

Opportunistic response of birds to wildfire in saltmarsh, Ash Island, NSW

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Fire modifies bird habitat by altering vegetation structure and increasing the availability of some food resources (e.g. seeds). Following a wildfire in saltmarsh at Ash Island in the Hunter Estuary in January 2012, bird monitoring indicated that five bird species benefited during the following year. Black-fronted Dotterels and Magpie-larks responded rapidly, but were only present during the first three months. White-fronted Chats and Australasian Pipits showed a similar immediate response, which persisted throughout the year. However, in the case of chats there was some evidence of seasonal fluctuations, with winter favoured. Stubble Quail, a species rare in the area, were present for several months, first arriving eight months after the fire. The attraction of these species to the burnt area is consistent with their preference for relatively open habitat and their ground-feeding preferences.

INTRODUCTION

Saltmarsh offers a unique environment for many species of birds. It is one of the most biologically productive habitats supporting a wide variety of insects, invertebrates and fish. It is dominated by salt tolerant plants, such as grass and shrubs and offers an extensive food source at either end of the tidal range. Australian saltmarsh habitat has been studied closely over the past decade (Saintilan 2009).

On 22 January 2012 a wildfire occurred in the northern section of Ash Island. The fire burnt over 26.3ha, including 7.7ha of saltmarsh and 17.4ha of kikuyu pasture. Fires in saltmarsh are a rare occurrence and the opportunity arose to examine the effect wildfire had on bird assemblages and the way these changed over time as the saltmarsh recovered.

Ash Island is part of the Hunter River estuary and is the western section of the much larger Kooragang Island (32°52' S 151°44' E). The Hunter Bird Observers Club was invited by NSW National Parks and Wildlife Service to conduct a bird monitoring program, following the 2012 wildfire. The main objectives of the study were to measure the changes in bird populations in regenerating burnt saltmarsh; compare populations of regenerating saltmarsh to control areas of mature

unburnt saltmarsh and to collate this information to inform future management of fires within saltmarsh. A secondary objective was to measure the diversity of the bird population in the area immediately surrounding the surveyed saltmarsh habitat.

Fires often create new foraging opportunities, which are rapidly exploited by birds (Woinarski & Recher 1997), as occurred in this study. This paper provides a summary of the results obtained in the 12 month period immediately after the fire, with a focus on species which opportunistically exploited conditions created by the fire. These species were the Black-fronted Dotterel *Elseyornis melanops*, Magpie-lark *Grallina cyanoleuca*, White-fronted Chat *Epthianura albifrons*, Australasian Pipit *Anthus novaeseelandiae* and Stubble Quail *Coturnix pectoralis*.

METHODS

Four irregularly shaped 2ha survey sites were used (**Figure 1**). Two sites, red (32°50'19"S, 151°43'18"E) and white (32°50'30"S, 151°43'20"E) were at opposite ends of the burnt area. The two other sites, yellow (32°50'31"S, 151°43'33"E) and blue (32°50'19"S, 151°43'32"E) were used as controls in areas of unburnt saltmarsh.

Each total survey involved recording data from within all the 2ha sites and also within a 500 metre radius of the centre of the sites. This included the area covered while walking between sites. A standard BirdLife Australia survey method was used, where each 2ha site was monitored for 20 minutes. The typical overall survey time was between 2 and 2.5 hours. Most surveys commenced 0.5–1.5 hours after sunrise to minimise the impact of variation in diurnal temperature. Only one set of surveys was conducted on any day, usually involving two observers. Results were collated in five lists, one for each of the 2ha sites and one covering the total survey area. Surveys commenced approximately one month after the fire; the delay being associated with the time required to establish the project after the fire occurred.



Figure 1. Survey sites in saltmarsh at Ash Island, Hunter Wetlands National Park

RESULTS

This analysis covers the first 12 months of the study (March 2012 to February 2013) and involves 37 surveys, during which 69 bird species were recorded. The average number of species seen per visit was 16. Reporting rates (the frequency species were observed) and mean numbers for each species during the total survey are shown in **Table 1**. Reporting rates for the total survey (RR_T) reflect the presence of bird species at all sites and the surrounding area and unless the species was seen exclusively at one 2ha site, RR_T values were higher than the reporting rates for individual sites (RR).

The most obvious initial impact of the fire was to create large areas of bare ground, except for stumps of burnt *Juncus* (mainly *Juncus acutus*). These bare areas immediately provided ideal feeding habitat for the four species which are the primary focus of this paper. Comparison between the occurrence of these species in the burnt and unburnt areas (**Figure 2**) indicates the fire was beneficial to all four species. Differences in RRs between burnt and unburnt sites were highly significant statistically for White-fronted Chats and Australasian Pipits (χ^2 test; $p < 0.01$). Reporting rates were of insufficient magnitude to test the other two species. The chronology of species occurrence and the mean number of birds/survey at the burnt sites is shown in **Figure 3**.

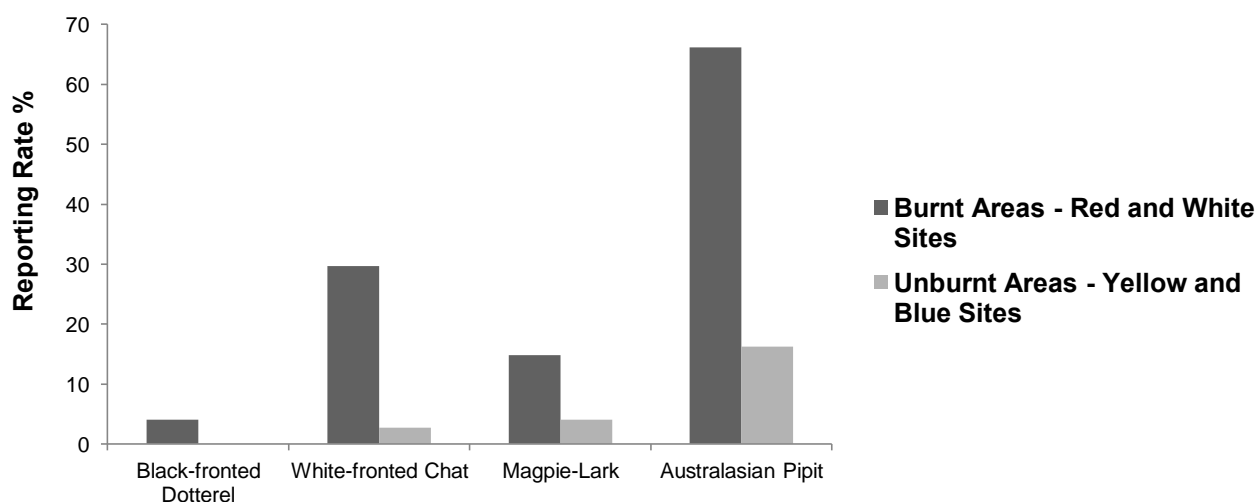


Figure 2. Comparison of the occurrence of four bird species at burnt and unburnt saltmarsh survey sites between March 2012 and February 2013.

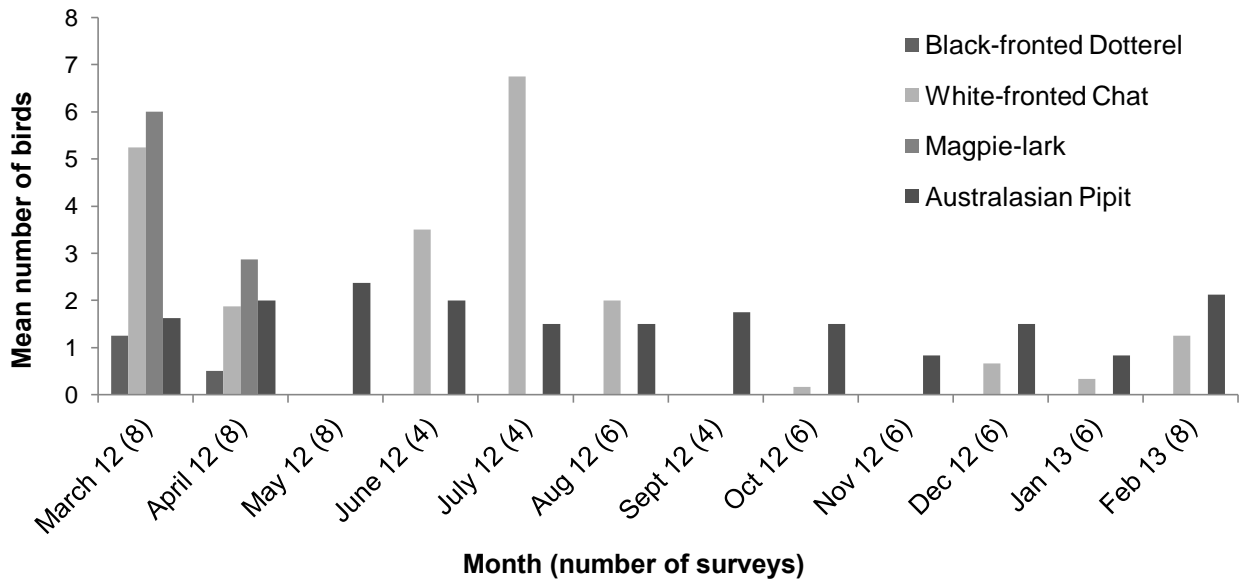


Figure 3. The mean numbers of birds present per survey and the timing of occurrence of the four species opportunistically exploiting the burnt sites.

Black-fronted Dotterels were only recorded at the burnt red site (RR 8%), with a maximum of 9 birds present. All records of this species were during the first two months after the wildfire. The ground was wet with pools of water.

Magpie-larks were the dominant species present during inspections of the area to select the survey sites before formal monitoring commenced. During the surveys they were intermittently present (RR_T 38%) and recorded at all four sites, but most of the records occurred during the first three months after the fires, when up to 38 birds occurred as flocks in the burnt areas. Subsequently, they were recorded infrequently in small numbers (<6) and were absent from the burnt areas (Figure 3).

White-fronted Chats (RR_T 45.9%) were frequently seen in the burnt red (RR 27%) and white (RR 32%) sites. Occasional birds were seen in the two unburnt control zones (Figure 4). Chats were most frequently seen and most numerous during the first three months after the fire and during winter between June and August (Figure 3), when flocks of up to 12 birds were present.

The omnipresent Australasian Pipit (RR_T 100%) benefited most from the fire, occurring in the burnt red (RR 41%) and white (RR 92%) sites in every month. An interesting point to note is the occurrence of pipits in the unburnt areas (Figure 5), where they were primarily seen at the yellow site on a track and in an area of bare ground. Pipits were not associated with the unburnt saltmarsh vegetation. While usually less numerous than

White-fronted Chats (Figure 3), a maximum count of 18 suggested pipits occasionally flock.

The occurrence of a fifth species, the Stubble Quail, is also attributed to the fire. A single bird of this species was first seen on 30 August and was subsequently recorded regularly (RR_T 24%) over the next four months with up to four individuals present. All records were in or immediately adjacent to the burnt sites, with the white (RR 14%) preferred to the red (RR 3%) site.

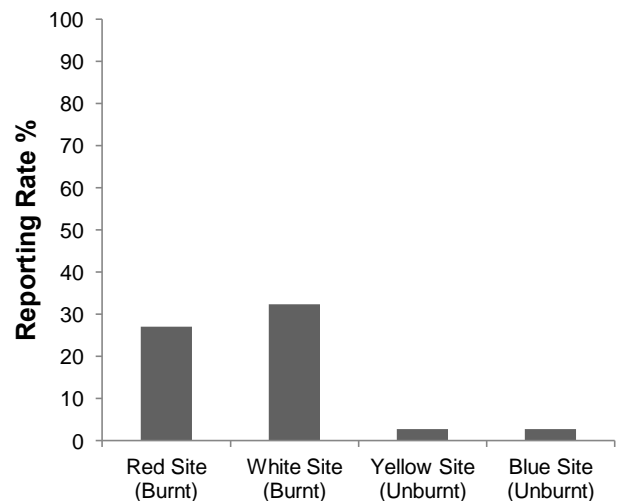


Figure 4. Comparison of reporting rates for White-fronted Chats at burnt and unburnt saltmarsh sites.

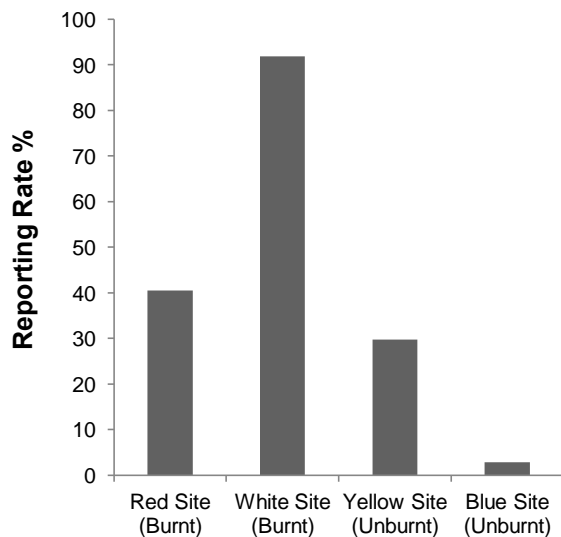


Figure 5. Comparison of reporting rates for Australasian Pipits at burnt and unburnt saltmarsh sites.

DISCUSSION

Fires change the structure of vegetation and make food resources like dead insects and seeds available to opportunistic bird species (Woinarski & Recher 1997). This can result in short-term occupation of an area after fires by species which would normally find an area unattractive. Decreased ground cover attracts species favouring open country and increased seed availability is beneficial to specialist feeders like finches and quail (Woinarski & Recher 1997). Potential advantages for the five species which apparently benefited are discussed below.

The occurrence of Black-fronted Dotterel was unexpected and of short duration. Although it is possible the dotterels were only using the area to roost, they probably also fed in the area. Black-fronted Dotterels feed on small molluscs, aquatic and terrestrial insects, and thrive in open environments similar to that created by the fire; though normally around fresh water (the extent to which the water pools were brackish following heavy rainfall is uncertain). The removal of vegetation in the fire potentially benefited the bird's method of actively foraging and running in search of prey (BirdLife Australia 2013). It is not understood why the red site was favoured over the white site.

Like the dotterel, Magpie-larks also prefer open ground to feed, where they can move easily to locate insects, larvae and invertebrates. Their

occurrence in the burnt areas after the fire was similar to the Black-fronted Dotterel; predominantly involving presence of flocks during the first three months, followed by lack of sightings once the vegetation began to regenerate.

The White-fronted Chat has undergone widespread decline in NSW, particularly in the highly urbanised coastal zone (Jenner *et al.* 2011), and has been listed as a threatened species with vulnerable status in NSW (Roderick & Stuart 2010). Chats found the burnt areas very attractive, not only immediately after the fire, but throughout the year, particularly during the winter months. The White-fronted Chat is more suited to marsh areas with low vegetation (BirdLife Australia 2013) and was rarely seen away from such habitat in this study (i.e. mature saltmarsh dominated by *Juncus* tussocks appeared unsuitable). The burnt areas obviously offered exceptional opportunities for feeding on small insects etc. with the white site preferred to the red, possibly because vegetation regeneration was more advanced at the latter, reducing open areas. Though regarded as mostly sedentary, these results suggest chats are locally opportunistic when foraging.

The Australasian Pipit is an open country species, which benefited from the structural changes to vegetation caused by the fire. Its attraction to the burnt area is consistent with other studies (Woinarski & Recher 1997). While it occurs regularly on Ash Island, it is usually associated with open ground rather than the *Juncus* dominated mature saltmarsh of the control sites (e.g. showed preference for the tracks and clear areas of the yellow site). The white site proved to be more favourable (**Figure 5**) with the maximum number of birds reported in one survey being 10 in February 2013. Other surveys of the white site reported flocks of between 5 and 6 birds between April 2012 and June 2012. The Australasian Pipit feeds on insects, their larvae and seeds making it ideally placed to take advantage of the effects of the fire, both immediately after and during the regeneration period.

Quail are known to be attracted to burnt areas so their presence was not unexpected. However, the first Stubble Quail was not recorded until eight months after the fire and involved a species which is considered locally uncommon. The status of the Stubble Quail is uncertain in the Hunter Region and it may be irruptive (Stuart 2012), explaining the delayed response to the changed conditions at Ash Island, a well watched area where it has only been recorded on two previous occasions (Stuart

pers. comm.). The Brown Quail *Coturnix ypsilophora* is common on Ash Island, and was subsequently recorded during these surveys (**Table 1**), but not as frequently as the Stubble Quail nor exclusively in burnt areas.

The advantage gained by the invading species came at the expense of several saltmarsh specialist species like the Golden-headed Cisticola *Cisticola exilis* and the Tawny Grassbird *Megalurus timoriensis*, which were absent or scarce at the burnt sites compared with the unburnt control saltmarsh sites (**Table 1**). Discussion of the displaced species and the timing of their re-colonisation of the burnt sites will be the subject of a subsequent paper.

One year after the fire the burnt areas were rapidly re-vegetating. Fires often provide nutrients, which promote rapid growth of ground cover vegetation, particularly herbs and grasses (Woinarski & Recher 1997). The composition and structure of regrowth vegetation may, like the bird species described in this paper, involve an initial transition phase. It is important to monitor the continuing changes, in both bird populations and vegetation, as the burnt areas transition to a mature state. The invasive bird species, favouring bare ground, are expected to be progressively lost as the vegetation density increases. There is a risk that the ultimate outcome in terms of both vegetation and bird population will be different from the habitat destroyed by fire (Clarke 2008).

In summary the immediate impact of the saltmarsh fire appeared to create a habitat that was clearly beneficial to a number of bird species. Such a fire has not been recorded on Ash Island in the past. Many of the species, which took advantage of the burnt areas, inhabit other areas of Ash Island and this 'new habitat' extended their opportunities for food and so their local range. Further study over a longer period of time is required to evaluate the full impact of the saltmarsh fire and the impact on the bird population. It is important that monitoring continues because of the unique opportunity to study an important ecological event with an uncertain outcome.

CONCLUSIONS

Bird monitoring during the year following the fire proved a number of species of birds, most notably ground-feeding species, such as the Black-fronted Dotterel, Magpie-lark and White-fronted Chat, Australian Pipit and Stubble Quail benefited from vegetation removal. Regeneration of the saltmarsh has proved to be slow, with some weeds seemingly taking advantage of the clear areas in the first year of the study. Only further research through regular surveys will help understand the full impact of the fire and firm conclusions cannot be drawn until the areas of burnt saltmarsh have matured.

ACKNOWLEDGEMENTS

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Table 1. Summary of bird species recorded during saltmarsh surveys: March 2012 - February 2013.

Common Name	Scientific Name	Total Survey RR%	Mean Number	Maximum Number	Red Site RR%	White Site RR%	Yellow Site RR%	Blue Site RR%
Stubble Quail	<i>Coturnix pectoralis</i>	24.3	1.8	4.0	2.7	13.5		
Brown Quail	<i>Coturnix ypsilophora</i>	10.8	3.0	7.0	2.7			2.8
Black Swan	<i>Cygnus atratus</i>	5.4	2.0	3.0	10.8		2.7	
Chestnut Teal	<i>Anas castanea</i>	2.7	2.0	2.0				
Pacific Black Duck	<i>Anas superciliosa</i>	18.9	2.9	8.0			2.7	
Fork-tailed Swift	<i>Apus pacificus</i>	2.7	5.0	5.0		2.7		2.8
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	13.5	1.0	1.0				8.3
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	2.7	1.0	1.0				
Pied Cormorant	<i>Phalacrocorax varius</i>	2.7	3.0	3.0			2.7	
Australian Pelican	<i>Pelecanus conspicillatus</i>	13.5	9.0	25.0				2.8
Australasian Bittern	<i>Botaurus poiciloptilus</i>	2.7	1.0	1.0				
White-necked Heron	<i>Ardea pacifica</i>	5.4	2.5	4.0				
Eastern Great Egret	<i>Ardea modesta</i>	18.9	1.6	4.0	2.7		5.4	
Intermediate Egret	<i>Ardea intermedia</i>	2.7	2.0	2.0	5.4	2.7		
Cattle Egret	<i>Ardea ibis</i>	10.8	1.5	2.0	2.7			
White-faced Heron	<i>Egretta novaehollandiae</i>	56.8	2.6	12.0	8.1	13.3	10.8	5.6
Australian White Ibis	<i>Threskiornis molucca</i>	59.5	14.0	74.0	13.5	5.4	18.9	25
Eastern Osprey	<i>Pandion cristatus</i>	5.4	1.0	1.0		2.7	5.4	2.8
Black-shouldered Kite	<i>Elanus axillaris</i>	16.2	1.3	2.0	16.2			
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	35.1	1.2	2.0		2.7		5.6
Whistling Kite	<i>Haliastur sphenurus</i>	24.3	1.1	2.0	5.4		2.7	2.8
Swamp Harrier	<i>Circus approximans</i>	48.6	1.4	3.0	2.7		5.4	5.6
Nankeen Kestrel	<i>Falco cenchroides</i>	8.1	1.0	1.0	2.7			
Australian Hobby	<i>Falco longipennis</i>	5.4	1.5	2.0		2.7		2.8
Black-fronted Dotterel	<i>Elseyornis melanops</i>	8.1	4.7	9.0	8.1			
Masked Lapwing	<i>Vanellus miles</i>	27.0	1.9	2.0	13.5			
Latham's Snipe	<i>Gallinago hardwickii</i>	2.7	1.0	1.0				
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	8.1	6.0	15.0				2.8
Eastern Rosella	<i>Platycercus eximius</i>	27.0	2.8	6.0		5.4	2.7	2.8
Eastern Koel	<i>Eudynamis orientalis</i>	10.8	1.0	1.0				
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	5.4	1.0	1.0				
Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>	5.4	2.0	3.0				
Black-eared Cuckoo	<i>Chalcites osculans</i>	2.7	1.0	1.0				
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	2.7	1.0	1.0				
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	5.4	1.0	1.0				
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	16.2	1.8	4.0				2.8
Sacred Kingfisher	<i>Todiramphus sanctus</i>	2.7	1.0	1.0				
Superb Fairy-wren	<i>Malurus cyaneus</i>	97.3	13.6	28.0	48.6	73	75.7	44
Variiegated Fairy-wren	<i>Malurus lamberti</i>	2.7	5.0	5.0				
Mangrove Gerygone	<i>Gerygone levigaster</i>	27.0	1.1	2.0			2.7	
Yellow Thornbill	<i>Acanthiza nana</i>	29.7	3.0	6.0			2.7	
Brown Thornbill	<i>Acanthiza pusilla</i>	2.7	2.0	2.0				
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	2.7	1.0	1.0				
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	5.4	13.0	25.0		2.7		
White-fronted Chat	<i>Epthianura albifrons</i>	45.9	7.6	24.0	27	32.4	2.7	2.8
Brown Honeyeater	<i>Lichmera indistincta</i>	2.7	1.0	1.0				
White-naped Honeyeater	<i>Melithreptus lunatus</i>	2.7	25.0	25.0		2.7		
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	40.5	2.7	6.0		2.7	2.7	11.1
Golden Whistler	<i>Pachycephala pectoralis</i>	2.7	1.0	1.0				
Rufous Whistler	<i>Pachycephala rufiventris</i>	5.4	1.0	1.0				
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	10.8	1.0	1.0			2.7	
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	24.3	5.3	14.0		5.4	13.5	2.8
Grey Butcherbird	<i>Cracticus torquatus</i>	10.8	1.3	2.0		2.7	2.7	2.8
Pied Butcherbird	<i>Cracticus nigrogularis</i>	5.4	4.5	6.0				
Australian Magpie	<i>Cracticus tibicen</i>	48.6	1.7	3.0		5.4		
Grey Fantail	<i>Rhipidura albiscapa</i>	59.5	2.2	8.0			13.5	8.3
Willie Wagtail	<i>Rhipidura leucophrys</i>	45.9	2.5	7.0		29.7		2.8
Australian Raven	<i>Corvus coronoides</i>	94.6	3.3	9.0		21.6	27	30.6
Magpie-lark	<i>Grallina cyanoleuca</i>	37.8	8.1	38.0		10.8	2.7	5.6
Golden-headed Cisticola	<i>Cisticola exilis</i>	91.9	8.4	23.0	45.9	45.9	59.5	75
Tawny Grassbird	<i>Megalurus timoriensis</i>	94.6	3.9	9.0	5.4	2.7	45.9	77.8
Little Grassbird	<i>Megalurus gramineus</i>	70.3	3.1	6.0	2.7	8.1	35.1	30.6
Brown Songlark	<i>Cincloramphus cruralis</i>	2.7	1.0	1.0				
Silvereye	<i>Zosterops lateralis</i>	37.8	3.1	8.0		2.7	5.4	5.6
Welcome Swallow	<i>Hirundo neoxena</i>	54.1	10.9	50.0	13.5	24.3	29.7	19.4
Fairy Martin	<i>Petrochelidon ariel</i>	5.4	3.0	5.0			5.4	
Tree Martin	<i>Petrochelidon nigricans</i>	5.4	1.5	2.0		2.7		2.8
Red-browed Finch	<i>Neochmia temporalis</i>	2.7	2.0	2.0				
Australasian Pipit	<i>Anthus novaeseelandiae</i>	100.0	4.4	18.0	40.5	91.9	29.7	2.8
Total Number of Species		69			26	27	28	30