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Supplementary material

Appendix 1: the effect of longer-scale decisions at a seasonal scale

A.1 Methods

A.1.1 Resource use and selection

We tallied the number of locations falling into each habitat categories to estimate habitat use for caribou during the calving and post-calving period. We estimated resource selection patterns for different landscape attributes using Resource Selection Functions (RSFs; Boyce *et al.* 2002; Manly *et al.* 2002). We estimated RSFs by comparing habitat characteristics of observed and random locations with a mixed-effects logistic regression with individual caribou as the random factor (Gillies *et al.* 2006). We drew random locations for a given individual within the 99% utilization distribution evaluated from a Brownian bridge kernel approach (Horne *et al.* 2007). Random locations were drawn at a density of 2 points per km^2. Observed and random locations were characterized by dummy variables representing landcover types (with Wetland as the reference category). We tested for collinearity among variables using the variance inflation factor (Graham 2003). As we were interested in selection in response to all landcover types, we only evaluated the global model containing all dummy variables.

A.1.2 Importance of long-distance movement in patterns of resource use and selection

We assessed caribou resource use and selection patterns without the presence of long-distance decisions toward specific resources by evaluating space-use expectation based on caribou motion capacity alone. We represent the motion capacity of caribou by assuming that caribou follow a correlated random walk (Bergman, Schaefer & Luttich 2000) in their landscape, but with different rate of movement in different habitat. In such an instance, selection or preference for specific resources could only be achieved from a reduction in movement rates and increased tortuosity in specific habitat (Bastille-Rousseau, Fortin & Dussault 2010). This means that the distribution of step lengths and turning angles would be different based on the habitat in which a specific step originated. Potts et al. (2014) extracted habitat specific step length and turning angles distributions using the same data as this study. They used a Weibull distribution to parameterize step length distribution and a bivariate von Mises distribution to characterize turning angles distribution. Further details of the estimation can be found in Potts et al. (2014).

We used these results to replicate the motion capacity of caribou and to generate movement patterns of caribou in their landscape based on a correlated random walk. We generated 500 separated movement paths of 1000 steps based on these distributions. This would be analogous to an actual dataset of GPS locations containing 500 individuals and followed at the same frequency (2 hours) and roughly same duration (1 May – 1 August) that caribou GPS monitoring. We randomly initiated the movement path within the area delimited by the extent of caribou GPS relocations. We tallied the proportion of locations falling into each habitat categories to estimate use. We performed a RSF using the same methodology than above but using the simulated movement paths instead. We kept the same habitat as reference layer. We compared the change in relative selection for the different habitats, which is indicating of the importance of longer-scale decisions toward resources for caribou.

We also performed a latent selection difference function (LSD; Latham, Latham & Boyce 2011) to contrast selection patterns from caribou with prediction from movement models based on the motion capacity alone. We used a logistic regression to compare the attributes of locations used by actual caribou with predicted locations from the movement models. This model does not work with individual as a random factor and we therefore used a Huber-White sandwich estimator to improve standard error estimation (Latham *et al.* 2011).

A.2 Results

A.2.1 Caribou resource use and selection

During the calving and post-calving period, caribou were generally found in coniferous open habitat (>50% of locations, Table S1). Barren and wetland habitats were also used fairly frequently (Table S1). On the other hand, less than 10% of locations were found in other and coniferous dense habitats. These patterns of space-use translated in selection by caribou for coniferous open habitat while barren, other and coniferous habitats were all avoided relative to wetland. There was noticeable inter-individual variation in caribou habitat selection (random factor individual variance = 0.647).

A.2.2 Importance of longer-scale decisions in patterns of resource use and selection

For wetland, barren, and coniferous dense and open habitats, simulated movement based on a basic correlated random walk model revealed similar patterns of habitat use (<27% relative variation in habitat use, Table S1). For other dense habitat, predicted habitat use differed more importantly (by 290%). Patterns of habitat selection estimated from these simulations revealed a higher divergence from observed patterns. Other and coniferous dense both showed opposite patterns in selection in comparison to simulated movements. This indicates the strong role longer-scale decisions play in the resulting avoidance of these habitats. Estimated coefficients for barren and coniferous open did not differ significantly (Table S1). Latent selection differences coefficients indicated that for all habitats, patterns of space-use were different between the observed and simulated locations, indicating that longer-scale decisions are playing a role in patterns of space-use.

Table A1. Estimated or predicted habitat use (percent), selection (parameter estimates ± C.I.) and latent selection differences (parameter estimates ± C.I.) for 140 female caribou, Newfoundland, 1 May – 1 August, 2008-2010 and simulated movement path (n=500). Selection for actual and simulated locations was estimated from mixed-effects RSFs while latent selection differences was estimated using a logistic regression. Each regression was estimated with wetland as the reference category. Positive coefficients are indicative of selection for a resource while negative coefficients represent avoidance of this resource.

	Actual locations		Simulated locations		Latent selection
	Use(%)	Selection	Use(%)	Selection	differences
Wetland	0.243		0.226		
Barren	0.133	-0.060 (-0.082 ,-0.038)	0.118	-0.065 (-0.088 ,-0.041)	0.040 (0.025 ,0.055)
Other	0.030	-1.038 (-1.069 ,-1.006)	0.117	0.077 (0.053 ,0.102)	-1.423 (-1.445 ,-1.401)
CD	0.076	-0.151 (-0.182 ,-0.120)	0.096	0.205 (0.177 ,0.233)	-0.308 (-0.325 ,-0.291)
CO	0.518	0.075 (0.057 ,0.093)	0.443	0.105 (0.087 ,0.123)	0.084 (0.073 ,0.095)

Table A2. Full list of candidate models estimating a local or long distance responses to resources. Models differed in the radius R and grain size D (Figure 1) regarding how long-distance response was estimated. Models were ranked based on, but AIC is also provided for comparison purposes.

Rank	Scale	R	D	Maximum log-likelihood	AIC	BIC
1	Long	2000	2000	-281625	563258.1	563298.7
2	Long	2000	1500	-283237	566482.4	566522.9
3	Long	1500	500	-286085	572177.4	572169.4
4	Long	2000	1000	-286396	572800.7	572841.2
5	Long	3000	3000	-286967	573942.6	574043.8
6	Long	4000	6000	-288322	576652.6	576693.1
7	Long	2000	750	-289297	578601.4	578702.6
8	Long	3000	2000	-289630	579267.7	579259.7
9	Long	5000	6000	-290053	580113.1	580153.7
10	Long	1500	350	-290679	581366.1	581406.7
11	Long	4000	3000	-291615	583238.7	583230.7
12	Long	3000	1500	-291807	583621.5	583662
13	Long	2000	500	-293778	587564.9	587556.9
14	Long	4000	2000	-295154	590315.2	590355.8
15	Long	5000	3000	-295275	590557.9	590598.4
16	Long	3000	1000	-295639	591285.8	591387
17	Long	1500	250	-295725	591457.6	591449.6
18	Long	4000	1500	-297858	595723.3	595763.9
19	Long	2000	350	-298669	597346.8	597448.1
20	Long	5000	2000	-299083	598174.4	598166.4
21	Long	3000	750	-299086	598181	598221.5
22	Long	5000	1500	-302227	604462.9	604503.4
23	Long	4000	1000	-302282	604571.7	604672.9
24	Long	2000	250	-304039	608085.2	608077.2
25	Long	3000	500	-304319	608646.8	608687.4
26	Long	4000	750	-306176	612359.6	612400.1
27	Long	1500	150	-306964	613935.8	614037
28	Long	5000	1000	-307343	614694.8	614686.8
29	Long	3000	350	-310056	620119.1	620159.7
30	Local	-	-	-310805	621617.1	621718.3
31	Long	5000	750	-311632	623271.2	623372.4
32	Long	4000	500	-311914	623835.9	623876.4
33	Long	1500	100	-312546	625100.7	625141.2

34	Long	2000	150	-315740	631488.9	631590.2
35	Long	3000	250	-315954	631915.2	631907.2
36	Long	5000	500	-317880	635767.2	635807.7
37	Long	4000	350	-317934	635875.3	635976.6
38	Long	2000	100	-321473	642954.8	642995.4
39	Long	5000	350	-324175	648357.5	648458.7
40	Long	4000	250	-324272	648551.5	648543.5
41	Long	1500	75	-326509	653026.8	653067.3
42	Long	3000	150	-328202	656411	656451.5
43	Long	5000	250	-330575	661158.7	661260
44	Long	1500	50	-333567	667141.2	667133.2
45	Long	3000	100	-334370	668748.3	668788.8
46	Long	2000	75	-335805	671617.9	671658.4
47	Long	4000	150	-337177	674361.7	674462.9
48	Long	2000	50	-343019	686046	686038
49	Long	5000	150	-343412	686832.3	686872.9
50	Long	4000	100	-343468	686944	686984.6
51	Long	3000	75	-349429	698865	698966.2
52	Long	5000	100	-349713	699433.2	699425.2
53	Long	3000	50	-357091	714189.9	714230.4
54	Long	4000	75	-358605	717218.6	717319.8
55	Long	5000	75	-365046	730099.1	730091.1
56	Long	4000	50	-366237	732482.1	732522.6
57	Long	1500	25	-367450	734908.5	734949.1
58	Long	5000	50	-372409	744825.9	744927.1
59	Long	2000	25	-377133	754274.6	754266.6
60	Long	3000	25	-391335	782677.5	782718
61	Long	4000	25	-400342	800692.6	800733.1
62	Long	5000	25	-406645	813298.1	813399.3

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