The following supplement accompanies the article

Identifying foraging habitats of adult female long-nosed fur seal *Arctocephalus forsteri* based on vibrissa stable isotopes

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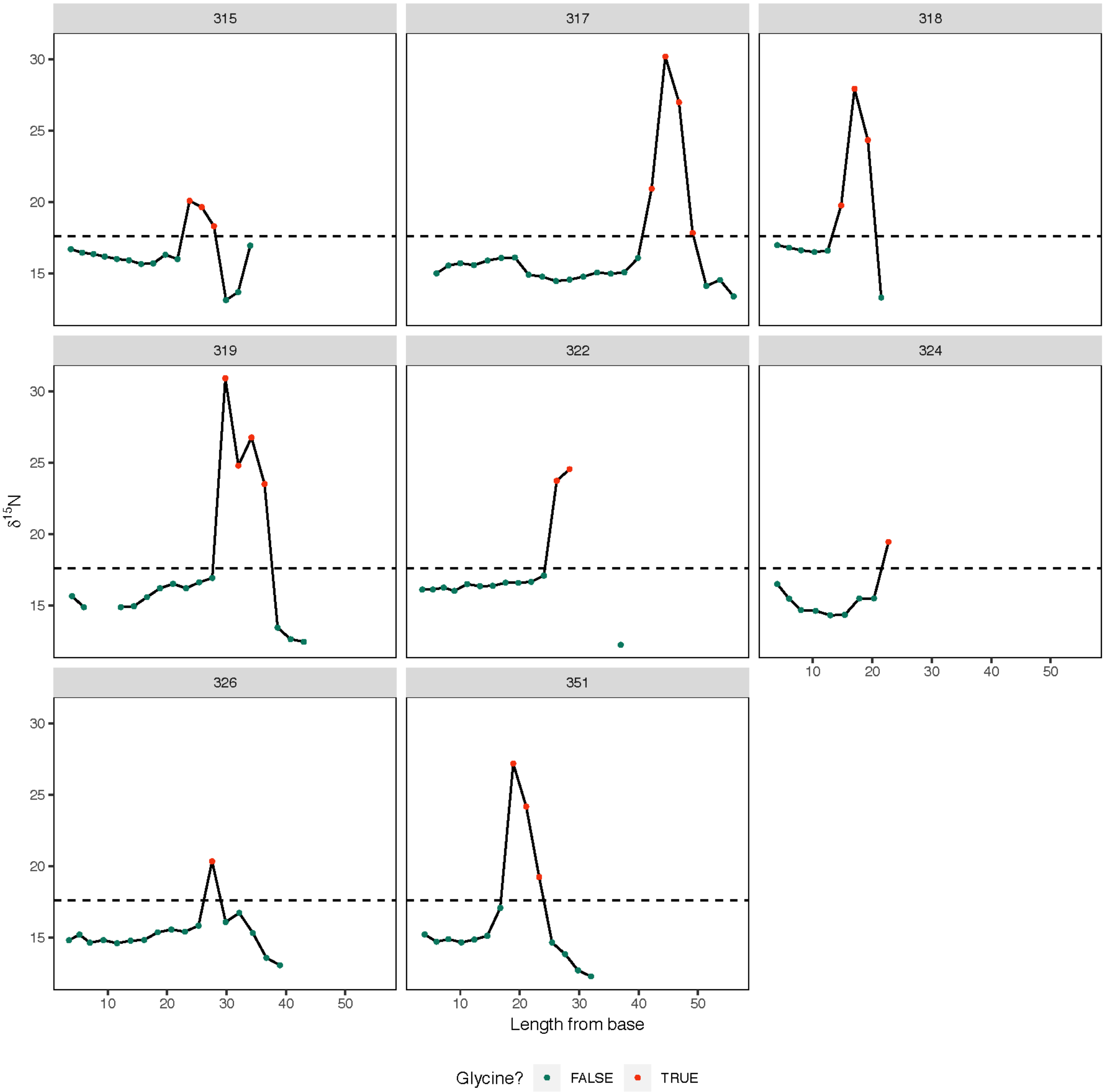

Figure S1. Sequence of $\delta^{15}N$ from adult female long-nosed fur seals administered with a ^{15}N-enriched glycine biomarker at initial capture. The threshold for segments influenced by the glycine was visually determined to be 17.6 ‰. Units: length from base (mm); $\delta^{15}N$ (‰).

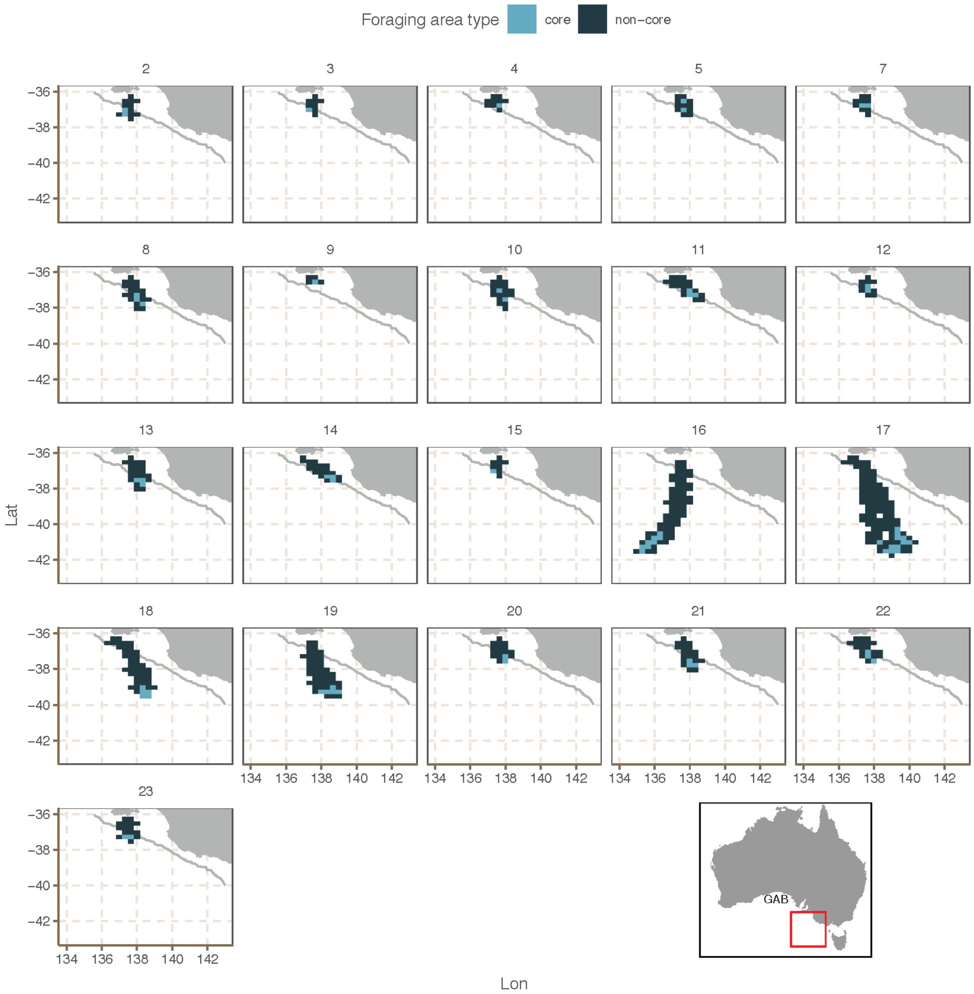

Figure S2. Example of core foraging areas of consecutive trips (number above each plot) from adult female Long-nosed fur seal #450. Core foraging areas are defined as cells in the 90th percentile of the time spent (h) in 30 x 30 km cells for each trip. Inset: the study region relative to Australia. Great Australian Bight, GAB.

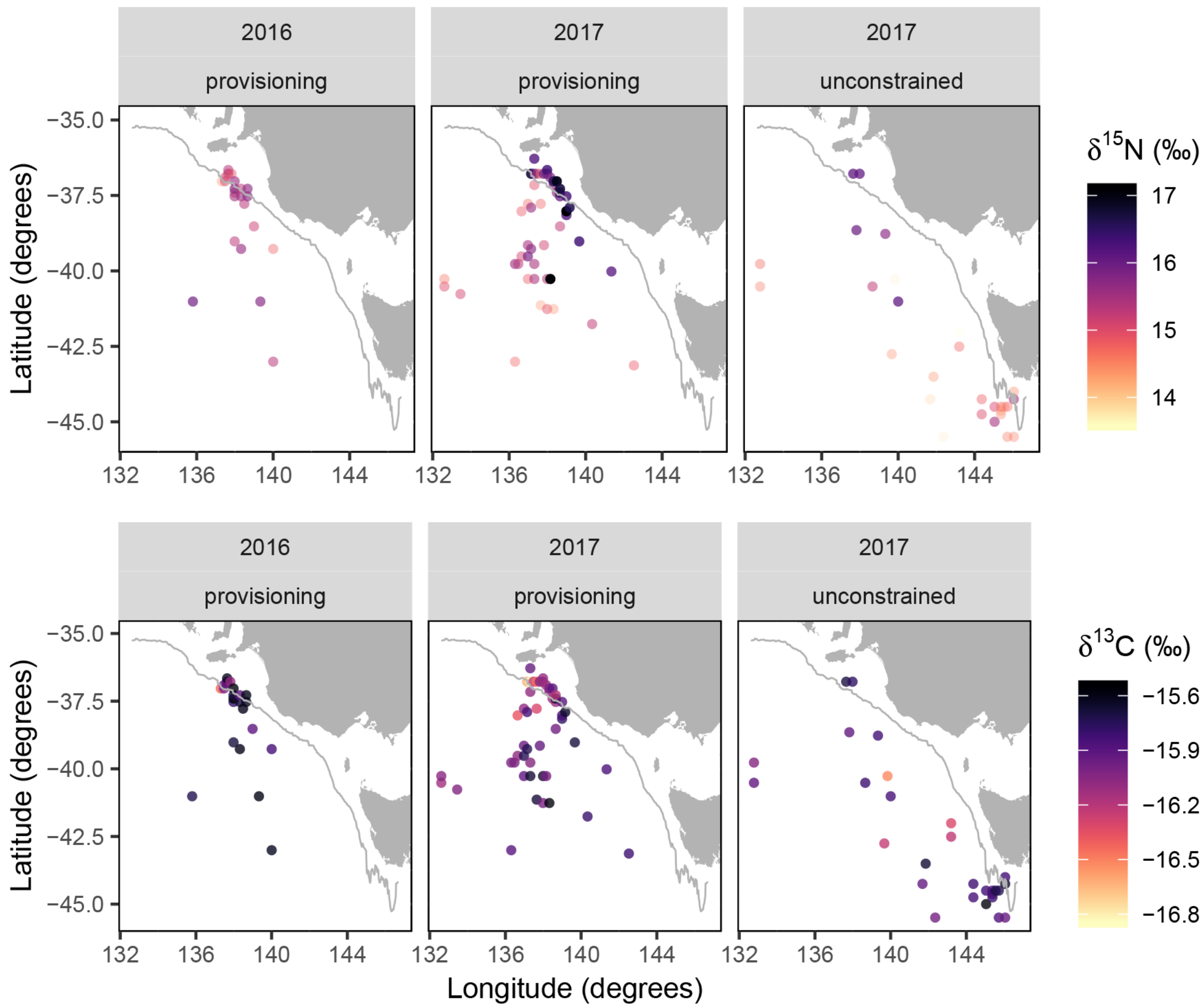

Figure S3. The annual mean stable isotope values at the median core foraging location of individual trips. Lower isotope values are lighter in colour and more transparent. Provisioning represents females that were provisioning a pup whereas unconstrained females were not. The grey solid line represents the 2000 m isobath which separates the continental shelf and shelf break from oceanic waters.

Figure S4. Combined carbon (diamond shape, dashed line) and nitrogen (circle shape, solid line) stable isotope plot of individual adult females. Clusters and uncertainty groupings were obtained from model-based clustering analysis. Clusters 1 and 3 are associated with oceanic foraging while cluster 2 is associated with shelf foraging. Provisioning females are rearing a pup and are considered central place foragers whereas unconstrained females are not. Provisioning females tend to display a bimodal foraging strategy where they switch from predominantly shelf to predominantly oceanic foraging in the middle of lactation. However, some provisioning females may only forage on the shelf or oceanic habitat for most of the lactation period. Unconstrained females are less limited in the foraging range and tend to travel further south than provisioning females.

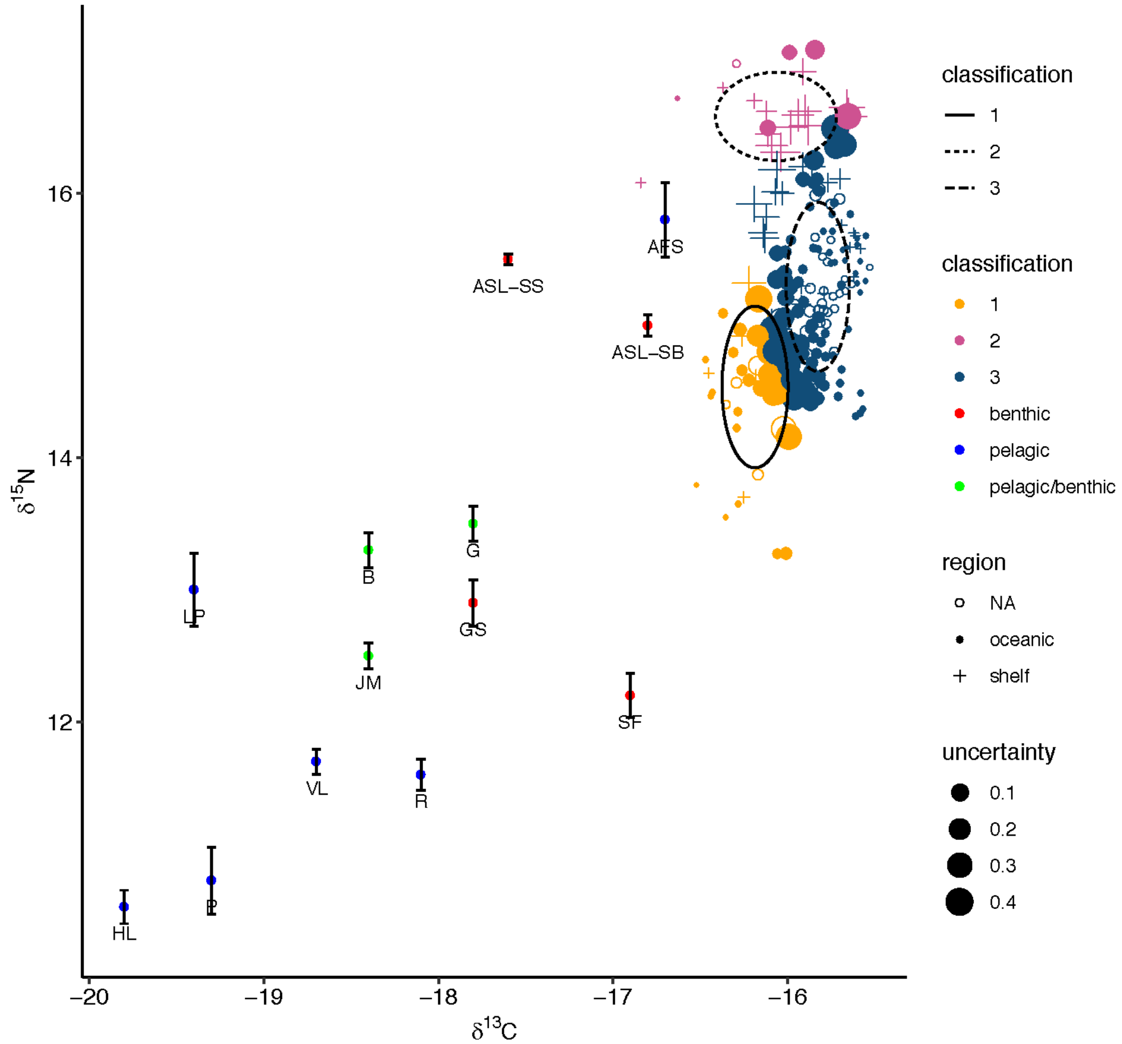

Figure S5. The same isotope biplot as in Fig. 5 with isotope signatures (mean ± SE) of common female Long-nosed fur seal prey (Page et al. 2005) (sampled from southeastern Australia, Davenport & Bax, 2002) and nearby marine mammals – AFS, Australian fur seal (Davenport & Bax 2002) and ASL, Australian sea lion from Seal Bay (SB) and Seal Slide (SS) (Lowther et al. 2013). G, gemfish, B, barracouta, LP, Little penguin, GS, Gould's squid; JM, Jack mackeral; VL, Velvet leatherjacket; R, redbait; SF, sand flathead, P, pilchard, HL, Hector's lanternfish. Y- and X-axes units in ‰.

Table S1. Regrowth vibrissa lengths of 18 adult female long-nosed fur seals. Vibrissae were cut and plucked in 2016 and 2017, respectively. Each vibrissa was sectioned and sampled sequentially into ~ 2 mm segments. [a] the subcutaneous length of a different vibrissa that was plucked on the recapture date.

ID	Whisker length (mm)	Sub. length (mm)	No. sections
2016			
69	48	10[a]	24
71	46	10[a]	24
73	26	9[a]	12
77	28	7[a]	15
450	26	8[a]	14
Sub mean	34.8 ± 11.2		
2017			
307	39	10	20
311	39	8	18
329	31	8	14
340	33.5	8	16
353	33	10	14
315	34	9.5	17
317	56	10	25
318	26	8	12
319	43	10	20
322	37	9	18
324	35	8	15
326	39	7	18
351	32	8	15
Sub mean	36.2 ± 8.2	8.7 ± 1.1	
Overall mean			17.3 ± 4

Table S2. Results of the model selection process to obtain the final models. Models were selected using backwards selection and evaluated using Aikaike's Information Criterion (AIC). d, delta; df, degrees of freedom.

Model	AIC	dAIC	df
$\delta^{15}N$			
state + region*year + (1 | seal)	283.0	0.0	7
region*year + region*state + (1 | seal)	284.1	1.0	8
region*year + region*state	320.6	37.5	7
$\delta^{13}C$			
region + (1 | seal)	-44.6	0.0	4
region + year + (1 | seal)	-43.4	1.2	5
region + year + state + (1 | seal)	-38.7	5.9	6
state + region*state + (1 | seal)	-36.9	7.8	7
region*year + region*state + (1 | seal)	-31.9	12.7	8
region*year + region*state	-15.9	28.7	7
Oceanic cluster			
yday*year	138.5	0.0	5
yday + year	148.7	10.2	4

Table S3. Number of vibrissae stable isotope samples allocated to each cluster group for each study year.

Cluster	**Year**	
	2016	**2017**
1	8	29
2	0	20
3	58	89
Total	66	138

Table S4. Stable isotope values of each individual female long-nosed fur seal (glycine-biased $\delta^{15}N$ values were excluded from calculation) and clusters from model-based cluster analysis.

Seal/cluster	$\delta^{15}N$ (‰)				$\delta^{13}C$ (‰)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
069	15.1	0.2	14.4	15.3	-15.9	0.2	-16.4	-15.7
071	15.4	0.4	14.6	16	-15.8	0.2	-16.3	-15.5
073	15.3	0.3	14.9	15.7	-15.8	0.3	-16.3	-15.6
077	15.3	0.3	14.8	15.7	-15.8	0.2	-16.1	-15.6
307	14.1	0.6	13.3	14.8	-16.1	0.2	-16.5	-15.8
311	15.3	0.4	14.7	15.8	-16.1	0.2	-16.5	-15.7
315	16.1	0.3	15.7	16.7	-16.1	0.1	-16.2	-16
317	15.3	0.6	14.5	16.1	-15.8	0.1	-15.9	-15.7
318	16.7	0.2	16.5	17	-16.1	0.2	-16.4	-15.9
319	15.8	0.8	14.9	16.9	-15.9	0.1	-16	-15.8
322	16.4	0.3	16	17.1	-15.8	0.1	-15.9	-15.7
324	15.1	0.8	14.3	16.5	-15.7	0.2	-16.1	-15.6
326	15.3	0.6	14.6	16.7	-16.2	0.3	-16.8	-16
329	14.5	0.4	13.9	15.3	-16.1	0.1	-16.3	-15.9
340	14.6	0.2	14.2	15.1	-16	0.2	-16.4	-15.8
351	15.1	0.8	14.6	17.1	-16	0.2	-16.4	-15.9
353	15	0.5	14.4	15.5	-15.7	0.1	-15.8	-15.6
450	15.5	0.5	14.5	15.9	-15.8	0.3	-16.4	-15.6
Overall	15.3	0.7	13.3	17.1	-15.9	0.2	-16.8	-15.5
Cluster 1	14.5	0.5	13.3	15.3	-16.2	0.1	-16.5	-16
Cluster 2	16.6	0.3	16.1	17.1	-16.1	0.3	-16.8	-15.7
Cluster 3	15.3	0.5	14.3	16.5	-15.8	0.1	-16.2	-15.5

References

Davenport SR, Bax NJ (2002) A trophic study of a marine ecosystem off southeastern Australia using stable isotopes of carbon and nitrogen. Can J Fish Aquat Sci 59: 514−530