

Choquenot, D. and Forsyth, D. M. 2012. Exploitation ecosystems and trophic cascades in non-equilibrium systems: pasture – red kangaroo – dingo interactions in arid Australia. – *Oikos* 000: 000–000.

## Appendix A1

### Sensitivity of results to uncertainty in the functional response of dingoes

Figure A1 (overleaf). Typical simulated trajectories of pasture biomasses (lower figures), and kangaroo (middle figures) and dingo densities (upper figures) as stochasticity (coefficient of variation;  $CV = [\text{standard deviation}/\text{mean}] \times 100\%$ ) in the functional response of dingoes increases from 0% (left column) to 100% (right column). These examples are for a mean quarterly rainfall of 42 mm ( $CV = 0\%$ ).

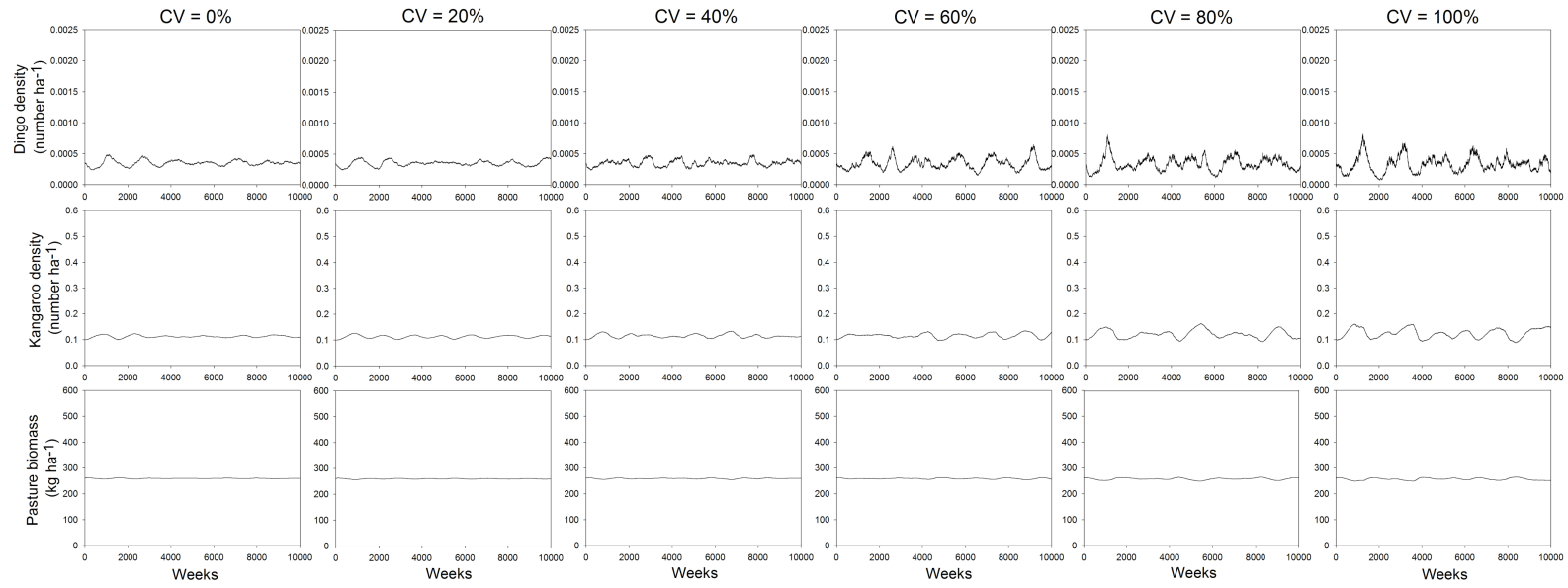


Table A1. Means and variances of simulations in which kangaroo off-take varied according to a deterministic (CV = 0%) or stochastic (CV = 20, 40, 60, 80 and 100%) functional response in the absence of stochastic variation in primary productivity and dingo culling. There were 500 simulations for each stochastic scenario.

Culling CV%	Pasture biomass (kg ha <sup>-1</sup> )		Kangaroo density (number ha <sup>-1</sup> )		Dingo density (number ha <sup>-1</sup> )	
	Mean	CV%	Mean	CV%	Mean	CV%
<u>Productivity = 42 mm quarter<sup>-1</sup></u>						
0%	260.43	0.00	0.109	0.00	0.00035	0.00
20%	259.85	0.04	0.112	0.43	0.00035	0.41
40%	259.24	0.09	0.114	0.93	0.00035	0.77
60%	258.57	0.13	0.117	1.28	0.00035	1.07
80%	257.87	0.19	0.120	1.77	0.00034	1.37
100%	257.19	0.25	0.123	2.32	0.00034	1.76
<u>Productivity = 50 mm quarter<sup>-1</sup></u>						
0%	311.60	0.00	0.140	0.00	0.00087	0.00
20%	314.02	0.22	0.128	2.67	0.00089	0.82
40%	313.92	0.13	0.129	1.55	0.00089	0.92
60%	311.51	0.20	0.140	2.21	0.00091	1.32
80%	307.87	0.39	0.158	3.72	0.00094	1.95
100%	302.01	0.80	0.186	6.23	0.00098	2.41
<u>Productivity = 60 mm quarter<sup>-1</sup></u>						
0%	363.14	0.00	0.193	0.00	0.00153	0.00
20%	370.15	0.29	0.156	3.61	0.00138	2.34
40%	337.48	11.53*	0.328	62.56*	0.00174	21.84*

60%	271.45	0.91	0.673	1.88	0.00189	0.97
80%	262.01	0.45	0.722	0.84	0.00163	1.53
100%	256.39	0.43	0.752	0.76	0.00142	2.00

Productivity = 70 mm quarter<sup>-1</sup>

0%	263.48	0.00	1.058	0.00	0.00250	0.00
20%	262.96	0.04	1.061	0.06	0.00247	0.07
40%	258.17	0.12	1.088	0.16	0.00220	0.43
60%	253.15	0.18	1.117	0.23	0.00189	0.95
80%	249.31	0.22	1.140	0.28	0.00162	1.52
100%	246.51	0.24	1.156	0.30	0.00142	2.06

Productivity = 80 mm quarter<sup>-1</sup>

0%	253.34	0.00	1.465	0.00	0.00250	0.00
20%	253.03	0.03	1.467	0.03	0.00247	0.07
40%	250.07	0.08	1.485	0.02	0.00220	0.44
60%	246.82	0.12	1.506	0.13	0.00189	0.92
80%	244.21	0.16	1.523	0.16	0.00163	1.57
100%	242.18	0.17	1.536	0.18	0.00142	2.11

Productivity = 90 mm quarter<sup>-1</sup>

0%	248.17	0.00	1.849	0.00	0.00250	0.00
20%	247.94	0.02	1.850	0.02	0.00247	0.07
40%	245.75	0.06	1.865	0.06	0.00220	0.49
60%	243.27	0.10	1.883	0.09	0.00189	0.97
80%	241.25	0.13	1.897	0.12	0.00162	1.64
100%	239.75	0.14	1.907	0.12	0.00142	2.10

Productivity = 100 mm quarter<sup>-1</sup>

0%	244.94	0.00	2.224	0.00	0.00250	0.00
20%	244.76	0.02	2.225	0.02	0.00247	0.07
40%	242.99	0.05	2.239	0.04	0.00220	0.48
60%	240.99	0.08	2.257	0.07	0.00189	1.00
80%	239.36	0.10	2.266	0.08	0.00163	1.53
100%	238.10	0.11	2.276	0.09	0.00142	2.08

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\*this scenario had considerably higher variances than other scenarios.

## Appendix A2

### Sensitivity of results to stochasticity in the efficacy of dingo culling

Figure A2 (overleaf). Typical simulated trajectories of pasture biomasses (lower figures), and kangaroo (middle figures) and dingo densities (upper figures) as stochasticity (coefficient of variation;  $CV = [\text{standard deviation}/\text{mean}] \times 100\%$ ) in the efficacy of dingo culling increases from 0% (left column) to 100% (right column). These examples are for a mean quarterly rainfall of 60 mm ( $CV = 0\%$ ) and culling beginning at 1200 weeks.

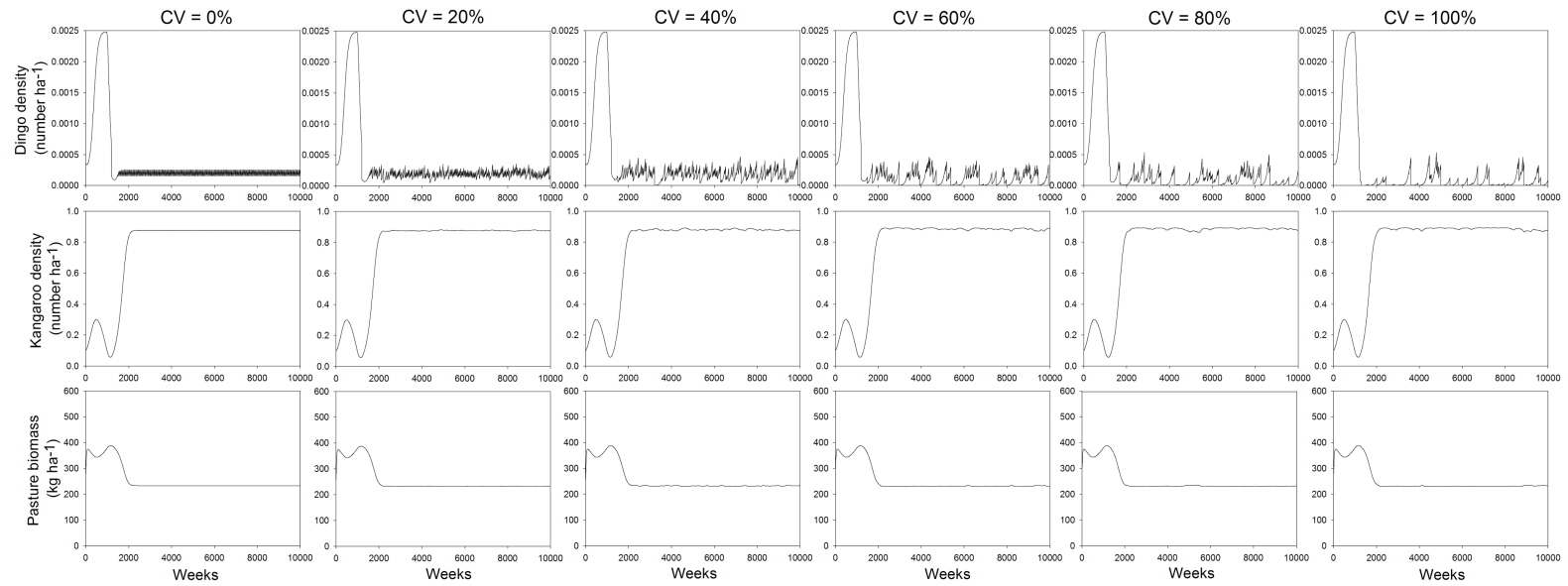


Table A2. Means and variances of simulations in which dingoes were culled annually to 10% of their deterministic density with increasing stochasticity in the efficacy of culling (CV = 0, 20, 40, 60, 80 and 100%). There were 500 simulations for each stochastic scenario.

Culling CV%	Pasture biomass (kg ha <sup>-1</sup> )		Kangaroo density (number ha <sup>-1</sup> )		Dingo density (number ha <sup>-1</sup> )	
	Mean	CV%	Mean	CV%	Mean	CV%
<u>Productivity = 42 mm quarter<sup>-1</sup></u>						
0%	233.92	0.00	0.225	0.00	0.00004	0.00
20%	233.88	0.02	0.226	0.08	0.00004	1.82
40%	233.55	0.04	0.227	0.18	0.00004	5.21
60%	233.11	0.06	0.229	0.26	0.00003	9.99
80%	232.81	0.06	0.230	0.28	0.00002	14.81
100%	232.62	0.06	0.231	0.26	0.00002	16.85
<u>Productivity = 50 mm quarter<sup>-1</sup></u>						
0%	236.78	0.00	0.500	0.00	0.00011	0.00
20%	236.75	0.02	0.500	0.05	0.00011	1.48
40%	236.42	0.06	0.502	0.14	0.00010	5.20
60%	235.75	0.10	0.505	0.22	0.00007	11.26
80%	235.33	0.10	0.507	0.23	0.00005	16.40
100%	235.04	0.10	0.509	0.21	0.00004	20.37
<u>Productivity = 60 mm quarter<sup>-1</sup></u>						
0%	241.79	0.00	0.833	0.00	0.00020	0.00
20%	241.74	0.04	0.833	0.07	0.00020	1.55
40%	241.31	0.09	0.835	0.14	0.00017	5.69

60%	240.49	0.13	0.840	0.19	0.00012	11.98
80%	239.80	0.13	0.844	0.20	0.00008	19.75
100%	239.50	0.16	0.845	0.24	0.00006	26.89

Productivity = 70 mm quarter<sup>-1</sup>

0%	233.74	0.00	1.233	0.00	0.00032	0.00
20%	233.71	0.02	1.233	0.02	0.00032	1.39
40%	233.28	0.08	1.235	0.09	0.00028	6.12
60%	232.35	0.13	1.241	0.15	0.00019	15.72
80%	231.73	0.13	1.245	0.15	0.00013	22.72
100%	231.33	0.10	1.247	0.11	0.00009	24.96

Productivity = 80 mm quarter<sup>-1</sup>

0%	232.76	0.00	1.598	0.00	0.00032	0.00
20%	232.74	0.02	1.598	0.02	0.00032	1.48
40%	232.40	0.06	1.601	0.06	0.00028	5.72
60%	231.74	0.09	1.605	0.09	0.00019	13.39
80%	231.21	0.08	1.609	0.08	0.00013	18.81
100%	230.90	0.08	1.611	0.08	0.00009	25.48

Productivity = 90 mm quarter<sup>-1</sup>

0%	232.21	0.00	1.962	0.00	0.00032	0.00
20%	232.20	0.02	1.962	0.01	0.00032	1.66
40%	231.94	0.04	1.964	0.04	0.00028	5.03
60%	231.36	0.07	1.968	0.06	0.00019	12.76
80%	230.96	0.07	1.971	0.06	0.00013	20.52
100%	230.73	0.06	1.973	0.05	0.00009	21.75

Productivity = 100 mm quarter<sup>-1</sup>

0%	231.85	0.00	2.325	0.00	0.00032	0.00
20%	231.84	0.01	2.325	0.01	0.00032	1.57
40%	231.61	0.04	2.327	0.03	0.00028	5.98
60%	231.13	0.08	2.331	0.06	0.00019	16.81
80%	230.78	0.07	2.334	0.06	0.00013	24.20
100%	230.59	0.06	2.335	0.05	0.00009	26.46

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