10.1071/ZO23048

Australian Journal of Zoology

Supplementary Material

The parasites of free-ranging terrestrial wildlife from Australia's south-west

Amy S. Northover[A,B,*], *Stephanie S. Godfrey*[B,C], *Alan J. Lymbery*[D], *Adrian F. Wayne*[E], *Sarah Keatley*[B], *Amanda Ash*[B], *Dazlyn Badsha*[F], *Siobhon L. Egan*[G], *James Barr*[B], *and R. C. Andrew Thompson*[B]

[A]Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Kensington, WA 6151, Australia.

[B]College of Science, Health, Engineering and Education, Murdoch University, Murdoch, WA 6150, Australia.

[C]Department of Zoology, University of Otago, Dunedin 9016, New Zealand.

[D]Centre for Sustainable Aquatic Ecosystems, Harry Butler Institute, Murdoch University, Murdoch, WA 6150, Australia.

[E]Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Manjimup, WA 6258, Australia.

[F]College of Veterinary Medicine, Murdoch University, Murdoch, WA 6150, Australia.

[G]Harry Butler Institute, Murdoch University, Murdoch, WA 6150, Australia.

[*]Correspondence to: Amy S. Northover Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Kensington, WA 6151, Australia Email: amy.northover@dbca.wa.gov.au

Appendices

The parasites of free-ranging terrestrial wildlife from Australia's south-west

Appendix Table 1. The *Trypanosoma* species identified in woylies (*Bettongia penicillata*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the trypanosome with the highest overall prevalence.

	Overall	Dryandra	Warrup East	Walcott	Perup	UWR
Trypanosoma spp. infection	759/1405 (54.0%) 51.4-56.6%	160/354 (45.2%) 40.1-50.4%	148/264 (56.1%) 50.0-61.9%	**294/382 (77.0%)** **72.5-80.9%**	120/336 (35.7%) 30.8-41.0%	37/69 (53.6%) 42.0-64.9%
Trypanosoma vegrandis	402/1325 (30.3%) 27.9-32.9%	99/353 (28.0%) 23.6-33.0%	60/240 (25.0%) 19.9-30.9%	**214/355 (60.3%)** **55.1-65.2%**	16/308 (5.2%) 3.2-8.4%	13/69 (18.8%) 11.3-29.8%
Trypanosoma copemani	300/1325 (22.6%) 20.5-25.0%	76/353 (21.5%) 17.6-26.1%	60/240 (25.0%) 19.9-30.9%	101/355 (28.5%) 24.0-33.4%	39/308 (12.7%) 9.4-16.9%	**24/69 (34.8%)** **24.6-46.6%**
Trypanosoma noyesi	100/1325 (7.5%) 6.2-9.1%	16/353 (4.5%) 2.8-7.3%	19/240 (7.9%) 5.1-12.1%	22/355 (6.2%) 4.1-9.3%	**38/308 (12.3%)** **9.1-16.5%**	5/69 (7.2%) 2.8-16.3%
Trypanosoma sp. ANU2	30/1325 (2.3%) 1.6-3.2%	0/353 (0%) 0.0-1.3%	6/240 (2.5%) 1.0-5.5%	12/355 (3.4%) 1.9-5.9%	**11/308 (3.6%)** **1.9-6.4%**	1/69 (1.4%) 0.0-8.7%
Trypanosoma gilletti	11/1325 (0.8%) 0.4-1.5%	0/353 (0%) 0.0-1.3%	**4/240 (1.7%)** **0.5-4.4%**	2/355 (0.6%) 0.0-2.2%	5/308 (1.6%) 0.6-3.9%	0/69 (0%) 0.0-6.5%

Note: *UWR includes the six unfenced sites (Balban, Boyicup, Corbal, Dudijup, Dwalgan and Winnejup) where woylies were captured for translocation into Dryandra.*

Appendix Table 2. The *Trypanosoma* species identified in brush-tailed possums (*Trichosurus vulpecula hypoleucus*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the trypanosome with the highest overall prevalence.

	Overall	Dryandra	Warrup East	Walcott	Perup
Trypanosoma spp. infection	262/317 (82.6%) 78.1-86.4%	152/198 (76.8%) 70.4-82.1%	**41/41 (100%)** **89.5-100%**	38/41 (92.7%) 79.7-98.1%	31/33 (93.9%) 78.4-98.9%
Trypanosoma vegrandis	77/313 (24.6%) 20.2-29.7%	43/198 (21.7%) 16.5-28.0%	14/41 (34.1%) 21.6-49.5%	8/41 (19.5%) 10.1-34.4%	**12/33 (36.4%)** **21.0-54.9%**
Trypanosoma copemani	183/313 (58.5%) 52.9-63.8%	85/198 (42.9%) 36.2-49.9%	34/41 (82.9%) 68.3-91.7%	**36/41 (87.8%)** **73.9-95.0%**	28/33 (84.8%) 67.3-94.3%
Trypanosoma noyesi	65/313 (20.8%) 16.6-25.6%	**53/198 (26.8%)** **21.1-33.4%**	2/41 (4.9%) 0.6-17.2%	7/41 (17.1%) 8.3-31.7%	3/33 (9.1%) 2.4-25.5%
Trypanosoma sp. ANU2	3/313 (1.0%) 0.2-2.9%	0/198 (0%) 0.0-2.4%	**3/41 (7.3%)** **1.9-20.3%**	0/41 (0%) 0.0-10.5%	0/33 (0%) 0.0-13.0%

Appendix Table 3. The *Trypanosoma* species identified in chuditch (*Dasyurus geoffroii*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the trypanosome with the highest overall prevalence.

	Overall	Dryandra	Warrup East	Walcott
Trypanosoma spp. infection	14/119 (11.8%) 7.1-19.0%	1/54 (1.9%) 0.0-10.9%	4/41 (9.8%) 3.4-23.3%	**9/23 (39.1%)** **20.5-61.2%**
Trypanosoma vegrandis	5/118 (4.2%) 1.6-9.9%	0/54 (0%) 0.0-8.1%	0/41 (0%) 0.0-10.5%	**5/23 (21.7%)** **8.3-44.2%**
Trypanosoma copemani	8/118 (6.8%) 3.3-13.1%	0/54 (0%) 0.0-8.1%	4/41 (9.8%) 3.4-23.3%	**4/23 (17.4%)** **5.7-39.5%**
Trypanosoma noyesi	8/118 (6.8%) 3.3-13.1%	1/54 (1.9%) 0.0-10.9%	1/41 (2.4%) 0.0-14.0%	**6/23 (26.1%)** **11.1-48.7%**
Trypanosoma sp. ANU2	1/118 (0.8%) 0.0-5.2%	0/54 (0%) 0.0-8.1%	**1/41 (2.4%)** **0.0-14.0%**	0/23 (0%) 0.0-17.8%

Note: *Chuditch do not occur within Perup Sanctuary*.

Appendix Table 4. The gastrointestinal parasite eggs, oocysts and larvae identified from woylies (*Bettongia penicillata*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the parasite with the highest overall prevalence (excludes unidentified nematode eggs/larvae).

	Overall	Dryandra	Warrup East	Walcott	Perup	UWR
Cestode egg	21/946 (2.2%) 1.4-3.4%	**21/317 (6.6%)** **4.3-10.0%**	0/212 (0%) 0.0-2.2%	0/235 (0%) 0.0-2.0%	0/126 (0%) 0.0-3.7%	0/56 (0%) 0.0-7.9%
Coccidian oocysts	141/946 (14.9%) 12.8-17.3%	10/317 (3.2%) 1.7-5.8%	38/212 (17.9%) 13.3-23.7%	50/235 (21.3%) 16.5-27.0%	29/126 (23.0%) 16.5-31.2%	**14/56 (25.0%)** **15.5-37.9%**
Linstowinema sp. egg	2/946 (0.2%) 0.0-0.8%	0/317 (0%) 0.0-1.5%	0/212 (0%) 0.0-2.2%	0/235 (0%) 0.0-2.0%	1/126 (0.8%) 0.0-4.9%	**1/56 (1.8%)** **0.0-10.5%**
Lungworm larvae	13/946 (1.4%) 0.8-2.4%	0/317 (0%) 0.0-1.5%	3/212 (1.4%) 0.3-4.3%	3/235 (1.3%) 0.3-3.9%	**7/126 (5.6%)** **2.6-11.3%**	0/56 (0%) 0.0-7.9%
Potoroxyuris sp. egg	18/946 (1.9%) 1.2-3.0%	0/317 (0%) 0.0-1.5%	1/212 (0.5%) 0.0-2.9%	0/235 (0%) 0.0-2.0%	**17/126 (13.5%)** **8.5-20.7%**	0/56 (0%) 0.0-7.9%
Strongyle egg	712/946 (75.3%) 72.4-77.9%	102/317 (32.2%) 27.3-37.5%	201/212 (94.8%) 90.8-97.2%	**233/235 (99.1%)** **96.7-100.0%**	122/126 (96.8%) 91.8-99.0%	54/56 (96.4%) 87.0-99.6%
Strongyloides-like egg	449/946 (47.5%) 44.3-50.6%	91/317 (28.7%) 24.0-33.9%	79/212 (37.3%) 31.0-44.0%	154/235 (65.5%) 59.2-71.3%	**94/126 (74.6%)** **66.3-81.4%**	31/56 (55.4%) 42.4-67.6%
Trichuris sp. egg	4/946 (0.4%) 0.1-1.1%	0/317 (0%) 0.0-1.5%	0/212 (0%) 0.0-2.2%	0/235 (0%) 0.0-2.0%	**4/126 (3.2%)** **1.0-8.2%**	0/56 (0%) 0.0-7.9%
Unidentified nematode eggs/larvae	715/946 (75.6%) 72.7-78.2%	198/317 (62.5%) 57.0-67.6%	161/212 (75.9%) 69.7-81.2%	201/235 (85.5%) 80.4-89.5%	102/126 (81.0%) 73.1-86.9%	**53/56 (94.6%)** **84.7-98.7%**

Note: *UWR includes the six unfenced sites (Balban, Boyicup, Corbal, Dudijup, Dwalgan and Winnejup) where woylies were captured for translocation into Dryandra.*

Appendix Table 5. The gastrointestinal parasite eggs, oocysts and larvae identified from brush-tailed possums (*Trichosurus vulpecula hypoleucus*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the parasite with the highest overall prevalence.

	Overall	Dryandra	Warrup East	Walcott	Perup
Bertiella sp. egg	10/234 (4.3%) 2.3-7.8%	**9/172 (5.2%)** **2.7-9.8%**	0/24 (0%) 0.0-17.2%	1/23 (4.3%) 0.2-24.0%	0/15 (0%) 0.0-25.3%
Coccidian oocysts	34/234 (14.5%) 10.6-19.7%	**29/172 (16.9%)** **12.0-23.2%**	3/24 (12.5%) 3.3-33.5%	1/23 (4.3%) 0.2-24.0%	1/15 (6.7%) 0.3-24.0%
Gravid nematodes	36/234 (15.4%) 11.3-20.6%	3/172 (1.7%) 0.4-5.3%	**15/24 (62.5%)** **40.8-80.4%**	13/23 (56.5%) 34.9-76.1%	5/15 (33.3%) 13.0-61.3%
Oxyurid sp. egg	1/234 (0.4%) 0.0-2.7%	0/172 (0%) 0.0-2.7%	**1/24 (4.2%)** **0.2-23.1%**	0/23 (0%) 0.0-17.8%	0/15 (0%) 0.0-25.3%
Parastrongyloides egg	33/234 (14.1%) 10.2-19.2%	0/172 (0%) 0.0-2.7%	10/24 (41.7%) 22.8-63.1%	12/23 (52.2%) 31.1-72.6%	**11/15 (73.3%)** **44.8-91.1%**
Protospirura sp. *egg*	12/234 (5.1%) 2.9-8.9%	8/172 (4.7%) 2.3-9.1%	1/24 (4.2%) 0.2-23.1%	0/23 (0%) 0.0-17.8%	**3/15 (20.0%)** **5.3-48.6%**
Strongyle egg	157/234 (67.1%) 60.8-72.8%	98/172 (57.0%) 49.5-64.1%	**24/24 (100%)** **82.8-100.0%**	21/23 (91.3%) 70.5-98.5%	14/15 (93.3%) 66.0-99.7%
Unidentified nematode eggs/larvae	48/234 (20.5%) 15.8-26.2%	8/172 (4.7%) 2.3-9.1%	**16/24 (66.7%)** **44.7-83.6%**	15/23 (65.2%) 42.8-82.8%	9/15 (60.0%) 32.9-82.5%

Appendix Table 6. The gastrointestinal parasite eggs, oocysts and larvae identified in chuditch (*Dasyurus geoffroii*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For each parasite, the site with the highest prevalence is highlighted in bold. Bold type also denotes the parasite with the highest overall prevalence.

	Overall	Dryandra	Warrup East	Walcott
Anoplocephalid egg	4/112 (3.6%) 1.1-9.2%	1/65 (1.5%) 0.0-9.2%	**3/29 (10.3%)** **2.7-28.5%**	0/18 (0%) 0.0-21.9%
Bertiella sp. egg	3/112 (2.7%) 0.6-8.0%	**3/65 (4.6%)** **1.1-13.4%**	0/29 (0%) 0.0-14.6%	0/18 (0%) 0.0-21.9%
Capillaria egg	1/112 (0.9%) 0.0-5.5%	0/65 (0%) 0.0-6.9%	0/29 (0%) 0.0-14.6%	**1/18 (5.6%)** **0.3-29.4%**
Coccidian oocysts	12/112 (10.7%) 6.1-18.0%	8/65 (12.3%) 6.2-22.8%	**12/29 (41.4%)** **24.1-60.9%**	2/18 (11.1%) 1.9-36.1%
'Megastrongyle' egg	9/112 (8.0%) 4.2-14.8%	3/65 (4.6%) 1.1-13.4%	**5/29 (17.2%)** **6.5-36.5%**	1/18 (5.6%) 0.3-29.4%
Oxyurid spp. eggs	10/112 (8.9%) 4.8-15.9%	4/65 (6.2%) 2.0-15.3%	1/29 (3.4%) 0.2-19.6%	**5/18 (27.8%)** **10.7-53.6%**
Physaloptera sp. egg	1/112 (0.9%) 0.0-5.5%	0/65 (0%) 0.0-6.9%	**1/29 (3.4%)** **0.2-19.6%**	0/18 (0%) 0.0-21.9%
Spiruroid egg	3/112 (2.7%) 0.6-8.0%	1/65 (1.5%) 0.0-9.2%	**2/29 (6.9%)** **1.2-24.2%**	0/18 (0%) 0.0-21.9%
Strongyle egg	92/112 (82.1%) 73.9-88.2%	45/65 (69.2%) 57.1-79.1%	**29/29 (100%)** **85.4-100.0%**	**18/18 (100%)** **78.1-100.0%**
Unidentified nematode eggs/larvae	22/112 (19.6%) 13.3-28.2%	9/65 (13.8%) 7.3-24.6%	5/29 (17.2%) 6.5-35.5%	**8/18 (44.4%)** **22.4-68.7%**

Note: *Chuditch do not occur within Perup Sanctuary*.

Appendix Table 7. Prevalence data (by site) for each ectoparasite taxonomic group identified as present on woylies (*Bettongia penicillata*) in the field [no. infected/no. tested (% infected); 95% CI].

Parasite group	Overall	Dryandra	Warrup East	Walcott	Perup	UWR
Ticks	1055/1303 (81.0%)	252/361 (69.8%)	196/270 (72.6%)	**400/413 (96.9%)**	144/190 (75.8%)	63/69 (91.3%)
	78.7-83.0%	64.9-74.3%	67.0-77.6%	**94.6-98.2%**	69.2-81.3%	81.9-96.2%
Fleas	534/1285 (41.6%)	6/358 (1.7%)	129/267 (48.3%)	**283/403 (70.2%)**	79/188 (42.0%)	37/69 (53.6%)
	38.9-44.3%	0.7-3.7%	42.4-54.3%	**65.6-74.5%**	35.2-49.2%	42.0-64.9%
Lice	924/1283 (71.9%)	230/359 (64.1%)	195/265 (73.6%)	295/400 (73.8%)	**151/190 (79.5%)**	53/69 (76.8%)
	69.3-74.3%	59.0-68.9%	67.9-78.5%	69.2-77.8%	**73.1-84.6%**	65.5-85.2%
Mites	663/1282 (51.7%)	61/358 (17.0%)	178/267 (66.7%)	**276/399 (69.2%)**	119/189 (63.0%)	29/69 (42.0%)
	49.0-54.4%	13.5-21.3%	60.8-72.0%	**64.5-73.5%**	55.9-69.5%	31.1-53.8%

Note: *Total numbers may vary between parasite groups for each site, due to inconsistencies in data collection (i.e., hosts that were not subjectively graded in the field were not included in prevalence estimates). UWR includes the six unfenced sites (Balban, Boyicup, Corbal, Dudijup, Dwalgan and Winnejup) where woylies were captured for translocation into Dryandra.*

Appendix Table 8. The ectoparasite species identified on woylies (*Bettongia penicillata*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For parasites within each ectoparasite taxonomic group, the site and parasite species with the highest prevalence is highlighted in bold (excludes unknown and unidentified larval/nymph stages).

	Species	Overall	Dryandra	Warrup East	Walcott	Perup	UWR
Ticks	*Amblyomma* spp.	79/921 (8.6%) 6.9-10.6%	**50/303 (16.5%)** **12.7-21.1%**	13/178 (7.3%) 4.2-12.2%	15/195 (7.7%) 4.7-12.4%	1/177 (0.6%) 0.0-3.5%	0/68 (0%) 0.0-6.6%
	Amblyomma triguttatum	2/921 (0.2%) 0.00-0.8%	1/303 (0.3%) 0.0-2.1%	0/178 (0%) 0.0-2.6%	**1/195 (0.5%)** **0.0-3.2%**	0/177 (0%) 0.0-2.6%	0/68 (0%) 0.0-6.6%
	Ixodes australiensis	210/921 (22.8%) 20.2-25.6%	0/303 (0%) 0.0-1.6%	75/178 (42.1%) 35.1-49.5%	**92/195 (47.2%)** **40.3-54.2%**	29/177 (16.4%) 11.6-22.6%	14/68 (20.6%) 12.6-31.8%
	Ixodes myrmecobii	60/921 (6.5%) 0.05-8.3%	1/303 (0.3%) 0.0-2.1%	11/178 (6.2%) 3.4-10.9%	13/195 (6.7%) 3.9-11.2%	**33/177 (18.6%)** **13.6-25.1%**	2/68 (2.9%) 0.3-10.8%
	Ixodes tasmani	1/921 (0.1%) 0.00-0.6%	**1/303 (0.3%)** **0.0-2.1%**	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	0/68 (0%) 0.0-6.6%
	Ixodes woyliei	88/921 (9.6%) 7.8-11.6%	**50/303 (16.5%)** **12.7-21.1%**	4/178 (2.2%) 0.7-5.9%	21/195 (10.8%) 7.1-16.0%	3/177 (1.7%) 0.4-5.2%	10/68 (14.7%) 8.1-25.3%
	Unidentified larval/nymph stages	576/921 (62.5%) 59.4-65.6%	187/303 (61.7%) 56.1-67.0%	89/178 (50.0%) 42.7-57.3%	133/195 (68.2%) 61.3-74.3%	111/177 (62.7%) 55.4-69.5%	**56/68 (82.4%)** **71.4-89.7%**
	Unknown	17/921 (1.8%) 1.1-3.0%	1/303 (0.3%) 0.0-2.1%	1/178 (0.6%) 0.0-3.5%	**13/195 (6.7%)** **3.9-11.2%**	2/177 (1.3%) 0.1-4.4%	0/68 (0%) 0.0-6.6%
Fleas	*Acidesta chera*	1/921 (0.1%) 0.00-0.6%	0/303 (0%) 0.0-1.6%	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	**1/68 (1.5%)** **0.0-8.8%**
	Choristopsylla ochi	1/921 (0.1%) 0.00-0.6%	0/303 (0%) 0.0-1.6%	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	**1/68 (1.5%)** **0.0-8.8%**
	Echidnophaga myrmecobii	2/921 (0.2%) 0.00-0.8%	0/303 (0%) 0.0-1.6%	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	1/177 (0.6%) 0.0-3.5%	**1/68 (1.5%)** **0.0-8.8%**
	Echidnophaga perilis	1/921 (0.1%) 0.00-0.6%	0/303 (0%) 0.0-1.6%	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	**1/68 (1.5%)** **0.0-8.8%**
	Pygiopsylla hilli	82/921 (8.9%) 7.2-10.9%	0/303 (0%) 0.0-1.6%	30/178 (16.9%) 12.1-23.1%	**47/195 (24.1%)** **18.6-30.6%**	1/177 (0.6%) 0.0-3.5%	4/68 (5.88%) 1.9-14.7%
	Pygiopsylla tunneyi	148/921 (16.1%) 13.8-18.6%	0/303 (0%) 0.0-1.6%	40/178 (22.5%) 17.0-29.2%	**82/195 (42.1%)** **35.3-49.1%**	10/177 (5.6%) 3.0-10.3%	16/68 (23.5%) 15.0-35.0%
	Stephanocircus dasyuri	120/921 (13.0%) 11.0-15.4%	0/303 (0%) 0.0-1.6%	14/178 (7.9%) 4.7-12.9%	38/195 (19.5%) 14.5-25.7%	**56/177 (31.6%)** **25.2-38.8%**	12/68 (17.6%) 10.3-28.6%
Lice	*Boopia uncinata*	1/921 (0.1%) 0.00-0.6%	**1/303 (0.3%)** **0.0-2.1%**	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	0/68 (0%) 0.0-6.6%
	Paraherterodoxus calcaratus	624/921 (67.8%) 64.7-70.7%	203/303 (67.0%) 61.5-72.0%	119/178 (66.9%) 59.6-73.3%	124/195 (63.6%) 56.6-70.0%	**131/177 (74.0%)** **67.1-79.9%**	47/68 (69.1%) 57.3-78.8%
	Unidentified nymph stages	6/921 (0.7%) 0.3-1.5%	1/303 (0.3%) 0.0-2.1%	**3/178 (1.7%)** **0.4-5.1%**	1/195 (0.5%) 0.0-3.2%	1/177 (0.6%) 0.0-3.5%	0/68 (0%) 0.0-6.6%
	Unknown	8/921 (0.9%) 0.4-1.7%	1/303 (0.3%) 0.0-2.1%	2/178 (1.1%) 0.1-4.3%	0/195 (0%) 0.0-2.4%	**4/177 (2.3%)** **0.7-5.9%**	1/68 (1.5%) 0.0-8.8%
Mites	*Androlaelaps fahrenholiz*	1/921 (0.1%) 0.00-0.6%	0/303 (0%) 0.0-1.6%	**1/178 (0.6%)** **0.0-3.5%**	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	0/68 (0%) 0.0-6.6%
	Haemolaelaps hattanae	305/921 (33.1%) 30.2-36.2%	33/303 (10.9%) 7.8-15.0%	**93/178 (52.2%)** **44.9-59.5%**	99/195 (50.8%) 43.8-57.7%	68/177 (38.4%) 31.6-45.8%	12/68 (17.6%) 10.3-28.6%
	Haemolaelaps marsupialis	1/921 (0.1%) 0.00-0.6%	0/303 (0%) 0.0-1.6%	0/178 (0%) 0.0-2.6%	0/195 (0%) 0.0-2.4%	0/177 (0%) 0.0-2.6%	**1/68 (1.5%)** **0.0-8.8%**
	Haemolaelaps quartus	146/921 (15.9%) 13.6-18.4%	18/303 (5.9%) 3.8-9.3%	19/178 (10.7%) 6.9-16.2%	2/195 (1.0%) 0.1-4.0%	**68/177 (38.4%)** **31.6-45.8%**	6/68 (8.8%) 3.9-18.4%
	Unidentified larval/nymph stages	11/921 (1.2%) 0.6-2.2%	1/303 (0.3%) 0.0-2.1%	1/178 (0.6%) 0.0-3.5%	2/195 (1.0%) 0.1-4.0%	3/177 (1.7%) 0.4-5.2%	**4/68 (5.9%)** **1.9-14.7%**
	Unknown	8/921 (0.9%) 0.4-1.7%	1/303 (0.3%) 0.0-2.1%	2/178 (1.1%) 0.1-4.3%	1/195 (0.5%) 0.0-3.2%	**3/177 (1.7%)** **0.4-5.2%**	1/68 (1.5%) 0.0-8.8%

Note: *Trombiculid mites identified on five hosts [Dryandra (origin UWR) n = 1; Perup Sanctuary n = 4] but were not morphologically identified (data not included in table above).*

Appendix Table 9. Prevalence data (by site) for each ectoparasite taxonomic group identified as present on brush-tailed possums (*Trichosurus vulpecula hypoleucus*) in the field [no. infected/no. tested (% infected); 95% CI].

Parasite group	Overall	Dryandra	Warrup East	Walcott	Perup
Ticks	194/322 (60.2%)	124/200 (62.0%)	31/48 (64.6%)	**31/41 (75.6%)**	8/33 (24.2%)
	54.8-65.4%	55.1-68.4%	50.4-76.5%	**60.4-86.3%**	11.7-42.6%
Fleas	124/319 (38.9%)	80/199 (40.2%)	11/48 (22.9%))	17/41 (41.5%)	**16/31 (51.6%)**
	33.7-44.3%	33.6-47.1%	13.2-36.8%	27.8-56.7%	**33.4-69.4%**
Lice	8/320 (2.5%)	2/199 (1.0%)	1/48 (2.1%)	2/41 (4.9%)	**3/32 (9.4%)**
	1.2-5.0%	0.1-3.9%	0.0-12.1%	0.6-17.2%	**2.5-26.2%**
Mites	91/318 (28.6%)	55/198 (27.8%)	**16/48 (33.3%)**	12/40 (30.0%)	8/32 (25.0%)
	23.9-33.8%	22.0-34.4%	**21.7-47.5%**	18.1-45.6%	12.1-43.8%

Note: *Total numbers may vary between parasite groups for each site, due to inconsistencies in data collection (i.e., hosts that were not subjectively graded in the field were not included in prevalence estimates).*

Appendix Table 10. The ectoparasite species identified on brush-tailed possums (*Trichosurus vulpecula hypoleucus*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For parasites within each ectoparasite taxonomic group, the site and parasite species with the highest prevalence is highlighted in bold (excludes unknown and unidentified larval/nymph stages).

	Species	Overall	Dryandra	Warrup East	Walcott
Ticks	*Amblyomma* spp.	21/189 (11.1%) 7.3-16.5%	**16/116 (13.8%)** **8.6-21.4%**	3/37 (8.1%) 2.1-23.0%	2/36 (5.6%) 1.0-20.0%
	Haemaphysalis bancrofti	2/189 (1.1%) 0.1-4.1%	**2/116 (1.7%)** **0.1-6.5%**	0/37 (0%) 0.0-11.7%	0/36 (0%) 0.0-12.0%
	Haemaphysalis bremneri	1/189 (0.5%) 0.0-3.3%	**1/116 (0.9%)** **0.0-5.3%**	0/37 (0%) 0.0-11.7%	0/36 (0%) 0.0-12.0%
	Haemaphysalis humerosa	2/189 (1.1%) 0.1-4.1%	0/116 (0%) 0.0-4.0%	**2/37 (5.4%)** **0.9-19.5%**	0/36 (0%) 0.0-12.0%
	Ixodes australiensis	5/189 (2.6%) 1.0-6.3%	0/116 (0%) 0.0-4.0%	1/37 (2.7%) 0.1-15.8%	**4/36 (11.1%)** **3.6-27.0%**
	Ixodes myrmecobii	9/189 (4.8%) 2.4-9.0%	0/116 (0%) 0.0-4.0%	1/37 (2.7%) 0.1-15.8%	**8/36 (22.2%)** **10.7-39.6%**
	Ixodes tasmani	69/189 (36.5%) 30.0-43.6%	37/116 (31.9%) 24.1-40.9%	**20/37 (54.1%)** **37.1-70.1%**	12/36 (33.3%) 19.1-51.1%
	Unidentified larval stages	**76/189 (40.2%)** **33.5-47.3%**	45/116 (38.8%) 30.4-47.9%	14/37 (37.8%) 22.9-55.2%	**17/36 (47.2%)** **30.8-64.3%**
Fleas	***Choristopsylla ochi***	**71/189 (37.6%)** **31.0-44.7%**	**53/116 (45.7%)** **36.9-54.7%**	6/37 (16.2%) 6.8-32.7%	12/36 (33.3%) 19.1-51.1%
	Pygiopsylla tunneyi	10/189 (5.3%) 2.8-9.6%	1/116 (0.9%) 0.0-5.3%	3/37 (8.1%) 2.1-23.0%	**6/36 (16.7%)** **7.0-33.5%**
	Stephanocircus dasyuri	1/189 (0.5%) 0.0-3.3%	0/116 (0%) 0.0-4.0%	0/37 (0%) 0.0-11.7%	**1/36 (2.8%)** **0.1-16.2%**
	Unknown	1/189 (0.5%) 0.0-3.3%	0/116 (0%) 0.0-4.0%	**1/37 (2.7%)** **0.1-15.8%**	0/36 (0%) 0.0-12.0%
Lice	*Paraheterodoxus calcaratus*	2/189 (1.1%) 0.1-4.1%	0/116 (0%) 0.0-4.0%	0/37 (0%) 0.0-11.7%	**2/36 (5.6%)** **1.0-20.0%**
Mites	*Haemolaelaps hattanae*	4/189 (2.1%) 0.7-5.6%	1/116 (0.9%) 0.0-5.3%	1/37 (2.7%) 0.1-15.8%	**2/36 (5.6%)** **1.0-20.0%**
	Haemolaelaps marsupialis	2/189 (1.1%) 0.1-4.1%	0/116 (0%) 0.0-4.0%	0/37 (0%) 0.0-11.7%	**2/36 (5.6%)** **1.0-20.0%**
	Liponyssoides lukoschusi	6/189 (3.2%) 1.3-7.0%	**6/116 (5.2%)** **2.2-11.1%**	0/37 (0%) 0.0-11.7%	0/36 (0%) 0.0-12.0%
	Ornithonyssus praedo	1/189 (0.5%) 0.0-3.3%	0/116 (0%) 0.0-4.0%	**1/37 (2.7%)** **0.1-15.8%**	0/36 (0%) 0.0-12.0%
	Trombiculid mite	**51/189 (27.0%)** **21.2-33.8%**	**46/116 (39.7%)** **31.2-48.8%**	4/37 (10.8%) 3.5-26.4%	1/36 (2.8%) 0.1-16.2%
	Ulyxes penelope	1/189 (0.5%) 0.0-3.3%	0/116 (0%) 0.0-4.0%	0/37 (0%) 0.0-11.7%	**1/36 (2.8%)** **0.1-16.2%**
	Unidentified larval stages	16/189 (8.5%) 5.2-13.4%	8/116 (6.9%) 3.4-13.3%	**5/37 (13.5%)** **5.1-29.6%**	3/36 (8.3%) 2.2-23.6%
	Unknown	9/189 (4.8%) 2.4-9.0%	1/116 (0.9%) 0.0-5.3%	**5/37 (13.5%)** **5.1-29.6%**	3/36 (8.3%) 2.2-23.6%

Note: *Ectoparasites from Perup Sanctuary were not morphologically identified except for a subset of samples used to confirm the presence of E. myrmecobii (n = 5). Trombiculid mites were identified in the field on an additional six hosts from Perup Sanctuary but were not morphologically identified (data not included in table above).*

Appendix Table 11. Prevalence data (by site) for each ectoparasite taxonomic group identified as present on chuditch (*Dasyurus geoffroii*) in the field [no. infected/no. tested (% infected); 95% CI].

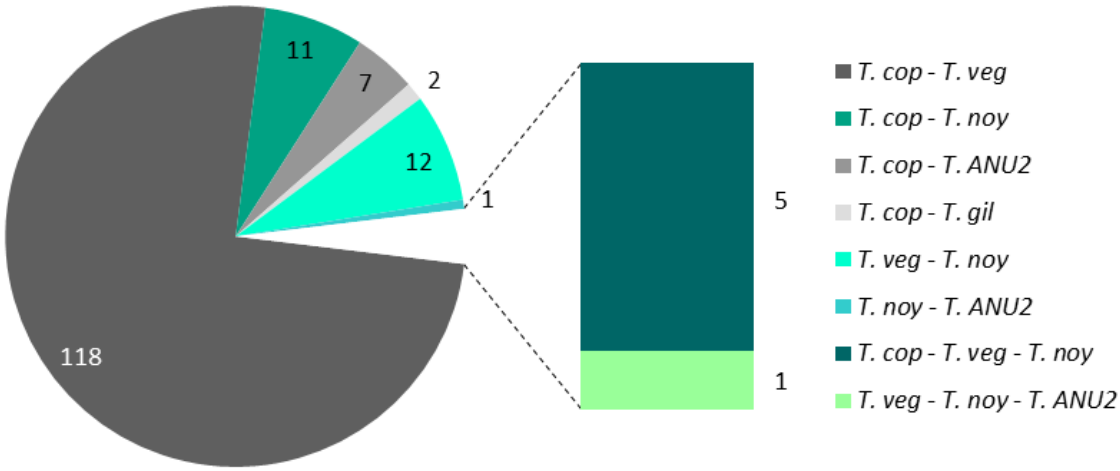
Parasite group	Overall	Dryandra	Warrup East	Walcott
Ticks	53/118 (44.9%)	11/54 (20.4%)	25/40 (62.5%)	**17/24 (70.8%)**
	36.3-53.9%	11.7-33.1%	47.0-75.6%	**48.8-86.6%**
Fleas	54/119 (45.4%)	9/55 (16.4%)	25/40 (62.5)%)	**20/24 (83.3%)**
	36.7-54.3%	8.7-28.6%	47.0-75.6%	**61.8-94.5%**
Lice	14/118 (11.9%)	2/54 (3.7%)	7/40 (17.5%)	**5/24 (20.8%)**
	7.1-19.1%	0.4-13.4%	8.5-32.4%	**7.9-42.7%**
Mites	60/118 (50.8%)	18/54 (33.3%)	23/40 (57.5%)	**19/24 (79.2%)**
	41.9-59.7%	22.3-46.7%	42.2-71.5%	**57.3-92.1%**

Note: *Total numbers may vary between parasite groups for each site, due to inconsistencies in data collection (i.e., hosts that were not subjectively graded in the field have not been included in prevalence estimates). Chuditch do not occur within Perup Sanctuary.*

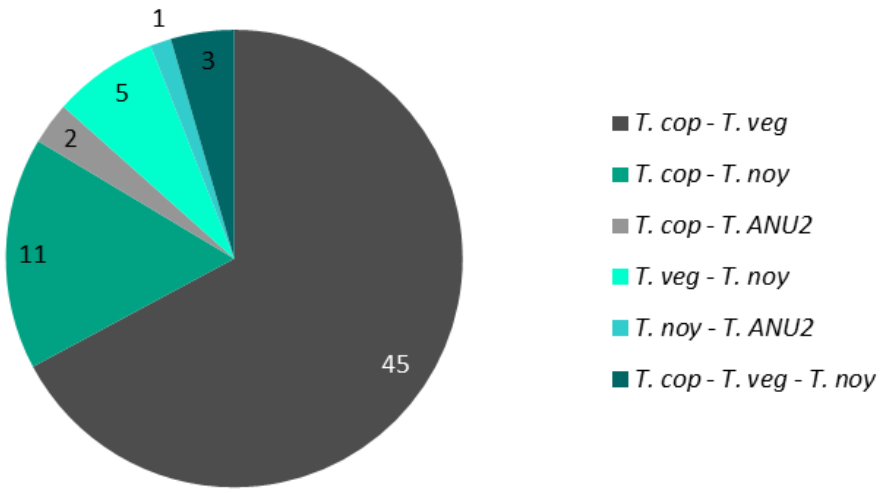
Appendix Table 12. The ectoparasite species identified on chuditch (*Dasyurus geoffroii*) with prevalence data for each site [no. infected/no. samples tested (% infected); 95% CI]. For parasites within each ectoparasite taxonomic group, the site and parasite species with the highest prevalence is highlighted in bold (excludes unknown and unidentified larval/nymph stages).

	Species	Overall	Dryandra	Warrup East	Walcott
Ticks	***Ixodes australiensis***	17/84 (20.2%) 13.0-30.2%	0/25 (0%) 0.0-16.6%	**13/36 (36.1%)** **21.3-53.8%**	4/23 (17.4%) 5.7-39.5%
	Ixodes fecialis	11/84 (13.1%) 7.4-22.2%	0/25 (0%) 0.0-16.6%	1/36 (2.8%) 0.1-16.2%	**10/23 (43.5%)** **23.9-65.1%**
	Ixodes tasmani	7/84 (8.3%) 3.9-16.6%	**3/25 (12.0%)** **3.2-32.3%**	2/36 (5.6%) 1.0-20.0%	2/23 (8.7%) 1.5-29.5%
	Unidentified larval/nymph stages	34/84 (40.5%) 30.6-51.2%	6/25 (24.0%) 10.2-45.5%	15/36 (41.7%) 26.0-59.1%	**13/23 (56.5%)** **34.9-76.1%**
Fleas	*Acidesta chera*	13/84 (15.5%) 9.2-24.9%	0/25 (0%) 0.0-16.6%	**8/36 (22.2%)** **10.7-39.6%**	5/23 (21.7%) 8.3-44.2%
	Choristopsylla ochi	1/84 (1.2%) 0.0-7.2%	0/25 (0%) 0.0-16.6%	**1/36 (2.8%)** **0.1-16.2%**	0/23 (0%) 0.0-17.8%
	Echidnophaga myrmecobii	11/84 (13.1%) 7.4-22.2%	**8/25 (32.0%)** **15.7-53.6%**	1/36 (2.8%) 0.1-16.2%	2/23 (8.7%) 1.5-29.5%
	Echidnophaga perilis	3/84 (3.6%) 0.8-10.5%	1/25 (4.0%) 0.2-22.3%	0/36 (0%) 0.0-12.0%	**2/23 (8.7%)** **1.5-29.5%**
	Pygiopsylla tunneyi	29/84 (34.5%) 25.2-45.2%	0/25 (0%) 0.0-16.6%	16/36 (44.4%) 28.3-61.7%	**13/23 (56.5%)** **34.9-76.1%**
	Stephanocircus dasyuri	18/84 (21.4%) 14.0-31.5%	0/25 (0%) 0.0-16.6%	9/36 (25.0%) 12.7-42.5%	**9/23 (39.1%)** **20.5-61.2%**
Lice	***Boopia uncinata***	9/84 (10.7%) 5.6-19.4%	0/25 (0%) 0.0-16.6%	5/36 (13.9%) 5.2-30.3%	**4/23 (17.4%)** **5.7-39.5%**
	Paraherterodoxus calcaratus	3/84 (3.6%) 0.8-10.5%	1/25 (4.0%) 0.2-22.3%	**2/36 (5.6%)** **1.0-20.0%**	0/23 (0%) 0.0-17.8%
	Unknown	1/84 (1.2%) 0.0-7.2%	0/25 (0%) 0.0-16.6%	0/36 (0%) 0.0-12.0%	**1/23 (4.3%)** **0.2-24.0%**
Mites	*Haemolaelaps hattanae*	2/84 (2.4%) 0.2-8.9%	0/25 (0%) 0.0-16.6%	1/36 (2.8%) 0.1-16.2%	**1/23 (4.3%)** **0.2-24.0%**
	Haemolaelaps marsupialis	4/84 (4.8%) 1.6-12.1%	0/25 (0%) 0.0-16.6%	**3/36 (8.3%)** **2.2-23.6%**	1/23 (4.3%) 0.2-24.0%
	Ornithonyssus dasyuri	1/84 (1.2%) 0.0-7.2%	**1/25 (4.0%)** **0.2-22.3%**	0/36 (0%) 0.0-12.0%	0/23 (0%) 0.0-17.8%
	Trombiculid mite	39/84 (46.4%) 36.2-57.0%	**13/25 (52.0%)** **31.8-71.7%**	15/36 (41.7%) 26.0-59.1%	11/23 (47.8%) 27.4-68.9%
	Unidentified larval/nymph stages	22/84 (26.2%) 18.0-36.6%	5/25 (20.0%) 7.6-41.3%	**11/36 (30.6%)** **16.9-48.3%**	6/23 (26.1%) 11.1-48.7%

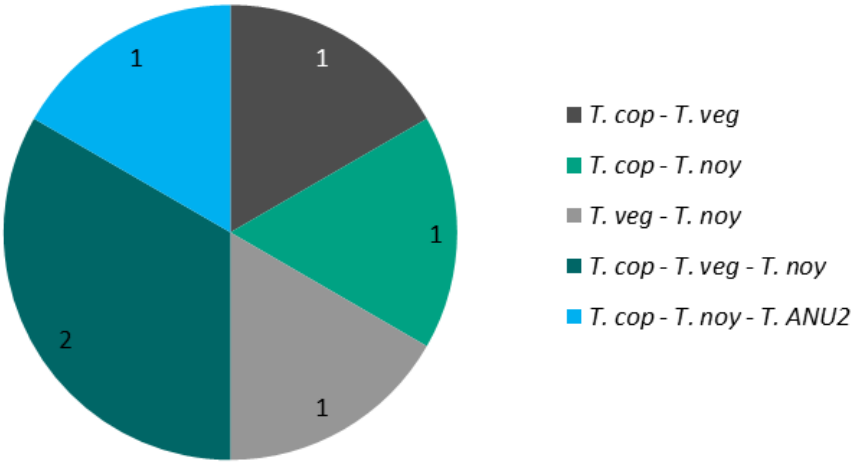
Note: *Trombiculid mites were identified in the field on an additional three hosts [n = 2, Dryandra; n = 1, Walcott], but were not morphologically identified (data not included in table above).*



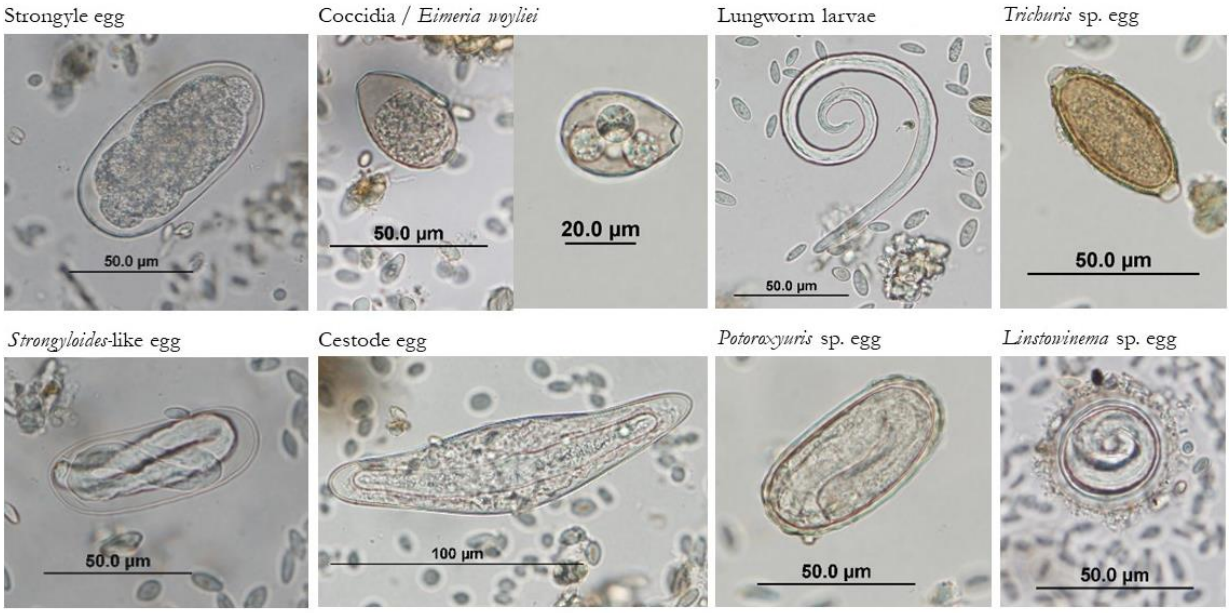
Appendix Fig. 1. The number (and type) of *Trypanosoma* spp. coinfections identified in woylies (*Bettongia penicillata*). The bar graph (right) shows the number (and type) of coinfections with three *Trypanosoma* species. T. cop = *Trypanosoma copemani*; T. veg = *Trypanosoma vegrandis*; T. noy = *Trypanosoma noyesi*; T. ANU2 = *Trypanosoma* sp. ANU2; T. gil = *Trypanosoma gilletti*.



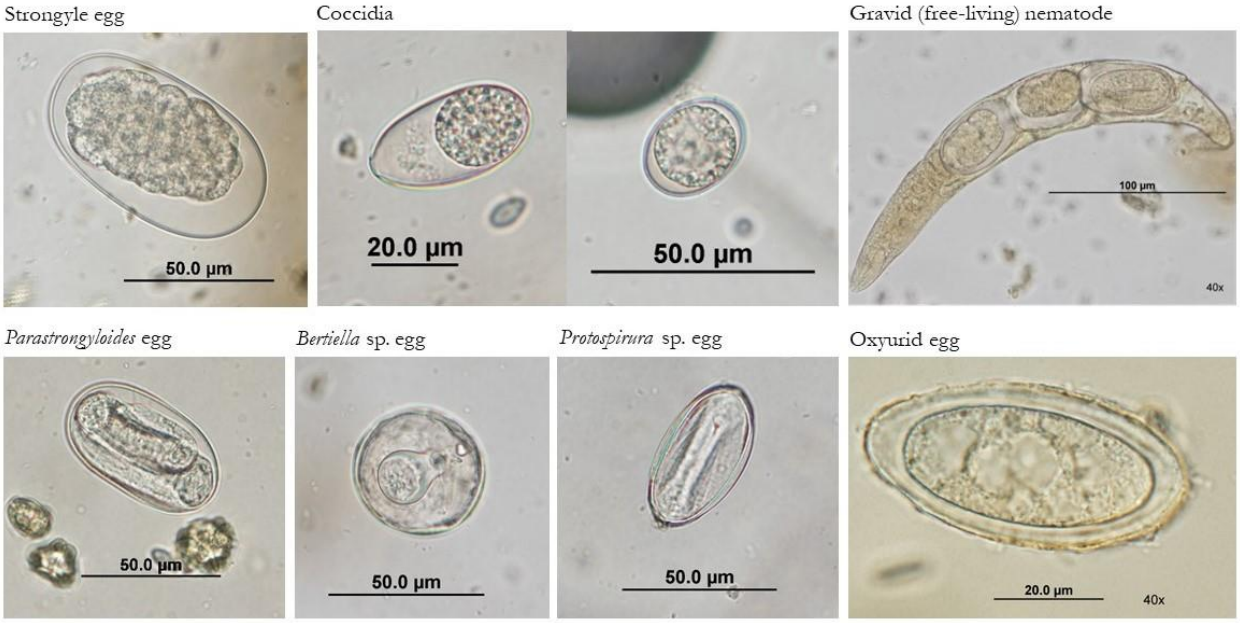
Appendix Fig. 2. The number (and type) of *Trypanosoma* spp. coinfections identified in brush-tailed possums (*Trichosurus vulpecula hypoleucus*). T. cop = *Trypanosoma copemani*; T. veg = *Trypanosoma vegrandis*; T. noy = *Trypanosoma noyesi*; T. ANU2 = *Trypanosoma* sp. ANU2.



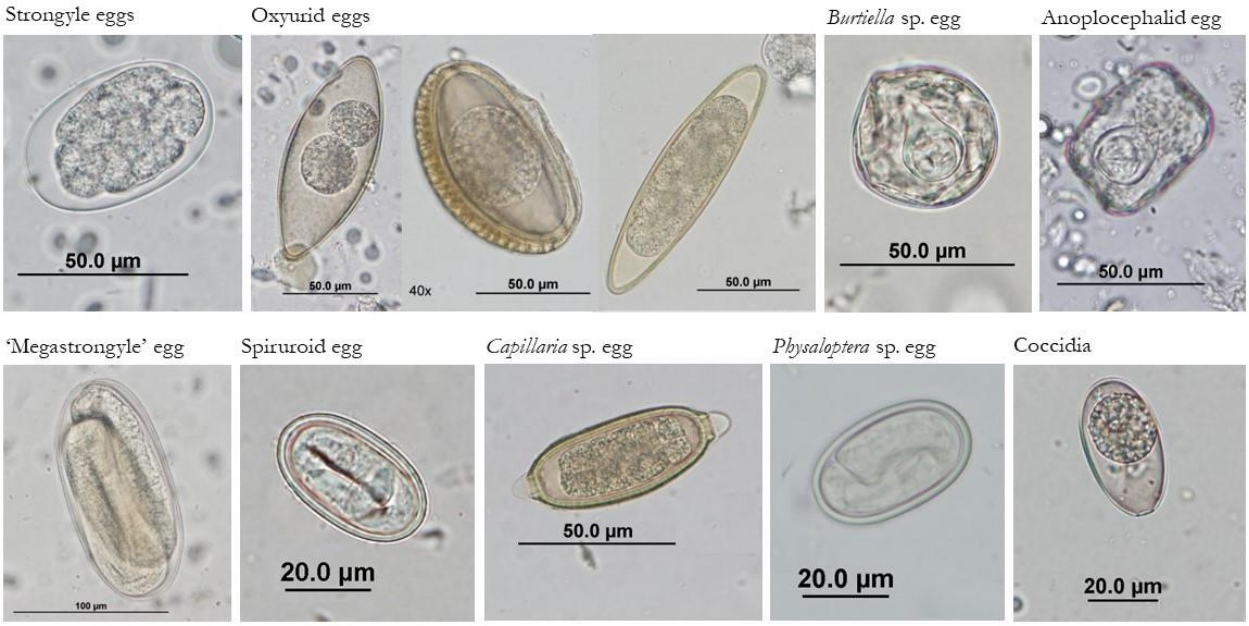
Appendix Fig. 3. The number (and type) of *Trypanosoma* spp. coinfections identified in chuditch (*Dasyurus geoffroii*). T. cop = *Trypanosoma copemani*; T. veg = *Trypanosoma vegrandis*; T. noy = *Trypanosoma noyesi*; T. ANU2 = *Trypanosoma* sp. ANU2.



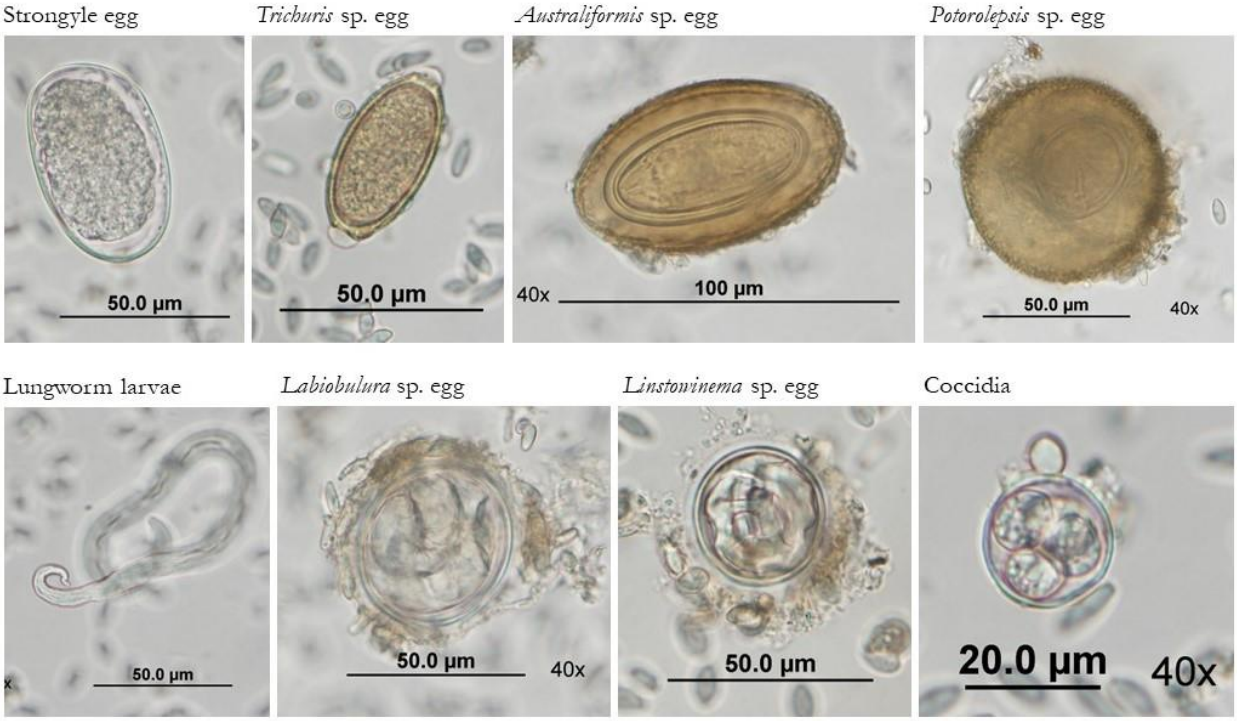
Appendix Fig. 4. Examples of the gastrointestinal parasite eggs, oocysts and larvae detected in faeces from woylies (*Bettongia penicillata*). *Eimeria woyliei* was identified in cases where sporulated oocysts were apparent and distinguishing morphological characteristics were visible (see Northover *et al*. 2019). *Trichuris* sp. eggs were differentiated from *Capillaria* sp. eggs (see Appendix Fig. 6) based on their smaller size [length 49.5-53.4 µm (51.4), width 22.1-23.9 µm (23.1); *n* = 3] and typical marquise shape (e.g., Hillman, 2016). *Trichuris* sp. eggs from *B. penicillata* morphologically resembled those from *I. fusciventer* [length 50.0-52.2 µm (51.3), width 22.1-23.9 µm (23.1); *n* = 3] (see Hillman *et al*. 2017). *Linstowinema* sp. eggs were almost spherical in shape and differentiated from *Labiobulura* sp. eggs (see Appendix Fig. 7) based on their smaller size [length 30.9-32.1 µm (31.5), width 33.0-34.6 µm (33.8); *n* = 2].



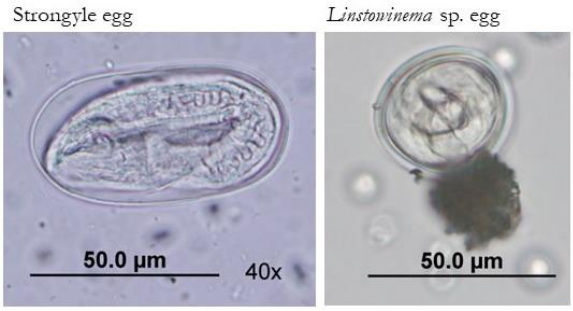
Appendix Fig. 5. Examples of the gastrointestinal parasite eggs, oocysts and larvae identified in faeces from brush-tailed possums (*Trichosurus vulpecula hypoleucus*). *Protospirura* sp. eggs [length 50.0-53.2 µm (51.9), width 26.6-29.8 µm (28.1); *n* = 5] were distinguished from *Physaloptera* sp. eggs (see Appendix Fig. 6) based on their elliptical shape and tapered outer cell wall (i.e., narrowing evident towards tapered ends); *Physaloptera* sp. eggs were oval shaped with a uniformly thick shell wall (see Appendix Fig. 6).



Appendix Fig. 6. Examples of the gastrointestinal parasite eggs, oocysts and larvae detected in faeces from chuditch (*Dasyurus geoffroii*). *Physaloptera* sp. egg [length 38.9-40.0 µm (39.5), width 23.2 µm; *n* = 2]; *Capillaria* sp. egg (length 71.3 µm, width 25.5 µm; *n* = 1).



Appendix Fig. 7. Examples of the gastrointestinal parasite eggs, oocysts and larvae detected in faeces from quenda (*Isoodon fusciventer*). *Labiobulura* sp. eggs were differentiated from *Linstowinema* sp. eggs based on their larger size [length 46.9-47.7 µm (47.3), width 41.7-43.2 µm (42.4); *n* = 2]; morphologically consistent with Hillman *et al*. (2017).



Appendix Fig. 8. Examples of the gastrointestinal parasite eggs detected in faeces from brush-tailed phascogale (*Phascogale tapoatafa wambenger*).

References

Hillman AE (2016) Urbanisation and small marsupials in the greater Perth region, Western Australia. PhD thesis, Murdoch University, Perth.

Hillman AE, Ash AL, Kristancic AR, Elliot AD, Lymbery AJ, Robertson ID, Thompson RCA (2017) Validation of various parasite detection tests for use in the Australian marsupials quenda (*Isoodon obesulus*) and brushtail possums (*Trichosurus vulpecula*). *Journal of Veterinary Diagnostic Investigation* **29**, 64-75. doi:10.1177/1040638716674509

Northover AS, Keatley S, Godfrey SS, Lymbery AJ, Wayne AF, Elliot A, Thompson RCA (2019) Identification of a novel species of *Eimeria* Schneider, 1875 from the woylie, *Bettongia penicillata* Gray (Diprotodontia: Potoroidae) and the genetic characterisation of three *Eimeria* spp. from other potoroid marsupials. *Systematic Parasitology* **96**, 553-563. doi:10.1007/s11230-019-09870-y