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Wildlife Research

Supplementary Material

Estimating roadkill rates while accounting for carcass detection and persistence using open-population capture–recapture models

Talita Menger[A,B,*], *Andreas Kindel*[A,B], *and Ismael Verrastro Brack*[A,B]

[A]Graduate Program in Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil.

[B]Núcleo de Ecologia de Rodovias e Ferrovias - NERF (Road and Railroad Ecology Group), Department of Ecology, Institute of Biosciences, Federal University of Rio Grande do Su, Porto Alegre, RS, Brazil.

[*]Correspondence to: Talita Menger Graduate Program in Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil Email: talitamenger.r@gmail.com

Supplementary Material

Appendix S1. Parameters estimates for the full data, with stretches sampled in four (stretch 1) or eight occasions (stretches 2,3 and 4). Detailed estimates with Bayesian credibility intervals (BCI) for detection and persistence probabilities, superpopulation size, and daily roadkill rates/km for each species in each road stretch and session. Coefficient of variation (CV; posterior standard error/mean) was calculated for roadkill rates.

Road Stretch	Sampling Session	Observed roadkill		Detection probability		Persistence probability		Superpopulation size		Daily roadkill rate/km		CV for Daily roadkill rate/km	
													
1	1	11	2	0.83 (0.55 – 0.99)	0.72 (0.26 – 0.99)	0.73 (0.51 – 0.91)	0.80 (0.41 – 0.99)	12 (11 – 15)	3 (2 – 6)	0.009 (0 – 0.020)	0.004 (0 – 0.012)	0.70	1.03
	2	12	10	0.61 (0.41 – 0.83)	0.47 (0.22 – 0.74)	0.87 (0.68 – 0.99)	0.64 (0.39 – 0.91)	13 (12 – 18)	16 (10 – 29)	0.003 (0 – 0.019)	0.001 (0 – 0.012)	1.92	4.07
	3	11	8	0.63 (0.43 – 0.83)	–	0.94 (0.80 – 0.99)	–	12 (11 – 16)	–	0.010 (0 – 0.027)	–	0.92	–
	4	11	11	0.49 (0.22 – 0.87)	0.27 (0.08 – 0.59)	0.79 (0.44 – 0.99)	0.83 (0.50 – 0.99)	15 (11 – 26)	25 (12 – 61)	0.019 (0 – 0.059)	0.036 (0 – 0.135)	1.00	1.13
	5	17	4	0.85 (0.66 – 0.96)	0.69 (0.31 – 0.99)	0.88 (0.75 – 0.98)	0.76 (0.42 – 0.99)	18 (17 – 20)	5 (4 – 9)	0.017 (0 – 0.025)	0.008 (0 – 0.023)	0.34	0.90
	6	11	6	0.52 (0.31 – 0.75)	–	0.77 (0.54 – 0.96)	–	14 (11 – 21)	–	0.001 (0 – 0.014)	–	2.83	–
	7	21	0	0.80 (0.62 – 0.93)	–	0.92 (0.81 – 0.99)	–	22 (21 – 25)	–	0.028 (0 – 0.045)	–	0.45	–
2	1	139	62	0.73 (0.69 – 0.78)	0.80 (0.71 – 0.87)	0.93 (0.91 – 0.96)	0.82 (0.76 – 0.88)	145 (141 – 151)	66 (62 – 71)	0.127 (0.112 – 0.141)	0.084 (0.076 – 0.093)	0.06	0.05
	2	133	28	0.61 (0.55 – 0.66)	0.57 (0.44 – 0.69)	0.93 (0.90 – 0.96)	0.91 (0.82 – 0.97)	146 (139 – 154)	32 (28 – 37)	0.162 (0.143 – 0.18)	0.033 (0.024 – 0.042)	0.06	0.14
3	1	14	38	0.58 (0.30 – 0.84)	0.46 (0.29 – 0.64)	0.60 (0.41 – 0.79)	0.77 (0.63 – 0.90)	19 (14 – 30)	53 (43 – 68)	0.032 (0.014 – 0.056)	0.130 (0.100 – 0.173)	0.32	0.14
	2	25	24	0.57 (0.45 – 0.67)	0.38 (0.25 – 0.54)	0.89 (0.81 – 0.95)	0.81 (0.70 – 0.90)	28 (25 – 32)	33 (26 – 43)	0.014 (0 – 0.026)	0.009 (0 – 0.040)	0.43	1.40
4	1	31	18	0.82 (0.74 – 0.88)	0.60 (0.45 – 0.73)	0.93 (0.88 – 0.97)	0.88 (0.79 – 0.96)	32 (31 – 34)	20 (18 – 24)	0.064 (0.050 – 0.080)	0.021 (0 – 0.043)	0.12	0.60
	2	25	7	0.61 (0.48 – 0.73)	0.55 (0.24 – 0.83)	0.91 (0.83 – 0.98)	0.73 (0.47 – 0.94)	28 (25 – 32)	9 (7 – 16)	0.105 (0.079 – 0.133)	0.026 (0.010 – 0.055)	0.13	0.44

Appendix S2. Parameters estimates for the data subsets from stretches with eight sampling occasions (stretches 2, 3 and 4). Detailed estimates with Bayesian credibility intervals (BCI) for detection and persistence probabilities, superpopulation size, and daily roadkill rates/km for each species in each road stretch and session with data from four, five, six, seven and eight occasions. Coefficient of variation (CV; posterior standard error/mean) was calculated for roadkill rates.

Road Stretch	Session	Number of occasions	Observed roadkill		Detection probability		Persistence probability		Superpopulation size		Daily roadkill rate/km		CV for Daily roadkill rate/km	
														
2	1	4	101	38	0.78 (0.72 – 0.84)	0.68 (0.52 – 0.83)	0.98 (0.95 – 0.99)	0.91 (0.79 – 0.99)	105 (102 – 110)	43 (38 – 50)	0.170 (0.136 – 0.200)	0.097 (0.071 – 0.123)	0.10	0.13
		5	112	43	0.77 (0.71 – 0.82)	0.79 (0.66 – 0.89)	0.98 (0.96 – 0.99)	0.87 (0.78 – 0.95)	116 (113 – 121)	46 (43 – 51)	0.151 (0.125 – 0.174)	0.088 (0.074 – 0.102)	0.08	0.08
		6	122	47	0.75 (0.70 – 0.80)	0.78 (0.67 – 0.87)	0.98 (0.95 – 0.99)	0.85 (0.76 – 0.92)	126 (123 – 131)	50 (47 – 55)	0.139 (0.118 – 0.158)	0.081 (0.069 – 0.093)	0.07	0.07
		7	133	56	0.75 (0.71 – 0.80)	0.79 (0.70 – 0.87)	0.95 (0.93 – 0.98)	0.85 (0.79 – 0.91)	138 (134 – 143)	59 (56 – 54)	0.138 (0.121 – 0.154)	0.084 (0.075 – 0.094)	0.06	0.06
		8	139	62	0.73 (0.69 – 0.78)	0.80 (0.71 – 0.87)	0.93 (0.90 – 0.96)	0.82 (0.76 – 0.88)	145 (141 – 151)	66 (62 – 71)	0.127 (0.112 – 0.141)	0.084 (0.076 – 0.093)	0.06	0.05
	2	4	81	16	0.65 (0.50 – 0.79)	0.61 (0.37 – 0.84)	0.80 (0.67 – 0.92)	0.89 (0.71 – 0.99)	96 (87 – 110)	19 (16 – 24)	0.232 (0.176 – 0.284)	0.027 (0 – 0.052)	0.12	0.56
		5	99	20	0.62 (0.52 – 0.71)	0.55 (0.36 – 0.73)	0.89 (0.82 – 0.96)	0.92 (0.78 – 0.99)	113 (105 – 125)	23 (20 – 29)	0.206 (0.170 – 0.241)	0.032 (0 – 0.052)	0.09	0.37
		6	113	21	0.62 (0.54 – 0.70)	0.51 (0.36 – 0.66)	0.90 (0.84 – 0.95)	0.93 (0.81 – 0.99)	127 (119 – 137)	24 (21 – 30)	0.194 (0.167 – 0.221)	0.026 (0 – 0.042)	0.07	0.34
		7	124	27	0.62 (0.56 – 0.68)	0.56 (0.41 – 0.71)	0.92 (0.88 – 0.96)	0.90 (0.79 – 0.98)	137 (129 – 146)	31 (27 – 37)	0.176 (0.155 –0.197)	0.038 (0.03 – 0.049)	0.06	0.15
		8	133	28	0.61(0.55 – 0.66)	0.57 (0.44 – 0.69)	0.93 (0.90 – 0.96)	0.91 (0.82 – 0.97)	146 (139 – 154)	32 (28 – 37)	0.161(0.143 – 0.179)	0.033 (0.024 – 0.042)	0.06	0.14
3	1	4	10	16	0.54 (0.26 – 0.90)	0.44 (0.21 – 0.73)	0.74 (0.44 – 0.97)	0.83 (0.52 – 0.99)	13 (10 – 22)	24 (17 – 40)	0.019 (0 – 0.626)	0.098 (0 – 0.193)	1.07	0.49
		5	13	20	0.71 (0.34 – 0.95)	0.48 (0.23 – 0.78)	0.63 (0.39 – 0.89)	0.74 (0.48 – 0.97)	16 (13 – 24)	30 (21 – 46)	0.047 (0.019 – 0.078)	0.113 (0.048 – 0.187)	0.30	0.30
		6	13	27	0.65 (0.30 – 0.94)	0.46 (0.23 – 0.73)	0.56 (0.32 – 0.82)	0.75 (0.53 – 0.97)	17 (13 – 27)	39 (29 – 57)	0.042 (0.016 – 0.074)	0.131 (0.084 – 0.196)	0.33	0.21
		7	14	34	0.60 (0.26 – 0.86)	0.51 (0.30 – 0.72)	0.64 (0.43 – 0.87)	0.76 (0.60 – 0.91)	18 (14 – 28)	46 (37 – 60)	0.035 (0 – 0.061)	0.132 (0.100 – 0.178)	0.38	0.15
		8	14	38	0.58 (0.30 – 084)	0.46 (0.29 – 0.64)	0.60 (0.41 – 0.80)	0.77 (0.63 – 0.90)	19 (14 – 30)	53 (43 – 68)	0.032 (0.014 – 0.056)	0.130 (0.100 – 0.173)	0.32	0.14
	2	4	22	21	0.59 (0.43 – 0.76)	0.42 (0.20 – 0.79)	0.86 (0.71 – 0.97)	0.73 (0.44 – 0.96)	25 (22 – 30)	32 (22 – 51)	0.007 (0 – 0.045)	0.039 (0 – 0.143)	1.89	1.22
		5	22	21	0.58 (0.55 – 0.73)	0.58 (0.31 – 0.89)	0.82 (0.68 – 0.92)	0.65 (0.43 – 0.85)	25 (22 – 31)	27 (21 – 40)	0.003 (0 – 0.029)	0.039 (0 – 0.094)	2.68	0.83
		6	22	24	0.54 (0.43 – 0.65)	0.47 (0.25 – 0.70)	0.90 (0.81 – 0.97)	0.75 (0.57 – 0.92)	24 (22 – 28)	32 (26 – 44)	0.001 (0 – 0.007)	0.039 (0 – 0.086)	2.37	0.67
		7	23	24	0.54 (0.44 – 0.65)	0.45 (0.26 – 0.68)	0.91 (0.84 – 0.97)	0.73 (0.57 – 0.87)	25 (23 – 29)	33 (26 – 46)	0.002 (0 – 0.015)	0.029 (0 – 0.069)	2.20	0.73
		8	25	24	0.57 (0.45 – 0.67)	0.38 (0.25 – 0.54)	0.89 (0.81 – 0.95)	0.81 (0.70 –90)	28 (25 – 32)	33 (26 – 43)	0.014 (0 – 0.026)	0.009 (0 – 0.040)	0.32	0.14
4	1	4	24	15	0.80 (0.65 – 0.91)	0.64 (0.44 – 0.86)	0.94 (0.85 – 0.99)	0.80 (0.62 – 0.96)	25 (24 - 27)	17 (15 – 22)	0.050 (0 – 0.102)	0.013 (0 – 0.066)	0.62	1.63
		5	27	17	0.77 (0.66 – 0.86)	0.63 (0.41 – 0.83)	0.95 (0.87 – 0.99)	0.82 (0.66 – 0.96)	28 (27 - 30)	19 (17 – 24)	0.072 (0.036 – 0.104)	0.037 (0 – 0.081)	0.23	0.68
		6	30	17	0.81 (0.72 – 0.88)	0.58 (0.42 – 0.76)	0.95 (0.90 – 0.99)	0.86 (0.73 – 0.96)	31 (30 – 33)	19 (17 – 23)	0.083 (0.061 – 0.104)	0.019 (0 – 0.056)	0.14	0.99
		7	31	17	0.80 (0.72 – 0.87)	0.57 (0.43 – 0.72)	0.93 (0.88 – 0.98)	0.88 (0.78 – 0.96)	32 (31 – 34)	19 (17 – 23)	0.074 (0.057 – 0.093)	0.008 (0 – 0.038)	0.13	1.55
		8	31	18	0.81 (0.74 – 0.88)	0.60 (0.45 – 0.73)	0.93 (0.88 – 0.97)	0.88 (0.80 – 0.96)	32 (31 - 34)	20 (18 – 24)	0.064 (0.050 – 0.080)	0.021 (0 – 0.043)	0.12	0.60
	2	4	14	4	0.64 (0.40 – 0.86)	0.64 (0.22 – 0.95)	0.90 (0.69 – 0.99)	0.55 (0.22 – 0.87)	16 (14 – 21)	6 (4 – 14)	0.103 (0 – 0.178)	0.002 (0 – 0.027)	0.44	4.77
		5	17	4	0.60 (0.40 – 0.80)	0.55 (0.25 – 0.82)	0.88 (0.71 – 0.99)	0.77 (0.49 – 0.86)	20 (17 – 26)	5 (4 – 10)	0.113 (0.042 – 0.171)	0.001 (0 – 0.012)	0.28	4.40

		6	20	4	0.55 (0.40 – 0.72)	0.57 (0.29 – 0.85)	0.91(0.78 – 0.99)	0.76 (0.49 – 0.96)	23 (20 – 29)	5 (4 – 9)	0.109 (0.056 – 0.158)	0.001 (0 – 0.008)	0.23	3.21
		7	22	5	0.60 (0.45 – 0.74)	0.58 (0.28 – 0.85)	0.92 (0.81 – 0.99)	0.76 (0.52 – 0.95)	24 (22 – 29)	6 (5 – 11)	0.102 (0.069 – 0.135)	0.009 (0 – 0.027)	0.16	0.83
		8	25	7	0.61 (0.58 – 0.73)	0.55 (0.24 – 0.83)	0.91 (0.83 – 0.98)	0.73 (0.47 – 0.94)	28 (25 - 32)	9 (7 – 16)	0.105 (0.08 – 0.133)	0.026 (0.010 – 0.055)	0.13	0.44