

Development of foraging strategies with age in a long-lived marine predator

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Supplement 1. SSM parameter estimates, proportion of locations estimated as travelling and foraging, and results of mixed-effects models comparing movement of male and female young of year

Table S1. Estimated parameter means for each of the 10 groups of grey seal satellite tracks modelled and reported in Breed et al. (2009) (marked with *) for comparison with estimates of young-of-the-year (YOY) and subadults in the present analysis. As in Breed et al. (2009), tracks were modelled in data blocks. There were 4 YOY blocks and 1 subadult block. Parameter estimates were similar in all groups. α_1 : transition probability of remaining in foraging state at time t if in foraging state at $t-1$; α_2 : Transition probability of switching to travelling state at time t if in foraging state at $t-1$; θ_{for} : turning angle parameter of the foraging state; θ_{trv} : turning angle parameter of the travelling state; γ_{for} : autocorrelation parameter of the foraging state; γ_{trv} : autocorrelation parameter of the travelling state; F: female; M: male

Group	γ_{for}	γ_{trv}	θ_{for}	θ_{trv}	α_1	α_2
Subadults mixed	0.51	0.93	177.4	1.4	0.92	0.17
YOY 1 (F)	0.61	0.91	171.7	-0.3	0.92	0.19
YOY 2 (F)	0.58	0.93	173.8	0.6	0.86	0.24
YOY 3 (M)	0.39	0.99	172.4	1.4	0.89	0.26
YOY 4 (M)	0.42	0.95	182.5	1.1	0.90	0.22
Adult 1* (M)	0.44	0.86	169.2	0.0	0.90	0.14
Adult 2* (M)	0.56	0.82	182.5	-1.4	0.91	0.15
Adult 3* (M)	0.58	0.66	176.7	-1.4	0.93	0.09
Adult 4* (M)	0.54	0.90	175.7	-0.4	0.92	0.12
Adult 5* (M)	0.42	0.74	176.7	-1.4	0.95	0.07
Adult 6* (F)	0.58	0.98	179.6	0.0	0.94	0.24
Adult 7* (F)	0.52	0.88	178.2	3.9	0.90	0.28
Adult 8* (F)	0.64	0.94	180.0	0.0	0.92	0.41
Adult 9* (F)	0.48	0.96	171.7	2.9	0.97	0.19
Adult 10* (F)	0.50	0.94	177.1	0.0	0.95	0.19

Table S2. Overall percentage of state-space model locations inferred as foraging, travel and uncertain in YOY grey seals by individual. The percentage of locations inferred as foraging is significantly different between the sexes ($p = 0.008$).

Seal	Sex	Foraging (%)	Travel (%)	Uncertain (%)
7374	Male	50.6	39.7	9.6
7379	Male	45.2	36.2	18.6
7362	Male	59.6	26.8	13.6
7357	Male	49.6	39.0	11.3
7381	Male	61.8	29.2	8.9
7360	Male	48.6	38.7	12.7
7380	Male	49.5	41.5	9.0
7358	Male	38.3	51.2	10.4
7370	Male	50.8	40.0	9.2
7356	Male	72.9	19.2	7.9
7355	Male	47.4	40.0	12.6
7367	Male	49.0	43.4	7.5
Mean \pm SD		51.9 \pm 8.9	37.1 \pm 8.4	10.9 \pm 3.1
7376	Female	68.4	24.5	7.0
7375	Female	64.6	29.6	5.8
7378	Female	90.6	5.1	4.3
7361	Female	84.2	7.9	7.9
7369	Female	54.3	38.4	7.3
7365	Female	75.8	17.5	6.7
7373	Female	74.1	22.2	3.7
7377	Female	68.7	22.5	8.8
7371	Female	42.8	42.8	14.4
7372	Female	62.8	31.8	5.3
7363	Female	60.6	31.2	8.2
7359	Female	47.6	43.7	8.7
Mean \pm SD		66.2 \pm 14.0	26.4 \pm 12.4	7.3 \pm 2.8

Table S3. Overall percentage of state-space locations inferred as foraging, travel and uncertain in subadult grey seals by individual

Seal	Sex	Foraging (%)	Travel (%)	Uncertain (%)
7387	Female	81.7	12.4	5.9
7382	Male	58.9	25.6	15.3
7385	Female	51.9	39.0	9.0
7383	Male	72.5	20.5	6.9
7388	Male	56.8	36.4	6.7
7386	Male	73.1	17.9	8.9
Mean \pm SD		65.8 \pm 11.2	25.3 \pm 10.5	8.8 \pm 3.4

Table S4. Summary of behavioural differences from linear mixed-effects model results between male and female YOY grey seals. Overall group (*G*) means did not differ significantly for any behavioural trait. There were some modest seasonal differences. *: Males foraged in significantly deeper water than females during the summer (39.8 ± 4.5 m for males vs. 32.8 ± 4.8 m for females). **: Females tended to remain on foraging patches for significantly longer than males during winter (1.5 ± 0.5 d for males vs. 4.7 ± 2.1 d for females)

Response variable	Male YOY	Female YOY	<i>G</i> p-value	Smallest season \times <i>G</i> p-value
Distance to shore (km)	41.0 \pm 5.6	32.0 \pm 5.3	0.19	0.08
Water depth (m)	36.6 \pm 3.9	38.1 \pm 5.2	0.76	<0.0001*
Trip length (d)	8.3 \pm 2.8	8.3 \pm 1.3	0.96	0.16
Patch distance (km)	48.4 \pm 10.2	34.2 \pm 8.6	0.25	0.05
Foraging ratio	0.60(0.57–0.63)	0.67(0.62–0.71)	0.67	0.06
Patch residence (d)	1.53 \pm 0.3	2.39 \pm 0.66	0.19	0.003**
Travel time (d)	0.64 \pm 0.22	1.60 \pm 0.71	0.14	0.09
Travel speed (km h ⁻¹)	1.52 \pm 0.16	1.63 \pm 0.23	0.67	0.06
Travel tortuosity	1.63 \pm 0.13	1.58 \pm 0.15	0.67	0.06