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APPENDIX C

Posterior summaries for the harbor seal example

Table C1. Marginal posterior summaries for a Bayesian analysis of harbor seal activity budgets utilizing both location and diving data. Where applicable, subscripts indicate movement behavior states (R = resting, F = foraging, and T = transit) and sex (1 = male, 2 = female).

Parameter	Estimate	95% HPDI	
		Lower	Upper
	Movement parameters		
$r_{R,1}$	0.12	0.00	0.34
$r_{F,1}$	0.12	0.00	0.35
$r_{T,1}$	1.14	0.97	1.39
$r_{R,2}$	0.15	0.00	0.46
$r_{F,2}$	0.15	0.00	0.45
$r_{T,2}$	1.14	0.97	1.47
$\alpha_{R,1}$	7.45	7.05	7.84
$\alpha_{F,1}$	7.95	7.58	8.35

$\alpha_{T,1}$	8.89	8.54	9.24
$\alpha_{R,2}$	7.24	6.75	7.78
$\alpha_{F,2}$	7.79	7.32	8.27
$\alpha_{T,2}$	8.83	8.35	9.33
$\beta_{R,1}$	0.36	0.01	0.74
$\beta_{F,1}$	0.47	0.13	0.85
$\beta_{T,1}$	1.27	0.96	1.61
$\beta_{R,2}$	1.13	0.65	1.60
$\beta_{F,2}$	0.46	-0.03	0.96
$\beta_{T,2}$	1.30	0.93	1.61
$\sigma^2_{r_{R,1}}$	0.28	0.11	0.56
$\sigma^2_{r_{F,1}}$	0.28	0.13	0.59
$\sigma^2_{r_{T,1}}$	0.29	0.11	0.57
$\sigma^2_{r_{R,2}}$	0.35	0.15	0.76
$\sigma^2_{r_{F,2}}$	0.36	0.13	0.76
$\sigma^2_{r_{T,2}}$	0.35	0.14	0.76
$\sigma^2_{\alpha_{R,1}}$	0.41	0.18	0.81
$\sigma^2_{\alpha_{F,1}}$	0.39	0.17	0.77
$\sigma^2_{\alpha_{T,1}}$	0.29	0.12	0.57

$\sigma^2_{\alpha_{R,2}}$	0.52	0.22	1.14
$\sigma^2_{\alpha_{F,2}}$	0.44	0.15	0.92
$\sigma^2_{\alpha_{T,2}}$	0.38	0.12	0.80
$\sigma^2_{\beta_{R,1}}$	0.32	0.15	0.64
$\sigma^2_{\beta_{F,1}}$	0.30	0.13	0.60
$\sigma^2_{\beta_{T,1}}$	0.31	0.14	0.58
$\sigma^2_{\beta_{R,2}}$	0.52	0.19	1.13
$\sigma^2_{\beta_{F,2}}$	0.39	0.15	0.83
$\sigma^2_{\beta_{T,2}}$	0.37	0.15	0.80
	Diving parameters		
$\upsilon_{R,1}$	1.00	1.00	1.00
$\delta_{R,1}$	6.26	5.99	6.53
$\upsilon_{F,1} = \upsilon_{T,1}$	9.98	9.91	10.00
$\delta_{F,1} = \delta_{T,1}$	3.39	3.33	3.43
$\upsilon_{R,2}$	1.00	1.00	1.00
$\delta_{R,2}$	9.20	8.47	9.97
$\upsilon_{F,2} = \upsilon_{T,2}$	6.53	6.10	6.98
$\delta_{F,2} = \delta_{T,2}$	2.69	2.53	2.82
	Location error parameters		
σ_x	0.0055	0.0055	0.0055

σ_y	0.0034	0.0033	0.0034
	State transition probability parameters		
$\psi_{R,R,1}$	0.80	0.79	0.81
$\psi_{R,F,1}$	0.17	0.16	0.18
$\psi_{R,T,1}$	0.03	0.02	0.04
$\psi_{F,R,1}$	0.13	0.12	0.14
$\psi_{F,F,1}$	0.81	0.80	0.82
$\psi_{F,T,1}$	0.06	0.05	0.07
$\psi_{T,R,1}$	0.19	0.16	0.21
$\psi_{T,F,1}$	0.19	0.16	0.22
$\psi_{T,T,1}$	0.62	0.58	0.65
$\psi_{R,R,2}$	0.71	0.69	0.73
$\psi_{R,F,2}$	0.29	0.26	0.31
$\psi_{R,T,2}$	0.01	0.00	0.01
$\psi_{F,R,2}$	0.10	0.09	0.12
$\psi_{F,F,2}$	0.85	0.84	0.86
$\psi_{F,T,2}$	0.04	0.03	0.05
$\psi_{T,R,2}$	0.19	0.14	0.24
$\psi_{T,F,2}$	0.24	0.18	0.30
$\psi_{T,T,2}$	0.58	0.52	0.64

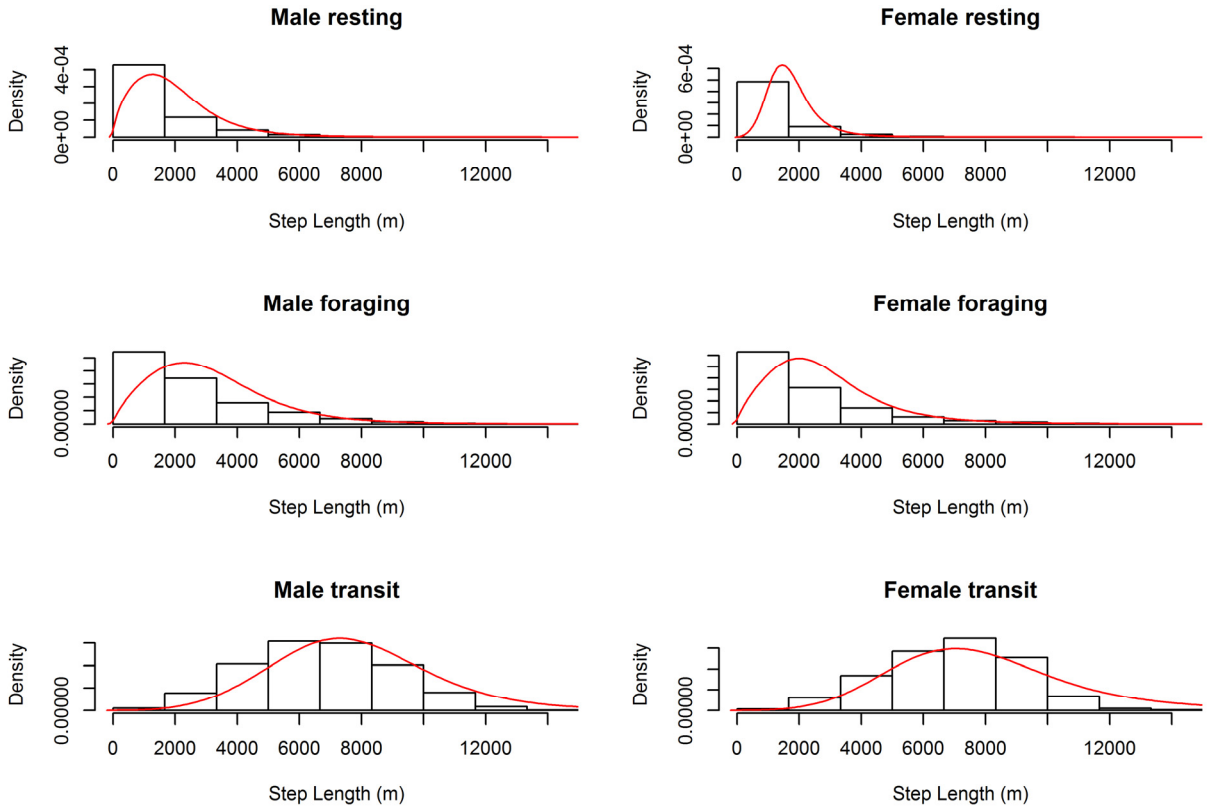

FIG. C1. Posterior histogram of sex- and state-dependent step lengths for 17 harbor seals in the UK. The population-level posterior density of the Weibull distribution for step length is shown in red.

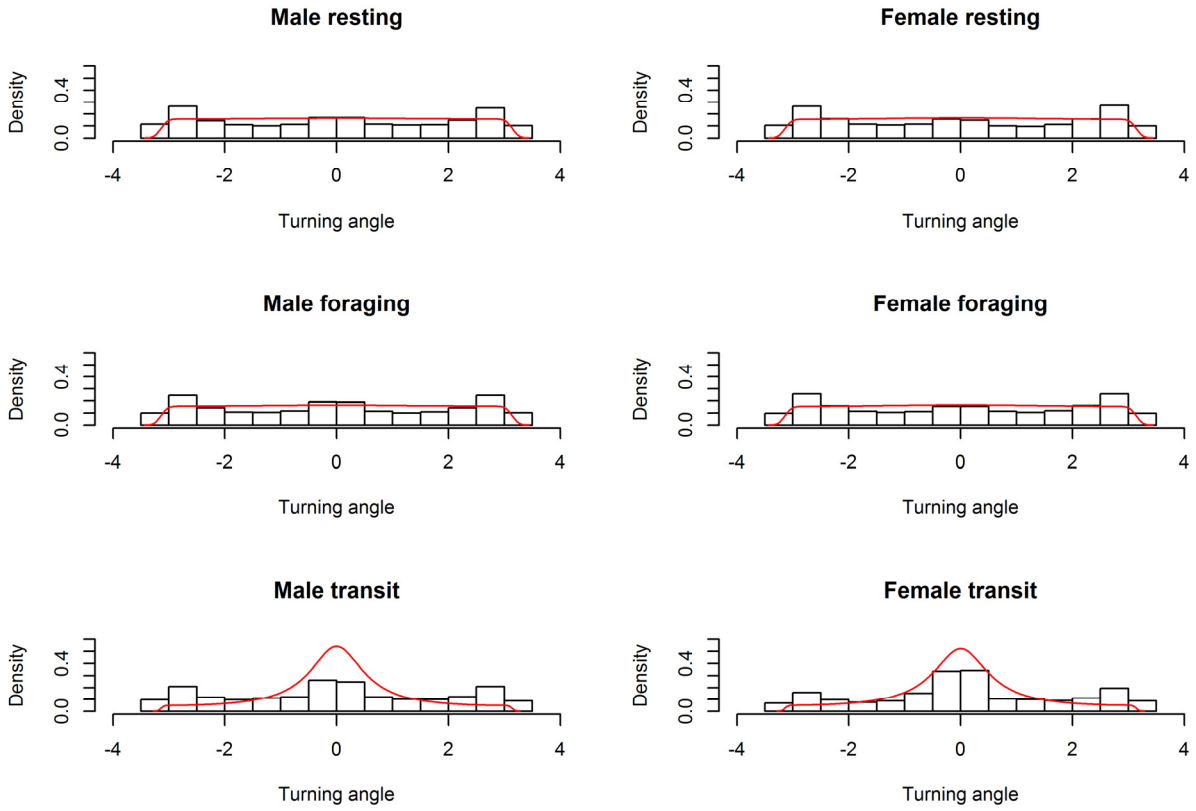

FIG. C2. Posterior histogram of sex- and state-dependent turning angles for 17 harbor seals in the UK. The population-level posterior density of the wrapped Cauchy distribution for turning angle is shown in red.

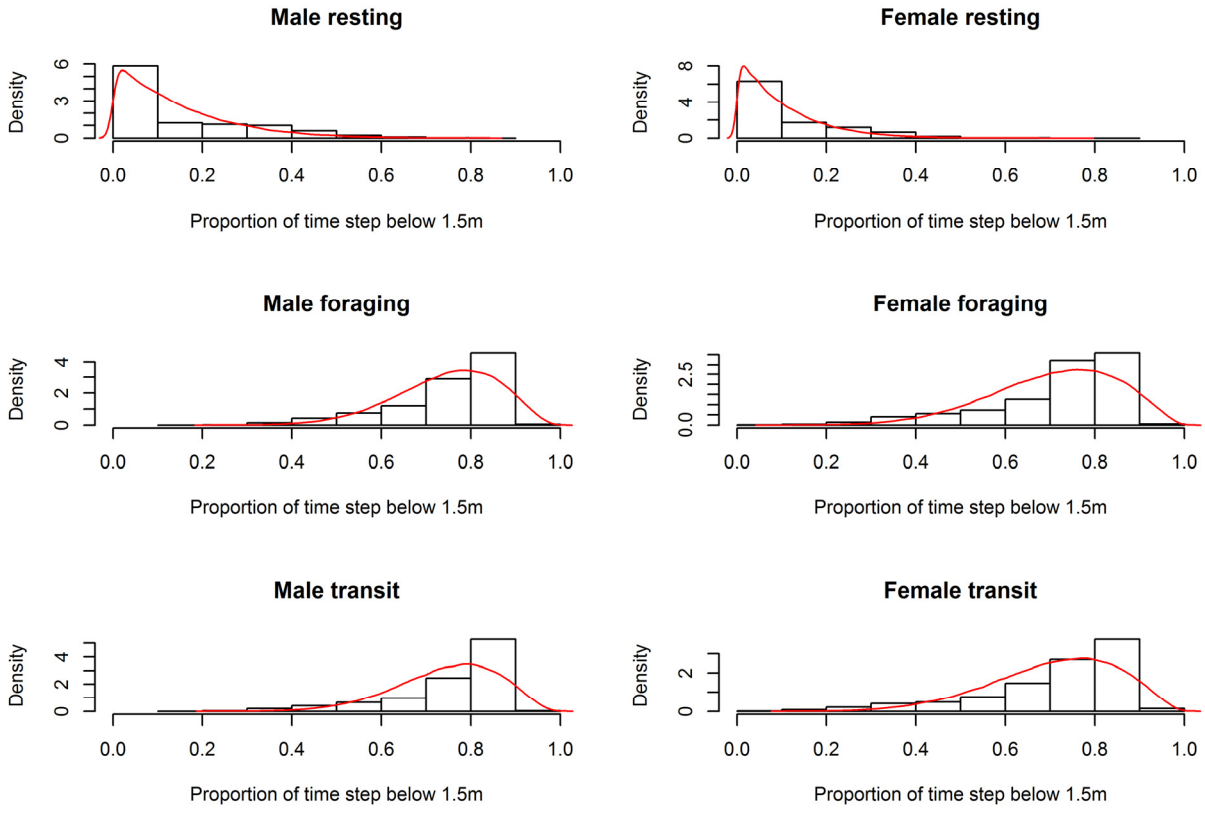

FIG. C3. Posterior histogram of sex- and state-dependent proportions of time step spent diving below 1.5m $\left(\omega_{n,t}\right)$ for 17 harbor seals in the UK. The population-level posterior density of the Beta distribution for $\omega_{n,t}$ is shown in red.