Report on the 2015 Translocation of Chuditch from Western Australia to the central Flinders Ranges in South Australia

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Background

This report provides a summary of the 2015 translocation of chuditch (*Dasyurus geoffroii*) to the Flinders Ranges. This translocation was the second programmed movement of this species to South Australia, conducted to supplement the population established in 2014. Seven prior translocations have been undertaken within Western Australia since 1992 (Morris et al 2003). The full background for this translocation program is provided in the initial translocation proposal (Moseby and Peacock 2013), report on the 2014 translocation (Johnson and Rayner 2014) and in the annual review (Ecological horizons 2014). Further information is available in the Translocation proposal and Animal Ethics application prepared by the Western Australian Department of Parks and Wildlife (DPaW; Morris and Page 2014). These documents outline the process pertaining to the capture, selection, transport and release of 37 adult chuditch undertaken in March and April 2014 and subsequent monitoring of individuals at the release sites.
The annual review (Ecological Horizons 2014) contained sufficient positive data on success indicators, primarily based on survivorship, breeding and population recruitment as determined by radio-telemetry and trapping, to receive approval from the Chuditch Recovery Team and Department of Parks and Wildlife for a second translocation in 2015.

Flinders Ranges

In 2014, 37 chuditch were translocated to the Flinders Ranges from Western Australia with an additional 4 animals supplied by the Alice Springs Desert Park zoo. Of these animals, 37 were released wearing VHF radio-collars with mortality mode, allowing survival and movement of released animals to be monitored closely. The following information has been extracted from updates and reports provided by Ecological Horizons (2014).

Eleven mortality events were recorded post release. All but one of these has been attributed to cat predation through autopsy and DNA analysis (nb. Twelve deaths were listed in the annual review, however one animal whose collar was found torn and tested positive for cat DNA has since been captured alive). Large (>4kg) male cats have been found responsible for at least six of these deaths (again through autopsy and DNA testing). It is suspected that the remaining predation events and major injuries to an additional three chuditch were also the result of attacks from large male cats.

As expected male chuditch did move further from the release locations than females, but only as far as six kilometres away (remaining within the release area). Females only moved an average of two and a half kilometres from their release points before settling into a stable home range. All radio-collars were removed prior to the end of 2014, leaving trapping and camera trapping as the only means to continue monitoring post release survival of translocated individuals. In the most recent trapping session (March 2015) thirteen animals captured in Western Australia and translocated to the Flinders Ranges were caught.

Regular trapping has revealed that animals gained weight post translocation and the release team have concluded that food does not appear to be a limiting factor. Dietary analysis has shown that animals have been eating a wide range of items including both vertebrates (eg. rabbits, mice, birds) and invertebrates (eg. centipedes, spiders). All females captured during the breeding season were found to be carrying pouch young, in one unusual circumstance seven pouch young were recorded (females normally only have six nipples). To date, 22 first generation individuals have been captured as independent animals. These quolls appear to be extremely healthy with a number of animals exceeding 1kg within six months of leaving the maternal den (maximum weight in March 2015 1.5kg).

Translocation Criteria and Source Sites

Given that a population had been established in the Flinders Ranges in 2014 and males translocated stayed within the release area, females and males were translocated together in 2015.
Animals were sourced from three sites over a three week period in preparation for the flight on the 6th of May. Selected individuals were accumulated at the purpose built holding facility at Native Animal Rescue in Malaga (NAR).

Minimum criteria were again set for individuals of both sexes to ensure that only healthy chuditch aged between one and three years would be selected as suitable for fitting of radio-telemetry collars. The first criterion set to meet this goal was restricting collection of animals to females exceeding 700g and males exceeding 1000g. To ensure consistency with the evaluation of collected individuals, all candidates which met the weight criteria were inspected by staff with considerable experience in chuditch research to determine approximate age and overall health of individuals. However, only 25 of the 40 animals were to be fitted with 25g collars in Western Australia. The remaining 15 were to be fitted with 7g collars upon arrival in South Australia which meant that healthy animals which fell just below the weight threshold could still be selected for translocation.

The sites used in 2014 were once again considered to supply the target of 40 individuals in 2015. The reintroduced Julimar population was monitored three months after the removal of 20 individuals in 2014 and the population was found to have incurred no detrimental impacts. This was based upon trap success rates which had increased from 5.25% in 2013 to 15% in 2014 with a trapping effort of 400 trap nights. A target of 20 individuals was set for 2015 from this site.

The natural Perup population was monitored along the Balban, Yendicup and Moopinup transects immediately prior to the planned 2015 program and the results were inconclusive as to whether there had been negative impact or not. On the Moopinup line 18 individuals were captured in 2015 as compared to 31 in 2014, on the Balban line one chuditch was captured in November 2014 down from 10 in March 2014 and on the Yendicup line nine individuals were captured in 2015 in comparison to six captured in March 2014. However, there was high trap success for other species at these sites, making it difficult to determine if the numbers of chuditch captured was due to harvesting for the translocation in 2014 or an artefact of trap saturation from other species. A precautionary principle approach was taken to these sites and all were omitted from the 2015 program. Alternative nearby sites at Corbal, Warrup East and Winnejup were considered to contain stable populations of chuditch and these were included as 2015 source sites. A target of 13 individuals was set for these sites combined.

In an attempt to increase the genetic diversity of the Flinders Ranges founder population, source sites with some geographic separation from those used in 2014 were considered. The wheatbelt reserves within the Dryandra complex were a possible option following a significant increase in captures and sighting. Ongoing PhD studies however precluded this site. Chuditch records within the Fizgerald River National Park on the south coast had been reported as increasing in recent years. This had been confirmed in trapping undertaken as part of a broader prey – predator study within the park. This site is over 350km from the nearest source site listed above and was considered viable for 2015. A target of seven chuditch was set for this site. Locations of all of the 2015 source sites can be found in figure 1.

Trapping and processing protocols

Medium sized wire cage traps (220 x 220 x 550 mm, Sheffield Wireworks, Welshpool) baited with either chicken necks or a mixture of peanut butter, oats and sardines were placed at 200m intervals along all target transects (Table 1). Traps were checked in the morning and all were cleared within three hours of sunrise. Traps at the Perup site were rebaited in the morning and left open, traps at all other sites were closed in the morning and were opened upon rebaiting in the afternoon.

All animals caught were processed according to DPaW Standard Operating Procedure 9.2 *Cage traps for live capture of terrestrial vertebrates*. Animals captured at Perup were marked with eartags, while Julimar and Fitzgerald animals were marked using passive integrated transponder (PIT) tags. Standard morphometric data was collected at all sites for all animals upon first capture for the session. Additional records collected at Perup included ecto-parasite count, body condition, coat condition and agitation level. Information outlining all captures is presented in Table 1.

Additional information and samples were collected from chuditch which met the initial weight criteria for translocation. This included behaviour observations and scat samples. Collected individuals then had their teeth inspected and body condition assessed. All animals with worn or missing teeth, an excess of ecto-parasites, poor body condition or any skin condition were rejected for translocation – these animals in addition to all by-catch, were released the same morning of capture. Individuals selected for translocation received additional marking, so that all animals going to South Australia had both a PIT tag and an eartag.

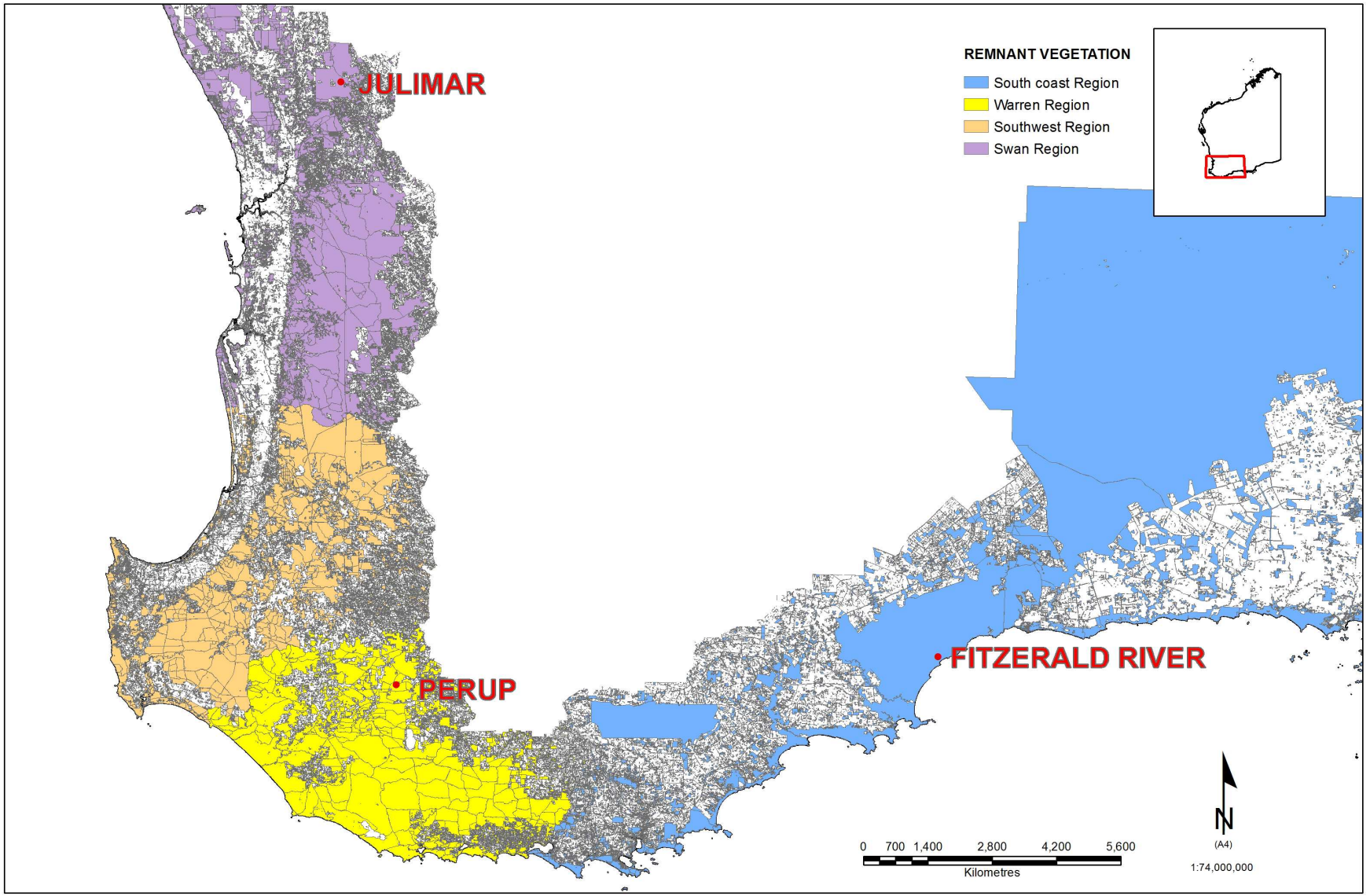

Figure 1: Location of proposed chuditch collection sites Julimar, Centaur, George and Perup blocks in the southwest of Western Australia. Coloured areas depict remnant vegetation within the three Department of Parks and Wildlife Regions.

Trapping effort and success

The target source population at Julimar was trapped over the week 13 - 17th April with three transects, Woylie, Gakalling and Hewett, having a total of 210 traps set for two nights and 191 set on the final night. The results were positive with a total of 66 chuditch individuals being captured (Table 2). From these captures, twelve females and eight males were selected for transport to the holding facility at NAR. These individuals were secured in nestboxes (19x265x430mm) and driven directly to NAR by air-conditioned vehicle with a daily travel time of 2 hours.
Trapping at Fitzgerald River was conducted the following week with three transects, Cocanarup, Drummond south firebreak east and Drummond south firebreak west, achieving a total of 1033 trap nights over four nights. As expected, numbers were low with a total of nine individuals captured (Table 2). Of these individuals six were selected for translocation, one female and five males. Due to the distance from Perth (~600km) animals were not transferred daily. Chuditch caught on the first morning of trapping were held indoors overnight within a covered cage trap and fed chicken wings. These individuals, in addition to those captured on the second morning, were driven to Perth by vehicle relay via Hyden with a total travel time of approximately 6 hours. Individuals captured on the third morning were held under the same conditions as previous individuals and were transferred directly to NAR with animals captured on the final day of trapping.
The final week of trapping took place at Perup with three transects, Winnejup, Corbal and Warrup, having a total of 150 traps set for two nights. The transect harvest threshold of animals was reached for the Corbal transect on the first night, these traps were re-distributed across the Winnejup and Warrup transects for the second night of trapping. A total of 300 trap nights yielded 18 individuals across the three transects, of these 13 were transferred to Perth. The animals selected for translocation from Perup were made up of nine females and four males (Table 2). Those caught on the first day were transferred by vehicle relay via Donnybrook and those caught on the second day were transferred directly to NAR. Travel time for these transfers was five hours.

Captive management

Chuditch were housed in purpose built 3x2x2m pens furnished with a nest box, foliage, hollow logs and branches for climbing. Foliage was refreshed and moved around once per week to provide stimulation. Upon arrival at NAR nest boxes were placed in the enclosures and animals left to come out of their boxes at their own accord.
In keeping with previous standards used at Perth Zoo (Gaikhorst 1998), chuditch were fed on a diet of mice, chicks, whitebait, boiled egg and carnivore pellets. Upon arrival, females received 105g of food per day which was dropped back to 70g following the first week in captivity. Males received 135g upon arrival, which was dropped back to 105g. The diet was increased upon arrival to prevent weight loss caused due to the stress of the new captive environment.

Radio-telemetry and vet checks

Sirtrack two-stage VHF transmitters with mortality mode were fitted to 13 females and 12 males on the 1st of May at the NAR clinic. The transmitters contained an internal loop antenna and were mounted on suede leather collars that were fastened using a plastic nut and bolt covered by heatshrink (Sirtrack, Havelock North). The remainder of the suede was also covered with heatshrink to try and prevent the skin reactions observed in last year's translocation. All collars were fitted by or under the supervision of experienced staff from the Department of Parks and Wildlife or the South Australian Reintroduction team. Veterinary checks of each individual were also made at this time with ecto-parasite and DNA samples collected (Appendix). Majority of animals were in a healthy condition, however three females collected for the translocation were found to have tooth root abscesses. As such it is recommended that a closer inspection is made of teeth and jaws of animals at the collection sites to make sure that animals selected for translocation are in the best condition possible.

A visual inspection of the neck condition and collar fit was made on the 5th of May, while animals were still in captivity. Three animals showed early signs of neck hair loss and rubbing, these collars were removed and refitted to new animals as a precautionary measure.

Aircraft transfer

All individuals were captured in their pens and transported in their individual nestboxes to Jandakot Airport early on the morning of the 6th of May. Loading and securing the nestbox cargo into a Cessna 206 Stationair was supervised by the pilot Matt Graham. The flight departed Jandakot at approximately 6.25am. Following refuelling stops at Kalgoorlie and Ceduna the aircraft arrived at the Wilpena pound airstrip in the evening. The flight was uneventful and all chuditch arrived safely.
The release at Wilpena pound was planned and supervised by the South Australian team.

Table 1: Sites trapped, trapping effort and trapping success for all species captured during collection of chuditch for translocation to South Australia.
Species code: Dg – *Dasyurus geoffroii*, Tv – *Trichosurus vulpecular*, Rf – *Rattus fuscipes*, Ta – *Tachyglossus aculeatus*, Pal – *Pseudomys albocinerus*, Po – *Pseudomys occidentalis*, Ssp. – *Sminthopsis sp.*, Tr – *Tiliqua rugosa*, Vr – *Varanus rosenbergi*, Io – *Isoodon obesulus,* Mm – *Mus musculus*, Pa - *Parantechinus apicalis*, Pt – *Phascogale tapoatafa,* Cc – *Corvid coronoides*.

Site	Transect	Trap nights	Bait type	Species: total captures (no. individuals)														Total capture	Trap success
				Dg	*Tv*	*Rf*	*Ta*	*Pal*	*Po*	*Ssp.*	*Tr*	*Vr*	*Io*	*Mm*	*Pa*	*Pt*	*Cc*		
Julimar	Hewett	210	Universal	14 (14)	4 (4)	0	0	0	0	0	0	0	0	0	0	0	0	18	8.5%
	Gakalling	191	Universal	35 (26)	2 (2)	0	0	0	0	0	0	0	0	0	0	0	0	37	19.4%
	Woylie	210	Universal	32 (26)	13 (12)	0	1 (1)	0	0	1 (1)	0	0	1 (1)	1 (1)	0	0	1 (1)	50	23.8%
Fitzgerald	Firebreak East	348	Universal/chicken	4 (4)	1	5	0	0	0	0	0	14	0	1	1	0	0	26	7.5%
	Firebreak West	339	Universal/chicken	1 (1)	0	0	0	1	6	0	0	0	1	2	0	0	0	11	3.2%
	Cocanarup	346	Universal/chicken	4 (4)	0	3	1	0	0	0	2	0	0	16	0	0	0	26	7.5%
Perup	Corbal	70	Chicken	10 (10)	4 (4)	0	0	0	0	0	0	0	0	0	0	2	0	16	22.8%
	Warrup	97	Chicken	7 (7)	2 (2)	0	0	0	0	0	0	0	1 (1)	0	0	1	0	11	11.3%
	Winnejup	133	Chicken	2 (2)	6 (6)	0	0	0	0	0	0	0	0	0	0	3	0	11	8.3%

Table 2: Trap effort per site, captures, trap success and numbers translocated for chuditch caught during collection of individuals for translocation to South Australia

Site	Transect	Trap nights	Individuals caught		Total captures	Chuditch translocated		Trap success (chuditch only)	% translocated	
			Male	Female		Male	Female		Male	Female
Julimar	Hewett	210	9	5	14	3	3	6.7%	33.3	60
	Gakalling	191	11	15	35	4	3	18.3%	36.7	20
	Woylie	210	12	14	32	1	6	15.2%	8.3	42.9
Julimar total		**611**	**32**	**34**	**81**	**8**	**12**	**13.3%**	**25**	**35.3**
Fitzgerald	Firebreak East	348	4	0	4	1	0	1.1%	25	0
	Firebreak West	339	1	0	1	1	0	0.3%	100	0
	Cocanarup	346	3	1	4	3	1	1.2%	100	100
Fitzgerald total		1033	**8**	**1**	**9**	**5**	**1**	0.9%	**62.5**	**100**
Perup	Corbal	70	2	8	10	1	4	14.2	50	50
	Warrup	97	2	5	7	2	4	6.2	100	80
	Winnejup	133	1	1	2	1	1	1.5	100	100
Perup total		**300**	**5**	**14**	**19**	**4**	**9**	**6.3**	**80**	**64.3**

Student projects

One student was involved in this stage of the translocation, investigating the influence of different factors associated post release survival.

Melissa Jensen (PhD, University of Adelaide)
One component of Melissa's PhD is to determine if temperament traits can be identified in chuditch and investigate if temperament can influence post release survival, movement patterns and habitat use.
Behavioural observations made during the collection of chuditch which were completed in contribution to Melissa's work. Further tests were completed by Melissa while the animals were held at NAR, to determine different components of each individuals temperament.
All observations of these tests were done using infrared remote sensing cameras, one still and one video set up on each individual during the test period. Some tests were purely observational, others included the introduction of items into the enclosure to measure the response of chuditch to these items. These included a ball or other novel object to measure boldness, a 'kong' with food to measure tenacity and extra food under cover or out in the open to measure vigilance and naivety. Other items including predator scent to measure boldness and a mirror to measure aggression were used, but were left outside the enclosure rather than in with the animal. Animals were checked half an hour after starting each test, if any adverse reactions were recorded tests were ceased.

Media

Media coverage of this program was increased in 2015 given the positive outcomes of the 2014 translocation. Animals were visited at NAR by the Western Australian Minister for the Environment and a large media contingent on the 29th of April. A number of news articles were published as a result of this visit, along with stories on both Channel ten and ABC news programs. Further to these, channel sevens Today Tonight also produced a story which was aired both in Perth and Adelaide. All media releases were informative and provided positive exposure about the program to the general public.

Translocation Success

Monitoring protocols will be similar to those utilized in 2014. A combination of radio-telemetry and trapping will provide data on key indicators. The longer-term viability of the population may not be evident for a considerable period of time. Data from 2014 suggest that there may be some vulnerability to predation in the early stages of a release and it could be anticipated that this trend may continue in 2015. Cats were identified as the main threatening process to translocation success in the Flinders Ranges. Control of cats will continue with protocols and effort modified in light of the lessons learned in 2014.

Future Translocations

Success indicators include:

- The monitoring of any source population to detect if any decline in trap success is evident.
- The survival of >50% of each of the released populations during the first 3 months
- Additional longer term criteria including breeding success and population increases

Source sites utilized in 2014 and 2015 will be monitored prior to considering any further translocation from those localities. A total of 76 individuals have now been removed from these sites with the majority coming from Julimar and Upper Warren/Perup. Further translocations in the near future should consider obtaining wider genetic coverage with lower numbers of individuals to be drawn from alternate sites such as Dryandra, Fitzgerald/Ravensthorpe and the Western Woodlands. Larger scale additional translocations may be considered pending strong evidence of longer term key success indicators being met.

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Appendix

Examinations: Friday 1st of May

Name	PIT tag	Date of admission	Admission weight	Examination weight	Weight gain/loss	Body Condition Score	HR	Ectoparasites	Cardiovascular /Respiratory auscultation	Skin findings (body)	Head/Mouth examination
Lady Littleton(F)	699400	30/4/15	875	850	Loss 25	2.5/5	90	Flea around ear	NAD	NAD	NAD
Star (F)	697412	15/4/15	830	1010	Gain 180	2.5/5	120	Yes, collected	NAD	NAD	Soft tissue abscess right lower lip
Burke (M)	346153	14/4/15	1160	1100	Loss 60	3/5	200	Nil	NAD	NAD	NAD
Fairy Queen (F)	926222	29/4/15	770	750	Loss 20	3/5	198	Nil	NAD	NAD	Cerumin (wax) ++ ears, smear taken
Raven (F)	346475	15/4/15	840	970	Gain 130	3/5	200	Nil	NAD	AD	Suspected tooth rot abscess
Katinka (F)	921502	15/4/15	1070	1080	Gain 10	3/5	156	Mites	NAD	AD	Suspected abscess mandible (left)
Zuytdorp (F)	919488	29/4/15	860	850	Loss 10	3/5	156	Nil	NAD	NAD	NAD
Shacklet on (M)	703349	22/4/15	2050	2040	Loss 10	4/5	156	Nil	NAD	NAD	Some wear and plaque
Sepia (F)	346170	15/4/15	1000	1040	Gain 40	3/5	120	Nil	NAD	NAD	Tooth rot abscess actively discharging
Mildura (F)	919782	14/4/15	880	1130	Gain 250	3/5	180	Nil	NAD	NAD	NAD
Phillip(M)	920483	29/4/15	1680	1710	Gain 30	3/5	150	Nil	NAD	AD	Some wear, missing upper right pre-molar
Warburt on (M)	921682	29/4/15	1620	1690	Gain 70	3.5/5	114	Nil	NAD	NAD	Right canine chipped and dead
Mary Ann (F)	346072	14/4/15	790	950	Gain 160	3/5	132	Nil	NAD	NAD	NAD
Ada (F)	917442	15/4/15	1150	1240	Gain 90	3/5	150	Nil	NAD	NAD	NAD

Name	PIT tag	Date of admission	Admission weight	Examination weight	Weight gain/loss	Body Condition Score	HR	Ectoparasite	Cardiovascular /Respiratory auscultation	Skin findings (body)	Head/Mouth examination
Eyre	608859	24/4/15	1400	1490	Gain 90	3.5/5	144	Nil	NAD	NAD	NAD
Kennedy (M)	698865	22/4/15	1100	1170	Gain 70	3/5	162	Nil	NAD	NAD	NAD
Belinda (F)	758116	29/4/15	780	820	Gain 40	2/5	140	Nil	NAD	NAD	NAD
Ringbolt (F)	042953	15/4/15	790	880	Gain 90	2/5	144	Nil	AD	NAD	Mild discharge from ears
Wylie (M)	922076	29/4/15	1060	1060	No change	3/5	108	Ear mites	NAD	NAD	NAD
Flinders (M)	924819	14/4/15	800	970	Gain 170	3/5	198	Ear mites	NAD	NAD	Slight tooth wear
Mira Flores	919832	29/4/15	800	800	No change	3/5	125	Mites, fleas and ticks around ears	NAD	NAD	NAD
Lala (F)	042709	29/4/15	660	680	Gain 20	2/5	120	Mites in ears	NAD	NAD	NAD
Sturt (M)	918631	14/4/15	950	1090	Gain 140	3/5	192	Nil	NAD	NAD	Some wear and plaque
Georgette (F)	915550	29/4/15	740	750	Gain 10	2.5/5	180	Nil	NAD	NAD	NAD
Zedora (F)	698753	22/4/15	840	700	Loss 140	3/5	70	Nil	NAD	NAD	NAD
Europa (F)	346078	14/4/15	760	760	No change	3/5	160	Nil	NAD	NAD	NAD
Baudin (M)	920600	14/4/15	1240	1330	Gain 90	3/5	120	Nil	NAD	NAD	NAD
Batavia (F)	645683	14/4/15	1010	1050	Gain 40	3/5	174	Nil	NAD	NAD	NAD
Emma (F)	920746	14/4/15	890	940	Gain 50	3/5	186	Nil	NAD	Healing scratch to right leg	Slight abscess upper right premolar
Dampier (M)	703497	23/4/15	1610	1630	Gain 20	3.5/5	132	Nil	NAD	NAD	Some wear and plaque

Name	PIT tag	Date of admission	Admission weight	Examination weight	Weight gain/loss	Body Condition Score	HR	Ectoparasite	Cardiovascular /Respiratory auscultation	Skin findings (body)	Head/mouth examination
Koomban a (F)	724313	30/4/15	1100	1090	Loss 10	3/5	162	Some mites	NAD	NAD	NAD
Calliance (F)	924646	29/4/15	830	810	Loss 20	3/5	132	Some ticks and ear mites	NAD	NAD	NAD
Twilight (F)	346059	14/4/15	720	730	Gain 10	3/5	200	Nil	NAD	AD	NAD
Cook (M)	346029	14/4/15	1210	1390	Gain 180	3/5	192	Nil	NAD	NAD	Lower right canine broken and dead
Wills (M)	921968	14/4/15	1340	1490	Gain 150	3/5	156	Nil	NAD	NAD	Some wear and plaque
Bass (M)	346127	14/4/15	1260	1360	Gain 100	3/5	192	Nil	NAD	NAD	NAD
Mawson (M)	699285	21/4/15	860	900	Gain 40	3/5	198	Nil	2 short bursts of tachycardia	NAD	NAD
Mitchell(M)	916998	14/4/15	1140	1230	Gain 90	3/5	186	Nil	NAD	NAD	Left lower canine broken
McArthu r (M)	922112	29/4/15	1190	1190	No change	3/5	180	Nil	NAD	NAD	NAD