ikoala report

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2019-11-13

1. Files and parameters

Input files

- Report file name: ikoala report
- Report type: monitoring
- Data base: database/GDA94z55Database2019May.accdb
- Study periods file: periods/periods.csv
- Study site file: sites/sites_coastal_2.csv
- Study area: Coastal
- Projection: +proj=utm +zone=55 +south +ellps=WGS84 +datum=WGS84 +units=m +no_defs

Output folder (containing tables, images and maps)

- Results folder: results

Report content summary

This is an automatically generated report of koala occurrence, activity and tree species preference analysis for specified sampling period/s and region.

An *ikoala* monitoring report is created. Please be aware that there need to be at least two periods defined and sites are taken from the provided sites file. All sites within the grid defined by the sites file: sites/sites_coastal_2.csv are includedsites/sites_coastal_2.csv.

The report is for the area exending -36.61 to -36.54 latitude and 149.9 to 149.9longitude.

Definitions of terms detailed explanations of analyses are in provided in the ikoala supplementary report.

The study area name/s in database and specified survey periods are provided in Table 1 below.

Table 1: *Survey period(s)*

period	from	to
1	2007	2010
2	2011	2015
3	2016	2019

2. Study area and occurence results

Figure 1, below, shows the study area, the grid-sites assessed and presence/absence results for all periods.

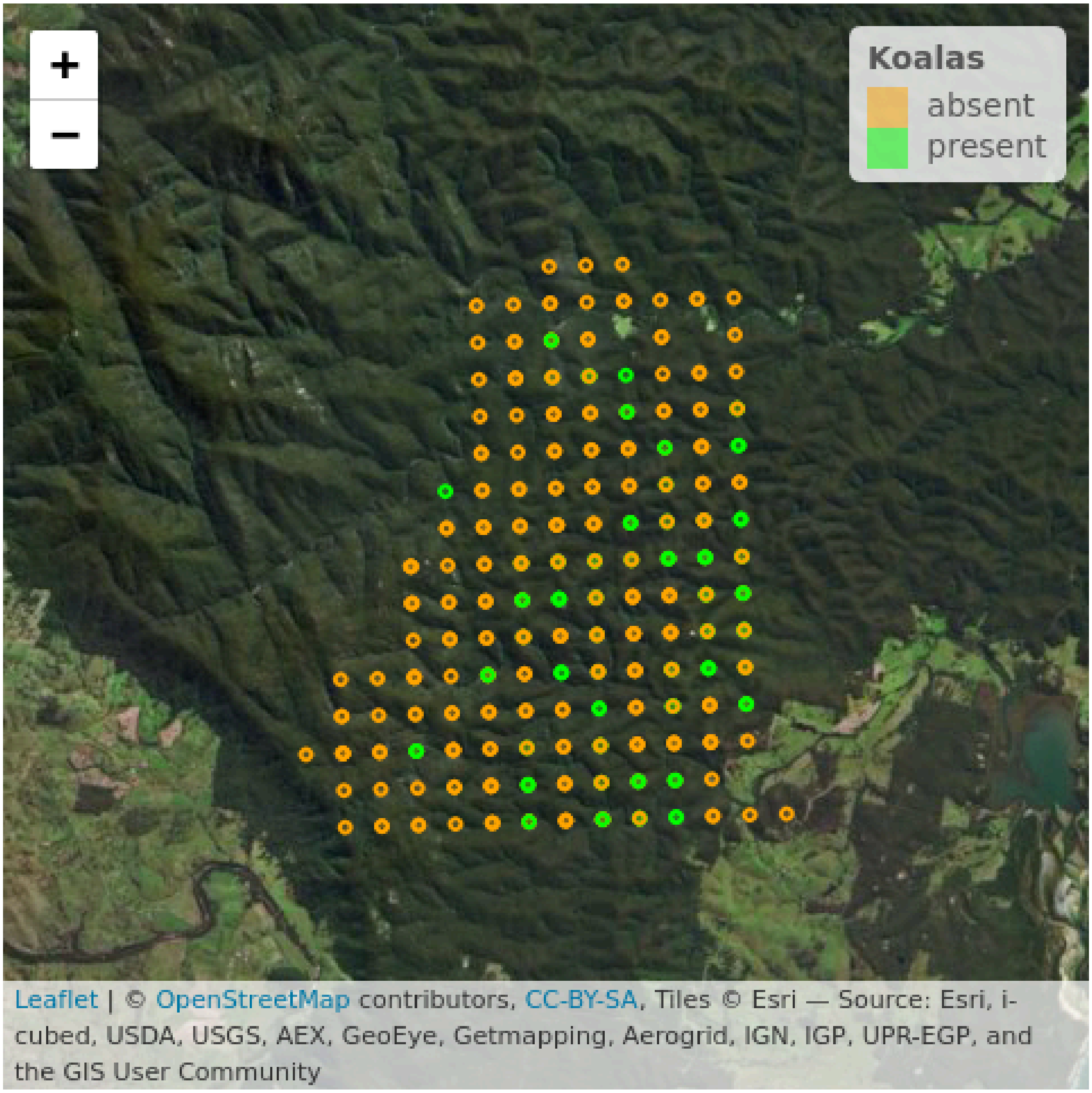


Table 2 provides a summary of occurrence at grid-sites and trees within those sites that were assessed in all specified periods.

Table 2: *Summary for occurrence of koalas within the study area*

	Count and proportion
Visited sites	331
Active sites	77 (23.3 %)
Inactive sites	254 (76.7 %)
Examined trees	9843
Active trees	199(2%)
Inactive trees	9644(98%)
Trees at active sites	2310(23%)
Trees at inactive sites	7533(77%)

3.) Monitoring results

Monitoring periods

Definition of monitoring periods

period	from	to
1	2007	2010
2	2011	2015
3	2016	2019

Monitoring area.

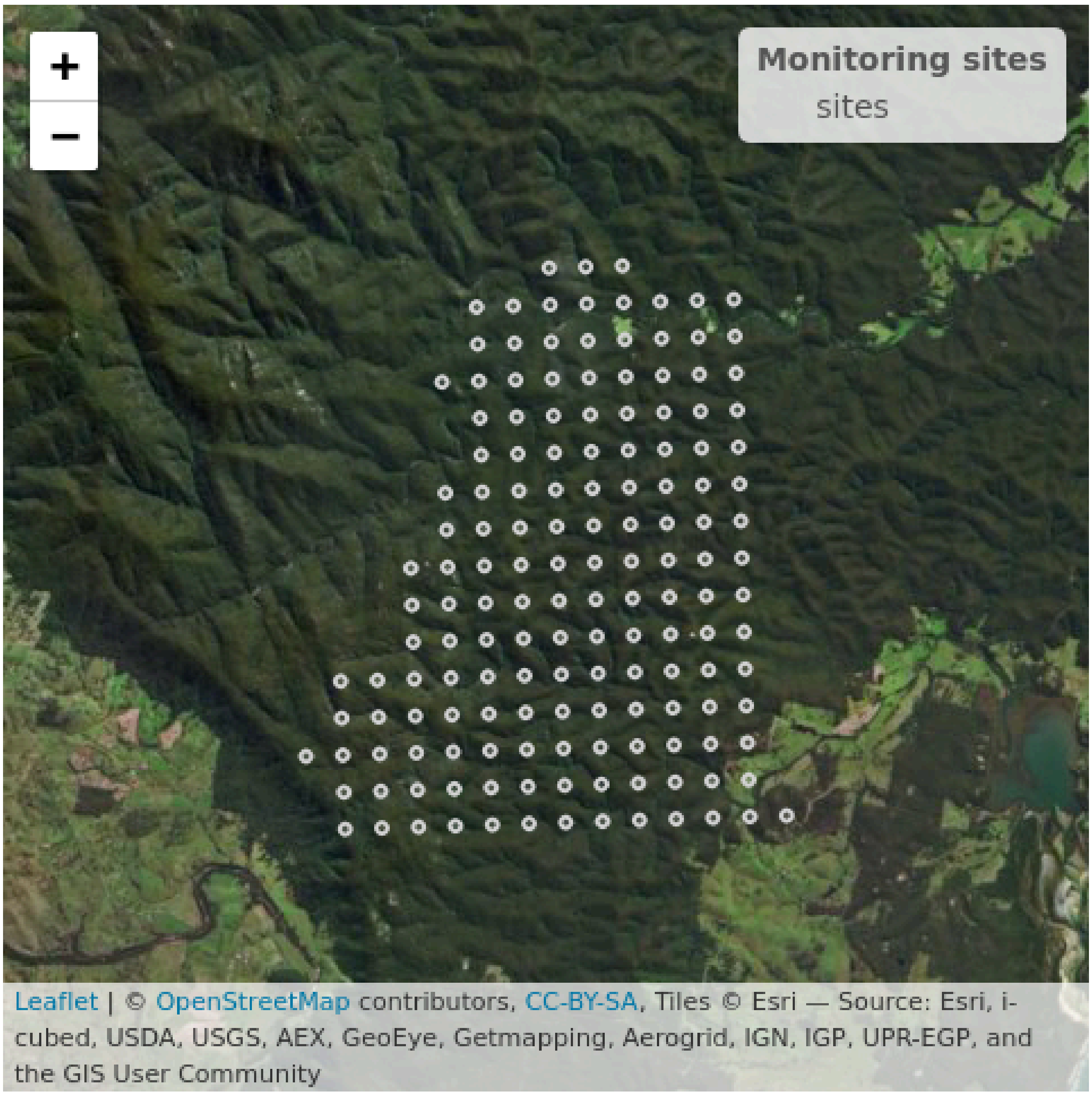


Figure 2: *Monitoring area. The monitoring area is defined by the sites listed in file: and consists of 154 sites.*

Summary tables per period

Table 3: *Summary of occurences of koalas per study period within the monitoring site. Please note that sites within were moved to corrosponding monitoring sites. Sites visited more than once during a period were combinded into one observation.*

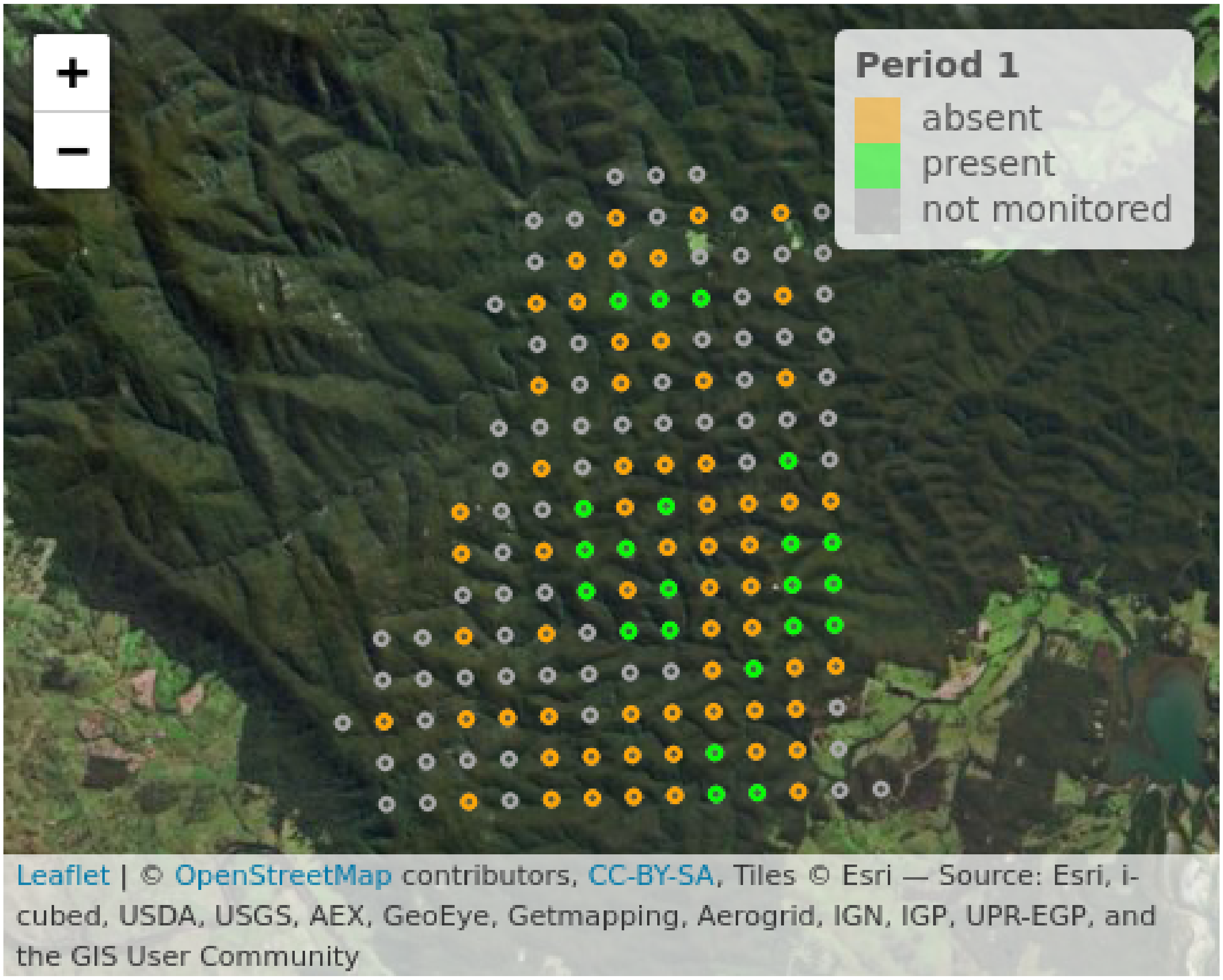
	Period 1	Period 2	Period 3
absent	61	103	90
present	22	32	23
not monitored	71	19	41
Sum	154	154	154

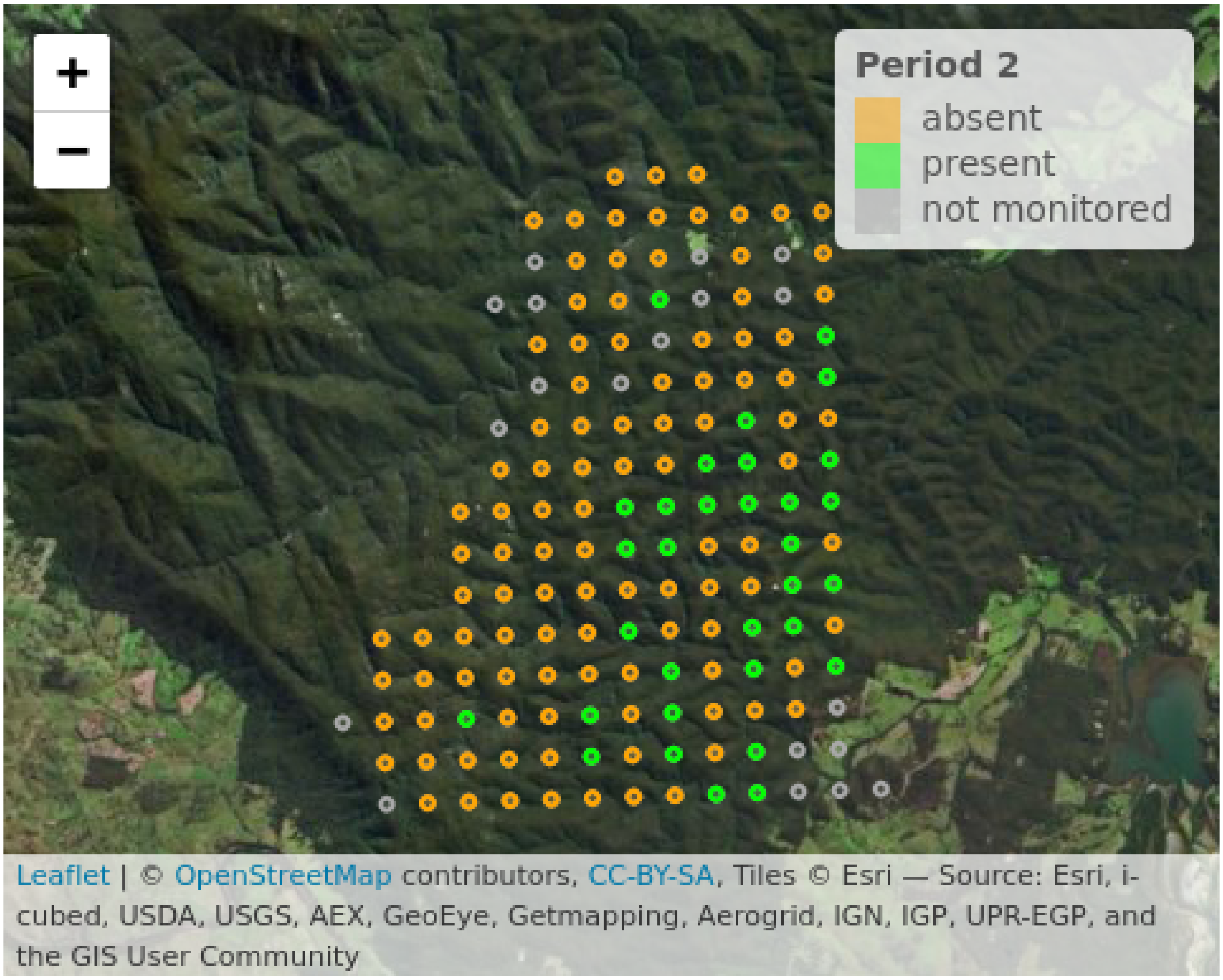
Table 4: *Percentage of occurrences of koalas per study period*

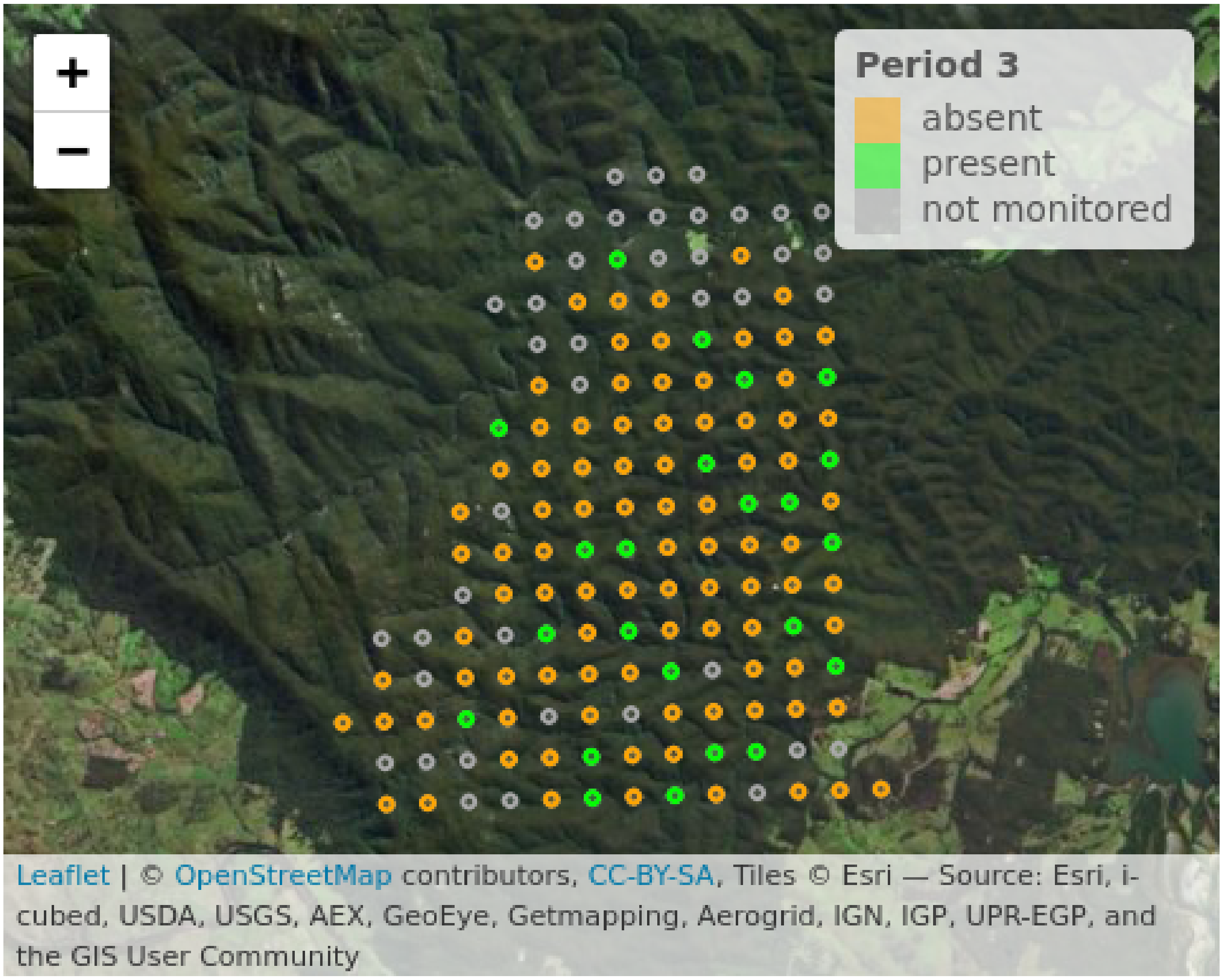
	Period 1	Period 2	Period 3
absent [%]	73	76	80
present [%]	27	24	20
Sum	100	100	100

Mapped results per period

The following figures show the grid-sites that were assessed in each monitoring period and their absence/presence results.


+
−
Period 1
absent
present
not monitored
Leaflet | © OpenStreetMap contributors, CC-BY-SA, Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community


+
−
Period 2
absent
present
not monitored
Leaflet | © OpenStreetMap contributors, CC-BY-SA, Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community



Estimated occupancy over time and probability of detection

A Bayesian-based occupancy modelling approach was used to estimate site occupancy. Site occupancy is analagous to to the proportion/percentage of sites that are active, but accounts for imperfect detection of koala activity. Two parameters are estimated using this approach. The first is *psi*, the proportion of sites that are occupied adjusted for imperfect detection and *p*, the probability of detection given that koala faecal pellets are present. To obtain our estimate of *p*, we treat each actual site visit as three repeated visits with 10 trees being searched as a part of each repeated visit. This step is required as the estimation of *p* requires temporally repeated visits to the same sight with the assumption that there is no change in population size or activity levels between visits. We have performed testing with varying numbers of trees being visited during the repeat visits and have found that it has only limited effects on the estimate of *p*

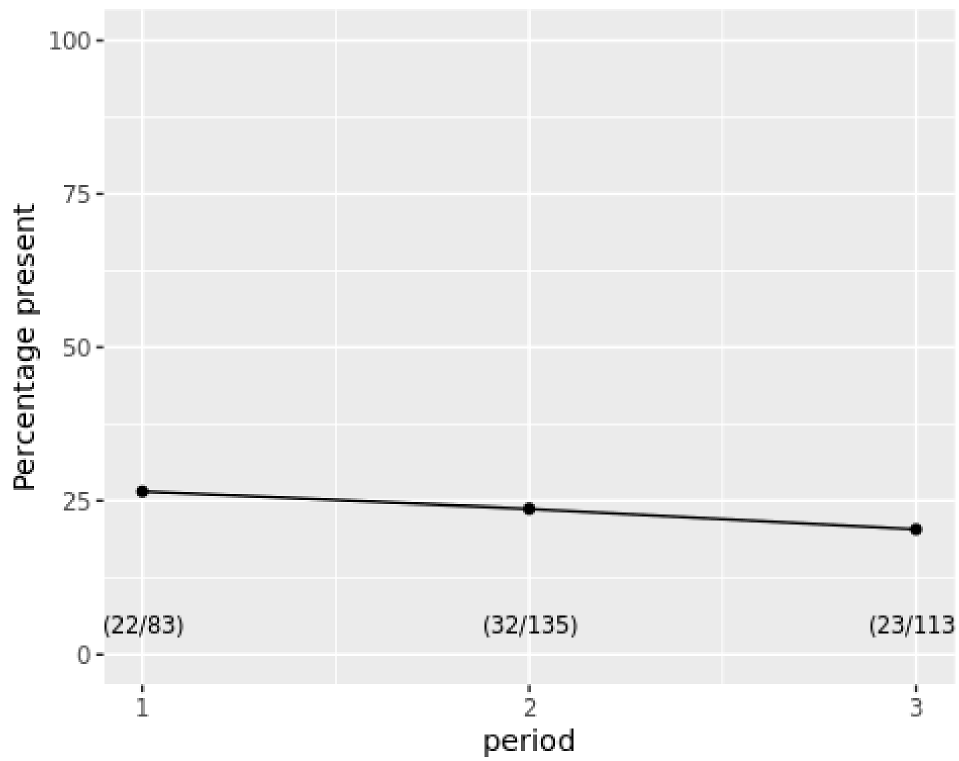


Figure 3: *Percentage of occupied sites over periods*

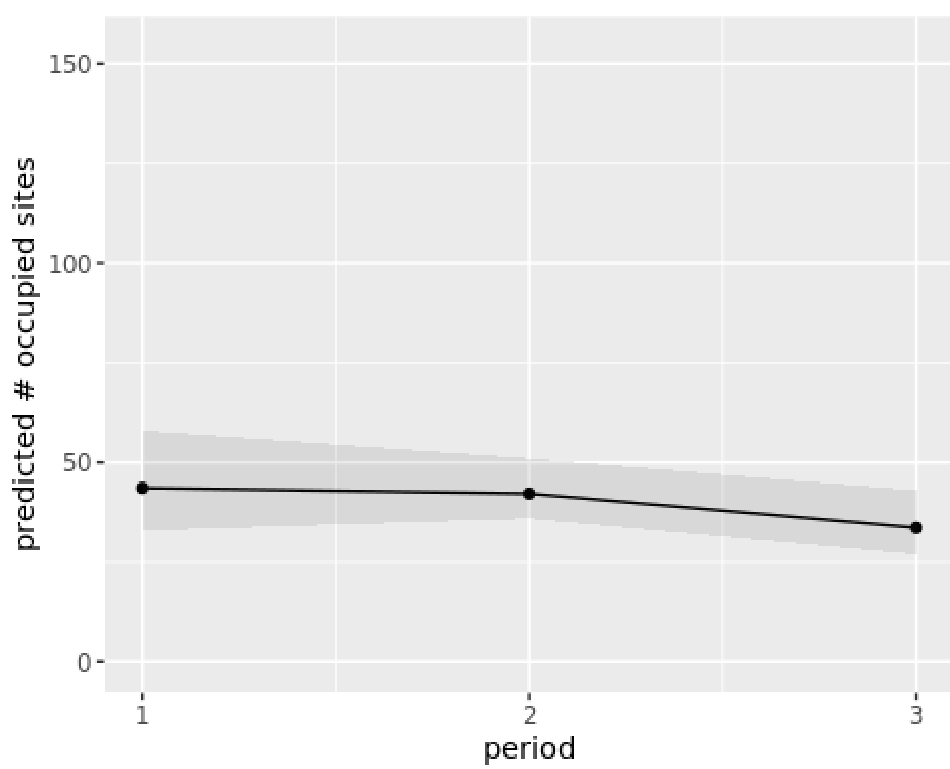


Figure 4: *Predicted number of sites occupied over periods (out of a total of 154 sites)*

Summary output of occupancy model

Table 5 below consits of the following parameters:

- the occupancy rate at each period
- the numober of occupied/active sites in each period
- the probability that koala pellets would be detected if they were present at a grid-site
- the probability that a grid-site unoccupied in a period and is occupied in the following period (site colonisation rate)
- the probability that a grid-site occupied in a period would be unoccupied in the following period (site extinction rate).

In regards to the last two columns: 2.5% indicates the measure in which the mean of the parameter will be less than the 2.5% figure 2.5% of the time in a random selection of sites, and 97.5% indicates the mean of the parameter will be less than the 97.5% figure 97.5% of the time in a random selection of sites.

Table 5: *Summary output of occupancy model.*

	mean	sd	2.5%	97.5%
occupancy rate[P1]	0.287	0.055	0.189	0.402
occupancy rate[P2]	0.279	0.043	0.201	0.369
occupancy rate[P3]	0.226	0.042	0.15	0.314
# occupied sites[P1]	44	6	33	58
# occupied sites[P2]	42	4	36	51
# occupied sites[P3]	34	4	27	43
detection probability at a site (30 trees)	0.867	0.033	0.794	0.922
colonisation rate[P1-2]	0.191	0.05	0.102	0.296
colonisation rate[P2-3]	0.125	0.046	0.045	0.225
extinction rate[P1-2]	0.503	0.116	0.288	0.741
extinction rate[P2-3]	0.485	0.097	0.303	0.681
probability of increase[P1-2]	0.459	0.498	0	1
probability of increase[P2-3]	0.139	0.346	0	1

4.) Activity of koalas in the study area

Figure 5 shows the koala activity levels (the proportion of trees with koala faecal pellets at each grid-site) and the activity contours derived from these values. Activity contours are analagous to elevation contours. They are derived from the activity values of each sampled site and those of its 8 nearest neighbours and delineated so that points of equal resulting value are joined. The values for activity of koalas in unsampled points (i.e. inbetween sampling sites) is interpolated using a smoothing function.

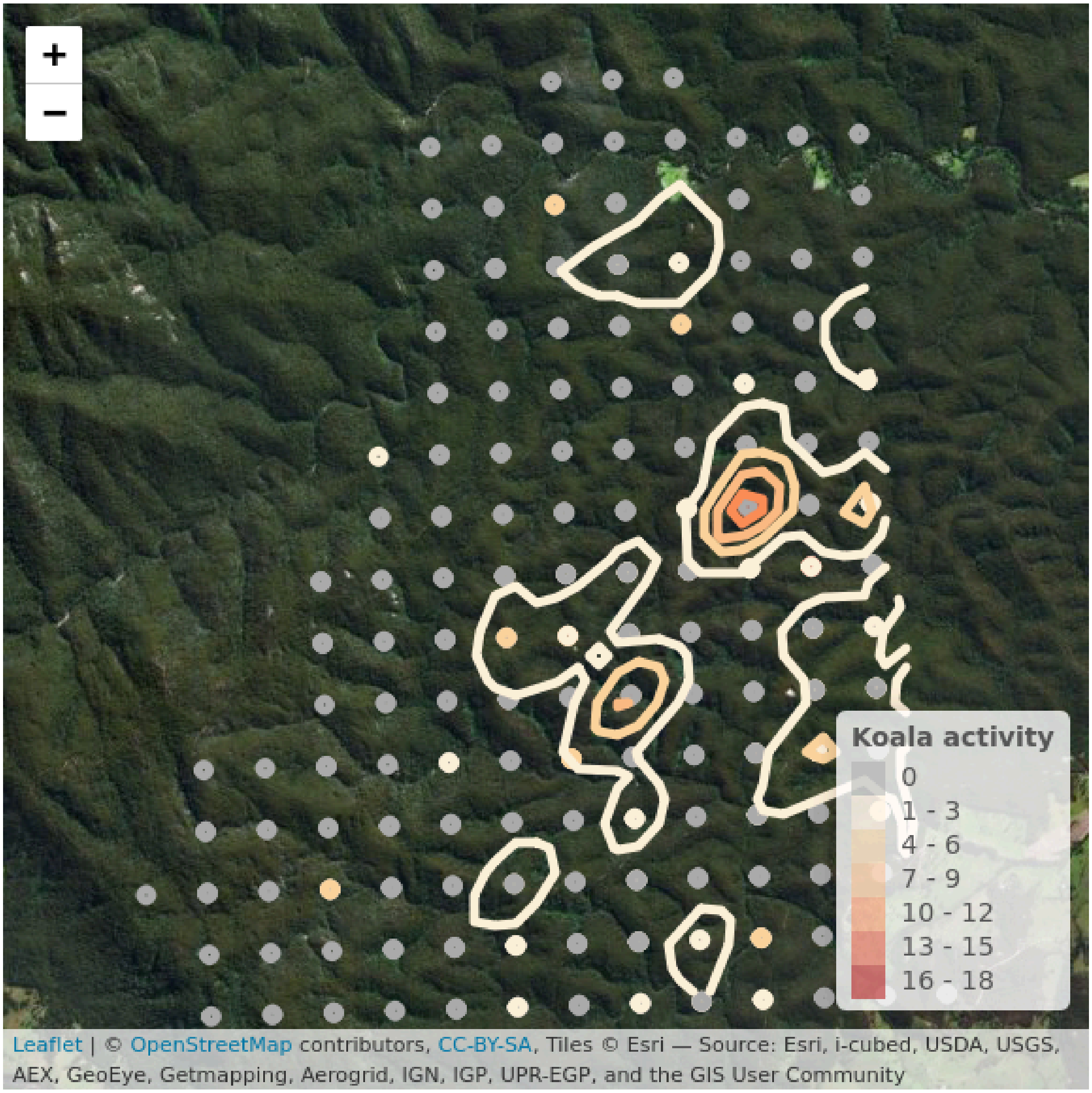


Figure 5: *Site-specific koala activity levels and derived activity contours*

5.) Koalas' tree species preference results

Tree species strike-rates at active sites.

One measure for comparing the study area's koalas' tree species preferences is the probability of finding koala faecal pellets under a specific tree species at active sites, termed the strike-rate in this report. The strike rate for each tree species is calculated by dividing number of trees of species X with one or more faecal pellets with the total number of trees of that species sampled at all active sites. Additional information about this approach is provided the ikoala supplementary report.

Figure 6, below, consists of Boxplots overlaid with dotplots showing the distribution of site-specific strike rates at active sites, thus enabling the visualization of the distribution of strike rates across active sites for selected species. Dotplots show actual values of strike rates at each site, while boxplots provide additional information about strike rate distribution. The bottom edge of the box corresponds to the lowest 25% of strike rates for a species, the line in the box shows the median (lowest 50%) and the top edge of the box corresponds to the upper 75% of strike rates for a specific tree species. The whiskers at the top and bottom of the box indicate 1.5x the inter-quartile range and the dots outside the range of the whiskers represent outliers (i.e. values beyond 1.5x, the 75% and 25% cut-off values).

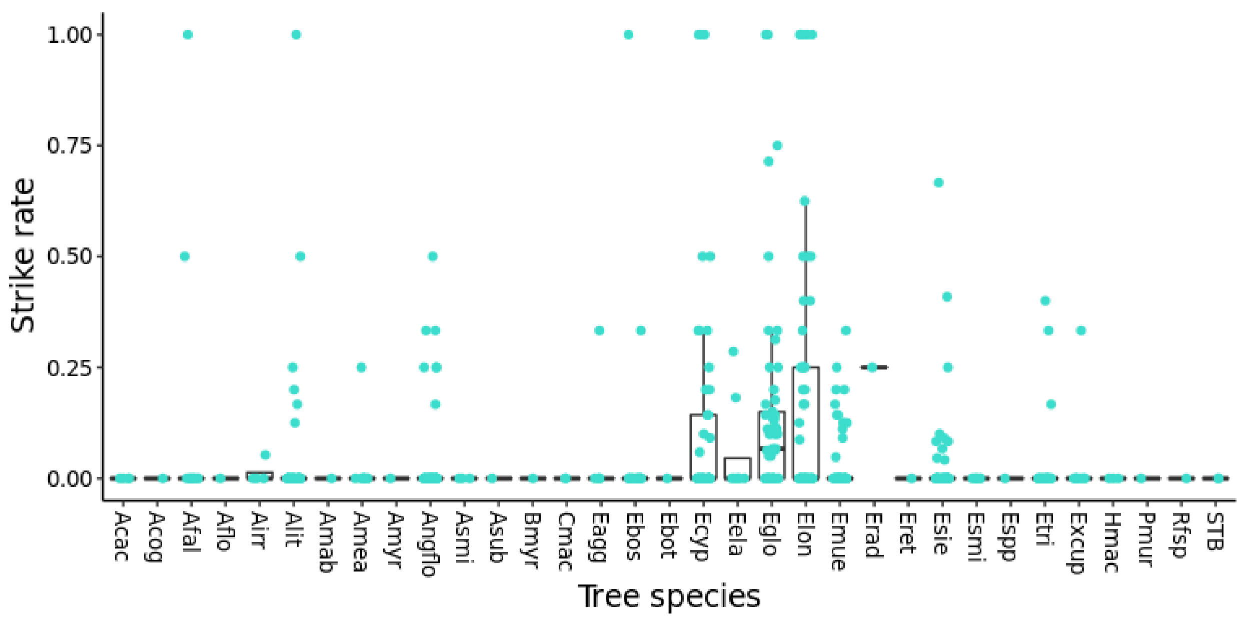


Figure 6: *Boxplots overlaid with dotplots showing the distribution of site-specific strike rates at active sites and dots showing the site-specific strike rates of individual sites*

Overall strike rate

Another measure of strike rates is termed the overall strike rate. This investigates the study's data on tree species selection by koalas, from all sites, whether or not the site is active. Overall strike rates for each species are shown in Figure 7 below. Please, note that the overall strike rate for each species shown in this figure is a single value (i.e. the mean probability across all sites), therefore no distribution is shown. If koalas truly prefer tree species X, the overall strike rate for the tree species would be high.

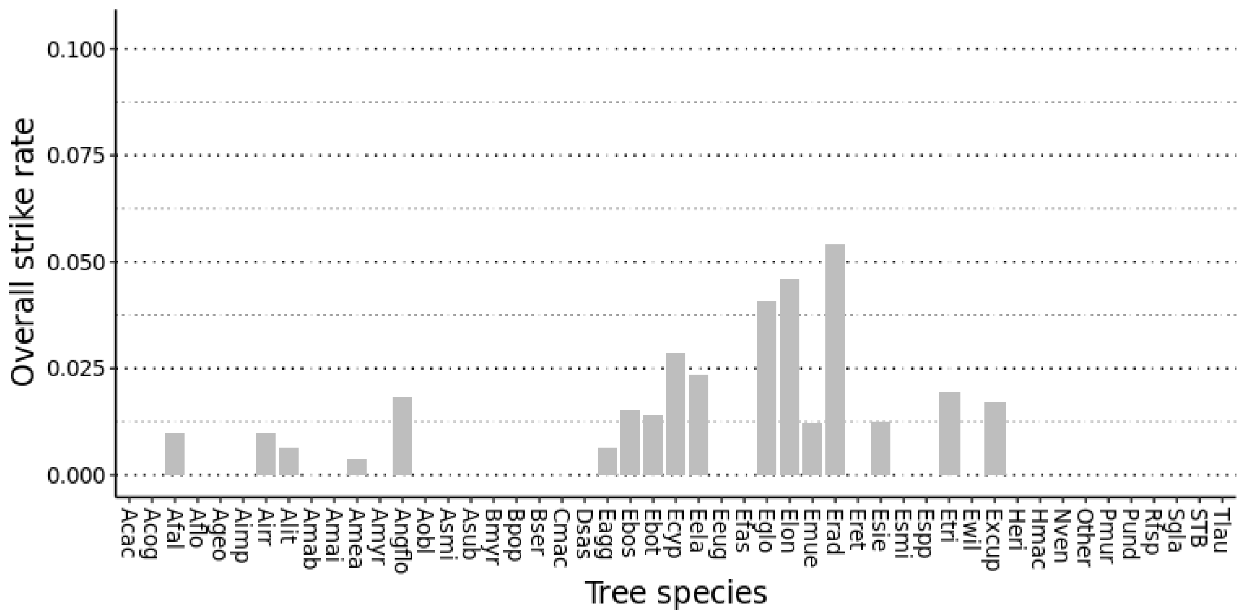


Figure 7: *Overall strike rates for each tree species present at visited sites.*

A summary of tree species' strike-rates at active sites and overall strike rates at all sites is shown in Table 6.

Table 6: *Summary of koala activity by tree species for active and inactive sites within the study area. ('N inactive sites' and 'N active sites' = the number of inactive and active sites the species was recorded at respectively; 'N trees at inactive sites' and 'N trees at active sites' = the number of trees of a species recorded at inactive and active sites respectively; 'N trees with faecal pellets' = the number of trees of a species with faecal pellets;and 'Mean strike rate (and standard error)' were calculated from the site-specific strike rate data).*

Tree ID	# of inactive sites	# of active sites	Count at inactive sites	Count at active sites	# of faecal pellets	Mean strike rate	SE
Acac	9	4	33	13	0	0	0
Acog	NA	1	NA	1	0	0	NA
Afal	62	11	181	19	2	0.136	0.07 4
Aflo	10	1	29	6	0	0	NA
Ageo	1	NA	1	NA	0	NA	NA

Aimp	3	NA	3	NA	0	NA	NA
Airr	9	4	66	36	1	0.013	0.004
Alit	135	42	916	218	8	0.053	0.012
Amab	NA	1	NA	2	0	0	NA
Amai	4	NA	4	NA	0	NA	NA
Amea	46	11	233	38	1	0.023	0.012
Amyr	NA	1	NA	2	0	0	NA
Angflo	110	52	318	125	9	0.04	0.01
Aobl	1	NA	2	NA	0	NA	NA
Asmi	9	3	84	3	0	0	0
Asub	2	1	13	8	0	0	NA
Bmyr	14	1	131	13	0	0	NA
Bpop	1	NA	2	NA	0	NA	NA
Bser	1	NA	1	NA	0	NA	NA
Cmac	NA	2	NA	2	0	0	0
Dsas	4	NA	57	NA	0	NA	NA
Eagg	49	5	230	15	2	0.067	0.038
Ebos	52	18	197	49	4	0.074	0.035
Ebot	15	1	47	1	1	0	NA
Ecyp	121	45	514	195	22	0.137	0.019
Eela	23	8	131	38	4	0.058	0.018
Eeug	3	NA	5	NA	0	NA	NA
Efas	1	NA	3	NA	0	NA	NA
Eglo	108	53	847	452	58	0.149	0.011
Elon	138	57	581	231	41	0.214	0.022
Emue	147	53	1064	312	18	0.039	0.004
Erad	7	1	29	8	2	0.25	NA
Eret	NA	1	NA	1	0	0	NA
Esie	134	49	1323	399	24	0.037	0.006
Esmi	29	7	142	21	0	0	0
Espp	NA	1	NA	1	0	0	NA
Etri	45	25	123	64	4	0.036	0.013
Ewil	1	NA	1	NA	0	NA	NA

Excup	31	10	42	14	1	0.033	0.028
Heri	1	NA	1	NA	0	NA	NA
Hmac	11	3	34	8	0	0	0
Nven	1	NA	1	NA	0	NA	NA
Other	4	NA	4	NA	0	NA	NA
Pmur	4	1	7	1	0	0	NA
Pund	6	NA	9	NA	0	NA	NA
Rfsp	1	1	4	1	0	0	NA
Sgla	1	NA	1	NA	0	NA	NA
STB	10	2	75	13	0	0	0
Tlau	1	NA	7	NA	0	NA	NA

Bootstrap simulation

Figure 8, below, shows the distributions of observed - simulated strike rates assuming koalas choose trees within the study area at random. For each tree species in the study area, ikoala performs a bootstrap simulation with 100,000 permutations to determine the middle 95% of the distribution of the differences between the observed and simulated strike rates, indicating the species that koalas are actively avoiding (distribution is below 0) or selecting for (distribution is above 0). Bootstrap simulations test whether the observed overall strike rate for a tree species is significantly different from the overall strike rate that would be expected if koalas were choosing trees at random.

Additional information and references about these analytical methods and references are provided in the ikoala supplementary report.

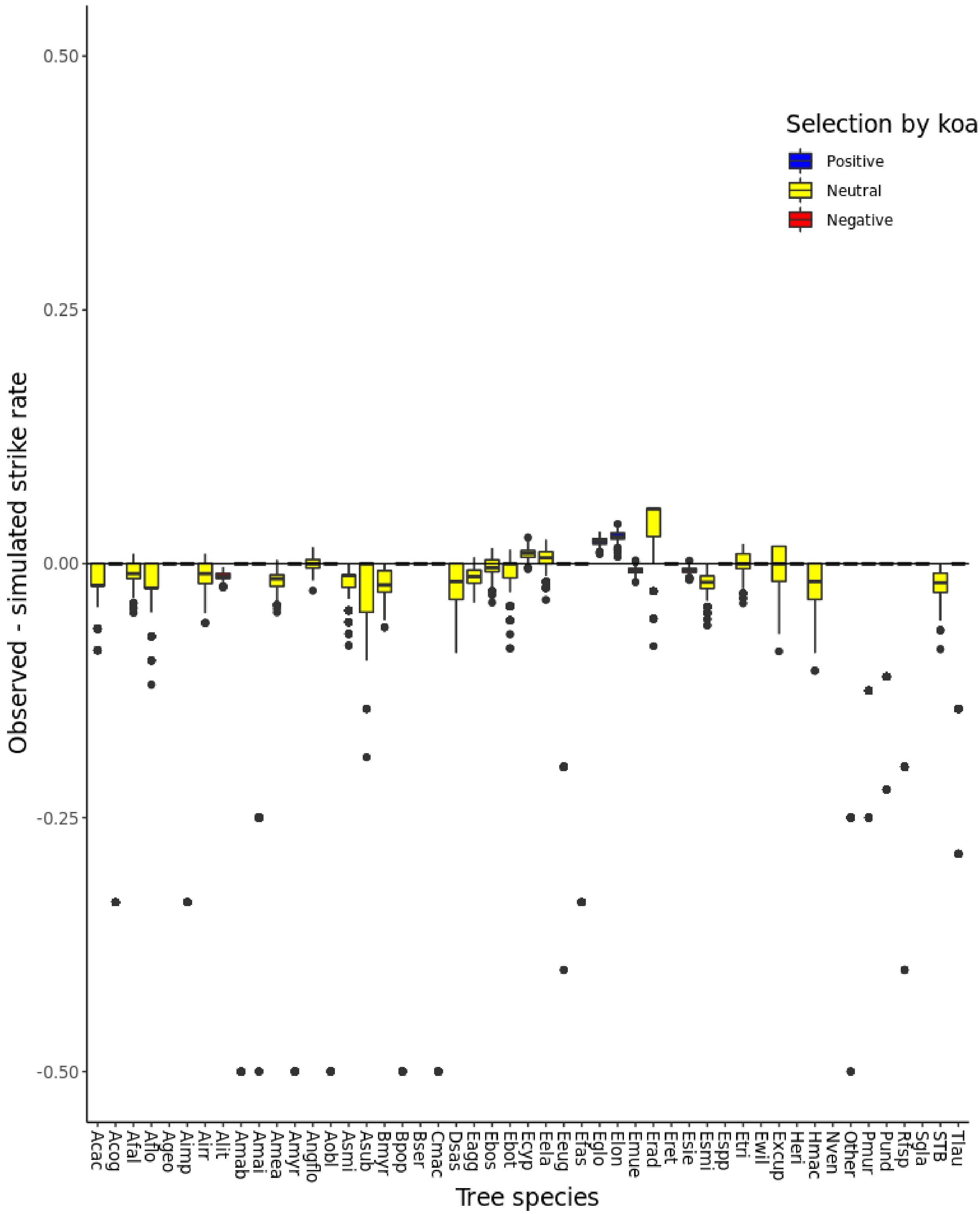


Figure 8: *Distributions of observed - simulated strike rates assuming that koalas choose trees within the study area at random. Distributions whose middle 95% do not include 0 suggest that the tree species is either being positively selected (i.e. the boxplot is above 0 and has a blue fill colour) or negatively selected (i.e. the boxplot is below 0 and has a red fill colour). Boxes for tree species that are being neutrally selected have a yellow fill colour.*

Tree size preference

The relationship between tree size and their use by koalas is shown in Figure 9

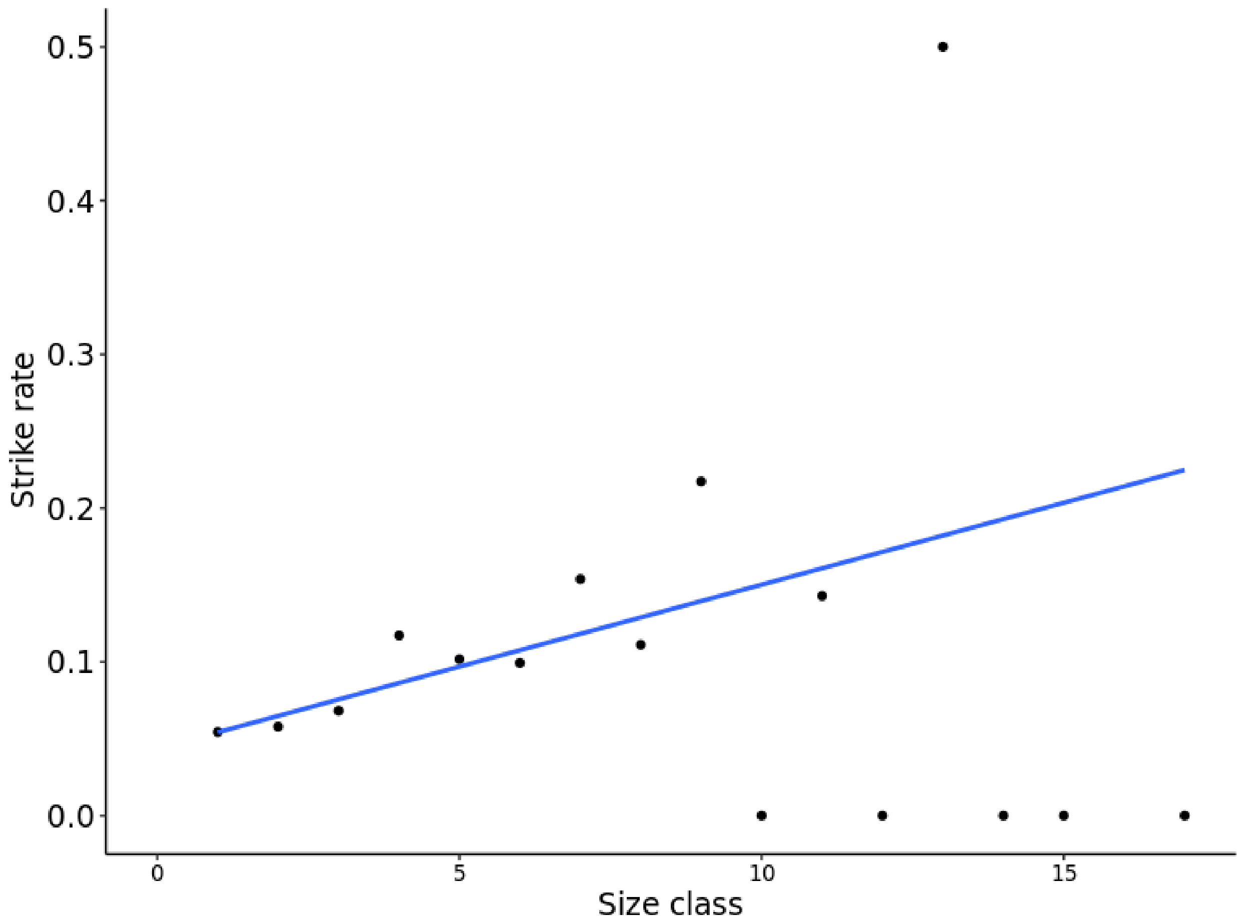


Figure 9: *Relationships between tree size (DBH) and strike rate across all tree species.*

For each tree species, ikoala performs a weighted linear regression between strike rate and tree size, with each size class weighted by the number of trees (of the species of interest) in the size class. Results for all tree species are shown in Figure 10 and `tabRef("regsum")` below. The R^2 value shows the proportion of the change in strike rate with tree size that can be attributed to tree size. The slope of the relationship informs us about the overall direction of the relationship. A positive slope value indicates that koalas prefer larger trees than smaller trees of a particular species, whereas negative slope value indicates the opposite. The absolute value for the slope (i.e. how far the slope value is from zero in any direction) indicates the steepness of the relationship. High absolute value for the slope indicates a large difference in strike rates between size class 1 and size class 2, and size class 2 and size class 3, etc. The p-value provides information about the significance of the observed relationship; in general, only relationships with $p<0.05$ are considered to be significant, but if regressions are being performed for a large number of trees, a more appropriate significance level is 0.05/N, where N is the number of regressions performed.

Additional information and references about these analytical methods and references are provided in the ikoala supplementary report.

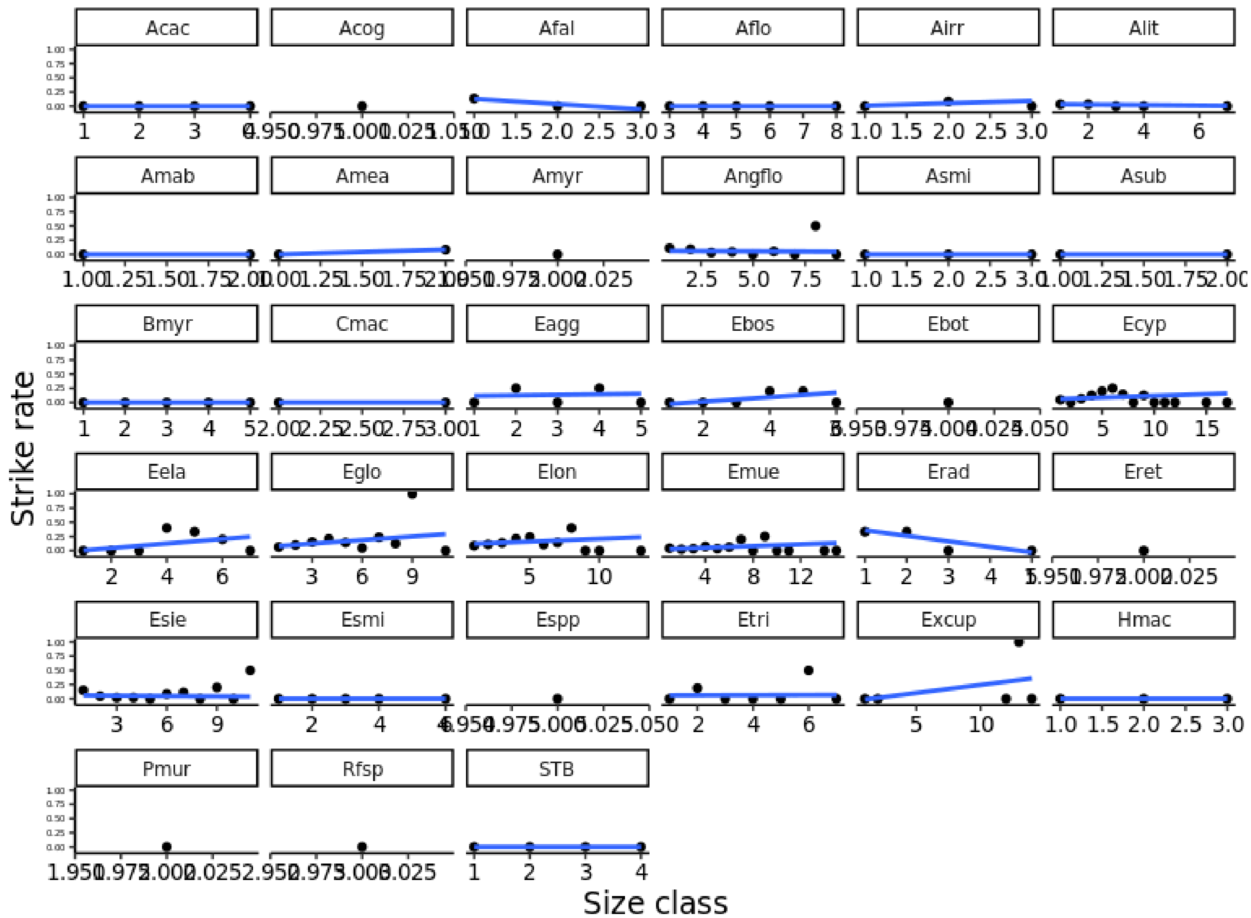


Figure 10: *Relationships between tree size (DBH) and strike rate for each tree species.*

Table 7: *Summary terms for linear regressions of strike rate on tree size for each tree species found at active sites weighted by the number of trees in each size class. Summary terms include the number of trees used in the regression (N), intercept and slope of the regression line, the R2 value and the p-value for the regression.*

Species	N	Intercept	Slope	R-square	p-value
Acac	13	0	0	NA	NA
Acog	NA	0	NA	NA	NA
Afal	19	0.2222	-0.09259	0.8681	0.2367
Aflo	6	0	0	NA	NA
Airr	36	-0.03448	0.0431	0.431	0.544
Alit	218	0.03813	-0.004477	0.3452	0.2975
Amab	2	0	0	NA	NA
Amea	38	-0.08333	0.08333	1	NA
Amyr	NA	0	NA	NA	NA
Angflo	125	0.06275	-0.001768	0.002383	0.9008

Asmi	3	0	0	NA	NA
Asub	8	0	0	NA	NA
Bmyr	13	0	0	NA	NA
Cmac	2	0	0	NA	NA
Eagg	15	0.1058	0.009615	0.01099	0.8668
Ebos	49	-0.06682	0.03995	0.4533	0.1427
Ebot	NA	0	NA	NA	NA
Ecyp	195	0.05626	0.00609	0.05038	0.4404
Eela	38	-0.03418	0.03984	0.2184	0.2904
Eglo	451	0.0607	0.02103	0.246	0.1449
Elon	231	0.1116	0.009692	0.08883	0.3734
Emue	311	0.02102	0.007523	0.1517	0.1883
Erad	8	0.4563	-0.09709	0.7282	0.1467
Eret	NA	0	NA	NA	NA
Esie	399	0.06136	-0.002051	0.00407	0.8522
Esmi	21	0	0	NA	NA
Espp	NA	0	NA	NA	NA
Etri	64	0.05914	0.001137	0.0002625	0.9725
Excup	14	-0.04031	0.02844	0.2779	0.3614
Hmac	8	0	0	NA	NA
Pmur	NA	0	NA	NA	NA
Rfsp	NA	0	NA	NA	NA
STB	13	0	0	NA	NA

ikoala supplementary report

6. Definition of terms

The terminology and analyses performed within this report are consistent with reports by Phillips & Callaghan (2000), Allen et al. (2009), Biolink (2011), and Gruber & Adamack 2016). The terms include:

- *Grid-site*, which is a site that coincides with the envisioned grid of the study area
- *Occurrence*, which is determined by the presence or absence of koala faecal pellets at a sampling site for every period
- *Active*, a site where at least one koala faecal pellet was found during a period.
- *Activity* level, which is the proportion of trees with one or more koala faecal pellets at sampling sites for every period.
- *Strike rate*, which is the preference for certain tree species defined as the probability for every period that a faecal pellet is found under a tree of a specified tree species.

7. Occupancy trend analyses

If more than one period is defined, an analysis on the trend of occurrence between periods is run. The analysis uses a Bayesian occupancy modelling approach as detailed in Gruber & Adamack (2016).

Site occupancy is derived from the proportion of sites recorded as active in each period, but accounts for the imperfect detection of koala activity. Two parameters are estimated using this approach. The first is psi, the proportion of sites that are occupied adjusted for imperfect detection and *p*, the probability of detection given that koala faecal pellets are present. To obtain our estimate of *p*, multiple surveys within sampling periods (also called seasons) were assumed. Presence/absence data from the 30 trees from each grid-site were subdivided into random subsamples of 10 trees, resulting in 3 surveys per location (K=3). The dataset consisted therefore of seasons (periods) and 3 surveys per season.

This step is required as the estimation of p requires temporally repeated visits to the same site with the assumption that there is no change in population size or activity levels between visits. We have performed testing with varying numbers of trees being assessed during the repeat visits and have found that it has only limited effects on the estimate of *p*.

8. Koalas' tree species preference analysis

###Strike rate

In this section, we modified the data analysis methods of Phillips & Callaghan (2000). In their report, Phillips & Callaghan (2000) defined strike rate as the probability that a faecal pellet would be found under a particular tree species and only considered trees at active sites (i.e. the number of trees of species X with one or more faecal pellets divided by the total number of trees of species X at all active sites). Here, we calculated site-specific strike rates for each tree species (i.e. the number of trees of species X with one or more faecal pellets at a site divided by the total number of trees of species X at that site) across all active sites. This enables us to visualise the distribution of strike rates across active sites for a particular species rather than just knowing the mean value of the strike rate for a particular tree species across all active sites.

The distribution of strike rates for each tree species across all active sites is shown in Figure 8, where we overlaid boxplots with dotplots. Dotplots show actual values of strike rates at each site. However, since multiple sites can have the same strike rate, which would not be visible using dotplots only, the boxplots provide additional information about stike rate distribution. The bottom edge of the box corresponds to the lowest 25% of strike rates for a species, the line in the box shows the median (lowest 50%) and the top edge of the box corresponds to the upper 75% of strike rates for a specific tree species. The whiskers at the top and bottom of the box indicate 1.5x the inter-quartile range and the dots outside the range of the whiskers represent outliers (i.e. values beyond 1.5x (the 75% cut-off value - the 25% cut-off value).

###Overall strike rate

We developed a second measure of strike rates to investigate the study's data on tree species selection by koalas, which we call the overall strike rate. The overall strike rate differs from the original strike rate in that it considers all sites, whether or not the site is active (i.e. the number of trees of species X with one or more faecal pellets is divided by the sum of all trees of species X at all assessed sites). Overall strike rates for each species are shown in Figure 7. Please, note that the overall strike rate for each species is a single value (i.e. the mean probability across all sites), therefore no distribution is shown in Figure 7. If koalas truly prefer tree species X, the overall strike rate for the tree species (shown above) would be high.

Bootstrap simulation

While the overall strike rate helps to determine if koalas are showing a preference for some tree species over others, it does not account for differences in the number of trees of each species. Thus, a tree species with only a few sampled trees, could have a very high overall strike rate with just 1 or 2 trees having faecal pellets. On the other hand, an abundant species would require significant numbers of trees with faecal pellets to have a high overall strike rate, but this is made difficult when koalas are potentially only using a small portion of trees in the region. To account for this problem, we used bootstrap simulations to test whether the observed overall strike rate for a tree species was significantly different from the overall strike rate that would be expected if koalas were choosing trees at random (hereafter referred to as simulated strike rate). For each tree species in the study area, we performed a bootstrap simulation with 100,000 permutations. For each set of simulations, we first determined the relative abundance of a tree species across all assessed sites (i.e. the number of trees of species X / the number of all trees), the total number of trees with koala faecal pellets present, and the number of trees of species X with faecal pellets present. For each bootstrap permutation, we generated a random deviate from a binomial distribution which represented the number of strikes assuming koalas choose trees at random. The number of trials was set to the total number of trees with koala faecal pellets present (all tree species), and the probability of a success was set to the proportion of all trees that were trees of species X. As it was possible to generate a random deviate that exceeded the number of trees of a species of interest, if the random deviate exceeded the number of trees of interest we adjusted the random deviate downward to the total number of trees of the species of interest. The random deviate was then converted to simulated strike rate by dividing the random deviate by the total number of trees of species X. Finally, the difference between the observed overall strike rate and the simulated strike rate was determined. After 100,000 permutations were performed, the middle 95% of the distribution of the differences between the observed and simulated strike rates was determined. If the middle 95% of the distribution of differences for a tree species does not include 0, it indicates that koalas are actively avoiding (distribution is below 0) or selecting for (distribution is above 0) a tree species (Figure 8). Bootstrapping is a stochastic process and for tree species that are on the cusp of being positively or negatively selected, their selection status can vary from one set of bootstrap simulations to another. However, by using a high number of replicates, we have reduced the likelihood of that happening.

Size class preference analyses

In addition to the preference of koalas for tree species, we also investigated the preferences of koalas for different tree sizes. Trees of each individual species were divided into 100 mm DBH intervals (i.e. 100 to 199 mm, 200 to 299 mm, etc.) and the strike rate (i.e. the probability considering active sites only) for each size class for each species was determined. The relationship between tree size and their use by koalas is shown in `figRef("sizeSRoverall")`. For each tree species, we performed a weighted linear regression between strike rate and tree size, with each size class weighted by the number of trees (of the species of interest) in the size class. Results for all tree species are shown in Table 7. The R^2 value shows the proportion of the change in strike rate with tree size that can be attributed to tree size. The closer the R^2 value is to 0, the weaker the relationship between tree DBH and koala strike rate for a particular species while the closer the R^2 value is to 1, the more important the role of tree size in the selection of trees by koalas. The slope of the relationship informs us about the overall direction of the relationship. A positive slope value indicates that koalas prefer larger trees than smaller trees of a particular species, whereas negative slope value indicates the opposite. The absolute value for the slope (i.e. how far the slope value is from zero in any direction) tells us about the steepness of the relationship. High absolute value for the slope indicates that there is a large difference in strike rates between size class 1 and size class 2, and size class 2 and size class 3, etc. The p-value provides information about the significance of the observed relationship - in general, only relationships with $p<0.05$ are considered to be significant, but if regressions are being performed for a large number of trees, a more appropriate significance level is 0.05/N, where N is the number of regressions performed.

9.) Tree Species Glossary

Table 8: *List of tree IDs used in this report and corresponding scientific and common names.*

Tree ID	Scientific name	Common name
Acac	Unidentified acacia	Unidentified acacia
Acog	Acacia cognata	Narrow-leaf bower wattle
Afal	Acacia falciformis	Hickory wattle
Aflo	Acacia floribunda	White sallow wattle
Ageo	Acacia georgensis	Bega wattle
Aimp	Acacia implexa	Lightwood
Airr	Acacia irrorata	Green wattle
Alit	Allocasuarina littoralis	Black she-oak
Amab	Acacia mabellae	Mabel's Wattle
Amai	Acacia maidenii	Maiden's Wattle
Amea	Acacia mearnsii	Black wattle
Amyr	Acacia myrtlefolia	myrtle wattle
Angflo	Angophora floribunda	Rough-barked angophora
Aobl	Acronychia oblongifolia	White aspen
Asmi	Acmena smithii	Lillypilly
Asub	Acacia subporosa	Bower wattle
Bmyr	Backhousia myrtifolia	Grey myrtle
Bpop	Brachychiton populneus	Kurrajong
Bser	Banksia serrata	Saw banksia
Cmac	Corymbia maculata	Spotted gum
Dsas	Doryphora sassafras	Nsw Sassafrass
Eagg	Eucalyptus agglomerata	Blue-leafed stingybark
Ebos	Eucalyptus bosistoana	Coastal grey-box
Ebot	Eucalyptus botryoides	southern mahogany, Bangalay
Ecyp	Eucalyptus cypellocarpa	Monkey gum, Mountain grey gum
Eela	Eucalyptus elata	River peppermint
Eeug	Eucalyptus eugenoides	Narrow-leafed stringybark
Efas	Eucalyptus fastigata	Brown barrell
Eglo	Eucalyptus globoidea	White stringybark
Elon	Eucalyptus longifolia	Woollybut
Emue	Eucalyptus muelleriana	Yellow stringybark
Erad	Eucalyptus radiata	Narrow-leafed peppermint
Eret	Elaeocarpus reticulatus	Blue olive berry
Esie	Eucalyptus sieberi	Silvertop ash
Esmi	Eucalyptus smithii	Gully peppermint
Espp	Eucalyptus species unidentified	Eucalyptus species unidentified

Etri	Eucalyptus sideroxylon subb tricarpa	Ironbark
Ewil	Eucalyptus willisii	Shining Peppermint
Excup	Exocarpus cuppressiformis	Native cherry
Heri	Hakea eriantha	Tree hakea
Hmac	Hakea macraeana	Macrae’s hakea
Nven	Notelaea venosa	Mock olive
Other	Other	Other
Pmur	Polyscias murrayi	Pencil cedar, Umbrella tree, Murray’s basswood, Chinky pine
Pund	Pittosporum undulatum	Pittosporum
Rfsp	Rainforest species	Rainforest species
Sgla	Synoum glandulosum	Scentless rosewood
STB	Unidentified stringybark	Unidentified stringybark
Tlau	Tristaniopsis laurina	Kanooka (Water Gum)

10.) References

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