

Birds in Plantations Kangaroo Island

Results of the 2018 P. F. Olsen Australia/ KIPT bird monitoring project.

Report prepared by Dr Holly Kirk

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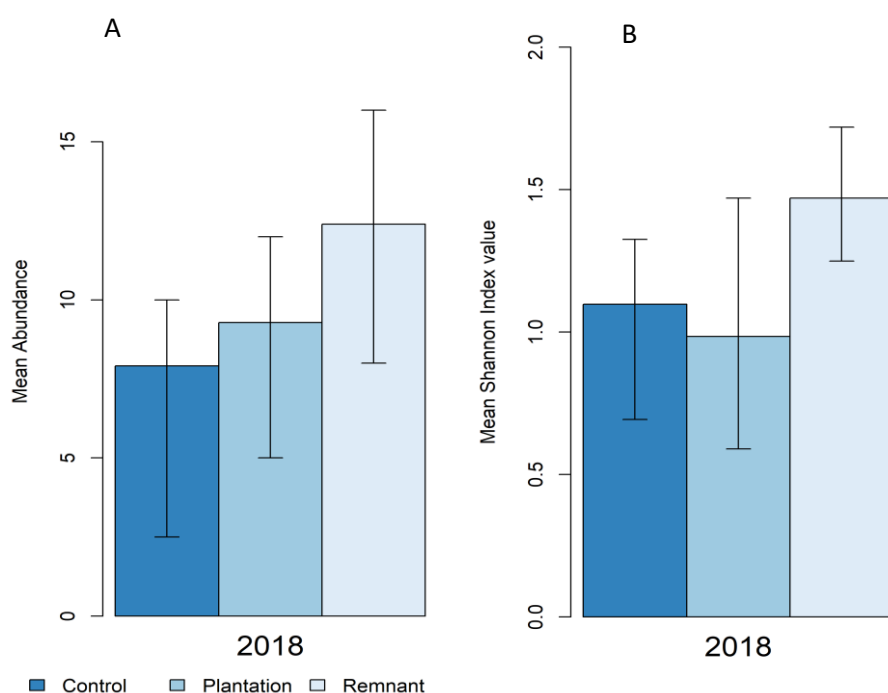


Executive Summary

This year is the first time that bird surveys have been conducted in KIPT owned plantations (managed by PF Olsen Australia) on Kangaroo Island, SA. The plantations were visited between 3rd and 18th November 2018, with twenty-two volunteer surveyors taking part. 86 surveys were completed, across 37 different properties or control sites.

Overall, plantation stands and the remnant habitat patches within them show comparable levels of bird abundance and diversity to nearby control sites within Flinders Chase National Park. Remnant habitat patches showed the highest bird abundance and diversity overall. Thirteen different foraging guild groups were recorded during the 2018 surveys, only one of these foraging guilds was not recorded in the plantation stand surveys (the low shrub insectivores).

No listed bird species have been recorded yet in KIPT owned properties on Kangaroo Island, although many of the woodland bird species recorded during surveys are members of the Kangaroo Island Narrow-leaved Mallee Woodland ecological community. This is a threatened ecological community which is only found on Kangaroo Island. Bird species which form part of this community are performing important ecosystem functions (such as pollination and seed dispersal), so supporting these species within KIPT properties will benefit the threatened Mallee Woodland community.



Mean bird abundance and diversity in survey transects on Kangaroo Island, SA in 2018.

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Introduction

PF Olsen Australia and BirdLife Australia have been working together since 2015 to monitor bird biodiversity in forestry plantations across southern Australia. Monitoring began in the Green Triangle, Victoria in 2015 and south-west Western Australia in 2017. The main findings from these two studies reflect the important role that forestry plantations may play in helping to maintain landscape level avian diversity, especially within a matrix of farmland: 1) bird diversity in plantations is maintained across years and 2) remnant habitat patches within plantations often contain comparable bird diversity and abundance to nearby control sites in national park.

In 2018 BirdLife Australia, PF Olsen Australia and Kangaroo Island Plantation Timbers (KIPT) began survey work in KIPT owned plantations on Kangaroo Island, South Australia. This survey work mirrors that ongoing in Victoria and Western Australia, following the same protocol. This report summarises findings from the first year of survey work (spring 2018) on Kangaroo Island, however any conclusions drawn from this data are currently limited given this is the start of the monitoring program.

Methods

KIPT plantations were visited between 3rd to 18th November 2018, with twenty-two volunteer surveyors taking part. 86 surveys were completed, across 37 different properties or control sites. Methods follow those used in both Victoria and Western Australia (see relevant reports from 2015-2017), following a standard 2Ha 20-minute survey technique (400m x 25m transect) similar to Loyn (1986). One main difference between Kangaroo Island and the other survey areas is that all the hardwood plantation stands are a similar age (between 10-20 years, all mature) as a harvesting rotation has not yet been established on the island. Six softwood plantations (*Pinus radiata*) were also surveyed on Kangaroo Island in addition to 23 hardwood plantations (mainly *Eucalyptus globulus*).

Site selection, transect placement and general methodology

Survey sites on Kangaroo Island were a mix of plantation stands (n=56), remnant habitat within plantation properties (n=17) and control sites within nearby national park (Flinders Chase National Park, n=13). The plantation properties were mainly located on the western side of the island (Figure 1) with a smaller number located in the north. Usually two survey transects were conducted within plantation stands: one internal transect located at least 70m from the edge of a stand (n=25, and one edge transect within the plantation trees but running along the edge of the stand (Figure 2). The external habitat bordering the edge transects comprised agricultural land (11 transects), national park (6 transects), remnant habitat (9 transects) and adjacent plantation stands (3 transects). Site visits and the positioning or ground-truthing of transects took place during October.

Bird surveys were undertaken by volunteer birders and KIPT/PF Olsen Australia employees, many of whom attended an introductory workshop in Kingscote on Saturday 6th October. During the fieldwork visits surveyors worked in pairs or small groups; each group were assigned a subset of sites to visit ensuring an even spread of different transect types across the different groups. Surveyors spent 20 minutes at each transect, conducting an area search along the transect length (walking slowly along the transect, searching 25m either side of the centre line). All bird species seen and heard were recorded, although birds seen/heard off transect or flying overhead were noted separately, as these individuals may not have been using the focal habitat type. Additional observations of other animals (e.g. koala or tammar wallaby) were made where appropriate.



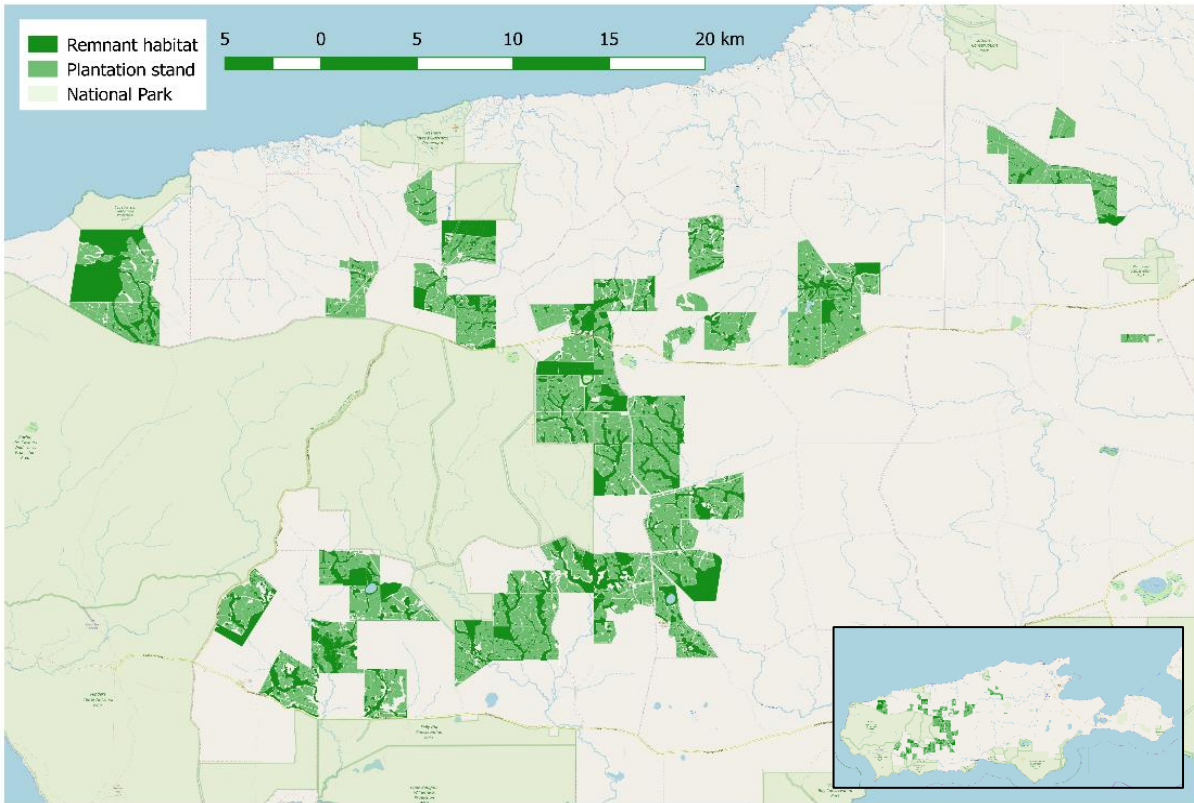


Figure 1. Overview of the KIPT owned plantations on Kangaroo Island, SA. The plantations are mainly at the western end of the island (see inset map).

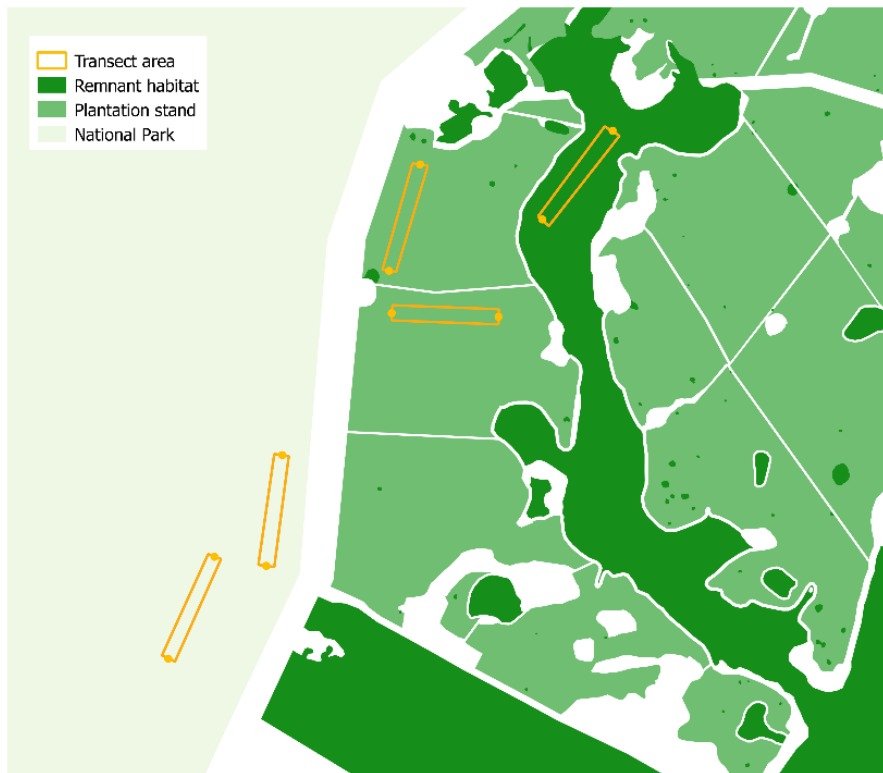


Figure 2. Detail showing five survey transects, three within the Jarmyn KIPT property (two plantation stand transects and one in remnant habitat) and two control transects in the nearby national park area.

Data analysis

Reporting Rates

Standardised data is important if we want to compare bird species over time. From the presence/absence data obtained through this project a reporting rate is calculated. This is calculated as:

$$RR = sp/stotal \quad \text{equation 1}$$

RR = reporting rate

sp = the number of surveys where a bird species is present

stotal = the total number of surveys undertaken.

Reporting rates are an “odds” calculation and form the basis of the Terrestrial Bird Index developed by BirdLife Australia for the Federal Department of Environment, and State of Environment reporting. This method allows for a standardised, long term analysis of the trends in occurrence of bird species and will be explored as data is collected within this project. This method may provide KIPT and P.F. Olsen Australia with a method to compare their plantation management with other land uses.

Indices and abundances

This report contains two main measures for comparing biodiversity across different land uses and areas: average abundance and the Shannon Diversity Index. Abundance is simply the total number of individuals counted during each survey. The Shannon Diversity Index is explained in more detail below. Both measures were calculated for each transect and then averaged across sites or land use treatments to account for transect level variation.

The Shannon Diversity Index (SI) is a measure of diversity that accounts for both the number of species recorded at a site and the abundance of individuals recorded within each species (Spellerberg & Fedor 2003). The SI is a standardised method for measuring species richness used in ecology that performs robustly in areas where a small number of species are dominant (have a much greater abundance than other species present). The SI allows standardise comparison of bird diversity and can be used as a long-term measure of temporal changes in the bird communities at each site. Ideally management should aim to maintain or increase the index value over time. There is no one optimal value, as sites differ in size, vegetation and location within the landscape matrix. Climate (both short term events like droughts and longer-term events such as climate change) will also contribute to changes in diversity values and must be considered when comparing temporal changes to determine if decreases (or increases) are caused by management activities or environmental factors.

The Shannon Diversity Index is calculated by using equation 2:

$$H = - \sum_{i=1}^s pi \ln pi \quad \text{equation 2}$$

H = Shannon Value

pi = the proportion of the i th species of the total number (n) of individuals recorded.

The higher the value of H = a more diverse a location. In this report all SI values were calculated in R using the `vegan` package (Oksanen et al., 2019).

Statistical analysis

Analyses were conducted using R 3.6.0 (R Foundation, 2019). Where appropriate, linear models were used to compare abundance and diversity in the three different land use types (plantation stand, plantation remnant and control habitat). Linear models were fitted to the log transformed Shannon Diversity Indices using the R internal `lm` package and to the abundance data using the `glm`



package with a log link function. Differences in foraging guild composition in the three treatment types were analysed using generalised linear mixed effects models (*glmer*) in the package *lme4* (Bates et al. 2015).

Results

During the survey period 869 individual birds were counted, 742 of these were recorded on survey transects. Only birds recorded on transects are included in the following summaries (Table 1), as “off-transect” sightings may have been in different habitat types. 38 different bird species were seen, the top five most commonly reported being Red Wattlebird, Crescent Honeyeater, Superb Fairy-wren, Brown Thornbill and Grey Currawong (Table 2).

Average abundance was highest within the remnant habitat ($X^2_{(1)} = 15.12$, $P < 0.001$), with generally high numbers of birds observed in the plantation properties (Figure 3). A Shannon Diversity Index was calculated for each transect, and the average (mean) index value calculated for each of the three transect types (Figure 1). Remnant habitat patches recorded the highest Shannon Index, indicating that these remnant patches may be playing an important role in maintaining bird diversity at a landscape level. However, there were no significant differences in the (log transformed) Shannon Index recorded on plantation stands, plantation remnants and control habitat ($F_{(2, 75)} = 3.23$, $P = 0.06$, $R^2_{(adj)} = 0.05$).

There was no difference in average bird abundance recorded in pine plantations ($N = 11$, Mean abundance = 10.6) and eucalyptus plantations ($N = 41$, Mean abundance = 9.0) ($X^2_{(1)} = 1.85$, $P = 0.17$). There was also difference ($F_{(1, 50)} = 0.03$, $P = 0.873$) between the mean bird diversity recorded on pine plantations (Mean Shannon Index = 0.97) compared to eucalyptus plantations (Mean Shannon Index = 1.05). 20 different bird species (out of the 38 seen during the survey period) were seen on pine plantations, however as there is only a very small sample size from pine plantations it is very difficult to draw any meaningful conclusions from this data.

Table 1. Summary of the number of surveys, bird abundance and diversity across the three main survey types, plantation stands, remnant habitat patches within plantations and control sites (national park areas outside plantations).

Survey type	Number of surveys	Number of species	Total abundance (average)	Shannon Index
Plantation stands	56	31	465 (9.29)	1.018
Plantation remnants	17	21	186 (12.4)	1.470
Control sites	13	23	87 (7.91)	1.098
OVERALL	86	38	742	1.116

Table 2. Full species list for bird surveys taking place on Kangaroo Island in 2018.

Common name	Latin name	Mallee Woodland species?	Foraging guild	Number surveys seen	Reporting Rate
Australian Magpie	<i>Cracticus tibicen</i>	Yes	OG	4	0.05
Australian Raven	<i>Corvus coronoides</i>	Yes	V	2	0.02
Bassian Thrush	<i>Zoothera lunulata</i>	No	DG	1	0.01
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Yes	C	3	0.03
Brown Thornbill	<i>Acanthiza pusilla</i>	Yes	TS	22	0.26
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	Yes	N	5	0.06
Brush Bronzewing	<i>Phaps elegans</i>	Yes	SG	1	0.01
Bush Stone-curlew	<i>Burhinus grallarius</i>	No	OT	1	0.01
Common Bronzewing	<i>Phaps chalcoptera</i>	Yes	SG	2	0.02
Crescent Honeyeater	<i>Phylidonyris pyrrhopterus</i>	Yes	N	43	0.50
Crimson Rosella	<i>Platycercus elegans</i>	No	ST	17	0.20
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	Yes	N	13	0.15
Galah	<i>Eolophus roseicapillus</i>	Yes	SG	3	0.03
Golden Whistler	<i>Pachycephala pectoralis</i>	Yes	TS	12	0.14
Grey Currawong	<i>Strepera versicolor</i>	Yes	V	19	0.22
Grey Fantail	<i>Rhipidura albiscapa</i>	Yes	C	12	0.14
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	Yes	G	14	0.16
Horsfield's Bronze-Cuckoo	<i>Chalcites basalus</i>	Yes	C	2	0.02
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	No	V	1	0.01
Little Raven	<i>Corvus mellori</i>	Yes	V	1	0.01
Little Wattlebird	<i>Anthochaera chrysoptera</i>	Yes	N	2	0.02
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	Yes	N	11	0.13
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	Yes	N	1	0.01
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	Yes	N	1	0.01
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	Yes	N	5	0.06
Red Wattlebird	<i>Anthochaera carunculata</i>	Yes	N	44	0.51
Scarlet Robin	<i>Petroica boodang</i>	Yes	OT	12	0.14
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	Yes	C	1	0.01
Silvereye	<i>Zosterops lateralis</i>	Yes	F	3	0.03
Spotted Pardalote	<i>Pardalotus punctatus</i>	Yes	C	1	0.01
Striated Pardalote	<i>Pardalotus striatus</i>	Yes	C	9	0.10
Striated Thornbill	<i>Acanthiza lineata</i>	Yes	C	13	0.15
Superb Fairy-wren	<i>Malurus cyaneus</i>	Yes	OT	26	0.30
Tawny-crowned Honeyeater	<i>Glyciphila melanops</i>	Yes	N	2	0.02
Wedge-tailed Eagle	<i>Aquila audax</i>	Yes	V	3	0.03
Welcome Swallow	<i>Hirundo neoxena</i>	No	A	1	0.01
White-browed Scrubwren	<i>Sericornis frontalis</i>	Yes	LS	4	0.05
Willie Wagtail	<i>Rhipidura leucophrys</i>	Yes	OG	1	0.01

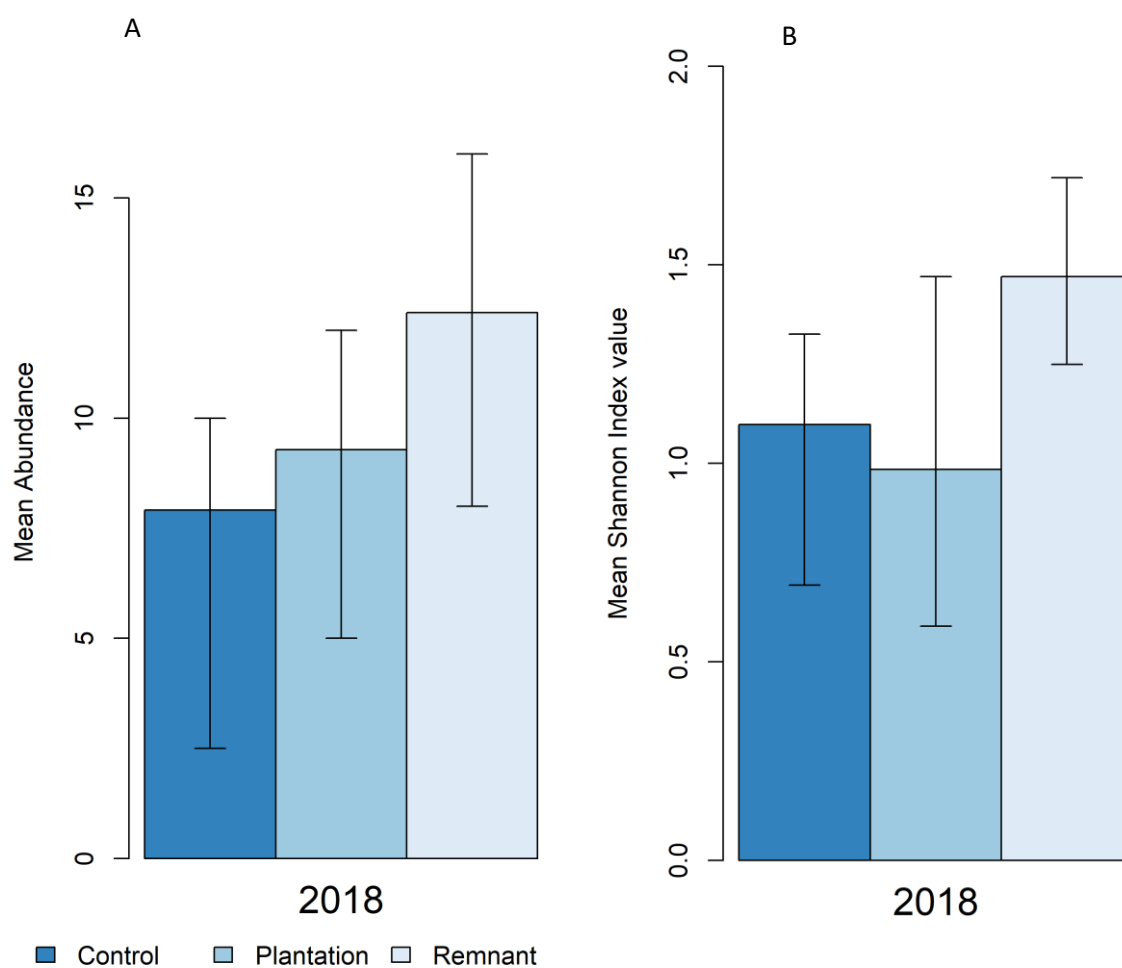


Figure 3. Mean abundance (A) and mean Shannon Diversity indices (B) recorded from the three different survey types, plantation stands, remnant habitat on plantations and control sites in nearby national park. Error bars show the 50% confidence intervals around each mean

Foraging guilds

Australian bird species can be classified into different foraging guilds, depending on both the type of food favoured by each species, and the methods employed to find the food (Table 3). These guild groups follow those of Loyn et al. (2007), and any additional species were placed in one of these defined guilds where appropriate.

Members of 13 guild groups were recorded on Kangaroo Island, however, six of these guilds only had one representative species (see below for more information). The most abundant foraging guild recorded during the 2018 surveys were nectarivorous bird species (N, Table 3). This group feeds on flowering plants and blue gum plantations probably provide a source of food for many members of this guild, which may explain the high numbers recorded in the plantation transects. The nectarivores recorded this year included seven species of honeyeater and two parrot species.

The second most abundant foraging guilds were canopy insectivores (C, species such as cuckoos and pardalotes) and bird species which forage on open ground under trees (OT) like the Superb Fairy-wren.

In general, species which forage higher in the forest canopy were common within the plantation stands, along with woodland birds that would spend time on the forest floor (Figure 4).

Guilds with representatives from only one species recorded during the 2018 Kangaroo Island surveys were as follows:

- Aerial insectivore: Welcome Swallow – members of this foraging guild are characterised by feeding on flying insects in open areas. They are less likely to be found below the tree canopy or in places with both mid-storey and canopy vegetation.
- Damp ground forager: Bassian Thrush, forages for insects and larvae within soft, damp ground, usually in denser understorey cover. Bassian thrush was seen foraging in plantation stands on Kangaroo Island.
- Frugivore: Silvereye – this species feeds primarily on fruits, but also takes insect prey. Most individuals recorded during the Kangaroo Island survey were seen in remnant habitat patches.
- Generalist: Grey Shrike-thrush. Generalist species do not follow a restricted diet, eating a wide range of foods. This is reflected in the survey results: Grey Shrike-thrush were seen in all the different habitat types.
- Low shrub insectivore: The White-browed scrubwren feeds in low understorey vegetation, preferring denser foliage. This species was only seen in remnant and control habitat transects on Kangaroo Island, not in plantation stands, which reflects its more specific habitat requirements.
- Seed in trees: Crimson Rosella – member of this foraging guild mostly feed on the seeds of eucalyptus, grasses and shrubs, so can be found at a range of canopy heights. Crimson Rosellas were seen in plantation stands and remnant habitat patches at 12 different KIPT properties on Kangaroo Island.

The seven remaining foraging guild groups had two or more species represented during the 2018 surveys. Only one of these groups was not recorded in the plantation stands (LS, low shrub insectivores). The plantation stands show a lower average abundance of species which require understorey and midstorey vegetation for foraging (figure 4) when compared to species which forage higher in the canopy or on the ground. This reflects the fact that forestry plantations, when compared to natural native habitat, are generally lacking understorey vegetation.

11 of the 13 foraging guilds were recorded in pine plantations, the two missing guilds were the frugivores (F) and nectarivores (N). This is expected, as both these groups feed on resources which are not present on pine tree species (flowers and fruits).



Table 3. Key to the foraging guild codes and total abundance

Code	Foraging guild	Total abundance
A	Aerial insectivore	3
C	Canopy insectivore	75
DG	Damp Ground	2
F	Frugivore	3
G	Generalist	16
LS	Low shrub insectivore	4
N	Nectarivore	368
OG	Open ground no trees	10
OT	Open ground under trees	89
SG	Seed on ground	11
ST	Seed in trees	56
TS	Tall shrub insectivore	61
V	Vertebrates	37

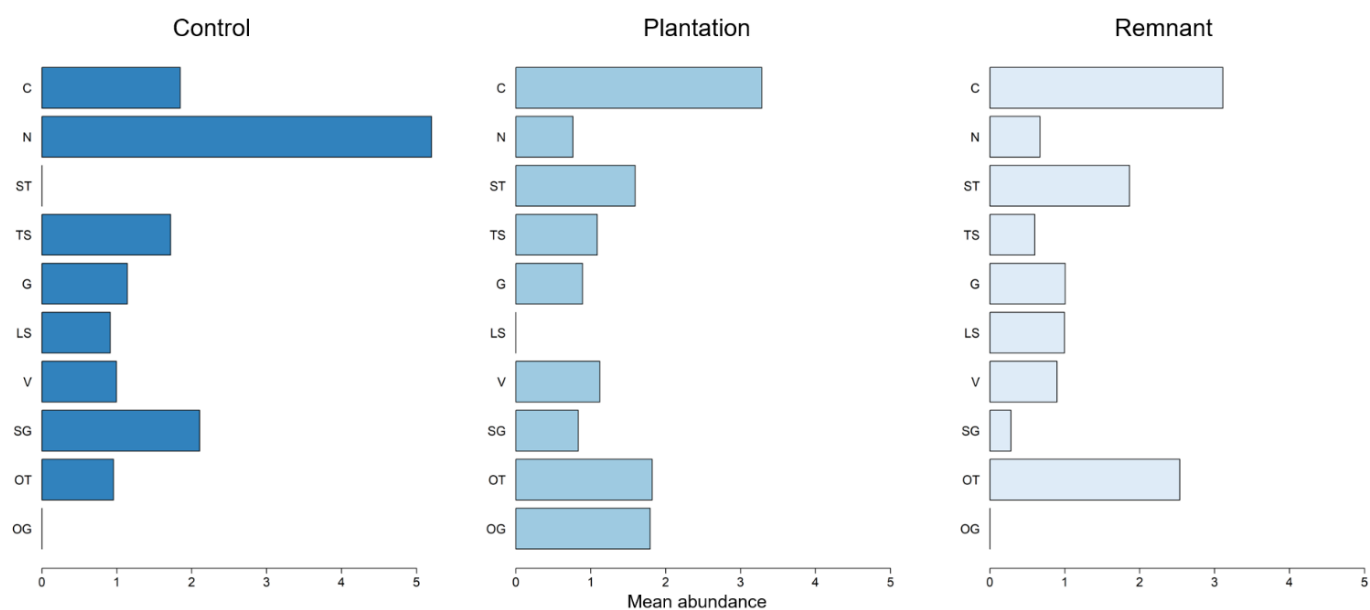


Figure 4. Summary of the mean abundance adjusted for survey effort for 10 of the 13 foraging guilds in the three treatment types (control transects in national park, plantation transects in plantation stands and remnant transects in plantations). Mean abundances were derived from a generalised linear mixed effects model measuring the interaction between guild type and transect type. These data are presented according to the approximate height at which each guild is foraging: canopy (C) being the highest, open ground (OT or OG) the lowest.

Canopy insectivores (C)

Black-faced cuckoo shrike, Grey Fantail, Horsfield’s Bronze Cuckoo, Shining Bronze-Cuckoo, Spotted Pardalote, Striated Pardalote, Striated Thornbill. These species are present in good numbers across all transects and are particularly well represented in plantation properties. All these species forage high up in the tree canopy, gleaning insects from the leaves and branches of trees.

Nectarivores (N)

Seven species of honeyeater; Brown-headed Honeyeater, Crescent Honeyeater, Eastern Spinebill, Little Wattlebird, New Holland Honeyeater, Purple-gaped Honeyeater, Red Wattlebird, Tawny-crowned Honeyeater and two parrot species; the Purple-crowned Lorikeet and Rainbow Lorikeet. Nectarivores were most commonly recorded in the control transects although they were present in the KIPT properties. The lower numbers seen in the plantations (compared to control transects) is probably related to the diversity of flowering plants and trees being lower within the plantations.

Open ground, no trees (OG)

Australian Magpie and Willie Wagtail. Both these common species forage on the ground and are frequently found on farmland or in areas where there is less vegetation. This guild group was most abundant in plantation transects, most likely due to the lack of understorey vegetation. No birds from this group were recorded in the control transects.

Open ground, under trees (OT)

Scarlet Robin, Superb Fairy-wren and Bush Stone-curlew. Members of this guild group all forage on the ground, eating mainly invertebrates. The robin and fairy-wren both forage from perches so do require some understorey vegetation.

Seed on ground (SG)

Brush Bronzewing, Common Bronzewing, Galah. These species all forage on the ground, mostly eating grass seeds. More of this group were observed in control habitat when compared to the plantations and remnant habitat patches.

Tall shrub insectivores (TS)

Brown Thornbill, Golden Whistler. Members of this foraging guild feed on insects found lower in the trees than those which are foraging in the canopy (C). Because of this they require tall shrubs and trees with more mid-height branches, mature bark and complex overall structure than are typically found in plantation stands.

Vertebrates (V)

Australian Raven, Little Raven, Grey Currawong, Laughing Kookaburra, Wedge-tailed Eagle. All these species eat vertebrates (frogs, lizards, small mammals and other birds). Many will opportunistically eat carrion and generally forage lower on the ground. The abundance of vertebrate foraging species was almost equal across all the three transect types.

Conservation Priority Species

There were no bird species from the Federal EPBC list or the South Australian Endangered/Vulnerable/Rare Species lists recorded on KIPT properties during 2018. However, 33 of the 38 different bird species recorded during the surveys are part of the Kangaroo Island Narrow-leaved Mallee Woodland ecological community (KI Mallee Woodland) list. The KI Mallee Woodland is an EPBC listed critically endangered ecological community that only occurs on Kangaroo Island. The KI narrow-leaved mallee tree (*Eucalyptus cneorifolia*) is the key plant species for this community and occurs in patches across Kangaroo Island. Although this community is mainly characterised by vegetation type, the bird species related to this community will provide important ecological roles including seed dispersal and pollination. If KIPT properties can contribute to the maintenance of these bird species' populations this may have wider conservation benefits for remnant KI Mallee Woodland patches nearby.



Discussion

Considerable support from Shauna Black (KIPT) and Hugh Watters (PF Olsen Australia) contributed to the smooth running of the surveys on Kangaroo Island. The number of volunteer surveyors was encouraging and hopefully will be maintained next year. However, a large proportion of the volunteers were not experienced bird surveyors. This may mean the number of species recorded will improve in later surveys as volunteers become more experienced. There were also difficulties moving through the habitat, particularly in control sites and some remnant habitat patches, due to very thick vegetation. Next year it is important to communicate with volunteers that it is not necessary to move across the whole transect, or in a straight line during the surveys. Some of the more difficult transects, particularly in control sites, could be relocated to account for this. Given the low number of pine plantations on the island, and the difficulty the volunteers had in surveying most of them due to the very high density of trees, it may be worth considering dropping these transects out of the survey in favour of the eucalyptus plantations.

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Appendix 1

Table showing summary information for the different properties surveyed on Kangaroo Island in 2018.

Property Name	Habitat type	Number of species	Number of guilds	Mean Shannon Diversity Index	Mean abundance
Alandale	Hardwood	11	7	1.48	12.3
Anderson/Roo Lagoon South	Hardwood	7	4	1.27	7.7
Aroona	Hardwood	5	4	0.91	6.5
Binnowie KI	Hardwood	7	4	0.94	9.3
Brookland Park	Hardwood	6	5	0.84	6.3
Carnarvon	Hardwood	10	6	1.53	10.5
Cooper Couchman	Hardwood	9	5	1.19	24.3
Cronins	Hardwood	7	5	0.95	6.0
Gosse East	Pine	11	5	1.63	20.5
Greenslopes	Hardwood	10	6	1.44	15.0
Gumridge	Pine	6	6	0.74	4.5
Hillview	Hardwood	5	4	0.80	3.0
Huxtable	Pine	4	4	1.05	NA
Jarmyn	Hardwood	9	6	0.75	10.7
Kangari Springs	Hardwood	7	4	0.61	NA
Kelda Lea	Hardwood	12	6	0.96	8.7
Kellendale	Hardwood	7	4	1.55	12.0
Kelly East	Pine	9	6	1.43	9.0
Kelly West	Pine	6	5	1.48	12.5
Laterite Hills	Hardwood	6	4	1.33	10.0
MacGill	Hardwood	4	3	0.45	5.0
Martin	Hardwood	6	5	1.05	6.5
Minnamurra	Hardwood	8	4	1.39	10.0
Morlands	Hardwood	5	4	1.55	7.0
Stephens KI	Hardwood	7	5	1.34	26.0
Stunsail Boom	Hardwood	10	7	0.95	8.0
Trethewey	Hardwood	8	5	1.49	10.0
Wingara North	Hardwood	7	6	1.35	8.5
Yerda South	Pine	6	6	0.35	NA
Control 1 - Gosse East	Control	9	6	0.99	7.0
Control 2 - Kellendale	Control	4	3	0.78	4.0
Control 3 - Gumridge	Control	5	3	1.30	6.5
Control 4 - Jarmyn	Control	11	4	1.64	19.5
Control 5 - Wingara North	Control	6	6	1.01	5.0
Control 7 - Andersons	Control	2	1	0.64	3.0





birds are in our nature



