5.2. Field health and disease sampling

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Abstract

Routine health checks and sampling for disease analyses were conducted on all woylies on Upper Warren fauna monitoring transects and Population Comparison Study sites. The principal benefit of the health checks is the increased likelihood of the detection of individuals displaying clinical symptoms that may provide clues or direct evidence of factors associated with recent woylie declines. Preliminary exploration indicates substantial differences in the prevalence of eye and skin conditions. Whether these differences are related to observer differences or associated with woylie declines remains to be investigated.

The routine sampling in the field of blood, faeces and ectoparasites from woylies for disease investigations is summarized. The history of sampling of radio-collared individuals associated with the 'Population Comparison Study' of woylie survivorship and mortality is also briefly summarized. Samples from radio-collared cohorts include biometrics, health checks and disease samples.

5.2.1. Introduction

Routine health checks and sampling for disease analyses were conducted on all woylies and some sympatric species trapped on Upper Warren fauna monitoring transects and Population Comparison Study sites. The field health checks constitute the best opportunity for detecting clinical symptoms of disease and assessing the general condition of animals more rigorously, and in more detail than has customarily been done during general fauna monitoring and research. This health check process also identifies individuals that may require additional disease sampling and/or referral to wildlife clinicians for further examination.

Field samples from fauna (blood, ectoparasites, faeces, tissue) for disease, food resource and genetic investigations by collaborating specialists were collected by field staff under the general direction of the Woylie Disease Reference Council (WDRC).

5.2.2. Methods

Details of the protocols associated with the field health checks and the sampling of blood, ectoparasites, faeces, and tissue are provided in the WCRP Operations Handbook (Volume 3). Procedural familiarization and skill development of nominated animal handlers performing the field health checks and sampling were primarily delivered via pre-trapping inductions, on-the-job training and a training day at Murdoch University. Training was provided by Adrian Wayne, visiting veterinarians and vet nurses assisting in the field and at a training day presented by technical and specialist expertise associated with the WDRC at Murdoch and Perth Zoo. The assessment of field examination and sampling competencies were conducted by Adrian Wayne. Improvements were made over time and where necessary in response to feedback from the technicians processing the samples, ongoing procedural reviews, trapping debriefings and collective learning exercises. Standardisation and consistency between operators was promoted by having a single assessor and procedural reviews (individuals and groups).

5.2.3. Results

5.2.3.1. Field health checks

A total of 173 and 740 health checks of woylies were recorded at Karakamia and Upper Warren respectively (Table 5.2.1). Preliminary exploration of the data indicates that skin conditions were the most commonly recorded observations (Figure 5.2.1.). Dermatitis (flaky and/or scaly skin), particularly on the rump, back and dorsal tail base were most prevalent. Scratches, dry lesions and scabbing were also frequently reported, especially on the back and rump (Figure 5.2.1.d&e). Most notable is the substantially higher reporting incidence at Balban and to a lesser extent, Winnejup of fur loss and/or scabbing around the eye (Figure 5.2.1.b), dermatitis and scratches, dry lesions and scabs. Approximately 40% of all health check records from these two sites were collected from one individual who worked almost exclusively on these two sites. This dataset remains to be fully examined and analysed.

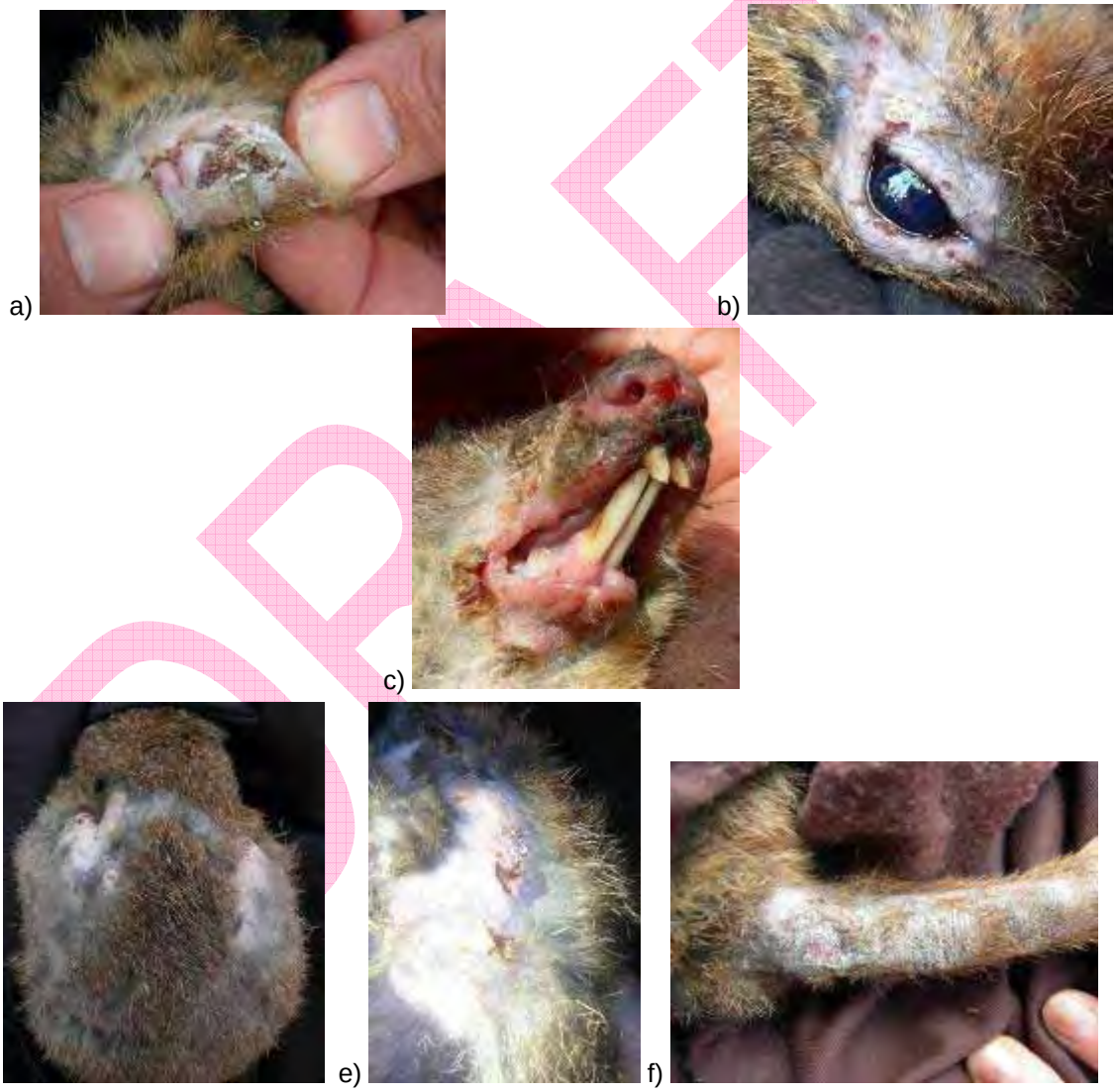

Figure 5.2.1. Examples of some of the conditions reported in the woylie field health checks.

a) Ectoparasites (ticks) in the ear, b) hair loss and scabbing around the eye, c) lesions and scarring around mouth, d&e) hair loss and scabbing on the back and rump, f) hair loss and scabbing on the tail

Table 5.2.1. Preliminary summary of selected incidences of woylie health records, body condition and coat condition (%).

Coat Condition and Body Condition indices are from woylies assessed between 11th July 2006 and 13th September 2007. Health conditions are from woylie field health checks performed from 11th July 2006. Dermatitis is the combined description of flaky, scaly or scabby skin.

	Karakamia (n=173)	Keninup (n=376)	Warrup (n=168)	Balban (n=98)	Winnejup (n=23)	Boyicup (n=17)	Corbal (n=33)	Chariup (n=11)	Moopinup (n=9)	Yendicup (n=3)	Tutanning (n=2)	Total (%) (n=913)
Eye Conditions												
fur loss and/or scabbing around eye	0.6	5.6	3.6	34.7	30.4			9.1	11.1			**7.8**
cloudy/cataracts	6.4	1.3	0.6	3.1	8.7							**2.4**
pus/discharge	0.6			1.0		5.9						**0.3**
Mouth												
scabbing around mouth		0.3		4.1	4.3							**0.7**
lower lip coming away				1.0			3.0					**0.2**
Dermatitis												
location not specified	4.6	2.4	3.6	44.9	8.7	5.9			1.0			**7.8**
back/rump		2.9	5.4			11.8	3.0					**2.5**
tail	1.7	10.1	7.7	34.7	39.1		6.1	9.1	11.1			**11.1**
Fur loss												
location not specified		1.3	1.2	3.1	4.3							**1.2**
back/rump		6.9	3.6	6.1	8.7							**4.4**
tail	0.6	5.9	2.4	9.2	17.4		12.1	9.1				**4.9**
Scratches, dry lesions, scabs												
location not specified	0.6	0.5	1.2	4.1	4.3		3.0					**1.2**
back/rump		2.1	6.0	13.3	17.4		3.0					**3.9**
tail	2.9	0.8	0.6	3.1								**1.3**
Body Condition Indices	n=175	n=428	n=210	n=100	n=30	n=19	n=34	n=10	n=9		n=7	**Total (%) (n=1022)**
1-2	8.6			1.0								**1.8**
3	58.9	21.0	8.1	28.0	16.7	5.3	2.9	10.0	11.1			**27.1**
4-5	32.6	79.0	91.9	71.0	83.3	94.7	97.1	90.0	88.9		100.0	**83.1**
Coat Condition Indices	n=175	n=427	n=209	n=99	n=30	n=18	n=34	n=10	n=9		n=7	**Total (%) (n=1018)**
1-2	1.1	1.2	1.0	2.0			2.9					**1.3**
3	23.4	11.0	9.6	18.2	23.3	38.9	2.9	10.0	11.1		14.3	**15.8**
4-5	75.4	87.8	41.6	79.8	76.7	61.1	94.1	90.0	88.9		85.7	**94.4**

5.2.3.2. Disease Sampling

Table 5.2.2 summarises the number of disease samples collected in the field as part of the WCRP, with Table 5.2.3 summarising those samples collected from the Upper Warren. Sampling within the Upper Warren occurred principally at the five PCS sites, with repeat sampling events over time to provide information on any possible spatial and/or longitudinal changes in disease prevalence (Table 5.2.4). In these tables, haematology sample numbers are based on results received from ClinPath prior to January 2008. Additional haematology results have since been received but have not yet been summarised. As of 30th January 2008, 633 haematology samples had been received by ClinPath, 511 of which were analysed. 122 samples were discarded due to clotting or insufficient quantities for analysis.

'Reference' serum from all trapping programs are in frozen storage at Murdoch University (care of Nevi Parameswaran) for future analyses as they may be needed and in response to any new evidence that might merit further investigation (e.g. screening for selected virus types). The numbers of reference sera collected are presented in Table 5.2.5. Tissue samples for genetic research and faeces for dietary analysis are addressed in the report elsewhere (Chapter 6 Conservation genetics and Section 4.5 Resources).

Table 5.2.2. The recorded number of woylie disease samples collected from trapping programs between March 2006 and November 2007.

	Haematology	Toxoplasma	Ectoparasites	Endoparasites	Salmonella
Upper Warren	429 (286)	474 (404)	767 (11*)	562 (68)	140 (137)
Karakamia	37 (37)	91 (81)	262	99 (62)	27
Batalling	26 (23)	30 (26)	26	21	0
Tutanning	5 (4)	8 (8)	6	4	0
Dryandra	12 (4)	13 (12)	12	6	0
South Australia	129 (89)	129 (86)	81	89 (42)	0
TOTAL	**629 (443)^**	**745 (617)**	**1154 (11*)**	**781 (172)**	**167 (137)**

Parentheses indicate number of samples reported to have been analysed to date.
^ Number of samples reported to have been analysed prior to January 2008
* indicate samples analysed for *Rickettsia*

Table 5.2.3. Number of woylie samples collected from the Upper Warren between March 2006 and November 2007.

	Haematology	Toxoplasma	Ectoparasites	Endoparasites	Salmonella
Balban	84	87	127	117	44
Boyicup2	12	13	17	13	4
Chariup	11	12	16	14	5
Corbal	32	33	50	55	26
Keninup2	152	173	355	212	18
Moopinup	6	6	9	7	0
Warrup2	99	116	153	114	31
Winnejup	23	24	27	22	7
Yendicup2	10	10	13	8	5
TOTAL	**429^**	**474**	**767**	**562**	**140**

Bold denotes PCS sites
^Haematology data available prior to January 2008

Table 5.2.4. Sample collection matrix for Upper Warren and Population Comparison Study sites.

EDTA, Plain and Smear= blood, Diet = Faeces for dietary analysis, Endo=Faeces for endoparasite analysis, Ecto= Ectoparasites, DNA= tissue (ear biopsy), Sal= Salmonella.

Sites		Mar-06	Apr-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Nov-07		Total
Balban	EDTA	40		8	1	0	6	7	2		1	14	0	0			5	EDTA	**84**
	Plain	42		8	1	0	6	7	2		0	15	0	0			5	Plain	**86**
	Diet	50		14	2	9	18	10	7		6	30	5	3			5	Diet	**159**
	Endo	48		19	2	0	6	7	2		1	30	1	0			1	Endo	**117**
	Ecto	43		12	0	6	13	6	7		5	25	4	3			3	Ecto	**127**
	DNA	0		8	1	1	8	10	0		3	17	0	0			0	DNA	**48**
	Smear	0		9	1	0	6	5	2		1	16	0	0			5	Smear	**45**
	Sal	43		0	0	0	0	0	0		1	0	0	0			0	Sal	**44**
Boyicup2	EDTA	4		1	0	0	0	4	0		0	3	0					EDTA	**12**
	Plain	4		1	1	0	0	4	0		0	3	0					Plain	**13**
	Diet	5		1	0	2	2	4	2		2	3	1					Diet	**22**
	Endo	5		1	0	0	0	4	0		0	3	0					Endo	**13**
	Ecto	5		1	1	1	1	3	0		1	3	1					Ecto	**17**
	DNA	0		1	1	1	0	2	0		0	2	0					DNA	**7**
	Smear	0		0	1	0	0	4	0		0	3	0					Smear	**8**
	Sal	4		0	0	0	0	0	0		0	0	0					Sal	**4**
Chariup	EDTA	4						0				7						EDTA	**11**
	Plain	6						0				6						Plain	**12**
	Diet	6						4				6						Diet	**16**
	Endo	5						3				6						Endo	**14**
	Ecto	6						3				7						Ecto	**16**
	DNA	0						4				5						DNA	**9**
	Smear	0						0				5						Smear	**5**
	Sal	5						0				0						Sal	**5**
Corbal	EDTA	25						0					7					EDTA	**32**
	Plain	27						0					8					Plain	**35**
	Diet	27						20					13					Diet	**60**
	Endo	25						19					11					Endo	**55**
	Ecto	21						17					12					Ecto	**50**
	DNA	0						20					8					DNA	**28**
	Smear	0						0					8					Smear	**8**
	Sal	26						0					0					Sal	**26**
Keninup2	EDTA	20		8	4	0	17	13	9		0	29	0	8	1		43	EDTA	**152**
	Plain	35		11	4	0	17	16	10		0	30	0	9	1		48	Plain	**181**
	Diet	36		16	10	28	47	30	28		37	81	33	22	2		37	Diet	**407**
	Endo	36		17	10	0	19	23	8		0	81	0	0	0		18	Endo	**212**
	Ecto	49		15	4	19	30	29	25		31	75	22	23	2		31	Ecto	**355**
	DNA	0		11	3	10	28	69	12		5	50	5	3	0		28	DNA	**224**
	Smear	0		6	4	0	16	15	7		0	29	8	0	1		25	Smear	**111**
	Sal	18		0	0	0	0	0	0		0	0	0	0	0		0	Sal	**18**
Moopinup	EDTA							0				6						EDTA	**6**
	Plain							0				6						Plain	**6**
	Diet							2				6						Diet	**8**
	Endo							1				6						Endo	**7**
	Ecto							3				6						Ecto	**9**
	DNA							3				5						DNA	**8**
	Smear							0				6						Smear	**6**
	Sal							0				0						Sal	**0**
Warrup2	EDTA	20		9	0	0	0	29	0		0		13	0			28	EDTA	**99**
	Plain	23		11	0	1	0	28	0		0		20	0			37	Plain	**120**
	Diet	30		10	1	5	3	37	5		20		63	10			32	Diet	**216**
	Endo	31		10	1	0	0	34	0		0		37	0			1	Endo	**114**
	Ecto	26		11	1	1	0	34	1		18		54	7			0	Ecto	**153**
	DNA	0		11	0	4	1	29	2		6		29	1			11	DNA	**94**
	Smear	0		10	0	0	0	30	0		0		17	0			28	Smear	**85**
	Sal	31		0	0	0	0	0	0		0		0	0			0	Sal	**31**
Winnejup	EDTA	8		2	2	3	0	4				4	0	0				EDTA	**23**
	Plain	2		2	2	3	0	4				4	0	0				Plain	**17**
	Diet	10		2	3	2	1	4				0	8	2				Diet	**32**
	Endo	10		1	2	0	0	4				0	5	0				Endo	**22**
	Ecto	6		2	1	3	1	4				0	9	1				Ecto	**27**
	DNA	0		2	2	3	0	2				0	3	0				DNA	**12**
	Smear	0		1	0	0	0	3				0	5	0				Smear	**9**
	Sal	7		0	0	0	0	0				0	0	0				Sal	**7**
Yendicup2	EDTA		8				0					2						EDTA	**10**
	Plain		8				0					2						Plain	**10**
	Diet		5				3					3						Diet	**11**
	Endo		5				0					3						Endo	**8**
	Ecto		7				4					2						Ecto	**13**
	DNA		0				4					3						DNA	**7**
	Smear		0				0					2						Smear	**2**
	Sal		5				0					0						Sal	**5**
Karakamia	EDTA			0		0	18	0		0		0		0		3	7	EDTA	**28**
	Plain			86		0	0	0		0		0		0		3	7	Plain	**96**
	Diet			0		15	0	18		40		27		36		28	32	Diet	**196**
	Endo			62		0	0	0		0		27		0		0	10	Endo	**99**
	Ecto			41		33	0	15		32		28		34		39	40	Ecto	**262**
	DNA			88		0	0	0		40		13		6		4	3	DNA	**154**
	Smear			0		0	0	0		0		0		0		3	7	Smear	**10**
	Sal			0		0	0	0		0		27		0		0	0	Sal	**27**
TOTAL		**874**	**38**	**529**	**66**	**150**	**275**	**650**	**131**	**112**	**138**	**772**	**410**	**168**	**7**	**80**	**497**		**4897**

Bold indicates PCS sites

Table 5.2.5. Number of reference sera collected between March 2006 and November 2007 from each trapping program

Site	Total # Reference sera
Upper Warren	444
Karakamia Sanctuary	74
Batalling	30
Dryandra	8
Tutanning	13
South Australia	87
TOTAL	**656**

5.2.3.3. Radio-collared woylie cohorts

The radio-collared cohorts at the five Upper Warren PCS sites are a subset of the woylies that have been examined and sampled in these areas. The incidence of data collection (biometrics and field health checks) and disease sample collection (blood, faeces and ectoparasites) of radio-collared individuals is provided in Tables 5.2.6 and 5.2.7 respectively.

Table 5.2.6. Summary of the incidents of biometric ('M') and field health check ('H') data recorded for woylie individuals radio-collared and monitored as part of the survivorship and mortality component of the Population Comparison Study.

Site	Animal Record#	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Fate
Balban	09-0-000-801	M												M				M				MH	MH	MH	MH		MH		MH				Removed 12/02/2007
Balban	09-0-000-862													M				M				MH		MH									Died 29/09/2006
Balban	09-0-000-893													M				M				MH		MH	M	MH							Died 4/12/2006
Balban	09-0-000-894													M				M				MH		MH									Died 5/10/2006
Balban	50-0-003-181	M												M				M				MH		MH	MH		MH		MH				Died 09/04/07
Balban	50-0-003-354																	M				MH		MH	M								Removed 5/09/2006
Balban	50-0-003-733																								MH		MH						Died 30/01/2007
Balban	50-0-003-884																					MH		MH									Died 13/09/2006
Balban	50-0-003-887																					M		MH	MH								Died 8/11/2006
Balban	50-0-003-894																					MH											Died 12/08/2006
Balban	50-0-003-911																						MH	MH	MH		MH		MH		MH	MH	Removed 12/12/2006
Boyicup	50-0-002-272					M								M									MH										Died 24/10/2006
Boyicup	50-0-003-741																					MH		MH	M	MH	MH		MH	MH	MH		Removed 6/09/2006
Keninup	50-0-002-539													M				M				MH	M	M	M	MH	MH		MH	MH	MH	MH	Removed 12/02/2007
Keninup	50-0-002-574													M								MH		MH	MH				M				Died 26/02/2007
Keninup	50-0-002-598													M								MH		MH	MH	MH	MH		MH	MH	MH	MH	Removed 29/05/2007
Keninup	50-0-003-221																	M				MH		MH	MH	MH	MH		M	MH	MH		Died 2/06/2007
Keninup	50-0-003-222																	M				MH		MH	M		MH		MH		MH	Off	Last trapped 13/04/07
Keninup	50-0-003-789																					MH		MH							MH	MH	Removed 5/09/2006
Keninup	50-0-003-790																					MH		MH	MH	M	MH		MH	MH	MH	MH	Removed 31/05/2007
Keninup	50-0-003-792																					MH		MH	MH								Died 15/11/06
Keninup	50-0-003-793																					MH		MH	H		MH		MH		MH		Removed 14/01/2007
Keninup	50-0-003-797																					MH											Died 29/08/2006
Keninup	50-0-003-801																					MH											Died 19/08/2006
Keninup	50-0-003-807																					MH	MH	MH	MH		MH		MH		MH	MH	Removed 29/05/2007
Keninup	50-0-003-815																						M	M	M		MH		MH		MH	MH	Removed 11/04/2007
Keninup	50-0-003-816																						MH	M	MH		MH		MH		MH	MH	Removed 30/05/2007
Keninup	50-0-003-819																						MH		MH		MH		H	M	MH		Removed 8/06/2007
Keninup	50-0-003-826																							MH	M		MH		MH		MH	MH	Removed 30/05/2007
Keninup	50-0-003-829																							M	M		MH						Removed 12/06/2007
Keninup	50-0-003-833																								MH		MH		M		MH	MH	Removed 29/05/2007
Keninup	50-0-003-842																								MH		MH		M			MH	Removed 31/05/07
Keninup	50-0-003-851																								M		M		M		M		Removed 12/02/2007
Keninup	50-0-003-859																										MH		M		MH	MH	Removed 12/02/2007
Keninup	50-0-003-867																										MH		MH		MH	MH	Removed 29/05/2007
Keninup	50-0-003-873																										MH		MH		MH	MH	Removed 29/05/2007
Keninup	50-0-003-929																						MH										Died 11/08/2006
Keninup	50-0-006-580																							M									Removed 5/09/2006
Warrup	50-0-002-307						M								M			M								MH			MH	MH	H	Removed 5/09/2006
Warrup	50-0-003-015																	M				MH		M	M		MH		MH				Died 30/03/2007
Warrup	50-0-003-072																	M				MH		M									Died 21/10/2006
Warrup	50-0-003-134													M				M				MH	M	M	M	MH	MH		MH		MH	MH	Removed 25/10/2006
Warrup	50-0-003-163													M								MH	M	M	M		MH		MH		MH	MH	Removed 6/09/2006
Warrup	50-0-003-188													M				M				MH		M	M	MH	MH		MH		MH	MH	Removed 12/02/2007
Warrup	50-0-003-193													M				M				MH			M	MH							Removed 25/10/2006
Warrup	50-0-003-834																					MH	M	M	M		MH		MH		MH	M	Removed 30/05/2007
Warrup	50-0-003-847																					MH		M	M		MH		MH		MH	MH	Removed 29/05/2007
Warrup	50-0-003-852																					MH		M	M	MH			MH		MH	MH	Removed 5/09/2006
Warrup	50-0-003-853																					MH		MH	M		M						Died 26/02/2007
Winnejup	00-0-003-715													M				M						MH	M	MH	MH		MH		MH		Died 21/05/2007
Winnejup	00-0-003-736																	M				MH	M	M		MH					MH	MH	Removed 29/05/2007
Winnejup	50-0-003-753																					MH											Died 22/07/2006
Winnejup	50-0-003-760																						MH	MH									Died 21/10/2006
Winnejup	50-0-003-766																						MH	M	M								Removed 6/06/2007
Winnejup	50-0-003-780																							H							MH		Removed 29/05/2007

Note: Shaded cells indicate the period when individuals were collared with mortality-sensitive radio-transmitters.

Table 5.2.7. Summary of the incidents of sampling for disease analyses (B=blood, F=faeces, E=ectoparasites) recorded for woylie individuals radio-collared and monitored as part of the survivorship and mortality component of the Population Comparison Study.

Site	Animal Record#	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Fate
Balban	09-0-000-801	BFE				BFE		F	BFE		BFE							Removed 12/02/2007
Balban	09-0-000-862	BFE				BFE		FE										Died 29/09/2006
Balban	09-0-000-893					BFE		F		F								Died 4/12/2006
Balban	09-0-000-894	FE				BFE		F										Died 5/10/2006
Balban	50-0-003-181	FE				BFE	F	FE	BFE		FE		FE					Died 09/04/07
Balban	50-0-003-354	BFE				FE		FE	F									Removed 5/09/2006
Balban	50-0-003-733								FE		BFE							Died 30/01/2007
Balban	50-0-003-884					BFE												Died 13/09/2006
Balban	50-0-003-887					BFE		E	FE									Died 8/11/2006
Balban	50-0-003-894					BFE												Died 12/08/2006
Balban	50-0-003-911						BF	E	F		FE		FE		FE	FE		Removed 12/12/2006
Boyicup	50-0-002-272						BE											Died 24/10/2006
Boyicup	50-0-003-741					BFE		F	FE	BF	FE		F	BFE	F			Removed 6/09/2006
Keninup	50-0-002-539	FE					F	FE	FE	BF	FE		F	BFE	F	FE		Removed 12/02/2007
Keninup	50-0-002-574					BFE		FE	BFE				F					Died 26/02/2007
Keninup	50-0-002-598					BFE		F	FE	BF	FE		FE	BFE	F	BFE		Removed 29/05/2007
Keninup	50-0-003-221	BE				BFE		FE	F	BFE	FE		F	BFE	FE			Died 2/06/2007
Keninup	50-0-003-222					BFE		F	FE		BFE		F			Off		Last trapped 13/04/07
Keninup	50-0-003-789					BFE	F	FE										Removed 5/09/2006
Keninup	50-0-003-790					BFE		F	F	FE	BF		FE	BFE		BFE	B	Removed 31/05/2007
Keninup	50-0-003-792					BFE			F									Died 15/11/06
Keninup	50-0-003-793					BFE		FE	FE		E		FE		FE			Removed 14/01/2007
Keninup	50-0-003-797					BFE												Died 29/08/2006
Keninup	50-0-003-801					BFE												Died 19/08/2006
Keninup	50-0-003-807					BFE	BFE	F	FE	FE			FE		FE	BFE		Removed 29/05/2007
Keninup	50-0-003-815						F	FE	F		BFE		FE		F	FE		Removed 11/04/2007
Keninup	50-0-003-816						BFE	FE	F		FE		FE		F	BFE		Removed 30/05/2007
Keninup	50-0-003-819						BFE		FE		F		F		F			Removed 8/06/2007
Keninup	50-0-003-826							FE	F		BFE		FE		F	BFE		Removed 30/05/2007
Keninup	50-0-003-829							FE	F		BF							Removed 12/06/2007
Keninup	50-0-003-833										BFE		FE		FE	BFE		Removed 29/05/2007
Keninup	50-0-003-842								F		BF							Removed 31/05/2007
Keninup	50-0-003-851								FE		BFE		FE		FE			Removed 12/02/2007
Keninup	50-0-003-859										BFE		FE		FE	FE		Removed 12/02/2007
Keninup	50-0-003-867										FE		FE		FE	BFE		Removed 29/05/2007
Keninup	50-0-003-873										BFE		FE		F	BF		Removed 29/05/2007
Keninup	50-0-003-929						BE											Died 11/08/2006
Keninup	50-0-006-580							FE										Removed 5/09/2006
Warrup	50-0-002-307					BFE				BFE			FE		BFE	FE		Removed 5/09/2006
Warrup	50-0-003-015	BF				BFE					F		FE					Died 30/03/2007
Warrup	50-0-003-072					BE												Died 21/10/2006
Warrup	50-0-003-134	BFE				BFE				BFE	F		FE		FE	FE		Removed 25/10/2006
Warrup	50-0-003-163					BFE		F					FE		F	FE		Removed 6/09/2006
Warrup	50-0-003-188					BE				BF			FE		BFE	E		Removed 12/02/2007
Warrup	50-0-003-193					BE				BFE								Removed 25/10/2006
Warrup	50-0-003-834					BFE												Removed 30/05/2007
Warrup	50-0-003-847					BFE							FE		FE	FE		Removed 29/05/2007
Warrup	50-0-003-852					BFE			F	F			FE		BFE	F		Removed 5/09/2006
Warrup	50-0-003-853					F		BFE										Died 26/02/2007
Winnejup	00-0-003-715	BFE						BFE		BFE					BFE			Died 21/05/2007
Winnejup	00-0-003-736	BF				BFE				BFE					BFE	FE		Removed 29/05/2007
Winnejup	50-0-003-753					BFE												Died 22/07/2006
Winnejup	50-0-003-760						BF	BFE										Died 21/10/2006
Winnejup	50-0-003-766						BFE		FE									Removed 6/06/2007
Winnejup	50-0-003-780							BE							FE			Removed 29/05/2007

Note: Shaded cells indicate the period when individuals were collared with mortality-sensitive radio-transmitters.

5.2.4. Discussion

5.2.4.1. Health check records

The data generated by the field health checks remain to be fully examined. Likely useful information to be generated from these data and the associated morphometric data include;

- Spatial and temporal differences in the incidence of symptoms and animal conditions.
- Identification of specific woylie individuals of interest for comparison with disease datasets that may provide evidence for the potential role of specific diseases in recent woylie declines.
- Assist disease specialists in the interpretation of disease data generated for the same individuals.

A closer examination of data is, however, required in the first instance. For example, the higher prevalence of records of eye and skin conditions in Balban and Winnejup are particularly interesting given the concurrent transition of the Balban woylie population from high to low density. This may provide associative evidence relating to the woylie declines, and/or clues as to the possible cause(s) of the declines. However, before this can be substantiated, the extent of observer differences in the field health checks first needs to be established.

This example, highlights the importance of consistency and quality of data generated for comparative health assessments, between observers and over space and time. The depth of disease and health data being collected from fauna as part of this research is unprecedented in DEC standardised monitoring protocols and the vast majority of fauna research more generally. Nonetheless, it is clear that ongoing critical review is necessary to optimise data quality and collection efficiency. For example, more detailed categorisation and scoring of severity of symptoms and conditions would assist in the improved standardization of reporting, which in turn, assists in the data analysis and interpretation. Adequate training of field staff is also centrally important to quality control and data management, particularly given that these skill sets are, in most cases, new to those that have traditionally been involved in fauna monitoring and research.

The full benefits of the detailed examination of trapped individuals that has been initiated in this research project are yet to be realized. Nonetheless, they are expected to include an increased likelihood in the detection of clues that may assist in the identification of the cause(s) for recent woylie declines, more specifically the role that disease(s) may or may not play, and more generally a deeper understanding of the ecology and biology of the woylie.

5.2.4.2. Disease sampling

The vast majority of samples collected for disease screening were associated with the PCS sites and Upper Warren fauna monitoring transects. Samples were also collected opportunistically from other Western Australian and South Australian sites for comparative purposes.

Samples sizes required to investigate diseases need to be sufficient to provide adequate representation within comparative sites to be able to confidently compare between sites. Furthermore, repeat sampling at these levels are required to investigate temporal changes in prevalence that might be associated with woylie declines. This necessitates having large samples sizes given the need to confidently detect low prevalence rates of pathogens and factors that can still have substantial affects on populations. For example, more than 59 samples are required to detect the presence of an agent with a true prevalence rate of 5% with 95% confidence (SAS). On this basis, despite the sample sizes being practically very large, statistically there may be inference limitations, particularly for the additional non-PCS sites.

5.2.4.3. Radio-collared woylie cohorts

The repeat sampling of woylie individuals over time provides a powerful investigative tool that may provide clues to what might be causing woylie declines at the population level. The radio-collared cohorts provide an especially useful subset of case histories given the additional information available regarding the survival and mortality of these individuals. While the data has now been predominantly organized in preparation for interrogation, the commencement of the development of these case histories remains to be started.

5.2.5. Future work

Field health check data;

- Complete categorisation of symptom descriptions.
- Assess observer differences in reporting of symptoms.
- Investigate differences between sites and temporal changes in the incidence of symptoms and associate the results to differences and changes in woylie populations.
- Make field check data available to collaborating disease investigators for comparison with other disease data.
- Review field health check procedures and data recording.

Disease sampling, once initial disease results are considered and through the co-operation with the WDRC;

1. Review the merits of repeat sampling to provide longitudinal context to disease incidence and prevalence.
2. Review whether sample sizes for sites of interest need increasing to increase the confidence of incidence/prevalence rates for specific diseases of interest.
3. Review whether new disease sampling is merited for specific diseases of interest that may have a role in woylie declines but have not yet been investigated (e.g. urine, oral-pharyngeal swabs, etc).
4. Co-operate with the Murdoch/DEC ARC research project to provide opportunities for sympatric species of medium-sized mammals within the Upper Warren region to be sampled for a similar suite of diseases to develop a more complete understanding of the diseases and parasites within native Western Australian fauna.

Radio-collared cohorts;

1. Complete the collation of all available data to develop full medical case histories of radio-collared individuals.
2. Examine disease and health data of radio-collared individuals to determine if there are any relationships between sites and individuals that died or survived the study period.

5.2.6. Conclusion

Routine field health checks have been incorporated into the standard operating procedures for fauna monitoring in the Upper Warren region. These have been used as the model adopted by the Murdoch/DEC ARC research project into wildlife diseases in WA threatened mammals and provides an opportunity for incorporation into broader Departmental monitoring and research activities, such as *Western Shield*. The field health checks substantially increase the likelihood of the detection of important information potentially relevant to woylie declines and to woylie ecology and biology more generally. The analysis of the data collected to date remains to be completed. The analysis of the disease samples is underway and progress is reported in subsequent sections of this report. The development of medical case-histories for the radio-collared woylie cohorts remains to be started.

5.2.7. Acknowledgements

We would like to thank, i) the WDRC for assistance in the development of the field health check and sampling procedures, ii) the field staff that conducted the health checks and assisted in the collection of samples, and iii) the volunteers for assisting in these activities.