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The avifauna of Rockhampton revisited after 45 years: additions, deletions and a checklist covering 135 years

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Abstract

The avifauna of the Rockhampton region, in central coastal Queensland, was first documented in 1887, based on six months of observations, then again in 1924, based on sightings made during a campout of one week. These and other historical records of birds in the region (comprising *c.*10,500 km^2), as well as in the neighbouring Shoalwater Bay Training Area, were summarised by Longmore (1978), who resided in Rockhampton for 20 months during 1973-1974, adding 88 species to previous lists. Longmore listed 324 currently recognised species, but after scrutinising the literature and available online data, we conclude that 17 of these species are insufficiently documented to be considered valid. On the other hand, we found reports of eight species that were recorded prior to the 1970s, yet were not listed by Longmore, and all have since been recorded at least once. Since 1975, no fewer than 35 species have been added to the region's checklist, doubtless the result of larger numbers of resident and visiting birdwatchers, as well as birding sites. Of the 35 additional species, 13 (37%) are shorebirds and seven (20%) are seabirds, most of which were added during the late 1970s and 1980s, during and after the first national atlas of Australian birds. Twelve species (35%) are Palearctic migrants. Only seven of the additional species have been added since 2000. At least five tropical species, including three mangrove-dependent sedentary species, appear to have expanded their range southwards into the region in recent decades, possibly due to increasing temperatures associated with climate change. Eleven species have been extirpated from the region over 135 years, resulting in one of the highest regional extinction rates in Australia. A checklist, summarising the past and present status of all 350 validated species of the region, is provided in the appendix.

Introduction

Since European colonisation over 230 years ago, the Australian avifauna has undergone massive changes (Recher & Lim 1990; Ford *et al.* 2001; Olsen *et al.* 2005). Partly due to the relatively low human population, there are few regional studies of avifaunal changes in tropical and subtropical Australia compared to those of temperate Australia. One significant exception is Coomooboolaroo, a large (454 km^2) pastoral property in eastern central Queensland, where the avifauna over the 60 years between 1873 and 1933 was chronicled by Barnard (1925, 1934), and re-surveyed 66 years later (Woinarski & Catterall 2004). Combining both periods, 45% of the total number of species had decreased, while only 13% had increased or colonised over that period, the majority during the second (1934-1999) period (Woinarski & Catterall 2004).

Only 100 km northeast of Coomooboolaroo lies the city of Rockhampton, 290 km southeast of Mackay and 93 km NW of Gladstone, Queensland. The earliest account of its avifauna was that of Broadbent (1888) who listed species observed in the Rockhampton area during his residence of six months, though the list also includes birds encountered on trips to Springsure and Barcaldine (260 km WNW, and 533 km W of Rockhampton, respectively). Almost four decades later, the

Royal Australasian Ornithologists Union (RAOU; later renamed BirdLife Australia) held its annual congress in Rockhampton from 15 to 21 October 1924, followed by a Campout at Byfield (Fig. 1) from 22 to 25 October, and a brief visit to North Keppel Island on the following day (Barrett 1925; Chisholm 1925; Sharland 1925; Wolstenholme 1925a,b).

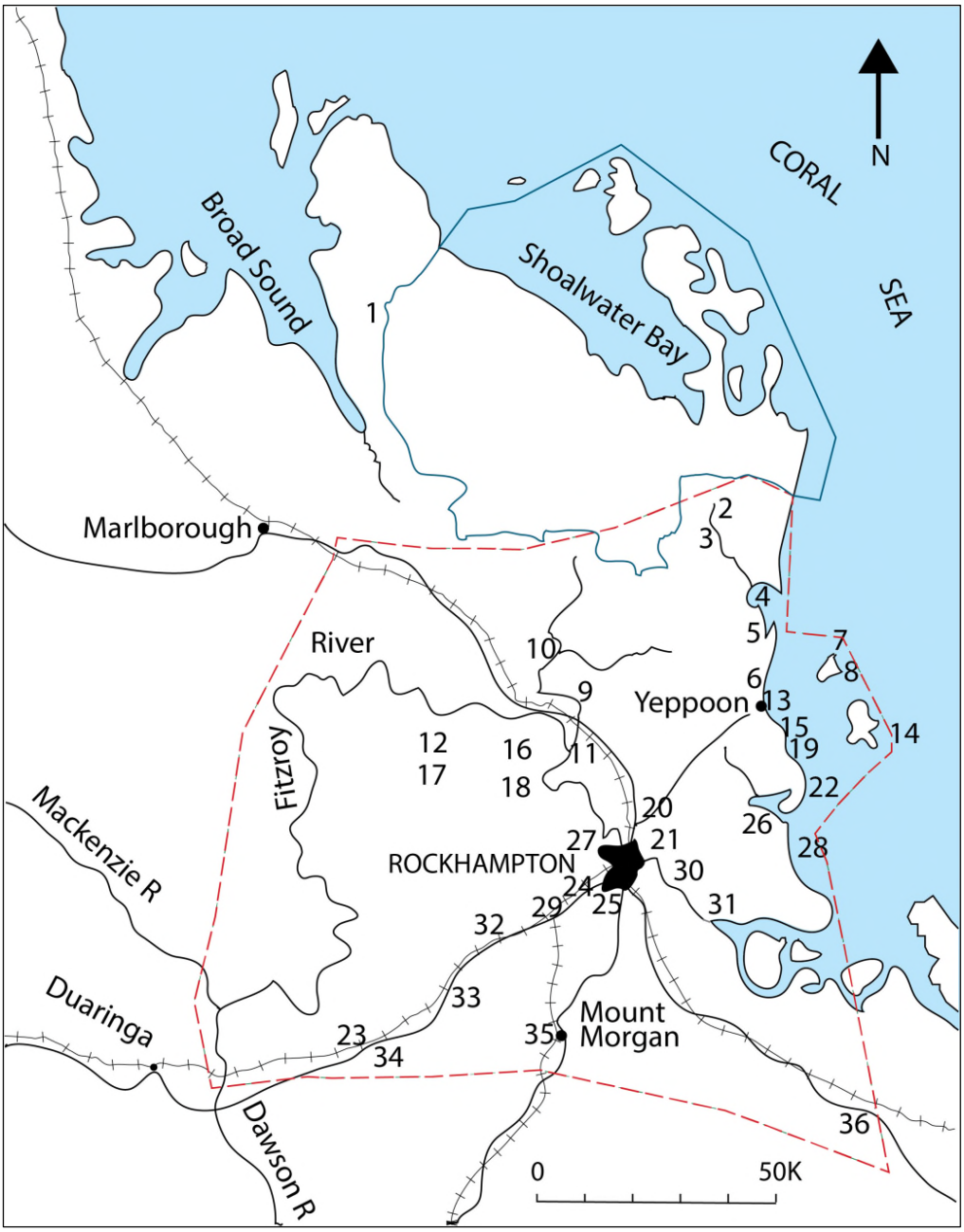
Fifty years later, Longmore (1978) resided in Rockhampton for 20 months from February 1973 to October 1974, and provided a comprehensive annotated list of the avifauna of the region, based on his field notes from October 1970 to November 1975, as well as records from the historical literature and unpublished manuscripts, and contemporary observers during the 1970s. His report provided species accounts of 329 species (*sensu lato*), comprising 258 species that he had personally recorded, and 71 species that had been reported in the literature (Longmore 1978). In addition to those within c. 70 km from Rockhampton, Longmore included records from Shoalwater Bay Army Training Area (SWBTA; 2940 km^2) to the north, based on a 3-week fauna survey by Nix (1972) in September 1971. Two decades later, SWBTA was more thoroughly surveyed over four months in 1991-1992 by Schodde *et al.* (1992).

Since Longmore's (1978) study, there has been no published review of the avifauna of the Rockhampton region. The first author has lived in the region, including Rockhampton, Yeppoon and Coowonga, since 1984, and has conducted systematic surveys on behalf of BirdLife Capricornia, and collected opportunistic records, in all parts of Longmore's study area. This work has yielded sufficient contemporary data to assess changes that have occurred since Longmore's review in the 1970s. In this paper we provide details of records of species that have been added since Longmore's review, critically assess records of species that appear to have been erroneously listed for the region, and finally, append a tabular checklist of all confirmed species of the region. Regionally extinct and declining species are dealt with in another report (Noske & Briggs, in press).

Study region

The region covered by Longmore (1978) was centred on Rockhampton (23°22'51"S, 150°30'53"E), and extended north to Byfield (60 km north of the Post Office), east to North and Great Keppel Islands (*c.* 50 km NE), south to Mount Larcom (68 km SE), and west to the Dawson River (88 km SW), covering *c.* 10,500 km^2. Longmore's report included a map showing the location of 37 sites that he visited or mentioned in the text, and although the map legend was inadvertently omitted when it was published, the names of the locations were subsequently provided to the first author by Longmore (*in litt.*). Figure 1 shows the same area and sites, as well as the boundaries of Shoalwater Bay Training Area and the polygon used in our online database searches for records of species of interest.

The site for Rockhampton was established in 1853, when Charles and William Archer, in search of grazing land, sailed up the Fitzroy River. The river and its tributaries drain the northern, western and central sections of the region, forming a large floodplain with many lagoons and swamps, such as Gracemere, Woolwash, Murray and Pink Lily Lagoons near Rockhampton. Low mountain ranges (maximum elevation, 664 m asl) and plateaux are present in the southwest (e.g. Mt Morgan), centre (Berseker Range) and northeast (e.g. Byfield) of the region, with undulating hills in the north. The Fitzroy Delta encompasses many mangrove-fringed islands, and Keppel Bay contains numerous offshore islands which are varied in form and structure, with some fringing reefs. There are also several swamps on the coastal plain, some of which are brackish, e.g. Corio Bay area, Iwasaki Wetlands and Kinka Wetlands.



1	Torilla Plain	14	Great Keppel Island	27	Pink Lily Lagoon
2	Waterpark Creek, Byfield	15	Lammermoor Beach	28	Joskeleigh
3	Byfield	16	South Yaamba	29	Gracemere
4	Corio Bay	17	Ridgelands 2	30	Fitzroy Vale
5	Fishing Creek	18	Alton Downs	31	Thompsons Point
6	Farnborough	19	Kinka Beach	32	Stanwell
7	Corroboree Rocks	20	Parkhurst	33	Wycarbah
8	North Keppel Island	21	Mount Archer	34	Westwood
9	Rossmoya	22	Emu Park	35	Mount Morgan
10	Doonside Rd	23	Gogango	36	Mount Larcom
11	Yaamba	24	Bessie Sue Lagoon	37	Archer
12	Ridgelands 1	25	Woolwash Lagoon		
13	Yeppoon	26	Keppel Sands		

Figure 1. Map of Rockhampton region reproduced from Longmore (1978), with addition of boundaries of Shoalwater Bay Training Area (green line) and polygon (red dashed line; see text). Numbers correspond to locations as per original, except for #1 and #23, which have been corrected.

Although Rockhampton straddles the Tropic of Capricorn, the climate is classified as humid sub-tropical, characterised by mild dry winters and hot wet summers (Nix 1977; Lloyd 1984). Mean maximum temperatures for Rockhampton Aero Club from 1939 to 2019 were highest in December (32.2°C), while minimum temperatures were lowest in July (9.7°C) (Fig. 2). Over the same 80 years, annual rainfall varied from 296 mm to 1,631 mm, with a mean (± standard deviation) of 808 (± 289) mm (BOM 2020). About two-thirds (68%) of this rain falls from October to March, a period hereafter called the wet season, when northwest monsoons often bring heavy rain and flooding. Rockhampton has experienced several large cyclones in 1918, 1949, 1976 and 2015, each of which caused significant damage to buildings in the city and/or surrounding areas (BOM 2020).

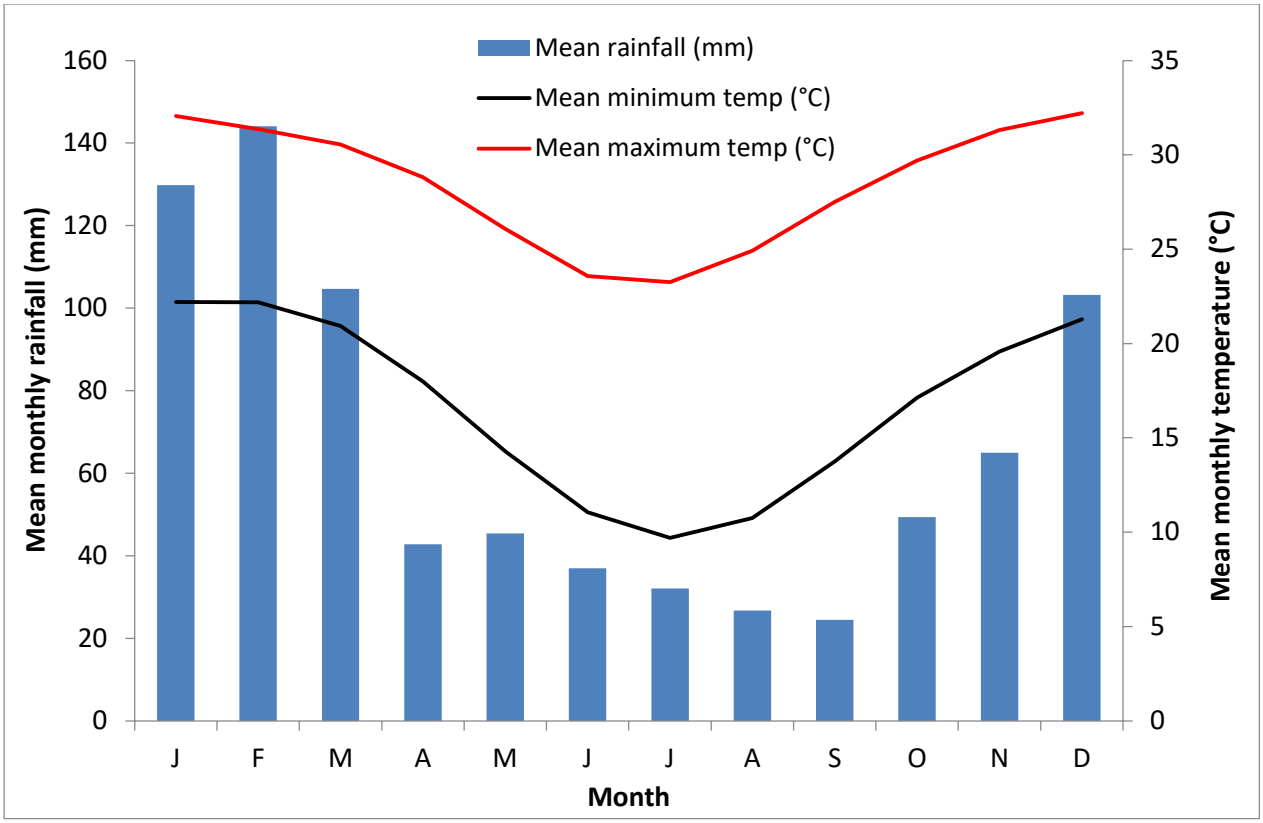


Figure 2. Mean monthly rainfall and minimum and maximum temperatures from 1939 to 2019 at Rockhampton Aero Club (source: BOM 2020).

The period during which Longmore resided in Rockhampton (1973-74) was atypically wet, and 1973 was the wettest recorded (1,631 mm) in the 77 years between 1939 and 2018. However, annual rainfall declined over the following three decades, with below-average rainfall in 24 (80%) of the 30 years from 1980 to 2009, and during the 1990s and 2000s, half (50%) of the years received less than 600 mm. Consistent with global warming, mean decadal minimum and maximum temperatures for Rockhampton have significantly increased by 0.23°C and 0.13°C per decade, respectively (Noske & Briggs, in press).

Despite the loss of almost two-thirds of its original vegetation cover due to clearing for pastureland, plantations, agriculture and urban areas (Noske & Briggs in press), a remarkable diversity of habitats still occurs in ROR today. Eucalypt woodlands and forests account for *c.* 78% of current vegetation cover, almost half of which is dominated by ironbarks of three species (38%) and Spotted Gum *Corymbia citriodora* (16%) on the ranges, hills and sand plains, and Coolibah (*Eucalyptus coolabah* or *E. microtheca*) or Red Gum (*E. tereticornis*) on floodplains

(10%). Semi-evergreen vine thickets (rainforest), such as those in the Byfield area (Plate 1), persist on the coastal ranges and dunes, comprising *c.* 6% of total vegetation cover. Along the coast and in estuaries such as Corio Bay (Plate 1) and Coorooman Creek large expanses of mangroves (*c.* 4% of total cover) provide habitat for mangrove-specialised bird species. Once covering over 1,000 km^2 (10%) of the region, Brigalow (*Acacia harpophylla*) has been almost eradicated, covering only 1.2% of ROR. The remaining cover comprises saltpans and tussock grasslands (7%), other Acacia-dominated woodlands (2.4%), paperbark (*Melaleuca*) forests, freshwater swamps and shrubland.

Plate 1. Some habitats and popular birding sites in the Rockhampton region. Clockwise from top left: tidal saltflats at Corio Bay, saltmarsh at Twelve Mile Creek, freshwater swamp at Kinka Wetlands, ironbark woodland at Cawarral, bloodwood woodland with grass-trees and cycads on Mount Archer, and rainforest at Byfield (all photographs, Allan Briggs)

Data sources and methods

Longmore (1978) assessed the status of all bird species recorded in the Rockhampton region from his own field notes, published historical accounts, and several unpublished sources, including a manuscript by W. B. Alexander concerning birds of the Westwood area during the 1920s. Neither of the unpublished sources was available to the present authors. In addition, Longmore (1978) conducted regular 2-h periods of observation in each of the region's major habitats, though he did not provide details of his sampling design. Since 2002, the first author and other BirdLife Capricornia volunteers have conducted surveys throughout the region, sampling all of the sites that Longmore visited (Fig. 1), as well as many additional ones, resulting in *c.* 20,000 records. The majority of those surveys were 20 min counts of 2 ha sites, in which both species and their abundance were recorded. They were conducted in all of the habitats sampled by Longmore, so the data are broadly comparable, though collected over a much longer period of time. Additional records from ROR were obtained from the following citizen science databases: eBird (2020), Birdata (2020), Atlas of Living Australia (ALA 2020) and WildNet (2021).

For historical records of birds in the region, we consulted the above mentioned published sources, and checked for additional records among the nine annual bird reports (1983–1991) published in *The Sunbird*. As Broadbent (1888) listed species seen at Springsure and Barcaldine as well as Rockhampton, we excluded species recorded only in the former two localities. For each species of interest, we consulted pertinent volumes of the *Handbook of Australian, New Zealand and Antarctic Birds,* and the two national bird Atlases, covering the periods 1977–1981 (Blakers *et al.* 1984) and 1998–2002 (Barrett *et al.* 2003), hereafter referred to as Atlas 1 and Atlas 2, respectively. As distribution maps in both atlases are based on 1° cells, we checked for records in the cell encompassing Rockhampton (23/150), as well as adjacent cells, including those to the north (22/150, encompassing SWBTA), west (23/149, encompassing Coomooboolaroo), and east (23/151, encompassing Gladstone). We also collated publicly available data on the birds of SWBTA and Coomooboolaroo for comparison with the Rockhampton region. Scientific names are provided in the Appendices. To avoid confusion, we abbreviate the city of Rockhampton as ROK, and the region surrounding it as ROR.

Results

Longmore (1978) listed 329 bird taxa, of which five (Northern Masked Lapwing *Vanellus miles miles*, Yellow Figbird *Sphecotheres viridis flaviventris*, Eastern Striated Pardalote *Pardalotus striatus ornatus*, Yellow-tipped Pardalote *Pardalotus s. striatus* and Western Striated Pardalote *Pardalotus s. substriatus*) are no longer considered species. We found records of 43 species in ROR that were not listed by Longmore (section 1, below). However, based on the evidence available, we conclude that 17 of the 324 species listed by Longmore are unconfirmed (section 2). On the other hand, five species listed as doubtful by Longmore appear to be valid (section 3). With the addition of 43 unlisted species, the total number of validated species recorded from ROR is 350 (Appendix 1).

In the following species accounts, records refer to ROR unless indicated otherwise by bold type; SWBTA denotes Shoalwater Bay Training Area. Sources are abbreviated in brackets as follows: Birdata (D), eBird (E), BirdLife Capricornia group (BC), ALA (A) and WildNet (W). Distances and directions of locations were measured as straight lines from Rockhampton Post Office using Google Earth, and are approximate only. Sites featured in the Figure 1 are indicated with a number preceded by the symbol '#'. Scientific names of species in Sections 1 and 3 are shown only in the checklist (Appendix 1), whereas in Section 2 (unconfirmed species), both English and scientific names are shown because these species are excluded from the checklist.

1. Additional species not listed by Longmore (1978)

Red-tailed Tropicbird
One record only, pertaining to a bird that was found on the golf course on Great Keppel Island on 15 November 1999 (A, B). It was exhausted, suggesting it was blown in by a storm, and later died. Also reported from Heron Island (c.143 km E) in 1986, 1987 and 2000, as well as Northwest Island (122 km E) in 1984 (A). The closest breeding colony is on Lady Elliot Island (240 km SE).

Diamond Dove
A specimen, held in Museums Victoria, was collected from Bimbi, Dawson River, in 1903 (A). Reported from Yeppoon in 1985 (Niland 1986). Reported from ROK cell during Atlas 1. Since then recorded near ROK and Causeway Lake in 1997 (E), The Caves (25 km N) in 2008 (D), near ROK and Marmor (39 km S) in 2013 and 2014 (E), Kinka Beach in 2017 (D), and Glendale (15 km N) in 2020 (BC). **SWBTA:** recorded by Schodde *et al.* (1992) but not by Nix (1972). **Coomooboolaroo**: between 1873 and 1933, appeared in times of drought, and during one such drought (1902) bred freely in all kinds of situations (Barnard 1925).

Spotted Nightjar
One observed at Limestone Creek, Bungundarra (38 km NNE), near Yeppoon, on 31 August 1957, and two on 28 February 1958 (Wheeler 1959). Also recorded at Coorooman Creek near Cawarral (22 km NE) on 28 December 1996 (W) and at Fernleigh (#1; 110 km NW), Torilla Plain, in April 2004 (R. Black, in litt.). **SWBTA:** observed on Stanage Bay Road near Banksia in April 2004 (R. Black, in litt.). **Coomooboolaroo:** Barnard (1925) found eggs of the species, which was considered very rare. Southern Australian populations are at least partly migratory, moving north in autumn and over-wintering in the monsoon tropics (Higgins 1999; Griffioen & Clarke 2002; McCrie & Noske 2015), suggesting that some of the ROR records involve other populations.

Oriental Cuckoo (Plate 2)
During Atlas 1, recorded in ROK cell and surrounding cells, while in Atlas 2, recorded in three adjacent cells only. **SWBTA**: Nix (1972) saw one bird at Freshwater Bay in September 1971, and Schodde *et al.* (1992) recorded it in 14 habitats, in two cases as "abundant". Single birds reported from Byfield in December 1998, Dawson River near Duaringa in February 2000 (D) and Yeppoon in February 2020 (BC).

Plate 2. Oriental Cuckoo, Yeppoon (Graham Durant)

Australian Spotted Crake
A specimen, held in Museums Victoria, was collected from Port Curtis, Rockhampton, but is undated (A). One recorded in Yeppoon on 10 April 1986 (Redhead 1988). Since 1986, only two known records from region surrounding ROR, one involving a bird observed southeast of Duaringa in 2000 (D) and another a bird at Fernleigh (#1; 110 km NW), Torilla Plain, on 2 July 2003 in beds of sedge *Schoenoplectus subulatus in muddy brackish marsh* (R. Jaensch, *in litt.*).

Short-tailed Shearwater
In September 2014, a storm blew several birds off course and they were found in gardens and paddocks just west of the coast (BC). Count of 134 birds off **SWBTA** in December 2011, and 32 birds in Corio Bay in November 2013 (E). Hundreds of dead birds washed up on beaches along Capricorn Coast in November 2013 and November 2015 (BC). Beach-washed specimens have been found as far north as Cairns, Innisfail and Townsville (Baker & Gill 1974; Longmore 1985). The closest breeding colony is probably Broughton Island, NSW (c.1,040 km S).

Australian Little Bittern
Recorded on track from Causeway Lake to Lammermoor Beach (35 km NE) on 4 November 1997 and on a dam at Glendale (15 km NNW) in October 2013 (E); also Archer Station (30 km SE) in March 2015 and Barmaryee Wetlands (34 km NE) in 1 February 2020 (R. Black, *in. litt.*). **SWBTA**: Nix (1972) reported flushing a small bittern from fringing reeds in Louisa Creek, and suggested it was possibly a "colour phase" of this species, but his description of the bird's plumage does not accord with any of this species; not recorded during 1991-92 surveys (Schodde *et al.* 1992). Reported from Gladstone cell (23/151) during both Atlas 1 and Atlas 2. Nearest recent record from St Lawrence Wetlands (150 km NW) in November 2007, where an adult female was discovered in tall bulrushes *Typha* sp. and captured opportunistically for the purposes of verifying its identity and sex with photographs, then released unharmed (R. Black and R. Jaensch, in. litt.). Although populations in southeast Australia are thought to be migratory, moving north as far as New Guinea in autumn and winter (Marchant & Higgins 1990; Jaensch 1988), some in northern Australia may be sedentary (Jaensch 1988).

Great-billed Heron
Ramsay (1877) observed this largely tropical species at the Fitzroy River mouth, as well as Wide Bay and Moreton Bay in southeast Queensland, and as far south as the Clarence River, NSW, indicating that it once occurred further south than now (Marchant & Higgins 1990). One observed at Bungundarra (38 km NNE) in August 1990 (Britton 1991). **SWBTA:** Nix (1972) observed a single bird on mangrove-fringed Shoalwater Creek in 1971, but not recorded during 1991-1992 survey. Birdata records south of ROK (e.g. Eurimbula NP in 1998, Tin Can Bay in 2000, and Deepwater NP near Agnes Waters in 2001) demonstrate that the species occasionally ventures further south.

Great Frigatebird
On the mainland, first reported from Bluff Rock (37 km NE) on 1 January 1983 (A). Subsequently reported from near Water Park Creek at Byfield in July 1998 (Atlas 2; B), and Emu Park-Bicentennial Park (39 km NE) on 14 July 2012 (E, A). Offshore records include Peak Island on 1 November 1995 (43 km E) and Great Keppel Island on 5 February 1999 and 2 May 2000 (B, A). Like the Lesser Frigatebird, this species is probably blown towards the mainland during storms. Closest breeding colony is on Raine Island, GBR.

Common Ringed Plover
An adult observed at Kinka Beach on 20 February 1987 (Redhead 1990; Crawford 1992) represented the second Queensland record, the first involving a bird at Boonooroo (350 km SE), near Maryborough, in July-August 1983 (Stewart 1984; Marchant & Higgins 1993). There have been no reports of this Palearctic-breeding species in Queensland since 1987.

Little Ringed Plover
A single bird seen at Lower Gracemere Lagoon (10 km W) on the Fitzroy River floodplain on 16 October 2003 (Jaensch *et al*. 2004a). Nearest recent records are of a single bird at Wunjunga Wetlands (500 km NNW), c.96 km SE of Townsville, from December 2018 to March 2020 (E). This East Asian-breeding species is a regular, albeit rare, migrant to northwest Australia.

Double-banded Plover
First reported from ROK cell during Atlas 1. A record from Sandy Point, Corio Bay, in 1995, is undated, while another from Leekes Creek mudflats on Great Keppel Island was made in December 1999 (A). Up to 45 birds seen during monthly counts from May to August 1995 at Sandy Point, Corio Bay (Houston & Mitchell 1997). Recorded at Kinka Beach (#19) from May to September each year from 2005 to 2011 (BC). Lack of sightings in 2012, 2013, 2014 and 2016 are probably due to increasing disturbance by people walking their dogs off-leash. Nevertheless, 15 were seen in 2017, seven in 2018, two in 2019 and seven in

2020 (BC). Although this New Zealand-breeding species winters mainly on the shores of southeast Australia, there are records as far north as Cape Tribulation, NQ (eBird 2020).

Oriental Plover
This Palearctic-breeding species migrates annually to inland northern Australia, but vagrant individuals have been recorded as far south as Victoria and eastern Tasmania. One bird recorded at Sandy Point, Corio Bay, in October 1996 (D); three birds at Kinka Wetlands (#19) in November 1997 (E), and one bird at 'Fitzroy Vale' (#30) in May 2016 (BC).

Australian Painted-snipe (Plate 3)
Two specimens, held in Museums Victoria, were collected from Rockhampton, but are undated (A). Reported from ROK cell during Atlas 1. Up to six birds counted at several locations on coastal grazing property of Balnagowan (35 km SE) on the Fitzroy River delta in June 2005, and a pair at Gavial Swamp (4 km SE) on 3 March 2008 (Black *et al.* 2010). In June 2013, 23 birds at ROK Botanical Gardens (BC) and three at Shalom Lagoon in north Rockhampton. Also one bird at Marmor (39 km S) in April 2014 (E). Black *et al.* (2010) provided compelling evidence that a significant proportion of the global population migrate annually from southeast Australia to the wetlands of coastal C and N Qld during autumn and winter. The species also breeds in the wider region, with at least three breeding records from coastal freshwater and brackish marshes on Torilla Plain and western Broad Sound, e.g. 30 May 2003 and 11 May 2007 (Jaensch *et al*. 2004b; Melzer *et al*. 2008), and it is likely that other local breeding by this secretive Endangered species has gone undetected.

Plate 3. Left, Australian Painted-snipe south of Emu Park (Gary Knight); right, Black-tailed Godwit at Murray Lagoon (Gary Knight)

Little Curlew
Single birds reported from Kelly's Landing Road (51 km NNE) on 4 November 1997 (A), on treeless coastal plain at Glenprairie (86 km NW) on 13 November 2007 (R. Jaensch, *in litt.*), and at Sea Hill, Curtis Island (49 km ESE) on 18 October 2019 (A). Also reported in ROK cell during Atlas 1 and Atlas 2.

Black-tailed Godwit (Plate 3)
First recorded on Casuarina Island at the Fitzroy River mouth in November 1978, then at Gracemere in November 1979 (Atlas 1; A). Since then, seen regularly on lagoons around ROK and Capricorn Coast, e.g. Kinka Beach (D). Between 1982 and 2018, eight records at Murray Lagoon (E, D), with 82 birds in October 2018 (BC); 55 birds at Gracemere Lagoon, and 120 at Lower Gracemere Lagoons, in October 2003 (R, Jaensch *in litt*.); 120 birds at Lotus Lagoon in 2012 (E). Also occurs regularly in freshwater and brackish wetlands on Torilla Plain and western Broad Sound, e.g. 58 birds on Torilla Plain on 1 May 2003 (R. Jaensch *in litt*.); 450 birds in brackish marsh on Bar Plain east of St Lawrence town on 28 March 2007 (Melzer *et al*. 2008).

Long-toed Stint
One at Twelve Mile Creek (40 km SE) on 24 November 2004 (Houston *et al.* 2006; M. Mathieson, in litt.). Also one on 29 October 2014 on saltflats on north-eastern Curtis Island (R. Black, in litt.), 55 km ESE of ROK. The only other records from eastern Queensland are from Cairns, where recorded 24 October 1988 (Britton 1990a), December 1995 and December 2005 (E), and Brisbane region, where recorded in December 1986 (Redhead 1988) and February 1987 (Redhead 1990), as well as in January, February and October 2018 (up to three birds), and March and December 2019 (E). This Siberian-breeding species is a regular migrant in small numbers to Australia, especially the northwest.

Pectoral Sandpiper
First recorded at Kinka Beach (#19) on 5 March 1987 (M. Crawford in Redhead 1990). Since then, only one record from ROR at Lake Mary (31 km NE) in March 2017 (D). Just northwest of ROR, a bird at Bar Plain (135 km NW), 18 km southeast of St Lawrence, 22-23 November 2006 (Melzer *et al.* 2008), and another at St Lawrence Wetlands on 24 October 2019 (E).

Asian Dowitcher
Seven birds at Yeppoon on 3 January 1988 (M. Crawford in Britton 1990a). Although single birds were seen annually from 2013 to 2019 in the Brisbane region, Southeast Queensland, there have been no further records in ROR since 1982 (D, E).

Wood Sandpiper
Seven records from Kinka Beach between December 1986 and February 1987 (D). Also two birds at Kinka Wetlands in March 2004 (D).

Australian Pratincole (Plate 4)
First recorded at Long Island Conservation Park (17 km NW) in December 1978 (Atlas 1; A). After a gap of 25 years, recorded at Shalom Lagoon (5 km N) in October 2003 (A). One record near Marmor in October 2009, and another from Cheetham Salt Works (29 km S) in December 2012 (D, E). Recorded at 'Fitzroy Vale', Fitzroy River (BC): July 2014 (4 birds), June 2015 (1), July 2015 (5), August 2015 (2), October 2015 (5) and May 2016 (4).

Plate 4. Australian Pratincole at Fitzroy Vale (Bob McTrusty)

Oriental Pratincole
Recorded at Windmill Plains, near Yeppoon, on 5 December 1989 (M. Crawford in Britton 1990b). No Birdata or eBird records for the region. This Palearctic-breeding species migrates regularly to northern Australia, but is occasional south of Hughenden (Higgins & Davies 1996).

Brown Noddy
First reported from ROK cell during Atlas 1, and recorded at Lake Mary near Yeppoon, in February 1985 (M. Crawford in Niland 1986), apparently blown *c.* 18 km inland during a storm. **SWBTA:** reported from Black Rock in February 1986 and November 1988 (A). One bird at Corio Bay in 2010 (E). The nearest records since 2010 are from Tannum Sands (130 km SE) on the mainland in 2013 (D), and well offshore in open ocean in 2017, when over 1,000 birds were counted (E). The closest breeding colony is on Lady Elliot Island (240 km SE) (King 1993).

Black Noddy
Reported from Great Keppel Island in March 1999 and January 2001 (D), and at sea between North and Great Keppel Islands in January 2003 (E). On mainland, reported from Corio Bay in February 2010 (E), and Kinka Beach in January 2013 (D). The closest breeding colony is on North West Island (122 km E) (King 1993), where over 100,000 breeding pairs bred most years from 1996 to 2000 (Dyer *et al.* 2005).

Sooty Tern
Observed close to Rosslyn Bay Harbour, Yeppoon, on 14 March 1989 (M. Crawford in Britton 1990b). Since then, recorded at Kinka Beach in 2013 (D) only. The closest breeding colony is probably Michaelmas Cay (c.890 km NW).

Black-naped Tern
Reported from ROK cell during Atlas 1. Also reported from Conical Is. near North Keppel Is. in December 1989, and from Shoal Is., Fitzroy River (25 km SE), in October 1999 (A). Since then, one record of six birds at Iwasaki Wetlands, north of Yeppoon in May 2002 (D). **SWBTA:** reported from Black Rock in February 1986 and November 1988 (A). The nearest breeding colony is on One Tree Island (162 km E) (King 1993).

Eastern Grass Owl
Museums Victoria holds a clutch of six eggs collected from Torilla (111 km NNW) by F.L. Berney on 19 March 1917 (A). Not reported from ROR during either atlas Atlas 1 or Atlas 2, but reported from Bajool (34 km S) in 1982 (E). Also flushed several times at sites on the Kunwarara Magnesite mines (50 km NNW) in May 2012 (R. Black, *in litt.*). **SWBTA:** Nix (1972) alleged that a Grass Owl "crash-landed" into a small tree beside his camp fire on the beach at Sabina Point in 1971, but it was not recorded during the 1991-1992 surveys. Two birds also observed on Curtis Island marine plain (72 km ESE) in October 2009 and October 2018, believed to be resident (R. Black, *in litt.*).

Black-breasted Buzzard (Plate 14)
First observed at Lake Mary, Yeppoon, on 16 June 1991 (Britton 1992). More recent records from Causeway Lake in 1997, Fitzroy Vale in 2013 and Lake Mary, Yeppoon, in 2016 (E); also Kinka Beach in March 2018, and Mulara on the Capricorn Coast in October 2018 (BC).

Little Kingfisher
One bird was sighted three times in mangroves on a tidal creek near Kelly's Landing, Corio Bay (#4), on 18 March 2012 (Roberts 2012a; E, D). **SWBTA:** recorded in mangroves along creeks in August-September 1991 (Schodde *et al.* 1992) and in April 2011 (M. Mathieson, pers. comm.). It has not since been seen at Corio Bay, and the nearest locality where the species is regularly recorded is Mackay, 255 km NW of Corio Bay. It is possible that the aforementioned bird was blown southward by Tropical Cyclone Yasi in February 2011. See also Mangrove Golden Whistler and Discussion.

Buff-breasted Paradise-Kingfisher (Plate 5)
This migratory species was previously known to breed in five areas of lowland rainforest in NE Queensland from islands of SW Torres Strait south to Mackay, where it was first discovered in 1981 (Nix 1984; Legge and Heinsohn 2001). In March 1975 an Australian Museum expedition collected an immature bird in an isolated patch of lowland rainforest at Eurimbula National Park (160 km SE), south of Gladstone (Nix 1984). The species was first recorded in ROR at Byfield in January 1985, and subsequent observations indicated that 20 pairs bred in the Byfield area (Black 2005). In February 1988 also recorded at Yeppoon

(V. Bartlem in Britton 1990a). Since 2005, at least two pairs have been observed annually, nesting on a private property on Mt Bayfield, near Byfield (BC). A bird hide has been installed near the nests to avoid disturbing the birds when they are feeding young. **SWBTA:** recorded at one site during 1992 wet season survey (Schodde *et al.* 1992).

Plate 5. Buff-breasted Paradise-Kingfisher at Byfield (Kevin Vins)

Long-billed Corella (Plate 6)
First noted in April 1991 on Great Keppel Island (Britton 1992), where a single bird was fed by local residents until 2017 when it was last seen. On the mainland, escapees were first recorded at Murray Lagoon (3 km SW) in August 1992 and Yeppoon in 2001 (E, D). At both latter locations, populations have slowly increased from 1-3 birds to 20 birds (BC). Native to extreme southeast Australia only, this species has established feral populations from escaped aviary birds at many localities further north in eastern Australia (Higgins 1999).

Crimson Rosella
An "unusual" record of this species from Yeppoon on 3 February 1985 (M. Crawford in Niland 1986) most likely concerned an aviary escapee. However, a pair was observed in stringybark forest on the Blackdown Tableland (150 km WSW) in late 1989 or early 1990 (Cody 1991). The nearest record is from Mount Walsh National Park (295 km SE) in November 2012 (E).

Superb Fairy-wren (Plate 6)
First recorded at Farnborough resort area, north of Yeppoon, in January 1978 (A) during Atlas 1, and also reported from ROK cell in Atlas 2. Since then, recorded around lagoons at Victoria Park, South Rockhampton, in 2005 (D), Yeppen Yeppen Lagoon (4 km S) in 2006 (D), Duck Ponds (5 km S) in 2011 (BC) and Limestone Creek, North Rockhampton, in 2011 (D). Also recorded east of Duaringa in 2003, near Yaamba (#11) in 2016, near Bajool (34 km S) in 2017 and The Caves (25 km N) in 2018 (BC, D). Not recorded in SWBTA or on Coomooboolaroo. Higgins *et al.* (2001) considered the northern limits of the

species' range as 23°S, but noted an observation at Moranbah (294 km NW; 22°00'S, 148°02'E) in June 1988 (Britton 1990a).

Plate 6. Left, Long-billed Corella in Rockhampton (Allan Briggs); right, Superb Fairy-wren at Blackdown Tablelands (Allan Briggs)

White-naped Honeyeater (Plate 7)
First recorded near Johanssen's Cave (23 km N) in 1977 (Atlas 1; A). Subsequently reported from Kinka wetlands (#19) in November 1997 (E), and Capricorn Coast in June 2000. In 2002 observed at Alligator Creek (17 km NW), Canal Creek (37 km N), and Werribee Creek (52 km N) during 19-21 November (A). Also at Byfield in June 2004 (D), Gracemere (9 km SW) in February 2007, Mount Morgan (#35) in June-July 2014, and at Lammermoor (#15) in May 2016 (E). Up to 26 birds at Stanwell (#32) throughout year in 2018, 2019 and 2020. **SWBTA:** described as common in 1971, when birds assumed to be migrants were moving south in September (Nix 1972), and in October 2000, at Tilpal Creek (A), but not recorded during 1991-1992 surveys. **Coomooboolooroo:** "common in the rangy country" (Barnard 1925), but during 1999 surveys, recorded in only two out of 476 quadrats, suggesting a decline since 1934 (Woinarski & Catterall 2004). In contrast, the increasing frequency of records in ROR since 2000 indicates that its local status has changed from irregular migrant to partial resident.

Plate 7. White-naped Honeyeaters at Blackdown Tablelands (Allan Briggs)

Rufous-throated Honeyeater
This tropical species was not recorded in ROR during Atlas 1 or Atlas 2, though many birds were observed as far south as Gin Gin and the lower Burnett River in October 1959 (Robertson 1962), and vagrants reported from as far south

as Noosa and Beerwah, SE Qld, by the late 1970s (Roberts 1979). First recorded in ROR in September 2003 at Byfield State Forest (A, E); also from Glendale in April 2017 (A, E) and Yaamba in October 2019 (B). **SWBTA:** Nix (1972) reported numbers feeding on the blossoms of *Melaleuca leucadendron* in a swamp at Freshwater Bay; but not recorded during 1991-1992 surveys.

Singing Honeyeater
Occasional visitor, first recorded from Westwood in October 1881 (A). One seen in trees on Fitzroy River bank in ROK in October 1924 (Wolstenholme 1925b). One in North ROK in March 1999 (D); four in the Marmor area in August 2008, June 2017, November 2018 and August 2020 (E); and one at ROK Botanical Gardens in March 2017 (E). **SWBTA:** Nix (1972) reported that "it occurs in brigalow and bauhinia groves to the west of the northern railway line and could be expected to occur in the drier western sectors", but not recorded in 1991-1992. **Coomooboolooroo:** between 1873 and 1933 numerous in a small patch of brigalow with mistletoes (Barnard 1925), but not recorded during 1999 survey (Catterall & Woinarski 2003).

Brown Gerygone
Campbell (1900) reported a nest of this species, listed as Brown Flyeater *G. fusca*, on the margin of the Fitzroy River on 2 October 1885, though Longmore incorrectly attributed it to the Western Gerygone (see below), which Campbell listed as Southern Flyeater [*G.*] *culicivora*. Higgins & Peter (2002) regarded this record as doubtful, yet the species was reported from ROK cell during both Atlas 1 and Atlas 2. Recorded on Capricorn Coast in 1998 (D), at Yeppoon in 2016 and Byfield in 2018 (E). No published records from SWBTA.

Mangrove Golden Whistler (Plate 8)
On 18 May 2012, Roberts (2012a; eBird 2020: S41297544) saw and photographed an adult male while kayaking among mangroves within 1.5 km east of Kelly's Landing (56 km NNE), Corio Bay. Outside ROR, an adult female was seen in a band of mangroves at Fernleigh (#1; 110 km NW), Torillo Peninsula, on 11 November 2003 (R. Black, *in litt.*). **SWBTA:** not recorded during CSIRO survey in 1971, but in August 1991, three specimens were collected from near Sabina Point (109 km NNW) and Ross Creek (A; Higgins & Peter 2002), though they had initially been misidentified as Golden Whistlers (Schodde *et al.* 1992). Another specimen was collected Akens Island (116 km NNW) in September 1993. Also observed on Warginburra Peninsula (103 km N) in December 2012 (A) and another site in April 2016 (M. Mathieson, *in. litt.*). As the species has not been re-sighted in Corio Bay since 2012, and the nearest locality where the species is regularly recorded is Mackay, 255 km NW of Kelly's Landing, it is possible that the bird seen in 2012 had been blown southward by Tropical Cyclone Yasi. See also Little Kingfisher and Discussion.

Plate 8. Mangrove Golden Whistler (immature male) at Corio Bay (Greg Roberts)

Plate 9. Broad-billed Flycatcher at Corio Bay: left, adult male (Greg Roberts); right, female (Gary Knight)

Broad-billed Flycatcher (Plate 9)
Although early reports of this species on the eastern coast of Australia had previously been treated as unconfirmed due to possible confusion with Leaden Flycatcher (Higgins *et al.* 2006), an immature male collected at Casuarina Island at the mouth of the Fitzroy River on 14 January 1901, and held at University Museum of Zoology, Cambridge, was confirmed to be this species (Boles 1984, 1988). In 2000, one bird was observed at Corio Bay. Since 2000, 1-5 birds seen at Corio Bay in 2008 (BC), 2012 (E, D; Roberts 2012b), 2013 (BC), and Stockyard Point in 2010 (D). **SWBTA:** observed in mangroves at Sabina Point beach in 1971 (Nix 1972), and at Ross Creek in 1991 (Schodde *et al.* 1992). Reports as far south as Sunshine Coast (Menkhorst *et al.* 2017) suggest the species may be expanding its range southwards.

Shining Flycatcher
Reported from ROK cell during Atlas 1 (1977-1982), by which time it was known to occur as far south as Moreton Bay (Storr 1984; Boles 1988). Recorded in mangroves at Corio Bay in 1999, 2014 and 2019 (E, D), around Ross Creek, Yeppoon, in 2017 (BC), Kinka Beach in 2018 and Yeppoon in 2020 (E). Since 2005 also seen on annual surveys in mangroves along Mulambin Creek which feeds into Causeway Lake, 8 km S of Yeppoon (BC). **SWBTA:** Not recorded in 1971, but found at Sabina Point and the mouth of Ross Creek in both 1991 and 1992, when no fewer than nine specimens were collected by Schodde *et al.* (1992). Yet the species was known from sites as far south as Noosa in 1958 (Officer 1969), Redcliffe in 1987 (Bielewicz & Bielewicz 1996) and Pumicestone Passage in 1988 (Britton 1990a). It was allegedly collected at the Tweed River in 1905, but was not recorded again in the far northeast corner of New South Wales until the 1970s (Cooper *et al.* 2020).

Brown Songlark (Plate 10)
Four observed at Limestone Creek, Bungundarra (38 km NNE), near Yeppoon, on 26 August 1956 (Wheeler 1957). Reported from ROK cell during both Atlas 1 and Atlas 2. Recorded near Stanwell (#32) in 1983 and 1998 (A). In the decade from 2000 to 2009, nine records, but from 2010 to 2019, excluding those from the same site in the same month, 82 records, mostly between ROK and Mt Larcom, especially on intertidal saltflats and large evaporation ponds surrounded by pastoral properties, east of a line between Bajool (34 km S) and Marmor (39 km S) (D, E, A). Surveys of marine plain grasslands over seven years from 2005 indicated a resident breeding population in the region, with peak counts of 24-25 birds at Twelve Mile Creek in December of 2010 and 2011 (Black & Houston 2013). **SWBTA:** in 1971, it was "often seen in the more open woodland areas of the western sectors ….. and also near the coast at Pine Mountain" (Nix 1972), though not recorded in 1991-1992. **Coomooboolaroo:** a regular visitor in late 1800s, but "very seldom seen" by 1933 (Barnard 1925) and not recorded during 1999 survey (Catterall & Woinarski 2003).

Plate 10. Brown Songlark at Twelve Mile Creek (Allan Briggs)

Barnard (1925) attributed its regional decline during the 20th century to the scarcity of grass, which in turn was blamed on poor rains, though Woinarski & Catterall (2004) suggested that the expansion of short grasslands due to livestock grazing was an important factor in its regional decline. This decline stands in striking contrast to the status of the resident population in ROR, and corroborates the view that the latter is separate, perhaps genetically, from the migratory populations of southern and inland populations (Black & Houston 2013).

Barn Swallow
Although there are several records of this Palearctic migrant reaching as far south as North Canungra in SE Queensland during 1970s (Higgins *et al.* 2006), the first and only ROR record was from Kinka Beach, Yeppoon, on 21 January 1989 (D. Stewart in Britton 1990b). No records in either eBird or Birdata.

Common Myna
Despite reports of the species from the ROK cell in both Atlas 1 and Atlas 2, this introduced species did not arrive in ROR until 2012 (BC) but since then, has spread across the region in both urban and rural areas. Reports indicate that the local population is still increasing, with 330 records (n=235 and 95, BC and E, respectively) until the end of 2020. Over 100 birds counted in one flock at Yeppoon, and 63 at Gracemere in 2019 (A).

2. Doubtful or unconfirmed species

Of the 324 species he listed for the region, Longmore (1978) considered ten as doubtful, indicating so with an asterisk beside their names. After assessing the evidence, we concur with Longmore on the doubtful status of five of these species (Masked Owl, Silver-crowned Friarbird, Varied Honeyeater, Scarlet Robin and Pale White-eye), as detailed below. On the other hand, the remaining five species that were flagged as 'doubtful' for ROR are accepted here, based on records since the 1970s and/or an assessment of the historical evidence. Records of four of these species are detailed below (see section 3), while those of the fifth (Powerful Owl) are dealt with elsewhere (Noske & Briggs, in press). However, we believe that twelve other species listed by Longmore (1978) are invalid, due to insufficient documentation. Furthermore, we found historical records of two additional species (Red-browed Treecreeper and Yellow-tinted Honeyeater) that were probably erroneously reported from ROR and overlooked or omitted by Longmore. Thus, the total

number of unconfirmed species is 19. In the following species accounts, 'L' denotes Longmore's (1978) description of the species' status.

Marbled Frogmouth *Podargus ocellatus*
L: "rare vagrant", based on a possible sighting of a bird from Byfield area in 1924, which was attributed to Wolstenholme. However, there is no mention of the species by Wolstenholme (1925a, b). ROR is north of the accepted range of the southern subspecies, and well south of the northern race. Nearest records are from Bulburin National Park in 1998 (D), Eurimbula National Park in 2011 (D) and Seventeen-Seventy in 2014 (D), all 160-170 km SE of ROK.

Wandering Albatross *Diomedia exulans*
L: "winter vagrant". Although Longmore stated that there were "several references to birds seen in region", neither of the cited sources (Nix 1972; Storr 1973) provide records. Indeed Storr (1973, 1984) stated that the species is seldom seen north of 24°S. Nearest records are from Heron Island (150 km E) in 2007 (E) and east of Swain Reefs (360 km NE) in 2001.

Northern Giant-Petrel *Macronectes halli*
L: "vagrant", based on an immature bird that was photographed at Emu Park, date unknown (Frauca 1974, in Longmore 1978). An unpublished record from Corio Bay on 20 June 2004 (A) requires confirmation. Nearest sightings are from Gannet Cay, Swain Reefs (255 km NE) in 2009 (D), and off the coast near Bundaberg in 2020 (BC).

Sooty Shearwater *Ardenna griseus*
L: "vagrant", based on sighting of five birds resting on the water *c.* 1 km east of North Keppel Island during a boat trip on 2 June 1974 (Longmore 1974, 1978). Identification based on "ashy coloured feathers on the undersides of the wings", but as Longmore (1974) admitted, some Short-tailed Shearwaters also show a pale flash on the underwing, and the latter species seems more likely on distributional grounds (see above account). Nearest records are from Gladstone Harbour in 1981, Heron Island in 2014, and several records near Swain Reefs in 2001 (E).

White-fronted Tern *Sterna striata*
L: "rare vagrant", based on a mounted immature specimen in National Museum of Victoria, which is labelled as being collected from Rockhampton, but has no accompanying data (Hindwood 1946). Neither Storr (1984) nor Higgins & Davies (1996) considered the provenance as valid. Breeding in New Zealand, this species is an uncommon winter visitor to southeast Australia and is rare north of Brisbane (Storr 1984). Nearest records are from Fraser Island (325 km SE; D) and Mooloolaba (450 km SE; E) in 1993.

Masked Owl *Tyto novaehollandiae*
L: "rare vagrant", based on a casual mention of the species by Broadbent (1888), with no details. Ramsay (1875, p. 580) "noticed in Mr. J.B. White's collection, obtained at Springsure (*c.* 260 km WSW), a very dark-faced variety; the facial disk was of a deep chestnut…". Barnard (1925) reported capturing a single bird with a rat-trap set at a bird cage in Coomooboolaroo (110 km WSW). Nearest records are from Dysart (240 km WNW; D) and near Theodore (180 km SSW; E) in 2001. Notwithstanding Barnard's (1925) record, we agree with Longmore that this species cannot be confirmed for ROR.

Red-browed Treecreeper *Climacteris erythrops*
Though not listed by Longmore, Broadbent (1888) listed this species along with the two other treecreeper species known for ROR (Appendix 1). However, the northern limits of this species are in the Conondale Ranges (Higgins *et al.* 2001), *c.* 400 km southeast of ROK.

Silver-crowned Friarbird *Philemon argenticeps*
L: "rare vagrant", based on two records, one of which is an unsourced sighting of two birds at Parkhurst (#20) on 22 September 1973. **SWBTA:** Bell (1968) claimed it was "very numerous" in the western parts, which were low-lying and very dry, but not in the eastern portion, where the land was better watered, hilly and more forested; however, neither Nix (1972) nor Schodde *et al.* (1992) found the species. Nearest sightings to ROK are from Cape Hillsborough (315 km N) in 2006 (E) and near Townsville in 2008 (D), whereas southern limit of similar Helmeted Friarbird *P. buceroides yorki* (Plate 11) near Clairview (180 km NW), and *possibly* as far as Shoalwater Bay (Higgins *et al.* 2001), the latter probably based on Bell's (1968)

statement that "I feel sure that Helmeted Friarbirds were among the flocks of [Noisy Friarbirds] that occurred in the more dense forests of Shoalwater Bay". We consider that Bell and others may have mistaken Helmeted Friarbirds for Silver-crowned as the two species are commonly confused where they co-occur in the Darwin region (McCrie & Noske 2015).

Plate 11. Helmeted Friarbird at Broadsound (Steve Kerr)

Eastern Spinebill *Acanthorhynchus tenuirostris*
L: "rare vagrant", based on a report of a bird heard calling several times in dry forest at Mount Wheeler on 9 February 1972 (observer unnamed), and "a mention" by R. Gannon, though Gannon (1962) does not mention ROR under this species. Nearest records are from Blackdown Tablelands (150 km WSW) and Kroombit Tops (120 km SSE), where it is a regular winter visitor. In view of the lack of published sightings, we treat the historical ROR record as unconfirmed.

Regent Honeyeater *Anthochaera phrygia*
L: "rare vagrant", based on two historical records. In August 1930, while crossing Byfield Creek, Ratcliffe (1938: 122) "caught a glimpse of the most beautiful of all the honey-eaters, the regent, whose black plumage is barred with gold". Also an undated, unconfirmed record of a single bird seen near Westwood (Longmore 1978). At Coomooboolaroo, "plentiful" in one year (not given) between 1873 and 1933 (Barnard 1925), but not since recorded (Catterall & Woinarski 2003). No records from C Qld in either atlas. **N**earest record since 2000 is from Rainbow Beach, near Fraser Island, in 2018 (E). It may not be coincidental that Ratcliffe's site is one of the few in ROR where the White-cheeked Honeyeater (which also has black and yellow in its plumage) occurs (R. Black, in litt.).

Varied Honeyeater *Gavicalis versicolor*
L: "rare vagrant", based on historical records and report of calls heard on Corroboree Island, north of Great Keppel Island in 1974. Wolstenholme (1925b) considered this species to be the commonest bird on North Keppel Island during the 1924 RAOU Campout, but his description of birds having brown and yellow streaked underparts, and some having streaked throats, indicates that they were Mangrove Honeyeaters *G. fasciogularis* (Plate 12) instead. Annual BC surveys of the island since 2013 have failed to find the Varied

Honeyeater, though Mangrove Honeyeaters are common. In SWBTA, Nix (1972) stated that the former species "is ever present in mangrove habitat and appeared to be much more numerous than the Mangrove Honeyeater", while Schodde *et al.* (1992) did not record the latter but reported Varied Honeyeaters at all mangrove sites. These historical records were considered doubtful by Higgins *et al.* (2001), who noted the similarity of the two species in habitats and calls. As the two species hybridise between Cardwell and Townsville (Ford 1978), it is unlikely that pure *versicolor* reaches Rockhampton. A report from ROK in 1999 (D) is the only record south of Bowen and might refer to a misidentified Mangrove Honeyeater or hybrid.

Plate 12. Mangrove Honeyeater on North Keppel Island (Mick Barker)

Grey-fronted Honeyeater *Ptilotula plumula*

L: "rare vagrant", based on specimens collected in 1881 from Gracemere (Mathews 1913), and another collected from Yaamba, on Fitzroy River, presumably also during late 1880s (Broadbent 1888). Both localities accepted by Storr (1973, 1984). In August 1956, five and 12 birds allegedly seen on outskirts of Rockhampton and at Cawarral, respectively (Wheeler 1957), accepted by (Gannon 1962), considered unconfirmed by Higgins *et al.* (2001). Since 1880s, the only record in ROR is from Mt Wheeler (25 km NE) in 1955 (E). **SWBTA:** Nix (1972) described it as locally common in woodland and part-cleared open woodland in the south-west, though it was not recorded by Schodde *et al.* (1992), nor at Coomooboolaroo during 50 years of residence by Barnard (1925). Nearest records are from Nebo (260 km NNW) in 1989 (Britton 1990b), near Clermont (300 km WNW) in 2001 and 2013 (D); and 13 birds in 2011 and seven in 2020 near Alpha (450 km W; E). Given the known current range of the species, it seems likely that historical specimens were mislabelled, and that Nix misidentified this, as well as two other *Ptilotula* species (see below).

Yellow-tinted Honeyeater *Ptilotula flavescens*
Although not listed by Longmore, there is an undated record from Yaamba (30 km N) (A). **SWBTA:** Nix (1972) claimed to have seen this species once, feeding in a flowering *Eucalyptus alba* near Banksia station in the western sector, in September 1971, but it was not recorded by Schodde *et al.* (1992). Not recorded at Coomooboolaroo. The nearest record is from Blackbraes National Park near Gilberton (780 km NW) in 2002 (D).

White-plumed Honeyeater *Ptilotula penicillatus*
L: "rare transient", based on Storr's (1973: 120) listing of "Rockhampton (rarely)" under its range. Subsequently, however, Storr (1984: 146) asserted that records of this species from the Fitzroy drainage probably referred to Grey-fronted Honeyeater (but see above), and that any reports east of Great Dividing Range required confirmation. Not recorded during either Atlas. **SWBTA:** Nix (1972) claimed it was moderately common wherever *Eucalyptus tereticornis* occurs, but it was not recorded during 1991-1992 surveys (Schodde *et al.* 1992). Not recorded from Coomooboolaroo, but reported from near Boolburra (75 km SW) in 2000 (A), and Dawson River, south of Duaringa (Fig. 1) in 2018 (D), on edge of ROR. Few other records within 200 km of coast (E).

Large-billed Gerygone *Gerygone magnirostris*
L: "rare vagrant", based on a report of a pair of birds in Berserker Ranges in December 1973. **SWBTA**: Nix (1972) claimed it was "quite common" in vine-forest, vine-thicket and dune-thicket habitat in the eastern sector, though he failed to find Fairy Gerygone *G. palpebrosa*. Schodde *et al.* (1992), on the other hand, found the latter species in those and several other habitats, whereas the Large-billed Gerygone was never recorded. Higgins & Peter (2002) dismissed records of the latter from the region, defining the southern limit of the species' range as Pleystowe (286 km NW) and elsewhere near Mackay (21°S). The nearest record is from Clairview (173 km N) in 2020 (E).

Western Gerygone *Gerygone fusca*
L: "rare vagrant", based on record(s) by W.B. Alexander (unpubl. MS per G. Storr) from western part of study area, probably during 1920s, and an alleged record by Campbell (1900). However, Campbell (1900) did not record this species in the region, and his gerygone record from the Fitzroy River refers to Brown Gerygone (see above). Western Gerygone was not recorded from ROR during Atlas 1, but during Atlas 2 it was reported from two adjacent cells to the west, and reporting rates increased nationally between the two periods (see Barret *et al.* 2003). Indeed, although Barnard (1925) did not record the species at Coomooboolaroo between1873 and 1934, surveys in 1990s showed it to be present year-round (Catterall & Woinarski 2003). Nearest recent records are from near Wowan (80 km SW) in 2009 (D), south of Thangool (155 km S) in 2004, and Blackwater (166km W) in 2019 (E).

Scarlet Robin *Petroica multicolor*
L: "rare vagrant". Longmore rightly questioned Broadbent's (1888) report of this species, which was allegedly seen in the "scrubs" at Black Gin Creek in *c.* 1887. Chisholm (1960) did not doubt this record, nor an alleged record for Rockingham Bay (>700 km NW) by E.P. Ramsay prior to 1857, but Storr (1984) ignored both records. In Queensland, this species is largely confined to the Granite Belt in the extreme southeast (Chisholm 1960; Roberts 1979; Higgins & Peter 2002; Niland & Grimshaw 2019), though vagrants have been reported near Brisbane, and as far north as Nanango (395 km S; D).

Pale-yellow Robin *Tregellasia capito*
L: "rare resident", based on Broadbent's (1888) report of the species at Black Gin Creek in June 1887, and an unsourced sighting of one at Byfield in October 1970. In addition, two birds allegedly seen at Bungundarra (38 km NNE), near Yeppoon, in August 1957 (Wheeler 1959). These sites are well north of the normal range of the southern nominate race, and well south of the northern race *nana* (Higgins & Peter 2002). Nearest records are from Rainbow Beach (475 km S; D, E) in 2015 and 2020.

Ashy-bellied White-eye *Zosterops citronella*
L: "rare vagrant", based on Wolstenholme's (1925b) report of several sightings of silvereyes with a uniformly green back, yellow throat and greyish-white underparts, in the "scrubs" at Byfield and Yeppoon during the RAOU Campout in 1924. Longmore (1978) rightly listed this species as doubtful, as there are no confirmed records south of Cape York Peninsula. Higgins *et al.* (2006) considered Wolstenholme's record, and records from Low Isles and Green Island, as erroneous and referring to Silvereyes *Z. lateralis vegetus*,

which occurs north of Burdekin River Drainage. However, on geographical grounds, birds in ROR most likely represent *Z. l. cornwalli,* which occurs south of that Drainage to about Hunter River, New South Wales. Storr (1984) used the trinomial *westernensis* for birds in south-eastern Queensland north to Byfield, though this name is now used for more southern populations (Higgins *et al.* 2006). Parenthetically, Kikkawa (1973) contended that birds from Green Island, off Cairns (now treated as race *vegetus*), had predominantly olive backs, approaching the appearance of the Pale White-eye.

3. Apparently valid species considered doubtful by Longmore (1978)

Five species that were flagged by Longmore (1978) as 'doubtful' for ROR are accepted here, based on records since the 1970s and/or an assessment of the historical evidence. Records of four of these species are detailed below, while those of the fifth (Powerful Owl) are dealt with elsewhere (Noske & Briggs, in press).

Pale-vented Bush-hen
A single bird was observed near the Botanic Gardens, Rockhampton, in September 1967 (A.R. McGill, pers. comm. in Longmore 1978). Recorded in ROR cell during Atlas 1. Reported from Stanwell Power Station in January 1983 (A) and Cawarral (between Rockhampton and Yeppoon) in June 1990 (Britton 1991). Since 2000, recorded at Belmont (16 km N; A); Corio Bay (#4) in 2013, Rossmoya (#9) in 2014, and Mt Morgan (#35) in 2016 (E); and Gracemere (#29) in 2015 (D). **SWBTA:** in 1971, Nix (1972) disturbed single birds from tussock and sedge in drainage lines at several widely-spaced locations, including 'The Glen' (63 km NNW) and north of Samuel Hill camp on the Freshwater Bay road (74 km NNE); but not recorded during 1991-1992 surveys (Schodde *et al.* 1992).

Greater Sooty Owl
Broadbent (1888) reported one bird on the Upper Fitzroy River, probably in Louisa Creek area. Neither Storr (1984) nor Higgins (1999) accepted this record. Nevertheless, in 1993 Hobcroft (1997) observed a bird at Eungella National Park, 325 km NW of Rockhampton and 750 km N of its previously documented range. In the same year, he also recorded one at Kroombit Tops (120 km SSE), west of Gladstone (Hobcroft 1997). **SWBTA:** reported from Shoalwater Creek on 9 January 2003 (A). Nearest recent records near Monto (175 km SSE; D), and Kroombit Tops (120 km SE; E) in 2015. Given that the species has been recorded further north than ROK, we consider this species to be a confirmed vagrant.

Rufous Owl
During the 1924 RAOU Campout, a large owl was flushed from thick scrub on the bank of Water Park Creek, near Byfield, and after settling for a short while on a tree limb, was watched by several campout participants, including "Messrs Chenery, Barnard and Alexander …… A few days later Mr Sharland saw a bird which he identified as this species" (Wolstenholme 1925b: 243). While Longmore considered these records doubtful, the calibre of the ornithologists involved suggests otherwise. Storr (1984) and Higgins (1999) accepted these and an additional record from Mt Jim Crow NP, about halfway between Yeppoon and Rockhampton (P. Doyle in Higgins 1999). Also reported from Blackdown Tablelands (150 km WSW) in late August 1976 (Pavey 1993). Nearest records since 1976 are from Sarina (250 km NNW; D) and Eungella (320 km NW; E), west of Mackay, in 2001. In view of a record further south than ROK, we consider this species to be a confirmed vagrant.

Bar-breasted Honeyeater (Plate 13)
Prior to 1980, only one published record, of 30 birds feeding in *Callistemon* at Rossmoya on 18 October 1975 (A.E.F. Rogers, pers. comm. in Longmore 1978). Reported breeding at Duaringa during Atlas 1. Recorded at Kinka Beach (#19) in September 1985, December 1989 and January 1990 (M. Crawford in Niland 1986, Britton 1990b, 1991), and at Fitzroy Barrage in Rockhampton in October 1990 (Britton 1991). During 20 years from 1999 to 2019, recorded in 60 months, and from over 30 sites, including the Botanic Gardens, Kershaw Gardens and Woolwash Lagoon in Rockhampton, Lammermoor Native Gardens near Yeppoon and Springer's Lagoon in Gracemere (A). Up to three individuals observed in each month from June 1996 to May 1997, at a site west of Yeppoon (Chan 1998), and six birds present at nearby Lake Mary in March 2017 (A). Breeding was reported at Twelve Mile Creek (40 km SE) in 2005 (Houston *et al.* 2006). **SWBTA**: not recorded in 1971 (Nix 1972), but during 1991-1992 surveys, three specimens collected in August, and two in May, all from the vicinity of billabongs along two freshwater creek systems (Schodde *et al.* 1992).

Plate 13. Bar-breasted Honeyeater on Hedlow Creek (Allan Briggs)

Discussion

Species accumulation over time

The number of bird species known to occur in ROR has risen steadily with each published study over the 145 years since Broadbent's account (Fig. 3). Of the 140 species he listed for ROR, Broadbent (1888) recorded five species (Masked Owl, Red-browed Treecreeper, Grey-fronted Honeyeater, Scarlet Robin and Pale-yellow Robin) that we believe were misidentified, leaving 135 valid species. Of these, three species (Greater Sooty Owl, Paradise Riflebird and Crimson Finch) were never recorded again in ROR. Nearly 40 years later, the RAOU campout in 1924 (Wolstenholme 1925a, b) produced a list of 182 species, of which 85 species had not been recorded by Broadbent. On the other hand, 40 (30%) of the species reported by Broadbent were not recorded by Wolstenholme (1925a, b), and of these, only three had probably already become locally extinct (Noske & Briggs, in press). That so many species were not recorded during the RAOU campout is probably due to its short duration and limited geographical scope. Only two species (Varied Honeyeater and Pale White-eye) were apparently misidentified by participants.

Fifty years later, after 20 months of residency and an additional three years of collecting field data and collating historical records, Longmore (1978) listed 324 full species for the region. As shown above, 17 of these species appear to be doubtful or lacking sufficient documentation. Of the remaining 307 species, only 95 were shared with both Broadbent's and Wolstenholme's lists, while 40 were shared only with Broadbent (1888) and 85 only with Wolstenholme (1925). Longmore's (1978) list included 88 valid species that had not previously been listed.

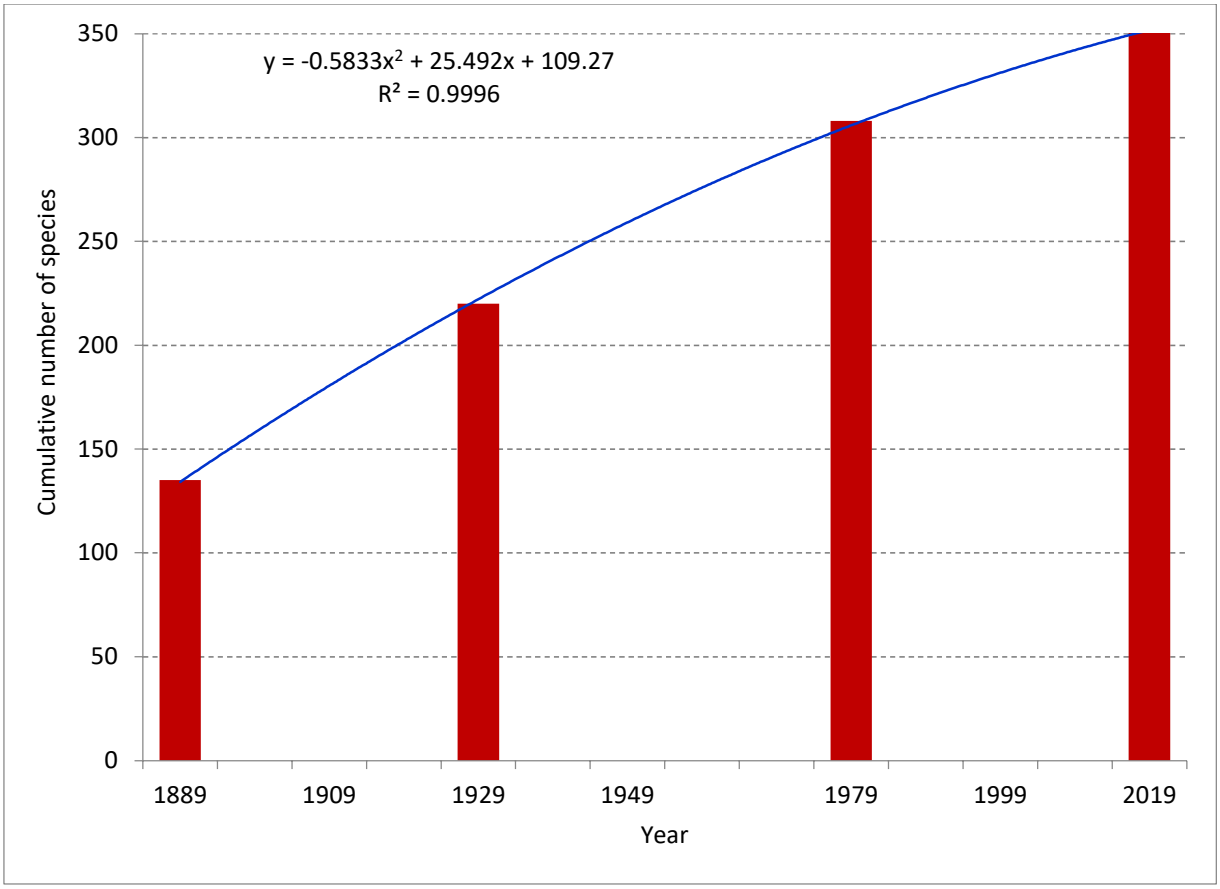


Figure 3. Cumulative number of confirmed bird species recorded in Rockhampton region (1889-2019), with line of best fit, polynomial equation and coefficient of determination (R^2).

We found historical reports of eight species that were recorded prior to the 1970s, yet were not listed by Longmore (1978). Three of these species were first recorded in the late 1800s (Great-billed Heron, Singing Honeyeater and Brown Gerygone) and five (Diamond Dove, Spotted Nightjar, Eastern Grass Owl, Broad-billed Flycatcher and Brown Songlark) between 1900 and 1960, and all have been observed at least once since the 1970s. The vast majority (35) of additional species, however, were first recorded after Longmore's (1978) review period (1970-1975), a fact that is not surprising given a large increase in the number of birdwatchers, both resident and visitors, since that time. Indeed ten species were added during the first Atlas (1977-1981), though only two were added during the second Atlas period (1998-2002). Moreover, the number of regularly visited birding sites has increased since the 1970s. Several additional species are found mainly on private properties to which Longmore and his predecessors may not have had access. Somewhat surprisingly, only seven species have been added this century.

Of the 35 species that have been added to the ROR checklist since 1975, 13 (37%) are shorebirds, ten of which were first recorded in the late 1970s and 80s. Of these ten species, seven are Palearctic-breeding migrants, two are Australian-breeding migrants (Australian Painted-snipe and Australian Pratincole) and one is a New Zealand-breeding migrant (Double-banded Plover). Seven (20%) of the additional species are seabirds, three (Black-naped Tern, Brown Noddy and Black Noddy) of which breed on islands of the Capricorn-Bunker Cays of the Southern Great Barrier Reef, only 120–240 km from Rockhampton. Of eight additional species that are landbirds, five are normally sedentary, while three are migratory, two of which breed in Northeast Asia (Oriental Cuckoo and Barn Swallow) and one in Australia (Buff-breasted Paradise Kingfisher). One of the additional species is non-indigenous (Common Myna) and two apparently derived from aviaries (Long-billed Corella and Crimson Rosella), though the latter has not persisted. Only two

additional species are waterbirds (Australian Spotted Crake and Australian Little Bittern). Further species are likely to be added in the future, perhaps including Swinhoe's Snipe *Gallinago megala* or Eastern Yellow Wagtail *Motacilla tschutschensis*, both of which were recorded at Bar Plain, east of St Lawrence in 2006 (R, Jaensch, *in litt.).*

Range expansions

Five tropical species appear to have expanded their ranges southwards into ROR in recent decades. Three of these species are normally sedentary and strongly associated with mangroves. Although the Broad-billed Flycatcher was first recorded in ROR as early as 1901, it was almost a century before it was re-discovered in ROR in 2000, and it has recently been reported as far south as the Sunshine Coast (Menkhorst *et al.* 2017; eBird 2020). The other two mangrove-specialised species, the Little Kingfisher and Mangrove Golden Whistler, were recorded in SWBTA during the CSIRO surveys of 1991-1992, about 20 years before their discovery in Corio Bay. That these two species were found in SWBTA before ROR is consistent with a gradual southward expansion of range, possibly due to rising temperatures in the region resulting from global climate change (Noske & Briggs, in press). Yet neither species has not been re-sighted in Corio Bay or elsewhere in ROR since 2012, and the nearest locality where they are regularly recorded is Mackay, 255 km NW of Corio Bay. Moreover, annual surveys of several mangrove sites along the coast between Mackay and the Capricorn Coast by BirdLife Capricornia volunteers over 15 years have failed to find these species.

One proximate explanation for the appearance of these two species in ROR is that they were blown southward by Tropical Cyclone Yasi, which brought gale force winds to Mackay and strong winds to Rockhampton in February 2011, only one year before they were recorded at Corio Bay. Significantly, the largest blocks of mangroves between Mackay and Rockhampton are situated on the sheltered western side of Torilla Peninsula, and the eastern shores of Shoalwater Bay, the latter only *c.* 30 km north of the mangrove-lined Water Park Creek that runs into Corio Bay. Given the frequency of cyclones in the past, these species may have already established populations on Torilla Peninsula and in SWBTA, conceivably before the first CSIRO survey in 1971.

The fourth species that has expanded its range southwards is the Buff-breasted Paradise-Kingfisher, a rainforest-specialised migrant that was first discovered in ROR in 1985, and soon afterwards (1992) in SWBTA. Its discovery in the Mackay region only four years beforehand suggests that its range has expanded in relatively recent times. On the other hand, the absence of records prior to 1985 may be due to the small number of birdwatchers and the species' restriction to small isolated patches of rainforest, many of which are located on private properties. Its apparent absence during the 1924 Campout may have been due to timing, as the species normally arrives in the first three weeks of November (Black 2005), whereas the Campout was held on 22-25 October. The fifth tropical species that has colonised ROR is the Bar-breasted Honeyeater, which was first recorded in ROR in 1975, yet by 1999 was present at five sites, and by 2014, in every month of the year.

ROR currently marks the southern distributional limits of the above five species, as well as the Orange-footed Scrubfowl *Megapodius reinwardt*, all of which have a wide distribution in the tropics. At least three of these species appear to have increasing populations in ROR. In contrast, only one native subtropical and temperate species (Superb Fairy-wren) appears to have reached the region, presumably from the south or west. It may not be coincidental that four (Powerful Owl, Speckled Warbler, Paradise Riflebird and Diamond Firetail) of the 22 species that are now regionally extinct or declining in ROR have a largely subtropical and/or temperate distribution, and are/were close to their northern limits in ROR (Noske & Briggs, in press). Whether the warming climate has contributed, directly or indirectly, to these range contractions and expansions, requires further study.

Comparison with surrounding areas

The fauna of neighbouring SWBTA was first assessed by Nix (1972), who based his review on known distribution patterns, supplemented by "incidental" observations made during a single survey in September 1991, apparently lasting three weeks (Richardson 1972). Thus, in many cases it is not clear whether a particular species was observed or merely expected to occur in the area. Nevertheless, we gauge that 204 species were recorded, excluding six species, four of which were honeyeaters that were possibly or probably misidentified (see Section 2 above). Two decades later, SWBTA was systematically surveyed between 7 August and 16 September 1991, and between 30 January and 27 February 1992, by Schodde *et al.* (1992) who censused birds at 61 fauna point sampling sites. Despite the much greater effort involved in their study, Schodde *et al.* (1992) recorded a total of 221 species (excluding Varied Honeyeater, see above), only 17 species more than Nix (1972) reported. However, no fewer than 73 species were recorded by one study, and not the other. Combining the two studies, the number of species that had been recorded in SWBTA until 1993 totals 249, which is considerably fewer species than the total for ROR (APPENDIX 1). This might be expected given that SWBTA is approximately one quarter (2,940 km^2) of the size of ROR (10,500 km^2), does not extend as far inland, and supports fewer habitats.

Only 100 km inland from the western edge of ROR lies the pastoral property of Coomooboolaroo, where Barnard (1925, 1934) chronicled the avifauna and its changes from 1873 to 1934. Catterall & Woinarski (2003) undertook bird surveys of the property in 1999, and combined with Barnard's records, listed 200 species of known status and an additional 42 species of uncertain status, due to few records. Of the total of 242 species recorded at Coomooboolaroo, 14 have never been recorded in ROR. Of these 14 species, eight were of unknown status, probably vagrant, while the remaining six had been recorded regularly during some period. Significantly, two of the latter group (Paradise Parrot *Psephotellus pulcherrimus* and Yellow-tufted Honeyeater *Lichenostomus melanops*) became extinct on the property before 1933, while three others declined between 1933 and 1999 (Swift Parrot *Lathamus discolor*, Musk Lorikeet *Glossopsitta concinna* and Red-browed Pardalote *Pardalotus rubricatus*). The sixth species (Western Gerygone) was one of nine that had either colonised the property since 1933, or had been overlooked or misidentified by Barnard (Catterall & Woinarski 2003). Tragically, 18 species had disappeared from the property, and a further 68 species had declined, before 1999 (Catterall & Woinarski 2003; Woinarski & Catterall 2004).

Conservation significance of region

Of the 308 confirmed species that Longmore (1978) listed, eleven resident species have been extirpated from the region, while another eleven species have declined (Noske & Briggs, in press). This number of regionally extinct species is one of the highest known in Australia (Noske & Briggs, in press). Habitat loss has undoubtedly played a major role in the demise of most of these species, as 16 are associated with either eucalypt woodland or rainforest, 63% and 70% of which have been cleared since Europeans settled in the region, respectively. In addition, livestock overgrazing probably played a role in the extirpation of four species of finches from the region (Franklin *et al.* 2005). Aware of the disastrous impact of habitat destruction on the birds of ROR, Longmore (1978) advocated the protection of large areas of woodland and forest for the preservation of many local bird species. His aspiration was realised with the gazettal of five national parks between 1988 and 1994.

The Rockhampton region is very important for the conservation of the Critically Endangered Capricorn Yellow Chat *Epthianura crocea macgregori*, which is known to breed at Pelican Creek Saltworks and Inkerman Creek Saltworks on the Fitzroy Delta between Bajool and Port Alma, as well as at Twelve Mile Creek (Houston *et al.* 2004, 2006; Jaensch *et al.* 2004c; R. Black, in litt.). Sites on Torilla Plain on the eastern side of Broad Sound account for two-thirds of the average

population of 250 birds, while the Fitzroy River delta area and Curtis Island account for 22% and 3.5%, respectively (Houston *et al.* 2018). Similarly the marine plain wetlands of ROR and adjacent areas must be regarded as nationally significant for the conservation of the Australian Painted-snipe, which is listed as Endangered under the EPBC Act 1999. Moreover, Corio Bay supports internationally significant numbers of Lesser Sand Plover and Eastern Curlew, and nationally significant numbers of Whimbrel and Terek Sandpiper, leading to its nomination as a Ramsar site, in conjunction with Shoalwater Bay (Houston & Mitchell 1997). The *Shoalwater and Corio Bays Area* was the second Ramsar site to be listed in Queensland, and comprising over 200,000 ha, represents the largest Ramsar site in the state (Ramsar 2021).

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Plate 14. Black-breasted Buzzard, Bowra, southwest Qld (Paul Turner)

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Appendix 1. Checklist of birds recorded in Rockhampton region and Shoalwater Bay Training Area, showing historical and current status.

This checklist summarises the status of all species that have been confirmed as occurring in the Rockhampton region (as defined above and shown in Fig. 1), as well as Shoalwater Bay Training Area (SWBTA). Unconfirmed species (see Results, section 2) are omitted. Names and taxonomic order follow the *BirdLife Australia Working List of Australian Birds v3* (BirdLife 2019). The known or inferred historical status of each species in the Rockhampton region is presented for three years, based on descriptions by Broadbent (1888), Wolstenholme (1925a, b) and Longmore (1978). Current status (2020) is based on records from BirdLife Capricornia and online databases (eBird 2020, Birdata 2020, ALA 2020 and WildNet 2020).

In the column labelled Longmore (1978), status abbreviations are shown in lower case if signifying personal records between 1970 and 1975, or upper case if referring to records by contemporaries or listed in published and unpublished reports, respectively; values in brackets refer to number of records. In the column labelled SWBTA, status abbreviations in upper case refer to the 1971 survey (Nix 1972), while those in lower case refer to the 1991-1992 surveys (Schodde *et al.* 1992). Species that are additional to those in Longmore's (1978) list (see Results, section 1 above) are shown in bold.

Status abbreviations: C, common; U, uncommon; R, rare (11-50 records); V, vagrant (≤10 records); L, localised; N, unknown; E, regionally extinct; D, declining.

English name	Scientific name	1888	1925	1978	2020	SWBTA
Emu	*Dromaius novaehollandiae*			U	U	Cc
Australian Brush Turkey	*Alectura lathami*	C	C	C	C	Cc
Orange-footed Scrub Fowl	*Megapodius reinwardt*		C	r	RL	Nr
Stubble Quail	*Coturnix pectoralis*			V(1)	V	
Brown Quail	*Coturnix ypsilophora*	C	C	C	C	Cu
King Quail	*Coturnix chinensis*			V(1)	D	Nr
Magpie Goose	*Anseranas semipalmata*		C	U	C	r
Plumed Whistling-Duck	*Dendrocygna eytoni*	N	C	C	C	Cr
Wandering Whistling-Duck	*Dendrocygna arcuata*		N	U	U	r
Musk Duck	*Biziura lobata*		R	v	V	
Pink-eared Duck	*Malacorhynchus membranaceus*			r	U	
Freckled Duck	*Stictonetta naevosa*			V(2)	R	
Black Swan	*Cygnus atratus*		N	C	C	C
Radjah Shelduck	*Tadorna radjah*		R	R	U	r
Cotton Pygmy-Goose	*Nettapus coromandelianus*			C	C	C
Green Pygmy-goose	*Nettapus pulchellus*			U	R	
Australian Wood Duck	*Chenonetta jubata*			C	C	Cu
Hardhead	*Aythya australis*		C	C	C	Cr
Australasian Shoveler	*Spatula rhynchotis*			r	R	
Pacific Black Duck	*Anas superciliosa*	N	C	C	C	Cu
Grey Teal	*Anas gracilis*		C	C	C	Cr
Chestnut Teal	*Anas castanea*			V(1)	U	
Australasian Grebe	*Tachybaptus novaehollandiae*		C	C	C	Cr
Hoary-headed Grebe	*Poliocephalus poliocephalus*		R	v	V	

English name	Scientific name	1888	1925	1978	2020	SWBTA
Great Crested Grebe	*Podiceps cristatus*			U	U	
Red-tailed Tropicbird	*Phaethon rubricauda*				**V**	
Rock Dove	*Columba livia*			C	C	
White-headed Pigeon	*Columba Leucomela*	N	C	V(1)	U	Nr
Spotted Dove	*Streptopelia chinensis*			C	C	
Brown Cuckoo-Dove	*Macropygia phasianella*	N	C	C	U	Cc
Wonga Pigeon	*Leucosarcia melanoleuca*	R	R	V	D	C
Squatter Pigeon	*Geophaps scripta*	N		U	U	Cu
Common Bronzewing	*Phaps chalcoptera*	N		U	U	Nr
Crested Pigeon	*Ocyphaps lophotes*			C	C	Nr
Diamond Dove	*Geopelia cuneata*				**V**	**r**
Peaceful Dove	*Geopelia placida*	C	C	C	C	Cc
Bar-shouldered Dove	*Geopelia humeralis*		C	C	C	Cc
Brown-capped Emerald Dove	*Chalcophaps longirostris*	N	C	U	U	Nu
Wompoo Fruit-Dove	*Ptilinopus magnificus*	N	R	U	U	Nu
Superb Fruit-Dove	*Ptilinopus superbus*		R	v	V	
Rose-crowned Fruit-Dove	*Ptilinopus regina*	N	C	C	C	Cc
Topknot Pigeon	*Lopholaimus antarcticus*	N		C	C	Nr
Tawny Frogmouth	*Podargus strigoides*	N	N	C	C	Cc
Spotted Nightjar	*Eurostopodus argus*				**V**	
White-throated Nightjar	*Eurostopodus mystacalis*	N	R	R	RL	Cu
Large-tailed Nightjar	*Caprimulgus macrurus*			v	R	Cu
Australian Owlet-nightjar	*Aegotheles cristatus*	N	N	U	R	Cc
White-throated Needletail	*Hirundapus caudacutus*	C		U	U	u
Fork-tailed Swift	*Apus pacificus*			R(2)	R	u
Pheasant Coucal	*Centropus phasianinus*	C	C	C	C	Cc
Eastern Koel	*Eudynamis orientalis*	N	C	U	C	Nc
Channel-billed Cuckoo	*Scythrops novaehollandiae*		R	U	C	Cc
Horsfield's Bronze-Cuckoo	*Chalcites basalis*		N	C	U	Nr
Shining Bronze-Cuckoo	*Chalcites lucidus*			C	U	Nu
Little Bronze-Cuckoo	*Chalcites minutillus*		C	U	U	u
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	N		C	C	Cu
Brush Cuckoo	*Cacomantis variolosus*		R	U	U	Cr
Pallid Cuckoo	*Heteroscenes pallidus*	N	C	U	U	Rr
Oriental Cuckoo	*Cuculus saturatus*				**V**	**Cc**
Buff-banded Rail	*Hypotaenidia philippensis*	C		C	C	Nu
Australian Spotted Crake	*Porzana fluminea*				**V**	
Baillon's Crake	*Zapornia pusilla*			V(1)	D	
Spotless Crake	*Zapornia tabuensis*			v	V	
Pale-vented Bush-hen	*Amaurornis moluccana*			v	R	C
Purple Swamphen	*Porphyria porphyria*		C	C	C	Cr
Dusky Moorhen	*Gallinula tenebrosa*		C	C	C	Cu
Black-tailed Native-hen	*Tribonyx ventralis*			v	R	N
Eurasian Coot	*Fulica atra*		C	C	C	Cr
Brolga	*Grus rubicundus*		N	C	C	Cu

English name	Scientific name	1888	1925	1978	2020	SWBTA
Australian Bustard	*Ardeotis australis*			U	U	u
Wedge-tailed Shearwater	*Ardenna pacificus*		C	C	V	r
Short-tailed Shearwater	*Ardenna tenuirostris*				**V**	
Black-necked Stork	*Ephippiorhynchus asiaticus*		R	C	C	Cr
Yellow-billed Spoonbill	*Platalea flavipes*		N	U	U	r
Royal Spoonbill	*Platalea regia*		N	C	C	u
Straw-necked Ibis	*Threskiornis spinicollis*		C	C	C	u
Australian White Ibis	*Threskiornis moluccus*		C	C	C	u
Glossy Ibis	*Plegadis falcinellus*		R	R	U	
Australian Little Bittern	*Ixobrychus dubius*				**V**	
Black Bittern	*Ixobrychus flavicollis*			U	RL	Nr
Nankeen Night-Heron	*Nycticorax caledonicus*		R	U	U	Cr
Striated Heron	*Butorides striatus*		R	C	C	Cu
Cattle Egret	*Bubulcus ibis*			R	C	Rr
White-necked Heron	*Ardea pacifica*		R	C	C	Cr
Great-billed Heron	*Ardea sumatrana*				**V**	**R**
Great Egret	*Ardea alba*		C	C	C	Nu
Intermediate Egret	*Ardea intermedia*		C	C	C	N
White-faced Heron	*Egretta novaehollandiae*		C	C	C	Cc
Little Egret	*Egretta garzetta*		C	C	C	Nr
Eastern Reef Egret	*Egretta sacra*		N	C	C	Cu
Australian Pelican	*Pelecanus conspicillatus*		N	C	C	Cu
Lesser Frigatebird	*Fregata ariel*		R	v	V	r
Great Frigatebird	*Fregata minor*				**V**	
Australasian Gannet	*Morus serrator*			U	R	r
Brown Booby	*Sula leucogaster*			C	U	
Masked Booby	*Sula dactylatra*			R	V	
Little Pied Cormorant	*Microcarba melanoleucos*	N	C	C	C	Cu
Great Cormorant	*Phalacrocorax carbo*			C	C	Nr
Little Black Cormorant	*Phalacrocorax sulcirostris*		C	C	C	Nu
Great Pied Cormorant	*Phalacrocorax varius*		C	C	C	Cu
Australasian Darter	*Anhinga novaehollandiae*	N	C	C	C	Nu
Bush Stone-curlew	*Burhinus grallarius*	C	C	C	C	Cc
Beach Stone-curlew	*Esacus magnirostris*		R	U	U	Nr
Australian Pied Oystercatcher	*Haematopus longirostris*		R	C	C	Cc
Sooty Oystercatcher	*Haematopus fuliginosus*		R	C	U	Rr
Red-necked Avocet	*Recurvirostra novaehollandiae*			V(1)	U	
Pied Stilt	*Himantopus leucocephalus*		R	U	C	C
Grey Plover	*Pluvialus squatarola*			V(1)	R	
Pacific Golden Plover	*Pluvialus fulva*		N	U	U	Nu
Common Ringed Plover	*Charadrius hiaticula*				**V**	
Little Ringed Plover	*Charadrius dubius*				**V**	
Red-capped Plover	*Charadrius rufiaapillus*		C	C	C	Cc
Double-banded Plover	*Charadrius bicinctus*				**R**	
Lesser Sand Plover	*Charadrius mongolus*			C	C	u

English name	Scientific name	1888	1925	1978	2020	SWBTA
Greater Sand Plover	*Charadrius lesahenaultii*			U	U	u
Oriental Plover	*Charadrius veredus*				**V**	
Black-fronted Dotterel	*Elseyornis melanops*	C	C	C	C	Cr
Banded Lapwing	*Vanellus tricolor*			V	V	
Masked Lapwing	*Vanellus miles*		C	C	C	Cu
Red-kneed Dotterel	*Erythrogonys cinctus*			V(3)	U	
Australian Painted-snipe	*Rostratula australis*				**R**	
Comb-crested Jacana	*Irediparra gallinacea*	C	R	C	C	Cr
Whimbrel	*Numenius phaeopus*		R	U	C	Cc
Little Curlew	*Numenius minutus*				**V**	
Far Eastern Curlew	*Numenius madagascariensis*		C	C	C	Cc
Bar-tailed Godwit	*Limosa lapponica*		R	C	C	Cc
Black-tailed Godwit	*Limosa limosa*				**U**	**u**
Ruddy Turnstone	*Arenaria interpres*			U	U	r
Great Knot	*Calidris tenuirostris*			U	U	c
Red Knot	*Calidris canutus*			C	U	
Broad-billed Sandpiper	*Limicola falcinellus*			V(1)	V	
Sharp-tailed Sandpiper	*Calidris acuminata*		R	C	C	Cu
Curlew Sandpiper	*Calidris ferruginea*			C	U	
Long-toed Stint	*Calidris subminuta*				**V**	
Red-necked Stint	*Calidris ruficollis*			C	C	u
Sanderling	*Calidris alba*			V(1)	R	
Pectoral Sandpiper	*Calidris melanotos*				**V**	
Asian Dowitcher	*Limnodromus semipalmatus*				**V**	
Latham's Snipe	*Gallinago hardwickii*			U	U	
Terek Sandpiper	*Xenus cinereus*			U	U	u
Common Sandpiper	*Actitis hypoleucos*			U	U	u
Grey-tailed Tattler	*Tringa brevipes*		R	C	C	u
Wandering Tattler	*Tringa incana*			V(1)	V	r
Common Greenshank	*Tringa nebularia*			C	C	u
Wood Sandpiper	*Tringa glareola*				**V**	
Marsh Sandpiper	*Tringa stagnatilis*			V(1)	C	
Red-backed Button-quail	*Turnix maculosa*	N		v	V	u
Black-breasted Button-quail	*Turnix melanogaster*			r	R	
Painted Button-quail	*Turnix varius*		N	U	R	Cu
Red-chested Button-quail	*Turnix pyrrhothorax*			v	V	u
Little Button-quail	*Turnix velox*		N	v	V	C
Australian Pratincole	*Stiltia isabella*				**R**	
Oriental Pratincole	*Glareola maldivarum*				**V**	
Brown Noddy	*Anous stolidus*				**V**	
Black Noddy	*Anous minutus*				**V**	
Silver Gull	*Larus novaehollandiae*	C	C	C	C	Cu
Sooty Tern	*Onychoprion fuscatus*				**V**	
Little Tern	*Sterna albifrons*			C	C	
Australian Gull-billed Tern	*Gelochelidon macrotarsa*			C	C	r

English name	Scientific name	1888	1925	1978	2020	SWBTA
Caspian Tern	*Hydroprogne caspia*		R	C	C	Nu
Whiskered Tern	*Chlidonias hybrida*		C	C	C	C
White-winged Black Tern	*Chlidonias leucoptera*			V(2)	R	
Black-naped Tern	*Sterna sumatrana*				**V**	
Common Tern	*Sterna hirundo*			V(1)	R	
Lesser Crested Tern	*Thalasseus bengalensis*			U	U	r
Greater Crested Tern	*Thalasseus bergii*		C	C	C	Nu
Eastern Grass Owl	*Tyto longimembris*				**RL**	
Greater Sooty Owl	*Tyto tenebricosa*	R		v	V	
Barn Owl	*Tyto alba*	C		R	R	Cr
Rufous Owl	*Ninox rufa*		R	v	V	
Powerful Owl	*Ninox strenua*	N		v	D	r
Barking Owl	*Ninox connivens*	N		s	R	u
Southern Boobook	*Ninox boobook*	C	R	U	U	Cu
Osprey	*Pandion haliaetus*	N	R	U	U	Cu
Black-shouldered Kite	*Elanus axillaris*			C	U	C
Black-breasted Buzzard	*Hamirostra melanosternon*				**V**	
Square-tailed Kite	*Lophoictinia isura*	N		V(1)	R	r
Pacific Baza	*Aviceda subcristata*	R	R	U	U	Nu
Wedge-tailed Eagle	*Aquila audax*	C	R	C	C	Cc
Little Eagle	*Hieraaetus morphnoides*	R		U	U	r
Swamp Harrier	*Circus approximans*		R	C	U	Cr
Spotted Harrier	*Circus assimilis*			V(2)	R	r
Grey Goshawk	*Accipiter novaehollandiae*	R	C	U	R	Nr
Brown Goshawk	*Accipiter fasciatus*	C	R	C	U	Cu
Collared Sparrowhawk	*Accipiter cirrhocephalus*	C	R	U	R	Nu
Red Goshawk	*Erythrotriorchis radiatus*			r	E	N
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	C	C	U	U	Nu
Whistling Kite	*Haliastur sphenurus*	N	C	C	C	Cu
Brahminy Kite	*Haliastur indus*	C	C	C	C	Nu
Black Kite	*Milvus migrans*	C		U	C	Cr
Rainbow Bee-eater	*Merops ornatus*	C	C	C	C	Cc
Oriental Dollarbird	*Eurystomus orientalis*		C	U	U	Cc
Little Kingfisher	*Ceyx pusillus*				**V**	**r**
Azure Kingfisher	*Ceyx azureus*	C	N	C	U	Cu
Forest Kingfisher	*Todiramphus macleayii*	C	C	C	C	Cc
Collared Kingfisher	*Todiramphus chloris*	N		U	R	Nr
Sacred Kingfisher	*Todiramphus sanctus*	C	C	C	C	Nu
Red-backed Kingfisher	*Todiramphus pyrrhopygia*			U	V	
Buff-breasted Paradise Kingfisher	*Tanysiptera sylvia*				**RL**	**r**
Laughing Kookaburra	*Dacelo novaeguineae*	C	C	C	C	Cc
Blue-winged Kookaburra	*Dacelo leachii*	C	N	C	C	Cc
Nankeen Kestrel	*Falco cenchroides*	C	R	C	C	Cu
Australian Hobby	*Falco longipennis*	R		U	C	r
Brown Falcon	*Falco berigora*	N	R	C	C	Cu

English name	Scientific name	1888	1925	1978	2020	SWBTA
Black Falcon	*Falco subniger*	R	R	v	R	
Peregrine Falcon	*Falco peregrinus*	C		U	R	Rr
Cockatiel	*Nymphicus hollandicus*			C	C	
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*			U	C	Cc
Glossy Black-Cockatoo	*Calyptorhynchus Lathami*		N	R	R	Nu
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	N		V(1)	V	
Galah	*Eolophus roseicapillus*			U	C	
Little Corella	*Cacatua sanguinea*			U	C	
Long-billed Corella	*Cacatua tenuirostris*				**U**	
Sulphur-crested Cockatoo	*Caaatua galerita*	C	C	C	C	Cc
Crimson Rosella	*Platycercus elegans*				**V**	
Pale-headed Rosella	*Platycercus adscitus*		C	C	C	Cc
Little Lorikeet	*Glossopsitta pusilla*	N		C	U	Cc
Rainbow Lorikeet	*Trichoglossus haematodus*	N	C	C	C	Cc
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	N	C	C	C	Cc
Budgerigar	*Melopsitticus undulatus*			U	V	
Australian King-Parrot	*Alisterus scapularis*	N	R	r	U	N
Red-winged Parrot	*Aprosmictus erythropterus*	C	N	C	C	Cc
Noisy Pitta	*Pitta versicolor*		R	U	U	u
Regent Bowerbird	*Sericulus chrysocephalus*		R	R	E	
Satin Bowerbird	*Ptilonorhynchus violaceus*	N		v	V	r
Spotted Bowerbird	*Ptilonorhynchus maculata*	R		C	V	
White-throated Treecreeper	*Cormobates leucophaea*	N	C	C	R	Cr
Brown Treecreeper	*Climacteris picumnus*	C	R	C	D	Cr
Variegated Fairy-wren	*Malurus lamberti*	N		U	V	
Superb Fairy-wren	*Malurus cyaneus*				**R**	
Red-backed Fairy-wren	*Malurus melanocephalus*	N	C	C	C	Cc
White-cheeked Honeyeater	*Phylidonyris nigra*		R	U	RL	Cu
Brown Honeyeater	*Lichmera indistincta*	N	C	C	C	Cc
Blue-faced Honeyeater	*Entomyzon cyanotis*	C	C	C	C	Cc
White-naped Honeyeater	*Melithreptus lunatus*				**R**	**C**
White-throated Honeyeater	*Melithreptus albogularis*		C	C	C	Cc
Black-chinned Honeyeater	*Melithreptus gularis*	N		U	R	Ru
White-eared Honeyeater	*Nesoptilotis leucotis*			r	V	R
Striped Honeyeater	*Plectorhyncha lanceolata*	C		C	U	C
Little Friarbird	*Philemon citreogularis*	C	N	C	C	Cc
Noisy Friarbird	*Philemon corniculatus*	C	C	C	C	Cc
Dusky Honeyeater	*Myzomela obscura*		C	C	C	Cc
Scarlet Honeyeater	*Myzomela sanguinolenta*	N	C	C	C	Cc
Bar-breasted Honeyeater	*Ramsayornis fasciatus*			V	C	r
Rufous-throated Honeyeater	*Conopophila rufogularis*				**V**	
Yellow Chat	*Ephthianura crocea*			v	RL	
Lewin's Honeyeater	*Meliphaga lewinii*	C	C	C	C	Cc
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*			u	D	
Singing Honeyeater	*Gavicalis virescens*				**V**	

English name	Scientific name	1888	1925	1978	2020	SWBTA
Mangrove Honeyeater	*Gavicalis fasciogularis*			C	C	N
Fuscous Honeyeater	*Ptilotula fusca*			C	D	Ru
Yellow-faced Honeyeater	*Caligavis chrysops*			r	V	C
Noisy Miner	*Manorina melanocephala*	C	C	C	C	Cc
Yellow-throated Miner	*Manorina flavigula*			U	R	
Spotted Pardalote	*Pardalotus punctatus*	C		U	R	C
Striated Pardalote	*Pardalotus striatus*	C	C	C	C	Cc
Brown Gerygone	*Gerygone mouki*				**R**	
Fairy Gerygone	*Gerygone palpebrosa*		R	C	U	c
White-throated Gerygone	*Gerygone olivacea*	N	R	U	U	Cu
Mangrove Gerygone	*Gerygone levigaster*		N	C	U	Ru
Weebill	*Smicrornis brevirostris*	N		C	R	Cu
Speckled Warbler	*Pyrrholaemus sagittatus*	C		U	D	R
White-browed Scrubwren	*Sericornis frontalis*		R	C	U	Cu
Large-billed Scrubwren	*Sericornis magnirostris*		R	U	U	Nu
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	N	R	U	V	R
Yellow Thornbill	*Acanthiza nana*		R	U	V	
Brown Thornbill	*Acanthiza pusilla*		R	U	V	R
Buff-rumped Thornbill	*Acanthiza reguloides*			v	V	r
Grey-crowned Babbler	*Pomatostomus temporalis*	N	R	C	C	Cu
Varied Sittella	*Daphoenositta chrysoptera*	N	R	U	U	Cu
Australasian Figbird	*Sphecotheres vieilloti*	C	C	C	C	Cc
Olive-backed Oriole	*Oriolus sagittatus*	N	R	C	C	Cc
Crested Bellbird	*Oreoica gutturalis*	N		v	E	
Eastern Shrike-tit	*Falcunculus frontatus*		R	U	E	Rr
Rufous Whistler	*Pachycephala rufiventris*	C	C	C	C	Cc
Golden Whistler	*Pachycephala pectoralis*	C		U	U	Ru
Mangrove Golden Whistler	*Pachycephala melanura*				**RL**	
Little Shrike-thrush	*Colluricincta megarhyncha*	C	C	C	C	Cc
Grey Shrike-thrush	*Colluricincta harmonica*	C	N	C	C	Cc
Eastern Whipbird	*Psophodes olivaceus*	N	R	U	U	Cu
Ground Cuckoo-shrike	*Coracina maxima*			R	V	
Barred Cuckoo-shrike	*Coracina lineata*		R	R	D	N
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	C	C	C	C	Cc
White-bellied Cuckoo-shrike	*Coracina papuensis*	R	N	C	C	Cc
Common Cicadabird	*Coracina tenuirostris*	N	R	U	U	Nc
White-winged Triller	*Lalage tricolor*		R	U	U	Nr
Varied Triller	*Lalage leucomela*	C	C	C	C	Cc
Pied Currawong	*Strepera graculina*	C	R	C	C	Rc
Australian Magpie	*Gymnorhina tibicen*	C	C	C	C	Cc
Pied Butcherbird	*Cracticus nigrogularis*	C	C	C	C	Cc
Grey Butcherbird	*Cracticus torquatus*	C	C	C	C	Cc
Masked Woodswallow	*Artamus personatus*	N		r	R	
White-browed Woodswallow	*Artamus superciliosus*	N		U(1)	V	
Dusky Woodswallow	*Artamus cyanopterus*	N		U(1)	D	

English name	Scientific name	1888	1925	1978	2020	SWBTA
Black-faced Woodswallow	*Artamus cinereus*		N	C	C	Cr
Little Woodswallow	*Artamus minor*	C	R	C	D	r
White-breasted Woodswallow	*Artamus leucorhynchus*	C	C	C	C	Cc
Willie Wagtail	*Rhipidura Leucophrys*	C	C	C	C	Cu
Rufous Fantail	*Rhipidura rufifrons*	C	R	U	U	Rc
Grey Fantail	*Rhipidura fuliginosa*	C		C	C	Cc
Spangled Drongo	*Dicrurus bracteatus*	C	R	C	C	Cc
Leaden Flycatcher	*Myiagra rubecula*		N	C	C	Cc
Broad-billed Flycatcher	*Myiagra ruficollis*				**RL**	**Rr**
Satin Flycatcher	*Myiagra cyanoleuca*			U	R	
Shining Flycatcher	*Myiagra alecto*				**RL**	**u**
Restless Flycatcher	*Myiagra inquieta*	C	R	C	U	Rr
Magpie-lark	*Grallina cyanoleuca*	C	C	C	C	Cu
Spectacled Monarch	*Symposiarchus trivirgatus*		N	C	C	Nc
White-eared Monarch	*Carterornis leucotis*		R	U	RL	Cu
Black-faced Monarch	*Monarcha melanopsis*	N	R	U	RL	Nu
Torresian Crow	*Corvus orru*	N	C	C	C	Cc
Australian Raven	*Corvus coronoides*			V(1)	U	
White-winged Chough	*Corcorax melanorhamphos*	N		U	U	
Apostlebird	*Struthidea cinerea*			C	C	
Paradise Riflebird	*Lophorina paradiseus*	R		v	E	
Rose Robin	*Petroica rosea*	N		u	V	Rr
Red-capped Robin	*Petroica goodenovii*			r	V	
Jacky Winter	*Microeca fascinans*	C	R	C	V	Cu
Eastern Yellow Robin	*Eopsaltria australis*	N	N	U	U	Cu
Hooded Robin	*Melanodryas cucullata*	N		r	E	
Horsfield's Bushlark	*Mirafra javanica*			U	C	Cc
Zitting Cisticola	*Cisticola juncidis*			V(1)	U	
Golden-headed Cisticola	*Cisticola exilis*		R	C	C	Cc
Australian Reed-Warbler	*Acrocephalus australis*			C	C	C
Brown Songlark	*Cincloramphus cruralis*				**U**	**C**
Rufous Songlark	*Cinclorhamphus mathewsi*			C	R	Cr
Tawny Grassbird	*Megalurus timoriensis*	C	N	U	U	Cu
Little Grassbird	*Poodytes gramineus*			V(1)	R	
Fairy Martin	*Petrochelidon ariel*	N	C	C	C	Cu
Tree Martin	*Petrochelidon nigricans*		C	C	C	Cc
Welcome Swallow	*Hirundo neoxena*		C	C	C	Cc
Barn Swallow	*Hirundo rustica*				**V**	
Silvereye	*Zosterops lateralis*	N	N	U	U	Cc
Common Starling	*Sturnus vulgaris*			C	R	
Common Myna	*Acridotheres tristis*				**C**	
Russet-tailed Thrush	*Zoothera heini*		R	v	E	N
Mistletoebird	*Dicaeum hirundinaceum*	N	C	C	C	Cc
Olive-backed Sunbird	*Cinnyris jugularis*		N	U	C	Cc
Scaly-breasted Munia	*Lonchura punctulata*			C	C	

English name	Scientific name	1888	1925	1978	2020	SWBTA
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	N		U	C	Nu
Diamond Firetail	*Stagonopleura guttata*			r	E	
Red-browed Finch	*Neochmia temporalis*	C	C	C	R	Cr
Crimson Finch	*Neochmia phaeton*	C		r	E	
Star Finch	*Neochmia ruficauda*			r	E	
Plum-headed Finch	*Neochmia modesta*	N		U	U	R
Black-throated Finch	*Poephila cincta*	N	R	U	E	R
Zebra Finch	*Taeniopygia castanotis*		R	C	R	
Double-barred Finch	*Taeniopygia bichenovii*	N	C	C	C	Cu
House Sparrow	Passer *domesticus*			C	C	
Australasian Pipit	*Anthus novaeseelandiae*	C	C	C	C	Cu
Total number of species		**135**	**180**	**307**	**350**	**249**

Additions to the avifauna of Diamantina National Park, Queensland

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Abstract

The avifauna of Diamantina National Park, southwest Queensland, is reasonably well documented with 183 species reported to date. This report provides details of an additional 16 species that have been recorded since 2010, as well as recent records of 24 uncommon species.

Introduction

Ley *et al.* (2011) summarised the status and distribution of 183 species of birds recorded from 1994 to 2009 in Diamantina National Park, southwest Queensland. Here we up-date that document, mainly with sightings since 2010, but also including some historical records. The addition of 16 species brings the total number of species for the park to 199.

Methods

We extracted relevant bird sighting records from the following sources: (1) lists compiled by Birds Queensland members during visits to the National Park in August 2013, July 2014, August 2015 and September 2017, (2) Wildnet (2020), all of which were submitted by CM and Fiona Leverington while they were the resident QPWS rangers at the Park from 2013 to 2019; (3) eBird (2017); and a few miscellaneous sources. We excluded records that, based on our experience of the birds of the Park, we considered to be unlikely and/or lacked adequate documentation.

For consistency with Ley *et al*. (2011) coordinates of sightings were rounded to one minute of latitude and longitude. For nomenclature and the sequence of species we used BirdLife Australia's *Working List of Australian Birds* (BirdLife Australia 2019).

Annotated list

In the following list, new species for Diamantina National Park are marked with an asterisk. Wildnet records are designated 'W' and records from the Birds Queensland expeditions to the Park are designated 'BQ'.

Musk Duck *Biziura lobata*
Additional records, from Lake Constance (23°51'S, 141°0'E) on 2 May 2016, from Paraputcheri Waterhole (24°4'S, 140°56'E) on 27 June 2017 (W), and from Hunters Gorge (23°40'S, 141°6'E) on 22 September 2017 (BQ).

Black Swan *Cygnus atratus*
Additional records, from Paraputcheri Waterhole (24°3'S, 140°52'E) on 27 September 2017 (BQ), and in floodwater from the Diamantina River near the ranger base (23°45'S, 141°7'E) on 18 March 2018 (CM pers. obs.).

Channel-billed Cuckoo *Scythrops novaehollandiae*
Additional records, at the ranger base (23°45'S, 141°8'E) on 2 February 2015, and at the Gum Hole campground (23°40'S, 40°59'E) on 13 January 2017 (W).

***Buff-banded Rail** *Hypotaenidia philippensis*
Present at the old broken dam south of the ranger base (23°46'S, 141°8'E) on 14 January 2017 (W).

***Australian Spotted Crake** *Porzana fluminea*
Present at the ranger base (23°45'S, 141°8'E) on 1 February 2018 (W).

Little Egret *Egretta garzetta*
One additional record, at Lightning Creek (23°52'S, 141°11'E) on 18 January 2015 (W).

Red-necked Avocet *Recurvirostra novaehollandiae*
Additional records, at Lake Constance (23°51'S, 141°0'E) on 21 July 2013 and 2 August 2013, and at Dippa Dippa Waterhole (24°0'S, 141°1'E) on 18 October 2013 (W).

Red-capped Plover *Charadrius ruficapillus*
One additional record, at Paraputcheri Waterhole (24°4'S, 140°56'E) on 27 June 2017 (W).

Oriental Plover *Charadrius veredus*
A second record for the Park, one bird at the old broken dam south of the ranger base (23°46'S, 141°8'E) on 24 September 2017 (BQ).

Plains-wanderer *Pedionomus torquatus*
Locations of sightings since 1995 in Diamantina NP include (more detailed locations not available): in the vicinity of Eight Mile Creek on the Winton Road north of the ranger base, near Foothills Tank about 15 km northwest of the ranger base, near the Davenport Downs boundary south of the ranger base, and on the sand dune behind the ranger base; during long-standing and on-going surveys birds have been detected at many other sites in Diamantina NP, in Astrebla Downs NP, and in the Nails Creek corridor that separates them (Rich 2016).

***Australian Painted-snipe** *Rostratula australis* (Plate 1)
One bird present at the old broken dam south of the ranger base (23°46'S, 141°8'E) on 26 January 2014 (W).

***Black-tailed Godwit** *Limosa limosa*
Present at Lake Constance (23°51'S, 141°0'E) on 5 November 2019 (W).

Sharp-tailed Sandpiper *Calidris acuminata*
Additional records, at Cooridy Creek (23°56'S, 141°12'E) on 14 and 15 December 2013, 27 January 2014, and 26 January 2016, and at Cooryie Creek (23°47'S, 141°9'E) on 27 and 28 January 2017 (W).

Red-necked Stint *Calidris ruficollis*
One additional record, one bird in the bore drain at the Mayne Pub Bore (23°32'S, 141°21'E) on 19 September 2017 (BQ).

***Latham's Snipe** *Gallinago hardwickii*
One bird in the channels of the Diamantina River below Janet's Leap lookout (23°41'S, 141°7'E) on 19 September 2017 (BQ).

Common Greenshank *Tringa nebularia*
Additional records, at Cooridy Creek (23°56'S, 141°12'E) on 15 December 2013 and 23 January 2016, and at Lightning Creek (23°52'S, 141°11'E) on 23 and 24 January 2016 (W).

Plate 1. Australian Painted-snipe male, Lake Samsonvale, SE Qld (Graham Donaldson)

Marsh Sandpiper *Tringa stagnatilis*
One additional record, at Goodappa Waterhole (24°1'S, 140°58'E) on 27 September 2017 (BQ)

Red-chested Button-quail *Turnix pyrrhothorax*
Additional records, from the Diamantina River near the ranger base (23°45'S, 141°7'E) on 17 March 2018 (W), and from 'Diamantina National Park' (no more specific locations given), eBird checklist S61319614 dated 10 November 2019 submitted by Nigel Jackett, and eBird checklists S32789745 and S32790720 dated 8 and 10 September 2016 respectively submitted by Peter Valentine and including a breeding record of a nest with eggs (eBird 2017).

Silver Gull *Larus novaehollandiae*
One additional record, at Eurathunda Waterhole (23°57'S, 140°55'E) on 5 November 2019 (W).

Caspian Tern *Hydroprogne caspia*
Additional records, at Lake Constance (23°51'S, 141°0'E) on 11 November 2015, and at Paraputcheri Waterhole (24°4'S, 140°5'E) on 27 June 2017 (W).

***White-winged Black Tern** *Chlidonias leucopterus* (Plate 2)
One record, at Cooridy Creek (23°56'S, 141°12'E) on 27 January 2014 (W).

***Eastern Grass Owl** *Tyto longimembris*
One historical record, a probable and credible sighting by an experienced observer of one bird on the ground in open country near, but not at, Gum Hole campground (no more detailed location available) on 25 September 2003 (Chris Coleborn pers. comm. to Andrew Silcocks 27 December 2017). Eastern Grass Owls have been recorded previously in the vicinity of Diamantina NP, including at Elizabeth Springs Conservation Park to the northwest (Antos & Dann 2014) and at Astrebla Downs NP to the southwest (Stewart & Gynther 2003).

Plate 2. White-winged Black Tern, Cooridy Creek, Diamantina NP (Chris Mitchell)

Letter-winged Kite *Elanus scriptus*
Recorded at the ranger base (23°45'S, 141°8'E) on 1 August 2014, at the Diamantina River near the ranger base (23°45'S, 141°7'E) on 17 January 2015, and west of the ranger base towards the eastern boundary (23°42'S, 141°21'E) on 18 August 2018 (W). These birds lived in this vicinity for approximately 3 months

***Black-breasted Buzzard** *Hamirostra melanosternon*
One record, at Lightning Creek (23°52'S, 141°11'E) on 28 March 2018 (W). A surprising absentee from the previous Park list.

Swamp Harrier *Circus approximans*
Additional records, at the Diamantina River west of the ranger base (23°45'S, 141°7'E) on 8 May 2012, west of the ranger base towards the eastern boundary (23°44'S, 141°24'E) on 8 May 2012, and at the ranger base (23°45'S, 141°8'E) on 20 September 2019 (W).

***White-bellied Sea-Eagle**
Haliaeetus leucogaster Present at Hunters Gorge (23°40'S, 141°6'E) on 15 April 2014 and 16 April 2015, and at the Diamantina River crossing (23°42'S, 141°5'E) on 23 February 2016 (W).

***Oriental Dollarbird** *Eurystomus orientalis*
One bird at the Diamantina River crossing (23°42'S, 141°5'E) on 6 December 2017 (W).

Grey Falcon *Falco hypoleucos*
Active nests on the telecom tower beside the Winton Road on the Hamilton Range (23°41'S, 141°9'E) and at the Mayne Pub earth tank (23°32'S, 141°22'E) in September 2017 (BQ).

Night Parrot *Pezoporus occidentalis*
Since a dead juvenile bird was found beside an internal fence in 2006 (Cupitt & Cupitt 2008, McDougall *et al*. 2009) there have been several more records from the eastern section of the Park. Acoustic surveys since 2013 have detected birds at several sites, and the species is likely to be resident (Leseberg *et al*. 2019, Nick Leseberg pers. comm. to AL 9 August 2020). Population size is unknown, but likely very small and probably fewer than 10 pairs. Further surveys are required to identify roosting sites.

***Varied Lorikeet** *Psitteuteles versicolor*
A dead specimen was collected at Gum Hole campground (23°40'S, 140°59'E) on 18 July 2014 (BQ) and handed in to the Queensland Museum by Ian Gynther (Heather Janetzki pers. comm. to AL 19 August 2020).

Splendid Fairy-wren *Malurus splendens*
A third record for the Park, at Bummbelberry Waterhole (23°58'S, 141°31'E) which is about 11 km east of Scotts Tank, on 12 June 2016 (W). Although common at Goneaway NP just to the east (AL pers. obs.), the species only just scrapes into Diamantina NP which is the extreme western limit of the known range in Queensland.

***Rufous-crowned Emu-wren** *Stipiturus ruficeps* (Plate 3)
Recorded in the east of the Park at two locations in the same grid block (23°46'S, 141°40'E) on 17 October 2019 by Nick Leseberg, Nigel Jackett, Bruce Greatwich and Patrick Webster (eBird 2017, N. Leseberg pers. comm. to AL 29 October 2019). This extends the known range of what is possibly a small and isolated population of this widespread species further to the southwest from Goneaway NP where it is common (AL pers. obs.).

Plate 3. Rufous-crowned Emu-wren at Lark Quarry, 110 km SW of Winton (Graham Donaldson)

Striped Honeyeater *Plectorhyncha lanceolata*
A second record for the Park, at Gum Hole campground (23°40'S, 140°59'E) on 26 September 2017 (BQ). At the very limit of its Queensland range here.

Painted Honeyeater *Grantiella picta* (Plate 4)
Additional records, on the western boundary of the Park (23°40'S, 140°50'E) on 9 August 2013, and at Gum Hole campground (23°40'S, 140°59'E) on 22 August 2013 and 25 July 2014 (BQ). All 11 of our records have been in the period July-September suggesting that the species may be a winter-spring visitor to the area as proposed by Higgins *et al*. (2001).

***Little Friarbird** *Philemon citreogularis*
Present at Gum Hole campground (23°40'S, 140°59'E) on 20 October 2013 (W).

Plate 4. Painted Honeyeater, Bowra, southwest Qld (Julie Sarna)

Grey-headed Honeyeater *Ptilotula keartlandi* (Plate 5)
Additional records, on the western boundary of the Park (23°40'S, 140°50'E) on 9 August 2013, and in the hard country of the Goyder Range (23°35'S, 141°4'E & 23°36'S, 141°3'E) where the birds were feeding in flowering Western Bloodwood *Corymbia terminalis* on 19 August 2013 (BQ).

Plate 5. Grey-headed Honeyeater, Alice Springs, NT (Jill Brown)

***Grey-crowned Babbler** *Pomatostomus temporalis*
Recorded at the ranger base (23°45'S, 141°8'E) on 5 December 2015 and 11 January 2017 (W).

***Olive-backed Oriole** *Oriolus sagittatus*
One historical record with photograph, from 'Diamantina National Park' (no more detailed location specified), eBird checklist S58723836, dated 29 May 2012, submitted by Rosemary Lloyd (eBird 2017). Although outside its accepted range here, it is present elsewhere in the Channel Country to the east and north of Diamantina NP (AL pers. obs.).

***Tawny Grassbird** *Cincloramphus timoriensis*
One record, at Gum Hole (23°40'S, 140°59'E) on 14 April 2013 of '8+ birds spaced out every 40-50 m along waterhole in large fringing beds of *Persicaria lapathifolia* Pale Knotweed' (Julian Reid 'Bird Sightings' birdsqueensland.org.au accessed 27 November 2020).

Little Grassbird *Poodytes gramineus*
One additional record, at Gum Hole campground (23°40'S, 140°59'E) on 22 August 2013 (BQ).

Discussion

It is probably true to say that no bird list is ever complete and it is not surprising that in the decade following the completion of data collection for the first publication on the birds of Diamantina National Park (Ley *et al.* 2011) a further 16 species have been added to the Park list.

Of the additional species, eight are within the potential range which they may occupy erratically or opportunistically, and whose occurrence at Diamantina NP is to be expected. These are the two Rallids, Australian Painted-snipe, Black-tailed Godwit, White-winged Black Tern, Eastern Grass Owl, White-bellied Sea-Eagle and Tawny Grassbird. Four species are beyond their accepted ranges, and may thus be considered vagrants: Varied Lorikeet, Grey-crowned Babbler, Little Friarbird and Olive-backed Oriole. Two migratory species, Latham's Snipe and Oriental Dollarbird, may be expanding their range, as numbers of reports of both seem to be increasing in the Channel Country. The Black-breasted Buzzard, on the other hand, is widespread across the north and inland of the continent, and the single record for Diamantina NP is the exception to what appears to be a gap in its distribution around the Channel Country. This suggests that there may be a gap in the distribution of the species around the Park. Only one species, the Rufous-crowned Emu-wren, is likely to have been present in the Park since our surveys began, yet remained undetected until 2019.

Additional species will undoubtedly be found in the Park in the future. Following the recent discovery of the Rufous-crowned Emu-wren in the Park an intriguing possibility as a future addition to the list is the Striated Grasswren *Amytornis striatus.* In central Queensland both species occur as small isolated populations of widespread species, are sympatric across much of their known ranges, and both are reasonably common in Goneaway NP (AL pers. obs.) which is only 35 km from the eastern boundary of Diamantina NP. The latter is the most remote and least surveyed part of Diamantina NP; it is also currently covered by a Prohibited Access order preventing public access to the eastern half of the Park.

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Survival, movements and breeding success of Bush Stone-curlews *Burhinus grallarius* in the Moreton Bay Region, Queensland

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Abstract

The survival, movements and breeding success of Bush stone-curlews on Coochiemudlo Island in Moreton Bay, Queensland, was studied from 2007 to 2019 through monthly counts and observations of leg-flagged birds. In addition, annual counts organised by Redland City Council have been conducted since 1997. The population on the island increased from 1997 to 2007 and has since remained relatively stable at between 171 and 216 birds. Most movements were within Coochiemudlo Island but there was evidence of movements of birds to other islands in Moreton Bay and to and from adjacent mainland sites. Of 324 potential breeding events, 179 (55%) either failed to hatch any young or lost all hatched young prior to independence. The number of birds reared to fledging was high (1.04 per breeding attempt) when compared to that of mainland sites. The high productivity and evidence of movements away from the island suggest that these birds could be an important source of recruitment for less successful mainland populations. Based on resightings of leg-flagged resident birds, mean apparent annual adult survival rate was 92.91%. A comparable study at a mainland site would allow a demographic comparison with our study, providing a better understanding of factors influencing populations in eastern and southern Australia.

Introduction

The Bush Stone-curlew *Burhinus grallarius* occurs primarily in coastal and sub-coastal regions of Australia (Barrett *et al.* 2003). Although the species is reported to be in decline over much of its range, particularly in southern Australia (Gates & Paton 2005), populations in northern Australia are probably stable (Marchant & Higgins 1996; Garnett & Crowley 2000). The decline across much of southern Australia has been related to a range of factors including land clearing and disturbance (Webster & Baker-Gabb 1994), predation by introduced predators (Johnson & Baker-Gabb 1994; Baltais 2006), and vehicles, at least in areas near large human populations (DECC 2006).

The species normally lays two eggs (Marchant & Higgins 1996), and frequently makes and multiple breeding attempts each year as mortality shortly after hatching is common (Garnett 1985). In Victoria, from 52 eggs, only 17 offspring survived for more than four weeks (Johnson & Baker-Gabb 1994) and in Brisbane a study of six nesting pairs found that only five offspring reached independence (Wilson 1989). Protected areas and islands often have higher productivity, thought to be linked to reduced predator impacts (Gates & Patton 2005; Johnson & Baker-Gabb 1994; Cannard & Milton 2012).

Bush Stone-curlews are apparently capable of living up to 30 years (Baltais 2006). However, the oldest known banded bird was recaptured only 15 years and 3 months after being banded, and was alive when released (ABBBS 2021). The species is sedentary, breeding birds holding territory while breeding and dispersing only locally during the non-breeding season (Marchant & Higgins 1993). The mean distance travelled by recaptured or recovered birds was only 5 km from their original banding site although one individual was recorded moving 104 km (ABBBS 2021). Using radio-tracking, Gates (2001) established that most breeding birds maintained a home range of 26–64 ha, but non-breeding birds appeared to range more widely, with one individual located 8 km from its original capture location on Kangaroo Island.

Encompassing a large area of southern Moreton Bay in southeast Queensland, Redland Shire has a up to 150 breeding pairs of Bush Stone-curlews (Baltais 2006). This may be up to 1% of the Australian population, estimated at 10,000–15,000 individuals (Birdlife International 2020). However, even in this region of high abundance, there are large areas of seemingly suitable habitat on the mainland with fewer than expected or no birds, thus highlighting the vulnerable nature of this species (Baltais 2006).

In this paper we present long-term demographic data on Bush Stone-curlews inhabiting the islands of Moreton Bay, primarily Coochiemudlo Island. We provide estimates of the population size and adult survival rates in the region, and details of the frequency and distance of local movements, and breeding success. We also consider the role of such island populations as source populations for less secure mainland populations where productivity and survival may be markedly lower.

Methods

Counting and catching

Since 1997, Redland City Council has organised an annual count of the Bush Stone-curlew population on Coochiemudlo Island, in southern Moreton Bay, in February. The count is undertaken just before dusk when the birds are most active. Teams of volunteers are allocated fixed areas of the island to search so that the count can be completed as quickly as possible, reducing the potential for double counting of mobile individuals or groups.

Since May 2009, the Queensland Wader Study Group has supplemented these annual counts by conducting monthly counts of the birds on the island. These have been done with a smaller group of volunteers, surveying the island between dawn and midday by bicycle, ensuring that all streets and open areas are checked for birds. This different approach has been adopted due to the difficulties of organising a large team of volunteers to survey the island every month.

Additional visits to the island were made periodically between January 2009 and December 2019 to catch and band birds for monitoring. Birds were caught in mist nets set flush to the ground between trees and houses. Teams of people surrounded birds and slowly walked them into the nets. Birds were removed from the nets and placed in a calico bag before being banded. Each captured bird was fitted with an Australian Bird and Bat Banding Scheme (ABBBS) metal band on the left tarsus and a green, individually engraved leg flag on the right tibia (Plate 1). The green leg flag code could be read using binoculars and enabled multiple resightings of banded birds to be collected without the need to recapture the bird.

Plate 1. Bush Stone-curlew, leg flag APM, caught and banded (#101-42773) on 3 May 2021 on Coochiemudlo Island (Jon Coleman)

Captured birds were aged using known plumage characters (Marchant & Higgins 1996), and their body mass recorded to the nearest gram. In addition, the total head length, tarsus and wing length were measured to the nearest 0.1 mm following the methods described in Lowe (1989).

Re-sightings and monitoring breeding success

Resightings of leg-flagged birds were made during monthly and annual counts with adhoc sightings provided by members of the public, mainly at locations away from Coochiemudlo Island. Recovery reports from the ABBBS were also received for birds found dead or injured during the period of the study. Where possible, additional information for each resighting was recorded, including if the bird was paired, if it was found breeding and if the breeding attempt was successful, how many young were hatched and reared.

Additionally, some birds were banded at locations away from Coochiemudlo Island. Occasional visits were made during the period of the study to other islands and mainland sites to band birds and to look for leg-flagged individuals dispersing from Coochiemudlo Island. The areas visited and the sites at which birds were banded are shown in Figure 1.

Breeding attempts were recorded by direct observation of banded and un-banded pairs on the monthly visits. The incubation period of the species is 25-28 days and young remain with their parents for up to 71 days (Marchant & Higgins 1996). The duration of the breeding attempt, along with input from residents on the island, allowed breeding pairs and their fates to be tracked over multiple monthly visits. For each pair, the number of eggs laid, the number of young hatched and the number of young reared to fledging was recorded where possible. The date of each breeding event was also recorded to establish the duration of the breeding season in each year of the study. (Fig 1)

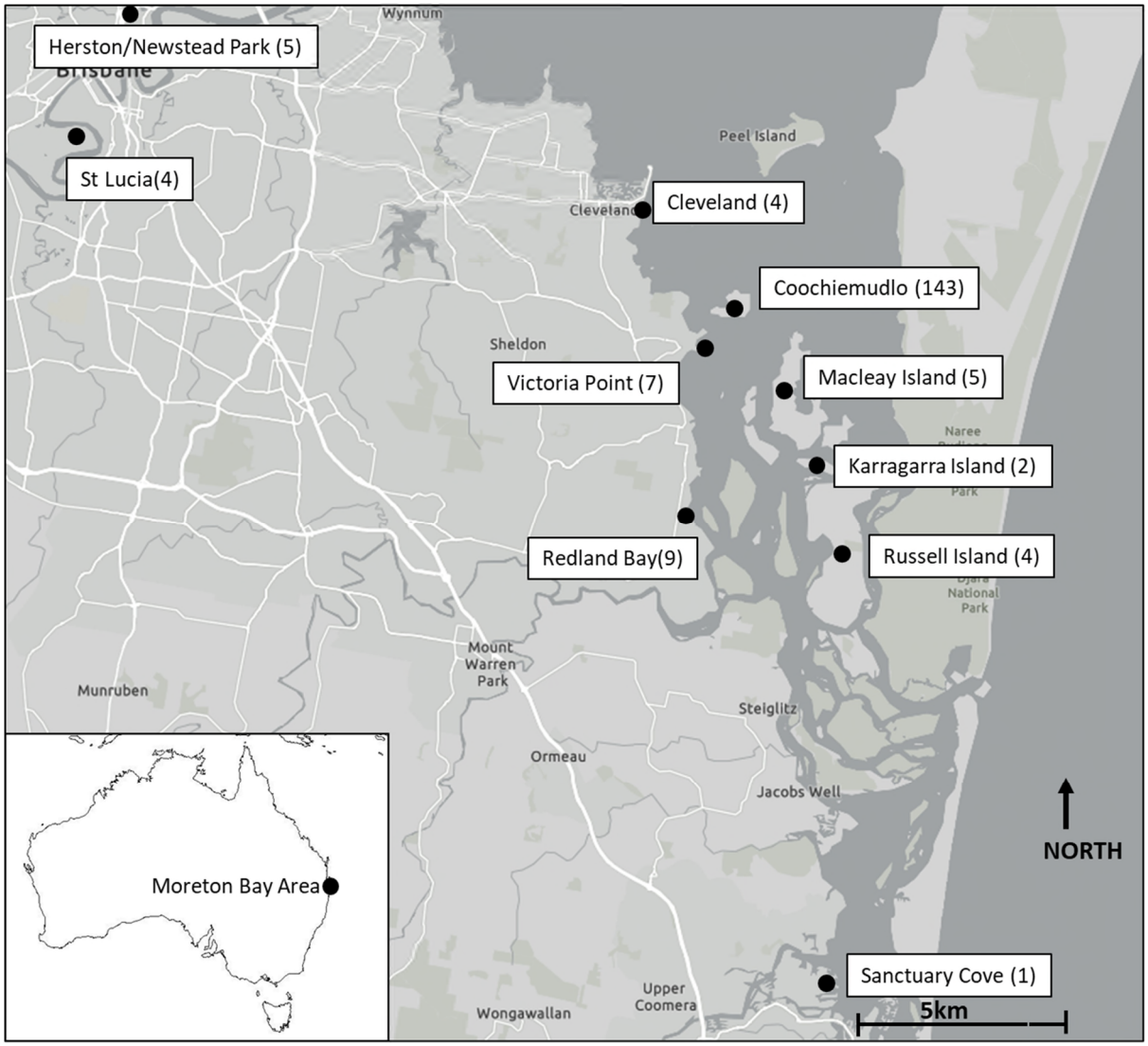

Figure 1. Locations at which Bush Stone-curlews were banded in Moreton Bay from September 2008 to December 2019.

Statistical analysis and estimation of apparent mean adult survival rates

Apparent annual survival rates were estimated for birds banded as adults in 2008 and 2009 combined, on Coochiemudlo Island using a live recaptures only model (Seber 1970), employing MARK survival estimation software v9.0 (White and Burnham 1999). Multiple re-encounters (recaptures and re-sightings) in any calendar year were combined to provide a single annual encounter event rather than using each monthly visit and encounter as a discrete encounter event.

Four basic survival models were tested, with the following assumptions:
Model 1: Φ(t)P(t) survival rate and recapture probability time-dependent;
Model 2: Φ(t)P(.) survival rate time-dependent and recapture probability constant;
Model 3: Φ(.)P(t) survival rate constant and recapture probability time-dependent; and
Model 4: Φ(.)P(.) both parameters constant.

In these models, Φ represents the apparent survival rate and P, the calculated recapture probability, with the symbol (t) used to represent a time-dependent value and (.) a constant value over time.

The best fit models were selected on the basis of the lowest value of Akaike's Information Criterion (AIC) being the model that best represents the observed data (Akaike 1973). A Goodness of Fit (GOF) estimation was used to assess the model fit to the data. Where GOF could not be applied due to low sample sizes the models were recalculated using the actual calculated ĉ value rather than the model value for comparison, using the alternative method to GOF described in Cooch & White (2015).

To correct for the potential inclusion of juveniles, birds within their first year of life that had attained adult plumage, survival rates were calculated again using a Time since Marking Model (TSM). Eight models were tested using this method to assess whether juveniles had been inadvertently included in the cohort samples and if so, to calculate more accurate mean adult survival rates (Cooch & White 2015):

Model 1: Φ(M2-,/.)P(.) two TSM classes for survival, both constant through time, recapture probability constant;
Model 2: Φ(M2-./t)P(.) two TSM classes for survival, first class (juveniles) constant, second class (adults) time dependent, recapture probability constant;
Model 3: Φ(M2-./.)P(t) two TSM classes for survival, both constant through time, recapture probability time dependent;
Model 4: Φ(M2-t/.)P(.) two TSM classes for survival, first class (juveniles) time dependent, second class (adults) constant, recapture probability constant;
Model 5: Φ(M2-./t)P(t) two TSM classes for survival, first class (juveniles) constant, second class (adults) time dependent, recapture probability time dependent;
Model 6: Φ(M2-t/t)P(.) two TSM classes for survival, both time dependent, recapture probability constant;
Model 7: Φ(M2-t/.)P(t) two TSM classes for survival, first class (juveniles) time dependent, second class (adults) constant, recapture probability time dependent; and
Model 8: Φ(M2-t/t)P(t) two TSM classes for survival, both time dependent, recapture probability time dependent.

Results

Population of Bush Stone-curlews on Coochiemudlo Island

The annual Redland City Council-led counts of Bush Stone-curlews on Coochiemudlo Island showed an overall significant linear increase in the number of birds since 1997 ($r=0.87$, $df=21$, $p<0.0001$) (Fig. 2) with a slope estimate of 49.23 (standard error, ± 0.97). The lowest count of 37 birds was made in 1997 and the highest count of 216 was made in 2018, although in 2019 only 171 birds were recorded. The most rapid increase occurred over that 13-year period between 1997 and 2009 when numbers more than quadrupled. Between 2009 and 2019 numbers have fluctuated between 171 and 216 birds, with no significant trend ($r=0.06$, $df=9$, $p=0.84$).

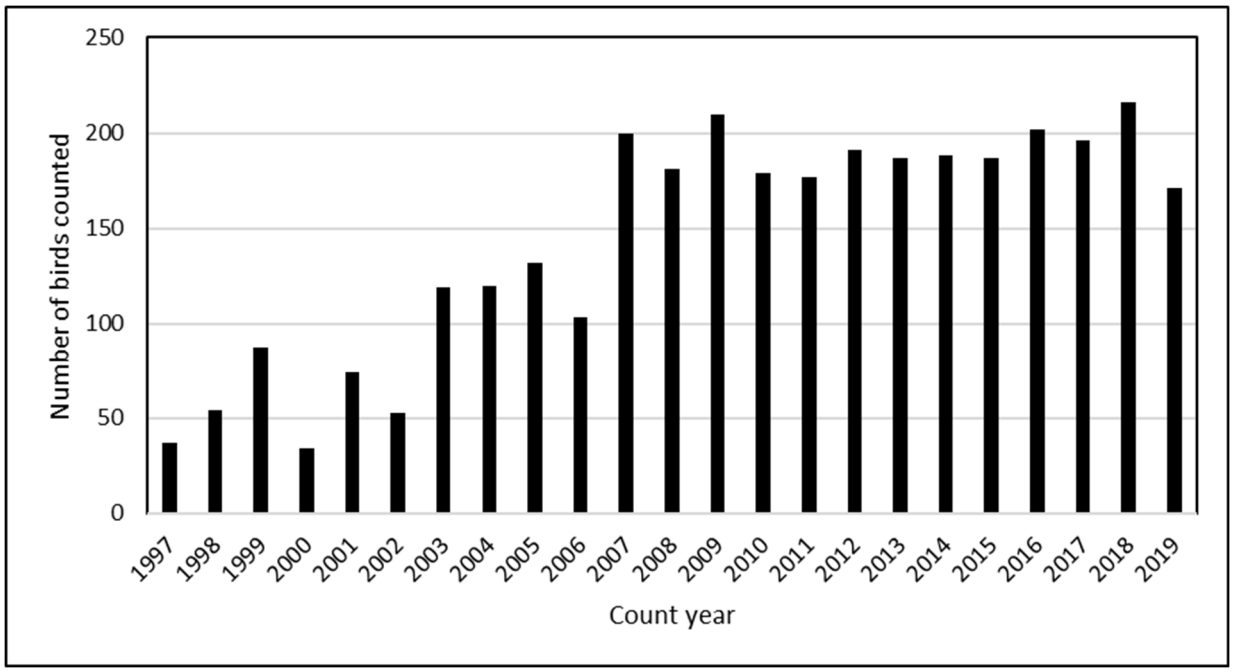

Figure 2. Annual February counts of Bush Stone-curlews on Coochiemudlo Island between 1997 and 2019, collected by Redland City Council.

Monthly counts conducted since May 2009 (Fig.3) show an increase in numbers over time ($r=0.37$, $df=111$. $P<0.001$), contrasting with the annual February count data, in which there is no apparent trend in numbers between 2009 and 2019. Mean monthly counts varied throughout the year (Fig. 4), with the highest mean counts in July and the lowest in October. However, these differences were not statistically significant (ANOVA $F=1.42$, $df=11,101$, $P=0.18$).

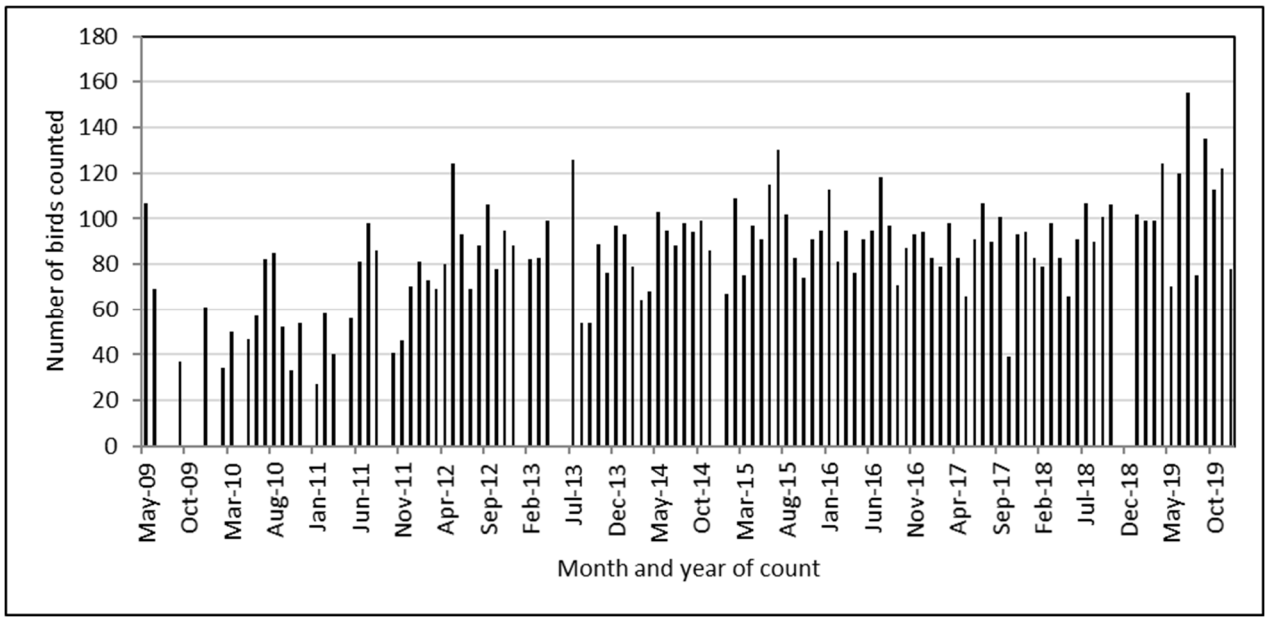

Figure 3. Monthly counts of Bush Stone-curlews on Coochiemudlo Island from May 2009 to December 2019.

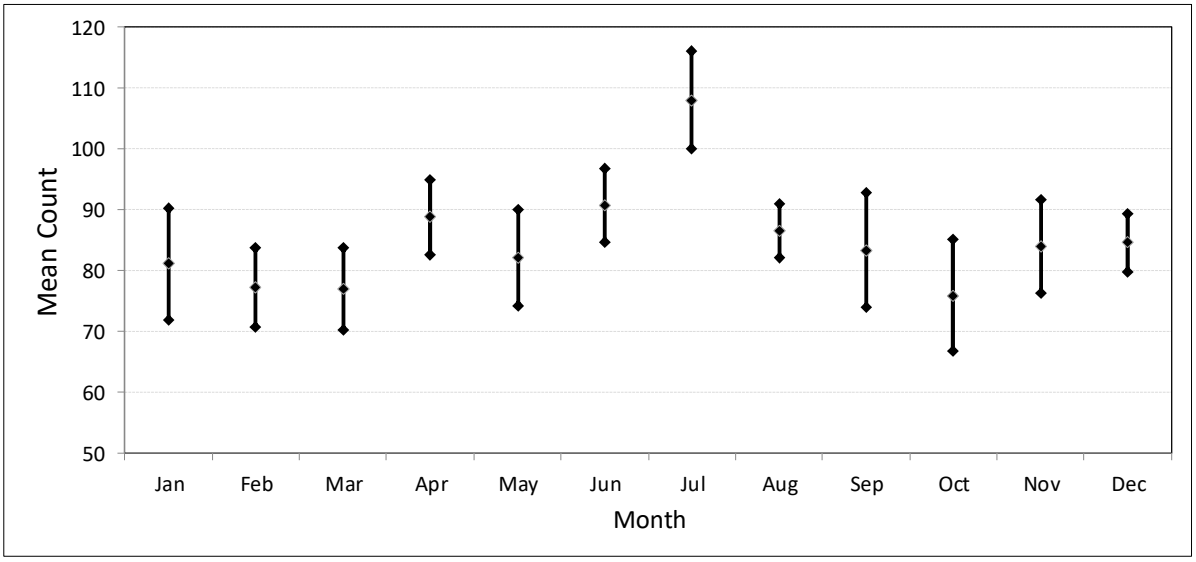

Figure 4. Mean monthly counts of Bush Stone Curlews on Coochiemudlo Island from May 2009 to December 2019 (bars represent standard errors from the mean).

Movements in the Moreton Bay area

From 7 September 2008 to 31 December 2019, a total of 184 Bush Stone-curlews were banded at 12 sites in the Moreton Bay and Brisbane region. The majority (143) were banded on Coochiemudlo Island. Figure 1 shows the locations used in this study and the number of birds banded at each location.

Over the period of the study a total of 1,035 re-sightings of leg-flagged birds were recorded. Of the 143 individuals banded on Coochiemudlo Island, 23 (16.1%) were not seen again, while 103 (72.0%) were resighted one or more times on Coochiemudlo Island only, and 17 (11.9%) were resighted at locations away from Coochiemudlo Island. Eleven of the movements (64.7%) were between Coochiemudlo Island and Victoria Point, the nearest mainland point from the island. Of these seven individuals either returned to Coochiemudlo Island or moved between Coochiemudlo Island and Victoria point two or more times.

Of the 41 birds banded at locations away from Coochiemudlo Island, 22 (53.7%) were not seen again, 11 (26.8%) were resighted one or more times but only at the banding location and 8 (19.5%) birds were recorded moving to a new location. Again, most movements were local inter-island movements, or movements between islands and the mainland. The longest movement was of a bird banded in Brisbane and resighted on Coochiemudlo Island, a movement of 32 km. All movements away from the banding site are shown in Figure 5.

Of the 25 individuals recorded moving away from their banding location, eight (32%) were banded as juveniles. The remaining birds were banded as adult birds suggesting that both juvenile and adult birds disperse to new locations. Although the status of most birds at sites away from Coochiemudlo Island was not recorded, four were found dead and three birds dispersing from Coochiemudlo Island were recorded on territories with mates.

Figure 5. All recorded movements of Bush Stone-culews away from their banding locations

Breeding success on Coochiemudlo Island

From January 2008 to December 2019 a total of 324 potential breeding events were recorded. Of these, 179 (55.3%) either failed to hatch any young or lost each of their young prior to independence. This latter category accounted for ten (3.1%) of all breeding attempts, indicating that once hatched, pairs usually rear at least one nestling to independence. Of the 179 failed nesting attempts, there was evidence of a second breeding attempt in ten cases (5.6%).

Breeding occurred between July and January, with most records of birds on nests or with newly hatched young from August to October (Fig. 6). Of the 324 potential breeding events, 93 (28.7%) successfully resulted in chicks (Plate 2) being reared to independence. Of the 93 successful nesting attempts, there were four occasions (4.30%) where pairs immediately re-nested once offspring had been reared to independence. The remaining 52 (16.05%) potential breeding events involved pairs that were recorded on a territory but the outcome for that season was unknown with birds either not recorded again or breeding and the outcome of that breeding attempt remaining unknown. The cause of breeding failure was recorded on four occasions. Laughing Kookaburras *Dacelo novaeguineae* took eggs from two nests and a nestling from another, and one 3-week old juvenile was also run over by vehicle.

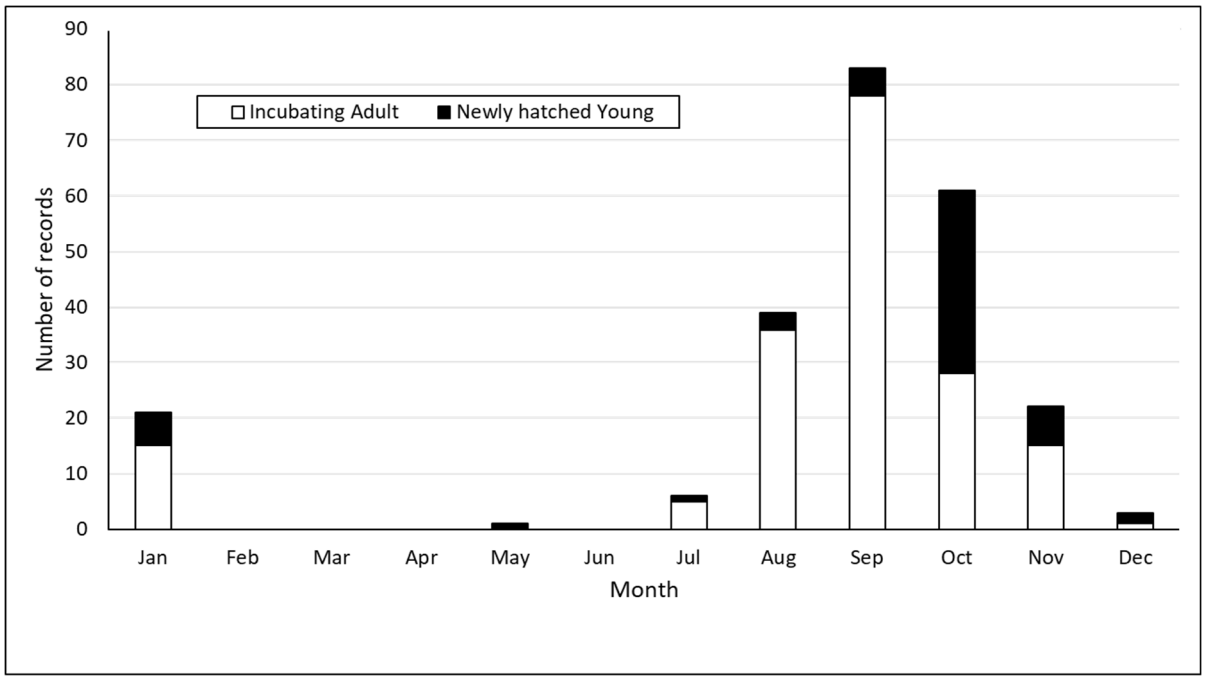

Figure 6. Records of Bush Stone-curlew pairs on Coochiemudlo Island recorded on nests (open bars) and pairs with newly hatched young (black bars) aggregated by month for the period 2008 to 2019.

Plate 2. Bush Stone-curlew (unbanded) and hatchling in Brisbane City Botanic Gardens, 3 November 2007 (Jon Coleman)

Analysing all breeding attempts in which the outcome was known, successful or otherwise, the mean number of nestlings produced per breeding attempt over the 12 years between 2008 and 2019 was 1.42 (± 0.04), and the number of young reared to independence was 1.04 (± 0.06). . The mean number of hatchlings per breeding attempt varied significantly between years (ANOVA, F=2.42, df=11,180, P=0.01), from the lowest value of 0.83 (± 0.22) in 2011 to the highest value of 1.71 (± 0.25) in 2017 (Fig. 7). The mean number of young reared per breeding pair also varied significantly between years (ANOVA F=2.42, df=11,180, P=0.02), (Fig. 8) but the differences between years were still significant from the lowest value of 0.5 (± 0.2) in 2018 to the highest value of 1.5 (± 0.5) in 2017.

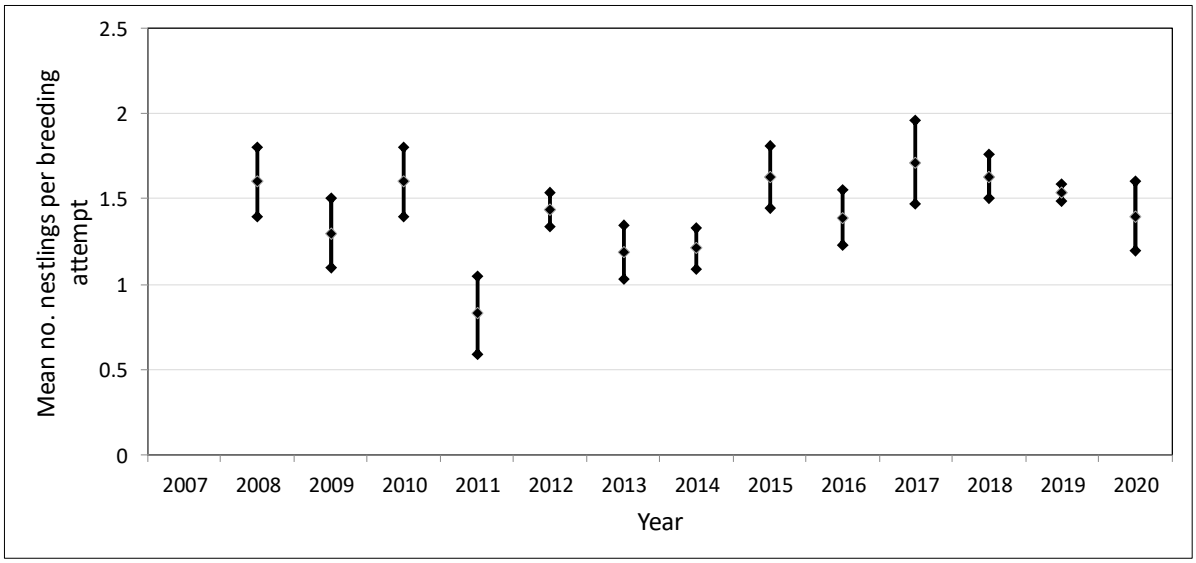

Figure 7. Mean young hatched per breeding attempt on Coochiemudlo Island in each year of the study (bars represent standard error from the mean).

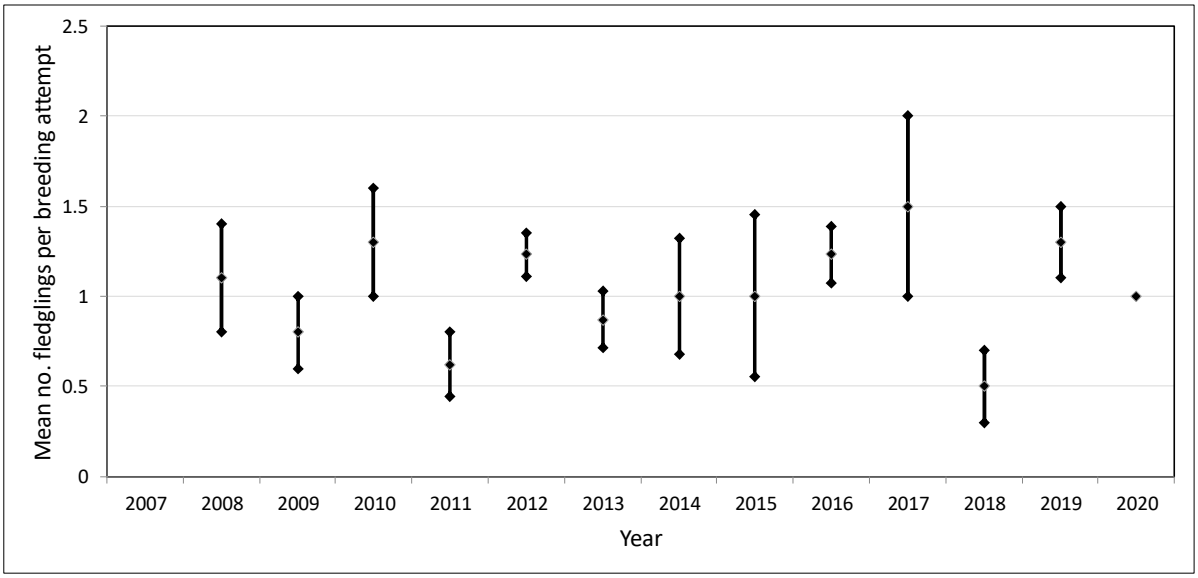

Figure 8. Mean young reared per breeding attempt on Coochiemudlo Island in each year of the study (bars represent standard error from the mean)

Longevity and survival rates

The earliest birds banded in this study were banded in November 2008 (n=21) and January 2009 (n=38), with a further 29 birds banded between May and November 2009. For the 16 birds banded as adults in the 2008 cohort, four (25.0%) were resighted in 2019, 11 years after banding. For the 47 adult birds banded in the 2009 cohort, 17 (36.2%) were resighted in 2019, 10 years after banding. Longevity records from both cohorts thus indicate that the species could survive in the wild well beyond the tenure of this study.

Mean apparent adult survival rates were calculated for the 2008 and 2009 cohorts combined using the time-dependent live recaptures model. For the combined sampling cohort the most appropriate model assumed a constant survival and time-dependent recapture probability (Table 1). The apparent adult annual survival rate for this cohort was calculated to be 88.6% (± 0.02%) with resighting probabilities varying from 19.3% to 43.6%.

Insufficient data were available to test the model fit to the data using a Goodness of Fit test so the calculated actual median ĉ value of 2.31 for each cohort was used to recalculate corrected models rather than using the default ĉ value. The results of the corrected models confirmed the model selections as appropriate and the best fit to the data, in which the QAIC values for the selected models were still the lowest observed. Based on lowest AIC and number of model variables, we selected a TSM model with time-dependent juvenile survival, constant adult survival and time-dependent recapture probability. The revised mean adult survival rate for the combined 2008 and 2009 cohort was 92.9% (± 1.8%).

Table 1. Standard Cormack Jolly-Seber Live Recapture models used to analyse survival rates of Bush Stone-curlews banded as adults on Coochiemudlo Island in 2008 and 2009. The selected model is shown in bold.

Model	AIC_c	ΔAIC_c	Model likelihood	No. parameters	Deviance
Φ(t)P(t)	480.20	0.00	0.17	19	147.45
Φ(t)P(.)	526.25	49.61	0	11	213.25
Φ(.)P(t)	**476.63**	**19.22**	**0**	**11**	**163.65**
Φ(.)P(.)	535.54	58.91	0	2	531.46

The cause of death for banded birds on Coochiemudlo Island was rarely recorded during the study period. However, ABBBS records and reports from residents indicate that impact with vehicles caused the death of four adult banded birds on Coochiemudlo Island and two adults at nearby Victoria Point. The cause of death of three other adult banded birds involved fishing line injuries, in one case due to ingestion of the fishing hook and line.

Numbers of Bush Stone-curlews on Coochiemudlo Island

The Bush Stone-curlew has declined across much of its southern range (Garnett & Crowley 2000; Gates & Paton 2005). Three major events are believed to be responsible for this decline (Robinson 1998) with the first associated with land clearing during European settlement,

followed by further declines in the 1950's with changes in agriculture practises and the introduction of the Red Fox *Vulpes vulpes.* A removal of bounties on foxes in Victoria in the 1980's has further impacted Bush Stone-curlew populations in south eastern Australia. This decline contrasts with the increase in abundance on Coochiemudlo Island which has led to a plateaued population level in recent years.

Foxes are known to still predate the species in the southern Australia (Johnson & Baker-Gabb 1994). Experiments have demonstrated that Bush Stone-curlew productivity is significantly better if ground predators are excluded (Gates & Paton 2005). Coochiemudlo Island is very likely fox free and, despite being heavily populated, is still suitable for Bush Stone-curlew habitation as urban development, and patterns of associated land clearing, is thought to have created conditions favourable to the species (Cannard & Milton 2012). The lack of predators and abundance of suitable habitat are therefore likely to explain the population increase seen on Coochiemudlo Island. The recent plateauing of numbers recorded may be an indication that the island has approached maximum carrying capacity but further work on territory sizes and available habitat would be required to quantify this.

Movements in the Moreton Bay area

The high numbers of birds banded and only recorded within the confines of Coochiemudlo Island is not surprising and is consistent with results from other studies. For example, Gates (2001) identified that resident breeding Bush Stone-curlews typically ranged within a 26 to 64-ha range but two other groups, more mobile breeders and non-breeding birds, ranged more widely. A 70-ha home range for this species was calculated for birds in Victoria (Johnson & Baker-Gabb 1994), with 95 ha calculated as the usual home range in northern Queensland (Wilson 1989). All these calculated home ranges fall well within the surface area of Coochiemudlo Island, estimated at 500 ha, so a large sedentary population on the island could be expected.

Gates (2001) noted in the more mobile Bush Stone-curlew cohorts' evidence of some of birds dispersing to new locations. The movement data from Coochiemudlo Island and adjacent areas suggests this may also be the case in our study with movements away from the island recorded. While most recorded movements were between Coochiemudlo Island and Victoria Point, the nearest mainland site, there were other movements to mainland sites further away and a number of examples of inter-island movements. This involved both juveniles and adult birds dispersing and although the status of these birds was rarely recorded, several were known to have established territories in those locations. This may suggest that Coochiemudlo Island may be a source population for other islands and the local mainland in that part of Moreton Bay.

Breeding success on Coochiemudlo Island

The breeding season in this population was from July to January, similar to the breeding season recorded in South Australia (Schodde & Mason 1980) and in northern Queensland (Marchant & Higgins 1996). This seems to coincide with the wettest times of the year in those areas and with a diet primarily consisting of insects and other invertebrates (Marchant & Higgins 1996) this presumably aligns chick rearing with periods of increased food supply arising from wetter conditions. Some breeding pairs on Coochiemudlo Island nested more than once in a season,

particularly if the first clutch or brood were lost. Other populations of the species are known to rapidly replace clutches (Wilson 1989; Marchant & Higgins 1996).

The number of fledglings produced per breeding attempt on the island (1.04) appears high when compared to a local mainland study which recorded only 0.8 nestlings fledglings per breeding attempt (Anderson 1991). This may reflect a lack of predators and more suitable habitat on Coochiemudlo Island when compared to mainland sites, such as in Victoria (Johnson & Baker-Gabb 1994) where fledging rates are also low. These differences in breeding productivity suggest that Moreton Bay island populations may be an important source of recruitment for mainland populations.

Longevity and survival rates on Coochiemudlo Island

The Bush Stone-curlew is known to be long-lived with the oldest birds in this study being at least 11 years old and still resighted regularly. The high adult survival rate calculated at 94.47% supports the recorded longevity in this species and suggests the species can live well beyond what has been recorded to date in this study. Green *et al.* (1997) recorded a mean annual adult survival rate of only 83% in the European Stone-curlew *Burhinus oedicnemus* which although lower, likely reflects the migratory nature of this species when compared to Bush Stone-curlew which are resident. Establishing a comparative study at a mainland location to compare breeding success and survival rates in this species would be beneficial in understanding the factors influencing Bush Stone-curlew numbers in Eastern and Southern Australia.

Acknowledgements

We would like to acknowledge the Queensland Department of Environment and Science for its support of these projects through the issue of scientific permits over the years. We also thank Redland City Council for authorising access to sites throughout Redland shire and providing access to unpublished data on Bush Stone-curlews on Coochiemudlo Island. Many volunteers and banders have contributed to the dataset through either counting and recording leg flag sightings in monthly surveys or helping with the catching and banding of birds. The Australian Bird and Bat Banding Scheme provided the bands used in this study. The authors are grateful to all these organisations and individuals. Finally, we dedicate this paper to the memory of David Milton, whose contribution to shorebird research and conservation was outstanding, and without whose dedication and keen interest this study would have been difficult to sustain.

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The status of the White-fronted Honeyeater in central-western Queensland

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Abstract

Previously considered a rare visitor to central-western Queensland, the White-fronted Honeyeater *Purnella albifrons* is shown in this review to be a regular if erratic visitor and at least an occasional breeder in the region.

Introduction

The White-fronted Honeyeater *Purnella albifrons* has been considered an outlier in Queensland from its main range to the south and west. Storr (1984) described it as 'apparently a rare visitor to arid western interior' of the state. Higgins *et al*. (2001) noted very few records from Queensland while citing Storr (1984), and their distribution map is almost completely blank for the central-west and the Channel Country. They further noted that 'there are no published [breeding] records from Qld'. The distribution map for the species in Barrett *et al.* (2003) shows records in Queensland are sparse and scattered, and only as far north as the vicinity of Diamantina National Park (23°S), and the vicinity of Welford National Park (25°S). Schodde & Mason (1999) simply encompass the whole of the Channel Country in a dotted line designated 'irregular range'.

Recent records suggest that the species is more regular and more widely spread in Queensland than has been documented. In this review I update previous assessments using my own records from the Channel Country, supplemented with records from eBird (2017). The observations here include a breeding record at Welford National Park (NP), and some observations on food plants. The area of interest is central-western Queensland, part of the Channel Country, and bounded roughly by Bladensburg NP to the north, Idalia NP to the east, Welford NP to the south and Diamantina NP to the west, an area which encompasses Lochern NP.

Methods

My records of White-fronted Honeyeater have been accumulated during a wider investigation of birdlife in the Channel Country, for which the overall methodology has been described elsewhere (Ley *et al*. 2011). Each of these records is unique by month and one minute of latitude and longitude, i.e. a species cannot be recorded more than once in a given grid block and month. Thus records included here are separated from each other spatially and/or temporally, thereby minimising the possibility of double-counting individual birds. The most visited of the locations named was Welford NP which was surveyed regularly from 2012-2019. Visits to the other locations were more sporadic.

Additional records of the species from the area of interest were sought from eBird (2017). As befits a mobile species whose movements are apparently erratic and possibly nomadic, and

which may follow the flowering of favoured plants, there are a very few isolated records at outlying sites, such as Longreach sewage treatment plant, to the east at St George and even as far as Brisbane, and to the north at Dajarra and Richmond (eBird 2017). These are not considered further.

Results

Table 1 summarises 45 records of the White-fronted Honeyeater from the area in question, including six records from checklists submitted to eBird (2017). A majority of the records were from Welford NP where the most ornithologically productive year was 2012 (pers. obs.), which was preceded by a period of unusually high rainfall (Shane Hume, pers. comm.). In that year there were 14 records from the Park, all in the period April-August suggesting continuous occupancy during that time. Bird surveys were continued in the Park every year for the next seven years and from 2013 to 2018 the most records in any year was two (2015), while there were no records in 2018, a dry year. A second concentration of records occurred in July 2019, another productive time that was preceded by relatively high rainfall earlier in the year: White-fronted Honeyeaters were present at four locations in and near the Park and nested at one (Table 1).

Table 1. Records of White-fronted Honeyeater from central-western Queensland. AL, author.

Date	No. recs.	Observer	eBird Checklist
Bladensburg National Park (n=10)			
29-Aug-06	1	L&C Ezzy	S30621889
22-Oct-09	2	AL	
16-Dec-12	1	AL	
19-Jul-15	1	John Lowry	S24310797
25-Apr-16	1	AL	
28-Apr-16	1	Peter Valentine	S29787482
19-Mar-17	1	AL	
21-Mar-17	1	AL	
10-Aug-18	1	Mark Ley	S47911421
Idalia National Park (n=6)			
May-18	6	AL	
Welford National Park (n=24)			
Apr–Aug 2012	14	AL	
26-Feb-13	1	AL	
11-Feb-14	1	AL	
1-Jun-15	1	AL	
4-Jun-15	1	AL	
15-Oct-16	1	AL	
27-Feb-17	1	AL	
21-Jul-19	2	AL	
26-Jul-19	1	Tyde Bands, Matt Wright	S58479277, S5848459
27-Jul-19*	1	Tyde Bands, Matt Wright	S5840032, S58479368
Diamantina National Park (n=2)			
23-May-96	1	AL	
18-Aug-05	1	AL	
Lochern National Park (n=3)			
6-Jun-18	1	AL	
21-May-18	1	AL	
24-May-18#	1	AL	

* near Oakham property just outside S boundary of Welford NP.

from Noonbah Station which adjoins Lochern NP to west.

The species was observed foraging, presumably on floral nectar, in Western Bloodwood *Corymbia terminalis* at Bladensburg NP (John Lowry, eBird checklist S24310797), a mistletoe at Idalia NP, Spotted Emu-bush *Eremophylla maculata* at Welford NP and Diamantina NP, and Harlequin Emu-bush *E. duttonii* at Lochern NP (Angus Emmott pers. comm., 16 Jun 2014; Plate 1). In addition, at Bladensburg National Park, individuals of this species, Brown Honeyeater *Lichmera indistincta*, Black Honeyeater *Sugomel nigrum* and White-plumed Honeyeater *Ptilotula penicillata* have been seen probing the flowers of Yellow Bush Pea *Sesbania cannabina,* and carrying its pollen on their faces, suggesting that this plant provides nectar (pers. obs.).

On 21 July 2019 two fledglings were observed at Welford NP (Plate 2). Adult birds nearby behaved in an agitated fashion and appeared to be trying to lure the observers from the vicinity of the young, which were only able to fly or flutter for short distances low in the vegetation (Catherine Hirsch, Maggie Overend, Marion Roper, pers. com., 18 April 2020).

Plate 1. White-fronted Honeyeater and Harlequin Emu-bush at Lochern National Park, 6 June 2014. (Angus Emmott).

Discussion

The White-fronted Honeyeater occurs more widely, albeit sparsely, in Queensland than has been previously acknowledged. The 2014 sighting at Lochern NP was the first record for the district by a long-term resident observer (Angus Emmott, pers. comm. 16 June 2014), which hints at the possibility that the species is expanding its range into new areas or becoming more regular in western Queensland, but it seems more likely that the increase in number of records is due to an increase in birdwatcher activity in the region, which is revealing what has always been the case. The rise in popularity of eBird (2017), with its easily updated and widespread

publicly-available recording of sightings, and accessibility of submitted data, has undoubtedly contributed to redefining the species' distribution, which on the basis of these records, extends into the Channel Country, where it is a regular, if erratic, visitor and at least an occasional breeder.

The White-fronted Honeyeater is highly nectarivorous and is often recorded in association with plants in flower (Higgins *et al.* 2001). Seven species of Emu-bushes (*Eremophila* spp) are listed as recorded sources of nectar by Higgins *et al.* (2001), to which can now be added the Harlequin Emu-bush. Breeding of the White-fronted Honeyeater has not previously been recorded in Queensland, at least up to mid-2000 (Higgins *et al.* 2001). The presence of newly fledged young at Welford National Park on 21 July 2019 confirms that the birds bred there and, using the incubation and nestling periods detailed by Higgins *et al.* (2001), the eggs were evidently laid in the last week of June.

Plate 2. Newly fledged White-fronted Honeyeater at Welford National Park 21 July 2019. (Marion Roper).

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