Amytornis
WESTERN AUSTRALIAN JOURNAL OF ORNITHOLOGY
Volume 2 (2010) 29-41
ARTICLE

The foraging behaviour of woodland birds along the mulga-eucalypt line on Mt. Gibson Station, Western Australia during late winter and spring

Harry F. Recher[1, 2] and William E. Davis Jr.[3]

[1] School of Natural Sciences, Edith Cowan University, Joondalup, Western Australia, Australia 6027
[2] P.O. Box 154, Brooklyn, New South Wales, Australia 2083. *Email: hjrecher@bigpond.com*
[3] 23 Knollwood Drive, East Falmouth, MA 02536, USA. *Email: wedavis@bu.edu*

Abstract. The foraging behaviour of woodland birds on Mt Gibson Station along the mulga-eucalypt line in Western Australian (WA) is described for two plant associations, Salmon Gum/York Gum (*Eucalyptus salmonophloia/E. loxophleba*) woodland and York Gum/Cypress Pine (*Callitris glaucophylla*) woodland. Seventy-seven species of terrestrial birds were recorded, with 43 found in both woodlands. Foraging data were obtained for 39 species. Of these, 24 were arthropod-eaters, six were herbivores (foliage and seed-eaters), and nine were honeyeaters (Meliphagidae) taking nectar, fruit and other carbohydrates (lerp and honeydew), as well as arthropods. Among the arthropod-eaters, there was one group that foraged more frequently on *Acacia* and *Callitris* and a second that foraged more frequently on *Eucalyptus*. These were not absolute distinctions, with most species using a range of plants, but it highlights the importance for birds of non-eucalypt plant genera. Eucalypts were the main source of nectar and other carbohydrates taken by honeyeaters. Herbivores, of which four were parrots, fed on young leaves, flowers and flower buds, seeds and seed pods, and fruit. Foraging resources were allocated among species by habitat, plant species, foraging height, food type, and prey-attack behaviour.

Keywords. eucalypt woodland birds, foraging behaviour, resource allocation, mulga-eucalypt line, Salmon Gum, York Gum, Cypress Pine

Introduction

This is the third in a series of papers describing the foraging profile of eucalypt forest and woodland birds in Western Australia (see Recher and Davis 1998, 2002). The observations presented here are from York Gum (*Eucalyptus loxophleba*) and Salmon Gum (*E. salmonophloia*) woodlands along the mulga-eucalypt line on Mt. Gibson Station immediately north of the wheatbelt. The "line" represents a transition zone between the birds of the more arid Mulga (*Acacia aneura*) shrublands to the north and east, and the less arid eucalypt woodlands to the south and west (Serventy and Whittell 1962). The series describes the foraging behaviours of eucalypt forest and woodland birds during the late winter and spring in Western Australia, with the aim of identifying the foraging resources used by birds and the ways in which these resources are apportioned among species. Describing the foraging profile of entire avian assemblages is effective for comparing the ecology of species sharing the same habitat and exposed to the same environmental conditions. In this paper, we describe how eucalypt woodland birds on the mulga-eucalypt line forage, the type of food taken, and the substrates and plants used. Data are also presented on species abundances, assemblages, and habitats.

Birds Australia
CONSERVATION THROUGH KNOWLEDGE

A Publication of:
Birds Australia
Western Australia

Methods

Study area

We worked on Mt. Gibson Station (29°36'S, 117° 24'E) 350 km northeast of Perth, Western Australia. Data were collected 8-13 September and 3-6 October 2000, 14-18 August 2001, 6-9 July 2002, and 4-11 September 2003 from 11 sites. Annual rainfall at Mt. Gibson is 350 ± 101 mm (mean ± SD; 1983-2008); rainfall was 479 mm in 2000, 345 in 2001, 191 in

2002, and 336 in 2003. Mean monthly maximum temperature is 17°C in June and 35°C in January (at Dalwallinu; 30°17'S, 116°40'E). Rainfall is greatest in winter (May-July; mean 124 ± 56 mm) and least in summer (November-January; 61 ± 44 mm). Climate data from Mt. Gibson Station records and the Commonwealth of Australia, Bureau of Meteorology.

For the decade preceding this study, grazing by sheep and goats on Mt. Gibson Station was progressively reduced and large areas had never been grazed. As a result, much of Mt. Gibson retains its original vegetation, with intact shrub and ground vegetation layers. Eleven sites dominated by Salmon Gum or York Gum were selected to include areas grazed and ungrazed by domestic animals. Distances between sites were from 2 to 20 km. Each site was about 10 ha in area (after Recher and Davis 1998, 2002). Two ungrazed sites, one dominated by Salmon Gum, the other by York Gum, were burnt in a wildfire in December 2000 and were not sampled after burning.

For each site, the dominant canopy, understorey, shrub, and ground vegetation plants were listed. Canopy height, height of emergents, extent and height of the understorey and shrub layers, and percent cover of bare ground, ground vegetation, litter and woody debris (including logs), and an average height range for ground, shrub, subcanopy, and canopy vegetation were estimated by HFR.

Foraging data

Observations commenced shortly after sunrise and continued to dusk. We began at a different site each day and minimized recording data on the same individuals on the same day by moving between sites.

Foraging was recorded for birds encountered. For each individual, we recorded up to five consecutive foraging manoeuvres following Recher and Gebski (1989). Only manoeuvres in which the bird obtained or attempted to obtain food were recorded ('prey attacks'). We recorded the species of bird, the substrate and height of the prey, and the manoeuvre used by the bird following the terminology in Recher *et al.* (1985) and Recher and Davis (1998, 2002). Some uncommon manoeuvres, such as snap, have been deleted or combined; in this paper, hover/hawk, hover/snatch, and hover/glean are combined with hover.

Species abundances

Following the procedures of Recher and Davis (2002), the number of individuals of each species heard or seen at each site was recorded. Seven such counts were completed in Salmon Gum/York Gum woodland and 10 in York Gum/*Callitris* woodland. Abundant species were recorded in orders of magnitude (i.e., 1-10, 10-100, 100-1000, and >1000 individuals). Recording some species in orders of magnitude is necessary as their numbers, flocking behaviour, and frequent movement preclude precise counts while other data are collected. Names for species of birds are given in Appendix 1.

Data analysis and presentation

For each species we present the number of foraging manoeuvres observed, the percent use of substrates and manoeuvres, percent use of vegetation layers, and the mean and standard deviation of foraging heights. Data are also presented on the use of plant species and genera. As we could not always assign a plant to genus or species, some data are grouped by plant type (e.g., shrub, ground vegetation). Data from all sites and years are combined. Not all data were recorded for every observation and the number of observations for different categories (e.g., manoeuvre and substrate) may not always agree.

Bird species for which we recorded fewer than 10 foraging manoeuvres are not presented in the tables. Although substrates were recorded as finely as possible, sample sizes for many categories were too small for analysis and have been grouped as Ground (bare ground, litter, logs, and coarse woody debris), Bark (small and large branches, trunks, loose and hanging bark), and Foliage (twigs, petioles, and eucalypt seed capsules). Foraging at flowers was separated as taking nectar or feeding on arthropods. Due to small sample sizes, dead substrates are not separated from live.

Results

Site characteristics and descriptions

The vegetation at bird foraging sites differed structurally and floristically, with four sites dominated by Salmon Gum and seven by York Gum. Cue York Gum (*E. straiaticalyx*) occurred in association with Salmon Gum and mallee eucalypts (*Eucalyptus* spp.) on one site. White Cypress Pine (*Callitris glaucophylla*) was a significant component of the understorey within woodlands dominated by York Gum (Table 1). Mistletoes were common in the eucalypt canopy throughout.

At all sites litter was concentrated at the base of trees, within clumps of shrubs, against logs and among coarse woody debris (Table 1), with 40-60% of the ground surface bare. Within stands of trees canopy cover ranged from nearly continuous (York Gum) to less than 10% (Salmon Gum), but overall was less than 20%. Sites dominated by Salmon Gum tended to be open, with few shrubs and sub-canopy plants. Shrub and sub-canopy layers were variable between sites, with the tallest shrubs and most extensive shrub layers occurring in association with York Gum. There was little ground vegetation (<5-10% cover).

Table 1. Soil, topography, structure, and floristics of the two woodland types sampled for bird foraging studies at Mt. Gibson Station on the mulga-eucalypt line of Western Australia during 2000-2003. Number of sites in parentheses.

Woodland	York Gum/Cypress Pine (*n* = 7)	Salmon Gum/York Gum (*n* = 4)
Soil	Sandy, red loam; some with gilgai	Clayey, red loam
Topography	Lower; run-on areas	Higher; run-off areas
Grazing History	Grazed and ungrazed; areas continue to be grazed by sheep	Grazed and ungrazed; no grazing in the past decade
Canopy Layer	Even-aged York Gum 10-15 m; some Salmon Gum to 20 m	Stands of Salmon Gum 30-35 m; patches of York Gum 15 m; one site with Cue York Gum and mallees
Sub-canopy	Cypress Pine to 6 m along edge of York Gum stands	Limited; a few sapling eucalypts
Shrub Layer	Patchy, but well-developed and vertically structured, species rich shrub layer with Cypress Pine; shrubs to 4 m; *Acacia, Senna, Eremophila, Exocarpos, Grevillea, Melaleuca, Olearia, Santalum* spp.	Patchy, vegetation to 3 m away from tree canopy; same genera occur as with York Gum, but Cypress Pine absent; some sites with saltbush *Atriplex* sp. forming a low shrub layer
Ground	Extensive bare ground with windblown litter; abundant coarse woody debris; sparse ground vegetation	Extensive bare ground with windblown litter; abundant coarse woody debris; sparse ground vegetation

Bird species richness and community composition

We recorded 77 species of terrestrial birds; 50 species in Salmon Gum/York Gum woodland and 57 in York Gum/Cypress Pine woodland, with 43 species shared (Appendix 1). Most species were uncommon. Two-thirds of the 64 species recorded during counts (n = 17) occurred on fewer than eight counts. In York Gum/Cypress Pine woodland (10 counts), 11 species (19 %), and in Salmon Gum/York Gum woodland (7 counts), 16 species (32 %), were only recorded on a single count. The Weebill was the only species to occur on all counts (Table 2).

Among frequently recorded species, Chestnut-rumped and Inland Thornbills, Rufous Treecreeper, Red-capped Robin, and Weebill were more abundant in York Gum/Cypress Pine woodland (Table 2). Striated Pardalotes were equally common in Salmon Gum/York Gum woodland and York Gum/Cypress Pine woodland. Galah, Australian Ringneck, Red Wattlebird, and Tree Martin were more abundant in Salmon Gum/York Gum woodlands (Table 2). Among nectar-feeders, Spiny-cheeked Honeyeater was recorded more frequently in York Gum/Cypress Pine woodland (Table 2), but it, Red Wattlebird, and Brown, Grey-fronted, and White-fronted Honeyeaters were most abundant in Salmon Gum/York Gum woodland (Table 3a). White-eared Honeyeater and Yellow-throated Miner were more abundant in York Gum/Cypress Pine woodland (Table 3a).

Foraging behaviour

We recorded 10 or more prey attacks for 39 species of birds. Species were classified as arthropod-eaters (24 spp.), herbivores (foliage and seed eaters; 6 spp.), and

Table 2. Most frequently recorded woodland bird species on Mt. Gibson Station during late winter and spring, 2000-2003. Species are ranked in order of frequency of occurrence (number of censuses reported) and abundance (maximum number of individuals in any one census) separately for York Gum/Cypress Pine and Salmon Gum/York Gum.

York Gum/Cypress Pine woodland (10 counts)			Salmon Gum/York Gum woodland (7 counts)		
Bird Species	**Frequency**	**Abundance**	**Bird Species**	**Frequency**	**Abundance**
Weebill	10	100-1000	Weebill	7	10-100
Chestnut-rumped Thornbill	10	10-100	Tree Martin	6	10-100
Spiny-cheeked Honeyeater	10	15	Striated Pardalote	6	10-100
Red-capped Robin	9	30	Red Wattlebird	5	10-100
Grey Shrike-thrush	9	8	Australian Ringneck	5	10-100
Australian Raven	9	4	Galah	5	10-100
Striated Pardalote	8	10-100	Rufous Treecreeper	5	10
Rufous Treecreeper	8	25	Chestnut-rumped Thornbill	5	5
Inland Thornbill	8	20	Red-capped Robin	5	3

nectar-feeders (honeyeaters; 9 spp.) according to the most abundant food types taken.

Arthropod-eaters

Foraging manoeuvres

Gleaning was the most common prey-attack manoeuvre observed for birds feeding on arthropods (Table 4a). Eight species (33%) took food by gleaning on more than 85% of observations. Black-faced Cuckoo-shrike and Rufous Whistler foraged primarily by snatching (>70% of observations). Red-capped Robin and Jacky Winter were pouncers (>50% of observations), while four species (Rainbow Bee-eater, Grey Fantail, Dusky Woodswallow, and Tree Martin) were aerial foragers taking prey by hawking and/or sweeping (Table 4a). Willie Wagtails flitted. They also hawked, often taking two or more insects in one flight. Nine species (38%) gleaned (56-77% of observations), but also probed (Black-capped Sittella), hawked (Western Warbler and Willie Wagtail), hovered (Weebill) or used a diversity of foraging manoeuvres (Chestnut-rumped and Inland Thornbills, Grey Shrike-thrush, and White-winged Triller; Table 4a).

Foraging substrates

Ten species (42%) took more than 50% of their prey from the ground (Tables 5a, 6a). Two of these, Willie Wagtail and Jacky Winter, took prey from the ground and air. The Black-capped Sittella specialised) in bark foraging (92% of observations). Nine species (38%) were foliage foragers (>60% of observations). Four species foraged primarily on flying insects (>70% of observations). Dusky Woodswallow also took prey from the ground and ground vegetation. Grey Fantail mostly took insects in flight, but also gleaned, pounced, snatched, and flushed insects from ground vegetation, tree trunks, and foliage, which were then caught in air.

Foraging heights

Grey Fantail, Chestnut-rumped Thornbill, and White-winged Triller foraged mainly in the shrub layer, but also took food from the ground, sub-canopy, and canopy (Table 6a). Five species (21%) foraged mainly in the sub-canopy, with the Striated Pardalote foraging equally in the sub-canopy and canopy. Five species foraged in the canopy or above (>50% of observations). Two of these species, Dusky Woodswallow and Black-capped Sittella, also took prey from the ground and/or lower layers of vegetation.

Six percent of foraging observations for Weebill and 14% for Striated Pardalote were of birds foraging

Table 3. (a) Foraging for nectar by honeyeaters (Meliphagidae) and species abundances, with percent frequency of occurrence during censuses in parentheses, on Mt. Gibson Station during late winter and spring, 2000-2003. Numbers are percent nectar-feeding of total foraging observations (*n*) and the percent of nectar-feeding recorded for York Gum and Salmon Gum, *Eremophila* spp., and other shrubs, including *Grevillea* and *Hakea*. YG/CP is York Gum/Cypress Pine woodland; SG/YG is Salmon Gum/York Gum woodland. (b) Other birds that took nectar.

			% nectar-foraging on various plants				Species abundances (%)	
(a) Honeyeaters	***n***	**% Nectar foraging**	**Shrubs**	***Eremophila***	**York Gum**	**Salmon Gum**	**YG/CP**	**SG/YG**
Red Wattlebird	59	17	0	0	50	50	1 (30)	10-100 (71)
Brown-headed Honeyeater	149	48	14	0	86	0	20 (60)	30 (57)
Singing Honeyeater	20	50	0	0	50	50	1 (30)	2 (14)
Grey-fronted Honeyeater	265	53	23	14	28	35	30 (20)	10-100 (43)
Brown Honeyeater	129	53	7	0	86	7	30 (5)	10-100 (57)
White-eared Honeyeater	57	54	0	0	100	0	6 (70)	0 (0)
Spiny-cheeked Honeyeater	226	65	0	7	79	14	15 (100)	10-100 (29)
White-fronted Honeyeater	75	78	0	9	30	61	10-100 (40)	100-1000 (14)
Yellow-throated Miner	286	80	0	33	67	0	15 (40)	10 (29)

(b) Other birds that took nectar	***n***	**% Nectar foraging**	**Shrubs**	***Eremophila***	**% York Gum**	**% Salmon Gum**
Chestnut-rumped Thornbill	508	1	0	0	100	0
Inland Thornbill	208	1	0	0	100	0
Australian Ringneck	211	23	0	10	90	0
Striated Pardalote	521	11	0	0	91	9
Weebill	529	2	0	0	91	9

on the ground (Table 6a), an uncommon foraging substrate for these species. With both, ground-foraging was associated with cold and rain. Weebills foraged for ants (*Iridomyrmex* sp.), while pardalotes foraged for lerp that had been dislodged from the canopy. There were also unusual observations (33%; 5 observations) of Australian Magpie, typically a ground-forager, foraging in Salmon Gums, where they took lerp from foliage during an outbreak of a large *Glycaspis* psyllid.

Plant species

Among arthropod-eaters, there were two groups; those that foraged more often in *Acacia* spp. and *C. glaucophylla* and those that foraged more often in *Eucalyptus* spp. (Table 7a). The distinction was not absolute; most species foraged on a broad range of plants (Table 7a). Greater than 55% of the observations of Western Warbler, Splendid Fairy-wren, and Black-eared Cuckoo were of individuals foraging in *Acacia* spp., while >30% of the observations of Inland, Chestnut-rumped, and Yellow-rumped Thornbills, Redthroat, and Grey Fantail were of birds foraging in *C. glaucophylla* (Table 7a). Eight species took >50% of their prey from eucalypts (Table 7a). Among eucalypt specialists, York Gum was used most frequently, with seven species taking >40% of their prey from York Gum. Two species took >45% of their prey from Salmon Gum; Rufous Treecreeper (47%) and Black-capped Sittella (54%). Rufous Treecreeper foraged equally often in York Gum (47%) and used mallee eucalypts on 5% of occasions.

Table 4. Percent use of foraging manoeuvres (prey-attack behaviour) on Mt. Gibson Station, late winter and spring, 2000-2003. (a) Arthropod-eaters; (b) Herbivores; (c) Nectar-feeders

Species/Foraging Guild	*n*	Foraging Manoeuvre							
		Pounce	Probe	Glean	Hang/ glean	Hover	Snatch	Hawk	Sweep
(a) Arthropod-eaters									
Glean									
Australian Magpie	15	0	0	100	0	0	0	0	0
Redthroat	75	0	0	100	0	0	0	0	0
Southern Whiteface	363	0	3	97	0	0	1	0	0
Yellow-rumped Thornbill	130	0	0	96	2	1	1	0	0
Rufous Treecreeper	288	0	8	91	0	0	1	0	0
Striated Pardalote	521	0	10	85	2	1	2	0	0
Black-eared Cuckoo	23	0	0	96	0	0	4	0	0
Splendid Fairy-wren	226	0	1	95	0.5	1	2	0.5	0
Glean and Probe									
Black-capped Sittella	36	0	28	72	0	0	0	0	0
Glean and Hawk									
Western Warbler	13	0	0	77	0	0	8	15	0
Willie Wagtail	91	3	0	64	0	0	1	32	0
Glean and Hover									
Weebill	529	0	2	62	5	24	6	1	0
Glean and Snatch									
Chestnut-rumped Thornbill	507	0.1	4	72	0	8	11	5	0
Inland Thornbill	207	0	1	76	1	4	16	2	0
Grey Shrike-thrush	29	3	10	70	0	0	17	0	0
White-winged Triller	27	0	4	56	0	0	33	7	0
Snatch									
Black-faced Cuckoo-shrike	29	0	0	3	0	0	97	0	0
Rufous Whistler	135	0	1	19	0	1	73	6	0
Pounce									
Red-capped Robin	350	67	0	14	1	3	10	5	0
Jacky Winter	254	51	0	2	0	4	9	34	0

Table 4. Continued.

Species/Foraging Guild	Foraging Manoeuvre								
	n	Pounce	Probe	Glean	Hang/ glean	Hover	Snatch	Hawk	Sweep
Aerial									
Rainbow Bee-eater	10	0	0	0	0	0	0	100	0
Grey Fantail	105	4	0	6	0	3	15	72	0
Dusky Woodswallow	57	14	0	0	0	0	2	49	35
Tree Martin	567	0	0	0	0	0	0	0	100
(b) Herbivores									
Glean									
Bourke's Parrot	30	0	0	100	0	0	0	0	0
Common Bronzewing	92	0	0	100	0	0	0	0	0
Emu	38	0	0	100	0	0	0	0	0
Galah	40	0	0	100	0	0	0	0	0
Australian Ringneck	211	0	0	100	0	0	0	0	0
Regent Parrot	26	0	0	100	0	0	0	0	0
(c) Nectar-feeders									
Probe									
Singing Honeyeater	20	0	100	0	0	0	0	0	0
White-fronted Honeyeater	286	0	80	2	0	0.8	2	15	0
White-eared Honeyeater	57	0	94	4	0	0	0	2	0
Yellow-throated Miner	75	0	81	19	0	0	0	0	0
Spiny-cheeked Honeyeater	226	0	65	24	0.1	1	3	7	0
Brown Honeyeater	129	0	61	29	0	1	0	9	0
Brown-headed Honeyeater	149	0	56	31	12	0	1	0	0
Grey-fronted Honeyeater	265	0	53	35	1	2	3	6	0
Glean									
Red Wattlebird	59	0	17	64	0	0	0	19	0

Foliage/Fruit/Seed-eaters

We classed five species as foliage/fruit/seed-eaters (Table 7b). In addition, Common Bronzewing fed on seeds taken from the ground (Table 5b), but not from vegetation. These six species foraged by gleaning (Table 4b), with Bourke's Parrot and Galah foraging from the ground or ground vegetation (Tables 6b, 7b). Excluding the Common Bronzewing, a granivore, five species are shown in Table 5 as herbivores. Bourke's Parrot, Galah, and Emu foraged primarily on young foliage, which may have included seeds and flowers (>50% of observations). Emu and Galah fed (>25% of observations) on green seed pods taken from ground vegetation and, for the Emu, from shrubs (39%), principally *Acacia* spp. (28% of observations where the plant species was identified; Tables 6b, 7b). Australian Ringneck foraged on green eucalypt capsules (49%), with York Gum (39%) taken more often than Salmon Gum (18%). They also fed at flowers (23%), taking nectar from a variety of shrub species, including *Eremophila* spp. (3%), ate young leaves from ground plants (7%), and took lerp and scale insects from eucalypt foliage. Regent Parrots fed on *Exocarpos aphyllus* fruit (20%), ate leaves and flower buds of saltbush *Atriplex* sp. (4%), and took lerp from Salmon Gum (76% of observations; Table 6b).

Nectar-feeders

Fourteen species were recorded feeding on nectar (Table 3). Nine were honeyeaters (Meliphagidae) (Table 3a), eight of which foraged primarily by probing (>50% of observations; Table 4c). Probing was principally associated with taking nectar (>45%; Table 5c), but Red Wattlebird (10%), White-eared (41%), Brown (11%), and Brown-headed (11%) Honeyeaters probed under loose and decorticating bark (Table 5c), where they took honeydew. Gleaning foliage was the next most common foraging behaviour of honeyeaters (Table 4c) and was primarily associated with taking lerp from eucalypts. Hawking insects was a frequent

Table 5. Percent use of substrates on Mt. Gibson Station during late winter and spring, 2000-2003. Ground includes litter, logs and coarse woody debris; bark includes branches, trunks and stems, and loose and hanging bark; and foliage includes twigs, petioles and eucalypt capsules other than for seed. Foraging at flowers is divided into taking nectar and taking insects (arthropods). (a) Arthropod-eaters; (b) Herbivores; (c) Nectar-feeders.

		Substrate							
						Flower			
Species/Foraging Guild	***n***	**Ground**	**Bark**	**Foliage**	**Air**	**Nectar**	**Insect**	**Fruit**	**Seed**
(a) Arthropod-eaters									
Ground									
Southern Whiteface	363	98	0	1	0	0	0	0	1
Yellow-rumped Thornbill	130	90	0	8	0	0	2	0	0
Splendid Fairy-wren	226	84	4.5	10	1	0	0.4	0	0
Redthroat	75	83	12	5	0	0	0	0	0
Red-capped Robin	350	77	9	8	5	0	1	0	0
Rufous Treecreeper	288	73	27	0	0	0	0	0	0
Australian Magpie	15	67	0	33	0	0	0	0	0
Grey Shrike-thrush	29	66	17	17	0	0	0	0	0
Ground and Aerial									
Willie Wagtail	91	63	2	3	32	0	0	0	0
Jacky Winter	254	52	3	11	33	0	1	0	0
Bark									
Black-capped Sittella	36	8	92	0	0	0	0	0	0
Foliage									
Black-faced Cuckoo-shrike	29	0	0	83	0	0	17	0	0
White-winged Triller	27	0	0	78	7	0	15	0	0
Striated Pardalote	521	12	1	75	0	11	1	0	0
Weebill	529	6	4	86	1	2	1	0	0
Western Warbler	13	0	8	77	15	0	0	0	0
Inland Thornbill	207	0	9	86	2	1	2	0	0
Rufous Whistler	135	0	11	83	6	0	0	0	0
Black-eared Cuckoo	23	0	13	87	0	0	0	0	0
Chestnut-rumped Thornbill	507	6	17	64	5	1	7	0	0
Aerial									
Rainbow Bee-eater	10	0	0	0	100	0	0	0	0
Tree Martin	567	0	0	0	100	0	0	0	0
Dusky Woodswallow	57	14	0	2	84	0	0	0	0
Grey Fantail	105	11	2	15	72	0	0	0	0
(b) Herbivores (foliage and seed)									
Common Bronzewing	92	100	0	0	0	0	0	0	0
Bourke's Parrot	30	0	0	100	0	0	0	0	0
Regent Parrot	26	0	0	81	0	0	0	19	0
Galah	40	63	0	0	0	0	0	0	37
Emu	38	8	0	53	0	13	0	0	26
Australian Ringneck	211	7	0	21	0	23	0	0	49
(c) Nectarivores									
Singing Honeyeater	20	0	0	0	0	50	50	0	0
White-fronted Honeyeater	286	1	1	2	16	80	0	0	0
Yellow-throated Miner	75	1	8	11	0	80	0	0	0
Spiny-cheeked Honeyeater	226	1	0	21	7	65	0	6	0
Brown Honeyeater	129	0	11	22	8	59	0	0	0
White-eared Honeyeater	57	0	41	3	2	54	0	0	0
Grey-fronted Honeyeater	265	0	3	38	6	53	0	0	0
Brown-headed Honeyeater	149	0	11	37	0	52	0	0	0
Red Wattlebird	59	0	10	54	19	17	0	0	0

behaviour for Red Wattlebird (19% of observations), White-fronted (15%), Brown (9%), and Grey-fronted (6 %) Honeyeaters (Table 4c).

Other than Singing Honeyeater, which we observed foraging mainly in *Acacia* spp. (75% of observations), most (>65%) honeyeater foraging was in eucalypts (Tables 5c, 7c). Nectar was taken from eucalypts and shrubs, including *Eremophila* spp. Spiny-cheeked Honeyeater took *Exocarpos aphyllus* fruit (6%; Table 5c). Brown Honeyeaters also foraged in *C. glaucophylla* (14% of observations). More than 80% of the foraging of honeyeaters occurred in the subcanopy and canopy of eucalypts (Table 6c). The Yellow-throated Miner (24% of observations) was the only honeyeater to forage in low (<1.0 m) shrubs or on the ground (3%; Table 6c).

Considering only observations of honeyeaters taking nectar, *Eremophila* spp. were important for Grey-fronted Honeyeater (14% of observations) and Yellow-throated Miner (33%). Grey-fronted (23%) and Brown-headed (14%) Honeyeaters took nectar from a variety of shrubs, including *Grevillea* spp. (Table 3a). Most nectar was taken by honeyeaters from York and Salmon Gums, with no clear preference for species, nor any indication that a species was more abundant in the woodlands where it obtained most of its nectar (Table 3a).

Guild structure

Species were assigned to foraging guilds on percent use of foraging manoeuvres, substrates, and foraging height range. Among arthropod-eaters, eight guilds based on foraging manoeuvres were recognized (Table 4a), five of which are dominated by gleaners. Additionally there was a snatcher guild with two species, an aerial foraging guild with four species, and a pouncer guild comprised of Red-capped Robin and Jacky Winter. Herbivores (foliage and seed-eaters) formed a separate guild of gleaners (Table 4b), while honeyeaters formed a guild of probers (Table 4c).

Considering substrates, five guilds of arthropod-eaters were recognized, two dominated by ground-foragers (Table 5a). The Black-capped Sittella comprised a bark-foraging guild. A third guild consisted of nine species that took their prey predominantly (>65% of observations) from foliage. There was an aerial foraging guild of four species, within which Dusky Woodswallow and Grey Fantail also took prey from the ground, ground vegetation, bark, and foliage (Table 5a). There was a separate guild of herbivores, comprised of four parrots, the Emu, and Common Bronzewing (Table 5b). The guild of nectar-feeders was comprised solely of honeyeaters, which also took lerp, honeydew, and fruit (Table 5c). Taking nectar by other species was incidental (Table 3b).

Based on foraging heights, ten species of arthropod-eaters comprised a ground-foraging guild (Table 6a). Three species, Grey Fantail, Chestnut-rumped Thornbill, and White-winged Triller, foraged from the ground into the canopy, but made greatest use of the shrub and subcanopy layers. There were six subcanopy foragers, four of which also foraged (>20% of observations) in the canopy. Five species foraged primarily in the canopy (Table 6a). Four of the six herbivores took most of their food from the ground (>60%), while Port Lincoln and Regent Parrots foraged over a wide height range from the ground to the canopy (Table 6b). Of the nectar-feeders, most foraged in the subcanopy and canopy (Table 6c).

Among arthropod-eaters, species were sorted into two plant specialist guilds; birds that foraged more frequently on *Acacia* and *Callitris* and those that foraged more frequently on *Eucalyptus* (Table 7a).

Discussion

At Mt. Gibson, woodland birds used a complex array of resources, with species feeding on arthropods and other fauna, nectar, lerp, honeydew, foliage, fruits, and seeds. Within each of these food categories, species differed in foraging manoeuvres, substrates, plant species visited, and foraging height. There was also segregation of species by habitat, with Salmon/York Gum woodland having a different assemblage of bird species from York Gum/Cypress Pine woodland. Similar patterns of resource allocation among bird species have been shown previously for eucalypt forest and woodland avifaunas in southern Australia (Recher *et al.* 1985; Ford *et al*. 1986; Recher and Davis 1998, 2002; Miller and Cale 2000; Loyn 2002).

Species richness

Species richness in woodlands at Mt. Gibson is similar to other woodlands in southwest Western Australia. Sixty-four species of birds were recorded during censuses at Mt. Gibson (29°36'S, 117°24'E) in Salmon and York Gum woodlands, 52 species at Dryandra (32° 45'S, 116°55'E) in Wandoo (*Eucalyptus wandoo*) and Powderbark Wandoo (*E. accedens*) woodlands (Recher and Davis 1998), and 63 species in Salmon Gum/ Morrel (*E. melanolxylen*, *E. longicornis*) woodlands at Yellowdine (31°17'S, 119°39'E) (Recher and Davis 2002).

Differences in habitat structure associated with plant species composition account for many of the differences we observed in the distribution of bird species at Mt. Gibson. Although not evident from our censuses, York Gum/Cypress Pine woodlands at Mt. Gibson had a richer avifauna than Salmon Gum/York Gum woodlands. We attribute this to extensive, species rich, and vertically structured shrub layers associated with York Gum/Cypress Pine woodlands.

Table 6. Percent use of vegetation layers by foraging birds, with mean and standard deviation of foraging height in metres, on Mt. Gibson Station during late winter and spring, 2000-2003. Vegetation layers shown as a height range in metres. (a) Arthropod-eaters; (b) Herbivores; (c) Nectar-feeders.

		Ground	Shrub	Sub-canopy	Canopy	Foraging Height
Species/Foraging Guild	***n***	**0–0.1**	**0.2–1.0**	**1.1–5.0**	**>5.0 m**	**mean (SD)**
(a) Arthropod-eaters						
Ground						
Southern Whiteface	273	99	1	0	0	0.002(0.02)
Yellow-rumped Thornbill	130	95	0	4	1	0.3(1.1)
Splendid Fairy-wren	204	85	6	9	0	0.2(0.5)
Redthroat	75	84	1	15	0	0.5(1.2)
Red-capped Robin	350	76	8	15	1	0.5(1.1)
Rufous Treecreeper	287	72	1	18	9	1.4(2.8)
Willie Wagtail	91	71	15	10	4	0.8(2.6)
Australian Magpie	15	67	0	7	26	4(5.9)
Grey Shrike-thrush	31	61	13	10	16	1.7(3)
Jacky Winter	258	56	11	29	4	1.2(2.1)
Shrub-Subcanopy/canopy						
Grey Fantail	121	19	13	57	11	2.6(2.4)
Chestnut-rumped Thornbill	505	9	23	60	8	2.1(1.8)
White-winged Triller	27	4	22	26	48	4.8(4.3)
Subcanopy						
Inland Thornbill	207	0	10	89	1	2.5(1.1)
Western Warbler	13	0	8	69	23	2.7(1.6)
Black-eared Cuckoo	22	0	5	95	0	2(0.5)
Rufous Whistler	135	1	5	64	30	3.9(1.9)
Weebill	527	6	1	55	38	5.2(3.3)
Striated Pardalote	460	14	0	43	43	5.3(3.8)
Canopy and above						
Dusky Woodswallow	57	14	2	30	54	11.1(9.2)
Black-capped Sittella	52	11	8	8	73	7.1(4.1)
Black-faced Cuckoo-shrike	29	0	0	10	90	8.1(2.7)
Rainbow Bee-eater	10	0	0	10	90	9.6(4.3)
Tree Martin	567	0	0	4	96	21.7(12.1)
(b) Herbivores (foliage, fruit and seed)						
Ground						
Bourke's Parrot	30	100	0	0	0	0.1(0)
Common Bronzewing	92	100	0	0	0	0(0)
Galah	40	100	0	0	0	0.03(0.05)
Emu	38	61	39	0	0	0.5(0.5)
Shrub-Subcanopy/canopy						
Australian Ringneck	211	9	21	21	49	5.2(4.6)
Canopy and above						
Regent Parrot	26	0	4	19	77	11.5(6)
(c) Nectar-feeders						
Shrub-Subcanopy/canopy						
Yellow-throated Miner	75	3	27	24	46	4.7(3.2)
Canopy and above						
Spiny-cheeked Honeyeater	225	2	4	40	54	5.9(4.1)
Brown-headed Honeyeater	148	0	0	44	56	5.2(2)
Grey-fronted Honeyeater	265	0	12	27	61	7.4(5.4)
White-fronted Honeyeater	281	1	9	27	63	8.6(5.3)
White-eared Honeyeater	57	0	4	31	65	6.5(2.4)
Brown Honeyeater	129	0	3	32	65	6.6(4.3)
Singing Honeyeater	20	0	0	5	95	4(2.6)
Red Wattlebird	59	0	0	0	100	13.6(3.3)

Table 7. Percent use of plants by birds foraging in Salmon/York Gum and York Gum/Cypress Pine woodlands on Mt. Gibson Station during late winter and spring, 2000-2003. Species of *Brachycome*, *Senna*, *Eremophila*, *Exocarpos*, *Grevillea*, *Hakea*, *Maireana*, *Melaleuca*, *Santalum*, *Solanum* and unidentified shrubs are combined as "Shrubs." Some plants with only one observation have been omitted. Foraging observations on *Acacia* spp. and *Callitris glaucophylla* have been combined, as have observations of foraging on *Eucalyptus* spp. Number of observations refers to foraging on living plants. Birds with fewer than 10 observations on identified plants have been omitted. (a) Arthropod-eaters; (b) Herbivores; (c) Nectar-feeders.

Species/Foraging Guild	*n*	Ground vegetation	Shrubs	*Acacia* and *Callitris*	*Eucalyptus* spp.
(a) Arthropod-eaters					
***Acacia* and *Callitris* Specialists**					
Western Warbler	11	0	0	91	9
Splendid Fairy-wren	33	12	18	70	0
Black-eared Cuckoo	22	0	32	68	0
Grey Fantail	11	27	0	64	9
Redthroat	13	0	0	62	38
Inland Thornbill	208	1	13	61	25
Chestnut-rumped Thornbill	225	1	*26*	54	19
Red-capped Robin	63	6	6	46	42
Yellow-rumped Thornbill	13	38	16	31	15
***Eucalyptus* specialists**					
Jacky Winter	33	49	9	12	30
Rufous Whistler	126	0	6	41	53
White-winged Triller	22	5	9	32	54
Grey Shrike-thrush	10	0	0	30	70
Weebill	481	0	1	6	93
Black-capped Sittella	28	0	0	3	97
Rufous Treecreeper	72	0	0	1	99
Striated Pardalote	436	0	0	1	99
Black-faced Cuckoo-shrike	29	0	0	0	100
(b) Herbivores (foliage, fruit and seed)					
Bourke's Parrot	30	100	0	0	0
Emu	35	58	14	28	0
Galah	15	33	67	0	0
Regent Parrot	26	0	24	0	76
Australian Ringneck	188	0	27	16	57
(c) Nectarivores					
Red Wattlebird	30	0	0	0	100
White-eared Honeyeater	56	0	0	0	100
White-fronted Honeyeater	236	0	11	0	89
Brown-headed Honeyeater	149	0	9	5	86
Brown Honeyeater	118	0	9	14	77
Grey-fronted Honeyeater	247	0	21	7	72
Spiny-cheeked Honeyeater	225	0	17	11	72
Singing Honeyeater	20	0	0	50	50
Yellow-throated Miner	63	0	34	0	66

Cypress Pine is an important component of these woodlands, providing a different foliage and vegetative structure from other plants. A complex shrub layer allows bird species to co-exist, each exploiting different combinations of substrates, foraging heights, plant species, and food types. By contrast Salmon Gum woodlands lacked a well-developed, species rich shrub layer and were comparatively poor in bird species.

Many bird species at Mt. Gibson were restricted to or most abundant in association with York Gum and Cypress Pine or alternatively with Salmon Gum. Chestnut-rumped and Inland Thornbills, and Spiny-cheeked Honeyeater are species that forage extensively in shrub and subcanopy vegetation and were most abundant in York Gum/Cypress Pine woodlands. Although predominantly a ground pouncer, the Red-capped Robin also requires a shrub layer and rarely occurred in Salmon Gum woodlands (see Recher *et al.* 2002),

whereas Tree Martin, Galah, and Australian Ringneck were more abundant in Salmon Gum woodlands. These used the abundant tree hollows in Salmon Gum for nesting, while the open canopy provided foraging space for martins. Some canopy foragers, such as Striated Pardalote, showed little difference between the two woodlands, while the Weebill was most abundant in York Gum woodlands. Thus, differences in species assemblages between the two woodlands at Mt. Gibson can be attributed to differences in foraging resources, vegetation structure, and nest sites.

Although seven species of arthropod-eaters were recorded foraging in York Gum more frequently than Salmon Gum, we have no evidence that birds selected one species over the other. We did not quantify the relative amounts of York and Salmon Gum foliage available to foraging birds, but York Gum dominated a majority of the sites and the greater use of York Gum by birds may simply reflect its greater abundance.

Nectar-feeders

Although nectar-feeders were prominent in all habitats at Mt. Gibson, Purple-crowned Lorikeets were uncommon and aggregations of honeyeaters were limited, with only small numbers of individuals (hundreds, not thousands of birds). The small number of nectar-feeders reflects the limited blossom in eucalypt woodlands at Mt. Gibson during the times of our observations. As the blossoming of eucalypts differs spatially, seasonally, and from year-to-year (including the timing of blossoming; pers. obs.), the numbers of nectar-feeders may differ significantly over time. However, the dominance of Salmon Gum and York Gum, and the relative scarcity of other species of eucalypts, suggests that large congregations of nectar-feeders in the eucalypt woodlands at Mt. Gibson are more likely to be exceptional than regular.

Acknowledgements. The research at Mt. Gibson was supported by a Vice Chancellor's Distinguished Researcher Award to HFR. WED participated in the study while a visiting Research Fellow at Edith Cowan University in the School of Natural Sciences. We thank the Australian Wildlife Conservancy and the station's previous lessees for permission to work at Mt. Gibson. J. Cousin, S. Davies, G. R. Fulton, and M. Page reviewed the manuscript for us and provided useful advice for which we are grateful. M. Page made available data on rainfall and goats for Mt. Gibson Station.

References

Christidis, L., and Boles, L. (2008). 'Systematics and Taxonomy of Australian Birds.' (CSIRO Publishing: Canberra.)

Ford, H. A., Noske, S., and Bridges, L. (1986). Foraging of birds in eucalypt woodland in north-eastern New South Wales. *Emu* **86**, 168-179.

Loyn, R. H. (2002). Patterns of ecological segregation among forest and woodland birds in south-eastern Australia. *Ornithological Science* **1**, 7-27.

Miller, J. R., and Cale, P. (2000). Behavioural mechanisms and habitat use by birds in a fragmented agricultural landscape. *Ecological applications* **10**, 1732-1748.

Recher, H. F., and Davis, W. E., Jr. (1998). Foraging profile of a wandoo woodland avifauna during spring. *Australian Journal of Ecology* **23**, 514-28.

Recher, H. F., and Davis, W. E., Jr. (2002). Foraging profile of a Salmon Gum woodland avifauna in Western Australia. *Journal of the Royal Society of Western Australia* **85**, 103-111.

Recher, H. F., and Gebski, V. (1989). Analysis of the foraging ecology of eucalypt forest birds: sequential versus single-point observations. *Studies in Avian Biology* **13**, 534-48.

Recher, H. F., Holmes, R. T., Schulz, M., Shields, J., and Kavanagh, R. (1985). Foraging patterns of breeding birds in eucalypt forest and woodland of south-eastern Australia. *Australian Journal of Ecology* **10**, 399-420.

Serventy, D. L., and Whittell, H. M. (1962). 'Birds of Western Australia.' 3rd Ed. (Paterson Brokensha Pty. Ltd.: Perth.)

Appendix 1. Relative abundances of woodland birds at Mt. Gibson Station as an entity during late winter and spring, 2000–2003. Numbers given for the two types of woodland are the maximum number of individuals recorded during a census, with the number of counts (frequency) during which a species was recorded in parentheses. Scientific and common names follow Christidis and Boles (2008), with the exception of the Western Warbler (= Western Gerygone), and the Black-capped Sittella and Golden Bronze-Cuckoo, which we retain as species, and the Scarlet Robin where we preserve its name as *P. multicolor*

Common name	Species name	Status	Abundance	Salmon Gum/ York Gum Woodland (*n*=7)	York Gum/ Cypress Pine Woodland (*n*=10)
Australian Hobby	*Falco longipennis*	resident	2-10	1 (1)	not recorded
Australian Magpie	*Cracticus tibicen*	resident	2-10	2 (1)	not recorded
Australian Raven	*Corvus coronoides*	resident	10-100	4 (3)	2 (9)
Australian Ringneck	*Barnardius zonarius*	resident	100-1000	10–100 (5)	10 (7)
Black-capped Sittella	*Daphoenositta pileata*	resident	10-100	6 (1)	10 (2)
Black-eared Cuckoo	*Chalcites osculans*	migrant	2-10	not recorded	1 (2)
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	resident, nomadic	10-100	4 (6)	4 (4)
Black-faced Woodswallow	*Artamus cinereus*	resident, nomadic	10-100	4 (1)	not recorded
Bourke's Parrot	*Neopsephotus bourkii*	resident	2-10	not recorded	4 (2)
Brown Falcon	*Falco berigora*	resident	2-10	2 (1)	1 (1)
Brown Goshawk	*Accipter fasciatus*	resident	2-10	2 (2)	2 (1)
Brown Honeyeater	*Lichmera indistincta*	resident, nomadic	1000+	10–100 (4)	30 (5)
Brown-headed Honeyeater	*Melithreptus brevirostris*	resident	100-1000	30 (4)	20 (6)
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	resident	1000+	5 (5)	10–100 (10)
Chiming Wedgebill	*Psophodes occidentalis*	rare, resident	1	not recorded	not recorded
Common Bronzewing	*Phaps chalcoptera*	resident, dispersive	10-100	2 (2)	2 (4)
Crested Bellbird	*Oreoica gutturalis*	resident	2-10	2 (2)	2 (7)
Crested Pigeon	*Ocyphaps lophotes*	resident	10-100	not recorded	2 (1)
Diamond Dove	*Geopelia cuneta*	rare resident	2	not recorded	not recorded
Dusky Woodswallow	*Artamus cyanopterus*	resident, dispersive	10-100	3 (2)	30 (1)
Emu	*Dromaius novaehollandiae*	resident, dispersive	100-1000	3 (1)	1 (4)
Galah	*Eolophus roseicapillus*	resident, dispersive	100-1000	10–100 (5)	5 (4)
Golden Bronze-Cuckoo	*Chalcites plagosus*	rare migrant	1	not recorded	not recorded
Golden Whistler	*Pachycephala pectoralis*	rare resident	2	not recorded	2 (1)
Grey Butcherbird	*Cracticus torquatus*	resident	10-100	1 (1)	2 (6)
Grey Currawong	*Strepera versicolor*	resident	10-100	4 (3)	1 (2)
Grey Fantail	*Rhipidura fuliginosa*	resident, dispersive	10-100	1 (3)	10 (6)
Grey Shrike-thrush	*Colluricincla harmonica*	resident	100-1000	2 (3)	8 (6)
Grey-fronted Honeyeater	*Licheonstomus plumulus*	resident, nomadic	1000+	10–100 (3)	30 (2)
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	resident, migrant	10-100	1 (1)	1 (5)
Inland Thornbill	*Acanthiza apicalis*	resident	1000+	2 (5)	20 (8)
Jacky Winter	*Microeca fascinans*	resident	10-100	2 (1)	6 (7)
Little Corella (Western)	*Cacatua pastinator*	nomadic	10-100	2 (3)	20 (2)
Little Crow	*Corvus bennetti*	resident, nomadic	10-100	2–10 (3)	1 (2)
Little Eagle	*Hieraaetus morphnoides*	resident	2-10	2 (1)	2 (3)
Magpie-lark	*Grallina cyanoleuca*	resident	2-10	not recorded	1 (1)
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	resident, dispersive	10	2 (3)	2 (5)
Malleefowl	*Leipoa ocellata*	resident	2-10	not recorded	not recorded
Mistletoebird	*Dicaeum hirundinaceum*	resident, nomadic	10-100	20 (4)	1 (1)
Nankeen Kestrel	*Falco cenchroides*	resident	2-10	not recorded	not recorded
Pallid Cuckoo	*Cacomantis pallidus*	rare migrant	2	2 (3)	1 (3)
Pied Butcherbird	*Cracticus nigrogularis*	resident	10-100	1 (3)	not recorded
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	dispersive, nomadic	10-100	2 (2)	not recorded
Rainbow Bee-eater	*Merops ornatus*	migrant	10-100	not recorded	1 (1)
Red Wattlebird	*Anthochaera carunculata*	resident, nomadic	10-100	10–100 (5)	1 (3)
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	migrant	2-10	not recorded	1 (2)
Red-capped Robin	*Petroica goodenovii*	resident	1000+	3 (5)	30 (9)
Red-tailed Black Cockatoo	*Calyptorhynchus banksii*	resident, dispersive	10-100	2 (2)	1 (4)
Redthroat	*Pyrrholaemus brunneus*	resident	100-1000	2 (1)	6 (3)
Regent Parrot	*Polytelis anthopeplus*	resident, dispersive	10-100	10 (1)	not recorded
Rufous Treecreeper	*Climacteris rufa*	resident	100-1000	10 (5)	25 (8)
Rufous Whistler	*Pachycephala rufiventris*	resident, migrant	100-1000	10 (4)	30 (5)

Appendix 1. Continued.

Common name	Species name	Status	Abundance	Salmon Gum/ York Gum Woodland (*n*=7)	York Gum/ Cypress Pine Woodland (*n*=10)
Scarlet Robin	*Petroica multicolor*	rare transient	1	not recorded	not recorded
Singing Honeyeater	*Lichenostomus virescens*	resident	2-10	2 (1)	1 (3)
Southern Boobook	*Ninox novaeseelandiae*	resident	2-10	not recorded	not recorded
Southern Whiteface	*Aphelocephala leucopsis*	resident, nomadic	10-100	3 (3)	5 (6)
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	resident, nomadic	100-1000+	10–100 (2)	15 (10)
Splendid Fairy-wren	*Malurus splendens*	resident	100-1000	2–10 (1)	15 (6)
Spotted Nightjar	*Eurostopodus argus*	resident	10-100	not recorded	not recorded
Square-tailed Kite	*Lophoictinia isura*	resident, dispersive	2-10	not recorded	2 (1)
Striated Pardalote	*Pardalotus striatus*	resident, nomadic	1000+	10–100 (6)	10–100 (8)
Sulphur-crested Cockatoo	*Cacatua galerita*	uncommon resident	2-10	2 (1)	not recorded
Tawny Frogmouth	*Podargus strigoides*	resident	10-100	not recorded	not recorded
Tree Martin	*Petrochelidon nigricans*	resident, migrant	100-1000	10–100 (6)	4 (4)
Wedge-tailed Eagle	*Aquila audax*	resident, dispersive	2-10	not recorded	1 (1)
Weebill	*Smicrornis brevirostris*	resident	1000+	10–100 (10)	100–1000 (7)
Welcome Swallow	*Hirundo neoxena*	resident	10-100	not recorded	not recorded
Western Warbler	*Gerygone fusca*	migrant	2-10	not recorded	2 (1)
Whistling Kite	*Haliastur sphenurus*	resident, dispersive	2-10	not recorded	1(1)
White-browed Babbler	*Pomatostomus superciliosus*	rare resident	1 group	not recorded	not recorded
White-eared Honeyeater	*Lichenostomus leucotis*	resident	10-100	not recorded	6 (7)
White-fronted Honeyeater	*Purnella albifrons*	resident, nomadic	1000+	100–1000 (1)	10–100 (4)
White-winged Triller	*Lalage sueurii*	migrant, nomadic	100-1000	not recorded	2 (2)
Willie Wagtail	*Rhipidura leucophrys*	resident	100-1000	2 (4)	8 (5)
Yellow-throated Miner	*Mamorina flavigula*	resident	100-1000	10 (2)	15 (4)
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	resident	100-1000	2 (4)	3 (5)
Zebra Finch	*Taeniopygia guttata*	transient nomad	1	not recorded	not recorded