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Long-term benefits and short-term costs: small vertebrate responses to predator exclusion and native mammal reintroductions in south-western New South Wales, Australia

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Table S1. Family and traits of reptile species captured in surveys at Scotia Wildlife Sanctuary 2008–2017.

Species	Family	Habit	Nocturnal	Diurnal	Diet
Anilios bicolor	Typhlopidae	fossorial	yes	no	Insectivore
Anilios bituberculatus	Typhlopidae	fossorial	yes	no	Insectivore
Aprasia inaurita	Pygopodidae	fossorial	yes	yes	Insectivore
Brachyurophis australis	Elapidae	fossorial	yes	no	Carnivore
Cryptoblepharus australis	Scincidae	arboreal	no	yes	Insectivore
Cryptoblepharus pannosus	Scincidae	arboreal	no	yes	Insectivore
Ctenophorus fordi	Agamidae	surface	no	yes	Insectivore
Ctenophorus pictus	Agamidae	surface	no	yes	Insectivore
Ctenotus atlas	Scincidae	surface	no	yes	Insectivore
Ctenotus inornatus	Scincidae	surface	no	yes	Insectivore
Ctenotus regius	Scincidae	surface	no	yes	Insectivore
Ctenotus robustus	Scincidae	surface	no	yes	Insectivore
Ctenotus schomburgkii	Scincidae	surface	no	yes	Insectivore
Ctenotus strauchii	Scincidae	surface	no	yes	Insectivore
Cyclodomorphus melanops	Scincidae	surface	yes	no	Omnivore
Delma australis	Pygopodidae	fossorial	yes	yes	Insectivore
Delma butleri	Pygopodidae	fossorial	yes	yes	Insectivore
Demansia psammophis	Elapidae	surface	no	yes	Carnivore
Diplodactylus vittatus	Diplodactylidae	surface	yes	no	Insectivore
Diporiphora nobbi	Agamidae	surface	no	yes	Insectivore
Egernia striolata	Scincidae	arboreal	no	yes	Insectivore
Eremiascincus richardsonii	Scincidae	fossorial	yes	no	Insectivore
Furina diadema	Elapidae	surface	yes	no	Carnivore
Gehyra versicolor	Gekkonidae	arboreal	yes	no	Insectivore
Heteronotia binoei	Gekkonidae	surface	yes	no	Insectivore
Lerista aericeps	Scincidae	fossorial	yes	yes	Insectivore
Lerista labialis	Scincidae	fossorial	yes	yes	Insectivore
Lerista punctatovittata	Scincidae	fossorial	yes	yes	Insectivore
Lerista timida	Scincidae	fossorial	yes	yes	Insectivore
Lialis burtonis	Pygopodidae	fossorial	yes	yes	Carnivore
Liopholis inornata	Scincidae	surface	yes	no	Omnivore
Lucasium damaeum	Diplodactylidae	surface	yes	no	Insectivore
Menetia greyii	Scincidae	surface	no	yes	Insectivore
Morethia adelaidensis	Scincidae	surface	no	yes	Insectivore
Morethia boulengeri	Scincidae	surface	no	yes	Insectivore
Morethia obscura	Scincidae	surface	no	yes	Insectivore
Nephrurus levis	Carphodactylidae	surface	yes	no	Insectivore
Oedura cincta	Diplodactylidae	arboreal	yes	no	Insectivore
Parasuta nigriceps	Elapidae	surface	yes	no	Carnivore
Pogona vitticeps	Agamidae	surface	no	yes	Omnivore
Pseudechis australis	Elapidae	surface	yes	yes	Carnivore

Table S1. *continued*

Species	Family	Habit	Nocturnal	Diurnal	Diet
Pseudonaja mengdeni	Elapidae	surface	yes	yes	Carnivore
Pseudonaja modesta	Elapidae	surface	yes	yes	Carnivore
Pygopus lepidopodus	Pygopodidae	fossorial	yes	yes	Carnivore
Pygopus schraderi	Pygopodidae	fossorial	yes	yes	Carnivore
Rhynchoedura angusta	Diplodactylidae	surface	yes	no	Insectivore
Strophurus elderi	Diplodactylidae	surface	yes	no	Insectivore
Strophurus intermedius	Diplodactylidae	arboreal	yes	no	Insectivore
Strophurus williamsi	Diplodactylidae	arboreal	yes	no	Insectivore
Tiliqua rugosa aspera	Scincidae	surface	no	yes	Omnivore
Varanus gouldii	Varanidae	surface	no	yes	Carnivore
Vermicella annulata	Elapidae	fossorial	yes	no	Carnivore

Table S2. Yearly and total captures (not adjusted for trap effort) of reptile and small mammal species at Scotia Wildlife Sanctuary 2008–2017.

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Anilios bicolor	3	4	9	1	6	2		2	8	2	37
Anilios bituberculatus		1		2			3	2	4	7	19
Aprasia inaurita	2									1	3
Brachyurophis australis	12	6	4	6	6	6	4	8	14	7	73
Cryptoblepharus australis	16	1	2	1	1	6	3	2		3	35
Cryptoblepharus pannosus	6	13	13	17	12	7	10	17	10	15	120
Ctenophorus fordi	19	11	22	28	31	16	14	25	24	35	225
Ctenophorus pictus	3	4	1	4	12	2		4	6	2	38
Ctenotus atlas	57	21	43	32	20	19	35	27	43	19	316
Ctenotus inornatus	72	59	65	106	57	59	90	72	110	67	757
Ctenotus regius	32	57	41	72	44	40	64	65	71	40	526
Ctenotus robustus				7			3				10
Ctenotus schomburgkii	131	105	122	142	129	122	92	112	90	77	1122
Ctenotus strauchii		36		2						1	39
Cyclodomorphus melanops							1			1	4
Delma australis	7	5	7	6	7		5	4	1	4	46
Delma butleri	2	1		3	5	1	4	4	2	1	23
Demansia psammophis	1	1		6	5		2	3	3	2	23
Diplodactylus vittatus	3	4	6	5	6	1	4	3		1	33
Diporiphora nobbi	11	4	12	32	41	13	11	13	20	12	169
Egernia striolata	9	8	8	7	5	4	6	6	9	2	64
Eremiascincus richardsonii	31	36	44	62	62	28	72	56	75	83	549
Furina diadema				1							1
Gehyra versicolor	18	30	11	7	20	11	20	31	35	21	204
Heteronotia binoei	25	14	21	22	28	22	39	47	43	43	304
Lerista aericeps		2		2		6	4	1	1	6	22
Lerista labialis	22	34	12	9	32	23	62	45	42	97	378
Lerista punctatovittata	51	55	66	77	77	24	53	72	66	132	673
Lerista timida	2	1	2	1	3	1	3	2	2	2	19
Lialis burtonis	3	3	2		8	2	6	5	5	5	39
Liopholis inornata	16	16	27	8	15	7	11	6	13	7	126
Lucasium damaeum	47	28	54	52	31	22	25	16	18	10	303
Menetia greyii	19	20	26	38	23	18	38	17	23	25	247
Morethia adelaidensis			3		8						11
Morethia boulengeri	42	23	50	68	62	27	38	54	62	44	470
Morethia obscura	10	8	11	18	7	18	23	6	21	11	133
Nephrurus levis	11	15	14	19	18	12	27	24	19	37	196
Oedura cincta	14	2	7	8	10	3	7	3	5	3	62
Parasuta nigriceps	1	1				3	1	1	3		10
Pogona vitticeps	1	5	4	5	10		5	8	4	5	47

Table S2. *continued*

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Pseudechis australis			1	1		1	3		1		7
Pseudonaja mengdeni			1						2		3
Pseudonaja modesta	1	4	5	6	8	5	10	2	9	8	58
Pygopus lepidopodus	2	1		2				1	3	5	14
Pygopus schraderi			6	1			2				9
Rhynchoedura angusta	75	76	84	60	59	35	75	62	40	46	612
Strophurus elderi	3	1		2	2		1	1	2	16	28
Strophurus intermedius	4	2					2	3		11	22
Strophurus williamsi	15	3	5	9	9	4	4	6	13	1	69
Tiliqua rugosa						1					1
Varanus gouldii	15	4	11	5	4	3	8	2	4	7	63
Vermicella annulata	2	1		1			3			1	8
Ningaui yvonneae	28	27	69	63	29	39	46	38	29	25	393
Pseudomys bolami	8	17	20	10	1	4	6	7	14		87
Sminthopsis crassicaudata				1						1	2
Sminthopsis macroura	1	2	2				1		1		7
Sminthopsis murina	17	20	41	67	6	26	18	17	40	25	277

Table S3. Top five species ranked by deviance in generalised linear model ~habitat + fenced for 2008–2017. Significant effects are bold.

	Habitat			Fenced		
Year	Ranked species	Deviance	*p* value	Ranked species	Deviance	*p* value
2008	***Ctenotus inornatus***	**58.74**	**0.001**	***Liopholis inornata***	**13.55**	**0.014**
	Ctenotus atlas	**29.97**	**0.001**	***Rhynchoedura angusta***	**11.02**	**0.049**
	Heteronotia binoei	**16.23**	**0.010**	*Lucasium damaeum*	7.21	0.238
	Ctenotus schomburgkii	12.50	0.060	*Morethia obscura*	5.90	0.409
	Oedura cincta	10.18	0.173	*Lerista punctatovittata*	5.52	0.474
2009	***Ctenotus inornatus***	**44.93**	**0.001**	***Rhynchoedura angusta***	**11.14**	**0.003**
	Ctenotus atlas	**24.50**	**0.002**	*Pogona vitticeps*	7.12	0.241
	Ctenophorus fordi	**24.17**	**0.002**	*Lerista punctatovittata*	4.48	0.792
	Gehyra versicolor	**22.97**	**0.002**	*Ctenotus inornatus*	4.21	0.792
	Ctenotus schomburgkii	**19.33**	**0.002**	*Cryptoblepharus pannosus*	4.09	0.814
2010	***Ctenotus inornatus***	**57.90**	**0.001**	***Rhynchoedura angusta***	**12.30**	**0.020**
	Ctenotus atlas	**45.80**	**0.001**	*Pseudonaja modesta*	6.92	0.317
	Ctenophorus fordi	**28.03**	**0.001**	*Ctenotus schomburgkii*	4.63	0.706
	Liopholis inornata	**18.96**	**0.002**	*Lucasium damaeum*	4.35	0.729
	Cryptoblepharus pannosus	**16.04**	**0.006**	*Ctenotus atlas*	4.34	0.729
2011	***Ctenotus inornatus***	**45.24**	**0.001**	*Lucasium damaeum*	9.15	0.154
	Ctenophorus fordi	**31.29**	**0.001**	*Eremiascincus richardsonii*	6.02	0.455
	Ctenotus atlas	**26.89**	**0.001**	*Ctenophorus pictus*	5.86	0.479
	Lerista punctatovittata	**17.19**	**0.010**	*Cryptoblepharus pannosus*	4.98	0.609
	Heteronotia binoei	**16.64**	**0.010**	*Brachyurophis australis*	4.62	0.682
2012	***Ctenotus inornatus***	**44.07**	**0.001**	***Ctenotus regius***	**23.72**	**0.001**
	Ctenophorus fordi	**37.88**	**0.001**	***Ctenotus inornatus***	**10.82**	**0.048**
	Ctenotus atlas	**25.16**	**0.001**	*Rhynchoedura angusta*	10.27	0.055
	Morethia boulengeri	**15.18**	**0.019**	*Liopholis inornata*	9.03	0.105
	Lialis.burtonis	**14.92**	**0.025**	*Diplodactylus vittatus*	7.92	0.183
2013	***Ctenotus inornatus***	**55.54**	**0.001**	***Lucasium damaeum***	**18.87**	**0.001**
	Ctenotus atlas	**35.87**	**0.001**	***Rhynchoedura angusta***	**12.20**	**0.013**
	Ctenophorus fordi	**20.98**	**0.002**	*Brachyurophis australis*	7.78	0.146
	Eremiascincus richardsonii	**14.32**	**0.033**	*Liopholis inornata*	5.97	0.362
	Ctenotus schomburgkii	9.93	0.175	*Pseudonaja modesta*	5.97	0.362
2014	***Ctenotus inornatus***	**60.70**	**0.001**	***Rhynchoedura angusta***	**21.64**	**0.001**
	Ctenotus atlas	**31.16**	**0.001**	***Eremiascincus richardsonii***	**13.80**	**0.007**
	Heteronotia binoei	**26.36**	**0.001**	*Pogona vitticeps*	5.89	0.454
	Ctenophorus fordi	**20.90**	**0.001**	*Ctenotus regius*	4.33	0. 791
	Gehyra versicolor	**16.95**	**0.006**	*Lerista timida*	4.16	0.842

Table S3. *continued*

	Habitat			Fenced		
Year	Ranked species	Deviance	*p* value	Ranked species	Deviance	*p* value
2015	***Ctenotus inornatus***	**54.38**	**0.001**	***Diporiphora nobbi***	**18.00**	**0.001**
	Ctenophorus fordi	**31.14**	**0.001**	***Rhynchoedura angusta***	**17.96**	**0.001**
	Ctenotus atlas	**30.01**	**0.001**	***Menetia greyii***	**15.45**	**0.003**
	Heteronotia binoei	**22.09**	**0.002**	***Ctenotus schomburgkii***	**14.96**	**0.003**
	Rhynchoedura angusta	**13.90**	**0.020**	*Eremiascincus richardsonii*	7.74	0.156
2016	***Ctenotus inornatus***	**48.10**	**0.001**	***Diporiphora nobbi***	**15.01**	**0.001**
	Ctenotus atlas	**43.66**	**0.001**	***Rhynchoedura angusta***	**11.61**	**0.001**
	Ctenophorus fordi	**34.46**	**0.001**	*Eremiascincus richardsonii*	9.77	0.070
	Gehyra versicolor	**23.45**	**0.001**	*Menetia greyii*	9.65	0.071
	Rhynchoedura angusta	**22.78**	**0.037**	*Morethia.obscura*	6.60	0.310
2017	***Ctenotus inornatus***	**51.91**	**0.001**	***Menetia greyii***	**20.98**	**0.001**
	Ctenophorus fordi	**44.04**	**0.001**	***Eremiascincus richardsonii***	**16.65**	**0.001**
	Ctenotus atlas	**29.71**	**0.001**	*Morethia.obscura*	8.68	0.110
	Heteronotia binoei	**20.04**	**0.001**	*Brachyurophis australis*	8.20	0.150
	Rhynchoedura angusta	**19.96**	**0.001**	*Ctenotus schomburgkii*	7.73	0.186

Table S4. For Stages 3 and 4 (outside the conservation fence), best model for species abundances of reptiles in each year of survey selected by lowest AIC, explanatory variables, deviance explained by each variable in the model ~*habitat* + *stage* and *p* value.

Year	Best model	Explanatory variable(s)	Deviance	*p* value
2008	~ habitat	habitat	210.0	0.001***
		stage	58.1	0.024*
2009	~ habitat	habitat	238.7	0.001***
		stage	51.7	0.112
2010	~ habitat	habitat	216.9	0.001***
		stage	65.0	0.025*
2011	~ habitat	habitat	226.4	0.001***
		stage	55.9	0.105
2012	~ habitat	habitat	203.0	0.001***
		stage	43.2	0.346
2013	~ habitat	habitat	174.2	0.001***
		stage	51.2	0.091
2014	~ habitat	habitat	249.6	0.001***
		Stage	51.5	0.218
2015	~ habitat	habitat	215.5	0.001***
		stage	46.5	0.197
2016	~ habitat	habitat	231.7	0.001***
		stage	50.4	0.221
2017	~ habitat	habitat	248.3	0.001***
		stage	53.8	0.093

Table S5. For Stages 3 and 4 (outside the conservation fence), best model for species abundances of small mammals in each year of survey selected by lowest AIC, explanatory variables, deviance explained by each variable in the model ~*habitat* + *stage* and *p* value.

Year	Best model	Explanatory variable(s)	Deviance	*p* value
2008	~ habitat	habitat	18.2	0.001***
		stage	0.01	0.989
2009	~ habitat	habitat	7.5	0.374
		stage	3.2	0.486
2010	~ habitat	habitat	4.7	0.646
		stage	1.4	0.743
2011	~ habitat	habitat	29.8	0.001***
		stage	5.3	0.280
2012	~ habitat	habitat	6.4	0.089
		stage	4.6	0.072
2013	~ habitat	habitat	9.0	0.030*
		stage	7.1	0.017*
2014	~ habitat	habitat	12.4	0.020*
		stage	3.6	0.219
2015	~ habitat	habitat	13.2	0.010**
		stage	4.5	0.133
2016	~ habitat	habitat	12.6	0.163
		stage	8.2	0.075
2017	~ habitat	habitat	5.0	0.401
		stage	0.5	0.851

Table S6. For Stages 1 and 2 (inside the conservation fence), best model for species abundances of reptiles in each year of survey selected by lowest AIC, explanatory variables, deviance explained by each variable in the model ~*habitat* + *stage* and *p* value.

Year	Best model	Explanatory variable(s)	Deviance	*p* value
2008	~ habitat	habitat	180.1	0.001***
		stage	83.8	0.001***
2009	~ habitat	habitat	147.0	0.003**
		stage	59.4	0.024*
2010	~ habitat	habitat	179.7	0.001***
		stage	51.5	0.084
2011	~ habitat	habitat	167.8	0.001***
		stage	66.1	0.024*
2012	~ habitat	habitat	171.3	0.001***
		stage	55.8	0.065
2013	~ habitat	habitat	143.0	0.001***
		stage	36.8	0.153
2014	~ habitat	habitat	186.2	0.001***
		Stage	70.8	0.001***
2015	~ habitat	habitat	158.0	0.001***
		stage	61.1	0.004**
2016	~ habitat	habitat	192.2	0.001***
		stage	63.0	0.006**
2017	~ habitat	habitat	206.8	0.001***
		stage	51.5	0.084

Table S7. For Stages 1 and 2 (inside the conservation fence), best model for species abundances of mammals in each year of survey selected by lowest AIC, explanatory variables, deviance explained by each variable in the model ~*habitat* + *stage* and *p* value.

Year	Best model	Explanatory variable(s)	Deviance	*p* value
2008	~ habitat	habitat	30.6	0.001***
		stage	4.0	0.407
2009	~ habitat	habitat	26.2	0.004**
		stage	3.6	0.514
2010	~ habitat	habitat	39.2	0.001***
		stage	3.5	0.498
2011	~ habitat	habitat	32.2	0.001***
		stage	1.5	0.757
2012	~ habitat	habitat	30.2	0.001***
		stage	3.3	0.299
2013	~ habitat	habitat	46.9	0.001***
		stage	6.9	0.099
2014	~ habitat	habitat	28.9	0.002**
		stage	3.1	0.481
2015	~ habitat	habitat	21.6	0.006**
		stage	11.2	0.021*
2016	~ habitat	habitat	30.6	0.001***
		stage	5.1	0.190
2017	~ habitat	habitat	32.4	0.001***
		stage	2.4	0.473