

## THE BIRDS OF BULGUNNIA AND MULYUNGARIE STATIONS IN THE PASTORAL ZONE OF ARID SOUTH AUSTRALIA

S.J.S. DEBUS, G. LOLLBACK, D.L. OLIVER and S.C. CAIRNS

### ABSTRACT

A list of birds observed on Bulgunnia Station (Lake Torrens/Lake Gairdner Basin) and Mulyungarie Station (lower North East), in spring 1997 and each spring and autumn from November 2002 to May 2005, is provided. Brief notes are given on selected species, including the Grey Falcon *Falco hypoleucos*, Plains-wanderer *Pedionomus torquatus* and Chestnut-breasted Whiteface *Aphelocephala pectoralis*, and an undescribed call of the Chirruping Wedgebill *Psophodes cristatus*.

### INTRODUCTION

This paper documents the results of repeated visits to two sites, in two seasons (spring and autumn) over several years, in the arid pastoral zone of South Australia. One site is located just inside the northern extremity of the Lake Torrens/Lake Gairdner Basin, between Tarcoola and Coober Pedy, and the other in the lower North East between Cockburn and Lake Frome. Other than an historical survey of the birds in the country surrounding Bulgunnia (McGilp 1949), dietary studies of the Barn Owl *Tyto alba* on Mulyungarie (Palmer 2001; Debus, Olsen and Rose 2004), and a survey of the avifauna of the North Olary Plains (Playfair, De Jong and Matthew 1997), these sites appear to have been little explored or documented ornithologically. However, there are several accounts of the avifauna of adjacent or intervening areas (Mack 1970; Black 1975; Pedler and Ragless 1978; Badman 1979; Gee, Gee and Read 1996; Read and Badman 1999; Read, Ebdon and Donohoe 2000), and there are some specific records for the two subject sites, particularly Bulgunnia (Pedler 1992, 1999; Matthew 1994; Carpenter *et al.* 2003). Our sightings were incidental to kangaroo *Macropus* spp. research, but an ornithologist was present on all survey trips and the cumulative totals probably reflect the bird communities fairly well (other than for cryptic species requiring targeted searches). These survey trips produced records or second-hand reports of several rare or threatened species, detailed herein.

### STUDY SITES AND METHODS

Bulgunnia (homestead at 30°10'S, 134°53'E)

is a rectangular sheep station c. 30 km x 100 km, oriented east–west, extending from the Stuart Highway (about halfway between Glendambo and Coober Pedy) to beyond the Central Australian Railway line. It falls within the Stony Plains Bioregion of Thackway and Creswell (1995). The vegetation is non-eucalypt, apart from planted eucalypts around the main homestead and several outstations: mainly mulga *Acacia aneura* woodland and bluebush *Maireana* spp. flats, some western myall *Acacia papyrocarpa* woodland, stands of black oak *Casuarina pauper*, and stony plains with dead finish *Acacia tetragonophylla* shrubs and low chenopods. Understorey shrubs include occasional sandhill grevillea *Grevillea stenobotrya* and *Eremophila* spp. There is a rocky rise (Twin Rockpiles) in the west, and other low stony rises. Intermittent watercourses are lined with dense shrubs including inland paperbark *Melaleuca glomerata*, and there are ephemeral lignum *Muehlenbeckia florulenta* or nitre goosefoot *Chenopodium nitrariaceum* swamps (the largest being Bulgunnia Swamp in the extreme north-east). Permanent water is restricted to bore-fed tanks with troughs, some of which have planted athel trees *Tamarix aphylla* around them. These tanks are the above-ground, open-topped kind with sheer internal walls.

Mulyungarie (homestead at 31°33'S, 140°47'E) is a sheep and cattle station of similar size but irregular in shape, tending largely north–south from c. 30 km north of Cockburn to the dog fence south-east of Lake Frome; the eastern boundary is the New South Wales border. It falls within the Broken Hill Complex Bioregion of Thackway and Creswell (1995). The vegetation is mainly non-eucalypt, apart from planted eucalypts around the homestead: black oak and white cypress-pine *Callitris glaucophylla* woodland, chenopod flats, narrow-leaved hop-bush *Dodonaea viscosa*/turpentine bush *Eremophila sturtii* needle bush *Hakea leucoptera* shrubland, stands of bullock bush *Alectryon oleifolius*, and some sparse or dead mulga woodland. Minor, intermittent watercourses are lined with low coolibah *Eucalyptus coolabah* or black box

Table 1. Annual rainfall (mm) at Bulgunnia (B) and Mulyungarie (M) during the study period.

Year	B	M
1997	204	284
1998	208	143
1999	100	166
2000	193	364
2001	209	152
2002	28	37
2003	222	191
2004	158	139

*E. largiflorens*, and ephemeral lakes and swamps are lined with lignum or chenopods. Permanent water is restricted to several large earth dams, and a few bore-fed tanks with troughs.

Mean annual rainfall is 150 mm at Bulgunnia and 170 mm at Mulyungarie. Annual rainfall during the survey period was variable: high in 1997–2001, low in 2002 and around average in 2003–04 (Table 1), though conditions seemed dry in 2004–05, with sparse surface water on Mulyungarie and no surface water on Bulgunnia.

Bulgunnia and Mulyungarie were surveyed on each field trip (Table 2). Survey trips and personnel were as follows, with SC (kangaroo ecologist) on all trips:

- Spring 1997 (DO) – Mulyungarie 28 October–5 November, Bulgunnia 7–14 November.
- Spring 2002 (GL) – Bulgunnia 2–7 November, Mulyungarie 11–12 November.
- Autumn 2003 (GL) – Bulgunnia 9–14 May, Mulyungarie 15–20 May.
- Spring 2003 (GL) – Bulgunnia 8–17 November, Mulyungarie 18–24 November.
- Autumn 2004 (GL) – Bulgunnia 18–21 April, Mulyungarie 24–28 April.
- Spring 2004 – Bulgunnia (SD) 13–23 November, Mulyungarie (SC only) 25–30 November.
- Autumn 2005 (SD) – Bulgunnia 23–28 April, Mulyungarie 29 April–3 May.

Cairns also visited the two stations in November–December 2005, with G. Körtner on Bulgunnia when ephemeral swamps held water after recent rain; they made incidental observations of some bird species. Cairns and Lollback also visited the two stations in May 2006, when Bulgunnia was very dry and there was still some

water on Mulyungarie, and noted bird species incidentally.

The focus of each trip was kangaroo work: accompanying a professional shooter (for the meat trade) at night from dusk in spring; conducting slow (20 km/h) driving transects for c. 2 h from sunrise and 2 h until dusk in autumn; and visiting a series of permanent habitat photo-points through the middle of the day (for c. 5 minutes per point) in both seasons. Otherwise, bird survey was possible at overnight camps (sometimes at bores) and opportunistically during the day. On spring mornings after a night with the shooter, a bird walk of about an hour was possible in mid-morning. On mornings after an ‘off duty’ night (i.e. no shooting), a bird walk was possible for about 2 h from sunrise. Bird walks of about an hour were also possible on most afternoons. In autumn, a bird walk of about an hour was possible in mid-morning and for about half an hour in early afternoon. Records were also obtained during frequent commuting trips around both properties. Bird survey was limited on Mulyungarie in 2002 when GL was on kangaroo duty every night, and SD was absent from the Mulyungarie leg of the trip in November 2004 (though SC made many opportunistic sightings of birds there).

A limitation of the study is that survey effort for a given season across years, or for seasons (autumn and spring) within years, was not consistent: the observers had different levels of experience, and the daily (and nightly) work schedule differed across years and seasons. Hence, some species may have been missed in some years or seasons. We emphasise that bird data were collected simply as cumulative species totals for each property on each trip and are essentially opportunistic, with incidental notes on sightings we (mainly SD in 2004–05) considered significant.

## RESULTS

We recorded 120 species overall: 91 or 92 on Bulgunnia and 90 on Mulyungarie, with much overlap (Table 2, which gives scientific names). A visit by A.B. Black (pers. comm.) to Mulyungarie in May 2001 adds six species to our list for that property: Straw-necked Ibis *Threskiornis spinicollis*, Diamond Dove, Redthroat, Yellow-rumped Thornbill, Pied Butcherbird *Cracticus nigrogularis* and Little Crow. In November 2005, G. Körtner observed the following five

Table 2. Bird species recorded at Bulgunnia and Mulyungarie in October/November 1997 (Oliver), November 2002, May 2003, November 2003 and April 2004 (Lollback), November 2004 (Debus for Bulgunnia, Cairns for Mulyungarie), and April/May 2005 (Debus). X = present, ? = unconfirmed.

Species	Bulgunnia							Mulyungarie						
	11.97	11.02	5.03	11.03	4.04	11.04	4.05	11.97	11.02	5.03	11.03	4.04	11.04	5.05
Emu <i>Dromaius novaehollandiae</i>	-	-	X	X	X	X	X	X	X	X	X	X	X	X
Stubble Quail <i>Coturnix pectoralis</i>	X	-	-	-	-	X	-	-	-	-	-	-	-	-
Freckled Duck <i>Stictonetta naevosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Black Swan <i>Cygnus atratus</i>	-	-	-	-	-	-	-	X	-	-	-	-	-	X
Australian Wood Duck <i>Chenonetta jubata</i>	-	-	-	-	-	-	-	X	-	-	X	-	-	X
Pacific Black Duck <i>Anas superciliosa</i>	-	-	-	-	-	-	-	X	-	-	-	X	-	-
Grey Teal <i>Anas gracilis</i>	-	-	-	-	-	-	-	-	X	-	X	-	-	X
Pink-eared Duck <i>Malacorhynchus membranaceus</i>	-	-	-	-	-	-	-	-	-	-	-	-	X	X
Hardhead <i>Aythya australis</i>	-	-	-	-	-	-	-	-	X	-	-	-	-	X
Australasian Grebe <i>Tachybaptus novaehollandiae</i>	-	-	-	-	-	-	-	X	X	X	X	-	X	X
Hoary-headed Grebe <i>Polioccephalus poliocephalus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	-	-	-	X	-	-	-	X	-	-	-	-	-	-
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
White-faced Heron <i>Egretta novaehollandiae</i>	-	-	-	-	-	-	-	X	-	-	-	-	X	-
Australian White Ibis <i>Threskiornis molucca</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Kite <i>Milvus migrans</i>	X	-	-	-	-	-	-	X	-	-	X	-	X	-
Whistling Kite <i>Haliastur spenurus</i>	-	-	-	-	-	-	-	X	-	-	-	-	-	-
Spotted Harrier <i>Circus assimilis</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Brown Goshawk <i>Accipiter fasciatus</i>	-	-	-	-	X	-	-	-	-	-	X	-	-	-
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>	X	-	-	-	-	X	X	-	-	-	-	-	-	X
Wedge-tailed Eagle <i>Aquila audax</i>	X	X	X	X	X	X	X	X	-	X	X	X	X	X
Little Eagle <i>Hieraaetus morphnoides</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Brown Falcon <i>Falco berigora</i>	-	-	X	X	X	X	X	-	-	-	-	X	X	X
Australian Hobby <i>Falco longipennis</i>	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Grey Falcon <i>Falco hypoleucos</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Peregrine Falcon <i>Falco peregrinus</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Nankeen Kestrel <i>Falco cenchroides</i>	X	X	X	X	X	X	X	X	-	-	X	X	X	X
Black-tailed Native-hen <i>Gallinula ventralis</i>	X	-	-	-	-	-	X	X	-	-	-	-	X	X
Eurasian Coot <i>Fulica atra</i>	-	-	-	-	-	-	-	-	X	-	X	-	-	X
Australian Bustard <i>Ardeotis australis</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Banded Stilt <i>Cladorhynchus leucocephalus</i>	-	-	-	-	-	-	-	X	-	-	-	-	-	-
Red-necked Avocet <i>Recurvirostra novaehollandiae</i>	-	-	-	-	-	-	-	X	-	-	-	-	-	-
Inland Dotterel <i>Charadrius australis</i>	-	-	X	-	-	X	-	-	-	-	-	-	X	-
Black-fronted Dotterel <i>Euseiornis melanops</i>	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Banded Lapwing <i>Vanellus tricolor</i>	X	-	X	X	-	X	X	-	-	-	-	-	-	-
Masked Lapwing <i>Vanellus miles</i>	-	-	-	-	-	-	-	X	-	-	X	-	-	-
Australian Pratincole <i>Stiltia isabella</i>	-	-	-	-	-	-	-	-	-	-	X	-	X	-
Rock Dove <i>Columba livia</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Common Bronzewing <i>Phaps chalcoptera</i>	X	X	X	X	X	X	X	-	-	-	-	-	X	X
Crested Pigeon <i>Ocyphaps lophotes</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Diamond Dove <i>Geopelia cuneata</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	-
Peaceful Dove <i>Geopelia striata</i>	?	-	-	-	-	-	-	X	-	-	-	-	-	-
Galah <i>Cacatua roseicapilla</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Little Corella <i>Cacatua sanguinea</i>	X	-	X	-	X	X	-	X	-	-	X	X	X	X
Major Mitchell's Cockatoo <i>Cacatua leadbeateri</i>	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Cockatiel <i>Nymphicus hollandicus</i>	X	-	-	-	-	-	-	X	-	-	-	X	X	-
Blue Bonnet <i>Northiella haematogaster</i>	-	X	X	X	X	X	X	-	X	X	X	X	-	X
Mulga Parrot <i>Psephotus varius</i>	X	X	X	X	X	X	X	X	X	-	X	X	X	X
Budgerigar <i>Melopsittacus undulatus</i>	X	X	X	X	-	X	-	-	-	X	X	-	-	-
Bourke's Parrot <i>Neopsephotus bourkii</i>	X	-	X	-	X	X	X	-	-	-	-	-	-	X
Pallid Cuckoo <i>Cuculus pallidus</i>	X	-	X	-	-	X	X	-	-	X	X	X	-	-
Black-eared Cuckoo <i>Chrysococcyx osculans</i>	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalis</i>	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Southern Boobook <i>Ninox novaeseelandiae</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Barn Owl <i>Tyto alba</i>	-	X	-	-	-	X	X	-	-	-	-	-	X	X
Tawny Frogmouth <i>Podargus strigoides</i>	-	-	-	-	-	X	-	X	-	-	-	X	X	-
Spotted Nightjar <i>Eurostopodus argus</i>	-	X	-	X	-	X	-	-	-	-	-	-	-	-
Australian Owlet-nightjar <i>Aegotheles cristatus</i>	X	-	-	X	-	X	X	-	-	-	-	-	-	X
Fork-tailed Swift <i>Apus pacificus</i>	-	-	-	-	X	-	-	-	-	-	-	-	-	-

continues...



additional species on Bulgunnia: Grey Teal, Pink-eared Duck, White-necked Heron *Ardea pacifica*, Black-winged Stilt *Himantopus himantopus* and Common Greenshank *Tringa nebularia*. In December 2005, Cairns observed the following three additional species on Mulyungarie: Australian Hobby, Banded Lapwing and Grey Shrike-thrush, with Australian Bustard reported by P. Absalom (pers. comm.). In May 2006 Cairns and Lollback observed the Red-kneed Dotterel *Erythronyctes alba* on Mulyungarie. These figures take the grand totals to 96 or 97 species for Bulgunnia, and 101 for Mulyungarie. Specific comments on selected species are made in the annotated list (Appendix), including species not detected by us but reliably reported by other observers.

Coincident with the two properties being in different zoogeographical subregions, either side of the Eyrean Barrier, there were some differences in the bird communities: Chestnut-breasted Whiteface, Varied Sittella (black-capped race *pileata*) and possibly the Chestnut Quail-thrush (unconfirmed) only on Bulgunnia; Brown Treecreeper, Chestnut-crowned Babbler, White-breasted Woodswallow, Little Raven and Apostlebird only on Mulyungarie; and Chiming and Chirruping Wedgebill allospecies on Bulgunnia and Mulyungarie respectively. The Brown Treecreeper, Weebill and White-breasted Woodswallow were seen only in watercourse eucalypts on Mulyungarie, where the Chestnut-crowned Babbler and Apostlebird were associated with stands of trees (e.g. black oak, cypress-pine), whereas on Bulgunnia cypress-pine and eucalypts are absent and trees other than mulga are sparse.

Some other patterns are evident. Most of the waterbirds were recorded on Mulyungarie, which has the higher rainfall and its permanent water is in the form of large, open waterbodies, although a few species were seen on Bulgunnia when swamps held water. Mulyungarie also has a system of tree-lined ephemeral creeks of the Lake Frome Basin, and is closer to the other big waterbodies of the interior. In April–May 2005, the waterbird species listed for Mulyungarie (Table 2) were seen in ones or twos on the dams. The White Ibis and Black-tailed Native-hen appeared to be vagrants to Bulgunnia: a single ibis at a trough at an outstation, and in 2005 a single native-hen at sullage overflow from the laundry/shower block, with saltbush cover nearby, at the homestead.

Some waterbirds, Australian Bustard, small doves, Pied Honeyeater and a Fairy Martin nesting colony (under outstation eaves) were recorded only in wetter years of the survey. Several species were recorded only or mainly in spring, and seldom or not in autumn: Cockatiel, Budgerigar, bronze-cuckoos, Spotted Nightjar, kingfishers, Rainbow Bee-eater, Crimson Chat, Grey Shrike-thrush, White-winged Triller, White-breasted Woodswallow, Fairy Martin, and songlarks.

It was not an aim of the study to assess the effect of pastoralism on birds, but some gross patterns were evident. Bore-fed tanks and dams provided an artificial source of water for the abundant granivorous birds that drank there, e.g. Common Bronzewing, Crested Pigeon, Little Corella, Galah, Blue Bonnet, Mulga Parrot, Bourke's Parrot and Zebra Finch, and dams on Mulyungarie supported small numbers of common waterbirds in dry times. Water-points and surrounding trees also provided a source of prey, carrion (livestock and kangaroo carcasses) and nest sites for corvids and bird-eating raptors (see Appendix). Homestead gardens and surrounds supported species such as the Rainbow Bee-eater, Yellow-throated Miner, Spiny-cheeked and White-plumed Honeyeaters, Magpie-lark, Australian Magpie, corvids and Welcome Swallow, as well as some common seed-eaters (Crested Pigeon, Galah, Zebra Finch). However, the ground layer around livestock tanks and dams was pounded to dust in a 'trample zone' that extended for >100 m radius or several hectares. Hence, apart from the mulga trees and occasional waterside thicket that sheltered common pigeons, parrots and finches, the shrub layer and its guild of insectivorous passerines were scarce to absent in the vicinity of tanks; the few passerines there were usually aggressive species such as the Yellow-throated Miner and Spiny-cheeked Honeyeater. Furthermore, tanks caused some bird mortality via drownings (Budgerigars and Brown Falcon: see Appendix).

## DISCUSSION

The combined bird list for both properties is closely similar to that for Roxby Downs (cf. Read *et al.* 2000), which is located between Bulgunnia and Mulyungarie though closer to the former. The bird list for Bulgunnia is similar to that for other areas in the vicinity (McGilp 1949; Badman 1979; Gee *et al.* 1996; Read and

Badman 1999), allowing for the scarcity of waterbirds on Bulgunnia in recent drier times. The bird list for Mulyungarie is similar to that for the North Olary Plains (Playfair *et al.* 1997) and for elsewhere in the lower North East (Mack 1970; Black 1975; Pedler and Ragless 1978), again allowing for the recent drying of waterbird habitat and the limited extent of eucalypt woodland on drainage lines. A few species recorded only in the previous, more northerly surveys (cited above) do not normally occur as far south as Bulgunnia or Mulyungarie (e.g. Letter-winged Kite *Elanus scriptus*, Flock Bronzewing *Phaps histrionica*, Red-browed Pardalote *Pardalotus rubricatus*, Painted Finch *Emblema pictum*), and a few species recorded by Mack (1970) and Playfair *et al.* (1997) do not normally occur as far north as Mulyungarie (e.g. Red Wattlebird *Anthochaera carunculata*, Brown-headed Honeyeater *Melithreptus brevirostris*, White-bellied Cuckoo-shrike *Coracina papuensis*, several mallee specialists).

The results of this survey understate the number of waterbirds occurring, or potentially occurring, on these properties during wet years, particularly for Bulgunnia. For instance, an Intermediate Egret *Ardea intermedia* was seen on Bulgunnia Swamp in May 1997, and 20 Freckled Ducks were seen on Mulyungarie in 1994 (Carpenter *et al.* 2003).

The apparent seasonal occurrence, in spring rather than autumn, of the bronze-cuckoos, Spotted Nightjar, kingfishers, Rainbow Bee-eater, White-breasted Woodswallow and Fairy Martin may indicate that some of these species settle in these districts in some springs. However, there was little nocturnal survey in autumn and Spotted Nightjars (flushed from roads at night in spring) may have been missed. The Grey Shrike-thrush, a sedentary species that was scarce at the two study sites, may have been recorded only in spring because it is more vocal in that season. The Cockatiel, Budgerigar, Crimson Chat, White-winged Triller and songlarks, although apparently seasonal at our survey sites, are more likely to be opportunists or nomads that follow good conditions rather than particular seasons in the relevant part of South Australia (cf. Read and Badman 1999; Read *et al.* 2000). Additional data, for months other than April/May and October/November, are required in order to investigate more rigorously any seasonal patterns and migration.

The Chestnut-breasted Whiteface is a rarely

encountered species of remote areas, whose distribution and population are still enumerated as individual sightings and locations (Pedler 1992, 1999; Higgins and Peter 2003). Unobtrusive and coloured like its substrate, and among the last species in ground-feeding mixed flocks to flush, it might also avoid detection (Pedler 1992, 1999). Judging by our and previous records on Bulgunnia, and other records in the region (Pedler 1992, 1999; Carpenter *et al.* 2003), there appears to be much apparently suitable habitat (sparse, low shrubs on stony plains or rises) between Port Augusta and Coober Pedy that would be worth further survey for this species. The eastern side of Bulgunnia is a stronghold, e.g. 20+ birds near Lena Bore and others near Grace Bore (Pedler 1999); our record (Appendix) falls between these sites.

There is obvious scope for further work on the Plains-wanderer on Mulyungarie. There are observations also for the surrounding stations Boolcoomata, Wompinnie, Kalkaroo, Strathearn and Bundarra (P. Absalom, per A. Black).

Determining the effect of pastoralism on birds would require rigorous comparison of populations in grazed and reference areas (ungrazed, no artificial water sources), an approach that was beyond the scope of this study. Nevertheless, our observations are consistent with some effects of arid-zone pastoralism, notably the provision of water sources, identified by James, Landsberg and Morton (1999). That is, creation of waterbird habitat; likely increased abundance of seed-eaters (common pigeons, parrots and finches) that drink daily; extreme habitat degradation within 0.5 km of tanks which act as a focus for grazing, with consequent displacement of ground- and shrub-dwelling birds; and water sources being a focus for predation.

Bird drownings in open-topped tanks are a likely problem throughout the Australian pastoral zone (cf. Anderson, Maritz and Oosthuysen 1999). However, most pastoralists are gradually converting to fully enclosed polythene tanks, and many concrete and metal tanks are being covered (G. Carpenter pers. comm.). Our survey provides evidence that these actions should be supported.

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- S.J.S. Debus, G. Lollback, Damon L. Oliver\* and S.C. Cairns: Zoology, University of New England, Armidale, New South Wales 2351; <sdebus@une.edu.au>

\*Present address: Biodiversity Conservation Section, Dept Environment & Conservation, PO Box 2115, Queanbeyan, NSW 2620

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## APPENDIX

Selected annotated list of birds recorded on Bulgunnia and Mulyungarie.

**Collared Sparrowhawk.** Pairs were nesting on Bulgunnia in November 2004 at settlements that had a tank and athel tree(s): a female incubating in the homestead garden, and a pair with fledglings at an outstation (both nests in athel trees). At another tank a pair was resident in the surrounding mulga. Judging by piles of feathers under thickets at tanks, these hawks caught Crested Pigeons and Mulga Parrots that came to drink at troughs.

**Wedge-tailed Eagle.** Wedge-tailed Eagles, Brown Falcons and Nankeen Kestrels were the most common raptors on both properties, although rabbits *Oryctolagus cuniculus* were scarce. Wedge-tailed Eagles promptly found fresh dumps of kangaroo offal at sunrise, following a night's shooting and carcass dressing. They were also commonly seen on the abundant kangaroo road-kill between both properties, via the Stuart and Barrier Highways. Despite the effect of the calicivirus on rabbits, kangaroo carrion appears to support a large population of Wedge-tailed Eagles (cf. Falkenberg, Hurley and Stevenson 2000; Read and Wilson 2004).

**Brown Falcon.** The Brown Falcons seen on both properties were extremely pale (white ventrally and rufous dorsally, with a grey or slaty cast to the head and upperparts), and could be mistaken for Grey Falcons in some types of light but for their long legs and usually more languid flight. One Brown Falcon on Mulyungarie caught a small snake, apparently an elapid. On Bulgunnia one falcon was found dead at a tank, having apparently drowned and been fished out (with a purpose-built scoop, commonly left at tanks) by station personnel.

**Australian Hobby.** One pair bred in a raven's nest in the top of a mulga, at a tank on Bulgunnia, in November 2004.

**Grey Falcon.** An adult pair was seen and photographed in the far north of Mulyungarie (exact location suppressed) in May 2005, perched on the arm of a windmill vane at a tank. There was an old raven's nest on the windmill platform, and the fresh remains of a parrot (Mulga or Blue Bonnet) on the ground below. Singly, the falcons briefly flushed and returned to their perch, flying with fairly rapid beats and gliding with noticeably upswept wing-tips (rather like a Brown Falcon). After they eventually flushed to distant dead trees, one returned and swooped low over a large flock of Blue Bonnets, Mulga Parrots, Crested Pigeons and several Galahs that were drinking or gathering at the trough, before both falcons departed. A closer photograph of a different pair in the region (Figure 1) replicates well the features of our sighting.

**Plains-wanderer** *Pedionomus torquatus*. Not detected. However, this species was reported on Mulyungarie by P. Absalom (pers. comm.), who sees the birds during night work. He has precise records of sightings (including an individual in the hand) and of four nests. Some parts of Mulyungarie support apparently suitable habitat for Plains-wanderers (cf. Baker-Gabb 1998); for example, a grassy plain that resembled the photographs on pp. 11 and 13 of NPWS (2002). Further survey is desirable.

**Inland Dotterel.** Bred on Bulgunnia in May 2003, where at least one adult and two downy chicks were seen by Cairns and Lollback, on a stony bluebush plain c. 15 km SSW of the homestead.

**Rock Dove.** Apparently stray racing birds: one at the homestead in 1997 wore a leg band, and one in August 2005 was suspected to originate from a Coober Pedy to Port Augusta race (S. Miller pers. comm.).

**Peaceful Dove.** Observed by Oliver on Bulgunnia in November 1997. No further details are available, but the species was distinguished from the Diamond Dove also seen by Oliver at the time, and the Peaceful Dove was routinely familiar to him in eastern Australia. Treated here as a probable record; Bulgunnia is marginal or barely extralimital to the species' known range (cf. Higgins 1999; Barrett *et al.* 2003).

**Major Mitchell's Cockatoo.** A pair seen at East Tate Bore, near the Bulgunnia homestead, in April 2005. Also present on Bulgunnia in the non-survey years between 1997 and 2002, when about 10 frequented the Ooraminna outstation and smaller numbers fed on roadside wild melons on the property (Cairns pers. obs.).



APPENDIX (continued)

**Budgerigar.** In 1997, after rain in September–October, Budgerigars were estimated in millions on Bulgunnia in November, when tree branches broke under the weight of flocks and small numbers drowned in tanks; the birds were foraging and moving in large flocks, but no evidence of breeding was observed. Similar invasions occurred in previous wet years (M. Moore pers. comm.); it is not known whether these events were restricted to the Bulgunnia area. Otherwise, Budgerigars were seen in small numbers.

**Bourke's Parrot.** On Bulgunnia in November 2004 and April 2005, there was a constant stream of apparently dozens of calling birds coming to drink at tanks in the half-hour before dawn. On Mulyungarie in May 2005 small numbers of birds were seen coming to water at dusk (ones or twos), or heard coming to water at dawn (small groups of <10). The latter observations add to the minor cluster of records at the extremity of the species' range in South Australia, representing the south-western limits of the eastern Australian subpopulation (cf. Black 2001). These birds were seldom encountered in daytime, but on Bulgunnia in 2004/2005 they frequented mulga/black oak woodland.

**Sacred Kingfisher.** One bird, giving the species' characteristic four-note advertising *kik-kik...* call, was observed by Lollback at Bulgunnia homestead on 8 November 2003. The species was familiar to him in eastern Australia, but this bird's characters (checked against current field-guides, e.g. Slater *et al.* 1986) were carefully scrutinised to confirm its distinction from the Red-backed Kingfisher, which also occurred on Bulgunnia. The bird was green-blue dorsally (i.e. no rufous rump or streaked crown) and cream to buff ventrally, with cream or buff collar and loreal spot. The location is marginal or barely extralimital to the species' known range, and is perhaps not anomalous for a migrant (cf. Higgins 1999; Barrett *et al.* 2003).

**Australian Owlet-nightjar.** A nest with an unknown number of chicks was in the guttering of a shed on Bulgunnia in November 2003; a station worker extracted one chick and showed it to Cairns and Lollback



Figure 1. Pair of Grey Falcons in arid north-eastern South Australia, in similar circumstances to the sighting on Mulyungarie. Photographer Jim Robinson (courtesy Neil Jarvis).

APPENDIX (continued)

before replacing it. In a non-survey year between 1997 and 2002, a pair nested in the roof of a caravan at a shooter's camp on Mulyungarie, but the nest was robbed by a Gould's Monitor *Varanus gouldii* which climbed the adjacent tree, leapt onto the caravan roof, took the chick(s) and leapt to the ground.

**Treecreepers.** The White-browed Treecreeper was scarce on both properties, with single individuals seen once on each occasion (Table 2), in non-eucalypt habitat (scattered black oak and dead trees) on Bulgunnia and in eucalypt woodland on Mulyungarie. The latter bird was scrutinised closely to distinguish it from the Brown Treecreeper; the observer (Lollback) was familiar with the Brown Treecreeper in eastern Australia, and had seen a White-browed Treecreeper on Bulgunnia in the preceding week. The Brown Treecreeper was locally common in watercourse eucalypts on Mulyungarie. The White-browed Treecreeper is also sometimes recorded in eucalypt woodland (Higgins, Peter and Steele 2001).

**Grasswren sp.** The grasswren observed on Bulgunnia in November 1997 was possibly the Striated Grasswren *Amytornis striatus*, but there is no spinifex (its preferred habitat) on Bulgunnia though there is much chenopod shrubland (habitat of the Thick-billed Grasswren *A. textilis*; see Higgins *et al.* 2001). The locality is marginal or extralimital for either species (*A. striatus* or *A.t. myall*, cf. Higgins *et al.* 2001), and confirmation of the grasswren's identity on Bulgunnia is required. No further details of the location, habitat or bird's description are available, but the observer (Oliver) was confident that it was not a Rufous Fieldwren *Calamanthus campestris*.

**Chestnut-breasted Whiteface.** A group of six birds on Bulgunnia was observed in the north-east of the property near Marie Bore, about halfway between Grace Bore and Lena Bore (c. 15 km W of the Stuart Highway and 25 km NE of the homestead) in November 2004. The habitat was a stony rise with scattered, sparse pearl bluebush *Maireana sedifolia* and dead finish (some dead or partly dead) and the occasional small mulga, and appeared more barren than that frequented by Southern Whitefaces commonly seen elsewhere on Bulgunnia. The group flushed at close range from one shrub at a photo-point (Figure 2) and flew c. 20 m to the next shrub where their diagnostic features, including chestnut breast-band, were clearly seen through 8x Zeiss binoculars. Their calls were



Figure 2. Habitat of Chestnut-breasted Whiteface on Bulgunnia, November 2004. Photographer S.C. Cairns.

APPENDIX (continued)

- more bubbling and animated than those of the Southern Whiteface, more like those of the Buff-rumped Thornbill *Acanthiza reguloides*.
- White-plumed Honeyeater.** On Bulgunnia a few birds (<10?) occurred only in planted eucalypts around buildings, which the species must have colonised as the trees grew (cf. Read 1999). On Mulyungarie, they only occurred in planted eucalypts at the homestead and on eucalypt-lined creeks.
- Jacky Winter.** No further details are available for the record on Bulgunnia in November 1997, but the species was routinely familiar to the observer (Oliver) in eastern Australia. The location is not extralimital or otherwise unusual (cf. Higgins and Peter 2003), but the species is poorly known in the region (L. Pedler pers. comm.).
- Wedgebills.** The Chiming Wedgebills on Bulgunnia uttered three descending bell-like notes with the same rhythm as the ascending two notes and chirrup of the Chirruping Wedgebills on Mulyungarie (cf. the description of Chiming Wedgebill's four-note call in field guides and handbooks, e.g. Higgins and Peter 2003). As well as the typical chirrup, Chirruping Wedgebills in South Australia uttered a subdued monotonous clinking note (three pulses/second) like the mild alarm call of a Common Blackbird *Turdus merula*; this soft call was previously undescribed for wedgebills (cf. Higgins and Peter 2003).
- Quail-thrushes.** Two female-plumaged quail-thrushes flushed together by the slow-moving vehicle (<40 km/h) in the west of Bulgunnia, in mulga, were greyer than the Cinnamon Quail-thrushes frequently seen, and may have been Chestnut Quail-thrushes though confirmation was not possible. There is a prior record of the mulga-inhabiting Chestnut Quail-thrush for Bulgunnia (Higgins and Peter 2003); the source ('Aust. Atlas') is presumably one of the historical (1951–76) records in Blakers, Davies and Reilly (1984). However, past records may be unreliable and the occurrence of the Cinnamon, Chestnut and Chestnut-breasted Quail-thrush *Cinlosoma castaneothorax* (and possible hybrids) in the region requires reappraisal by critical fieldwork (Black and Walker 2006). Cinnamon Quail-thrushes on our study sites were on chenopod plains, though not always on stony substrate (e.g. sometimes on clay).
- Australian Magpie.** On Bulgunnia, most Magpies were not identified to subspecies or plumage form, but in 2004/2005 white-backed individuals were seen on the Tarcoola road south of the central homestead; intergrades with a narrow black saddle occurred at the homestead; and black-backed individuals were seen in the north of the property. A white-backed bird was seen on Mulyungarie, although most were apparently black-backed.
- Corvids.** The Australian Raven was the common corvid on both properties. Little Crows were identified several times on Bulgunnia by their calls, soaring high (spiralling on set wings) in groups, and their tameness around buildings. On one occasion in May 2005 two or three Little Ravens were identified by their rapid guttural calls, 'harder' and more clipped than the slightly more prolonged and nasal (but similarly rapid and deep) calls of the Little Crow, at a tank towards the south of Mulyungarie; they were quickly lost in the mêlée of more numerous Australian Ravens. Voice is the main identifying criterion for the two small corvids (e.g. Debus 1995; Higgins, Peter and Cowling 2006), particularly when distinguishing behaviour or morphology is not seen (as in this case). Mulyungarie is marginal or barely extralimital to the Little Raven's known range (cf. Barrett *et al.* 2003; Higgins *et al.* 2006).
- House Sparrow.** Seen at Bulgunnia homestead (two birds) in 1997 and at Ooraminna outstation between 1997 and 2002 (one bird) before the building was fire-damaged and vacated; they appear to have died out: they were not at the homestead in our 2002–05 surveys, or subsequently (S. Miller pers. comm.).