the BWK territory in this season was more than adequate to achieve the fledging of three young.

In Kakadu NP, BWKs foraged extensively in morning and evening twilight, with little or no activity from noon to 18:00 hrs, and 50% of food provisioning visits to the young were before 08:00 hrs or after 18:00 hrs (Curl 2005, p. 140). The nestlings on Magnetic Island were provisioned more evenly through the day than in Kakadu NP, particularly during the afternoon, but it is unclear to what extent our few crepuscular records (and the low number of records between 12:00 and 12:59 hrs) were due to gaps in our observations. Maximum daily temperatures in the main breeding months (September–December) are 5-10°C lower on the island than in Kakadu NP (BoM 2019), and the island frequently experiences a cooling effect from afternoon sea breezes, which can be expected to affect the activities of BWKs and their prey. The absence of provisioning visits to the nest hollow after the first young fledged on 4 January, despite continued surveillance, suggests that the second and third young were not fed during daylight hours while they remained in the nest. This is consistent with Curl's (2005) finding that after one chick had fledged, the remaining young, even if well-grown, lost weight in the nest because the adults preferentially provisioned the young outside the nest.

In our study reptiles were outstandingly important as nestling food, but this diet may not be typical of all BWK groups on the island. In Kakadu NP the proportions of different foods varied with the habitat of each BWK group (Curl 2005), and on a rocky foreshore at Geoffrey Bay, only 700 m from our study site, adult BWKs have been observed hunting crabs exposed at low tide, and feeding them to fledglings (Vandhana, pers. comm.). The absence of crustaceans in the diet of nestlings in this study implies that the territory of the BWK pair did not extend to the foreshore. Consistent with Curl's (2005) observation that BWKs rarely prey on other birds in Kakadu NP, we did not observe birds being depredated on Magnetic Island. At Nelly Bay (see Fig. 1), the sole record of a BWK preying on birds in many years of nest observations involved nestlings of Australasian Figbirds *Sphecotheres vieilloti* (J. Wieneke, pers. comm.). Curl (2005) found mammal prey remains in 0.6% of pellets regurgitated (by parents and young) in nest hollows, but as BWKs were never observed taking mammal prey in hundreds of daylight observations he concluded that mammals were taken during twilight. As we had few twilight records, it is possible that we missed mammal prey being taken to the nest.

Parry (unpublished, cited in Higgins 1999) found that 10% of the diet of LAK nestlings outside Melbourne comprised "pieces of meat" (sample size unknown), which is similar to the ~12% human-supplied foods in the present study. Although Curl's (2005) study included a food-supplemented wild BWK group which nested earlier than non-supplemented groups in the NT, the timing of the Magnetic Island nesting event was consistent with other BWK nests

in the region (Lavery *et al*. 1968). Our observation of a newly-fledged BWK taking an hour to ingest a large reptile greatly extends an observation of nestlings taking "more than 15 minutes" to do so (Hopkins 1957), though we found no detailed records for nestlings and none for fledglings.

In Kakadu NP two-thirds of BWK pairs nested in groups (Curl 2005), but the frequency of helpers in Queensland, including on Magnetic Island, is unknown. Further studies of the nesting behaviour of BWKs in a range of climatic zones and habitats in Queensland would be useful to determine whether the social organisation and breeding behaviour observed in this study are typical. BWKs in the NT were extremely wary, with up to ten days required to locate a single nest (Curl 2005, p. 4), but in many areas of Queensland they are more habituated to people, potentially facilitating further studies.

## Acknowledgements

Jo Wieneke provided maps of Arcadia (pre-digitisation) and advice, including on nest predation, and Betsy Jackes helped identify plants. The RAOU (now BirdLife Australia) supplied copies of other observers' Nest Record Scheme sheets. David Curl visited the site, attracted the BWK family with playback and discussed kookaburra ecology. We thank Jill Brown and members of the Birds Queensland Photography sub-group who kindly offered a range of excellent images of BWKs: those in Plate 1 were taken by Susan Chisholm and Vince Bugeja. Vandhana and Arcadia Coast Care very kindly provided photographs and notes on Blue-winged Kookaburras in Arcadia from 2000–2021. We thank Sarah Legge and Richard Noske for many helpful suggestions which improved the manuscript.

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**Plate 3.** Female Blue-winged Kookaburra, near Townsville (Rodney Appleby)

**Appendix 1.** Food items delivered to Blue-winged Kookaburra nestlings at Arcadia, Magnetic Island, North Queensland.

| Food type | Details |
|---|---|
| *Arthropods (75)* | |
| Insects | Grasshoppers; crickets; stick insects; mantids; cockroaches; cicadas; large beetle larvae ('witchetty grubs'); beetles, including 'Rhinoceros beetles' *Xylotrupes gideon* (11); a large piece of honeycomb or wasp nest; green tree ants *Oecophylla smaragdina* (on a skink, possibly adventitious); moths; robber fly |
| Arachnids | Spider (1); Centipedes, ~13 cm (2) |
| *Reptiles (132)* | |
| Geckos | Velvet Gecko *Oedura sp.* (2) and unidentified species (2) |
| Legless lizards | Burton's Legless Lizard *Lialis burtonis* (5); other long, slender reptiles (legless lizards or snakes), 10–90 cm (13) |
| Skinks | Large number of unid. small skinks, ~5–10 cm, including *Ctenotus sp*. (15); Blue-tongued Skink *Tiliqua scincoides* (10); *Carlia sp*. (1); unidentified large skinks (2), probably Pink-tongued Skink *Cyclodomorphus gerrardii* |
| Monitors | Black-tailed Monitor *Varanus tristis,* ~50 cm (2); unid. specimen (1) |
| *Frogs (5)* | Several green tree frogs *Litoria* sp.; unid. large brown amphibian |
| *'Barbeque' food (35)* | |
| Cooked | Fish; mince (hamburger); meat with fat; fried fish with batter; bacon; king prawn. Cooked crab shells found under nest tree. |
| Uncooked | Slab of raw meat |

# Obituary: Margaret Cameron AM (1937-2023)

Born in Ipswich on 10 September 1937, Margaret Alison Cameron passed away on 29 September 2023, aged 86, after two years at the Memory Support Unit at Fairview, Pinjarra Hills, not far from the town of her birth, to which she had returned 17 years earlier. With her passing, Australian ornithology has lost one of its greatest champions.

*Margaret relaxing during Black-throated Finch surveys, April 2012.*
*Photo: Maggie Overend*

### *Early life in Queensland*

The eldest daughter of Des and Margot Cameron, Margaret was fascinated with nature from the start, growing up on a small dairy farm near Tamborine Village and later another farm at Beechmont. Her interest in nature was encouraged by her father who had returned from war service in North Africa and New Guinea. As she was thought too young to ride to school, Meg's early education was by distance education, through the Queensland Primary Correspondence School. Later she and her younger sister, Jan, rode double-back on their horse, Paddy, to the one-room one-teacher Tamborine State School of 24 children. Paddy used to bolt home - the girls falling off from time to time and bumping and squashing the sugar bags of meat and groceries it was their job to bring home. Margaret described their life as that of very marginal dairy farmers - milking fewer than 30 Jersey cows by hand, selling the cream, feeding pigs skim milk, keeping a few chickens for eggs and growing vegetables, some for the Brisbane markets.

Margaret went on to Saint Margaret's Anglican Girls' School in Ascot, Brisbane. Along with all the other core subjects, she took Latin and French and for good measure, was taught extracurricular German and Ancient Greek by the Nuns. From there, she went to the University of Queensland, attending Women's College and gaining her BA, with honours in English. She subsequently pursued a career in academic librarianship, first serving in the State Library in Queensland and the University of Queensland, and later, Flinders University (S.A.) and Macquarie University (NSW). She was also librarian at the Australian Reference Library at the Australian Consulate in New York during 1962 and 1963. Ten years later she returned to the USA and also went to the UK having been awarded a Fulbright University Administrator Grant and as a British Council Cultural Visitor. While at Macquarie University library (1969-1977), she became involved with the running of several societies, including the Ornithology Section of the Royal Zoological Society of NSW and the NSW Field Ornithologists Club.

In 1977, Margaret was appointed the foundation Chief Librarian at Deakin University in Geelong, Victoria, and her career blossomed both professionally and ornithologically. She was Pro Vice-Chancellor from 1986 to 1990, a period that included the interregnum between two Vice-Chancellors when she acted as Head of the University. During the interview for this

position, she was asked by the interview panel why she wanted to work there. Answer: "Because it's the University closest to the Werribee Sewerage Farm"! In 1999, Deakin University bestowed on her an honorary degree, Doctor of the University, for her services as its Librarian and representative in many other capacities. When she retired, the Woolstores campus Library was officially named in her honour.

Margaret's organisational prowess was recognised by many Federal and State authorities, and during her lifetime, she served on over 30 national, state or local boards and committees. She was a member of the Advisory Committee of the Australian Biological Resources Study (1984 -1991) and was its Chairman from 1987. Within Victoria, she was a member and Chairman of the Research Advisory Committee to the Minister of Conservation, Forests and Lands from 1986 onwards, and a member of the Council of the Museum of Victoria, Library Board of Victoria, Geelong Community Foundation, Geelong Regional Commission, Rotary Club of Geelong, Environmental Advisory Board of Greater Geelong, National Wool Museum Committee of Management, Geelong College Council, and Geelong Hospital Board of Management for over 10 years.

If it wasn't obvious, Margaret loved Geelong and the Cats - both the AFL team and the real animals - but naturally kept her pets indoors. In 1987, Margaret's professional leadership was recognised by the award of Fellow of the Library Association of Australia, and in 1990 she received the honour of becoming a Member of the Order of Australia for her services to "library services, education and to ornithology".

### *Involvement with BirdLife Australia*

Margaret served as a Councillor for the Royal Australasian Ornithologists Union (RAOU, now BirdLife Australia) from 1980 to 1989, and was President during the last three years of that period, becoming the third woman to hold that office. Although she differed from most of her presidential predecessors in not being a professional ornithologist, she devoted much of her spare time to birds as an exuberant amateur. She was Chairman of the RAOU Library Committee from 1980 and Chairman of the Publications Committee from 1982 to 1989. From 1990 she was convenor of the Victorian Group of the RAOU. She was also a keen supporter of the Handbook of Australian, New Zealand and Antarctic Birds (HANZAB), Birds of Prey (BOP) Watch, and many other RAOU projects. In 1993, she was awarded a Fellowship of the RAOU, the highest honour bestowed by the organisation.

Margaret was an especially keen member of the Geelong Field Naturalists' Club, and she edited their quarterly journal, the Geelong Naturalist, for eight years (1980-1987). She was also a competent bird bander and counter, taking an active role in the Victorian Wader Studies Group for many years. Margaret was also a founding member of Birding-Aus which took flight in 1994, and she worked hard to establish the online birding community. Indeed, she posted the first-ever rare bird report - a Scarlet Honeyeater in the library carpark at Deakin's Geelong campus!

Margaret was an adventurer, visiting the remotest parts of Australia many times, driving huge distances in her tiny Subaru. But she also travelled overseas in pursuit of birds, including sub-Saharan Africa, and was one of the first Australians to join a birding tour of Papua (formerly Irian Jaya), which included a gruelling 5-day trek from the Snow Mountains to the Baliem Valley. She even survived a shipwreck in the Timor Sea at night!

*Margaret in 2016 after receiving her BQ Honorary Life Membership.*

*Photo: Garth Kelly*

### *Involvement with Birds Queensland*

Margaret had been a member of Birds Queensland (BQ) since 1973, and after returning to the state of her birth in 2004, she became actively involved in most BQ activities. She was Meeting Speaker Coordinator for more than six years, and volunteered to lead the first Diamantina Expedition in 2013, and since then led the 2014, 2015 and 2017 expeditions, as well as an expedition to Idalia and Lochern National Parks in 2016. In addition to leading at least one BQ bird walk a year, Margaret supported BQ's involvement in the biennial Peaks to Point Festival by leading a walk at her local site, Harding's Paddock, during three such events. She also played a pivotal role in organising bird information stands, particularly for events in and around Ipswich, such as the Ipswich Plant Expo. In 2016, Margaret was awarded Honorary Life Membership of BQ.

Margaret also made an immense contribution to the work of Birdlife Southern Queensland (BSQ), for which she received a citation in 2015. She coordinated the Daly's Lagoon (South Ripley) longitudinal monthly bird survey since 2005, and was a regular, reliable participant in other bird surveys such as those at Mt Ommaney and Pooh Corner Bushland Reserves, SEQ Catchments, Galilee Basin and Ballara Park Nature Refuge, as well as Adopt a Farm (Granite Belt). She was also a keen participant in most annual Twitchathons run by both BQ and BSQ, and was successful in raising the highest amount of funds in many such events.

Passionate about instilling an interest in birds and their habitats, she took many young people and beginners 'under her wing' and often enlisted them on her Twitchathon teams. Indeed, my first memories of Margaret hail from when I was a high school student in Sydney during the early 70s, and she was Librarian at Macquarie University. Margaret was a regular participant on the early pelagic (seabird) trips outside Sydney Heads during the early 70s, and though she succeeded in coercing me to partake in several of them, she clearly suffered less from seasickness.

I believe Margaret will be remembered as a highly intelligent, kind, generous and brave person. Wherever she lived, she worked for her community and for her church, and cared for strangers, as well as her friends and loved ones. She was self-reliant, and never seemed to complain. A true non-conformist, she got on with things in her own way, immune to fads or fashion, with her characteristic limitless energy and enthusiasm. Finally, I thank Ted Ringrose, Margaret's nephew, for many facts and anecdotes about her life.

**Richard Noske** (Past BQ President). Email rnoske@tpg.com.au