

The following supplements accompany the article

Creatures of habit: foraging habitat fidelity of adult female Australian sea lions

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Supplement 1. Supplemental tables contain detailed dive, movement and morphological data on 20 adult female Australian sea lions sampled. Additional methods pertaining to autoregressive integrated moving average modelling and first passage time analysis are also included.

Table S1. *Neophoca cinerea*. Descriptive statistics for (a) movement and (b) dive behaviour calculated from a randomly selected foraging trips for 20 adult female Australian sea lions tracked at 7 colonies in South Australia between October 2006 and June 2009. Abbreviation of Animal #ID in parentheses. Ecotypes designated as Inshore (I) or Offshore (O). –: data missing due to (a) no detectable transit phase or (b) no available dive data. UD-50 represents the fixed-kernel core range area used by animals at the 50% volume contour. For those adult females where transit and foraging behaviour was detected, all except 3 inshore-foraging animals travelled faster and further in transit than whilst foraging and none significantly altered their diving behaviour throughout a foraging trip

(a) Movement		Overall deployment data					Foraging Trip			Representative trip data							
		Animal #ID	Deployment date	Duration (d)	No. trips	UD-50 (km ²)	Ecotype	Duration (d)	Distance (km)	ARS scale (km)	Distance (km)		Time (h)		Mean speed (km h ⁻¹)		
Foraging	Transit										Foraging	Transit	Foraging	± SE	Transit	± SE	
2	Lilliput #5 (L5)	13/06/2009	3.74	2	12.7	I	1.05	36.34	0.53	13	23.3	11.3	14.12	1.15	0.08	1.65	0.11
3	Lilliput #3 (L3)	12/06/2009	7.45	6	20.6	I	0.69	34.2	2.37	16.52	17.68	10.07	30.49	1.59	0.09	1.84	0.09
4	Lilliput #2 (L2)	10/06/2009	6.1	3	22.9	I	1.25	66.98	0.1	36.53	30.45	25.65	4.08	1.34	0.07	4.1	0.11
6	Olive #138B (OL138B)	27/05/2009	32.83	17	12.4	I	1.38	50.2	0.1	5.9	44.4	10.68	21.33	0.51	0.04	1.99	0.06
8	Liguanea #4 (LIG4)	27/04/2009	4.89	2	4.7	I	0.93	37.1	1.85	14.6	22.5	15.05	7.84	0.97	0.09	2.87	0.11
12	Blefuscus #93 (BL93)	27/02/2008	30.81	18	15.5	I	0.73	77.56	2.65	54.76	22.8	7.9	9.62	1.84	0.07	3.85	0.18
14	West Waldegrave AF3 (WW3)	30/01/2008	4.33	2	121.1	I	1.1	66.5	0.25	14.2	52.3	6.45	20.12	2.2	0.06	2.6	0.09
15	Seal Slide AF1 (SS1)	22/10/2007	34.13	12	46.9	I	2.58	141.5	1.21	108.6	32.9	49.14	13.82	2.21	0.07	2.38	0.09
20	South Pages #982 (55938)	31/10/2006	112.58	45	161.2	I	1.87	91.1	1.1	22.9	68.1	28.99	17.46	0.79	0.05	3.9	0.26
19	South Pages #958 (55974)	30/10/2006	110.42	25	449.7	I	2.68	213.16	4.13	81.3	137.93	31.3	33.02	2.4	0.04	4.17	0.13
1	Lilliput #6 (L6)	14/06/2009	1.72	1	171.4	O	1.64	120.9	8.49	24.4	96.5	13.71	27.65	1.78	0.05	3.49	0.13
5	Lilliput #1 (L1)	10/06/2009	6.12	3	71	O	1.7	109.2	4.29	35.6	73.6	25.8	26.67	1.38	0.06	2.76	0.12
7	Olive #135B (OL135B)	26/05/2009	33.49	12	120	O	1.43	93.5	3.21	19.4	74.2	10.6	22.83	1.83	0.05	3.25	0.11
9	Liguanea #3 (LIG3)	27/04/2009	4.35	3	100.3	O	1.82	74.87	0.93	74.87	–	45.65	–	1.64	0.03	–	–
10	Liguanea #2 (LIG2)	25/04/2009	7.92	3	5.2	O	0.43	15.5	3.77	4.1	11.4	3.1	7.12	0.37	0.04	1.32	0.08
11	Blefuscus #94 (BL94)	28/02/2008	2.68	2	39.8	O	0.5	34.8	0.05	9.45	25.4	5.28	8.25	1.79	0.15	3.08	0.37
13	West Waldegrave AF5 (WW5)	30/01/2008	7.84	3	5.9	O	1.32	16.3	1.65	16.3	–	27.79	–	0.33	0.04	0.51	0.05
16	Seal Slide AF2 (SS2)	16/09/2007	34.89	11	633.9	O	1.61	90.2	0.05	39.7	50.5	21.69	17.06	1.83	0.06	2.96	0.13
17	South Pages #959 (55940)	3/11/2006	113.16	19	956.1	O	2.27	201.5	0.85	64	137.4	20.06	36.54	3.19	0.19	3.76	0.14
18	South Pages #954 (55976)	1/11/2006	41.26	9	1582.7	O	2.18	216.3	8.13	84.5	131.1	29.34	25.71	2.88	0.08	5.1	0.63

Table S2. *Neophoca cinerea*. Adult female Australian sea lion deployment and sampling data. Twenty adult females were sampled between October 2006 and June 2009. '-' denotes no data collected.

Animal #ID	Deployment date	Whisker		Individual data		
		Length (mm)	Segments	Length (cm)	Mass (kg)	Body Condition Index (BCI)
Lilliput #6	14/06/2009	122	24	173	104	-4.1
Lilliput #5	13/06/2009	139	24	153.5	96	-10.5
Lilliput #3	12/06/2009	123	18	165.5	102	-2.2
Lilliput #2	10/06/2009	169	24	162	91	1
Lilliput #1	10/06/2009	82	18	154	81	-0.8
Olive #138B	27/05/2009	85	18	160	80	5.7
Olive #135B	26/05/2009	110	24	169	100	2.5
Liguanea #4	27/04/2009	114	24	165	96	0.9
Liguanea #3	27/04/2009	56	12	151	79	-2.7
Liguanea #2	25/04/2009	99	24	163	92	1.4
Blefuscus #94	28/02/2008	153	24	146	71	-2.8
Blefuscus #93	27/02/2008	101	18	157	79	3.3
West Waldegrave AF3	30/01/2008	138	24	-	-	-
West Waldegrave AF5	30/01/2008	121	12	-	-	-
Seal Slide AF1	22/10/2007	241	24	-	-	-
Seal Slide AF2	16/09/2007	179	12	-	-	-
South Pages #959	3/11/2006	120	12	-	-	-
South Pages #954	1/11/2006	149	12	-	-	-
South Pages #982	31/10/2006	68	12	-	-	-
South Pages #958	30/10/2006	134	24	-	-	-

Table S3. *Neophoca cinerea*. Values for (Seasonal) Autoregressive Integrated Moving Average (SARIMA) models fitted to 14 adult female Australian sea lions with >18 isotope values. Abbreviation of Animal #ID in parentheses. Numbers in parentheses indicated fitted autoregressive (*p*), differencing order (*d*) and variance of the error term ('moving average') parameters (*q*) with additional parameters for seasonal components. Subscripted numbers next to SARIMA models indicate the time step duration of detected seasonal cycles. No significant residual autocorrelation was detected in any model (Ljung-Box Q <2.8, P>0.1 in all cases). Seasonality in one or both isotopes was detected in seven animals (bold) with only three being characterised by random temporal correlation (italicized).

Animal #ID	$\delta^{13}\text{C}$								$\delta^{15}\text{N}$							
	AR(1)	dif (AR(1))	ARIMA	SARIMA	BIC (AR1)	BIC (selected)	Ljung-Box Q	p	AR(1)	dif (AR(1))	ARIMA	SARIMA	BIC (AR1)	BIC (selected)	Ljung-Box Q	p
Lilliput #6 (L6)	(1,0,0)	-	-	-	-29.6	-	1.37	0.24	(1,0,0)	-	-	-	-31.67	-	0.27	0.61
Lilliput #5 (L5)	-	(1,1,0)	-	-	7.61	-	0.18	0.89	-	-	-	(1,0,0)(1,0,0)₆	-22.11	-25.43	0.96	0.33
Lilliput #3 (L3)	(1,0,0)	-	-	-	3.07	-	0.43	0.51	(1,0,0)	-	-	-	-19.83	-	0.009	0.92
Lilliput #2 (L2)	-	1,1,0	-	-	-1.65	-	0	0.99	-	-	-	(1,1,0)(1,1,0)₁₂	9.95	8.33	0.01	0.92
Lilliput #1 (L1)	(1,0,0)	-	-	-	19.47	-	0.73	0.39	(1,0,0)	-	-	-	-1.77	-	2.8	0.1
Olive #138B (OL138B)	(1,0,0)	-	-	-	3.65	-	0.84	0.36	-	(1,1,0)	-	-	9.6	-	0.04	0.85
Olive #135B (OL135B)	(1,0,0)	-	-	-	-32	-	2.29	0.13	-	-	-	(1,1,0)(1,0,0)₁₂	-37.16	-37.72	0.41	0.52
Liguanea #4 (LIG4)	-	-	-	(1,1,0)(1,1,0)₁₂	31.42	24.05	0.02	0.89	-	-	-	(1,1,0)(1,1,0)₁₂	47.82	28.82	0.61	0.42
Liguanea #2 (LIG2)	-	1,1,0	-	-	-6.8	-18.49	1.96	0.16	-	1,1,0	-	-	3.76	0.23	0.89	0.34
Blefuscu #93 (BL93)	-	-	-	(1,1,0)(1,0,0)₆	-	-	0.05	0.81	-	(1,1,0)	-	-	-42.16	-	0.002	0.96
Blefuscu #94 (BL94)	(1,0,0)	-	-	-	18.15	0.89	0.22	0.64	-	-	(1,1,0)	-	4.6	-5.1	0.02	0.89
West Waldegrave AF3 (WW3)	-	-	-	(0,0,2)(0,0,1)₁₂	-6.46	-27.5	0.04	0.83	-	-	-	(0,0,2)(0,0,1)₁₂	-19.71	-20.87	0.26	0.61
Seal Slide AF1 (SS1)	-	-	-	(1,1,0)(1,0,0)₆	-29.17	-29.55	-	-	-	-	-	(0,1,1)(0,0,1)₆	-10.1	-16.01	0.04	0.85
South Pages #958 (55974)	(1,0,0)	-	-	-	-15.65	-	0.09	0.92	-	-	(0,1,0)	-	-28.48	-30.63	1.16	0.28

SUPPLEMENT 2. ARIMA Modelling

ARIMA (p,d,q) models require the estimation of the number of autoregressive parameters (p) , the differencing order (d) and the variance of the error term ('moving average') parameters (q) . When data exploration suggested seasonality, additional parameters in the form $(p,d,q)_s$ required estimation with 's' representing the periodicity of seasonal influence. Thus, the minimum-parameter first order Seasonal ARIMA $(1,0,0)(0,0,0)_0$ model is essentially an aseasonal first-order autoregression that can be characterised as a temporally-correlated random walk, with the current value being influenced only by the value immediately preceding it.

FPT Analysis

FPT characterises the spatial scale at which patterns occur along a trajectory by identifying the time taken to cross a circle of known radius (Fauchald & Tveraa 2003). The circle radius at which greatest variance in log-transformed FPT ($\text{varlog}_{\max}\text{FPT}$) occurs denotes the spatial scale at which track tortuosity occurs, presumably due to increased search effort.