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BIRDS IN THE RICHMOND RIVER DISTRICT, N.S.W., 1973 - 1983.

I. DISTRIBUTION

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Distribution maps are given for 333 bird species recorded in the Richmond River district from 1973 to 1983. Presence and breeding are plotted by 10' squares. Local distribution patterns are discussed in relation to gross environmental factors.

INTRODUCTION

No detailed distributional accounts of the avifauna of the Richmond River district of north-eastern New South Wales are known. General lists of the birds of the Richmond Valley have been compiled by Kikkawa (1970) who listed 187 species, and the Richmond Valley Naturalists Club (1973) which recorded 267 species. More recently a broad indication of the distribution of birds in north-eastern NSW has been given by Morris, McGill and Holmes (1981).

This paper summarises distributional information by 10' grid squares for 333 species recorded by the author in the Richmond River district. The data presented were accumulated during almost 11 years residence (1973-1983) at Casino, in the central part of the district. A complementary annotated account summarising occurrence, status and breeding of birds in the district over the same period is presently in preparation.

SURVEY AREA

The survey area (Fig. 1) is defined as the catchment area of the Richmond River and its contiguous coastline. Also included are the minor coastal drainages of the Evans River (connected by canal to the Richmond River) and Jerusalem Creek, which lie between the Richmond and Clarence Rivers. The watershed of the McPherson, Tweed and Nightcap Ranges form the boundaries in the north and the Richmond Range in the west and south. On the coast Broken Head is taken as the northern limit, whilst a line due east from Mt. Doubleduke to the coast south of Jerusalem Creek is the arbitrary southern boundary. The offshore limit is 500 metres.

The Richmond River is one of the major coastal drainage systems in northern NSW with a catchment area of approximately 7 000 km². Much of this area is less than 200 metres above sea level (Fig. 2). Higher elevations are confined mainly to the northern and north-western water-

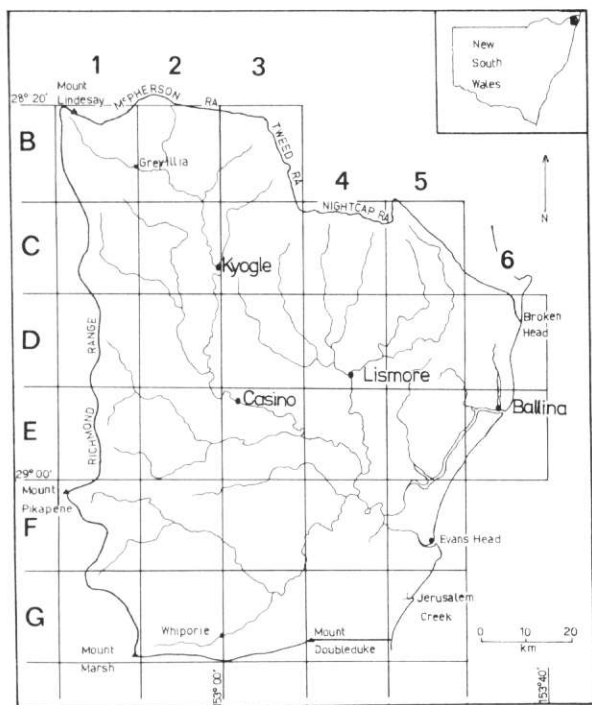


Figure 1. The survey area showing grid squares, co-ordinates and selected localities mentioned in text.

shed with the highest point being Mt. Lindsay (1 177m). Approximately 40% of the area is flat (slopes $<3^\circ$), 40% undulating slopes 3° – 15°) and 20% mountainous (slopes $>15^\circ$) (NSW Department of Conservation 1966).

Annual median rainfall everywhere exceeds 1 000mm (Fig. 3). The lower rainfall areas are the extensive flatlands (altitude mostly <100 m) away from the coast in the central and south-western parts. Annual totals for Casino (average 1 113mm) over the period covered by this report ranged from 856mm (1977) to 1 577mm (1974). Rainfall increases sharply near the coast and with increasing elevation in the northern watershed. Extreme annual totals for Mt. Nardi (average 2 822mm) were 1 610mm (1977) and 3 895mm (1974).

The Richmond River district was mostly forested before European settlement. The present distribution of forests (Fig. 4) indicates

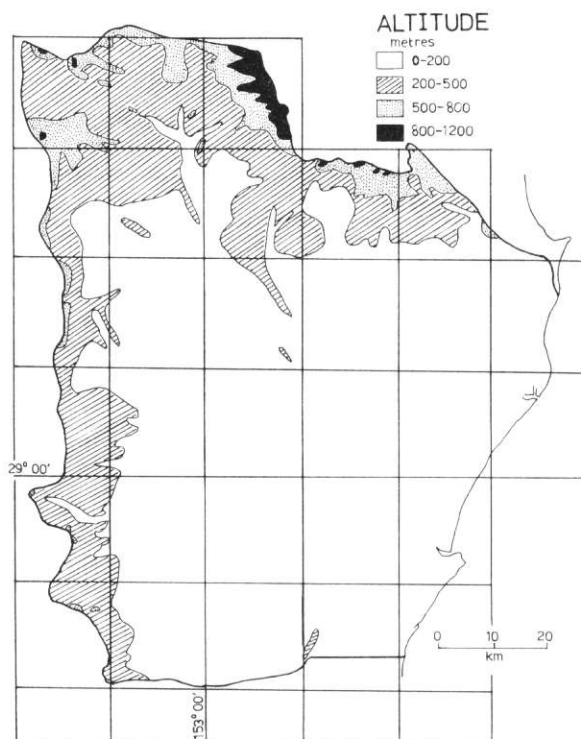


Figure 2. Altitude map of study area.

the extent of change since the beginning of settlement in the 1840's. Much of this alteration had occurred by 1900. In this period the forests of the floodplain, and the Big Scrub north and east of Lismore were almost completely cleared. Drainage of the wetlands of the floodplain for improved agricultural and pastoral production was also begun, a process which continued through to the 1960's. Since that initial period of intensive clearing, alteration of the natural vegetation has been most evident on the coastal strip as a result of mining for heavy minerals in stabilized dunes, and clearing of swamp sclerophyll forests and drainage of the land for sugar cane growing. The remaining uncleared lands are concentrated about the periphery of the catchment, mostly within state forests, national parks and nature reserves.

For the purposes of this report only broad vegetation forms and habitats occupying significant areas are distinguished (Fig. 4). Forest

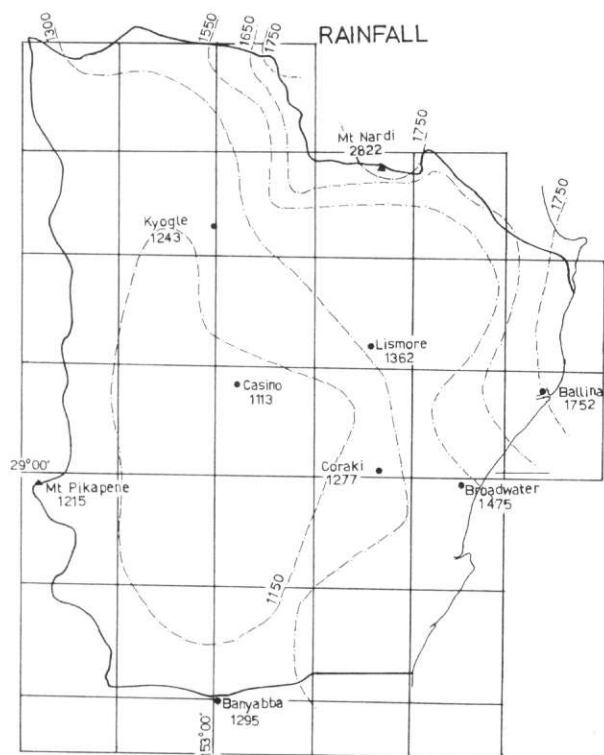


Figure 3. Average annual rainfall of study area.

classifications are based on Floyd (1970) and Forest Types Map (1975), Atlas of Resources of NSW Series (available from the Department of Decentralisation and Development, Sydney).

Rainforests: mostly subtropical rainforest that formerly covered a great proportion of the flats of the Richmond River, the southern slope of the Mt. Warning shield volcano (the Big Scrub), and the Tweed, Nightcap and McPherson Ranges, with pockets in the Richmond Range. Some warm temperate rainforest and (above 900m) cool temperate rainforest occurs with monsoon (dry) rainforest mainly in the lower rainfall areas along the Richmond Range. Forests much reduced, present distribution being confined essentially to the higher altitudes and steeper terrain of the watershed ranges. Only small isolated remnants of lowland rainforest remain (Fig. 4). Less than one five-hundredth of the Big Scrub (which formerly covered more than 750km²) remains today (Goldstein 1983).

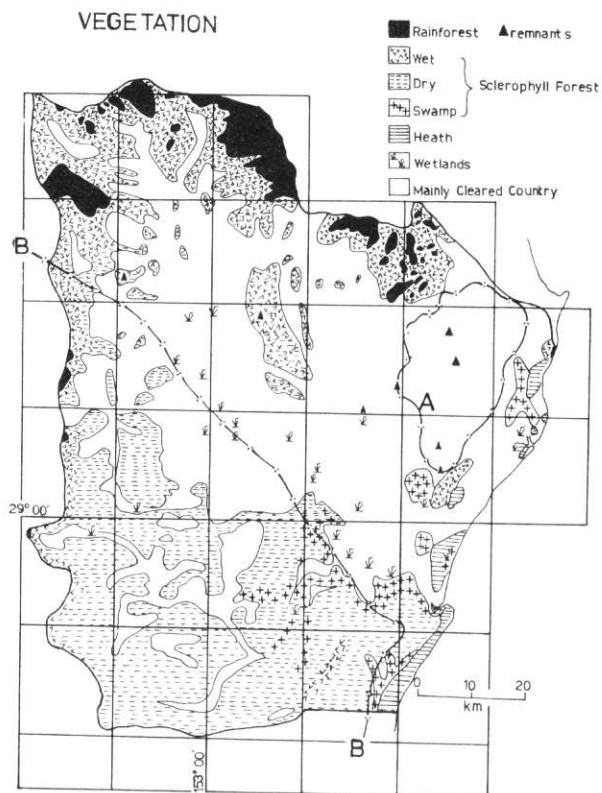


Figure 4. Vegetation types.

- (A) Approximate extent of former Big Scrub rainforest.
(B) Approximate northern limits of Spotted Gum in the Richmond Valley.

Sclerophyll forests: extensive forested areas remain on less fertile slopes and in the lower rainfall southern sector. Dry sclerophyll forests are widespread south of Casino (average rainfall <1150mm). The distribution of Spotted Gum *Eucalyptus maculata* (Fig. 4) in particular may importantly affect the local distribution of some bird species. Most of the eucalypt forest on the northern slopes of the valley where rainfall exceeds 1300 mm p.a. is of the wet sclerophyll subform. Areas of wet sclerophyll also occur along the Richmond Range and low coastal ranges near Wardell and Mt. Double-duck. Swamp sclerophyll associations (mainly *Melaleuca*, *Casuarina* and mangroves) are characteristic of low lying country near the coast. They are largely drained and/or cleared.

Coastal heath: important tracts of heath land complex are located on coastal sand country north and south of Evans Head, near Wardell and north of Lennox Head; remaining areas mostly within national parks or Crown land.

Wetlands (cf Goodrick 1970, Gosper 1981a, Gosper *et al.* 1983): mostly scattered swamps on the floodplain from below Kyogle to Woodburn and Broadwater. Formerly extensive but much reduced by drainage; now mostly remnant areas within cleared country. Estuarine wetlands associated with mouth of Richmond, and to lesser extent, Evans Rivers, largely reclaimed.

Coastline: mostly long stretches of sandy beach interrupted by low rocky headlands and estuary mouths at Ballina and Evans Head; few rock platforms and no offshore islands.

Mainly cleared country: extensive pastoral and agricultural lands, tending to increasing closer settlement toward the coast, especially north and east of Lismore (the largest urban centre, pop. 25 000). Landuse mainly grazing beef and dairy cattle on pastures dominated by introduced grasses (e.g. *paspalum*, *kikuyu*) and fodder crops on the floodplain, or on coarser pastures on less arable country. Sugar cane growing is concentrated on the coastal strip and small tropical fruit plantations in the north-eastern sector. Scattered timber, regrowth and remnants of natural vegetation occur throughout, although mainly restricted to creeksides in more intensively farmed areas. The absence of naturally occurring eucalypts from a large area north-east of Lismore once covered by the Big Scrub (Fig. 4) appears to importantly affect the local distribution of birds. In this area the exotic tree Camphor Laurel *Cinnamomum camphora* has become a conspicuous feature (cf Frith 1977).

METHODS

Distributional data were accumulated in the course of both systematic studies and general birdwatching. The collection of purely distributional information was largely secondary to other objectives. Systematic mapping of bird distribution on a square by square basis was not attempted nor was a deliberate effort made to achieve uniform coverage of the district.

Evidence of breeding was recorded when encountered but generally little effort was made to search for nests.

Beginning in 1973 a series of systematic surveys was carried out at selected sites in the district. These projects (see Gosper 1981a, 1981b, 1983 and in prep.) were mostly of 30 to 40 months duration and involved regular (monthly) censuses of birds using specific habitats. Habitats and sites (per 10' square — Fig. 1) surveyed in this manner were:

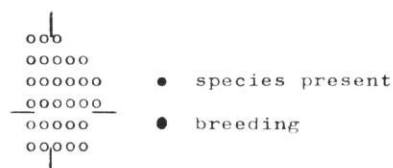
- (i) Floodplain-estuarine wetlands — E3, F4, D2 (2 sites), E4 (2 sites) and E6 (several sites).
- (ii) Coastline (littoral habitats) — E6 (2 sites), also beach-washed seabird patrols (mostly E6).
- (iii) Rainforests — D1, E1.
- (iv) Sclerophyll forests — F2 (2 sites), E5.
- (v) Urban — E3.

Data collected in this way were supplemented by general bird-watching throughout the area.

For the purpose of plotting distribution the district was divided into 30, 10' squares (Fig. 1). An overview of the grid squares covering the district was prepared using the Casino Project Map (1975 edition obtained from Forestry Commission of NSW). The State 1:25 000 Topographic Map Series (1975 *et seq.* issued by the Department of Lands NSW) were used in the field to accurately determine the position of observations.

DISTRIBUTION MAPS

A distribution map in the form of a grid is given for each species. This is a simplified representation of Figure 1, where each 10' square is denoted by a symbol (o). Latitude 29° 00' S. and longitude 153° 00' E. are indicated below.



English names for species recorded are used with the maps. An asterisk in front of the name denotes breeding within the district.

March, 1986

D. G. Gosper: Birds in the Richmond River District

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Emu	Hoary-headed Grebe	*Australasian Grebe	Grey-headed Albatross	Southern Giant-Petrel	Cape Petrel
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Great-winged Petrel	White-headed Petrel	Providence Petrel	Mottled Petrel	Gould's Petrel	Antarctic Prion
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Flesh-footed Shearwater	Wedge-tailed Shearwater	Sooty Shearwater	Short-tailed Shearwater	Fluttering Shearwater	Hutton's Shearwater
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Little Shearwater	Wilson's Storm-Petrel	Australian Pelican	Australasian Gannet	Red-footed Booby	Brown Booby
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Darter	Great Cormorant	*Pied Cormorant	Little Black Cormorant	*Little Pied Cormorant	Least Frigatebird
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White-tailed Tropicbird	*Pacific Heron	*White-faced Heron	*Cattle Egret	Great Egret	Little Egret
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Intermediate Egret	Eastern Reef Egret	*Striated Heron	Rufous Night Heron	Little Bittern	Black Bittern

<pre> ooo ooooo o●oooo ooooooo ooooo● ooooo </pre> <p>Australasian Bittern</p>	<pre> ooo o●ooo o●oooo ●●●●● ●●●●● ●●●● ooooo </pre> <p>*Black-necked Stork</p>	<pre> ooo ooooo o●oooo o●●o● o●●o● ooooo ooooo </pre> <p>Glossy Ibis</p>	<pre> o●o o●●●● ●●●●● ●●●●● ●●●●● ●●o●● ●●o●● </pre> <p>Sacred Ibis</p>	<pre> ●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● </pre> <p>Straw-necked Ibis</p>	<pre> ooo o●ooo o●●●● o●●●● o●●●● o●●●● o●ooo </pre> <p>*Royal Spoonbill</p>
<pre> ooo o●o●● o●o●o● o●o●o● ●●o●o ●●o●o </pre> <p>Yellow-billed Spoonbill</p>	<pre> ooo ooooo ooooooo oo●ooo ooooo ooooo </pre> <p>Wandering Whistling-Duck</p>	<pre> ooo o●ooo ooooooo ooooooo ooooooo oo●oo ooooo </pre> <p>Plumed Whistling-Duck</p>	<pre> ooo o●o●● o●o●o● o●o●o● o●o●● o●o●● o●o●● </pre> <p>*Black Swan</p>	<pre> ooo ooooo ooooooo oo●ooo ooooo ooooo </pre> <p>Freckled Duck</p>	<pre> ●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● ●●●●● </pre> <p>*Pacific Black Duck</p>
<pre> ooo ooooo o●oooo oo●ooo ooooo ooooo </pre> <p>Mallard</p>	<pre> o●o o●ooo o●o●o● o●o●o● o●o●o● o●o●o● o●ooo </pre> <p>*Grey Teal</p>	<pre> ooo ooooo o●oooo ooooooo ooooooo ooooooo ooooo </pre> <p>Chestnut Teal</p>	<pre> ooo ooooo o●oooo o●o●o● ooooo● ooooo● ooooo </pre> <p>Australasian Shoveler</p>	<pre> ooo ooooo ooooooo oo●ooo oo●ooo ooooo ooooo </pre> <p>Pink-eared Duck</p>	<pre> o●o o●o●● o●o●o● o●o●o● o●o●o● o●o●o● o●ooo </pre> <p>*Hardhead</p>
<pre> ●●● ●●●●● ●●●o● ●●●o● ●●●o● ●●●o● o●ooo </pre> <p>*Maned Duck</p>	<pre> ooo ooooo ooooooo ooooooo ooooooo ooo●o ooooo </pre> <p>Green Pygmy-Goose</p>	<pre> ooo ooooo ooooooo ooooooo ooooooo ooooo ooooo </pre> <p>Musk Duck</p>	<pre> ooo ooooo ooooooo ooooooo ooooo● ooooo● ooooo● </pre> <p>Osprey</p>	<pre> o●o o●o●● o●o●o● o●o●o● o●o●o● o●o●o● o●ooo </pre> <p>Black-shouldered Kite</p>	<pre> ooo oo●o● oo●o●o oo●o●o oo●o●o oo●o●o oo●ooo </pre> <p>Pacific Baza</p>
<pre> ooo oo●ooo oo●ooo oo●ooo ooooo ooooo </pre> <p>Black Kite</p>	<pre> ooo ooooo oo●o●o oo●o●o oo●o●o ooooo ooooo </pre> <p>*Brahminy Kite</p>	<pre> ooo o●ooo o●o●o● o●o●o● o●o●o● ooooo ooooo </pre> <p>*Whistling Kite</p>	<pre> ooo ●●o●o o●o●o● o●o●o● o●o●o● o●o●o● o●o●o● </pre> <p>*Brown Goshawk</p>	<pre> ●oo ooooo oo●o●o oo●o●o oo●o●o oo●o●o oo●o●o </pre> <p>Collared Sparrowhawk</p>	<pre> o●● ●●o●● oo●o●o oo●o●o oo●o●o oo●o●o oo●o●o </pre> <p>Grey Goshawk</p>
<pre> ooo ●oooo o●o●o● o●o●o● o●o●o● o●o●o● o●o●o● </pre> <p>*White-bellied Sea-Eagle</p>	<pre> ●●● ●●o●● ●●o●o● ●●o●o● ●●o●o● ●●o●o● ●●o●o● </pre> <p>Wedge-tailed Eagle</p>	<pre> ooo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>*Little Eagle</p>	<pre> ooo ooooo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Spotted Harrier</p>	<pre> ooo ooooo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Marsh Harrier</p>	<pre> ooo ooooo ooooooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Black Falcon</p>
<pre> ooo oo●o● oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Peregrine Falcon</p>	<pre> o●o o●ooo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Australian Hobby</p>	<pre> ooo oo●oo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Brown Falcon</p>	<pre> ●●● ●●o●● ●●o●o● ●●o●o● ●●o●o● oo●o● oo●o● </pre> <p>*Australian Kestrel</p>	<pre> ●o● ●o●o● ●o●ooo ●o●ooo ●o●ooo oo●ooo oo●ooo </pre> <p>*Australian Brush-turkey</p>	<pre> ooo oo●oo oo●ooo oo●ooo oo●ooo oo●ooo oo●ooo </pre> <p>Stubble Quail</p>

March, 1986

D. G. Gosper: Birds in the Richmond River District

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Double-banded
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Large
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*Red-capped
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Broad-billed
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*Little
Tern

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oooo●

Crested
Tern

ooo
ooooo
ooooooo
ooooo●
ooooo
ooooo
ooooo

Common
Noddy

ooo
ooooo
ooooooo
ooooo●
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ooooo
ooooo

Black
Noddy

●●●
●●●●
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ooooo
ooooo

Rose-crowned
Fruit-Dove

●●●
●●●●
●●●●●
●●●●●
●●●●●
ooooo
ooooo

Wompoo
Fruit-Dove

●●●
●●●●
●●●●●
●●●●●
●●●●●
ooooo
ooooo

*Topknot
Pigeon

o●●
●●●●
●●●●●
●●●●●
●●●●●
ooooo
ooooo

*White-headed
Pigeon

o●o
o●o●o
o●o●●●
●●●●●
oooo●
ooooo
ooooo

*Feral
Pigeon

ooo
●●●●
o●●●●
o●●●●
o●●●●
ooooo
ooooo

*Spotted
Turtle-Dove

●●●
●●●●
●●●●●
●●●●●
●●●●●
ooooo
ooooo

*Brown
Cuckoo-Dove

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●
●●●●

Peaceful
Dove

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●
●●●●

*Bar-shouldered
Dove

●●o
o●●●
o●●●●
o●●●●
o●●●●
o●●●
ooooo

*Emerald
Dove

ooo
ooooo
ooooooo
ooooo●
ooooo
ooooo
oooo●

Common
Bronzewing

●●●
●●●●
o●●●●
o●●●●
o●●●●
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o●●●●

*Crested
Pigeon

o●o
o●●●
o●●●●
o●●●●
o●●●●
o●●●●
o●●●●

Wonga
Pigeon

o●o
o●●●
o●●●●
o●●●●
o●●●●
o●●●●
o●●●●

Glossy
Black-Cockatoo

o●o
o●●●
o●●●●
o●●●●
o●●●●
o●●●●
o●●●●

Yellow-tailed
Black-Cockatoo

o●o
o●●●
o●●●●
o●●●●
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ooooo

Galah

March, 1986

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9

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Sulphur-crested
Cockatoo

●●●
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●●●●●
●●●●●

Rainbow
Lorikeet

●●●
●●●●
●●●●●
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●●●●●

*Scaly-breasted
Lorikeet

○○○
○○○○○
○○○○○○○
○○○○○○○
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Musk
Lorikeet

●●●
●●●●○
●●●●●○
●●●●●○
●●●●●
●●●●●

*Little
Lorikeet

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●

Australian
King-Parrot

○○○
○○○○○
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○○○○○

Cockatiel

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○○○○○
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○○○○○○○
○○○○○
○○○○○

Ground
Parrot

●●●
●●●●
●●●●●
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●●●●●
●●●●●

Crimson
Rosella

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●

*Eastern
Rosella

○○○
○○○○○
○○○○○○○
○○○○○○○
○○○○○
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Pale-headed
Rosella

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○○○○○
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○○○○○
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Oriental
Cuckoo

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○○●○○○
○○●○○○

Pallid
Cuckoo

●●●
●●●●
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●●●●●
●●●●●

*Brush
Cuckoo

●●●
●●●●
●●●●●
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●●●●●
●●●●●

*Fan-tailed
Cuckoo

○○○
○●●●●
○●●●●
○●●●●
○●●●●
○●●●●

*Horsfield's
Bronze-Cuckoo

●●●
●●●●
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●●●●●

*Shining
Bronze-Cuckoo

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○○●○○
○○●○○○
○○●○○○
○○●○○○
○○●○○○

Little
Bronze-Cuckoo

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●

*Common
Koel

●●●
○●●○○
●●●○○
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●●●○○

*Channel-billed
Cuckoo

●●●
●●●●
●●●●●
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●●●●●
●●●●●

*Pheasant
Cuckoo

●●●
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Powerful
Owl

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○●●●●
○●●●●○
○●●●●○
○●●●●
○●●●●

Southern
Boobook

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○○○○○○○
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*Barking
Owl

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●○○○○
○○●○○○
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○○●○○○
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Barn
Owl

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○○○○○○○
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Eastern
Grass Owl

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●○○○○○
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Sooty
Owl

●●●
●●●●
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*Tawny
Frogmouth

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Marbled
Frogmouth

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Australian
Owlet-nightjar

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White-throated
Nightjar

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White-throated
Needletail

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Fork-tailed
Swift

●●●
●●●●
●●●●●
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○●●●●○
○●●●●

*Azure
Kingfisher

●●●
●●●●
●●●●●
●●●●●
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●●●●●

*Laughing
Kookaburra

○○○
○●○○○
○●●○○○
○●●○○○
○●●○○○
○●●○○○

*Forest
Kingfisher

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○○○○○
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○○●○○○
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Red-backed
Kingfisher

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●●●●
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*Sacred
Kingfisher

●●●
●●●○○
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●●●●●

*Rainbow
Bee-eater

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●

*Dollarbird

●●●
●●●●
●●●●●
●●●●●
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●●●●●

*Noisy
Pitta

○○○
○○●○○
○○●○○○
○○●○○○
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○○○○○

Albert's
Lyrebird

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ooooooo
ooooooo
ooooo
ooooo
ooooo

Rufous
Scrub-bird

ooo
ooooo
o●oooo
o●oooo
o●oooo
o●ooo
ooooo

*Singing
Bushlark

ooo
ooooo
o●oooo
●●oooo
●●oooo
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ooooo

White-backed
Swallow

●●●
●●●●
●●●●●
●●●●●
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●●●●●

*Welcome
Swallow

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●
●●●●●

*Tree
Martin

●●●
●●●●
o●●●●
o●●●●
o●●●●
o●●●●
o●●●●

*Fairy
Martin

●●●
●●●●
●●●●●
●●●●●
●●●●●
o●●●●
o●●●●

*Richard's
Pipit

●●●
●●●●
●●●●●
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*Black-faced
Cuckoo-shrike

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●●●●
●●●●●
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*White-bellied
Cuckoo-shrike

ooo
o●●●●
o●●●●●
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o●●●●●

*Yellow-eyed
Cuckoo-shrike

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●●●●
●●●●●
●●●●●
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●●●●●
●●●●●

*Cicadabird

ooo
o●●●●
o●●●●●
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o●●●●●

*White-winged
Triller

●●●
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o●●●●●

*Varied
Triller

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*White's
Thrush

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●●●●
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Rose
Robin

ooo
ooooo
ooooo
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o●●oo

Flame
Robin

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

Scarlet
Robin

ooo
ooooo
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o●ooo
o●ooo

*Hooded
Robin

●●●
●●●●
●●●●●
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●●●●●

*Eastern
Yellow Robin

●●●
●●●●
●●●●●
●●●●●
●●●●●
●●●●●
●●●●●

*Jacky
Winter

●●●
●●●●
●●●●●
●●●●●
●●●●●
o●●●●
o●●●●

*Pale-yellow
Robin

●●●
●●●●
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o●●●●●
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Crested
Shrike-tit

●●●
●●●●
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●●●●●

*Golden
Whistler

●●●
●●●●
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*Rufous
Whistler

●●●
●●●●
o●●●●●
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o●●●●●
ooooo

*Little
Shrike-thrush

●●●
●●●●
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*Grey
Shrike-thrush

●●●
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o●●●●●
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ooooo

Black-faced
Monarch

●●●
●●●●
o●●●●●
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ooooo

*Spectacled
Monarch

ooo
●●●●
o●●●●●
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ooooo

White-eared
Monarch

●●●
●●●●
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*Leaden
Flycatcher

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Satin
Flycatcher

●●●
●●●●
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*Restless
Flycatcher

●●●
●●●●
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o●●●●●
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*Rufous
Fantail

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●●●●●

*Grey
Fantail

●●●
●●●●
●●●●●
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●●●●●
●●●●●
●●●●●

*Willie
Wagtail

●●●
●●●●
●●●●●
●●●●●
●●●●●
o●●●●
o●●●●

*Logrunner

●●●
●●●●
●●●●●
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●●●●●
●●●●●

Eastern
Whipbird

ooo
ooooo
ooooooo
ooooooo
ooooooo
ooooo
ooooo

Spotted
Quail-thrush

ooo
ooooo
ooooo●
o●oooo
●●●●●
o●●●●
o●●●●

*Grey-crowned
Babbler

ooo
ooooo
o●●●●
o●●●●
o●●●●
o●●●●
ooooo

*Clamorous
Reed-Warbler

ooo
ooooo
o●●●●
o●●●●
o●●●●
o●●●●
ooooo

Tawny
Grassbird

ooo
ooooo
o●●●●
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*Little
Grassbird

March, 1986

D. G. Gosper: Birds in the Richmond River District

11

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*Golden-headed
Cisticola

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Rufous
Songlark

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ooooo

Brown
Songlark

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*Superb
Fairy-wren

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ooooo
ooooo
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ooooo

*Variegated
Fairy-wren

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*Red-backed
Fairy-wren

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Southern
Emu-wren

ooo
ooooo
ooooo
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Eastern
Bristlebird

ooo
ooooo
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ooooo
ooooo
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ooooo

*Large-billed
Scrubwren

ooo
ooooo
ooooo
ooooo
ooooo
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*Yellow-throated
Scrubwren

ooo
ooooo
ooooo
ooooo
ooooo
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ooooo

White-browed
Scrubwren

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Speckled
Warbler

ooo
ooooo
ooooo
ooooo
ooooo
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*Weebill

ooo
ooooo
ooooo
ooooo
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ooooo
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*Brown
Gerygone

ooo
ooooo
ooooo
ooooo
ooooo
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*Mangrove
Gerygone

ooo
ooooo
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*White-throated
Gerygone

ooo
ooooo
ooooo
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*Brown
Thornbill

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ooooo
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ooooo
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*Buff-rumped
Thornbill

ooo
ooooo
ooooo
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ooooo
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ooooo

*Yellow-rumped
Thornbill

ooo
ooooo
ooooo
ooooo
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*Yellow
Thornbill

ooo
ooooo
ooooo
ooooo
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*Striated
Thornbill

ooo
ooooo
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*Varied
Sittella

ooo
ooooo
ooooo
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ooooo
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*White-throated
Treecreeper

ooo
ooooo
ooooo
ooooo
ooooo
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Red-browed
Treecreeper

ooo
ooooo
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*Brown
Treecreeper

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

Red
Wattlebird

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Little
Wattlebird

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Striped
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Noisy
Friarbird

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Little
Friarbird

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

Regent
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Blue-faced
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

Bell
Miner

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Noisy
Miner

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Lewin's
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
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ooooo

*Yellow-faced
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

Mangrove
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
ooooo
ooooo

*Yellow-tufted
Honeyeater

ooo
ooooo
ooooo
ooooo
ooooo
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*Fuscous
Honeyeater

ooo
ooooo
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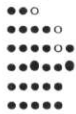
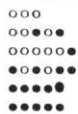
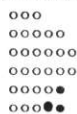
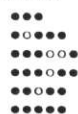
Black-chinned
Honeyeater

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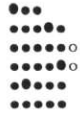
*White-throated
Honeyeater

ooo
ooooo
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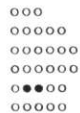
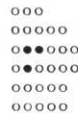
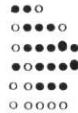
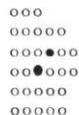
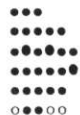
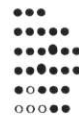
White-naped
Honeyeater

*Brown
HoneyeaterNew Holland
Honeyeater*White-cheeked
Honeyeater*Tawny-crowned
HoneyeaterEastern
Spinebill*Scarlet
Honeyeater

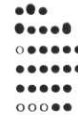
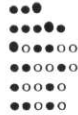
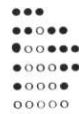
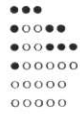
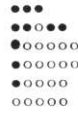
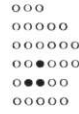
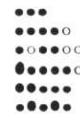
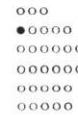
*Mistletoebird

*Spotted
Pardalote*Striated
Pardalote

*Silvereye

European
Goldfinch*House
Sparrow*Red-browed
FiretailDiamond
FiretailZebra
Finch*Double-barred
FinchPlum-headed
Finch*Chestnut-breasted
Mannikin*Nutmeg
Mannikin*Common
Starling*Olive-backed
Oriole

*Figbird

*Spangled
Drongo*Satin
Bowerbird*Regent
BowerbirdGreen
Catbird*Paradise
RiflebirdWhite-winged
Chough*Australian
Magpie-lark*White-breasted
WoodswallowWhite-browed
Woodswallow*Dusky
WoodswallowLittle
Woodswallow*Grey
Butcherbird*Pied
Butcherbird*Australian
Magpie*Pied
CurrawongAustralian
Raven*Torresian
Crow

RESULTS

Distributions recorded for 333 species in the Richmond River district are shown individually. Of these at least 18 were pelagic species, most being found as beach-washed derelicts only. Their occurrence in the district proper is apparently accidental (cf. Gosper 1981b).

Thirty species were recorded from all 30 grid squares. A further 52 species were recorded from 24 or more squares (i.e. >80% of the district). Such widespread species appear to survive in a broad range of habitats. In particular they are able to utilise sclerophyll forests (including remnants and regrowth) and/or mainly cleared country. Areas of one or both occur to some extent in all 30 grid squares covering the district. As data were collected consistently over a period of almost eleven years the maps record periodic incursions of some species into the district that accompanied extremes in climatic conditions affecting the eastern part of the Australian continent. In particular, were the extremely wet years of 1974-1976 and the disastrous and widespread drought which developed in the early 1980's.

Evidence of breeding was recorded for only 151 species, no doubt largely a reflection of the amount of effort devoted to searching for nests. Breeding distribution was poorly recorded in most species (cf. Fig. 5).

DISCUSSION

The maps should be regarded as indicative, rather than a definite record, of the local distribution of individual species. Interpretation of local distribution on a 10' basis present some difficulties as the 10' unit is relatively coarse, particularly in terms of mapping vegetation types and altitude. For future work the use of 5' squares is recommended. Experience gained from this survey indicates that by using the 10' scale it is not possible in most instances to identify the environmental component(s) limiting distribution. However a comparison of bird distribution maps with Figures 2, 3 and 4 (altitude, rainfall and vegetation maps) suggests that local distribution patterns of some species may be linked to one (or a combination) of these factors.

Altitude

The local distribution of some species appears superficially to have an altitudinal basis. In this

	1	2	3	4	5	6
B	137 8	141 7	112 8			
C	136 5	165 16	134 10	133 9	134 11	
D	134 22	176 21	168 15	144 24	114 9	161(+8) 21
E	152 15	150 5	205 44	181 25	169(+2) 10	203(+15) 37
F	129 8	145 40	130 9	168 14	180(+5) 9	
G	81 4	126 13	119 8	107 6	110(+1) 4	

Figure 5. Number of species recorded in each grid square.

Top: species present (in brackets, additional species beach-washed only).

Bottom: species breeding.

district the Crimson Rosella, Red-browed Tree-creeper, Bell Miner and White-naped Honey-eater are species associated with the higher elevations of the Ranges. All are resident down to 200m with Red-browed Tree-creepers down to 120m in the southern parts of the Richmond Range. White-naped Honey-eaters occasionally and Crimson Rosellas frequently are met at lower elevations in winter. All are typical Bassian forms and are resident down to sea level in the southern parts of their range in south-eastern Australia. It is unlikely that altitude directly limits local distribution in such instances. Rather altitude may be a factor affecting vegetation. The distribution pattern of these species is possibly a reflection of the distribution of vegetation forms associated with ranges (e.g. wet sclerophyll forests, Figs 2 and 4). In the case of the White-naped Honeyeater competition with the tropical White-throated Honeyeater in the north-east of NSW may also act to restrict it to heavy forests (G. Holmes pers. comm.).

The present distribution of the Rufous Scrub-bird, Eastern Bristlebird and Paradise Riflebird, all of which have marked lower altitudinal limits, may be linked to historical causes stemming from the almost complete destruction of lowland rainforest by the early part of this century. All three species formerly occurred in the Big Scrub for example (Chisholm 1951). Now, the Rufous Scrub-bird is found only above 600m, the Eastern Bristlebird above 300m (G. Holmes pers. comm.) while the Paradise Riflebird is resident down to 200m and is recorded occasionally at lower elevations in winter.

Some rainforest species show upper altitudinal limits although this is not apparent from the maps. The Little Shrike-thrush, Spectacled Monarch, White-eared Monarch and Wompoo Fruit-Dove appear to be absent from the higher parts of the watershed ranges (i.e. above 800m).

A marked altitudinal shift in distribution, on a seasonal basis, is evident in at least two species, the Rose Robin and Noisy Pitta. Between October and February the Rose Robin has been found in only a few places at elevations above 500m but in autumn and winter it is a common non-breeding visitor throughout the area. The Noisy Pitta which is apparently absent below 150m in spring and summer, is found down to sea level in suitable habitat in winter.

Rainfall

It is doubtful whether the apparent limits in local distribution of any species is attributable to rainfall alone. However a pronounced gradient is evident in rainfall from the drier south-western and central parts of the district to the wetter north and north-east (Fig. 3). Marked changes in soil types (McGarity and Vivian 1961) and in the natural vegetation (Fig. 4) occur along this gradient. This importantly affects local distribution of birds. Species adapted to wet areas tend to be concentrated in an arc across the northern parts of the district whilst, at the other extreme, in the drier south-west, a number of essentially inland species reach their easternmost (coastal) limits. Extending into this area are Hooded Robins, White-winged Choughs, Diamond Firetails, White-backed Swallows, Weebills and Speckled Warblers.

Rainfall outside the district, particularly widespread flooding or drought over inland south-eastern Australia, appears to have an important bearing on the abundance and local distribution of some birds (cf. Gosper *et al* 1983). Red-chested Button-quails, Black Kites, Freckled Ducks and Singing Bushlarks irrupted into the district, apparently in response to a severe inland drought. Others including Pallid Cuckoos, White-winged Trillers, Rufous Songlarks, Pink-eared Ducks and Red-kneed Dotterels became locally plentiful at such times whereas these species were scarce or even absent in most other years.

Habitat/ Vegetation Types:

Examples of species associated with or restricted to each of the broad habitat types distinguished are listed. In some instances local distribution may reflect a more specific association between particular species and vegetation types but such associations are not generally evident from data presented at the 10' scale.

Rainforests: The Pale-yellow Robin, Paradise Riflebird, Yellow-throated Scrubwren, Green Catbird, Marbled Frogmouth, Albert's Lyrebird and Wompoo Fruit-Dove are examples of species appearing dependent upon primary rainforest. Others such as the Regent Bowerbird, Brown Cuckoo-Dove, Emerald Dove and Large-billed Scrubwren are less restricted, also utilizing contiguous wet forests and scattered rainforest remnants. A few species range more widely still. White-headed and Topknot Pigeons may forage well away from rainforest proper, including mainly cleared country, especially where Camphor Laurels are common (cf. Frith 1982). Little Shrike-thrushes and Brown Gerygones frequent impoverished rainforest associations along water courses in otherwise dry forest and/or mainly cleared country.

Sclerophyll forests: There is a large bird fauna common to sclerophyll forests generally. Many of these species also utilize mainly cleared country (i.e. with sclerophyll remnants, timber bordering water courses, urban parkland) as well as coastal heathlands and, to a lesser extent, rainforest. Three broad subforms of sclerophyll forest are distinguished here. The distribution patterns of a few species suggest marked preferences for particular subforms.

Dry sclerophyll: Brown Treecreepers, Black-chinned Honeyeaters, Fuscous Honeyeaters, Common Bronzewing, Blue-faced Honeyeaters and Little Friarbirds. The distribution of the first three mentioned appears to be closely linked with that of Spotted Gum (see Fig. 4; pers. obs.).

Wet sclerophyll: White-naped Honeyeaters, Bell Miners and Red-browed Treecreepers.

Swamp sclerophyll: Striped Honeyeaters, Mangrove Gerygones and Mangrove Honeyeaters, the last two being dependent on estuarine mangrove communities.

Honeyeaters (Meliphagidae) are a conspicuous element of sclerophyllous communities in the district (unpub. data). Dry sclerophyll in particular appears relatively rich in nectar feeding species when compared to wetter forests, especially rainforest and former rainforest covered areas (cf. Figs. 4 and 6).

Coastal heaths: Southern Emu-Wrens, Ground Parrots and Tawny-crowned Honeyeaters are restricted to this habitat.

Wetlands: The distribution of waterbirds is concentrated on the floodplain (cf. Gosper 1981a). Species that are widespread (e.g. Pacific Black Duck, Little Pied Cormorant, Dusky Moorhen and Pacific Heron) are typically able to utilize streams, small bodies of water such as farm dams and/or wet pastures. Most palaeartic waders (Charadriiformes) are associated with the river estuaries (particularly the Richmond) and to a lesser extent the floodplain and coastline.

Coastline: Species typically distributed along the coastline include the Pied Oystercatcher, Little Tern, Common Tern and Osprey. Some predominantly associated with the coastline and estuaries, notably the Crested Tern, Silver Gull, Brahminy Kite, Pied Cormorant and Striated Heron, also disperse up river to the tidal limits and occasionally beyond.

Mainly cleared country: There is cleared country in all parts of the district except grid square G1, and with limited areas only in B3, G4 and G5 (Fig. 4). The widespread occurrence of Pied Butcherbirds, Australian Magpie-larks, Richard's Pipits, Crested Pigeons, Yellow-rumped Thornbills, Straw-necked Ibises and Masked Lapwings

	1	2	3	4	5	6
B	14	12	6			
C	10	10	10	7	8	
D	11	12	12	6	4	13
E	15	13	13	11	14	12
F	14	17	14	15	15	
G	13	14	15	15	15	

Figure 6: Number of honeyeater species (Meliphagidae) recorded in each grid square.

exemplify the extent of open country. Black-shouldered Kites, Barn Owls, Tawny Grassbirds, Golden-headed Cisticolas, Galahs, Chestnut-breasted Mannikins, Cattle Egrets and most quail species appear to prefer areas subject to more intensive agricultural use, mainly in the floodplain and towards the coast.

A synopsis of the number of species recorded and breeding in each grid square in the district is shown in Fig. 5. Limitations imposed by the methods by which these data were obtained and presented (see Aston and Balmford 1978, for discussion of some of the problems) permit only a general interpretation of distribution at a district level. Clearly, as no systematic attempt was made to actually map distribution on a square by square basis, species totals for most squares are by no means exhaustive.

The comparatively high species total for squares on the floodplain and along the coast reflect mainly the contribution of wetland species including Palaeartic waders and/or seabirds. Additionally squares E3 and E6, with the highest totals, received more intensive coverage because of observer residence and/or specific surveys

carried out at sites in these squares. The low total for G1 for example resulted from the small portion of the study area falling within that square (Fig. 1), minimal visitation and perhaps low diversity of habitat.

There are indications that the area north-east of Lismore (centred on grid square D5) may be somewhat impoverished in its present avifauna relative to adjacent parts of the district (cf. Figs. 4 and 5; also Fig. 6 pers. obs.). This area was formerly covered by the Big Scrub rainforest which was cleared 80 years ago. Today this area is mainly farmland with increasing growth of small tropical fruit and Macadamia holdings, hobby farms and closer settlement generally. Several small rainforest remnants remain and scrubby softwood regrowth (including Camphor Laurel) is common, especially along creeks.

A possible contributing factor to the apparent low diversity of birds is the absence of naturally occurring eucalypts from this area. Unlike other parts where, even in mainly cleared country scattered eucalypts occur, this area appears to lack the regular presence of certain birds that may otherwise be expected. Examples include Jacky Winters, Buff-rumped Thornbills, Dusky Woodswallows, Peaceful Doves, Little Lorikeets, Varied Sittellas, Striated Pardalotes, Double-barred Finches, White-bellied Cuckoo-shrikes and many honeyeaters (cf. Fig. 6).

ACKNOWLEDGEMENTS

I wish to thank Bill Watson, Graeme Fraser, John Izzard and Glenn Holmes, all of whom were resident in the district at some time during the period covered by this report, for sharing their knowledge of birds in the area. I also thank Glenn Holmes for comments on drafts of the paper and Miss B. Williams who typed the manuscript.

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