

# Oyster Harbour Catchment Group Project

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## Western Ringtail Possums in Albany: Core Habitat, Abundance, and Distribution

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Final Report

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By

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natural resource  
management program



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## 1. Introduction

The Western Ringtail Possum (*Pseudocheirus occidentalis*) is an arboreal, nocturnal, herbivorous marsupial endemic to the southwest of WA. It is about 30-35cm from head to rump and is distinguished by its long slender prehensile tail with a white tip, which it uses to curl around branches helping it move through the bush, and to carry twigs and leaves to build its drey (nest).

The species is suffering a dramatic decline in parts of its range throughout the South West. The population occurring along the South Coast around Albany may be a stronghold for the species, but information about this population is lacking.

Oyster Harbour Catchment Group, in partnership with the City of Albany, the Department of Parks and Wildlife, and the University of WA are carrying out a project to increase our knowledge of numbers and habitat preferences of this important population. This information is vital in aiding this population's management and conservation.

The project was funded by the Western Australian Government's State Natural Resource Management Program.

## 2. Methods

### 2.1 Spotlighting on Mt. Melville/ Kardarup , Mt. Clarence/Corndarup and Mt. Adelaide/Irreup.

A significant component of this project was to carry out spotlighting surveys on the Mounts (Central City) Reserves within the Albany townsite.

#### 2.1.1 Monitoring Sites

Six spotlighting transects were set up, three on Mt Melville and three on Mt Clarence/Adelaide (Figure 1). These were placed in each of the main vegetation types within the reserves which were assumed to be potentially suitable for Western Ringtail Possums (Table 1).

**Table 1: Vegetation types of each site. (ARVS vegetation types (Sandiford and Barrett 2010)).**  
Transect locations are shown in Figure 2.

Transect number	ARVS Vegetation Name
1	Marri ( <i>Corymbia calophylla</i> )/Jarrah ( <i>Eucalyptus marginate</i> ) Coastal Hills Forest and Jarrah/Sheoak ( <i>Allocasuarina fraseriana</i> ) /E. <i>staeri</i> Sandy Woodland
2	Marri/Jarrah Forest/Peppermint ( <i>Agonis flexuosa</i> ) Woodland
3	Marri/Jarrah Coastal Hills Forest
4	Marri/Jarrah Coastal Hills Forest and Jarrah Woodland

5	Marri/Jarrah Forest/Peppermint Woodland
6	Coastal <i>Banksia ilicifolia</i> Peppermint Low Woodland

### 2.1.2 Distance Sampling

The spotlighting sampling technique employed was that of Distance Sampling (Buckland, 2001). This technique was adopted for this project to attempt to provide robust monitoring regime that could be used to assess the size and trends in ringtail populations over time in core habitat in the Albany urban environment. Distance sampling allows for a random design to sample a proportion of a study area, and for this data to be used to estimate a probability of detection which can then be used to estimate the abundance and density of animals in the area of interest (Buckland, 2001). Distance sampling involves the counting of individuals or groups of individuals, along a line transect by sighting the animal and then measuring an accurate perpendicular distance from the line-transect. This method allows an accurate assessment of abundance or density to be made based on the concept that the probability of detecting an animal decreases as its distance from the observer increases. The reliability of abundance estimates is based on a number of key assumptions being met. These are that the objects (ringtails) on the line or points are detected with certainty, that they are detected at their initial location and that measurements are exact. In addition, the transects the study are must be positioned randomly (Buckland, 2001). All of these assumptions were met to the best of our ability in this survey work.

The distance sampling technique employed is outlined in Appendix 1.

Estimates of Western Ringtail Possum abundance have been conducted on the southern Swan Coastal Plain and Warren Region (Wayne et al., 2005; De Torres & Elscott, 2010). In the current project, distance sampling using the methods described in Buckland (2001) was used to estimate abundance and density of ringtail possums in the City of Albany Reserves; Mt Clarence and Mt Adelaide (combined) and Mt Melville.

Three transects were established in the two reserves covering Mt Melville and Mt Adelaide/Clarence (Figure 1). At each of the three transects sites four parallel transects were marked running through the bush at 50 m apart (Figure 2). Length of transects for Mt Melville totalled 1716m and Mt Adelaide/Clarence 1655m. Transects were walked in the same direction each period. Each transect was marked with reflective tape to enable leaders and volunteers to stay on the designated transects during each survey period.

Spotlighting data was analysed using the package 'Distance' (Miller, 2013 V0.9.7) and 'mrds' (Laake et al., 2013) in RStudio (R Core Team 2013, V1.1.456), and Stewart Ford from Biota provided code for analysis of the data and assisted with interpretation.

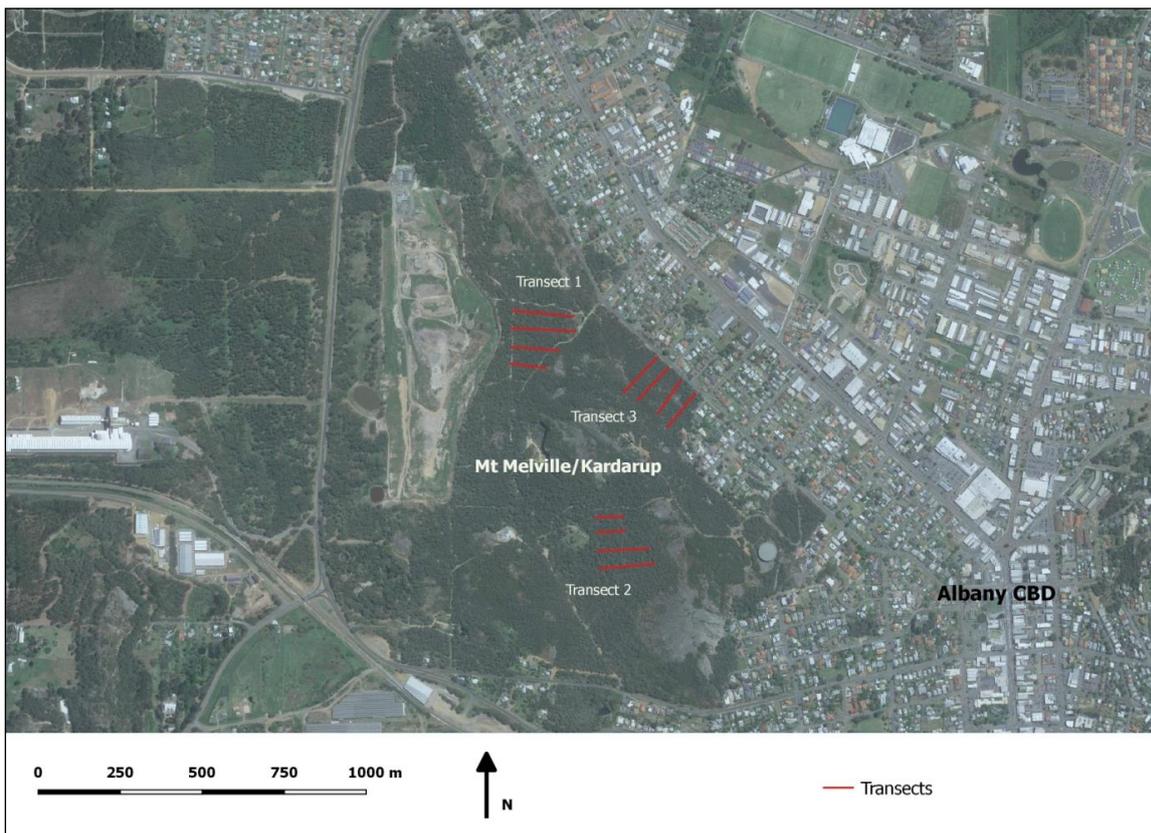
Each of the three sites was surveyed over a 10 day period, within a fortnight, usually over four consecutive nights (with the first night being for training), in four seasons. Surveys were supported by a significant input from volunteers. Observers included over 40 volunteers who helped with spotlighting. Volunteers included students, community members (ranging from 12 to 90 years old),

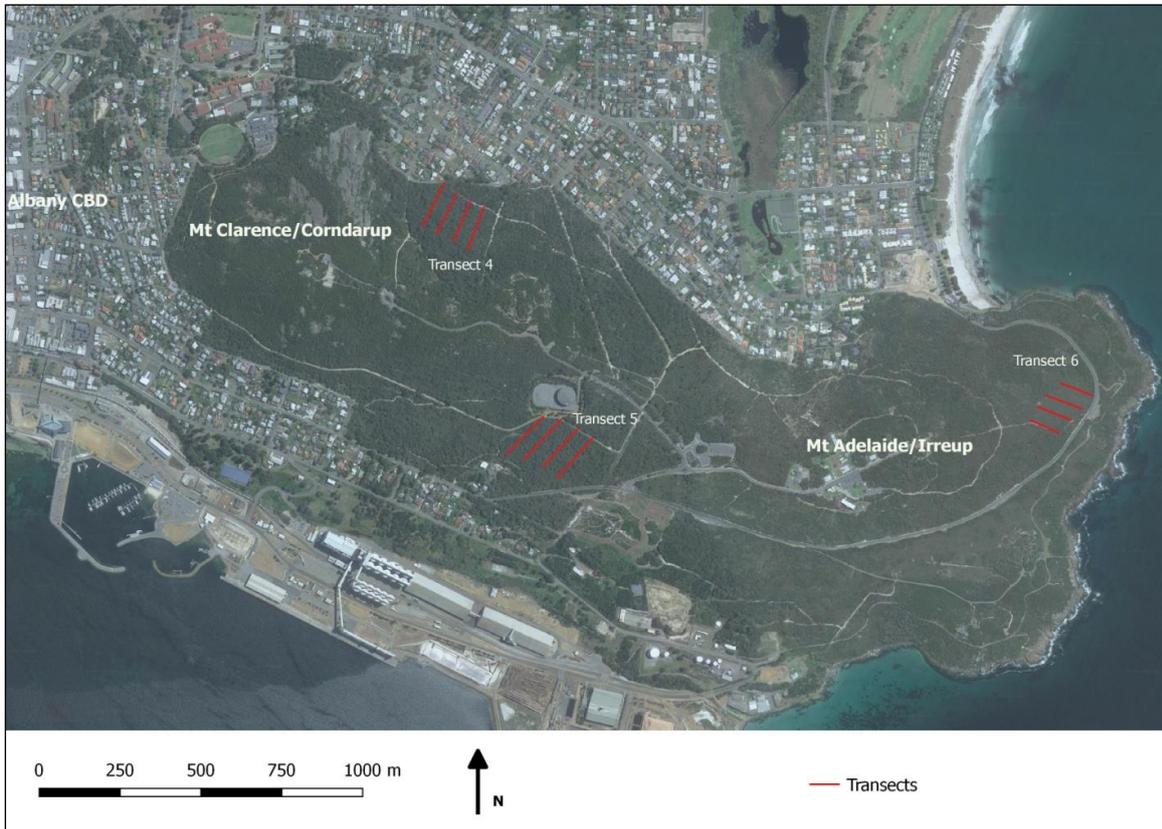
the Aboriginal Green Army team and community groups. City of Albany, DBCA and University of WA staff assisted by leading surveys, and providing some consistency in leaders over the survey period.

Data for each fortnight period were pooled for the two study sites (Mt Melville and Mt Adelaide/Clarence) to allow for comparison of the two reserves over the four survey periods.

**Table 1: Date surveyed for each transect.**

Site	Dates surveyed
<b>Mt Melville</b>	
Transect 1	12-13/07/16; 16-18&27/10/16; 22-25/01/17; 3-6/04/17;
Transect 2	12-13/07/16; 17,18,20,25/10/16; 22-25/01/17; 3-6/04/17;
Transect 3	12-13/07/16; 17,18,20,24/10/16; 22-25/01/17; 3-6/04/17;
<b>Mt Clarence/Adelaide</b>	
Transect 4	19-20/07/16; 17,18,20,27/10/16; 16-19/01/17; 9-12/04/17
Transect 5	19-20/07/16; 24-27/10/16; 16-19/01/17; 9-12/04/17
Transect 6	19-20/07/16; 24-27/10/16; 16-19/01/17; 9-12/04/17





**Figure 1: Spotlighting (distance sampling) transects on Mt Melville and Mt Clarence / Adelaide.**

## 2.2 Backyard Camera Trapping

Remote Cameras were deployed to establish the use of backyards around the two inner city reserves. Volunteers were sought from community members that resided in close proximity to the central city reserves.

A Backyard Camera Manual (*Albany Backyard Possum Sleuths*) was completed in late May 2016 (Appendix 2) and one remote camera was installed in each of eleven backyards to around the reserves in June 2017 (Figure 4). The cameras were installed for seven nights each month for 12 months, from June 2017 to May 2018.

The cameras were placed where they would have the best chance of obtaining the maximum number of Western Ringtail Possum photos, such as, along a fence line, a veranda railing, near a tree with a drey, or a roof.



Figure 2: Backyard camera locations.

### 3. Results

#### 3.1 Western Ringtail Possum Spotlighting- Winter and Spring 2016 and Summer and Autumn 2017.

##### 3.1.1 Spotlight counts

The results to date are presented as numbers of animals seen per night, per site. These numbers include pairs or triplets of animals observed together. These were only recorded as mother and young if this was obvious (for example young on the back of a mother or a pair with one individual half the size or less than the other).

During all spotlighting sessions numbers of Ringtail possums observed were variable both between sites and within sites on different nights (Table 2). Counts ranged from zero to 15 a night over all sites.

The highest count of the sampling period represents the number of individuals known to be alive (KTBA) on the transect within the four-night period of sampling in each season (values in bold-Figure

1). Taking these values, the season with the highest numbers at most transects was Winter, and the sites with the highest consistent numbers were transects 4 and 5.

Pairs or triplets of individuals were observed throughout all sampling seasons. If it is assumed that all pair or triplets consist of mother and one or two young then breeding appears to be spread over the four seasons sampled. This is consistent with the situation found in the Busselton population in which breeding occurred throughout the year but with most births occurring during April-June, with a secondary peak during October-December (Jones *et. al* 1994)

Brushtail possums (*Trichosurus vulpecular*) were only recorded on Site four in all seasons. Competition between Ringtail and Brushtail possums for habitat resources is suspected, especially where tree hollows are limited (Department of Parks and Wildlife 2014).



**Spotlighting volunteer Kara Pot and City of Albany  
Spotlighting Leader Darren Little, spotlighting on Mt  
Melville**

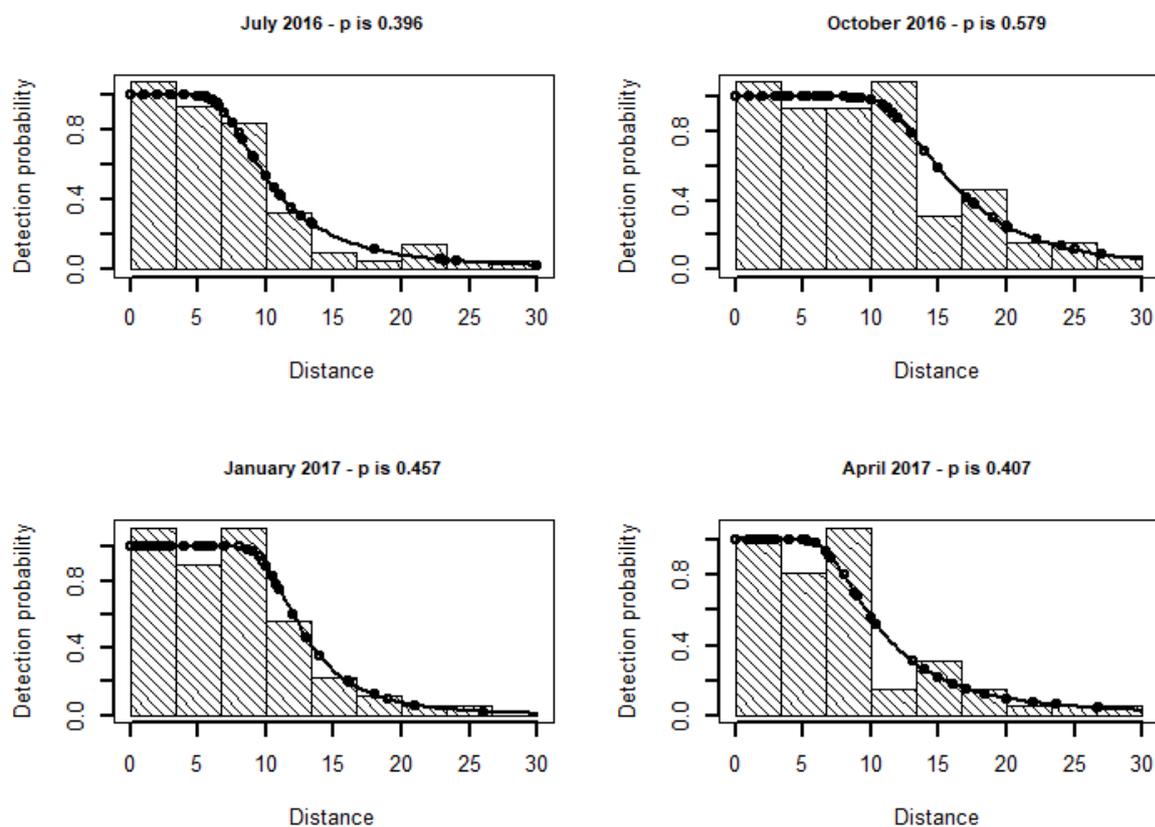
**Table 2: Results of Spotlighting over four spotlighting sessions (2016-2017).** Pairs and triplets included in counts. Numbers in bold are the highest for the four night spotlighting session.

Night	Number of Western Ringtail Possums seen on transects													
	Winter (July) 2016		Spring (October 2016)				Summer (January) 2017				Autumn (April) 2017			
	1	2	1	2	3	4	1	2	3	4	1	2	3	4
Site 1	6	4	3	3	2	0	0	4	1	1	1	2	3	0
Site 2	2	8	8	7	2	2	2	4	2	3	2	5	6	3
Site 3	7	12	8	0	3	4	4	2	3	1	5	2	3	4
Site 4	10	6	5	3	5	11	7	5	3	2	2	3	4	12
Site 5	13	15	7	11	5	1	10	8	8	12	12	5	8	5
Site 6	8	2	2	1	1	1	1	0	3	3	4	1	7	7

### 3.1.2 Distance Sampling

Each of the four survey periods were run independently for two sites, Mt Melville and Mts Clarence/Adelaide, and results for all sites were also pooled (Table 4). Truncation was set at 30m for all analysis, based on the optimal distance where the probability of detection was 0.15 (Buckland et al., 2001). Figure 3 shows this detection probability relative to distance of observed possums. This distance may vary over different sampling periods but was standardised for this report. It was assumed that variability in detection probability by the variability of observers was minimal, however this could be a factor influencing results.

Over the four seasons and pooling the survey area data there were 289 observations of Western Ringtail Possums following truncation of data, that is all records within the 30m. Density of Ringtail Possums was estimated to be between 1.63 and 3.16 animals per hectare (Figure 4), which varied depending on season. Densities on Mt Adelaide/Clarence were consistently higher than those on Mt Melville. Similarly the extrapolated estimate of numbers of individuals, or abundance, on Mt Adelaide/Clarence was higher than Mt Melville (Figure 4).



**Figure 3: Histograms of Western Ringtail Possum observations pooled for all sites and distance from observers, with detection probability (data were truncated at 30m).**

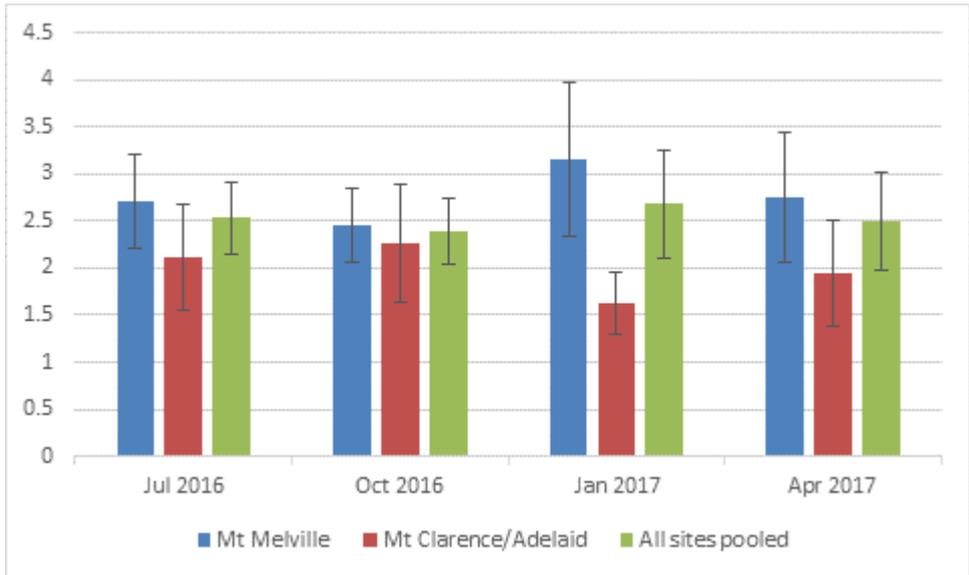


Figure 4: Density estimates of WRT's for the two survey areas by season

### 3.1.3 Height of Western Ringtail Possum observations in trees.

During spotlighting the height that individual possums were observed up a tree was recorded (Figure 5). Possums were most frequently been observed 5-6.9 m up trees, with only a few observations above 17m.

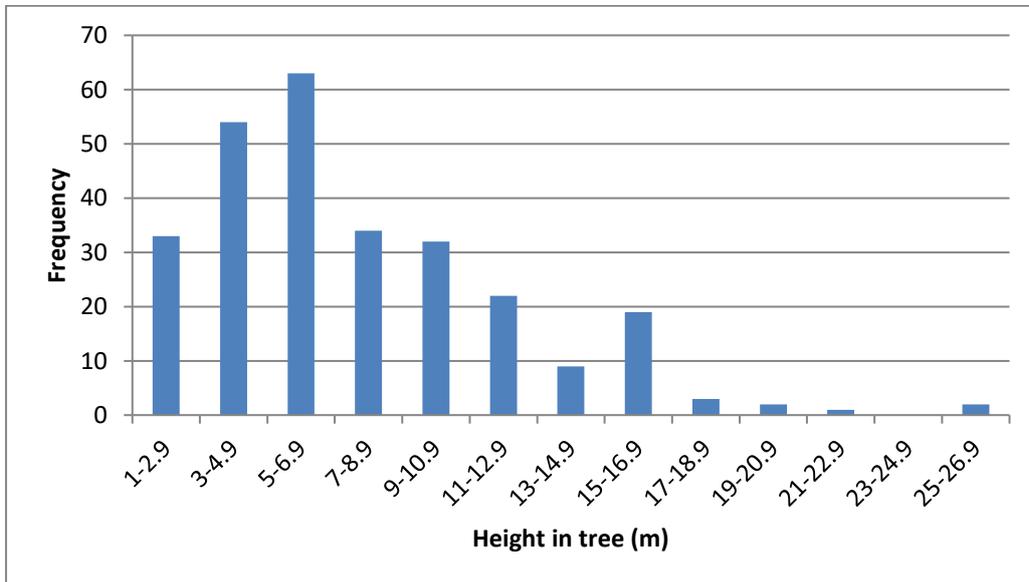


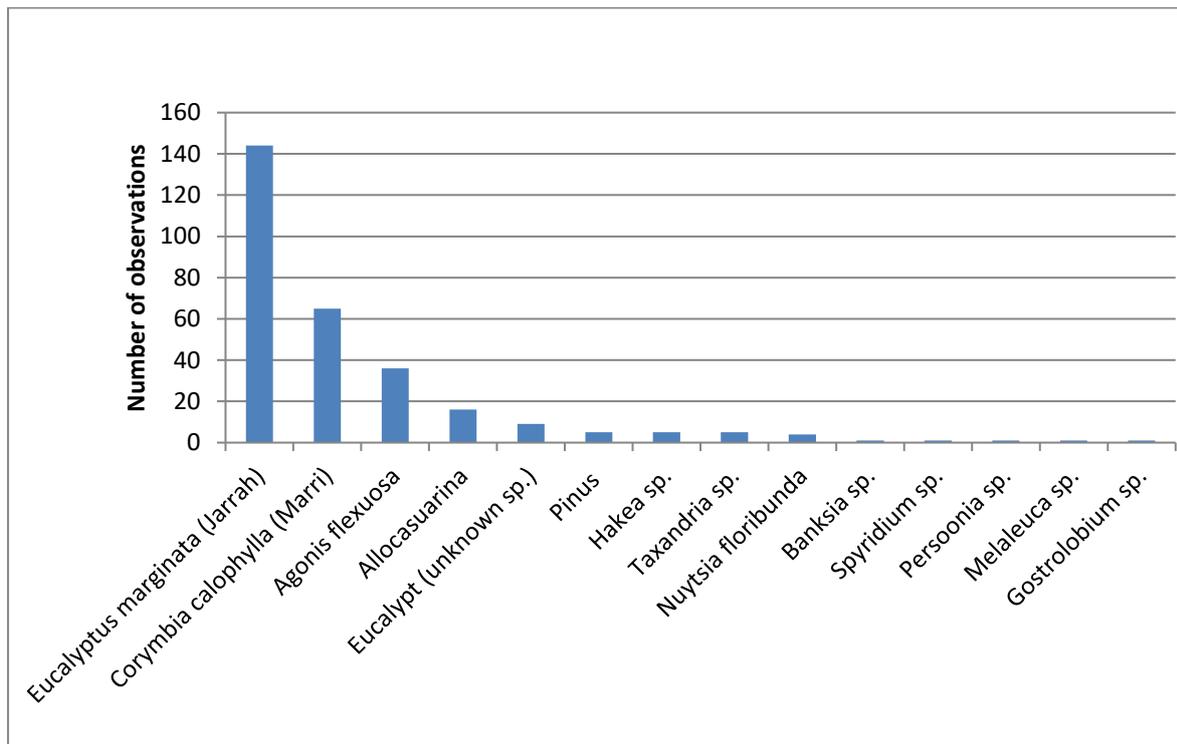
Figure 5; The frequency of different heights that Western Ringtail Possum individuals were observed in trees (observations for all nights, all sessions and all sites combined).

### 3.1.4 Tree species that Western Ringtail Possums were observed in while spotlighting

During spotlighting Ringtail possums were observed most frequently in Jarrah (*Eucalyptus marginata*), followed by Marri (*Corymbia callophylla*) (Figure 6). Observations in Peppermint (*Agonis*

*flexuosa*) were the third most frequent. This is consistent with the known diet of Ringtail possums from one study which was found to be almost exclusively comprised of the dominant or co-dominant upper and mid-storey myrtaceous plants: peppermint, marri and jarrah (Jones *et al.* 1994).

These values are not compared to their availability of these tree species within the vegetation communities. Van Helden *et. al* (2017) also found Jarrah and Marri to be the preferred tree species for Ringtail possums, while also considering the frequency of observations relative to the abundance of major tree species within their home range.



**Figure 6: The frequency of observations of Ringtail Possums in different tree species (observations for all nights all sessions and all sites combined).**

### 3.2 Backyard Camera Trapping

### 3.2.1 Observations from images

The Backyard Camera Trapping observations provided some useful information about the use of urban gardens around the central city reserves (Table 4). The volunteer *Backyard Possum Sleuths* were dedicated to ensuring cameras were set for seven nights each month where possible, and out of a potential 924 camera trap nights (11 backyards x 7 nights x 12 months) the cameras were deployed for 847 camera trap nights.

Nine out of the eleven backyards had Western Ringtail Possums visiting in all or most months. Pairs were observed throughout the year, and those that could be identified as an adult and a sub-adult were also identified in most months. An adult and two sub-adults were observed on two occasions in one backyard (10), in March and May. These results suggest that individuals are possibly breeding within backyards and that breeding likely occurs throughout the year. Cats were observed in four backyards (cats were not owned by the backyard owners). Brushtail Possums were observed in three backyards, all in July and August, indicating that the two possum species share the same space, at least at certain times of the year. All the Brushtail Possum observations were in Backyards surrounding Mt. Clarence/Adelaide, an observation consistent with spotlighting.

As the cameras were installed in the same location in each backyard for each monitoring session, the high number of nights where Western Ringtail Possums were observed indicates that possums are consistently use the same route night after night. It is not known, however, if the observed possums in each backyard were the same individuals over time.

**Table 3: Backyard Camera Results.** Numbers refer to locations in Figure 1. Western Ringtail Possums: Y = WRT observed, P = Pair observed, A&SA = Pair (Adult and Sub-adult) observed, PY = young in pouch observed; BTP=Brush-tail Possum observed; CAT = Cat observed; NS = Not Sampled.

Backyard	2016						2017					
	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Y	Y	Y	Y (A&SA)	Y	NS	Y	Y (P)	Y	N	N	Y
2	Y	Y	Y	Y	Y	Y	Y(PY)	Y	Y	Y	Y (A&SA)	Y
3	Y (A&SA)	Y (P)	Y	Y	NS	Y (A&SA)	Y (P)	Y (P)	Y (P)	Y (A&SA)	Y (PY; A&SA)	Y CAT
4	Y (A&SA)	Y	Y	Y	Y CAT	Y CAT	Y (A&SA) CAT	Y CAT	Y (P)	NS	Y (A&SA)	N CAT
5	Y	Y	Y	Y	Y	NS	Y	N	N	Y	Y	Y, CAT
6	Y	Y	N BTP	N	N	N	N	N	N	N	Y	Y
7	Y (P)	Y (A&SA) CAT	NS	NS	NS	NS	NS	Y	Y (P)	NS	Y (P)	Y CAT
8	NS	Y BTP	Y BTP	NS	Y	Y	Y	Y	Y	Y (P)	Y (P)	Y
9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	NS	Y BTP	Y (P) BTP	NS	Y (P)	Y (P)	Y (P)	NS	Y (P)	Y (A&2xSA)	Y (P)	Y (A&2xSA)
11	N	N	N	N	N	N	N	N	N	y	N	Y



*Figure 7: Backyard camera images of Western Ringtail Possums. From top left clockwise; Adult and sub-adult, Adults and 2 Sub-adults, carrying leaves in tail, cat.*

### 3.2.2 Zooniverse

The Backyard Camera Trapping generated many images. These all had to be viewed and information on the species present recorded (carried out by SG). However in order to log all the images into a database, with additional information such as date and time, requires many person hours. Zooniverse is an on-line image logging program that allows anyone to access the images and to identify the species present and log the images and associated information. The image information is then provided as a database.

A Zooniverse Project entitled **Western Ringtail Possums in Albany: Core Habitat, Abundance, and Distribution** has been developed, and is available on-line at:

<https://www.zooniverse.org/projects/dussumieri/western-ringtail-possums-core-habitat-abundance-and-distribution>

In order to log images Citizen Scientists must first register as a user.

**Zooniverse** is a citizen science web portal owned and operated by the Citizen Science Alliance.

### 3.2.3 Inaturalist

Community's personal sightings were a lot harder to collect as our desired app Zooniverse didn't have the ability but through much research into other online apps we discovered Inaturalist. Inaturalist is an online social network of people sharing biodiversity information to help each other learn about nature. It's also a crowdsourced species identification system and an organism occurrence recording tool. That the community can use it to record their observations, get help with identifications, collaborate with others to collect this kind of information, or access the observational data collected by other 750,000 and more users.

Our online project is; <https://www.inaturalist.org/projects/possums-in-the-greater-albany-area> and currently contains an online community of 23 people. Though this doesn't include the people prefer to email their observations for the project officer to put online.

## 4. Summary

Using raw counts (KTBA values) of Western Ringtail possums on the Albany Mounts Reserves over four seasons, numbers of individuals using the sites varied from night to night, and season to season.

Higher numbers were detected overall in sites with *Marri/Jarrah Coastal Hills Forest, Jarrah Woodland and Marri/Jarrah Forest/Peppermint Woodland* vegetation types. Observations were most frequently observed in Jarrah and Marri, at varying heights, but most frequently between 5-6.9 metres.

The application of distance sampling analysis to the data however provided a repeatable method of estimating density and number of animals in the study reserves over the four seasons of this project. The use of a wide range of individuals (both volunteers and staff from partner organisations) may have caused some variation in the probability of detection of individuals, and this potential variability needs to be acknowledged when interpreting the results. Densities of ringtails encountered support the work of Van Helden *et al* (2016), who found that ringtails had small home ranges in the jarrah and marri communities that dominate the central city reserves. Data collected during this project has potential to provide context for future surveys in the Albany area, and will be of value in establishing longer term trends in ringtail numbers in the central city reserves.

## 5. Recommendations

- Consider adopting distance sampling as a standard method for monitoring Western Ringtail Possum abundance within the South Coast population, as long as this is carried out within an appropriately designed framework.

- Continue monitoring Western Ringtail Possums on the central city reserves, using the established monitoring sites and employing distance sampling techniques and analysis, at least one per year in order to detect any significant changes in abundance.
- Engage existing volunteers ( and seek new volunteers) to assist with the monitoring and consider utilising dedicated volunteers to be trained in the distance sampling techniques so that they can form a Citizen Science Western Ringtail Monitoring Group.

## 6. References

Buckland, S.T., Anderson, D.R., Burnham, K.P, Laake, J.L., Borchers, D.L and Thomas, L. (2001). Introduction to Distance Sampling. Oxford University Press, Oxford, UK.

Department of Parks and Wildlife (2014). Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA.

Jones, B.A.; How, R.A. and Kitchener, D.J. (1994). A Field Study of *Pseudocheirus occidentalis*, (Marsupialia: Petauridae). II. Population studies. *Wildlife Research* **21**: 189-201.

Laake, J., Borchers, D., Thomas, L. Miller, D., and Bishop, J. (2013). Mrds:Mark-Recapture Distance Sampling (mrds). Retrieved from <http://CRAN.R-project.org/package=mrds>.

Miller, D. (2013). Distace: A simple way to fit detection functions to distance sampling data and calculate abundance/density for biological populations. Retrieved from <http://CRAN.R-project.org/package=Distance>.

Sandiford, E.M. and Barrett, S. (2010). Albany Regional Vegetation Survey: Extent, Type and Status. A project funded by the Western Australian Planning Commission (EnviroPlanning "Integrating NRM into Land Use Planning" and State NRM Program), South Coast Resource Management Inc. and the City of Albany for the Department of Environment and Conservation. Unpublished Report. Department of Environment and Conservation, Western Australia.

RStudio Team (2015). RStudio: Integrated Development for R. RStudio, Inc., Boston, MA  
URL <http://www.rstudio.com/>.

Van Helden, B.E., Speldewinde, P.C., Close P. G and Comer, S. J. (2016). Use of urban bushland remnants by the western ringtail possum (*Pseudocheirus occidentalis*): short-term home range size and habitat use in Albany, Western Australia. *Australian Mammalogy*:

Van Helden, B.E. (2016). Habitat use of western ringtail possums (*Pseudocheirus occidentalis*) in remnant bushland in Albany, Western Australia. Hons. Thesis. Faculty of Science, UWA, CENRM.

## ***Appendix 1: Distance Sampling Spotlighting Method***

### **Transects**

At each site there are 4 transects running parallel through the bush at 50 m apart. They are generally 100-150m long. These are walked from transect 1 to 4 as such (eg. Mt Melville site 3):

### **Mt Melville - Site 3**



Transects are marked with pink tape and reflective pieces attached to the tape and should be easy to follow at night with a head torch.

The ends and beginnings of the transects are marked with two pieces of reflective tape.

Equipment needed:

- GPS (spare batteries)
- Head torch (spare batteries)
- Rangefinder (spare batteries)
- Binoculars
- Recording sheet

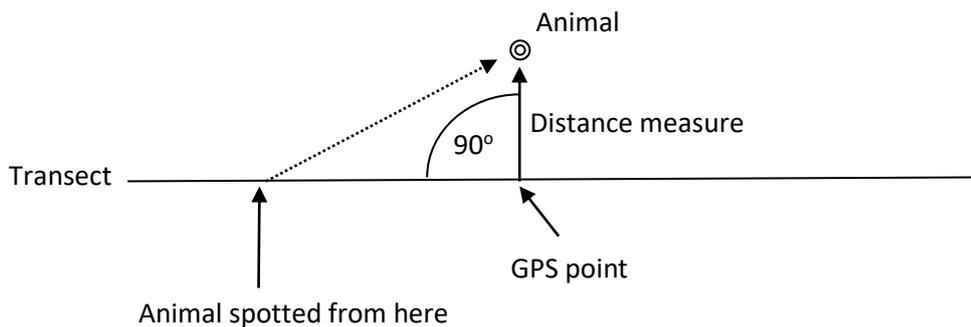
Spotlighting was carried out using the **distance sampling method**.

Distance sampling involves the counting of individuals or groups of individuals, along a line transect by sighting the animal and then measuring an accurate perpendicular distance from the line-transect as per the diagram below.

**NB: Spotting should be carried out by the same person (leader) on each transect. Other animals spotted should be noted.**

Once the animal is spotted, another team member moves along the transect until they are at right angles ( $90^\circ$ ) to the animal, while the spotter maintains the spotlight on the animal. A GPS coordinate is taken at this point. Then the distance to the animal is calculated with the range finder. Record the distance to the animal plus the direction from the transect.

If the range finder cannot be used at the  $90^\circ$  angle for some reason (eg. sight obscured by vegetation) then note the angle that is used.



***Appendix 2: Backyard Camera Manual***