This supplement presents additional information on methods, figures, and tables that provide added data and clarification.

Section 1: Space Use Analysis

A segmented regression approach with sensitivity testing was used to determine structural change in observed intra-annual space use patterns (Table S1). Segmented regressions are common statistical tools to model trends with abrupt changes, as observed in Figure 1. Our mixed effect model investigated the temporal effect (j_t) on observed home range size, while controlling for the random effect of tagged individual (Table S1). We fit models iteratively, varying potential breakpoints between October 1 and January 1. Minimum deviance was used as a benchmark for model performance to identify the best breakpoint (Figure S1). This method established a statistically-significant breakpoint on November 5th (Figure S1, Chow test, $f = 9.43$, $p < 0.000001$), distinguishing relatively-invariant trends in space use prior (June – Oct; Figure 1) to the rapidly-expanding space use trends that followed (Nov – Mar; Figure 1).

Table S1: Model results from the segmented rank regression with mixed effects of intra-annual space use expansion (a), where *b* is the intercept, *jt* is the Julian date of the 8-day sampling period (*t*), and *1|tag* are the mixed effects. Deviance reduction (Figure S1) determined an optimal breakpoint (B.P.) at November 5th marking the end of warm-month behavior (small, nearshore space use) and cold-month behavior (rapidly-expanding and wide-ranging space use).

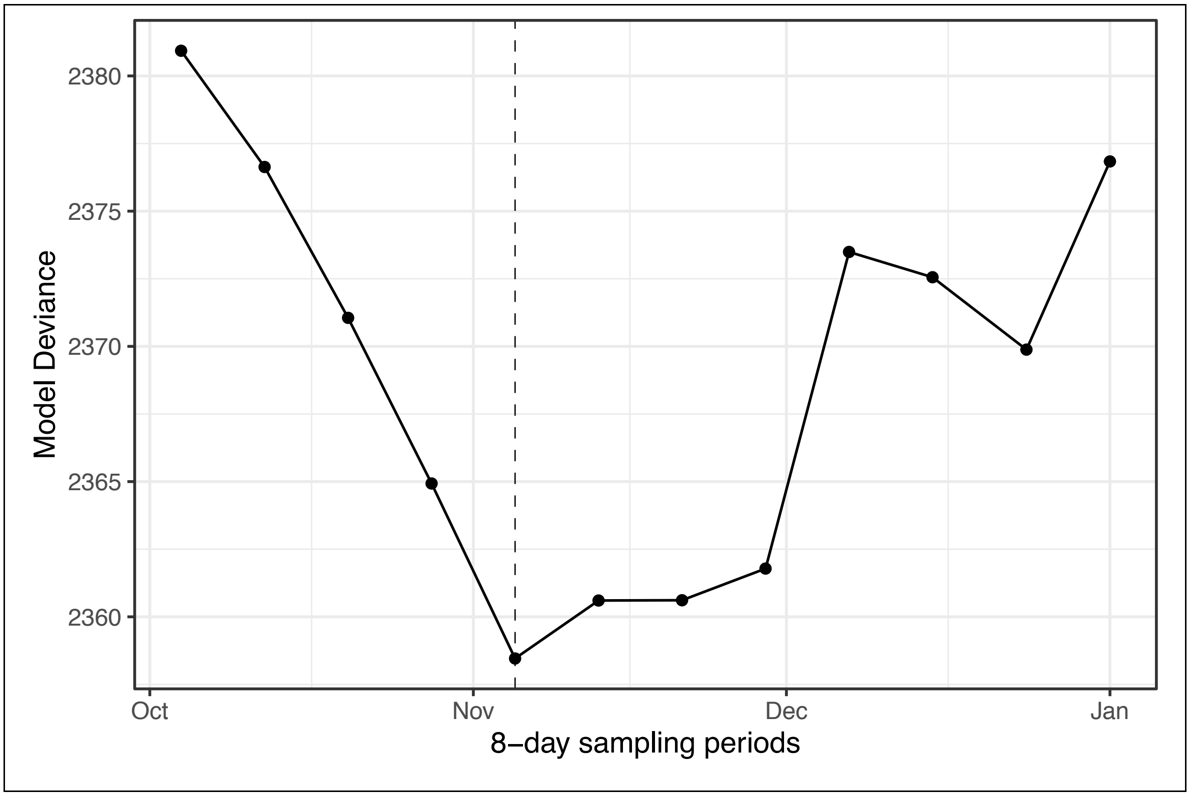
a)

$$area \sim \{ \begin{array}{ll} b + j_t + 1 | tag & for\ all\ t \le B.P. \\ b + j_t + 1 | tag & for\ all\ t > B.P. \end{array}$$

b)

Segment	Slope	t-value
<= B.P.	2.18	9.37
> B.P.	10.46	0.96

Figure S1: Deviance reduction of the segmented regression identifies November 5th (dashed line) as an optimal breakpoint in the space use patterns observed. On the basis of this quantitative determination, seal behavior was separated into two seasons: 1) warm months (tag on – Nov 5); and 2) cold months (Nov 5 – tag end).



A clustering analysis of space use estimates independently emphasized intra-annual shifts in the variability of individual's spatial behavior (Figure S2). Standardized medoids reported (Table S2) described small-, moderate-, and large-clusters of space used. Partitioning around medoids was selected for the method's robustness with small datasets and a focus on minimizing dissimilarity (Legendre and Legendre 2012). When partitioning around a medoid, the method identifies the observed data point that minimizes the sum of dissimilarities between all points labeled within that cluster. Minimizing dissimilarity thus focuses the clustering on Thus, cluster dissimilarity and diameter were assessed metrics of the cluster's variability between tagged individual's 8-day spatial behavior.

The cluster describing the smallest space use estimates (Figure S2) occurred predominantly prior to seasonal shifts (85%, 99 of 118 estimates; Table S2). Despite encompassing a disproportionate 40% of all samples, cluster 1 exhibited the least dissimilarity and shortest diameter across individuals (Table S2). For this season, tagged animals used space quite similarly and displayed a high degree of overlapping movements. 93% of this cluster's estimates occurred before the breakpoint, emphasizing the seasonal signature to the observed small ranges. Following the breakpoint, clusters 2 and 3 encapsulated greater ranges of variability (Figure S2). Estimates of cluster dissimilarity and diameters nearly doubled for each larger cluster (Table S2). Broader movements into a greater range of areas accompanied the greater dissimilarity observed (Figure 1).

Figure S2: Partitioning around k-medoids identified three clusters representing small-, moderate-, and large-sized home range estimates. The vast majority of small home ranges occured prior the behavioral breakpoint (dashed line). Ad-hoc evaluation was able to determine home ranges in cluster 1 following the seasonal break are related directly to breeding and fasting behavior involved in reproduction, when animals remain on land or near the breeding colony.

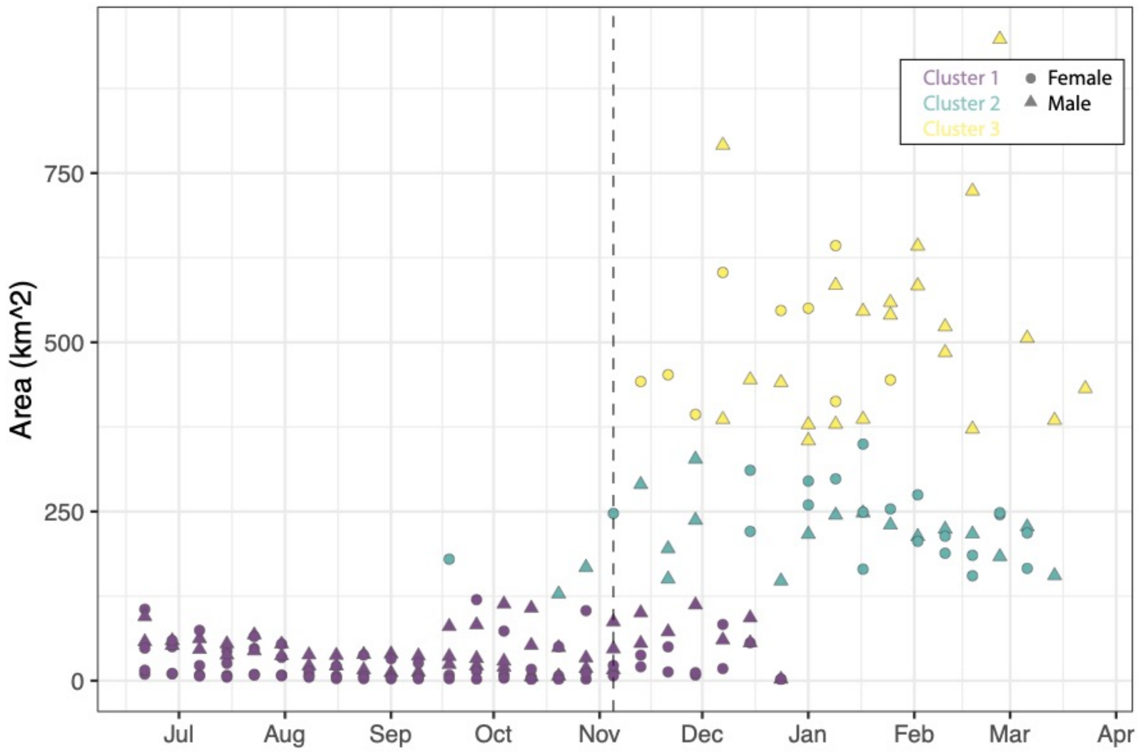


Table S2: Characteristics for each cluster detailed, including total number samples, number of samples during the warm season, and the cluster's standardized medoid, average dissimilarity, and average diameter, depicted apparent differences. Compared to other clusters, cluster 1 occurred near-exclusively during the warm season and exhibited the greatest homogeneity in spatial behavior.

	n				
Cluster	**All**	**Warm**	**Medoid**	**Dissimilarity**	**Diameter**
1	118	99	-0.69	0.13	0.63
2	78	8	0.36	0.22	1.18
3	93	0	1.77	0.56	3.15

Section 2: Trip Metric Analysis

The distribution of various trip metrics by sex and across season demonstrated differences observed in movement behavior (Figure S3). All metrics were log-transformed and scaled between 0 and 1 for comparison. Mixed effects modeling reported in the text used rank-transformed variables within a generalized logistic regression framework that was evaluated using ANOVAs. Rank transformation of variables relaxed normality assumptions, at a commensurate loss of power, by creating an ordinal variables (Legendre and Legendre

2012). For all metrics, season was best predicted by spatial movements than differences between sex (Table S3).

Figure S3: Seasonal plots by sex show the distribution of trip. Panels show the observed distance traveled (a), total duration (b), and maximum distance from shore (c) of foraging trips. All metrics are log-transformed and then scaled (0,1) for comparability.

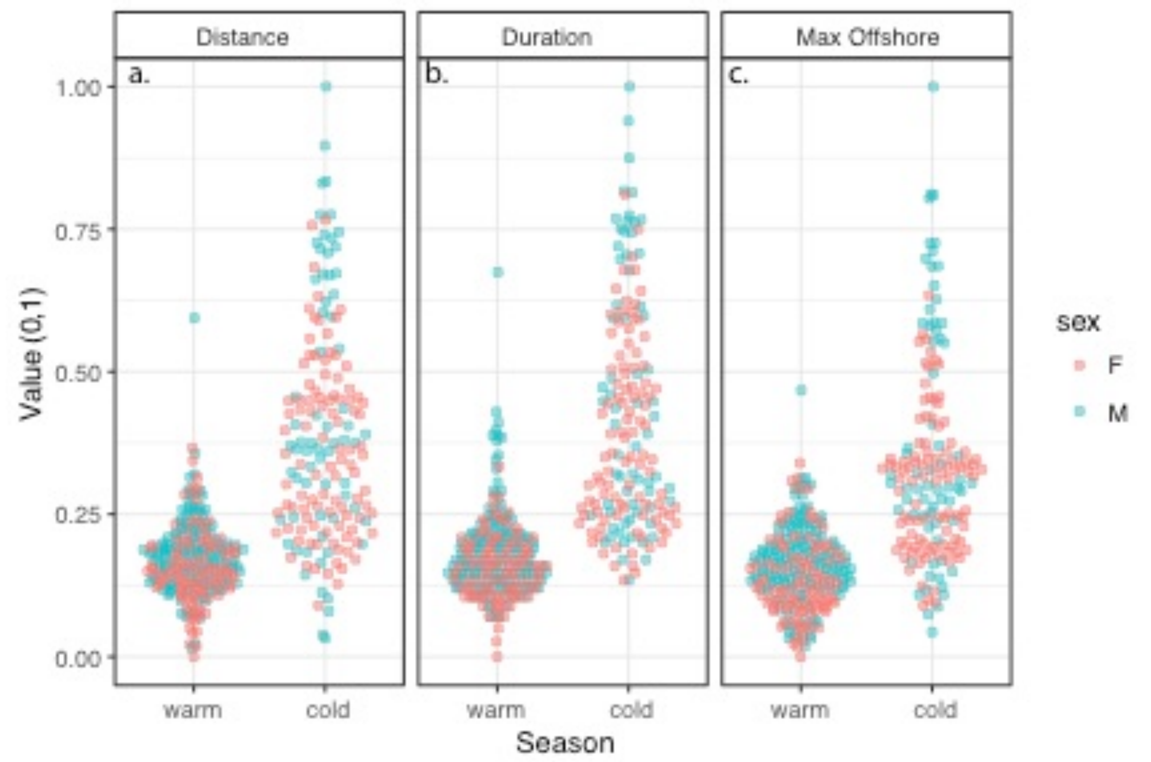


Table S3a: ANOVA comparisons (a) generalized logistic regression selected a model that differentiated season on the basis of trip metrics rather than sex (b).

Metric	Model	df	AIC	log-Likelihood	p-value
Distance	season ~ metric	4	297.648	-144.824	-
	season ~ metric + sex	5	298.050	-144.025	0.206
Max Offshore	season ~ metric	4	294.927	-143.464	-
	season ~ metric + sex	5	295.466	-142.733	0.227
Duration	season ~ metric	4	262.505	-127.252	-
	season ~ metric + sex	5	252.405	-126.202	0.147
Full	season ~ duration	4	232.044	-112.022	-
	season ~ duration + max offshore	**5**	**223.515**	**-106.757**	**0.0012**

	season ~ duration + max offshor + distance	6	224.974	-106.487	0.46

Table S3b: Parameter estimates of the final model selected via AIC reduction (Table S3a).

	Estimate	SE	t	p
Intercept	0.8148	0.0648	12.5813	< 0.0001
Duration	0.0022	0.0002	10.5772	< 0.0001
Max Offshore	0.0006	0.0002	3.2574	< 0.001

Section 3: Acoustic detection patterns of tagged sharks

Summary statistics were calculated for white sharks tagged during the seal tracking study (Table S4) as well as the overall acoustic array (Table S5). Detection rates were similar amongst sharks between and across years (Table S4). The center of the sampling array (Chatham, Monomoy – north) observed the highest detection rates, affirming the spatial arrangement of the acoustic array. For these reasons, predation risk is inferred from overall shark presence across coastal receivers during the study.

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Table S4. Mean detection rates per days of acoustic sampling across all sites and within each region.

		Daily detection rate				
Shark	**Sampling Year**	**All sites**	**Nauset / Orleans**	**Chatham**	**Monomoy (north)**	**Monomoy (south)**
WS11-03	2013	0.015	-	0.019	-	0.032
	2014	0.072	0.093	0.052	0.152	0.037
WS11-05	2013	1.386	0.421	1.89	2.682	0.009
	2014	0.044	0.079	0.052	0.004	0.046
WS12-01	2013	1.659	0.12	3.417	1.002	-
	2014	0.836	2.624	1.116	0.307	-
WS12-08	2013	-	-	-	-	-
	2014	0.91	0.353	1.652	1.293	0.005
WS12-09	2013	-	-	-	-	-

	2014	0.012	0.065	0.007	-	-
WS12-10	2013	0.004	-	0.009	-	0.004
	2014	0.008	-	0.021	-	0.007
WS12-14	2013	0.513	0.01	0.732	0.859	0.03
	2014	-	-	-	-	-
WS12-15	2013	0.287	-	0.131	0.603	0.479
	2014	0.087	0.041	0.101	0.126	0.065
WS12-16	2013	0.226	-	0.041	0.399	0.489
	2014	0.084	-	0.043	0.133	0.171
WS13-02	2013	0.047	-	0.038	0.084	0.062
	2014	0.083	0.072	0.099	0.126	0.028
WS13-03	2013	0.283	-	0.161	0.395	0.528
	2014	0.482	0.188	0.296	0.869	0.709
WS13-04	2013	0.078	0.079	0.07	0.139	0.036
	2014	0.042	0.122	0.021	0.027	0.025
WS13-05	2013	0.142	0.216	0.201	0.064	0.024
	2014	-	-	-	-	-
WS14-08	2014	1.047	1.705	1.627	0.509	0.06
WS14-17	2014	0.877	0.736	0.967	1.309	0.448
WS14-18	2014	0.453	0.525	0.434	0.481	0.281
WS14-23	2014	0.456	1.281	0.384	0.556	0.062
WS14-27	2014	0.094	0.003	0.059	0.262	0.069
WS14-44	2014	0.073	-	0.026	0.225	0.041
WS14-49	2014	0.037	0.077	0.022	0.04	0.017
WS14-50	2014	0.204	0.545	0.166	0.227	0.072
WS14-57	2014	0.037	-	0.034	0.084	0.024
WS14-61	2014	0.031	-	-	0.11	0.019
WS14-68	2014	0.003	-	0.001	0.005	0.006

Table S5: Acoustic sampling effort distributed within regions of the study area.

Region	Sampling Year	Receiver Stations	# Sharks	# Detections	Days sampled	Days >1 detection
Nauset	2013	3	5	322	356	20
	2014	3	16	3151	417	91
Chatham	2013	6	11	6307	940	122
	2014	3	21	5668	940	112
Monomoy (north)	2013	4	9	3122	466	81
	2014	3	20	3493	466	90
Monomoy (south)	2013	2	10	904	534	50
	2014	3	20	1228	534	67

Figure S4: Diel peaks in nearshore detections of tagged white sharks are shown by tagged individual (color), revealing consistent patterns in peak activities around dusk and dawn.