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CHANGES IN THE OCCURRENCE OF BIRDS AND CONSERVATION OF BIRD HABITATS IN THE PITTSWORTH SHIRE, DARLING DOWNS, SINCE 1972.

JOHN AND RUTH WALTER

ABSTRACT

Regular bird observations made in the Pittsworth Shire, Darling Downs, since 1972 have recorded marked changes in the presence of some of the 201 species present over the 35 year period. Thirteen, mainly larger terrestrial species; Crested Pigeon, Little Corella, Red-winged Parrot, Common Koel, Channel-billed Cuckoo, Blue-faced Honeyeater, Spiny-cheeked Honeyeater, Noisy Miner, Figbird, Grey Butcherbird, Pied Currawong, Common Myna and House Sparrow increased in abundance over the period. Twenty-six, mainly smaller terrestrial species; Common Bronzewing, Yellow-tailed Black-Cockatoo, Pheasant Coucal, Inland Thornbill, Yellow Thornbill, Brown Honeyeater, Golden-headed Cisticola, Tawny Frogmouth, Laughing Kookaburra, White-throated Treecreeper, Scarlet Honeyeater, Rose Robin, Black-faced Monarch, Pied Butcherbird, Double-barred Finch, Chestnut-breasted Mannikin, Rufous Songlark and Common Starling decreased in abundance over the period.

Drought has reduced the abundance and diversity of many species over the past decade and, whilst the abundances of species changed seasonally, the numbers of passerine species declined over the reporting period in the face of both drought and loss of habitat. The reservation and protection of several blocks of native habitat in the Shire has benefited populations of passerines. The number of non-passerine species remained unchanged, although the Australian Bustard *Ardeotis australis*, Brolga *Grus rubicunda* and Bush Stone-curlew *Burhinus grallarius*, have disappeared from the area.

INTRODUCTION

In 1972 we came from Victoria to live on a dairy and grain farm at Irongate

within the shire of Pittsworth. The following year we moved into the town of Pittsworth. The farm 'Karinya V' (then owned by Stephen and Gloria Temple Watts) has been the focus of much of our bird recording over the past 35 years, as it was for Stephen and his mother Betty Temple Watts, who kept daily records on the farm from August 1971 to January 1975. Irongate Conservation Park and Linthorpe Environmental Park are both significant habitats for birds within the Pittsworth Shire.

Pittsworth Shire lies at 151° 38' E 27° 43' S and covers an area of 1087 km² at an elevation of 520m a.s.l. approximately 40 km S-W of Toowoomba and 150km inland from the Australian east coast. The Shire (soon to be amalgamated into the Toowoomba Regional Council) supports approximately 4800 people living in two distinct topographical regions, in the west the flood plains of the Condamine River and to the east the basaltic upland soils of the western slopes of the Great Dividing Range.

The upland is mainly open forest with Mountain Coolibah *Eucalyptus organophila* dominant. On lower ridges Silver-leaved Ironbark *E. melanophloia* and Narrow-leaved Ironbark *E. crebra* are widespread and on the lower S-W slopes Poplar Box *E. populnea* prevails where sandstone soils intrude on the basalts. Acacia species, and Belah *Casuarina cristata* inhabit the sandstone soils adjoining the flood plain. Cypress pine *Callitris columellaris*, and *Brachybiton* spp. occur throughout, softwood scrub and vines form the understorey of the open forest, particularly, near Mt Wyangapinni. Most uplands were originally cleared for dairying but are now used to produce grain, with some returning to pasture and there are many small dams for watering stock.

The Condamine River flood plains originally supported native grassland dominated by Queensland Blue Grass *Picanthium serilius* and Oat Grass *Themeda* spp with a few scattered trees. The plains now produce grain or cotton, almost exclusively, with very few trees, most of which are planted around homesteads.

The area was linear gilgaied (melon hole type formations) allowing floods to move safely across the landscape to the N branch of the Condamine R. Most of the Shire area drains into the Condamine via Hodgsons Creek, Perrier's Gully, 14 Mile (Rocky Creek), Learmonth's Gully and Ashall Creek directly or (Linthorpe Creek) across a neighbouring shire. There are several large dams and water-harvesting ring tanks for irrigation. The average rainfall of Pittsworth Shire is 695mm and the average rainfall over the 35 years of the study is about normal at 692mm. Over the last 17 years the average drops to 656mm and in the last 10 years is only 620mm. Since the late 1980s annual

rainfall has been below average (except in 1995 when there was a minor flood) and the shire has been officially in drought for most of these latter years.

Irongate Conservation Park

In the 1970's the Temple Watts family made 29.035ha. (approx. 72 acres) of their farm available to the (then) Lands Department. It contained remnant native vegetation and was gazetted as an Environmental Park and later changed to Irongate Conservation Park so as to legally exclude cattle grazing. Straddling the basaltic-flood plain transition zone between the uplands and the Condamine R it now supports a dry Brigalow/Belah scrub with a vine understorey and provides key native habitats for birds within the shire.

In the early 1990's the Shire passed the management of the reserve to the Queensland Government and it is now under National Parks and Wildlife (EPA) control. Pittsworth Landcare Association Inc. also became interested in the management of the reserve and some botanical survey work was carried out by Geoff Bass, one of us (RWW), The Toowoomba Field Naturalist Club Inc. and others. In May 1994, we produced a book with Landcare funding detailing the park, its flora and fauna for use by schools and interested visitors (Walter & Walter 1994). One of us (JCW) designed a walking track and Geoff Bass organised the botanical signs. Later that year the Pittsworth Landcare Association Inc. obtained funding to supply material and expertise for a Regional Environment Employment Program administered by the Commonwealth Government. Community members were employed on priority regional environmental work under our supervision (JCW) and the walking track was upgraded, signs were erected and the perimeter re-fenced to exclude stock.

Linthorpe Environmental Park

Around the time the Temple Watts family sold the land which became the Irongate Conservation Park, Linthorpe Environmental Park was gazetted several kilometres to the east in the upland part of the shire. Formerly a stock water reserve, Linthorpe Environmental Park has native vegetation and a creek, open to cattle grazing under an agreement between the shire council and local graziers.

METHODS

The list of birds of the Pittsworth Shire (Table 1) was compiled from our own observations at Karinya V over a period of 35 years and the unpublished notes of Stephen and the late Betty Temple Watts (1971-1975). The notes are currently held by the authors and will be given to Stephen Temple

Watts for possible inclusion in the National Library of Australia, Canberra - where Betty's original paintings are presently held.

paintings currently in the National Library in Canberra. The notes are supplemented by observations from other localities like our own town garden, the Pittsworth Golf Course, McLean's Dam (a large storage dam supplying a commercial poultry farm), another large dam holding recycled sewage water for irrigation, the Pittsworth sewage ponds, the local abattoir dams and several roadside areas of bushland and grassland, and private property. The list was prepared under licence, using Simon Bennett's Bird Info program, which follows Clements Birds of the World. Species nomenclature and taxonomy follows Christidis and Boles (1994).

We surveyed the whole shire in 10-minute grids during the Royal Australasian Ornithologists Union first Atlas 1977-1981, and again in the second Atlas 1998-2002, using the 2-hectare - 20 minutes point survey method. We are still submitting regular sightings to the continuing Birds Australia Atlas. We did weekly surveys for the Queensland Ornithological Society's Garden Bird Survey and the quarterly Farm Bird Survey for Birds Australia.

RESULTS

The list of 201 bird species recorded over 35 years in the Pittsworth Shire (Table 1.) reveals the changes in their observed abundance and use of habitats. Thirteen, mainly larger terrestrial species; Crested Pigeon, Little Corella, Red-winged Parrot, Common Koel, Channel-billed Cuckoo, Blue-faced Honeyeater, Spiny-cheeked Honeyeater, Noisy Miner, Figbird, Grey Butcherbird, Pied Currawong, Common Myna and House Sparrow increased in abundance over the period. Twenty-six, mainly smaller terrestrial species; Common Bronzewing, Yellow-tailed Black-Cockatoo, Pheasant Coucal, Inland Thornbill, Yellow Thornbill, Brown Honeyeater, Golden-headed Cisticola, Tawny Frogmouth, Laughing Kookaburra, White-throated Treecreeper, Scarlet Honeyeater, Rose Robin, Black-faced Monarch, Pied Butcherbird, Double-barred Finch, Chestnut-breasted Mannikin, Rufous Songlark, Common Starling decreased in abundance over the period.

DISCUSSION

Prolonged drought in the Pittsworth Shire over the past two decades has reduced bird numbers and species diversity (Table 1). The impact of low

annual rainfall has been compounded by occasional flooding rainstorms outside of the growing season of little use to agriculture or native vegetation. As a consequence these dry years have impacted on both birds and bird habitats. In the early 1970s, water was piped on to the Pittsworth township and gardens became more productive. This has led to some bird species becoming more plentiful and, during the last decade of drought, others like the Pied Currawongs have become permanent residents in town.

In the period of the survey (1972 – 2007) the number of non-passerine species recorded for Pittsworth Shire remained little changed, although their numbers fluctuated seasonally. A few notable species, such as the Australian Bustard *Ardeotis australis*, Brolga *Grus rubicundus* and Bush Stone-curlew *Burhinus grallarius*, have disappeared from the area. The passerines have declined both in terms of their abundance and variety, due to loss of habitat and the drought. Many of the species which increased or decreased within the Shire also did so nationally over the period (Barrett *et. al.* 2003). House Sparrows increased locally and Common Bronzewing, Yellow-tailed Black-Cockatoo, Pheasant Coucal, Inland Thornbill, Yellow Thornbill, Brown Honeyeater and Golden-headed Cisticola decreased locally against national trends (Barrett *et. al.* 2003).

Part of the decline observed in some species may be due to changes to farming practices, clearing of vegetation and cultivating of grassland. Before the current drought, crop pests and mouse plagues were common, and led to some farmers using of highly toxic chemicals to protect their incomes. This led to a rapid decline in grassland passerine species and a subsequent decline in raptor numbers. However, these days most farmers are more environmentally aware and do not overuse chemicals and this should help halt this decline. Given better seasons we expect some of these species to increase again.

A few doubtful early 1970's records of nine species (not included in Table 1) are Wandering Whistling-Duck, *Dendrocygna arcuata*, Blue-billed Duck, *Oxyura australis*, Freckled Duck, *Stictonetta naevosa*, at large dams; Red Wattlebird, *Anthochaera camunculata*, Little Wattlebird, *Anthochaera chrysoptera*, Olive Whistler, *Pachycephala olivacea*, Grey Shrike-thrush, *Colluricincla harmonica* from Irongate CP and Emerald Dove, *Chalcophaps indica* at Irongate CP and Brush Cuckoo *Cacomantis variolosus* from Irongate CP and Linthorpe E P.

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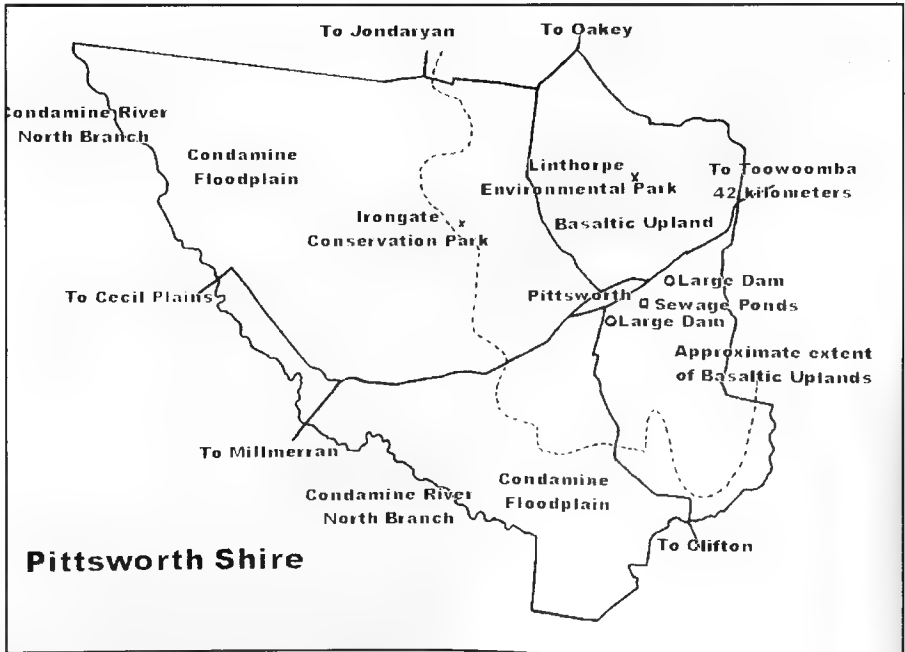
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JCW	John Walter
BTW	Betty Temple Watts
RWW	Ruth Walter
S	No change in abundance
D	Decrease in abundance
I	Increase in abundance
V	Vagrant
R	Rare
VR	Very rare
UC	Uncommon
MC	Moderately common
C	Common

Table 1.: The status of 201 species of birds recorded in the Pittsworth Shire, 1972-2007.

Species		Habitat and Comment	Shire Atlas	
Stubble Quail	<i>C. pectoralis</i>	Grasslands	MC	S
Brown Quail	<i>C. ypsilophora</i>	Wetter areas	MC	-
Plumed Whistling-Duck	<i>D. gytoni</i>	Huge numbers in wet years. Large dams, & North Branch Condamine R.	S, MC	S
Musk Duck	<i>B. lobata</i>	Large deep dams	R	S
Black Swan	<i>C. atratus</i>	Large dams	S,UC	S
Australian Wood Duck	<i>C. jubbata</i>	Common throughout close to water	S,C	I
Pacific Black Duck	<i>A. superciliosa</i>	Small dams, ponds in creeks and Condamine R.	S,C	I
Australasian Shoveler	<i>A. rhynchos</i>	Large dams	UC	I
Grey Teal	<i>A. gracilis</i>	Small dams, ponds in creeks and Condamine R.	S,C	S
Pink-eared Duck	<i>M. membranaceus</i>	Large dams	S,UC	S
Hardhead	<i>A. australis</i>	Dams	S,C	S
Australasian Grebe	<i>T. novaehollandiae</i>	Small dams	S,C	I
Hoary-headed Grebe	<i>P. poliocephalus</i>	Small dams	S,UC	S
Darter	<i>A. melanogaster</i>	Condamine R. and large dams	S,UC	I
Little Pied Cormorant	<i>P. melanoleucos</i>	Dams and creeks	S,C	S
Pied Cormorant	<i>P. varius</i>	Large dams	R	S
Little Black Cormorant	<i>P. sulcirostris</i>	Condamine R. and dams	S,C	S
Great Cormorant	<i>P. carbo</i>	Large dams	R	-

Australian Pelican	<i>P. conspicillatus</i>	Condamine R. large dams	S,UC	S
White-faced Heron	<i>E. novaehollandiae</i>	Most areas	S,C	D
Little Egret	<i>E. garzetta</i>	Condamine R.	UC	S
White-necked Heron	<i>A. pacifica</i>	Wet areas in some years	UC	D
Great Egret	<i>A. alba</i>	Dams, creeks and Condamine R.	MC	S
Intermediate Egret	<i>A. intermedia</i>	Condamine R.	UC	I
Cattle Egret	<i>A. ibis</i>	Open grassland, two sightings	R	S
Nankeen Night-Heron	<i>N. caledonicus</i>	Condamine R. and creek lines, no sightings since 2005	R	D
Glossy Ibis	<i>P. falcinellus</i>	Wet areas, 2 sightings in 30 years	R	D
Australian White Ibis	<i>T. molucca</i>	Mostly wet areas, seasonal visitor	S,C	S
Straw-necked Ibis	<i>T. spinicollis</i>	Large seasonal flocks some years in grassland and around dams.	S,C	S
Royal Spoonbill	<i>P. regia</i>	Large dams and Condamine R.	S,R	S
Yellow-billed Spoonbill	<i>P. flavipes</i>	Large dams and Condamine R.	S,MC	D
Black-necked Stork	<i>E. asiaticus</i>	Large dam, 1 sighting, none in last 20 years	VR	D
Black-shouldered Kite	<i>E. axillaris</i>	All areas depending on seasons	S,C	S
Black Kite	<i>M. migrans</i>	Odd sightings passing through	R	D
Whistling Kite	<i>H. spheerulus</i>	Condamine R. and wooded areas	S,C	D
Spotted Harrier	<i>C. assimilis</i>	Open grassland, autumn visitor	UC	D
Brown Goshawk	<i>A. fasciatus</i>	All areas including town gardens	S,C	I
Grey Goshawk	<i>A. novaehollandiae</i>	White morph recorded during mouse plague by BTW May 20th to August 6th in 1972. Photographed on clothesline (JCW)	VR	S
Collared Sparrowhawk	<i>A. cirrocephalus</i>	All areas including town gardens	S,MC	I
Wedge-tailed Eagle	<i>A. audax</i>	Two pairs nest in upland areas	S,UC	D
Little Eagle	<i>H. morphnoides</i>	Very few sightings	R	D
Brown Falcon	<i>F. berigora</i>	Probably the most common raptor on plains	S,C	D
Australian Hobby	<i>F. longipennis</i>	Seasonal visitor summer, 2 nesting records	S,V	-
Black Falcon	<i>F. subniger</i>	Occasional visitor	V	-
Peregrine Falcon	<i>F. peregrinus</i>	Occasional visitor	R	-
Nankeen Kestrel	<i>F. cenchroides</i>	All areas	S,C	D
Brolga	<i>G. rubicunda</i>	Wet grassland, one early record	VR	D
Buff-banded Rail	<i>G. philippensis</i>	Creek lines, one early record	D,VR	I
Baillon's Crake	<i>P. pusilla</i>	Perrier's Gully on "Avondale" property 1974	D,R	-
Dusky Moorhen	<i>G. tenebrosa</i>	Creeks and Condamine R.	D,UC	S
Eurasian Coot	<i>F. atra</i>	Dams	S,C	S
Australian Bustard	<i>A. australis</i>	One sighting on plain in 1970's	VR	D
Red-backed Button-quail	<i>T. maculosa</i>	Grassland, good seasons, netted at night with Don Seton NP&WS 1974	V	-
Little Button-quail	<i>T. rebox</i>	Grassland, good seasons, netted at night with Don Seton NP&WS 1974	V	-

Red-chested Button-quail	<i>T. pyrroborax</i>	Grassland, good seasons, netted at night with Don Seton NP&WS 1974	V	-
Latham's Snipe	<i>G. hardwickii</i>	Wet areas in wet seasons	UC	S
Marsh Sandpiper	<i>T. stagnatilis</i>	Large dams when mudflats showing	UC	1
Pectoral Sandpiper	<i>C. melanotos</i>	One sighting on mudflats of McLeans Dam 1979	VR	-
Sharp-tailed Sandpiper	<i>C. acuminata</i>	Large dams with mudflats and ephemeral flooded paddocks	UC	D
Bush Stone-curlew	<i>B. gallarinus</i>	Early records only, not seen or heard since 1980	VR	-
Black-winged Stilt	<i>H. himantopus</i>	Large dams	S,MC	S
Black-fronted Dotterel	<i>E. melanopus</i>	Dams and creeks	S,C	S
Red-kneed Dotterel	<i>E. cinctus</i>	Large dams with mudflats	V	-
Banded Lapwing	<i>V. tricolor</i>	Plains in suitable seasons	V	D
Masked Lapwing	<i>V. miles</i>	Wet areas, ovals, golf course	S,C	S
Australian Pratincole	<i>S. isabella</i>	Cultivated paddocks on plains not seen since mid 80's	V	D
Whiskered Tern	<i>C. hybridus</i>	Wet areas, large dams in small numbers	V	S
Rock Dove	<i>C. livia</i>	Around towns and grain silos	S,C	S
Common Bronzewing	<i>P. chalcoptera</i>	Sightings in 70's at Irongate CP and Linthorpe EP	D,VR	1
Crested Pigeon	<i>O. lophotes</i>	All areas	I,C	1
Squatter Pigeon	<i>G. scripta</i>	Sightings in 70's at Irongate CP and Linthorpe EP	D,VR	-
Peaceful Dove	<i>G. striata</i>	Upland wooded area, rare in town	S,C	1
Bar-shouldered Dove	<i>G. bumeralis</i>	Wooded upland areas only	S,UC	1
Glossy Black-Cockatoo	<i>C. lathami</i>	Several records in Casuarina groves or flying over	D,V	-
Yellow-tailed Black-Cockatoo	<i>C. fumeus</i>	Early records in wooded areas, no recent records	D,V	1
Galah	<i>C. roseicapilla</i>	Everywhere	S,C	1
Little Corella	<i>C. sanguinea</i>	Early records along Condamine R., now throughout, regular in town.	I,C	1
Major Mitchell's Cockatoo	<i>C. leadbeateri</i>	Several sightings, escapees	R	S
Sulphur-crested Cockatoo	<i>C. galerita</i>	Throughout mostly wooded areas and town	S,C	1
Cockatiel	<i>N. hollandicus</i>	All areas, large flocks at times, once winter visitors now most of the year	S,C	S
Rainbow Lorikeet	<i>T. haematodus</i>	Mostly town area dependant on garden flowering	S,UC	1
Scaly-breasted Lorikeet	<i>T. chlorolepidotus</i>	Uplands and town	S,C	S
Musk Lorikeet	<i>G. concinna</i>	Town and uplands when suitable eucalypts flowering	R	1
Little Lorikeet	<i>G. pusillo</i>	Condamine River red gum tree lines	R	1

Australian King-Parrot	<i>A. scapularis</i>	Wooded areas	R	I
Red-winged Parrot	<i>A. erythropterus</i>	Wooded areas and town; becoming more noticeable winter visitors	I,C	S
Eastern Rosella	<i>P. eximius</i>	Very few sightings along river and in town, possible hybrid Pale-head X Eastern	VR	I
Pale-headed Rosella	<i>P. adsitus</i>	Woodland; gardens	S,C	S
Australian Ringneck	<i>B. zonorius</i>	Odd sightings probably escapees	VR	S
Red-rumped Parrot	<i>P. baematouotus</i>	Grassland, uplands, golf course, ovals, town gardens	S,C	S
Budgerigar	<i>M. undulatus</i>	Occasional wild flocks passing through; some escapees	V	S
Turquoise Parrot	<i>N. pulchella</i>	Sightings in 70's at Irongate CP, no recent sightings, fairly common pre 1970 Colin Rhule pers. com.	VR	S
Oriental Cuckoo	<i>C. saturatus</i>	Seen at Irongate CP 4th Nov 1973 and in town 1974	VR	-
Pallid Cuckoo	<i>C. pallidus</i>	Most years in spring	S,UC	S
Fan-tailed Cuckoo	<i>C. flabelliformis</i>	Most years in spring	S,UC	I
Horsfield's Bronze-Cuckoo	<i>C. basalis</i>	Most years in spring	S,C	I
Shining Bronze-Cuckoo	<i>C. lucidus</i>	Most years in spring	S,UC	I
Common Koel	<i>E. scolopacea</i>	Spring to summer visitor, town area, most chicks reared by Magpie larks	I,C	I
Channel-billed Cuckoo	<i>S. noraeboollandiae</i>	Only since 2002, immatures photographed in garden, breeding unknown	I,UC	I
Pheasant Coucal	<i>C. phasianinus</i>	Roadside grasses, thick vegetation along creeks etc.	D,UC	I
Barking Owl	<i>N. connirens</i>	One at Irongate CP in May, June and July 1972 roosting near cottage.	R	-
Southern Boobook	<i>N. novaeseelandiae</i>	Throughout mostly wooded areas and town	S,C	D
Masked Owl	<i>T. novaehollandiae</i>	One record mobbed by noisy miners in town garden 29th April 1998	VR	-
Barn Owl	<i>T. alba</i>	Grasslands, most noticeable during mouse plagues, many road kills	D,C	D
Tawny Frogmouth	<i>P. strigoides</i>	Upland areas and town, breeds in town	D,UC	S
Australian Owllet-nightjar	<i>A. cristatus</i>	Woodland areas	UC	S
White-throated Needletail	<i>H. caudacutus</i>	Passing through on storm fronts sometimes in large numbers	V	D
Fork-tailed Swift	<i>A. pacificus</i>	Passing through on storm fronts in small numbers usually with W-T N	V	-
Laughing Kookaburra	<i>D. novaeguineae</i>	Woodland areas, occasionally in town	D,UC	S
Sacred Kingfisher	<i>T. sanctus</i>	Summer visitor to all areas	S,C	I
Rainbow Bee-eater	<i>M. ornatus</i>	Erratic visitors mostly flying over spring and autumn	S,UC	S

Dollarbird	<i>E. orientalis</i>	Woodland and town areas during summer	S,C	S
Noisy Pitta	<i>P. versicolor</i>	Found dead in a town garden by Marcus Lindenberg	VR	1
White-throated Treecreeper	<i>C. leucophaeus</i>	Woodland areas	D,VR	S
Superb Fairy-wren	<i>M. cyanens</i>	Gardens and woodland	S,C	1
Variiegated Fairy-wren	<i>M. lamberti</i>	Woodland	UC	1
Spotted Pardalote	<i>P. punctatus</i>	Woodland	UC	1
Striated Pardalote	<i>P. striatus</i>	Throughout, most wooded areas and town	C	1
White-browed Scrubwren	<i>S. frontalis</i>	Woodland	UC	1
Speckled Warbler	<i>C. sagittata</i>	Woodland	R	S
Weebill	<i>S. brevirostris</i>	Woodland and town	S,C	1
Western Gerygone	<i>G. fusca</i>	Winter only, woodland and town	R	1
White-throated Gerygone	<i>G. olivacea</i>	Woodland and town	C	1
Inland Thornbill	<i>A. apicalis</i>	Woodland occasional visitor	D,VR	1
Yellow-rumped Thornbill	<i>A. chrysorrhoa</i>	Throughout, mostly wooded areas and town	S,C	S
Yellow Thornbill	<i>A. nana</i>	Mainly woodland	D,UC	1
Spiny-cheeked Honeyeater	<i>A. rufogularis</i>	Woodland and town	1,C	1
Striped Honeyeater	<i>P. lanceolata</i>	Woodland and town	S,C	S
Noisy Friarbird	<i>P. corniculatus</i>	Woodland and town, seasonal visitors	MC	1
Little Friarbird	<i>P. citreogularis</i>	Woodland, Condamine R. and town, seasonal visitors	C	1
Blue-faced Honeyeater	<i>E. cyanotis</i>	Woodland and town	1,C	S
Noisy Miner	<i>M. melanocephala</i>	Woodland and town	1,C	S
Yellow-throated Miner	<i>M. flavigula</i>	Woodland	UC	S
Lewin's Honeyeater	<i>M. lewinii</i>	Linthorpe EP	R	S
Yellow-faced Honeyeater	<i>L. chrysops</i>	Passage migrants	UC	1
Fuscous Honeyeater	<i>L. fuscus</i>	Gardens	VR	1
White-plumed Honeyeater	<i>L. penicillatus</i>	Water courses	UC	1
Brown Honeyeater	<i>L. indistincta</i>	Woodland and town	D,C	1
Painted Honeyeater	<i>G. picta</i>	Woodland	VR	-
Eastern Spinebill	<i>A. tenuirostris</i>	Woodland	VR	1
Black Honeyeater	<i>C. niger</i>	First record on Eremophila in town (Alastair Silcock 9-10 Oct 2007)	VR	-
Scarlet Honeyeater	<i>M. sanguinolenta</i>	Woodland and town, mostly autumn	D,R	S
Jacky Winter	<i>M. fascians</i>	Woodland	D,R	D
Red-capped Robin	<i>P. goodenorii</i>	Throughout, mostly wooded areas and town	D,R	-
Rose Robin	<i>P. rosea</i>	Throughout, mostly wooded areas and town	D,R	S

Eastern Yellow Robin	<i>E. australis</i>	Linthorpe EP and Irongate CP; no recent sightings	R	I
Grey-crowned Babbler	<i>P. temporalis</i>	Woodland	UC	S
Varied Sittella	<i>D. chrysoptera</i>	Woodland	V	S
Golden Whistler	<i>P. pectoralis</i>	Woodland and town, winter	UC	I
Rufous Whistler	<i>P. rufiventris</i>	Woodland and town, autumn/winter	UC	I
Black-faced Monarch	<i>M. melanopsis</i>	Woodland	D,R	S
Leaden Flycatcher	<i>M. rubecula</i>	Woodland and town, seasonal passage migrants, summer/autumn	UC	I
Satin Flycatcher	<i>M. cyanoleuca</i>	Passage migrants, summer	R	S
Restless Flycatcher	<i>M. inquieta</i>	Woodland and town, Autumn visitor	UC	S
Magpie-lark	<i>G. cyanoleuca</i>	Throughout, mostly wooded areas and town	S,C	S
Rufous Fantail	<i>R. rufifrons</i>	Woodland, rare visitor to gardens	VR	S
Grey Fantail	<i>R. fuliginosa</i>	Woodland and town, more in winter	MC	I
Willie Wagtail	<i>R. leucophrys</i>	Throughout	C	I
Spangled Drongo	<i>D. bracteatus</i>	Passage migrant	UC	I
Black-faced Cuckoo-shrike	<i>C. novaebollandiae</i>	Woodland and town	S,C	S
White-bellied Cuckoo-shrike	<i>C. papuensis</i>	Woodland and town	VR	I
Ground Cuckoo-shrike	<i>C. maxima</i>	Open woodland	VR	
White-winged Triller	<i>T. tricolor</i>	Woodland and town, irregular breeding migrant	UC	D
Olive-backed Oriole	<i>O. sagittatus</i>	Woodland and town	MC	I
Figbird	<i>S. viridis</i>	Town, now regular residents	I,C	I
Masked Woodswallow	<i>A. personatus</i>	Only observed flying over preceding storms	R	D
White-browed Woodswallow	<i>A. superciliosus</i>	Only observed flying over preceding storms	R	D
Black-faced Woodswallow	<i>A. cinereus</i>	Used to be common summer breeding visitor	D,UC	D
Dusky Woodswallow	<i>A. cyanopterus</i>	Seen at Rifle Range in early 70's	VR	D
Grey Butcherbird	<i>C. torquatus</i>	Woodland and town	I,C	I
Pied Butcherbird	<i>C. nigrogularis</i>	Woodland and town, maybe declining with drought	D ² ,MC	S
Australian Magpie	<i>G. tibicen</i>	Throughout	S,C	S
Pied Currawong	<i>S. graculina</i>	Woodland, previously only winter visitors to town, permanent residents in drought years, now decimating the nesting population of smaller birds	I,MC	I
Australian Raven	<i>C. coronoides</i>	Town	R	I
Torresian Crow	<i>C. orru</i>	Throughout	S,C	I
White-winged Chough	<i>C. melanorhamphos</i>	Woodland occasional visits to town areas	D,UC	D
Apostlebird	<i>S. cinerea</i>	Woodland occasional visits to town areas	S,MC	S
Spotted Bowerbird	<i>C. maculata</i>	One record only under a Wilga tree in our town garden 1985	R	S

Singing Bushlark	<i>M. javanica</i>	Rank grassland and roadsides	D,UC	D
Richards Pipit	<i>A. australis</i>	Roadsides	D,MC	D
House Sparrow	<i>P. domesticus</i>	Mostly town areas and farm homesteads	I,C	D
Zebra Finch	<i>T. guttata</i>	Throughout	S,MC	D
Double-barred Finch	<i>T. bichenovii</i>	Woodland and town	D,MC	S
Plum-headed Finch	<i>N. modesta</i>	Roadside and creek lines in rank grass; sewage ponds	V	S
Red-browed Finch	<i>N. temporalis</i>	Linthorpe EP	R	S
Diamond Firetail	<i>S. guttata</i>	1 record early 70's Irongate CP	R	S
Nutmeg Mannikin	<i>L. punctulata</i>	Several records from Town and Irongate CP in 70's & 80's	R	S
Chestnut-breasted Mannikin	<i>L. castaneothorax</i>	Roadside and creek lines in rank grass	D,MC	S
Mistletoebird	<i>D. birmdinacenn</i>	Woodland and town	S,C	I
White-backed Swallow	<i>C. leucosternus</i>	Old quarry area at Irongate	R	D
Welcome Swallow	<i>H. neaxena</i>	Throughout	C	S
Tree Martin	<i>H. nigricans</i>	Mainly on the plain in large flocks ahead of storm fronts	UC	S
Fairy Martin	<i>H. ariel</i>	Throughout	C	S
Clamorous Reed-warbler	<i>A. australis</i>	Condamine R., creeks, dams in reeds or rank grass, 3 records in town gardens	UC	I
Little Grassbird	<i>M. graminens</i>	Wet areas	R	I
Rufous Songlark	<i>C. mathewsi</i>	Grassland and town gardens	D,UC	S
Brown Songlark	<i>C. cyanalis</i>	Grassland	D,UC	D
Golden-headed Cisticola	<i>C. exilis</i>	Roadside grass, Sorghum crops	D, MC	I
Silvereye	<i>Z. lateralis</i>	Woodland and town	S,C	I
Common Starling	<i>S. vulgaris</i>	Throughout	D?,C	S
Common Myna	<i>A. tristis</i>	Throughout	I,C	I

AVIFAUNA OF REMNANT BUSHLAND IN SOUTH-EAST QUEENSLAND

I: BRISBANE AND HINTERLAND

S.J.S. DEBUS

ABSTRACT

'Snapshot' surveys of the bird communities in suburban or peri-urban bushland sites were conducted in Greater Brisbane, across all seasons, between 1996 and 2004, as a benchmark against which future changes might be monitored. One hundred and forty-three species were detected over the six locations (59–76 species per site), including four state-listed rare or threatened species: Grey Goshawk *Accipiter novaehollandiae*, Glossy Black-Cockatoo *Calyptorhynchus latbani*, Powerful Owl *Ninox strenua* and Yellow-tufted Honeyeater *Lichenostomus melanops*. Some seasonal patterns were evident: Grey Goshawk in autumn/winter; Fan-tailed Cuckoo *Cacomantis flabelliformis* and Shining Bronze-Cuckoo *Chrysococcyx lucidus* in both autumn/winter and spring, all other cuckoos only in spring/summer; White-throated Nightjar *Eurostopodus mystacalis*, White-throated Needletail *Hirundapus caudacutus*, Forest and Sacred Kingfishers *Todirhamphus macleayi* and *T. sanctus*, and Dollarbird *Eurystomus orientalis* in spring/summer; Noisy Pitta *Pitta versicolor*, White-naped Honeyeater *Melithreptus lunatus* and Rose Robin *Petroica rosea* in autumn/winter; and Spectacled Monarch *Monarcha trivirgatus*, Leaden Flycatcher *Myiagra rubecula*, Cicadabird *Coracina tenuirostris*, White-winged Triller *Lalage suenzii*, Olive-backed Oriole *Oriolus sagittatus* and Fairy Martin *Hirundo ariel* in spring/summer.

INTRODUCTION

There have been many studies of aspects of the urban bird community in Greater Brisbane, such as the value of remnant urban bushland and the processes that influence the composition and richness of bird assemblages within components of the urban landscape (e.g. Green *et al.* 1989, Catterall *et al.* 1989, 1991, 1997, 1998, Bentley & Catterall 1997, Evans *et al.* 1997; Hudson *et al.* 1997, Sewell & Catterall 1998, Catterall 2004, Piper & Catterall 2006). Several other studies have presented inventories of the birds of specific locations within Greater Brisbane (Walters 1985, Marr 1986, Bielewicz & Beilewicz 1996).

This study is a 'snapshot' inventory of the birds of various bushland locations within Greater Brisbane, resulting from bird surveys conducted as part of environmental assessments for development proposals. The data are presented here simply to make them available for future use. They present the 'before' situation, as a baseline against which to conduct future surveys of the same locations, particularly since any development that may have occurred. Relevant environmental assessment documents, lodged with the respective local government authorities, contain a review of potential impacts on bird populations, especially threatened species, and suggested mitigation measures to reduce these impacts. Subsequent bird surveys could test any predictions about impacts, or the efficacy of any mitigation measures applied. A major shortcoming of environmental impact assessments is that there is rarely any such follow-up testing or monitoring.

STUDY SITES AND METHODS

The study locations were bushland sites at the times of the surveys (see Table 1 for survey locations and dates). The locations and habitats were as follows; surveys were conducted on the basis of property rather than habitat boundaries.

Cashmere: near One Mile Creek and Raymont Reserve; eucalypt forest (dry on ridge, moist with dense shrub layer in gully); ~100 ha.

Bayview: east of Mt Cotton Village Community Park, vicinity of German Church Road; dry eucalypt forest; ~100 ha.

Fitzgibbon: between Telegraph Road and railway line; dry eucalypt forest, some disturbed and open ground; ~100 ha.

Mt Cotton: between Venman Bushland National Park and West Mt Cotton Road; dry and moist eucalypt forest, gully rainforest; ~200 ha.

Bellbowrie: vicinity of Church Road West; dry eucalypt forest; ~50 ha.

Minnippi Parklands: north and north-western section (Cannon Hill); disturbed moist and dry eucalypt forest, weedy gallery forest, wetland; ~100 ha surveyed.

Bird surveys were area (habitat) searches, using visual and aural cues, which aimed to detect as many species as possible within the time constraints imposed by the relevant environmental impact study. Depending on the size of the site, surveys typically took two days (small sites, tens to 100+ hectares) or at least three days (larger sites, hundreds of hectares). The typical pattern was an afternoon survey, evening call-playback and spotlighting for threatened owls, then a morning survey, extended to a full day, second

evening survey and a third morning for large sites (and including at least two nocturnal survey sites ~1 km apart if the site was large enough). Surveys were conducted at a steady walk, meandering if necessary, and covering the entire site; scanning for raptors from vantage points was included if possible. An informal results-based stopping rule (Watson 2003) was used to judge when the species-accumulation curve against time was reaching an asymptote. That is, searching was curtailed when no new species were being added to the list in a reasonable time (e.g. an hour or two, depending on the size of the site). My role was to obtain an inventory of the bird species present at a given time, with targeted searches for rare or threatened species (as listed under Queensland legislation). Reserves in the vicinity of Minnippi Parklands (Belmont Hills and White's Hill: dry eucalypt forest) were surveyed for part of one day as components of that reserve complex, but included a nocturnal survey at White's Hill. Although investigation of seasonal occurrence was not an aim of the surveys, the six sites were fortuitously surveyed variously in autumn, autumn/winter, spring, spring/summer, and summer ($\times 2$).

RESULTS

One hundred and forty-three species were detected over the six locations, or 59–76 species per site (Table 1, which gives scientific names). State-listed rare or threatened species detected were the Grey Goshawk at Cashmere in autumn and Bayview in autumn/winter; Glossy Black-Cockatoo (feeding sign only, i.e. chewed *Allocasuarina* cones) at Bellbowrie; Powerful Owl at Bayview in autumn–winter and Mt Cotton in September (all playback responses); and a colony of Yellow-tufted Honeyeaters in gully vegetation at Cashmere. A notable occurrence was a single White Tern flying over land at Cashmere during cyclonic weather in May 1996.

Seasonal patterns evident were: Grey Goshawk recorded in autumn/winter; Fan-tailed Cuckoo and Shining Bronze-Cuckoo the only cuckoos recorded in autumn/winter, all other parasitic cuckoos being recorded only in spring/summer; White-throated Nightjar, White-throated Needle-tail, Forest and Sacred Kingfishers, and Dollarbird recorded only in spring/summer; Noisy Pitta, White-naped Honeyeater and Rose Robin recorded in autumn/winter; and Spectacled Monarch, Leaden Flycatcher, Cicadabird, White-winged Triller, Olive-backed Oriole and Fairy Martin recorded only or mainly in spring/summer (there being one autumn record of the Leaden Flycatcher). The Rufous Fantail in autumn may have been on passage, through Brisbane suburbs generally lacking its rainforest summer breeding habitat. The

Pheasant Coucal, Tawny Grassbird and Golden-headed Cisticola may have been vocal only in spring/summer, and therefore missed at other times, but also their rank grassy habitats were not represented at autumn/winter survey sites.

Only two introduced species were detected (no House Sparrows *Passer domesticus* or Common Starlings *Sturnus vulgaris*), and the Common Myna was recorded at only two sites.

DISCUSSION

Substantial patches of suburban or peri-urban bushland in Greater Brisbane support a rich terrestrial avifauna, with many forest birds still present, although the present snapshot results (especially for Belmont Hills and Whites Hill) are incomplete. The results of this study are similar to, or are a subset of, other partial or full inventories of birds across bushland sites in the Greater Brisbane suburbs (cf. Marr 1986, Green *et al.* 1989, Catterall *et al.* 1989, 1997, 1998, Bielewicz & Beilewicz 1996, Bentley & Catterall 1997, Sewell & Catterall 1998). One surprising result of this survey was the lack of records of the Pied Currawong *Strepera graculina* in suburban bushland locations (cf. Woodall 2004). Seasonal occurrences were generally as expected for bird species that are variously spring–summer breeding migrants or autumn–winter migrants to the Greater Brisbane lowlands (cf. Catterall *et al.* 1997, 1998).

To some extent the results of this survey indicate what may be lost to ongoing development in Greater Brisbane, as the bushland sites surveyed are gradually replaced by suburbia or other proposals. It is apparent that substantial patches of bushland, even ‘islands’ within suburbia, support a diverse assemblage of forest birds. However, as these patches are reduced and/or become isolated they can be expected to lose some of their birds, because the bird communities of continuous forest and urban bushland differ, with large, aggressive generalist species dominating in suburbia, Noisy Miners dominating edges, small patches and revegetation, and very small patches being depauperate in small forest species (e.g. Catterall *et al.* 1991, 1997, 1998, Evan *et al.* 1997, Hudson *et al.* 1997, Sewell & Catterall 1998, Catterall 2004; Piper & Catterall 2006). It would be useful to monitor the survey sites, and other urban or peri-urban bushland sites, into the future, to track changes in the bird communities therein as development proceeds.

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Table 1: Survey sites and times. C = Cashmere, May 1996; By = Bayview, May and July 1997; F = Fitzgibbon, November 2002; MC = Mt Cotton, September 2003 (s) and January 2004 (j); Be = Bellbowrie, January 2004; M = Minnippi Parklands (m) and nearby reserves (Belmont Hills Park, b and White's Hill, w), January 2004. Otherwise, X = bird species present. Parentheses indicate flying over (Magpie Goose) or feeding sign only (Glossy Black-Cockatoo). *Introduced species.

Species	C	By	F	MC	Be	M
Australian Brush-turkey <i>Alectura lathami</i>	X			s		
Brown Quail <i>Coturnix psilophora</i>						m
Magpie Goose <i>Anseranas semipalmata</i>						(w)
Australian Wood Duck <i>Chenonetta jubata</i>				s	X	m
Pacific Black Duck <i>Anas superciliosa</i>		X	X	s		m
Grey Teal <i>Anas gracilis</i>						m
Australasian Grebe <i>Tachybaptus novaehollandiae</i>				s		
Darter <i>Anhinga melanogaster</i>					X	
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	X					m
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>				s		
Australian Pelican <i>Pelecanus conspicillatus</i>					X	m
White-faced Heron <i>Egretta novaehollandiae</i>			X	s		
White-necked Heron <i>Ardea pacifica</i>			X			
Great Egret <i>Ardea alba</i>						m
Striated Heron <i>Ardea striata</i>						m
Nankeen Night Heron <i>Nycticorax caledonicus</i>			X			
Australian White Ibis <i>Threskiornis molucca</i>					X	mb
Straw-necked Ibis <i>Threskiornis spinicollis</i>						nw
Royal Spoonbill <i>Platalea regia</i>						m
Black-shouldered Kite <i>Elanus axillaris</i>			X			m
Pacific Baza <i>Ardea suberistata</i>		X	X	s		
Whistling Kite <i>Haliastur sphenurus</i>		X	X		X	
Brahminy Kite <i>Haliastur indus</i>			X			
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>			X			
Brown Goshawk <i>Accipiter fasciatus</i>		X	X	s		m
Grey Goshawk <i>Accipiter novaehollandiae</i>	X	X				
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>		X				w
Wedge-tailed Eagle <i>Aquila audax</i>		X		s		
Australian Hobby <i>Falco longipennis</i>				s		
Peregrine Falcon <i>Falco peregrinus</i>			X			

Purple Swampphen <i>Porphyrio porphyrio</i>						
Dusky Moorhen <i>Gallinula tenebrosa</i>						m
Painted Button-quail <i>Turnix varia</i>						
Masked Lapwing <i>Vanellus miles</i>						
White Tern <i>Gygis alba</i>	X					
*Spotted Turtle-Dove <i>Streptopelia dinensis</i>			X		X	m
Brown Cuckoo-Dove <i>Macropygia ambuinensis</i>					s	
Common Bronzewing <i>Phaps chalcoptera</i>					s	X
Crested Pigeon <i>Ocyphaps lophotes</i>	X				s	X mbw
Peaceful Dove <i>Geopelia striata</i>	X	X	X		sj	X
Bar-shouldered Dove <i>Geopelia humeralis</i>	X	X			s	X
Wonga Pigeon <i>Lencosarcia melanoleuca</i>					s	
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>						(X)
Yellow-tailed Black-Cockatoo <i>Calyptorhynchus fuliginosus</i>	X					
Galah <i>Cacatua roseicapilla</i>	X	X	X		s	X m
Little Corella <i>Cacatua sanguinea</i>			X			
Sulphur-crested Cockatoo <i>Cacatua galerita</i>	X	X	X		s	m
Rainbow Lorikeet <i>Trichoglossus haemateros</i>	X	X	X		sj	X mbw
Scaly-breasted Lorikeet <i>Trichoglossus chlorolepidotus</i>	X	X	X		s	X m
Little Lorikeet <i>Glossopsitta pusilla</i>		X				X
Australian King-Parrot <i>Alisterus scapularis</i>	X				s	
Pale-headed Rosella <i>Platycecus adscitus</i>		X			sj	X m
Pallid Cuckoo <i>Cuculus pallidus</i>			X			
Brush Cuckoo <i>Cacomantis variolosus</i>			X			X
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>	X	X			s	
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalis</i>			X			
Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i>		X			s	
Little Bronze-Cuckoo <i>Chrysococcyx minutillus</i>			X			
Common Koel <i>Endynamys scolopacea</i>			X			X m
Channel-billed Cuckoo <i>Seythropus novaehollandiae</i>						X m
Pheasant Coucal <i>Centropus phasianinus</i>						X m

Powerful Owl <i>Ninox strenua</i>		X			s		
Southern Boobook <i>Ninox novaeseelandiae</i>		X			s		
Tawny Frogmouth <i>Podargus strigoides</i>	X	X	X				mbw
White-throated Nightjar <i>Eurostoopodus mystacalis</i>					s	X	
Australian Owlet-nightjar <i>Aegothebes cristatus</i>		X			s		
White-throated Needletail <i>Hirundapus caudocinctus</i>				X	j		m
Azure Kingfisher <i>Alcedo azurea</i>	X						
Laughing Kookaburra <i>Dacelo novaeguineae</i>	X	X	X		sj	X	mw
Forest Kingfisher <i>Todiramphus macleayi</i>					s		bw
Sacred Kingfisher <i>Todiramphus sanctus</i>				X		X	mw
Rainbow Bee-eater <i>Merops ornatus</i>	X	X			sj	X	m
Dollarbird <i>Emystomus orientalis</i>				X		X	m
Noisy Pitta <i>Pitta versicolor</i>		X					
White-throated Treecreeper <i>Cormobates leucophaea</i>	X	X			s	X	
Superb Fairy-wren <i>Malurus cyaneus</i>							m
Variagated Fairy-wren <i>Malurus lamberti</i>	X	X	X		sj	X	mb
Red-backed Fairy-wren <i>Malurus melanocephalus</i>	X	X	X		s	X	m
Spotted Pardalote <i>Pardalotus punctatus</i>			X		s	X	
Striated Pardalote <i>Pardalotus striatus</i>	X	X	X		sj	X	mw
White-browed Scrubwren <i>Sericornis frontalis</i>	X	X			s	X	m
Large-billed Scrubwren <i>Sericornis magnirostris</i>	X						
Speckled Warbler <i>Chthonicola sagittata</i>							X
Weebill <i>Smicromis brevirostris</i>	X	X			s	X	
White-throated Gerygone <i>Gerygone olivacea</i>			X		s		
Brown Thornbill <i>Acanthiza pusilla</i>			X		sj		
Buff-rumped Thornbill <i>Acanthiza reguloides</i>			X		s		
Striated Thornbill <i>Acanthiza lineata</i>	X						
Striped Honeyeater <i>Plectorhyncha lanceolata</i>							X
Noisy Friarbird <i>Philemon corniculatus</i>		X	X			X	mbw
Little Friarbird <i>Philemon citreogularis</i>						X	

Blue-faced Honeyeater <i>Eintomyzon cyanotis</i>					X	m
Bell Miner <i>Manorina melanophrys</i>	X					
Noisy Miner <i>Manorina melanoccephala</i>	X	X	X	sj	X	mbw
Lewin's Honeyeater <i>Meliphaga lewinii</i>	X			sj		m
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>	X	X	X	sj	X	
Yellow-tufted Honeyeater <i>Lichenostomus melanops</i>	X					
White-throated Honeyeater <i>Melithreptus albogularis</i>	X	X	X	sj	X	mw
White-naped Honeyeater <i>Melithreptus lunatus</i>	X					
Brown Honeyeater <i>Lichmera indistincta</i>	X				X	m
White-cheeked Honeyeater <i>Phylidonyris nigra</i>					X	
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>	X	X		sj		
Rose Robin <i>Petroica rosea</i>	X	X				
Eastern Yellow Robin <i>Eopsaltria australis</i>	X	X	X	sj	X	m
Eastern Whipbird <i>Psophodes olivaceus</i>	X	X		s	X	m
Varied Sittella <i>Daphoenositta chrysoptera</i>		X		s		
Golden Whistler <i>Pachycephala pectoralis</i>	X	X	X	s		
Rufous Whistler <i>Pachycephala rufiventris</i>	X	X	X	s	X	
Little Shrike-thrush <i>Colluricincla megarhyncha</i>				sj		m
Grey Shrike-thrush <i>Colluricincla harmonica</i>	X	X	X	sj	X	m
Spectacled Monarch <i>Monarcha trivirgatus</i>				s		
Leaden Flycatcher <i>Myiagra rubecula</i>		X	X	s		
Magpie-lark <i>Grallina cyanoleuca</i>	X	X	X	s	X	m
Rufous Fantail <i>Rhipidura rufifrons</i>	X					
Grey Fantail <i>Rhipidura fuliginosa</i>	X	X		s		
Willie Wagtail <i>Rhipidura leucophrys</i>	X		X	s	X	m
Spangled Drongo <i>Dicrurus bracteatus</i>	X	X		s		b
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>	X	X	X	s	X	mbw
White-bellied Cuckoo-shrike <i>Coracina papuensis</i>					X	
Cicadabird <i>Coracina tenuirostris</i>			X	j	X	b
White-winged Triller <i>Lalage suenii</i>			X			
Varied Triller <i>Lalage leucomela</i>						m

Olive-backed Oriole <i>Oriolus sagittatus</i>			X	sj	X	mbw
Figbird <i>Sphacotheres viridis</i>	X	X	X	s	X	mw
White-breasted Woodswallow <i>Artamus leucorhynchus</i>	X	X	X			m
Grey Butcherbird <i>Cracticus torquatus</i>	X	X	X	sj	X	mbw
Pied Butcherbird <i>Cracticus nigrogularis</i>	X	X	X	sj	X	mbw
Australian Magpie <i>Cynuorhina tibicen</i>	X	X	X	sj	X	mb
Torresian Crow <i>Corvus orn</i>	X	X	X	sj	X	mbw
Satin Bowerbird <i>Ptilonorhynchus violaceus</i>	X					
Double-barred Finch <i>Taeniopygia bichenorii</i>	X		X		X	
Red-browed Finch <i>Neochmia temporalis</i>	X	X		s		
Chestnut-breasted Mannikin <i>Lonchura castaneothorax</i>						m
Mistletoebird <i>Dicaeum hirundinaceum</i>	X	X	X	s		w
Welcome Swallow <i>Hirundo neoxena</i>	X	X	X	s	X	mw
Tree Martin <i>Hirundo nigricans</i>		X	X	s	X	mw
Fairy Martin <i>Hirundo ariel</i>						m
Tawny Grassbird <i>Megalurus timoriensis</i>						m
Golden-headed Cisticola <i>Cisticola exilis</i>			X		X	m
Silvereye <i>Zosterops lateralis</i>	X	X	X	s	X	m
*Common Myna <i>Acridotheres tristis</i>			X			m
Totals (grand total 143 species)	59	63	61	76	64	74

AVIFAUNA OF REMNANT BUSHLAND IN SOUTH-EAST QUEENSLAND

II: THE GOLD COAST HINTERLAND

S.J.S. DEBUS

ABSTRACT

'Snapshot' surveys of the bird communities in bushland sites were conducted in the Gold Coast hinterland, in winter and spring, between 1995 and 1999, as a benchmark against which future changes might be monitored. One hundred and twenty-eight species were detected over the four locations (35–82 species per site), including four state-listed rare or threatened species: Grey Goshawk *Accipiter novaehollandiae*, Eastern Curlew *Numenius madagascariensis*, Glossy Black-Cockatoo *Calyptorhynchus lathami* and Albert's Lyrebird *Menura alberti*. Some seasonal patterns were evident: Fan-tailed Cuckoo *Cacomantis flabelliformis* and Shining Bronze-Cuckoo *Chrysococcyx lucidus* in both winter and spring, but Horsfield's Bronze-Cuckoo *C. basalis* only in spring; White-throated Nightjar *Eurostopodus mystacalis*, Forest Kingfisher *Todiramphus macleayi*, Leaden Flycatcher *Myiagra rubecula* and Rufous Fantail *Rhipidura rufifrons* in spring; White-naped Honeyeater *Melithreptus lunatus* and Rose Robin *Petroica rosea* in winter; and over-wintering records of Sacred Kingfisher *Todiramphus sanctus*, White-throated Gerygone *Gerygone olivacea* and (on the coast) Fairy Martin *Hirundo ariel*.

INTRODUCTION

This paper continues the theme of Debus (2007), by reporting on the bird communities of bushland remnants in the Gold Coast hinterland, another rapidly urbanising area in south-east Queensland. There is one previous inventory of the birds of a site in the northern Gold Coast hinterland (Dawson *et al.* 1991), and a study of the ecology of urban bushland birds provided a partial inventory of the birds at several sites also in the northern Gold Coast hinterland (Sewell & Catterall 1998). This study is a 'snapshot' inventory of the birds of various bushland locations around the Gold Coast, resulting from bird surveys conducted as part of environmental assessments for development proposals. It similarly presents a baseline for future surveys, which might test the persistence of certain species, or any predictions about impacts or any mitigation proposals made in the environmental assessment

documents (cf. Debus 2007).

STUDY SITES AND METHODS

The study locations were bushland sites at the times of the surveys (see Table 1 for survey locations and dates). Otherwise, the survey methods were as previously described for sites in Greater Brisbane (Debus 2007). Although investigation of seasonal occurrence was not an aim of the surveys, the four sites were fortuitously surveyed mostly in winter, with one site surveyed in spring, thus complementing the summer bias in the Brisbane surveys.

The locations and habitats were as follow.

Coomera: Green Meadows Road; dry eucalypt forest and woodland, *Acacia* regrowth, disturbed and grassland areas, swamp forest, wetland, estuarine habitats; ~200 ha.

Pimpama: Yawalpah Road (between Gold Coast motorway and old Pacific Highway); dry ridge-top eucalypt forest with *Allocasuarina* thickets; <10 ha.

Springbrook: altitudinal gradient from Springbrook National Park (near Springbrook village) and Numinbah State Forest down Springbrook–Mudgeeraba Road; dry and moist eucalypt forest, rainforest, wetland, disturbed land; ~100 ha surveyed.

Mudgeeraba: between Tolga Road and Chesterfield Drive (towards Bonogin); dry and moist gully eucalypt forest; ~150 ha.

RESULTS

One hundred and twenty-eight species were detected over the four locations, or 35–82 species per site (Table 1, which gives scientific names). State-listed rare or threatened species detected were Grey Goshawk and Albert's Lyrebird at Springbrook, Eastern Curlew at Coomera (in winter), and Glossy Black-Cockatoo at Springbrook and Mudgeeraba. Two introduced species were recorded, but not the House Sparrow *Passer domesticus* or, at the time, the Common Myna *Acridotheres tristis*.

Seasonal patterns evident were: Fan-tailed Cuckoo and Shining Bronze-Cuckoo recorded in winter as well as spring, but Horsfield's Bronze-Cuckoo recorded only in spring; White-throated Nightjar recorded only in spring; Forest Kingfisher recorded only in spring, though a winter record of Sacred Kingfisher; several winter records of White-throated Gerygone; White-naped Honeyeater and Rose Robin recorded in winter; Leaden Flycatcher and

Rufous Fantail recorded only in spring; and coastal records of martins in winter.

DISCUSSION

As for Greater Brisbane (Debus 2007), substantial patches of peri-urban bushland in the Gold Coast hinterland support a rich terrestrial avifauna, with many forest birds still present. The results of this study are similar to, or are a subset of, other inventories of birds across bushland sites in the northern Gold Coast hinterland (cf. Dawson *et al.* 1991; Sewell & Catterall 1998). The larger grand total and site totals for Greater Brisbane (Debus 2007) probably reflect the greater survey effort (i.e. more sites surveyed), and more surveys in spring/summer when more species are likely to be present. Seasonal occurrences were generally as expected for bird species that are variously spring–summer breeding migrants or autumn–winter migrants to the Greater Brisbane/Gold Coast lowlands (cf. Catterall *et al.* 1997, 1998), although overwintering records were obtained of the Sacred Kingfisher, White-throated Gerygone and Fairy Martin.

As for Greater Brisbane, the data in this study set a benchmark against which future changes in the bird community, with changes in land cover, might be monitored. Conversion of bushland to suburbia will likely favour a suite of adaptable species over the smaller forest specialists (e.g. Catterall *et al.* 1998 and related studies, reviewed by Debus 2007).

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Table 1: Survey sites and times. C = Coomera, June 1995; P = Pimpama, July 1997; S = Springbrook, July 1999; M = Mudgeeraba, September 1997. *Introduced species.

Species	C	P	S	M
Australian Brush-turkey <i>Alectura lathamii</i>			X	
Brown Quail <i>Coturnix ypsilophora</i>	X			
Australian Wood Duck <i>Chenonetta jubata</i>			X	X
Pacific Black Duck <i>Anas superciliosa</i>	X		X	
Grey Teal <i>Anas gracilis</i>	X			
Hardhead <i>Aythya australis</i>			X	
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	X			
Australian Pelican <i>Pelecanus conspicillatus</i>	X			
White-faced Heron <i>Egretta novaehollandiae</i>	X		X	X
Great Egret <i>Ardea alba</i>	X			
Australian White Ibis <i>Threskiornis molucca</i>	X			
Straw-necked Ibis <i>Threskiornis spinicollis</i>	X			
Osprey <i>Pandion haliaetus</i>	X			
Pacific Baza <i>Aviceda subcristata</i>			X	X
Whistling Kite <i>Haliastur sphenurus</i>	X	X		

Australian Brush-turkey <i>Alectura lathami</i>			X	
Brown Quail <i>Coturnix ypsilophora</i>	X			
Australian Wood Duck <i>Chenonetta jubata</i>			X	X
Pacific Black Duck <i>Anas superciliosa</i>	X		X	
Grey Teal <i>Anas gracilis</i>	X			
Hardhead <i>Aythya anstralis</i>			X	
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	X			
Australian Pelican <i>Pelecanus conspicillatus</i>	X			
White-faced Heron <i>Egretta novaehollandiae</i>	X		X	X
Great Egret <i>Ardea alba</i>	X			
Australian White Ibis <i>Threskiornis molucca</i>	X			
Straw-necked Ibis <i>Threskiornis spinicollis</i>	X			
Osprey <i>Pandion haliaetus</i>	X			
Pacific Baza <i>Ardeco suberistata</i>			X	X
Whistling Kite <i>Haliastur sphenurus</i>	X	X		
Brahminy Kite <i>Haliastur indus</i>	X			
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	X			
Brown Goshawk <i>Accipiter fasciatus</i>		X		X
Grey Goshawk <i>Accipiter novaehollandiae</i>			X	
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>		X	X	
Wedge-tailed Eagle <i>Aquila audax</i>		X	X	
Nankeen Kestrel <i>Falco cenchroides</i>	X			
Buff-banded Rail <i>Gallinallus philippensis</i>			X	
Painted Button-quail <i>Turnix varia</i>				X
Eastern Curlew <i>Numenius madagascariensis</i>	X			
Black-winged Stilt <i>Himantopus himantopus</i>	X			
Masked Lapwing <i>Vanellus miles</i>	X		X	X
Crested Tern <i>Sterna bergii</i>	X			
White-headed Pigeon <i>Columba leucocoma</i>			X	
*Spotted Turtle-Dove <i>Streptopelia chinensis</i>			X	X
Brown Cuckoo-Dove <i>Macropygia ambuinensis</i>			X	X

Common Bronzewing <i>Phaps chalcoptera</i>		X		
Crested Pigeon <i>Ocyphaps lophotes</i>			X	
Peaceful Dove <i>Geopelia striata</i>				X
Bar-shouldered Dove <i>Geopelia humberalis</i>	X		X	X
Wonga Pigeon <i>Leucosarcia melanoleuca</i>			X	
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>			X	X
Yellow-tailed Black-Cockatoo <i>Calyptorhynchus fuliginosus</i>			X	
Galah <i>Cacatua roseicapilla</i>		X	X	X
Sulphur-crested Cockatoo <i>Cacatua galerita</i>			X	X
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	X	X	X	X
Scaly-breasted Lorikeet <i>Trichoglossus chlorolepidotus</i>	X	X	X	X
Little Lorikeet <i>Glossopsitta pusilla</i>		X		
Australian King-Parrot <i>Alisterus scapularis</i>			X	X
Crimson Rosella <i>Platyercus elegans</i>			X	
Eastern Rosella <i>Platyercus eximius</i>			X	
Pale-headed Rosella <i>Platyercus adscitus</i>	X		X	X
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>			X	X
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalis</i>				X
Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i>			X	X
Southern Boobook <i>Ninox novaeseelandiae</i>				X
Tawny Frogmouth <i>Podargus strigoides</i>	X		X	X
White-throated Nightjar <i>Eurostoopodus mystacalis</i>				X
Australian Owlet-nightjar <i>Aegotheles cristatus</i>			X	
Laughing Kookaburra <i>Dacelo novaeguineae</i>	X	X	X	X
Forest Kingfisher <i>Todiramphus macleayi</i>				X
Sacred Kingfisher <i>Todiramphus sanctus</i>			X	
Rainbow Bee-eater <i>Merops ornatus</i>	X			X
Albert's Lyrebird <i>Menura alberti</i>			X	
White-throated Treecreeper <i>Cormobates leucophaea</i>	X	X	X	X
Superb Fairy-wren <i>Malurus cyanens</i>	X		X	
Variegated Fairy-wren <i>Malurus lamberti</i>	X	X	X	X
Red-backed Fairy-wren <i>Malurus melanocephalus</i>	X	X	X	

Spotted Pardalote <i>Pardalotus punctatus</i>	X	X	X	X
Striated Pardalote <i>Pardalotus striatus</i>	X	X	X	X
White-browed Scrubwren <i>Sericornis frontalis</i>	X			X
Large-billed Scrubwren <i>Sericornis magnirostris</i>			X	
Speckled Warbler <i>Clthonicola sagittata</i>	X			
Weebill <i>Smicronis brevirostris</i>	X	X		
Brown Gerygone <i>Gerygone mouki</i>			X	
Mangrove Gerygone <i>Gerygone laetigaster</i>	X			
White-throated Gerygone <i>Gerygone olivacea</i>	X	X	X	X
Brown Thornbill <i>Acanthiza pusilla</i>	X		X	X
Buff-rumped Thornbill <i>Acanthiza reguloides</i>			X	X
Striated Thornbill <i>Acanthiza lineata</i>			X	X
Striped Honeyeater <i>Plectorhyncha lanceolata</i>	X			
Noisy Friarbird <i>Philemon corniculatus</i>	X	X	X	X
Little Friarbird <i>Philemon citreogularis</i>				X
Blue-faced Honeyeater <i>Entomyzon cyanotis</i>			X	
Noisy Miner <i>Manorina melanoccephala</i>	X	X	X	X
Lewin's Honeyeater <i>Meliphaga lewinii</i>	X		X	X
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>	X	X	X	
Mangrove Honeyeater <i>Lichenostomus fasciocularis</i>	X			
White-throated Honeyeater <i>Melithreptus albigularis</i>	X	X	X	X
White-naped Honeyeater <i>Melithreptus lunatus</i>			X	
Brown Honeyeater <i>Lichmera indistincta</i>	X	X	X	
Eastern Spinebill <i>Acanthorhynchus tenuirostris</i>	X		X	
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>	X	X	X	X
Rose Robin <i>Petroica rosea</i>	X		X	
Pale-yellow Robin <i>Tregellasia capito</i>			X	
Eastern Yellow Robin <i>Eopsaltria australis</i>	X	X	X	X
Logrunner <i>Orthonyx temminckii</i>			X	
Eastern Whipbird <i>Psophodes olivaceus</i>	X		X	X
Varied Sittella <i>Daphoenositta chrysoptera</i>	X	X		X
Crested Shrike-tit <i>Falconinus frontatus</i>			X	X

Golden Whistler <i>Pachycephala pectoralis</i>	X	X	X	X
Rufous Whistler <i>Pachycephala rufiventris</i>	X	X	X	X
Little Shrike-thrush <i>Colluricincla megarhyncha</i>			X	
Grey Shrike-thrush <i>Colluricincla harmonica</i>	X	X	X	X
Leaden Flycatcher <i>Myiagra mbecula</i>				X
Magpie-lark <i>Grallina cyanoleuca</i>	X		X	
Rufous Fantail <i>Rhipidura rufifrons</i>				X
Grey Fantail <i>Rhipidura fuliginosa</i>	X	X	X	X
Willie Wagtail <i>Rhipidura leucophaea</i>	X			
Spangled Drongo <i>Dicrurus bracteatus</i>	X			X
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>	X	X		X
White-bellied Cuckoo-shrike <i>Coracina papuensis</i>	X			
Olive-backed Oriole <i>Oriolus sagittatus</i>		X		X
Figbird <i>Sphecopterus viridis</i>			X	X
Grey Butcherbird <i>Cracticus torquatus</i>	X	X	X	X
Pied Butcherbird <i>Cracticus nigrogularis</i>	X		X	X
Australian Magpie <i>Gymnorhina tibicen</i>	X		X	X
Pied Currawong <i>Strepera graculina</i>			X	X
Torresian Crow <i>Corvus orn</i>	X	X	X	X
Regent Bowerbird <i>Sericulus chrysocephalus</i>			X	
Satin Bowerbird <i>Ptilonorhynchus violaceus</i>			X	X
Double-barred Finch <i>Taeniopygia bichenorii</i>	X			
Red-browed Finch <i>Neochmia temporalis</i>	X	X	X	X
Chestnut-breasted Mannikin <i>Lanchnma castaneothorax</i>	X			
Mistletoebird <i>Dicaeum birundinaceum</i>	X		X	X
Welcome Swallow <i>Hirundo neosena</i>	X		X	
Tree Martin <i>Hirundo nigricans</i>	X			
Fairy Martin <i>Hirundo ariel</i>	X			
Tawny Grassbird <i>Megalurys timoriensis</i>	X			
Golden-headed Cisticola <i>Cisticola exilis</i>	X			
Silveryeye <i>Zosterops lateralis</i>	X	X	X	X
Bassian Thrush <i>Zosterops lunulata</i>			X	
*Common Starling <i>Sturnus vulgaris</i>			X	
Totals (grand total 128 species)	74	35	82	64

AVIFAUNA OF REMNANT BUSHLAND IN SOUTH-EAST QUEENSLAND

III: THE SUNSHINE COAST AND HINTERLAND

S.J.S. DEBUS

ABSTRACT

'Snapshot' surveys of the bird communities in bushland sites were conducted in the Sunshine Coast and hinterland, mainly in spring and summer, between 1996 and 2005, as a benchmark against which future changes might be monitored. One hundred and seventy-one species were detected over five bushland locations (61–108 species per site), including five state-listed rare or threatened species: Square-tailed Kite *Lophoictinia isura*, Grey Goshawk *Accipiter novaehollandiae*, Lewin's Rail *Dryolimnas pectoralis*, Glossy Black-Cockatoo *Calyptorhynchus lathami* and Powerful Owl *Ninox strenua*. Estuarine birds were also surveyed in Pumicestone Passage in spring/summer of 1996, 1997 and 1999; rare or threatened species recorded were Chestnut Teal *Anas castanea*, Sooty Oystercatcher *Haematopus fuliginosus*, Eastern Curlew *Numenius madagascariensis* and Little Tern *Sterna albifrons*. Some seasonal patterns were evident: Fan-tailed Cuckoo *Cacomantis flabelliformis* in autumn and spring/summer, but other cuckoos only in spring/summer; and White-throated Nightjar *Eurostopodus mystacalis*, White-throated Needletail *Hirundapus candacutus*, Forest and Sacred Kingfishers *Todirhamphus nacleayii* and *T. sanctus*, Dollarbird *Eurystomus orientalis*, monarch flycatchers, Rufous Fantail *Rhipidura rufifrons*, Cicadabird *Coracina tenuirostris*, and Olive-backed Oriole *Oriolus sagittatus* in spring/summer. Roost sites in Pumicestone Passage supported up to hundreds of Curlews, up to 1000+ Whimbrels *N. phaeopus* and Bar-tailed Godwits *Limosa lapponica*, and tens to ~200 individuals of some smaller shorebird species.

INTRODUCTION

This paper continues the theme of Debus (2007a,b), by reporting on the bird communities of bushland remnants on the Sunshine Coast and hinterland, another rapidly urbanising area in south-east Queensland. There is one previous inventory of the birds of a site in the relevant area (Roberts & Ingram 1976). Again, this study is a 'snapshot' inventory of the birds of various bushland locations around the Sunshine Coast, resulting from bird

surveys conducted as part of environmental assessments for development proposals. It similarly presents a baseline for future surveys, which might test the persistence of certain species, or any predictions about impacts or any mitigation proposals made in the environmental assessment documents (cf. Debus 2007a). The present study includes a case study of shorebirds on Bribie Island; the intention of the developer was to move an existing anthropogenic roost site offshore to a specially created sand island in Pumicestone Passage.

STUDY SITES AND METHODS

The study locations were bushland sites at the times of the surveys (see Table 1 for survey locations and dates). Otherwise, the survey methods at bushland sites were generally as previously described for sites in Greater Brisbane (Debus 2007a), though call playback was also used to survey Lewin's Rail at Coolum. Although investigation of seasonal occurrence was not an aim of the surveys, the five bushland sites were fortuitously surveyed mostly in spring and summer, with one site surveyed in autumn, thus complementing the summer bias in the Brisbane surveys and winter bias in the Gold Coast surveys (cf. Debus 2007a,b).

The five bushland locations and habitats were as follow.

Buderim: two sub-sites (A) near hospital; dry and moist eucalypt forest, littoral rainforest, swamp forest; ~20 ha. (B) Wises Road; disturbed rainforest, swamp forest, dry eucalypt forest; ~20 ha.

Coolum: between Peregian Beach and Yandina Creek; dry and moist eucalypt forest, swamp forest, wet heath; ~300 ha.

Landsborough: Mellum Creek; dry and moist eucalypt forest, gallery rainforest; disturbed land; ~100 ha.

Caloundra: Bells Creek (Caloundra West); dry eucalypt forest, swamp forest, heath, wetland, disturbed land; ~100 ha.

Kin Kin: east, towards Lake Cootharaba; dry and moist eucalypt forest, gallery rainforest, swamp forest, heath, pine plantation, agricultural; ~500 ha.

The 'Coolum' site consisted of two stages: stage 1 surveyed in summer and the adjoining stage 2 surveyed in autumn, then stage 2 resurveyed in spring three years later, after stage 1 had been cleared and converted to suburbia (there was no scope within the constraints of the study to resurvey stage 1 after development).

Targeted surveys were conducted for migratory shorebirds at a sixth location, Pumicestone Passage (mainly Bribie Island). Spring/summer surveys were conducted at roost sites at high tide, including at night with the aid of a spotlight at Dux Creek (Bribie Island) if king or neap tides peaked in the first few hours of darkness. The aim of the shorebird surveys was firstly a population census at the partly anthropogenic roost site (recently cleared mangroves) at Dux Creek, then concurrent population censuses at Dux Creek, Toorbul and Donnybrook, then ultimately to determine whether shorebirds displaced from Dux Creek would roost at alternative sites (Ningi Creek/Island, Toorbul and Donnybrook). For the last exercise, members of a team variously kept the birds off the Dux Creek site while simultaneously surveying the aforementioned alternative sites and the channel between those sites and Dux Creek. The advent of extensive, open roosting habitat at Dux Creek, while development of the site was suspended, meant that a new roosting site might be required when development was resumed and the Dux Creek site was lost. My involvement was at the population assessment stages, without any personal follow-up to investigate shorebird roosting on the proposed artificial ('sausage') sand island in the Passage after the Dux Creek site was lost.

RESULTS

One hundred and seventy-one species were detected over the six locations, or 61–108 species per site over the five bushland sites and 24 estuarine species at the Pumicestone Passage group of sites (Table 1, which gives scientific names). State-listed rare or threatened species detected were Square-tailed Kite, Lewin's Rail, Glossy Black-Cockatoo (feeding sign only, i.e. chewed *Allocasuarina* cones) and Powerful Owl at Coolum; Grey Goshawk at Buderim, Coolum and Kin Kin; Chestnut Teal, Sooty Oystercatcher and Little Tern at Bribie Island; and Eastern Curlew at all the Pumicestone Passage sites. The Lewin's Rail responded promptly to call playback, approaching vocally though staying hidden in dense cover. One introduced species was recorded, notably not the House Sparrow *Passer domesticus*, Common Starling *Sturnus vulgaris* or (at the time) Common Myna *Acridotheres tristis*.

As regards seasonal occurrence, the Fan-tailed Cuckoo was recorded in autumn as well as spring/summer, but all other parasitic cuckoos were recorded only in spring/summer; the White-throated Nightjar, White-throated Needletail, Forest and Sacred Kingfishers, Dollarbird, monarch

flycatchers, Rufous Fantail, Cicadabird and Olive-backed Oriole were recorded in spring/summer; and there were late autumn as well as spring/summer records of the White-throated Gerygone and Leaden Flycatcher.

Up to 500 Eastern Curlews used the Dux Creek roost, up to 300 used the Toorbul roost, and up to 70 (though usually <20) used the Donnybrook roost. Similarly, up to 1400 Bar-tailed Godwits roosted at Dux Creek, up to 900 at Toorbul, and up to 100 at Donnybrook. For Whimbrels, the respective numbers were up to 50 (though usually <10), up to 1000, and up to 1000. At Dux Creek there were up to 100 each of Sharp-tailed Sandpipers and Red-necked Stints and up to 200 Lesser Sand Plovers, with significant numbers also of Terek Sandpipers (40) and Common Greenshanks (15) on occasions, with a notable record of five Oriental Plovers on 12 October 1997. At Toorbul there were significant numbers of Red Knots (50), Greenshanks (30) and Grey-tailed Tattlers (tens). At Donnybrook there were at times significant numbers of Greenshanks (25).

During the shorebird disturbance experiment, it was apparent that some Eastern Curlews roosted voluntarily a Ningi Creek/Island before the disturbance at Dux Creek, and that after the birds were flushed from Dux Creek many dispersed to various roosts in the Passage: Curlews and Whimbrels mainly to Ningi Island, with some Curlews to Donnybrook; Great Knots (up to 200) and Godwits mainly to Toorbul; Great Knots (up to 150) and Greenshanks (up to 45) to Donnybrook. Some birds landed at but then left Donnybrook, and some Curlews dispersed towards Buckleys Hole (on Bribie Island) and to an unsurveyed roost apparently at Bullock Creek (between Donnybrook and Toorbul).

DISCUSSION

As for Greater Brisbane and the Gold Coast (Debus 2007a,b), substantial patches of urban and peri-urban bushland in the Sunshine Coast and hinterland support a rich terrestrial avifauna, with many forest birds present. The results of this study are largely a subset of the other inventory of birds in bushland on the Sunshine Coast (cf. Roberts & Ingram 1976). The larger grand total for the Sunshine Coast (cf. Debus 2007a,b) probably reflects in part the inclusion of targeted shorebird surveys, but more bush birds (in total and per site) were also recorded on the Sunshine Coast, for comparable effort to the Greater Brisbane surveys. This result probably reflects a latitudinal gradient in biological richness towards the tropics, and apparently

greater extent of habitat than remains farther south in the heavily urbanised Greater Brisbane and Gold Coast. Seasonal occurrences were generally as expected for bird species that are variously spring–summer breeding migrants or autumn–winter migrants to coastal south-east Queensland (cf. Barrett *et al.* 2003).

As for Greater Brisbane and the Gold Coast (Debus 2007a,b), the data in this study set a benchmark against which future changes in the bird community, with changes in land cover, might be monitored. Conversion of bushland to suburbia will likely favour a suite of adaptable species over the smaller forest specialists (e.g. Catterall *et al.* 1998 and related studies, reviewed by Debus 2007a). For instance, it was apparent from the periphery of Coolumb stage 1 that the modern ‘McMansion’ style of Gold Coast/Sunshine Coast development, with large two-storey ‘boxes’ crammed together on small lots and all native vegetation removed, will be even more hostile to forest birds than the older style of leafy suburbs.

The shorebird study illustrates the importance of sites in Pumicestone Passage to roosting migrant waders. A critical aspect for monitoring is whether the birds displaced from Dux Creek use any alternative (artificial) roost site(s) provided for them, or whether they have shifted to the other known long-established roosts. Any such monitoring results should be published in the scientific literature, rather than languish in obscurity in the ‘grey’ literature.

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Table 1: Survey sites and times. B = Buderim, November 1996 and October 1997; C = Coolum, January–February 2002 (j), May 2002 (m) and September 2005 (s); L = Landsborough, January 2004; Ca = Caloundra, February 2005; K = Kin Kin, September–October 2005; P = Pumicestone Passage (shorebirds only) in December 1996, October 1997 and December 1999 at Bribie Island (b), Ningi Creek/Island (n), Toorbul (t) and Donnybrook (d). Parentheses = feeding sign only for Glossy Black-Cockatoo. *Introduced species.

Species	B	C	L	Ca	K	P
Australian Brush-turkey <i>Alectura lathami</i>	X				X	
Brown Quail <i>Coturnix ypsilophora</i>	X	j		X	X	
King Quail <i>Coturnix chinensis</i>		s			X	
Plumed Whistling-Duck <i>Dendrocygna eytoni</i>			X			
Australian Wood Duck <i>Chenonetta jubata</i>		j		X	X	
Pacific Black Duck <i>Anas superciliosa</i>	X	jm	X	X	X	
Chestnut Teal <i>Anas castanea</i>						b
Hardhead <i>Aythya anstralis</i>					X	
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>			X	X		
Pied Cormorant <i>Phalacrocorax varius</i>		m				
Great Cormorant <i>Phalacrocorax carbo</i>					X	
Australian Pelican <i>Pelecanus conspicillatus</i>		m		X		
White-faced Heron <i>Egretta novaehollandiae</i>			X	X	X	
Great Egret <i>Ardea alba</i>				X		
Cattle Egret <i>Ardea ibis</i>					X	
Striated Heron <i>Ardea striata</i>						b
Australian White Ibis <i>Threskiornis molucca</i>		jm	X			n
Straw-necked Ibis <i>Threskiornis spinicollis</i>		m		X	X	
Osprey <i>Pandion haliaetus</i>		ms		X		
Black-shouldered Kite <i>Elanus axillaris</i>		ms			X	
Pacific Baza <i>Aviceda subcristata</i>	X		X		X	
Square-tailed Kite <i>Lophoictinia isura</i>		j				
Black Kite <i>Milvus migrans</i>	X					
Whistling Kite <i>Haliastur sphenurus</i>		jms		X		
Brahminy Kite <i>Haliastur indus</i>	X	jm		X		
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>		jm		X		
Spotted Harrier <i>Circus assimilis</i>					X	
Brown Goshawk <i>Accipiter fasciatus</i>	X	js			X	
Grey Goshawk <i>Accipiter novaehollandiae</i>	X	s			X	
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>		s			X	
Wedge-tailed Eagle <i>Aquila audax</i>					X	

Little Eagle <i>Hieraetus morphnoides</i>	j			
Australian Hobby <i>Falco longipennis</i>	j	X		
Peregrine Falcon <i>Falco peregrinus</i>	m	X	X	
Nankeen Kestrel <i>Falco cenobroides</i>	m			
Buff-banded Rail <i>Gallirallus philippensis</i>	s			
Lewin's Rail <i>Dryolimnas pectoralis</i>	ms			
Purple Swampphen <i>Porphyrio porphyrio</i>		X		
Dusky Moorhen <i>Gallinula tenebrosa</i>				X
Eurasian Coot <i>Fulica atra</i>		X		
Painted Button-quail <i>Turnix varia</i>				X
Black-tailed Godwit <i>Limosa limosa</i>				t
Bar-tailed Godwit <i>Limosa lapponica</i>				btd
Whimbrel <i>Numenius phaeopus</i>				bntd
Eastern Curlew <i>Numenius madagascariensis</i>				bntd
Marsh Sandpiper <i>Tringa stagnatilis</i>				d
Common Greenshank <i>Tringa nebularia</i>				btd
Terek Sandpiper <i>Nenus cinereus</i>				b
Common Sandpiper <i>Actitis hypoleucos</i>				b
Grey-tailed Tattler <i>Heteroscelus brevipes</i>				t
Great Knot <i>Calidris tenuirostris</i>				td
Red Knot <i>Calidris canutus</i>				td
Red-necked Stint <i>Calidris ruficollis</i>				b
Sharp-tailed Sandpiper <i>Calidris acuminata</i>				bt
Curlew Sandpiper <i>Calidris ferruginea</i>				bt
Pied Oystercatcher <i>Haematopus longirostris</i>				bd
Sooty Oystercatcher <i>Haematopus fuliginosus</i>				b
Pacific Golden Plover <i>Pluvialis fulva</i>				b
Lesser Sand Plover <i>Charadrius mongohs</i>				bt
Greater Sand Plover <i>Charadrius leschenaultii</i>				b
Oriental Plover <i>Charadrius veredus</i>				b
Masked Lapwing <i>Vanellus miles</i>	js	X	X	
Little Tern <i>Sterna albifrons</i>				b

*Spotted Turtle-Dove <i>Streptopelia chinensis</i>	X		X		
Brown Cuckoo-Dove <i>Macropygia amboinensis</i>	X	jms	X	X	X
Emerald Dove <i>Chalcophaps indica</i>			X		
Common Bronzewing <i>Phaps chalcoptera</i>				X	
Crested Pigeon <i>Ocyphaps lophotes</i>	X	ms		X	X
Peaceful Dove <i>Geopelia striata</i>	X	jms		X	X
Bar-shouldered Dove <i>Geopelia humeralis</i>	X	jms	X	X	X
Wonga Pigeon <i>Lencosarcia melanoleuca</i>			X		
Wompoo Fruit-Dove <i>Ptilinopus magnificus</i>					X
Rose-crowned Fruit-Dove <i>Ptilinopus regina</i>					X
Topknot Pigeon <i>Lopholaimus antarcticus</i>					X
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>		(j)			
Yellow-tailed Black-Cockatoo <i>Calyptorhynchus funereus</i>		jms	X		X
Galah <i>Cacatua roseicapilla</i>	X				X
Little Corella <i>Cacatua sanguinea</i>				X	X
Sulphur-crested Cockatoo <i>Cacatua galerita</i>	X				
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	X	jms	X	X	X
Scaly-breasted Lorikeet <i>Trichoglossus chlorolepidotus</i>	X	jms	X	X	X
Little Lorikeet <i>Glossopsitta pusilla</i>		j			
Australian King-Parrot <i>Alisterus scapularis</i>	X	j			X
Pale-headed Rosella <i>Platycercus adscitus</i>	X	jms		X	X
Brush Cuckoo <i>Cacomantis variolosus</i>		j		X	X
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>		jms			X
Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i>	X	j	X		X
Little Bronze-Cuckoo <i>Chrysococcyx minutillus</i>					X
Common Koel <i>Eudynamis scolopacea</i>	X	j	X	X	
Channel-billed Cuckoo <i>Scythrops noraebohandiae</i>	X	j	X		X
Pheasant Coucal <i>Centropus phasianinus</i>	X	js	X	X	X
Powerful Owl <i>Ninox strenua</i>		j			
Southern Boobook <i>Ninox noraebohandiae</i>					X
Masked Owl <i>Tyto noraebohandiae</i>					X
Barn Owl <i>Tyto alba</i>					X

Grass Owl <i>Tyto capensis</i>					X
Tawny Frogmouth <i>Podargus strigoides</i>	X		X		X
White-throated Nightjar <i>Eurostopodus mystacalis</i>				X	X
Australian Owlet-nightjar <i>Aegothebes cristatus</i>	X	j		X	X
White-throated Needletail <i>Hirundopus candocetus</i>	X		X	X	
Azure Kingfisher <i>Alcedo azurea</i>					X
Laughing Kookaburra <i>Dacelo novaeguineae</i>	X	jms	X	X	X
Forest Kingfisher <i>Todiramphus macleayii</i>	X	js	X	X	X
Sacred Kingfisher <i>Todiramphus sanctus</i>	X	js	X	X	X
Rainbow Bee-eater <i>Merops ornatus</i>	X	jms		X	X
Dollarbird <i>Eurystomus orientalis</i>	X	js	X	X	
White-throated Treecreeper <i>Cornobates leucophaeus</i>	X	j	X	X	X
Superb Fairy-wren <i>Malurus cyaneus</i>	X				
Variigated Fairy-wren <i>Malurus lamberti</i>		jms	X	X	X
Red-backed Fairy-wren <i>Malurus melanacephalus</i>	X	jms	X	X	X
Spotted Pardalote <i>Pardalotus punctatus</i>	X	jm			
Striated Pardalote <i>Pardalotus striatus</i>	X	jms	X	X	X
White-browed Scrubwren <i>Sericornis frontalis</i>	X	jms	X	X	X
Large-billed Scrubwren <i>Sericornis magnirostris</i>	X		X		X
Brown Gerygone <i>Gerygone moukei</i>			X		
White-throated Gerygone <i>Gerygone olivacea</i>	X	ms		X	X
Brown Thornbill <i>Acanthiza pusilla</i>	X	j	X	X	X
Red Wattlebird <i>Anthochaera carunculata</i>		m			
Little Wattlebird <i>Anthochaera chrysoptera</i>	X	jms		X	
Noisy Friarbird <i>Philemon corniculatus</i>	X	jms	X	X	X
Little Friarbird <i>Philemon citreogularis</i>					X
Blue-faced Honeyeater <i>Entomyzon cyanotis</i>		jms		X	X
Noisy Miner <i>Mavorina melanocephala</i>	X	jms		X	X
Lewin's Honeyeater <i>Meliphaga lewinii</i>	X	js	X	X	X
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>	X		X		X
White-throated Honeyeater <i>Melithreptus albogularis</i>	X	jms	X	X	X
Brown Honeyeater <i>Lichenura indistincta</i>	X	jms		X	X

White-checked Honeyeater <i>Phylidonyris nigra</i>		jms		X	X
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>	X	jms	X		X
Eastern Yellow Robin <i>Eopsaltria australis</i>	X	jms	X	X	X
Eastern Whipbird <i>Psophodes olivaceus</i>	X	js	X	X	X
Varied Sittella <i>Daphoenositta chrysoptera</i>		s			
Golden Whistler <i>Pachycephala pectoralis</i>	X	jms	X	X	X
Rufous Whistler <i>Pachycephala rufiventris</i>	X	jms		X	X
Little Shrike-thrush <i>Colluricincla megarhyncha</i>	X	j	X	X	X
Grey Shrike-thrush <i>Colluricincla harmonica</i>	X	jms	X	X	X
Black-faced Monarch <i>Monarcha melanopsis</i>					X
Spectacled Monarch <i>Monarcha trivirgatus</i>	X		X		X
White-eared Monarch <i>Monarcha leucotis</i>					X
Leaden Flycatcher <i>Myiagra rubecula</i>	X	jms	X	X	X
Magpie-lark <i>Grallina cyanoleuca</i>				s	X
Rufous Fantail <i>Rhipidura rufifrons</i>	X	j	X	X	X
Grey Fantail <i>Rhipidura fuliginosa</i>	X	jms	X	X	X
Willie Wagtail <i>Rhipidura leucophrys</i>		jms		X	X
Spangled Drongo <i>Dicrurus bracteatus</i>	X	jms	X	X	X
Black-faced Cuckoo-shrike <i>Coracina norueborlandiae</i>	X	jms	X	X	X
White-bellied Cuckoo-shrike <i>Coracina papuensis</i>				s	X
Cicadabird <i>Coracina tenuirostris</i>	X	j	X	X	
Varied Triller <i>Lalage leucophaea</i>					X
Olive-backed Oriole <i>Oriolus sagittatus</i>	X	js	X		X
Figbird <i>Sphecotheres viridis</i>	X	js	X	X	X
White-breasted Woodswallow <i>Artamus leucorhynchus</i>		jms			X
Dusky Woodswallow <i>Artamus cyanopterus</i>		m			
Grey Butcherbird <i>Cracticus torquatus</i>	X	jms	X	X	X
Pied Butcherbird <i>Cracticus nigrogularis</i>	X	jms		X	X
Australian Magpie <i>Gymnorhina tibicen</i>	X	jms	X	X	X
Pied Currawong <i>Strepera graculina</i>		jms	X		X
Torresian Crow <i>Corvus orn</i>	X	jms	X	X	X

Green Catbird <i>Ailuroedus crassirostris</i>	X				X	
Regent Bowerbird <i>Sericulus chrysocephalus</i>						X
Richard's Pipit <i>Anthus novaeseelandiae</i>						X
Double-barred Finch <i>Taeniopygia bichenorii</i>	X	ms		X		X
Red-browed Finch <i>Neochmia temporalis</i>	X	jms	X	X		X
Chestnut-breasted Mannikin <i>Lonchura castaneothorax</i>				X		X
Mistletoebird <i>Dicaeum bairdinaceum</i>	X	jms	X	X		X
Welcome Swallow <i>Hirundo neoxena</i>	X	jms	X	X		X
Tree Martin <i>Hirundo nigricans</i>		jms		X		
Fairy Martin <i>Hirundo ariel</i>		s				
Tawny Grassbird <i>Megalurus timoriensis</i>	X	ms		X		X
Golden-headed Cisticola <i>Cisticola exilis</i>	X	m	X	X		X
Silvereye <i>Zosterops lateralis</i>	X	ms	X	X		X
Totals (grand total 171 species)	75	100	61	79	108	24

AVIFAUNA OF REMNANT BUSHLAND ON THE TWEED COAST OF NORTHERN NEW SOUTH WALES

S.J.S. DEBUS

ABSTRACT

'Snapshot' surveys of the bird communities in bushland sites were conducted in the Tweed Coast and hinterland, in most months of the year, between 1993 and 1999, as a benchmark against which future changes might be monitored. One hundred and eighty-four species were detected over six bushland locations (56–150 species per site), including state-listed threatened species: Osprey *Pandion haliaetus*, Square-tailed Kite *Lophoictinia isura*, Bush-hen *Amaurornis olivaceus*, Comb-crested Jacana *Irediparra gallinacea*, Little Tern *Sterna albifrons*, Superb Fruit-Dove *Ptilinopus superbus*, Rose-crowned Fruit-Dove *P. regina*, Glossy Black-Cockatoo *Calyptorhynchus lathami*, Masked Owl *Tyto novaehollandiae*, Grass Owl *T. capensis*, Collared Kingfisher *Todiramphus chloris*, Mangrove Honeyeater *Lichenostomus fasciocularis*, Grey-crowned Babbler *Pomatostomus temporalis* and White-eared Monarch *Monarcha leucotis*. Some seasonal patterns were evident: Fan-tailed Cuckoo *Cacomantis flabelliformis* and Shining Bronze-Cuckoo *Chrysococcyx lucidus* the only cuckoos in autumn/winter, all other cuckoos only in spring/summer; White-throated Nightjar *Eurostopodus mystacalis* mainly in spring/summer, but also over-wintering; Sacred Kingfisher *Todiramphus sanctus* mainly in spring/summer, but also in autumn; White-throated Needletail *Hirundapus caudacutus*, Forest Kingfisher *T. macleayi* and Dollarbird *Eurystomus orientalis* in spring/summer; Rainbow Bee-eater over-wintering on the coast; Noisy Pitta *Pitta versicolor* in coastal lowlands in autumn/winter; monarch flycatchers, Rufous Fantail *Rhipidura rufifrons* and Cicadabird *Coracina tenuirostris* in spring/summer, with a few autumn records of Spectacled Monarch *Monarcha trivirgatus*, Leaden Flycatcher *Myiagra rubecula* and Cicadabird; and White-throated Gerygone *Gerygone olivacea*, Olive-backed Oriole *Oriolus sagittatus*, Fairy Martin *Hirundo ariel* and Clamorous Reed-Warbler *Acrocephalus stentoreus* over-wintering.

INTRODUCTION

This paper continues the theme of Debus (2007a,b,c), by reporting on the bird communities of bushland remnants on the New South Wales Tweed Coast and hinterland, another rapidly urbanising area on the subtropical coast

of eastern Australia, contiguous with the Gold Coast. Previous comprehensive inventories (Gosper 1982, 1986, Gosper & Holmes 2002) encompassed the present smaller survey area, and another comprehensive inventory (Milledge 1991) covered the area adjoining the south of the present study area. Again, this study is a 'snapshot' inventory of the birds of various bushland locations around the Tweed Coast, resulting from bird surveys conducted as part of environmental assessments for development proposals. It similarly presents a baseline for future surveys, which might test the persistence of certain species, or any predictions about impacts or any mitigation proposals made in the environmental assessment documents (cf. Debus 2007a). In particular, one set of surveys was conducted on the route of the proposed Yelgun–Tweed Heads motorway, which has since become operational.

STUDY SITES AND METHODS

The study locations were bushland sites at the times of the surveys (see Table 1 for survey locations and dates). Otherwise, the survey methods were generally as previously described for sites in Greater Brisbane (Debus 2007a). Although investigation of seasonal occurrence was not an aim of the surveys, the six bushland sites were fortuitously surveyed across all seasons and in most months, thus allowing some assessment of seasonal patterns.

The locations and habitats were as follow.

Ocean Shores: three sub-sites. (A) Billinudgel Nature Reserve; moist and dry eucalypt forest, rainforest, swamp forest, weedy and disturbed land; ~300 ha. (B) New Brighton (north edge of village); swamp forest, *Banksia* and *Acacia* scrub, sedgeland, weedy and disturbed land; ~50 ha. (C) Ocean Shores village; weedy and disturbed moist eucalypt forest; ~10 ha.

Pottsville: north edge of village, on Cudgera Creek; dry eucalypt forest, swamp forest, mangroves, estuarine, disturbed land; ~10 ha.

Cudgen Lake to Kingscliff (Kings Forest): moist and dry eucalypt forest, rainforest, swamp forest, gallery forest, *Banksia* scrub, pine plantation, wetland, disturbed land; ~1000 ha.

West Tweed Heads: three sub-sites. (A) Cobaki Lakes; moist and dry eucalypt forest, rainforest, swamp forest, agricultural, wetland; ~200 ha. (B) Cobaki Broadwater (southern foreshore); moist and dry eucalypt forest, swamp forest, mangroves, estuarine; ~100 ha. (C) Vintage Lakes; disturbed eucalypt forest and swamp forest, wetland; ~20 ha.

Yelgun to Stotts Island: moist and dry eucalypt forest, swamp forest,

rainforest, pine plantation, wetland, disturbed land, agricultural; ~500 ha surveyed (across accessible bushland areas along the route).

Uki: Mt Warning Road; moist eucalypt forest, rainforest, disturbed land; ~50 ha.

RESULTS

One hundred and eighty-four species were detected over the six locations, or 56–150 species per site (Table 1, which gives scientific names). However, other than Pottsville and Uki, 'sites' were really clusters of sub-sites that were individually or collectively surveyed on more than one occasion (see Table 1). Threatened species (as listed under NSW legislation) detected were Osprey, Square-tailed Kite, Bush-hen, Comb-crested Jacana, Little Tern, Superb Fruit-Dove, Rose-crowned Fruit-Dove, Glossy Black-Cockatoo, Masked Owl, Grass Owl, Collared Kingfisher, Mangrove Honeyeater, Grey-crowned Babbler and White-eared Monarch. Three introduced species were recorded but not, at the time, the Common Myna *Acridotheres tristis*.

Seasonal patterns evident were: Fan-tailed Cuckoo and Shining Bronze-Cuckoo the only cuckoos recorded in autumn/winter, all other parasitic cuckoos being recorded only in spring/summer; White-throated Nightjar recorded mainly in spring/summer, but also one over-wintering record; Sacred Kingfisher recorded mainly in spring/summer, but also in autumn; White-throated Needletail, Forest Kingfisher and Dollarbird recorded only in spring/summer; Rainbow Bee-eater recorded all year (i.e. over-wintering on the coast); Noisy Pitta recorded in coastal lowlands in autumn/winter; monarch flycatchers, Rufous Fantail and Cicadabird recorded in spring/summer, with one autumn record of Spectacled Monarch, Leaden Flycatcher and Cicadabird; and over-wintering records of White-throated Gerygone, Olive-Backed Oriole, Fairy Martin (on the coast) and Clamorous Reed-Warbler.

DISCUSSION

As for Greater Brisbane, Gold Coast and Sunshine Coast (Debus 2007a,b,c), substantial patches of peri-urban bushland in the Tweed Coast and hinterland support a rich terrestrial avifauna, with many forest birds present. The results of this study are largely a subset of the other inventories of birds in bushland in far north-eastern NSW (cf. Gosper 1982, 1986, Gosper & Holmes 2002, Milledge 1991). Seasonal occurrences were generally as expected for bird species that are variously spring–summer breeding migrants

or autumn–winter migrants to coastal north-eastern NSW (cf. Barrett *et al.* 2003), and the results of this study generally complement the seasonal patterns evident from similar ‘snapshot’ surveys in south-east Queensland (cf. Debus 2007a,b,c).

The larger grand total and site totals for the Tweed Coast, compared with the Queensland sites and in particular the bird-rich Sunshine Coast (cf. Debus 2007a,b,c), probably reflect the fact that most of the NSW sites were clusters of sub-sites surveyed repeatedly, in different seasons. Hence, the NSW sites had larger data sets. This aspect illustrates the value of surveys across the seasons for a more thorough inventory of bird species. Such comprehensive coverage is rarely achieved during single ‘snapshot’ surveys of the type commonly conducted for environmental impact studies for development proposals. Thus, many EIS-type fauna inventories (including the ones in this series of studies, particularly in Queensland) may be incomplete.

As for Greater Brisbane, the data in this study set a benchmark against which future changes in the bird community, with changes in land cover, might be monitored. Conversion of bushland to suburbia will likely favour a suite of adaptable species over the smaller forest specialists (e.g. Catterall *et al.* 1998 and related studies, reviewed by Debus 2007a). Similarly, the Tweed motorway may have fragmented habitat, created edge effects, encouraged Noisy Miners and other large aggressive birds, and increased the incidence of road kill. Previous comments on the ‘McMansion’ style of urbanisation, and the need for any monitoring data to be in the scientific as well as ‘grey’ literature (e.g. on motorway impacts), apply to the Tweed Coast and indeed other rapidly urbanising areas on the NSW coast (cf. Debus 2007c).

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Table 1: Survey sites and times. Data arranged as coastal sites south to north, then subcoastal sites, then inland site: OS = Ocean Shores area, December 1993 (= Billinudgel Nature Reserve, d), February 1995 (f), and July–August 1997 (j); P = Pottsville, February 1995; K = Cudgen Lake to Kingscliff, April 1996 (a), January 1998 (j), July 1998 (y), September 1999 (s) and October 1998 (o); TH = west Tweed Heads, November 1994 (n), February /March 1995 (f), May/July 1997 (m), and October 1998 (o); Y = transect, Yelgun to Stotts Island, August–September 1997 (s) and April 1998 (a); U = Uki, September 1998. The Yelgun transect followed the route of the proposed Yelgun–Chinderah motorway. *Introduced species.

Species	OS	P	K	TH	Y	U
Australian Brush-turkey <i>Alectura lathami</i>	d		jy	o	sa	X
Brown Quail <i>Coturnix ypsilophora</i>		X	j	o	sa	
Plumed Whistling-Duck <i>Dendrocygna cytoni</i>				m		
Wandering Whistling-Duck <i>Dendrocygna arcuata</i>			jy	f	sa	
Black Swan <i>Cygnus atratus</i>			jy	f		
Australian Wood Duck <i>Chenonetta jubata</i>			jy	fm	sa	
Pacific Black Duck <i>Anas superciliosa</i>	df		jyo	fmo	sa	X
Chestnut Teal <i>Anas castanea</i>				fo		
Hardhead <i>Aythya australis</i>					a	
Australasian Grebe <i>Tachybaptus novaehollandiae</i>				f		
Darter <i>Anhinga melanogaster</i>	f		yo	fo		
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	df	X	o	fm	sa	
Pied Cormorant <i>Phalacrocorax varius</i>			s	f		
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	df	X	o	f	s	
Great Cormorant <i>Phalacrocorax carbo</i>			js	f	sa	
Australian Pelican <i>Pelecanus conspicillatus</i>	f		yso	fo		
White-faced Heron <i>Egretta novaehollandiae</i>	j	X	jys o	fmo	sa	
Eastern Reef Egret <i>Egretta sacra</i>			j			
White-necked Heron <i>Ardea pacifica</i>			a		s	
Great Egret <i>Ardea alba</i>			jy	fm	a	
Intermediate Egret <i>Ardea intermedia</i>	dj				s	
Cattle Egret <i>Ardea ibis</i>	df		j	fm	sa	X
Striated Heron <i>Ardea striata</i>		X		fo		
Nankeen Night Heron <i>Nycticorax caledonicus</i>	d		j		s	
Australian White Ibis <i>Threskiornis molucca</i>	dfj	X	jy	fmo	sa	
Straw-necked Ibis <i>Threskiornis spinicollis</i>	f			fm	sa	
Royal Spoonbill <i>Platalea regia</i>	d			f	s	
Osprey <i>Pandion haliaetus</i>	d	X	jys	nfmo		
Black-shouldered Kite <i>Elanus axillaris</i>	f		j	nf	a	X

Pacific Baza <i>Ariceda subcristata</i>	df		jo	n	sa	X
Square-tailed Kite <i>Lophoictinia isura</i>	d					
Whistling Kite <i>Haliastur sphenurus</i>	df	X	ajys o	nfo	sa	
Brahminy Kite <i>Haliastur indus</i>	df	X	ajys o	fo	a	
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	df		jyo	fo	sa	
Swamp Harrier <i>Circus approximans</i>			yo	f	sa	
Brown Goshawk <i>Accipiter fasciatus</i>	f		jyso	nf	sa	
Grey Goshawk <i>Accipiter novaehollandiae</i>	dj		y	m	s	
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>	f		y	nm o		
Wedge-tailed Eagle <i>Aquila audax</i>			jyo	n	sa	
Little Eagle <i>Hieraaetus morphnoides</i>					s	
Australian Hobby <i>Falco longipennis</i>	df			f	s	
Peregrine Falcon <i>Falco peregrinus</i>	d		y	n	sa	
Nankeen Kestrel <i>Falco cenchroides</i>				o	nf	
Buff-banded Rail <i>Gallinallus philippensis</i>			j		a	
Bush-hen <i>Amamornis olivaceus</i>	d		j		s	X
Purple Swamphen <i>Porphyrio porphyrio</i>			jyo	f	sa	
Dusky Moorhen <i>Gallinula tenebrosa</i>	df			f	sa	X
Eurasian Coot <i>Fulica atra</i>				f		
Bar-tailed Godwit <i>Limosa lapponica</i>				f		
Whimbrel <i>Numenius phaeopus</i>			j	fo		
Eastern Curlew <i>Numenius madagascariensis</i>		X		fo		
Common Greenshank <i>Tringa nebularia</i>				fo		
Comb-crested Jacana <i>Iredoparva gallinacea</i>				f		
Black-winged Stilt <i>Himantopus himantopus</i>			jy	fm		
Masked Lapwing <i>Vanellus miles</i>	j	X	jyo	fm	sa	X
Silver Gull <i>Larus novaehollandiae</i>	f		js	f		
Crested Tern <i>Sterna bergii</i>	f		js			
Little Tern <i>Sterna albifrons</i>		X				
White-headed Pigeon <i>Columba leucomela</i>	dfj		jyo	f	sa	X

*Spotted Turtle-Dove <i>Streptopelia chinensis</i>	f		f	sa	X
Brown Cuckoo-Dove <i>Macropygia amboinensis</i>	dfj		nm o	sa	X
Emerald Dove <i>Chalcophaps indica</i>	df		yo	fo	X
Crested Pigeon <i>Ocyphaps lophotes</i>	fj		jyso	nfm o	sa X
Peaceful Dove <i>Geopelia striata</i>		X	aj	fo	s
Bar-shouldered Dove <i>Geopelia lunifrons</i>	dfj	X	ajys o	fo	sa X
Wonga Pigeon <i>Leucosarcia melanoleuca</i>	dj		jy		sa
Superb Fruit-Dove <i>Ptilinopus superbus</i>					X
Rose-crowned Fruit-Dove <i>Ptilinopus regina</i>	d			sa	X
Topknot Pigeon <i>Lopholaimus antarcticus</i>	fj		yo	sa	X
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	j	X		s	
Yellow-tailed Black-Cockatoo <i>Calyptorhynchus funereus</i>	d		y		
Galah <i>Cacatua roseicapilla</i>	df	X	jyso	nfm o	sa
Little Corella <i>Cacatua sanguinea</i>				fm	s
Sulphur-crested Cockatoo <i>Cacatua galerita</i>				nfm o	sa
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	dj		aj	nfm o	sa X
Scaly-breasted Lorikeet <i>Trichoglossus chlorolepidotus</i>	dfj	X	ajyo	nfm o	sa X
Little Lorikeet <i>Glossopsitta pusilla</i>	d				
Australian King-Parrot <i>Alisterus scapularis</i>	d		y	n	a X
Crimson Rosella <i>Platycercus elegans</i>				f	
Eastern Rosella <i>Platycercus eximius</i>	dj		jyo	nfm o	sa X
Pale-headed Rosella <i>Platycercus adsitus</i>				nfo	
Pallid Cuckoo <i>Cuculus pallidus</i>				n	
Brush Cuckoo <i>Cacomantis variolosus</i>	d		jo	no	X
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>	d		yso	no	sa X
Shining Bronze-Cuckoo <i>Chrysocolaptes lucidus</i>	d		ayso	fo	X
Little Bronze-Cuckoo <i>Chrysocolaptes minutillus</i>				n	
Common Koel <i>Eudynamis scolopacea</i>	df		jo	nf	X
Channel-billed Cuckoo <i>Scythrops naraebollandiae</i>			j	n	X
Pheasant Coucal <i>Centropus phasianinus</i>	d	X	jyo	n	sa X
Southern Boobook <i>Ninox novaeseelandiae</i>			jyo	nfm	sa

Masked Owl <i>Tyto novaehollandiae</i>	d		y	n		X
Barn Owl <i>Tyto alba</i>			jy	m	a	
Grass Owl <i>Tyto capensis</i>			y	f		
Tawny Frogmouth <i>Podargus strigoides</i>	d		j	nfmo	s	X
White-throated Nightjar <i>Eurostopodus nystacalis</i>	d		jy	nfo		
Australian Owlet-nightjar <i>Aegotheles cristatus</i>	d		jo	nfo		X
White-throated Needletail <i>Hirundapus caudacutus</i>	d		j	f		
Azure Kingfisher <i>Alcedo azurea</i>		X	jy	fo	s	
Laughing Kookaburra <i>Dacelo novaeguineae</i>	dfj		ajyso	nfmo	sa	X
Forest Kingfisher <i>Todiramphus macleayi</i>			jo		a	X
Sacred Kingfisher <i>Todiramphus sanctus</i>	d	X	ao	nfo	s	
Collared Kingfisher <i>Todiramphus chloris</i>				fo		
Rainbow Bee-eater <i>Merops ornatus</i>	dfj		ajyso	fo	sa	X
Dollarbird <i>Eurystomus orientalis</i>	df	X	jo	nfo	s	
Noisy Pitta <i>Pitta versicolor</i>				m	a	
White-throated Treecreeper <i>Cornobates leucophaeus</i>	d		jyo	nfmo		X
Superb Fairy-wren <i>Malurus cyanens</i>	dfj	X	jyso	fmo	sa	
Variagated Fairy-wren <i>Malurus lamberti</i>	dfj	X	jyo	nfmo	sa	X
Red-backed Fairy-wren <i>Malurus melanocephalus</i>	f	X	ajyo	fo	a	X
Spotted Pardalote <i>Pardalotus punctatus</i>	j		jy	fm	sa	
Striated Pardalote <i>Pardalotus striatus</i>	dfj	X	ajyo	nfmo	sa	X
White-browed Scrubwren <i>Sericornis frontalis</i>	dfj	X	ajyso	nfmo	sa	X
Large-billed Scrubwren <i>Sericornis magnirostris</i>	df		jo	m	sa	X
Mangrove Gerygone <i>Gerygone laevigaster</i>		X	js	fo		
White-throated Gerygone <i>Gerygone olivacea</i>			ajyo	nfmo	sa	
Brown Thornbill <i>Acanthiza pusilla</i>	dfj	X	ajyso	nfmo	sa	X
Yellow Thornbill <i>Acanthiza nana</i>			a	f		
Striated Thornbill <i>Acanthiza lineata</i>			yo	n	s	X
Little Wattlebird <i>Anthochaera chrysoptera</i>	df	X	ajso		s	X
Striped Honeyeater <i>Plectorhyncha lanceolata</i>	f	X	ay			
Noisy Friarbird <i>Philemon corniculatus</i>	dfj	X	ajyo	nfmo	sa	X

Little Friarbird <i>Philemon citreogularis</i>				j			
Blue-faced Honeyeater <i>Entomyzon cyanotis</i>		X				sa	
Noisy Miner <i>Manorina melanoccephala</i>	dfj	X	ajyo	nfm o	sa	X	
Lewin's Honeyeater <i>Meliphaga lewinii</i>	dfj	X	ajys o	nfm o	sa	X	
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>	f		yo	m	s	X	
Mangrove Honeyeater <i>Lichenostomus fasciocularis</i>				fo			
White-throated Honeyeater <i>Melithreptus albogularis</i>	fj	X	ajyo	nfm o	sa		
Brown Honeyeater <i>Lichmera indistincta</i>	d	X	ajys o	fmo	s	X	
White-cheeked Honeyeater <i>Phylidonyris nigra</i>	df	X	ajys o	m	s		
Eastern Spinebill <i>Acanthorhynchus tenuirostris</i>			y	n	s		
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>	dfj		ayo	nfm	sa	X	
Jacky Winter <i>Microeca fascians</i>				o			
Rose Robin <i>Petroica rosea</i>	j		y	m	sa	X	
Pale-yellow Robin <i>Tregellasia capito</i>						X	
Eastern Yellow Robin <i>Eopsaltria australis</i>	dfj		jyo	nfm o	sa	X	
Logrunner <i>Orthonyx temminckii</i>					a	X	
Grey-crowned Babbler <i>Pomatostomus temporalis</i>	d			f	s		
Eastern Whipbird <i>Psophodes olivaceus</i>	dfj	X	ajys o	nfm o	a	X	
Varied Sittella <i>Daphoenositta chrysoptera</i>			jy	n		X	
Crested Shrike-tit <i>Falcunculus frontatus</i>					a		
Golden Whistler <i>Pachycephala pectoralis</i>	dj		ajyo	m	sa	X	
Rufous Whistler <i>Pachycephala rufiventris</i>	dfj		ajys o	nfm o	sa	X	
Little Shrike-thrush <i>Colluricincla megarhyncha</i>	d			fmo	sa	X	
Grey Shrike-thrush <i>Colluricincla harmonica</i>	dfj	X	ajys o	nfm o	sa	X	
Black-faced Monarch <i>Monarcha melanopsis</i>	f		o		s	X	
Spectacled Monarch <i>Monarcha trivirgatus</i>	d		o		sa	X	
White-eared Monarch <i>Monarcha leucotis</i>	d				s	X	
Leaden Flycatcher <i>Myiagra rubecula</i>	df	X	ajso	nfo	sa	X	
Restless Flycatcher <i>Myiagra inquieta</i>				f	a		
Magpie-lark <i>Grallina cyanoleuca</i>	fj	X	ajyo	fmo	sa	X	
Rufous Fantail <i>Rhipidura rufifrons</i>	dfj		o	f	a		

Grey Fantail <i>Rhipidura fuliginosa</i>	dfj		ajyso	fmo	sa	X
Willie Wagtail <i>Rhipidura leucophrys</i>	fj	X	yso	fmo	sa	X
Spangled Drongo <i>Dicrurus bracteatus</i>	df		ajyso	nfmo	sa	X
Black-faced Cuckoo-shrike <i>Coracina novaebollandiae</i>	dfj	X	ajyso	nfmo	sa	X
Cicadabird <i>Coracina tenuirostris</i>	d	X	jo	nfo	a	
Varied Triller <i>Lalage leucomela</i>	dfj	X	yo	nfo	sa	X
Olive-backed Oriole <i>Oriolus sagittatus</i>	df		jyo	nfo	sa	X
Figbird <i>Sphecotheres viridis</i>	dj	X	jyso	nfmo	sa	X
White-breasted Woodswallow <i>Artamus leucorhynchus</i>	df	X	ajo	fo	a	
Dusky Woodswallow <i>Artamus cyanopterus</i>				n		
Grey Butcherbird <i>Cracticus torquatus</i>	fj	X	ajyo	nfmo	sa	X
Pied Butcherbird <i>Cracticus nigrogularis</i>	f	X	ajyso	nfmo	sa	X
Australian Magpie <i>Gymnorhina tibicen</i>	fj	X	ajyso	nfmo	sa	X
Pied Currawong <i>Strepera graculina</i>	dfj	X	ajyso	nfmo	sa	X
Torresian Crow <i>Corvus orru</i>	dfj	X	ajyso	nfmo	sa	X
Green Catbird <i>Ailuroedus crassirostris</i>					a	X
Satin Bowerbird <i>Ptilonorhynchus violaceus</i>				m	sa	X
Richard's Pipit <i>Anthus novaeseelandiae</i>			yo	m	s	
*House Sparrow <i>Passer domesticus</i>				f	a	
Double-barred Finch <i>Taeniopygia bichenovii</i>			js	f		
Red-browed Finch <i>Neobornia temporalis</i>	dfj		ajyso	fmo	sa	X
Chestnut-breasted Mannikin <i>Lonchura castaneothorax</i>			o			
Mistletoebird <i>Dicaeum biminidiaceum</i>	dfj	X	ajyo	nfo	sa	X
Welcome Swallow <i>Hirundo neoxena</i>	dfj	X	ajyso	fo	sa	X
Tree Martin <i>Hirundo nigricans</i>			a	n	sa	
Fairy Martin <i>Hirundo ariel</i>			y		s	
Clamorous Reed-Warbler <i>Acrocephalus stentoreus</i>			jyo	f	a	
Tawny Grassbird <i>Megalurus timoriensis</i>		X	yso	f	sa	
Little Grassbird <i>Megalurus gramineus</i>			yo	f		
Golden-headed Cisticola <i>Cisticola exilis</i>	df		jyo		sa	
Silveryeye <i>Zosterops lateralis</i>	dj	X	ajyso	nfmo	sa	X
*Common Starling <i>Sturnus vulgaris</i>					a	
Totals (grand total 184 species)	113	56	138	150	131	81



BOOK REVIEW

SHOREBIRDS OF AUSTRALIA

A Geering, L Agnew and S Harding

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Readers may remember the 1987 publication *Shorebirds in Australia* by Brett Lane. For many, Lane's work served as an introduction to the identification of waders and their habitats. Now, *Shorebirds of Australia* (2007) is a most welcome addition to the library of not only the serious ornithologist but the keen birdwatcher coming to grips with the identification of Australia's waders. It brings together the contributions of many authors and is much, much more than a field guide. Its size and weight makes it very suitable as a field guide – though it is a most valuable general shorebird reference too.

The book brings together the latest knowledge about the evolutionary history and taxonomy of shorebirds; their breeding ecology, migration; feeding ecology and habitat selection, plumages and topography, species descriptions, threats to shorebirds and conservation actions (including the importance of staging sites in the flyway, and the management of those threats).

The chapter on evolutionary history and taxonomy is particularly helpful both for its introduction to “shorebirds” and for its diagrammatic explanation of the evolutionary relationships of shorebirds. The discussion of Migration in chapter 3 is detailed and collates much research.

The section on species description is excellent. Each of Australia's shorebird species has two pages with two, three or four excellent colour photographs and details of adult non-breeding, breeding, juvenile, flight, voice, range habits and similar species as well as the distribution map. The photographs are outstanding in quality and will prove most helpful in the field.

The final chapter “Threats to shorebirds and conservation actions” will be of specific value to land managers as well as to the general reader. The bibliography is extensive and will prove a most useful reference source.

Students, amateurs and professionals, all, will value this attractive book for years because it is easy to use, comprehensive and authoritative.

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