The following supplement accompanies the article

Trophic position and foraging ecology of Ross, Weddell, and crabeater seals revealed by compound-specific isotope analysis

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Relationships of bulk $\delta^{13}C$ and $\delta^{15}N$ values with gender, sampling period, age class, and body mass of the Antarctic seals

Sampling period, gender, and age class have no significant effects on the bulk $\delta^{13}C$ values of Ross Seals (Figs. S5 and S6). However, there is a significant, but weak negative relationship between body mass and $\delta^{13}C$ values (R^2 value of 0.3 from a linear regression analysis, Fig. S6). Sampling period, gender, age class, and body mass all have no significant effects on the bulk $\delta^{15}N$ values of Ross seals (Figs. S5 and S6).

For Weddell seals, sampling period, gender, and body mass have no significant effects on bulk $\delta^{13}C$ values (Figs. S7 and S8). Adult Weddell seals have significantly higher bulk $\delta^{13}C$ values (-24.9 ± 0.6 ‰, n=93) than juveniles (-25.2 ± 0.6 ‰, n=17) and subadults (-25.4 ± 0.5 ‰, n=15) (p = 0.002 in both cases). Sampling period, gender, and body mass have no significant effects on bulk $\delta^{15}N$ values (Figs. S7, and S8). However, Weddell bulk $\delta^{15}N$ values are significantly lower in subadults (11.9 ± 0.7 ‰, n=15) than juveniles (12.6 ± 0.6 ‰, n=17) and adults (12.3 ± 0.6 ‰, n=93) (p-values of 0.02 and 0.004, correspondingly, from Bonferroni post-hoc comparisons) (Fig. S7).

Crabeater seal $\delta^{13}C$ values are not affected significantly by sampling period or gender (Fig. S9). Adult crabeater seals have significantly higher $\delta^{13}C$ values (-24.6 ± 1.3 ‰, n=76) than subadults (-26.3 ± 0.2 ‰, n=10) and juveniles (-26.2 ± 0.4 ‰, n=11) from Bonferroni post-hoc comparisons (p<0.001 in both cases) (Fig. S9). Additionally, crabeater seal $\delta^{13}C$ values increase significantly with increasing body mass (R^2 value of 0.4 from a linear regression analysis) (Fig. S10). The $\delta^{15}N$ values of crabeater seals do not vary significantly with gender (Fig. S9). One significant difference occurs across sampling periods: Amundsen Sea $\delta^{15}N$ values are significantly higher for the austral summer 2007/08 sampling (8.1 ± 0.4 ‰, n = 14) than the austral summer 2010/11 sampling (7.3 ± 0.6 ‰, n = 21) (p<0.001 from Bonferroni post-hoc comparisons). Adult crabeater seals have significantly lower $\delta^{15}N$ values (7.0 ± 0.8 ‰, n = 76) than subadult animals (8.3 ± 0.4 ‰, n = 10, p<0.0001 for the Bonferroni post-hoc comparison) and juvenile seals (7.8 ± 0.3 ‰, n = 11, p = 0.01 for the Bonferroni post-hoc comparison) (Fig. S9). The $\delta^{15}N$ values significantly increase with decreasing body mass (Fig. S10, R^2 value of 0.4 from a linear regression analysis).

Discussion of relationships of bulk stable isotope values with gender, sampling period, age class, and body mass of the Antarctic seals

Our Ross seal bulk $\delta^{13}C$ and $\delta^{15}N$ results suggest a similar diet and foraging region across different genders and age classes. In contrast, the significant relationship between body mass and $\delta^{13}C$ (increasing $\delta^{13}C$ values with decreasing body mass) suggests that Ross seals of

different sizes are foraging in slightly different areas. However, no significant relationship exists between body mass and phenylalanine (Phe) $\delta^{15}N$ value for Ross seals, which varies across different environments as described in the main text. Zhao et al. (2004) found no significant effects of age or sex on Ross seal $\delta^{13}C$ and $\delta^{15}N$ values.

Our Weddell and crabeater seal results show no significant effects of gender on $\delta^{13}C$ and $\delta^{15}N$ values, indicating that foraging area and diet do not differ across genders for these species. This finding is consistent with the results of Zhao et al. (2004) and Burns et al. (1998) for crabeater and Weddell seals, respectively. However, Zhao et al. (2004) reported that male Weddell seals have significantly higher $\delta^{13}C$ and $\delta^{15}N$ values than females.

Weddell seal bulk $\delta^{13}C$ values of adults are significantly higher than those of juveniles and subadults, suggesting that these animals vary their foraging region with age. In contrast, Zhao et al. (2004) and Aubail et al. (2011) found no significant variation in bulk $\delta^{13}C$ values across Weddell seal age classes. However, Goetz et al. (2017) found increasing $\delta^{13}C$ values with age for Weddell seals from analysis of red blood cells (RBC), consistent with our finding. Our results point to adult crabeater seals foraging in a different area than subadults and juveniles, perhaps further offshore given their higher $\delta^{13}C$ values, as well as the positive relationship between body mass and $\delta^{13}C$ value for this species. Likewise, Aubail et al. (2011) found significantly higher $\delta^{13}C$ values in crabeater adults than juveniles, and Hückstädt et al. (2012) found $\delta^{13}C$ values significantly increasing with increasing crabeater seal body mass. In contrast, Zhao et al. (2004) found no significant variability in $\delta^{13}C$ values across age groups.

In this study, both Weddell and crabeater seals have significant variability in $\delta^{15}N$ values across age classes. For crabeater seals, our finding of significantly lower $\delta^{15}N$ values in adults than juveniles is supported by the results of Aubail et al. (2011). The observed bulk stable isotope variation for Weddell and crabeater seals in this study could have resulted from differences in foraging regions, diet, or both between the various age classes. We did not attempt to explore the drivers of $\delta^{15}N$ variations across age classes of Weddell and crabeater seals further in our compound-specific isotope analysis of amino acids (CSI-AA) since limitations entailed in this analysis (i.e., expense and extensive laboratory processing) did not allow for aminio acid $\delta^{15}N$ measurements from a sufficient number of samples for such an investigation. For Weddell seals, we only conducted CSI-AA on tissues from adults. We performed CSI-AA on one subadult and five adults for crabeater seals. The subadult had a higher Phe $\delta^{15}N$ value (6.8 ‰) relative to that of the adults (5.6 ± 0.3 ‰) for the Amundsen/Ross sea region. The $\delta^{15}N_{Pro}$ and $\delta^{15}N_{Glu}$ for the subadult (15.7 ‰ and 15.1 ‰, respectively) were slightly higher than $\delta^{15}N_{Pro}$ and $\delta^{15}N_{Glu}$ values of adults (15.2 ± 0.8 ‰ and 14.7 ± 0.5 ‰) for the Amundsen and Ross Seas. This result indicates the higher bulk $\delta^{15}N$ values of subadult than adult crabeater seals may be driven by the former using a habitat with moderately higher $\delta^{15}N_{baseline}$ values and, perhaps, nitrogen drawdown than the latter. However, CSI-AA must be conducted on considerably more crabeater seal samples before $\delta^{15}N$ variation across age classes can be clearly established and the possible causes can be identified.

The results of other studies measuring bulk $\delta^{15}N$ values of Weddell and crabeater seals differed from our findings. Goetz et al. (2017) found increasing $\delta^{15}N$ values with increasing Weddell seal age. Zhao et al. (2004) compared $\delta^{15}N$ values of Weddell seal pups, juveniles, subadults, and adults, and found only one significant result: adults have higher $\delta^{15}N$ values than subadults. Aubail et al. (2011) reported no significant difference across Weddell seal age groups, which included juveniles and adults. For crabeater seals, Zhao et al. (2004) found no significant variability in $\delta^{15}N$ values of pups, juveniles, subadults, and adults. Overall, the effects of age, as well as gender, on the isotopic values of crabeater and Weddell seals vary

across the research to date. Furthermore, isotope baseline variability may contribute to the differences in bulk stable isotope values across age groups or genders, as mentioned above and discussed in detail in the main text.

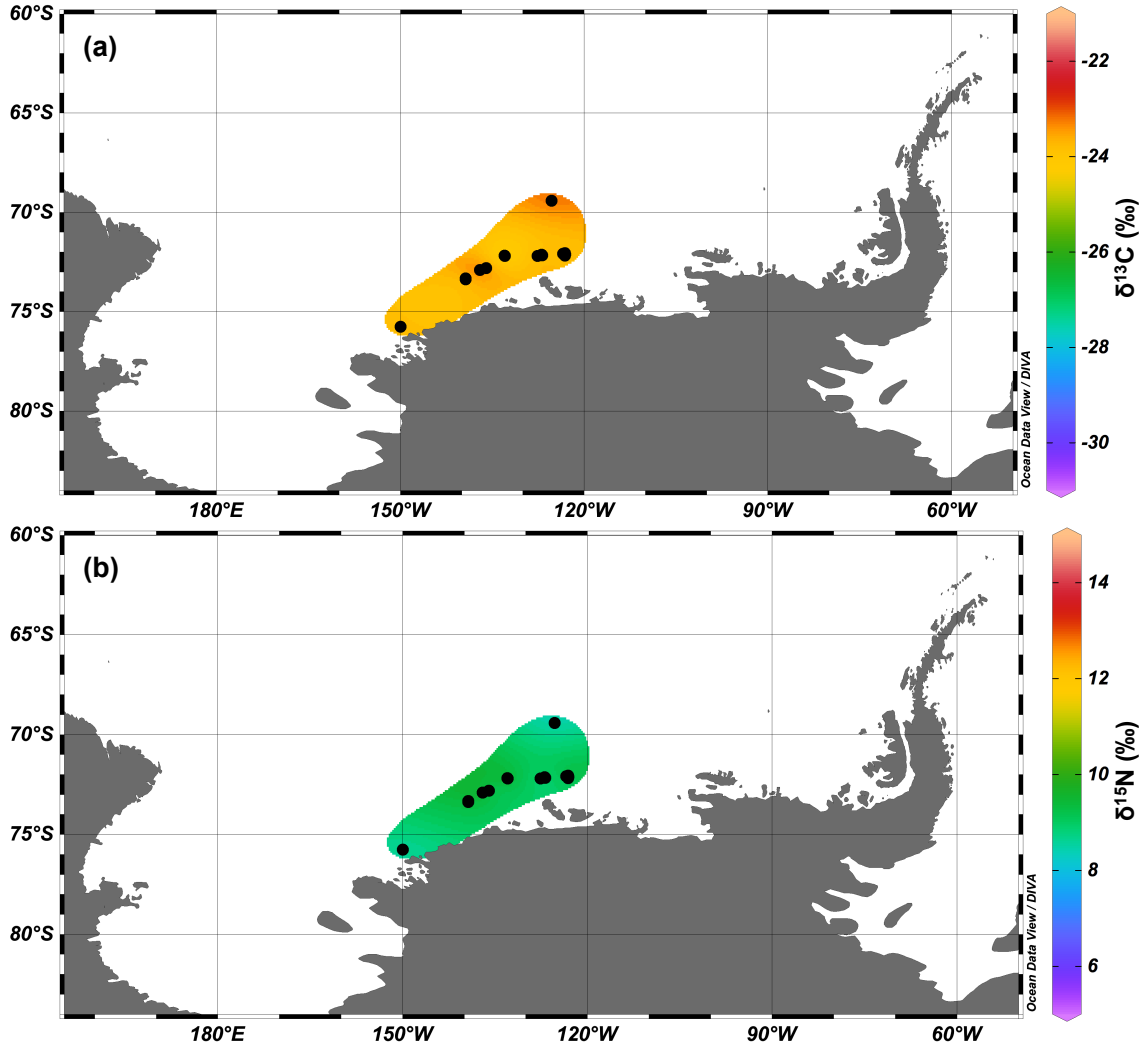

Fig. S1. Spatial variation in the bulk $\delta^{13}C$ (a) and $\delta^{15}N$ (b) values of Ross seals. Black dots indicate sampling locations. Figures were produced in Ocean Data View 4.7.4 (Schlitzer 2015).

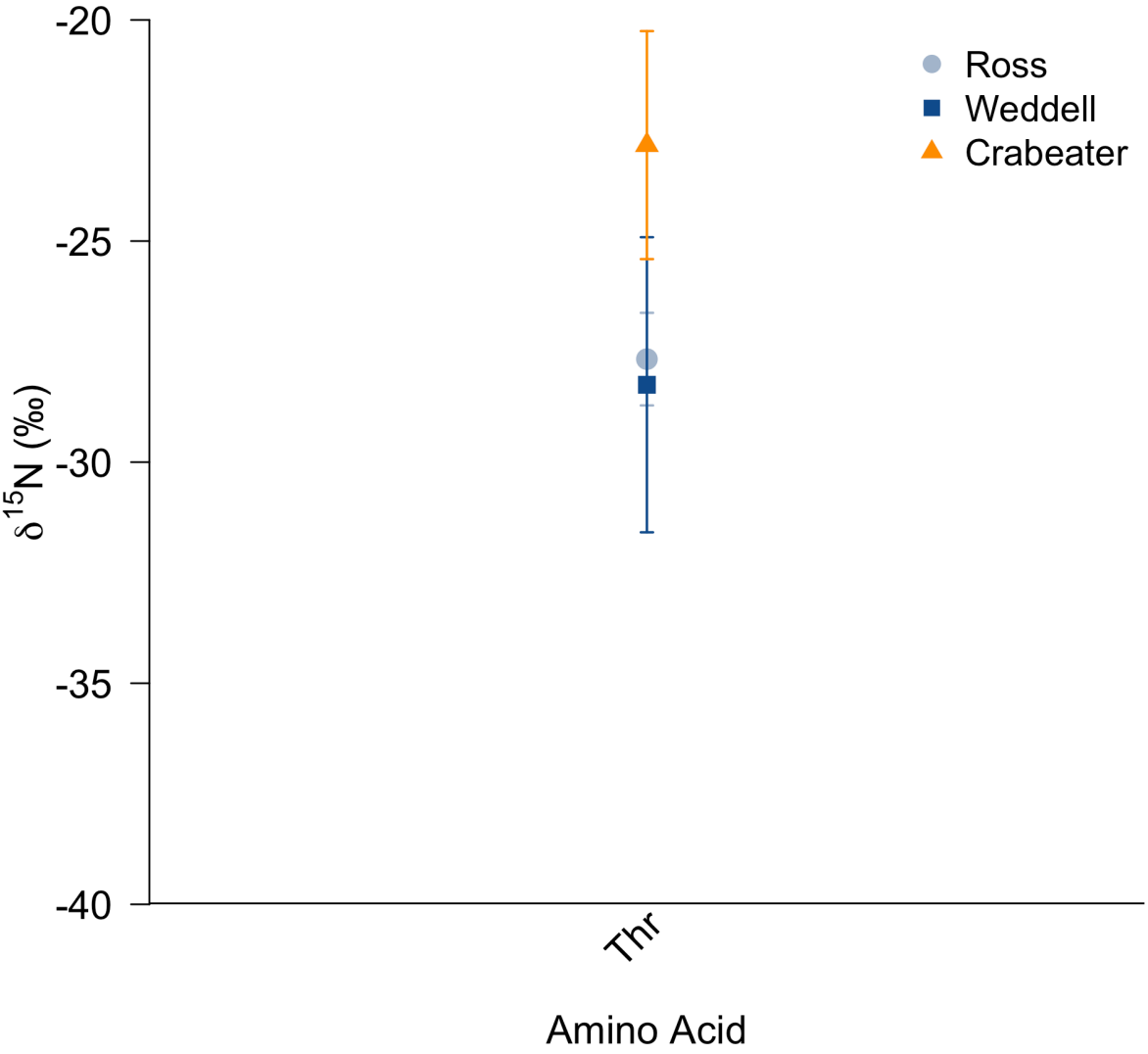

Fig. S2. The $\delta^{15}N$ values (mean ± 1 standard deviation) of threonine (Thr) for Ross, Weddell, and crabeater seals. Species are shown with colors: dark blue squares for Weddell seals, orange triangles for crabeater seals, and light blue circles for Ross seals.

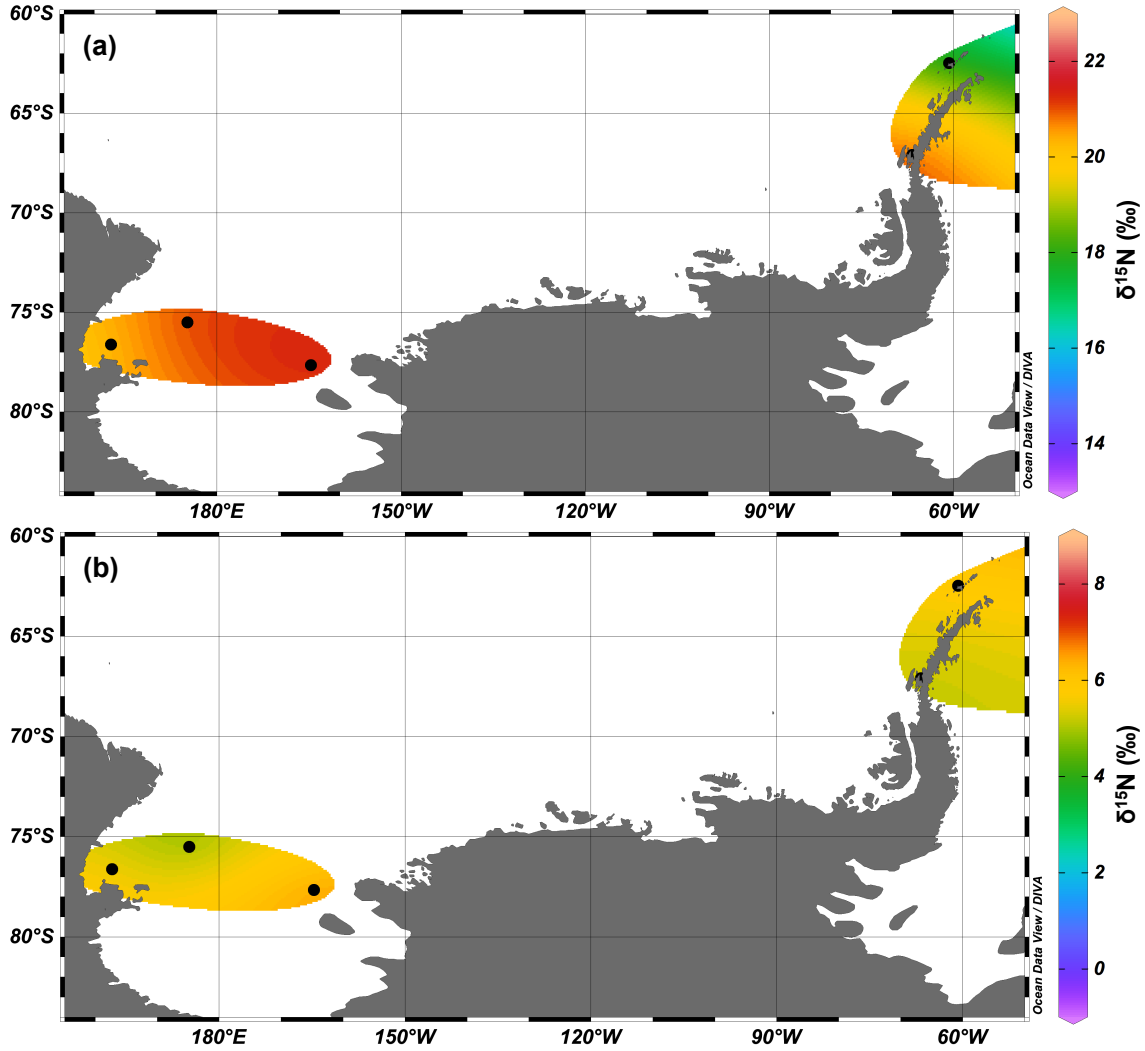

Fig. S3. Spatial variation in the $\delta^{15}N$ values of proline (a) and phenylalanine (b) values for Weddell seals. Black dots indicate sampling locations. Figures were produced in Ocean Data View 4.7.4 (Schlitzer 2015).

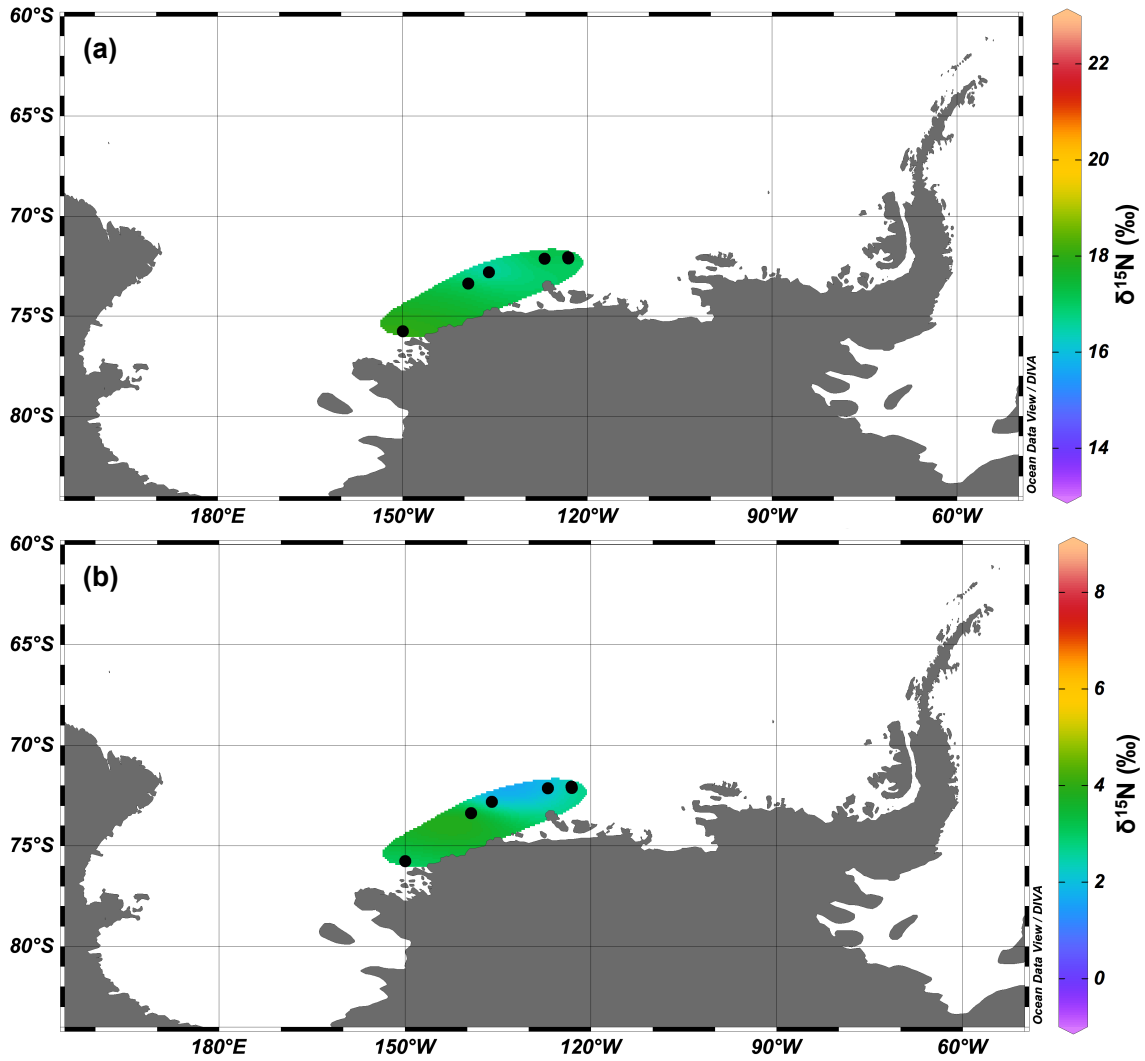

Fig. S4. Spatial variation in the $\delta^{15}N$ values of proline (a) and phenylalanine (b) values for Ross seals. Black dots indicate sampling locations. Figures were produced in Ocean Data View 4.7.4 (Schlitzer 2015).

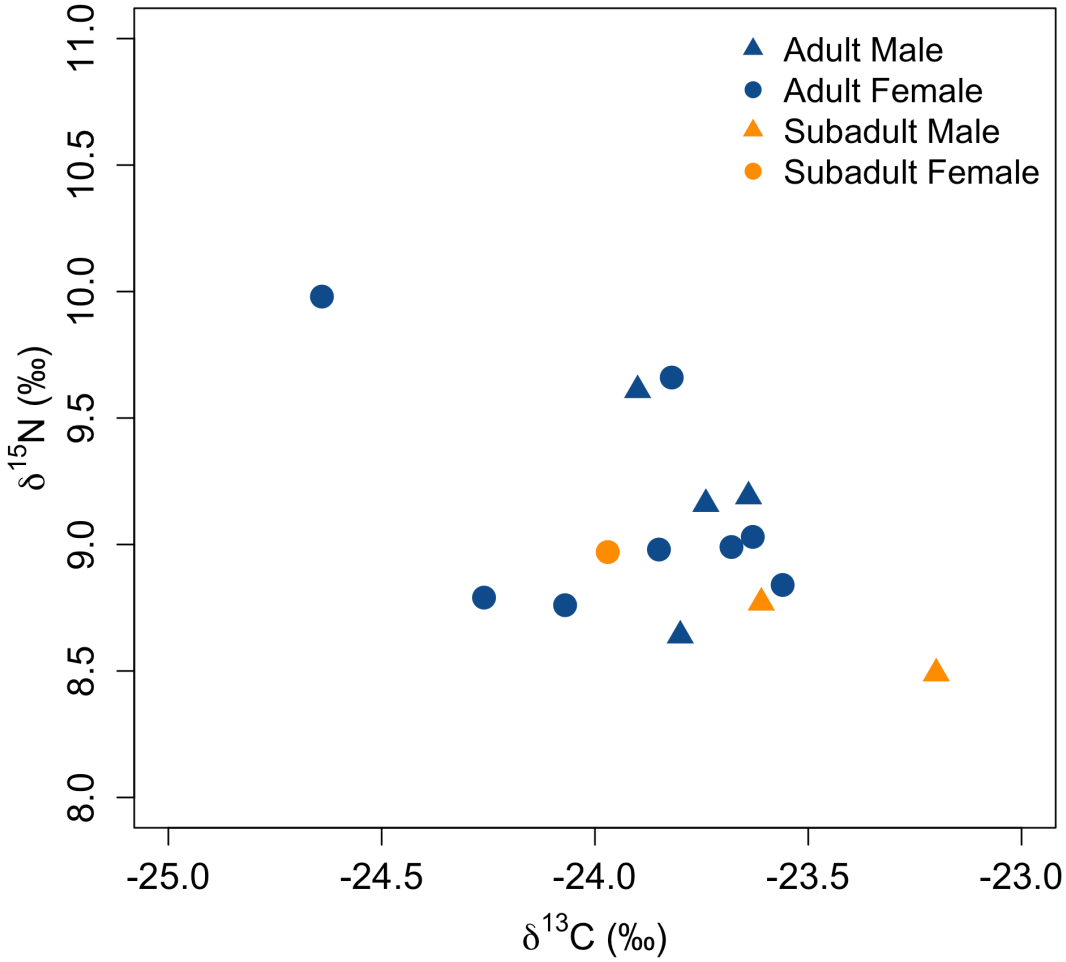

Fig. S5. The bulk $\delta^{13}C$ and $\delta^{15}N$ values for Ross seals. Age class and gender are indicated with colors (orange for subadults and dark blue for adults) and shapes (triangles and circles for males and females, correspondingly).

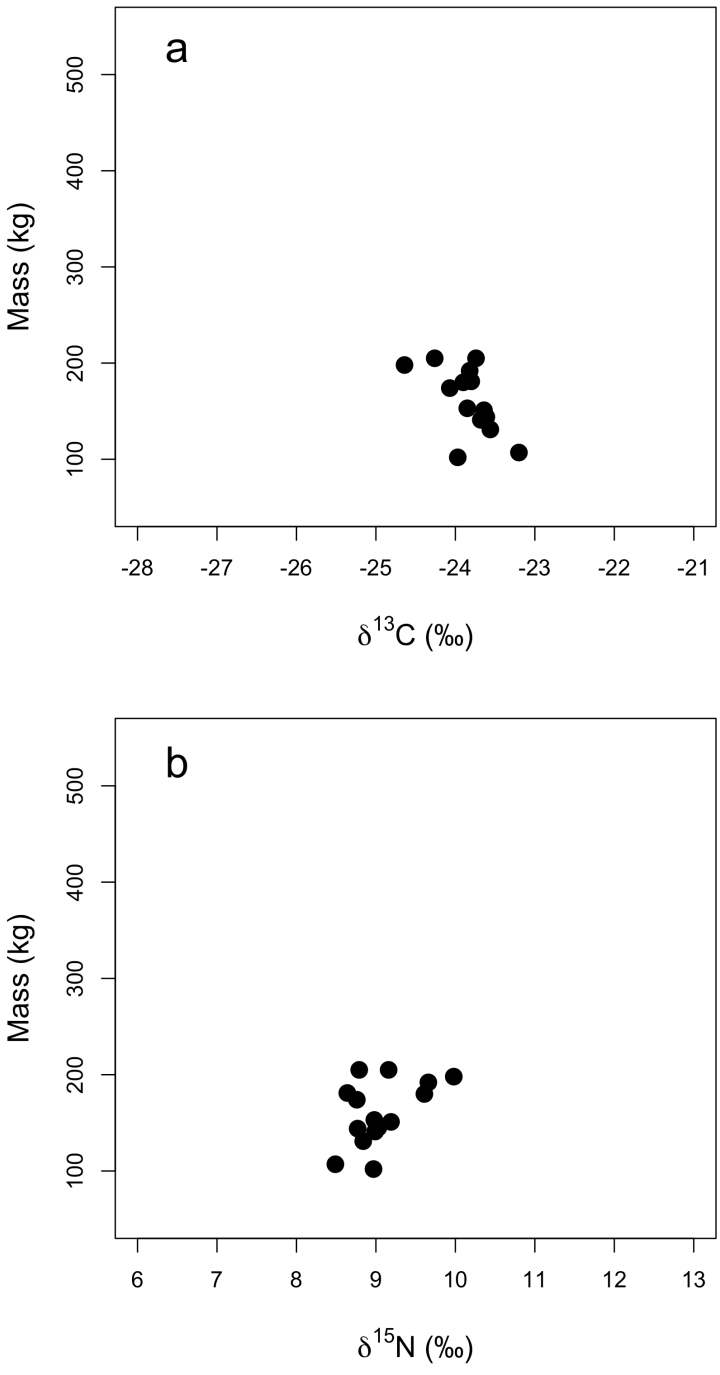

Fig. S6. Mass (kg) versus the bulk $\delta^{13}C$ (a) and $\delta^{15}N$ (b) values for Ross seals.

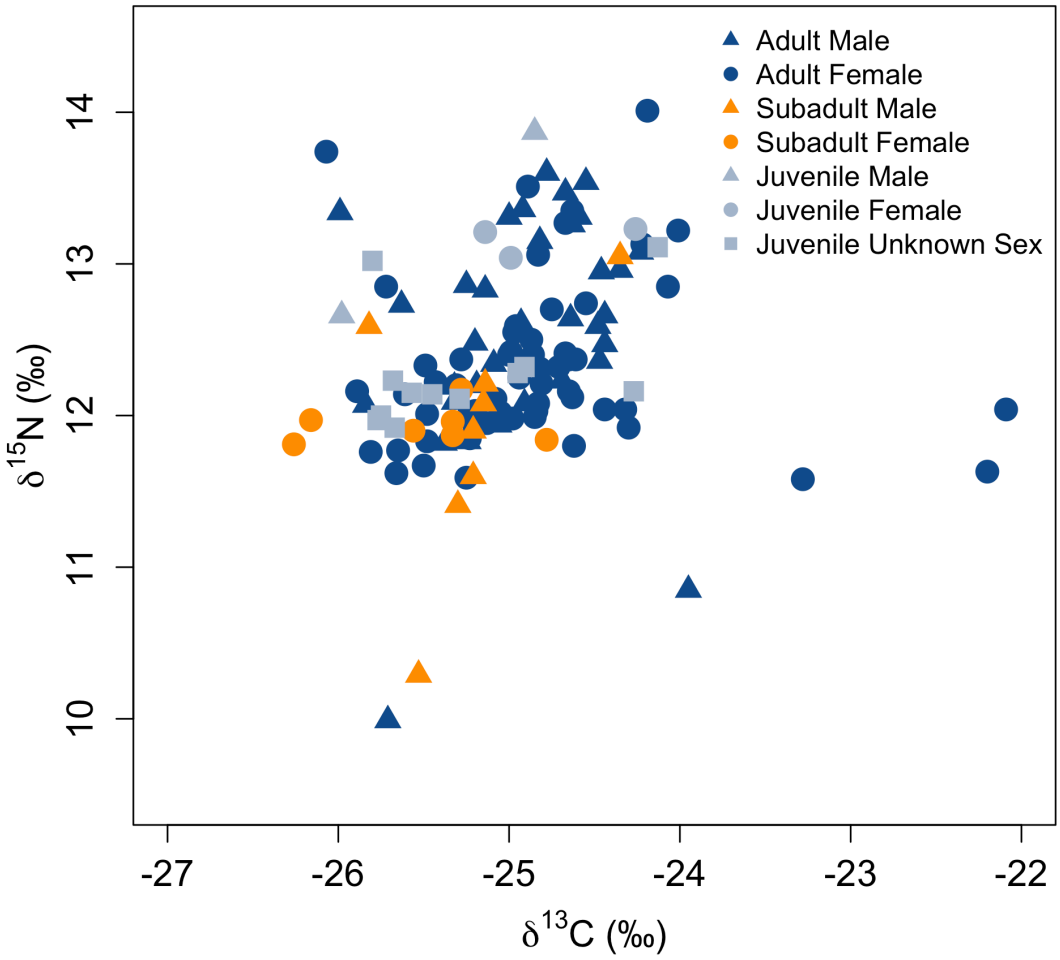

Fig. S7. The bulk $\delta^{13}C$ and $\delta^{15}N$ values for Weddell seals. Age class and gender are indicated with colors (light blue for juveniles, orange for subadults, and dark blue for adults) and shapes (triangles, circles, and squares for males, females, and unknown sex, correspondingly).

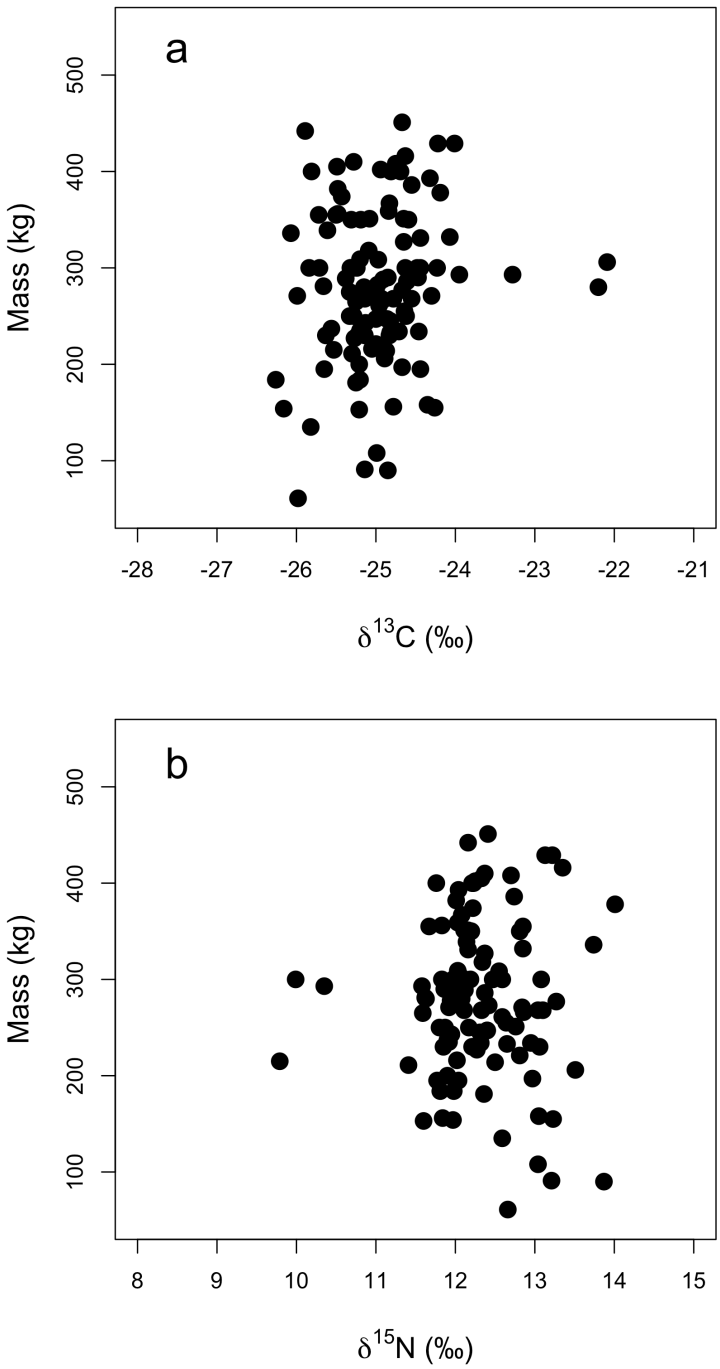

Fig. S8. Mass (kg) versus the bulk $\delta^{13}C$ (a) and $\delta^{15}N$ (b) values of Weddell seals.

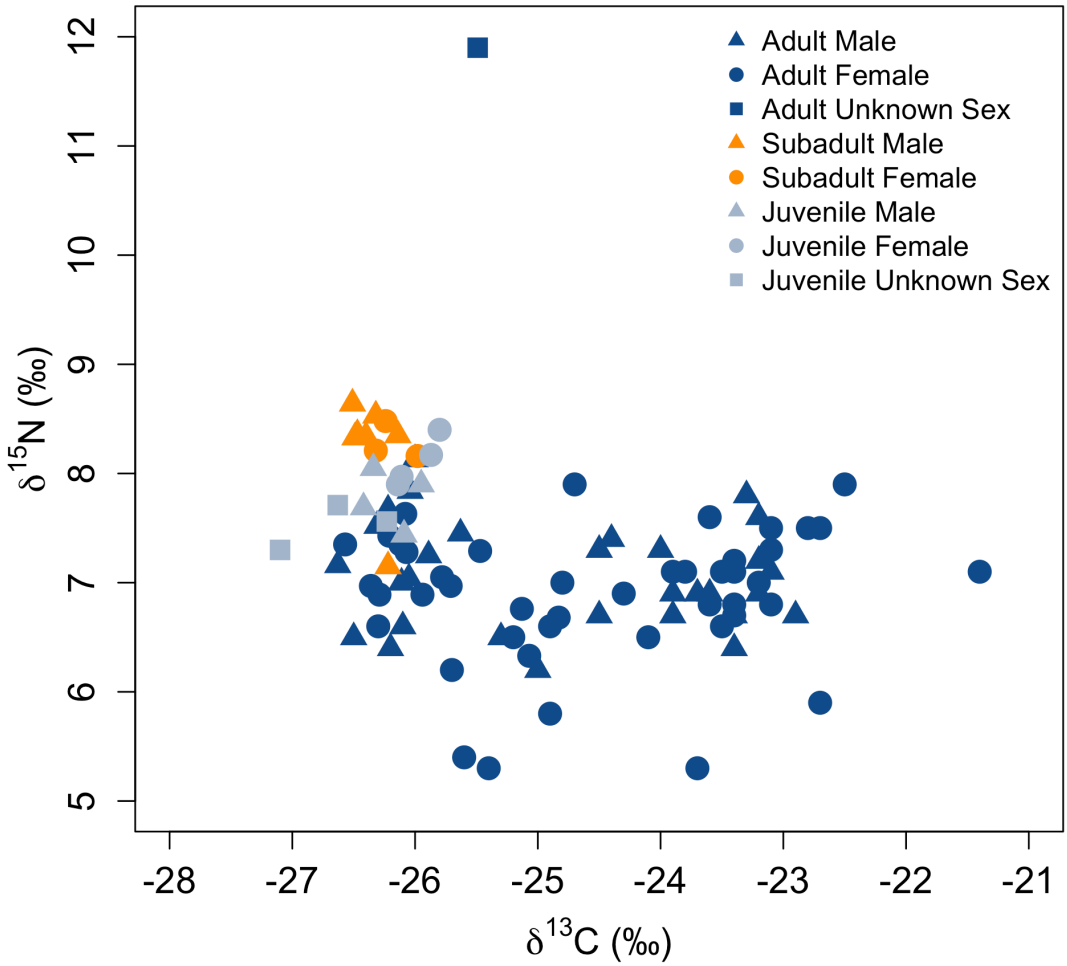

Fig. S9. The bulk $\delta^{13}C$ and $\delta^{15}N$ values for crabeater seals. Age class and gender are indicated with colors (light blue for juveniles, orange for subadults, and dark blue for adults) and shapes (triangles, circles, and squares for males, females, and unknown sex, correspondingly).

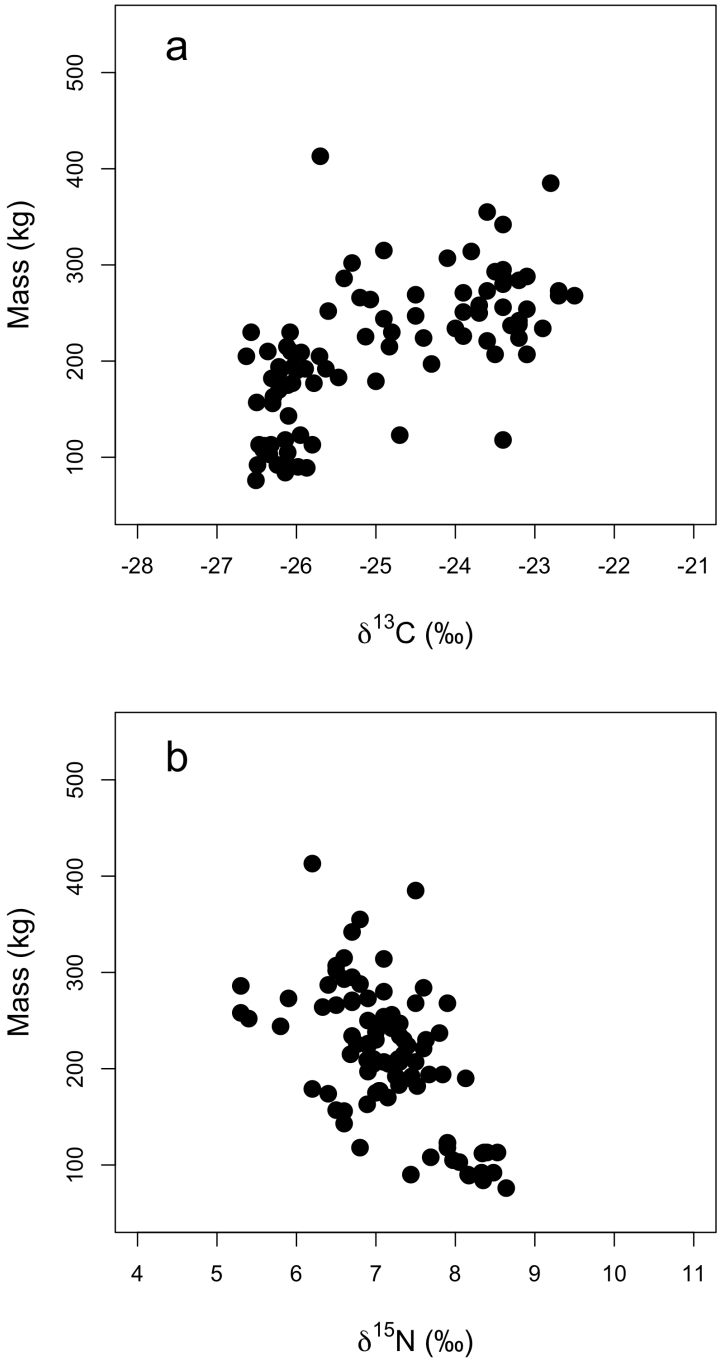

Fig. S10. Mass (kg) versus the bulk $\delta^{13}C$ (a) and $\delta^{15}N$ (b) values of crabeater seals.

Table S1. Sample information for Antarctic Seals. In cases where multiple sample types were obtained from a seal, we indicate the tissue from which isotopic values were used in figures and statistical analyses. Negative latitude and longitude indicate degrees south and west, respectively. Abbreviations: DD, decimal degrees; WB, whole blood; RBCs, red blood cells; F, female; M, male; na, information not available; Su, summer; Sp, spring; F, fall; W, winter; Oden, *RV Oden* cruises; MCM, McMurdo Station region; WAP, West Antarctic Peninsula area; Ad, adult; Sub, subadult; Juv, juvenile; Lat, latitude; Long, longitude.

Species	**Sample ID**	**Source**	**Season**	**Sample Type**	**Age Class**	**Sex**	**Weight (kg)**	**Lat (DD)**	**Long (DD)**
Crabeater	C02	*Oden*	Su 2010/11	Clot	Ad	F	163	-68.6	-102.3
	C03	*Oden*	Su 2008/09	WB	Sub	F	na	-70.6	-107.0
	C03	*Oden*	Su 2010/11	Clot	Ad	F	210	-68.6	-102.5
	C04	*Oden*	Su 2008/09	WB	Sub	M	92	-70.6	-107.0
	C06	*Oden*	Su 2008/09	WB	Sub	M	76	-71.1	-110.5
	C07	*Oden*	Su 2008/09	WB	Sub	F	92	-71.1	-110.5
	C07	*Oden*	Su 2010/11	Hair	Ad	F	205	-69.5	-103.7
	C10	*Oden*	Su 2010/11	Hair	Ad	F	225.4	-69.5	-103.7
	C11	*Oden*	Su 2010/11	Hair	Ad	F	264	-69.5	-103.7
	C14	*Oden*	Su 2010/11	Clot	Ad	F	215	-70.1	-107.4
	C15	*Oden*	Su 2010/11	WB	Sub	M	170	-70.1	-107.4
	C20	*Oden*	Su 2008/09	WB	Ad	M	190	-72.6	-116.0
	C20	*Oden*	Su 2010/11	RBCs	Juv	M	90	-72.7	-114.2
	C21	*Oden*	Su 2008/09	Clot	Sub	M	112	-72.6	-116.0
	C21	*Oden*	Su 2010/11	RBCs	Juv	M	103	-72.7	-114.2
	C22	*Oden*	Su 2008/09	Clot	Sub	M	113	-72.6	-116.0
	C32	*Oden*	Su 2008/09	WB	Ad	F	230	-70.2	-119.9
	C33	*Oden*	Su 2008/09	WB	Ad	M	194	-70.2	-119.9
	C43	*Oden*	Su 2008/09	WB	Ad	F	190	-69.4	-125.3
	C44	*Oden*	Su 2008/09	WB	Ad	M	182	-69.4	-125.3
	C45	*Oden*	Su 2008/09	WB	Ad	F	230	-70.2	-133.5
	C46	*Oden*	Su 2008/09	WB	Sub	F	90	-72.5	-146.5
	C47	*Oden*	Su 2008/09	WB	Ad	M	192	-74.4	-150.7
	C48	*Oden*	Su 2008/09	WB	Ad	F	177	-74.4	-150.7
	C50	*Oden*	Su 2008/09	WB	Sub	M	84	-75.4	-151.3

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	C51	*Oden*	Su 2008/09	WB	Ad	F	210	-75.4	-151.3
	C52	*Oden*	Su 2008/09	WB	Ad	F	183	-75.4	-151.3
	C143	*Oden*	Su 2010/11	WB	Juv	F	105	-72.1	-119.7
	C144	*Oden*	Su 2010/11	WB	Juv	F	118	-72.1	-119.7
	C153	*Oden*	Su 2010/11	WB	Ad	M	192	-72.1	-123.5
	C154	*Oden*	Su 2010/11	WB	Ad	M	177	-72.1	-123.5
	C155	*Oden*	Su 2010/11	Hair	Juv	M	108	-72.2	-126.7
	C156	*Oden*	Su 2010/11	WB	Juv	M	123	-72.2	-126.7
	C157	*Oden*	Su 2010/11	WB	Juv	F	113	-72.2	-126.7
	C158	*Oden*	Su 2010/11	WB	Juv	F	89	-72.2	-126.7
	C173	*Oden*	Su 2010/11	WB	Ad	F	209	-72.8	-135.6
	C174	*Oden*	Su 2010/11	WB	Ad	M	175	-75.3	-139.5
	C175	*Oden*	Su 2010/11	Hair	Ad	F	215	-73.3	-139.5
	C176	*Oden*	Su 2010/11	WB	Ad	M	205	-73.3	-139.5
	C177	*Oden*	Su 2010/11	WB	Ad	M	194	-75.8	-150.0
	Cr 1	MCM	Su 2009/10	Hair	Juv	na	na	-77.6	166.2
	Cr Royds	MCM	Su 2009/10	Hair	Juv	na	na	-77.6	166.2
	Cr 2	MCM	Su 2009/10	Hair	Juv	na	na	-77.6	166.2
	CS11-01	MCM	Su 2010/11	WB	Ad	na	na	-77.7	166.5
	G001	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	F	na	-67.3	-67.6
	G003	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	F	258	-67.3	-67.6
	G004	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	M	342	-69.2	-72.3
	G005	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	F	293	-69.3	-72.4
	G006	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	F	413	-69.3	-72.5
	G007	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	M	287	-69.3	-72.5
	G008	Hückstädt et al. (2012a)	F 2001	Whisker	Ad	F	355	-69.1	-72.4
	G009	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	M	179	-67.7	-69.3
	G010	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	F	307	-68.1	-70.4
	G012	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	F	288	-68.1	-70.2
	G013	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	M	234	-68.1	-70.2

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	G014	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	M	284	-68.1	-70.1
	G015	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	M	234	-67.2	-70.2
	G016	Hückstädt et al. (2012a)	W 2001	Whisker	Ad	F	273	-67.4	-70.9
	G017	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	118	-66.4	-66.8
	G018	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	157	-66.8	-66.8
	G019	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	156	-66.8	-66.8
	G020	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	143	-66.6	-67.5
	G021	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	271	-66.6	-67.5
	G022	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	268	-67.4	-67.7
	G023	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	174	-67.6	-68.2
	G024	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	256	-67.6	-69.0
	G026	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	266	-67.6	-69.0
	G027	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	226	-66.6	-67.5
	G028	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	314	-68.5	-69.8
	G029	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	242	-68.7	-70.0
	G030	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	M	250	-66.6	-67.5
	G031	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	385	-66.3	-66.6
	G032	Hückstädt et al. (2012a)	F 2002	Whisker	Ad	F	230	-68.8	-69.9
	G033	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	268	-66.3	-66.7
	G034	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	295	-66.5	-67.1
	G035	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	238	-66.4	-66.9
	G036	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	207	-66.4	-66.9
	G038	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	273	-67.2	-70.6
	G039	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	247	-68.6	-76.0
	G040	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	302	-68.5	-75.8
	G041	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	269	-68.1	-75.0
	G042	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	224	-68.0	-74.9
	G043	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	224	-68.0	-74.8
	G044	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	280	-65.7	-68.7
	G045	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	F	221	-65.6	-68.6

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	G046	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	237	-65.5	-68.5
	G047	Hückstädt et al. (2012a)	W 2002	Whisker	Ad	M	254	-65.7	-68.5
	G102	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	286	-67.2	-66.9
	G104	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	197	-67.2	-66.9
	G105	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	251	-67.2	-66.8
	G106	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	207	-67.2	-66.8
	G107	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	315	-67.0	-67.4
	G108	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	207	-67.2	-66.8
	G110	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	123	-67.1	-66.8
	G112	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	252	-65.2	-64.2
	G113	Hückstädt et al. (2012a)	F 2007	Whisker	Ad	F	244	-66.1	-65.4
	W02	*Oden*	Su 2008/09	WB	Sub	M	113	-71.7	-112.2
Weddell	W01	*Oden*	Su 2010/11	Hair	Ad	M	251	-72.6	-115.1
	W02	*Oden*	Su 2010/11	Hair	Ad	F	300	-72.6	-115.1
	W04	*Oden*	Su 2010/11	Clot	Ad	F	400	-72.8	-114.4
	W06	*Oden*	Su 2010/11	Clot	Ad	M	400	-72.9	-114.2
	W10	*Oden*	Su 2008/09	WB	Sub	F	156	-77.3	-165.5
	W11	*Oden*	Su 2008/09	WB	Sub	M	153	-77.3	-165.5
	W12	*Oden*	Su 2008/09	WB	Ad	M	318	-77.3	-165.5
	W14	*Oden*	Su 2008/09	WB	Ad	M	288	-77.3	-165.5
	W15	*Oden*	Su 2008/09	WB	Sub	M	211	-77.3	-165.5
	W17	*Oden*	Su 2008/09	WB	Ad	M	278	-77.3	-165.5
	W19	*Oden*	Su 2008/09	WB	Ad	F	309	-77.3	-165.5
	W103	*Oden*	Su 2010/11	WB	Ad	M	300	-72.6	-115.1
	W112	*Oden*	Su 2010/11	Hair	Ad	M	350	-72.9	-114.0
	W113	*Oden*	Su 2010/11	WB	Ad	M	255	-72.9	-114.0
	W116	*Oden*	Su 2010/11	WB	Ad	M	300	-71.7	-115.5
	W117	*Oden*	Su 2010/11	WB	Ad	F	290	-71.7	-115.5
	W118	*Oden*	Su 2010/11	WB	Ad	F	216	-71.7	-115.5

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	W130	*Oden*	Su 2010/11	WB	Sub	M	158	-72.5	-116.6
	W133	*Oden*	Su 2010/11	WB	Ad	M	300	-72.5	-116.6
	W136	*Oden*	Su 2010/11	WB	Ad	F	235	-72.9	-116.9
	W137	*Oden*	Su 2010/11	WB	Ad	F	243	-72.9	-116.9
	W155	*Oden*	Su 2010/11	WB	Juv	F	155	-72.1	-119.2
	W157	*Oden*	Su 2010/11	WB	Juv	F	108	-72.1	-119.2
	W174	*Oden*	Su 2010/11	WB	Ad	F	250	-72.1	-119.7
	W175	*Oden*	Su 2010/11	WB	Ad	M	300	-72.1	-119.7
	W176	*Oden*	Su 2010/11	WB	Ad	M	na	-72.1	-119.7
	W177	*Oden*	Su 2010/11	WB	Ad	M	234	-72.1	-119.7
	W182	*Oden*	Su 2010/11	Hair	Sub	M	215	-72.8	-135.8
	W185	*Oden*	Su 2010/11	WB	Ad	F	400	-75.5	-184.9
	W186	*Oden*	Su 2010/11	WB	Sub	F	154	-75.5	-184.9
	W208	*Oden*	Su 2010/11	WB	Sub	M	135	-78.7	-164.2
	W209	*Oden*	Su 2010/11	WB	Juv	M	61	-78.7	-164.2
	W214	*Oden*	Su 2010/11	WB	Sub	F	184	-77.6	-166.3
	W216	*Oden*	Su 2010/11	WB	Juv	F	91	-77.6	-166.3
	W219	*Oden*	Su 2010/11	WB	Sub	F	237	-77.7	-164.7
	W220	*Oden*	Su 2010/11	WB	Ad	F	261	-77.7	-164.7
	W222	*Oden*	Su 2010/11	WB	Ad	M	350	-77.7	-164.7
	W223	*Oden*	Su 2010/11	WB	Juv	M	90	-77.7	-164.7
	WS10-11	MCM	Su 2009/10	RBCs	Ad	F	308.5	-75.8	162.8
	WS10-12	MCM	Su 2009/10	RBCs	Ad	F	282.5	-75.8	162.8
	WS10-13	MCM	Su 2009/10	RBCs	Ad	F	245	-75.8	162.8
	WS10-17	MCM	Su 2009/10	RBCs	Ad	F	356	-76.5	162.8
	WS10-18	MCM	Su 2009/10	RBCs	Ad	F	265	-76.5	162.8
	WS11-11	MCM	Su 2010/11	WB	Ad	F	281	-76.6	162.7
	WS11-12	MCM	Su 2010/11	WB	Ad	F	355	-77.9	166.8
	WS11-13	MCM	Su 2010/11	WB	Ad	F	247	-76.9	162.5
	WS11-14	MCM	Su 2010/11	WB	Ad	F	286	-76.6	162.7

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	WS11-15	MCM	Su 2010/11	WB	Ad	F	195	-77.2	163.5
	WS12-11	MCM	Su 2011/12	RBCs	Ad	F	273	-76.9	162.8
	WS12-12	MCM	Su 2011/12	RBCs	Ad	F	374	-77.9	166.8
	WS12-13	MCM	Su 2011/12	RBCs	Ad	F	410	-77.9	166.8
	WS12-14	MCM	Su 2011/12	RBCs	Ad	M	227	-76.1	162.4
	WS12-15	MCM	Su 2011/12	RBCs	Ad	M	289	-76.5	162.7
	WS12-22	MCM	Sp 2012	WB	Ad	F	451	-77.7	166.5
	WS12-23	MCM	Sp 2012	WB	Ad	F	442	-77.7	166.9
	WS12-24	MCM	Sp 2012	WB	Ad	F	339	-77.7	166.8
	WS12-25	MCM	Sp 2012	WB	Ad	F	355	-77.7	166.9
	WS12-26	MCM	Sp 2012	WB	Ad	F	408	-77.7	166.7
	G103	WAP	F 2007	Serum	Ad	F	306	-67.2	-66.9
	G111	WAP	F 2007	Plasma	Ad	F	280	-67.1	-66.8
	LW11-03	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-05	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-06	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-07	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-08	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-09	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-10	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-11	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-12	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-13	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-14	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW11-15	MCM	Su 2010/11	WB	Juv	na	na	-74.9	163.7
	LW15-01	MCM	Sp 2015	WB	Ad	M	300	-77.8	166.8
	LW15-02	MCM	Sp 2015	WB	Sub	M	280	-77.8	166.8
	LW15-03	MCM	Sp 2015	WB	Ad	M	300	-77.8	166.8
	LW15-04	MCM	Sp 2015	WB	Ad	M	300	-77.8	166.8
	LW15-05	MCM	Sp 2015	WB	Ad	M	300	-77.8	166.8

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	LW15-06	MCM	Sp 2015	WB	Ad	M	300	-77.7	166.4
	LW15-07	MCM	Sp 2015	WB	Ad	F	350	-77.7	166.4
	LW15-08	MCM	Sp 2015	WB	Sub	F	250	-77.8	166.8
	LW15-09	MCM	Sp 2015	WB	Sub	F	275	-77.7	166.3
	LW15-10	MCM	Sp 2015	WB	Sub	M	230	-77.7	166.4
	LW15-11	MCM	Sp 2015	WB	Sub	F	250	-77.7	166.4
	LW15-12	MCM	Sp 2015	WB	Sub	M	200	-77.7	166.4
	W006	WAP	Su 2009/10	Whisker	Ad	M	293	-62.5	-60.8
	W013	WAP	Su 2009/10	Whisker	Ad	F	293	-62.5	-60.8
	WS10-01	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	327	-77.8	166.8
	WS10-02	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	378	-77.7	166.8
	WS10-03	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	214	-77.7	166.7
	WS10-04	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	195	-77.7	166.7
	WS10-05	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	271	-77.7	166.7
	WS10-06	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	M	271	-77.6	166.2
	WS10-07	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	234	-77.7	166.7
	WS10-19	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	M	184	-76.6	162.7
	WS10-20	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	M	181	-76.6	162.7
	WS10-21	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	F	393	-77.8	166.8
	WS10-22	Goetz et al. (2017)	Su 2009/10	Whisker	Ad	M	290	-77.8	166.8
	WS11-03	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	367	-77.9	166.8
	WS11-04	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	402	-77.9	166.8
	WS11-05	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	M	197	-76.6	162.7
	WS11-06	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	206	-76.6	162.7
	WS11-08	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	277	-76.6	162.7
	WS11-09	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	336	-77.9	166.8
	WS11-17	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	359	-77.9	166.7
	WS11-18	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	247	-77.9	166.7
	WS11-19	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	M	266	-77.7	166.7

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	WS11-21	Goetz et al. (2017)	Su 2010/11	Whisker	Ad	F	382	-77.9	166.8
	WS11-37	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	331	-77.4	166.3
	WS11-38	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	268	-77.4	166.3
	WS11-39	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	268	-77.7	166.3
	WS11-40	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	268	-77.7	166.3
	WS11-41	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	268	-77.7	166.3
	WS12-01	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	405	-77.9	166.8
	WS12-02	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	351	-77.0	162.8
	WS12-04	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	351	-77.9	166.8
	WS12-05	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	386	-76.6	166.7
	WS12-06	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	332	-76.5	166.8
	WS12-07	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	416	-77.8	166.8
	WS12-08	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	429	-77.8	166.8
	WS12-09	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	429	-77.8	166.8
	WS12-10	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	221	-76.6	162.9
	WS12-16	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	230	-76.5	162.7
	WS12-17	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	230	-77.8	166.8
	WS12-19	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	F	230	-77.9	166.8
	WS12-20	Goetz et al. (2017)	Su 2011/12	Whisker	Ad	M	233	-76.1	163.1
Ross	R01	*Oden*	Su 2008/09	WB	Sub	M	107	-69.4	-125.3
	R101	*Oden*	Su 2010/11	WB	Ad	M	180	-72.1	-123.2
	R102	*Oden*	Su 2010/11	WB	Ad	F	145	-72.2	-123.2
	R103	*Oden*	Su 2010/11	WB	Sub	F	102	-72.1	-123.1
	R104	*Oden*	Su 2010/11	WB	Ad	M	205	-72.1	-123.5
	R105	*Oden*	Su 2010/11	WB	Ad	M	151	-72.2	-126.9
	R106	*Oden*	Su 2010/11	WB	Ad	F	174	-72.1	-127.0
	R107	*Oden*	Su 2010/11	WB	Ad	F	131	-72.2	-127.6
	R108	*Oden*	Su 2010/11	WB	Ad	F	198	-72.2	-132.9
	R109	*Oden*	Su 2010/11	WB	Ad	F	153	-72.2	-133.0
	R110	*Oden*	Su 2010/11	Hair	Ad	F	205	-72.9	-137.1

Species	Sample ID	Source	Season	Sample Type	Age Class	Sex	Weight (kg)	Lat (DD)	Long (DD)
	R111	*Oden*	Su 2010/11	WB	Sub	M	144	-72.8	-136.0
	R112	*Oden*	Su 2010/11	WB	Ad	F	192	-73.4	-139.4
	R113	*Oden*	Su 2010/11	WB	Ad	F	141	-73.3	-139.4
	R114	*Oden*	Su 2010/11	WB	Ad	M	181	-75.8	-150.0

Table S2. Summary of tissue types used per analysis. Here, we indicate the sample type for which measurements have been used in figures and statistical analyses.

Sample Type	Bulk Stable Isotope Analysis	Compound-specific Isotope Analysis of Amino Acids
Whole Blood	14	6
Ross seal	66	3
Weddell seal	30	3
Crabeater seal	*110*	*12*
Total		
Red blood cells	0	0
Ross seal	10	0
Weddell seal	0	0
Crabeater seal	*10*	*0*
Total		
Clot	0	0
Ross seal	2	0
Weddell seal	5	0
Crabeater seal	*7*	*0*
Total		
Serum	0	0
Ross seal	1	0
Weddell seal	0	0
Crabeater seal	*1*	*0*
Total		
Plasma	0	0
Ross seal	1	1
Weddell seal	0	0
Crabeater seal	*1*	*1*
Total		
Whisker	0	0
Ross seal	41	2
Weddell seal	52	3
Crabeater seal	*93*	*5*
Total		
Hair	1	0
Ross seal	4	0
Weddell seal	8	0
Crabeater seal	*13*	*0*
Total		

Table S3. Effect of lipid extraction on isotopic values of crabeater, Weddell, and Ross seals. Sample ID as in Table S1. Abbreviations: WB, whole blood without lipid extraction; LE, whole blood with lipid extraction. The difference in isotopic value between whole blood samples with and without lipid extraction is reported. The average difference is 0.0 ± 0.1 ‰ and 0.2 ± 0.1 ‰ for $\delta^{13}C$ and $\delta^{15}N$, respectively. The average difference between the isotopic values with and without lipid extraction do not exceed the instrument error of 0.2 ‰ for either $\delta^{13}C$ and $\delta^{15}N$ values.

Species	**Sample ID**	**Year**	**Sample Type**	**$\delta^{13}C$ (‰)**	**LE $\delta^{13}C$ (‰)**	**$\delta^{15}N$ (‰)**	**LE $\delta^{15}N$ (‰)**	**$\delta^{13}C$ – LE $\delta^{13}C$ (‰)**	**$\delta^{15}N$ – LE $\delta^{15}N$ (‰)**
Crabeater	C03	2008	WB	-26.3	-26.5	8.2	8.0	0.2	0.2
	C06	2008	WB	-26.5	-26.6	8.6	8.5	0.1	0.1
	C07	2008	WB	-26.2	-26.3	8.5	8.3	0.1	0.2
	C20	2008	WB	-26.0	-26.0	8.1	7.9	0.0	0.2
	C46	2008	WB	-26.0	-26.0	8.2	8.1	0.0	0.1
	C52	2008	WB	-25.5	-25.7	7.3	7.1	0.2	0.2
	C153	2010	WB	-25.9	-25.9	7.3	7.2	0.0	0.1
	C154	2010	WB	-26.1	-26.1	7.0	6.9	0.0	0.1
	C176	2010	WB	-26.6	-26.7	7.2	7.0	0.1	0.2
Weddell	W12	2008	WB	-25.1	-25.1	12.3	12.1	0.0	0.2
	W15	2008	WB	-25.3	-25.3	11.4	11.2	0.0	0.2
	W117	2010	WB	-24.9	-24.9	12.0	11.8	0.0	0.2
	W216	2010	WB	-25.1	-25.2	13.2	13.1	0.1	0.1
	W223	2010	WB	-24.9	-24.9	13.9	13.8	0.0	0.1
Ross	R01	2008	WB	-23.2	-23.2	8.5	8.4	0.0	0.1
	R101	2010	WB	-23.9	-23.9	9.6	9.4	0.0	0.2
	R102	2010	WB	-23.6	-23.7	9.0	8.8	0.1	0.2
	R103	2010	WB	-24.0	-24.0	9.0	8.8	0.0	0.2
	R108	2010	WB	-24.6	-24.7	10.0	9.8	0.1	0.2
	R112	2010	WB	-23.8	-23.8	9.7	9.6	0.0	0.1
	R114	2010	WB	-23.7	-23.7	8.6	8.5	0.0	0.1

Table S4. Bulk $\delta^{13}C$ and $\delta^{15}N$ values of crabeater, Weddell, and Ross seals for multiple tissue types. These isotopic values are used to calculate the isotopic offsets between different tissue types, see Table S4 below. Abbreviations are as in Tables S1. Note, the multiple tissues types of an individual (indicated by an ID) were collected at the same time and place.

Species	**ID**	**Year**	**WB**		**Clot**		**RBCs**		**Hair**	
			$\delta^{13}C$ (‰)	**$\delta^{15}N$ (‰)**	**$\delta^{13}C$ (‰)**	**$\delta^{15}N$ (‰)**	**$\delta^{13}C$ (‰)**	**$\delta^{15}N$ (‰)**	**$\delta^{13}C$ (‰)**	**$\delta^{15}N$ (‰)**
Crabeater	C14	Su 2010/11			-26.1	7.3			-23.7	6.4
	C143	Su 2010/11	-26.1	8.0					-24.5	7.5
	C157	Su 2010/11	-25.8	8.4					-24.6	8.7
	C158	Su 2010/11	-25.9	8.2					-24.4	8.0
	C173	Su 2010/11	-25.9	6.9					-24.2	6.6
	C174	Su 2010/11	-26.1	7.0	-26.1	6.8			-24.4	7.5
	C176	Su 2010/11	-26.6	7.2			-26.8	6.9		
	C02	Su 2010/11			-26.3	6.9			-24.7	7.1
	C20	Su 2010/11					-26.1	7.4	-25.0	7.0
	C21	Su 2010/11					-26.3	8.1	-24.9	7.3
	C03	Su 2010/11			-26.4	7.0			-24.2	7.0
Weddell	WS12-22	Sp 2012	-24.7	12.4			-24.4	12.1		
	WS12-23	Sp 2012	-25.9	12.2			-25.3	11.7		
	WS12-24	Sp 2012	-25.6	12.1			-25.5	12.1		
	WS12-25	Sp 2012	-25.7	12.9			-25.0	12.0		
	WS12-26	Sp 2012	-24.8	12.7			-24.7	12.5		
	W116	Su 2010/11	-24.5	12.6					-23.2	12.9
	W117	Su 2010/11	-24.9	12.0					-23.3	12.7
	W118	Su 2010/11	-25.1	12.0	-24.9	11.9				
	W130	Su 2010/11	-24.4	13.1			-24.4	13.0		
	W133	Su 2010/11	-24.4	12.5					-23.0	13.1
	W136	Su 2010/11	-25.2	11.9	-25.3	12.0				
	W137	Su 2010/11	-25.1	12.0			-25.1	11.9	-23.6	12.8
	W176	Su 2010/11	-24.3	13.0					-22.9	13.0
	W208	Su 2010/11	-25.8	12.6			-25.9	12.4		
	W216	Su 2010/11	-25.1	13.2	-25.0	13.2				
	W219	Su 2010/11	-25.6	11.9	-25.4	11.9				
	W220	Su 2010/11	-25.0	12.6	-25.0	12.4				
	W04	Su 2010/11			-24.8	12.2			-23.5	12.6
	W06	Su 2010/11			-24.7	12.2			-23.5	12.2
Ross	R101	Su 2010/11	-23.9	9.6					-22.6	10.3
	R103	Su 2010/11	-24.0	9.0					-22.8	11.0
	R105	Su 2010/11	-23.6	9.2					-22.4	10.1
	R107	Su 2010/11	-23.6	8.8					-22.4	10.5
	R108	Su 2010/11	-24.6	10.0					-23.0	10.8

Table S5. Calculated isotopic offsets between different tissue types for crabeater, Weddell, and Ross seals. Abbreviations are as in Tables S1. If a calculated mean offset is ≤ 0.2 ‰, then the offset between the two tissue types is considered insignificant (less than instrumental error as indicated by the quality control standard).

Species	Offset Type	Sample ID	$\delta^{13}C$ Offset (‰)	$\delta^{15}N$ Offset (‰)	Mean $\delta^{13}C$ Offset (‰)	Mean $\delta^{15}N$ Offset (‰)
Crabeater	WB – Clot	C174	0.0	0.2	0.0	0.2
	WB – RBCs	C176	0.2	0.2	0.2	0.2
	WB – Hair	C143	-1.6	0.4	-1.6	0.0
		C157	-1.2	-0.3		
		C158	-1.5	0.2		
		C173	-1.7	0.3		
		C174	-1.7	-0.5		
	Clot – Hair	C14	-2.4	0.9	-2.0	0.0
		C174	-1.7	-0.7		
		C2	-1.5	-0.2		
		C3	-2.1	0.0		
	RBCs – Hair	C20	-1.1	0.4	-1.3	0.6
		C21	-1.5	0.8		
Weddell	WB – Clot	W118	-0.2	0.1	-0.1	0.1
		W136	0.1	-0.1		
		W216	-0.1	0.0		
		W219	-0.2	0.0		
		W220	0.0	0.2		
	WB – RBCs	WS12-22	-0.2	0.3	-0.2	0.3
		WS12-23	-0.6	0.4		
		WS12-24	-0.2	0.1		
		WS12-25	-0.7	0.9		
		WS12-26	-0.1	0.2		
		W130	0.1	0.1		
		W137	0.0	0.0		
		W208	0.0	0.2		
	WB – Hair	W116	-1.3	-0.3	-1.4	-0.5
		W117	-1.5	-0.7		
		W133	-1.4	-0.6		
		W137	-1.5	-0.9		
		W176	-1.4	0.0		
	Clot – Hair	W4	-1.3	-0.4	-1.2	-0.2
		W6	-1.2	0.0		
	RBCs – Hair	W137	-1.5	-0.9	-1.5	-0.9
Ross	WB – Hair	R101	-1.3	-0.7	-1.3	-1.2
		R103	-1.2	-2.0		
		R105	-1.2	-0.9		
		R107	-1.2	-1.6		
		R108	-1.6	-0.8		

Table S6. Bulk $\delta^{13}C$ and $\delta^{15}N$ values of Weddell seals for multiple blood sample types. These isotopic values are used to calculate the isotopic offsets between these different sample types, see Table S6 below. Abbreviations are as in Tables S1. Note, the multiple tissues types of an individual (indicated by an ID) were collected at the same time and place.

ID	Year	WB		Plasma		Serum		RBCs	
		$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)
LW15-01	Sp 2015	-25.8	12.1	-26.4	12.3	-26.2	12.7		
LW15-02	Sp 2015	-25.2	12.1	-25.6	13.0	-25.3	13.4		
LW15-03	Sp 2015	-25.3	12.1	-25.7	12.7	-25.5	13.1		
LW15-11	Sp 2015	-25.3	12.2	-26.2	12.8	-25.8	13.3		
LW15-12	Sp 2015	-25.2	11.9	-25.8	12.8	-25.5	13.3		
WS12-22	Sp 2012	-24.7	12.4					-24.4	12.1
WS12-23	Sp 2012	-25.9	12.2					-25.3	11.7
WS12-24	Sp 2012	-25.6	12.1					-25.5	12.1
WS12-25	Sp 2012	-25.7	12.9					-25.0	12.0
WS12-26	Sp 2012	-24.8	12.7					-24.7	12.5
W130	Su 2010/11	-24.4	13.1					-24.4	13.0
W137	Su 2010/11	-25.1	12.0					-25.1	11.9
W208	Su 2010/11	-25.8	12.6					-25.9	12.4

Table S7. Calculated isotopic offsets between different blood sample types for Weddell seals. Abbreviations are as in Tables S1. If a calculated mean offset is ≤ 0.2 ‰, then the offset between the two sample types is considered insignificant (less than instrumental error as indicated by the quality control standard).

Offset Type	Sample ID	$\delta^{13}C$ Offset (‰)	$\delta^{15}N$ Offset (‰)	Mean $\delta^{13}C$ Offset (‰)	Mean $\delta^{15}N$ Offset (‰)
Plasma – Serum	LW15-01	-0.2	-0.4	-0.3	-0.4
	LW15-02	-0.3	-0.4		
	LW15-03	-0.2	-0.4		
	LW15-11	-0.3	-0.5		
	LW15-12	-0.3	-0.5		
WB – Serum	LW15-01	0.4	-0.6	0.3	-1.1
	LW15-02	0.2	-1.3		
	LW15-03	0.1	-1.0		
	LW15-11	0.5	-1.2		
	LW15-12	0.3	-1.4		
WB – Plasma	LW15-01	0.5	-0.2	0.6	-0.7
	LW15-02	0.4	-0.9		
	LW15-03	0.4	-0.6		
	LW15-11	0.9	-0.7		
	LW15-12	0.6	-0.9		
WB – RBCs	WS12-22	-0.3	0.3	-0.2	0.3
	WS12-23	-0.6	0.5		
	WS12-24	-0.1	0.0		
	WS12-25	-0.7	0.9		
	WS12-26	-0.1	0.2		
	W130	0.1	0.1		
	W137	0.0	0.0		
	W208	0.0	0.2		

Table S8. Bulk $\delta^{13}C$ and $\delta^{15}N$ values of crabeater, Weddell, and Ross seals. Note, bulk $\delta^{13}C$ and $\delta^{15}N$ values are reported for the original measurement (Orig.) and with a correction to whole blood (Corr.) if the sample is a tissue type with a significant isotopic offset from whole blood. Isotopic offset between whole blood and the given sample type are reported in Tables S4 and S6, above. Atomic C:N ratios are from the original measurements. Samples with an asterisk and two asterisks are from Hückstädt et al. (2012a) and Goetz et al. (2017), correspondingly; all other data are from this study. Whisker data are from the segment representing the most recent time period, which best overlaps with the collection location and integrated time of blood tissues, except data from Hückstädt et al. (2012a) are an average for all segments. Abbreviations are as in Table S1. Additionally, "WAP," "RS," and "AM" abbreviate "West Antarctic Peninsula," "Ross Sea," and "Amundsen Sea," respectively.

Species	Sample ID	Season	Region	Sample Type	Orig. $\delta^{13}C$ (‰)	Orig. $\delta^{15}N$ (‰)	Corr. $\delta^{13}C$ (‰)	Corr. $\delta^{15}N$ (‰)	Atomic C:N
Crabeater	C02	Su 2010/11	AM	Clot	-26.3	6.9	–	–	3.8
	C03	Su 2008/09	AM	WB	-26.3	8.2	–	–	3.9
	C03	Su 2010/11	AM	Clot	-26.4	7.0	–	–	3.8
	C04	Su 2008/09	AM	WB	-26.5	8.3	–	–	4.0
	C06	Su 2008/09	AM	WB	-26.5	8.6	–	–	3.9
	C07	Su 2008/09	AM	WB	-26.2	8.5	–	–	3.9
	C07	Su 2010/11	AM	Hair	-24.1	7.0	-25.7	–	3.4
	C10	Su 2010/11	AM	Hair	-23.5	6.8	-25.1	–	3.4
	C11	Su 2010/11	AM	Hair	-23.5	6.3	-25.1	–	3.4
	C14	Su 2010/11	AM	Clot	-26.1	7.4	–	–	3.9
	C15	Su 2010/11	AM	WB	-26.2	7.2	–	–	3.9
	C20	Su 2008/09	AM	WB	-26.0	8.1	–	–	3.9
	C20	Su 2010/11	AM	RBCs	-26.1	7.4	–	–	3.8
	C21	Su 2008/09	AM	Clot	-26.4	8.3	–	–	3.9
	C21	Su 2010/11	AM	RBCs	-26.3	8.1	–	–	3.9
	C22	Su 2008/09	AM	Clot	-26.5	8.4	–	–	3.9
	C32	Su 2008/09	AM	WB	-26.1	7.6	–	–	3.9
	C33	Su 2008/09	AM	WB	-26.0	7.8	–	–	3.8
	C43	Su 2008/09	AM	WB	-26.2	7.4	–	–	3.9
	C44	Su 2008/09	AM	WB	-26.3	7.5	–	–	3.9
	C45	Su 2008/09	AM	WB	-26.6	7.4	–	–	3.9
	C46	Su 2008/09	AM	WB	-26.0	8.2	–	–	3.8
	C47	Su 2008/09	RS	WB	-25.6	7.5	–	–	3.9
	C48	Su 2008/09	RS	WB	-25.8	7.1	–	–	4.0
	C50	Su 2008/09	RS	WB	-26.1	8.4	–	–	4.0
	C51	Su 2008/09	RS	WB	-26.1	7.3	–	–	3.8
	C52	Su 2008/09	RS	WB	-25.5	7.3	–	–	3.8
	C143	Su 2010/11	AM	WB	-26.1	8.0	–	–	3.9
	C144	Su 2010/11	AM	WB	-26.1	7.9	–	–	3.9
	C153	Su 2010/11	AM	WB	-25.9	7.3	–	–	3.9
	C154	Su 2010/11	AM	WB	-26.1	7.0	–	–	3.9
	C155	Su 2010/11	AM	Hair	-24.8	7.7	-26.4	–	3.4
	C156	Su 2010/11	AM	WB	-26.0	7.9	–	–	3.9
	C157	Su 2010/11	AM	WB	-25.8	8.4	–	–	4.0
	C158	Su 2010/11	AM	WB	-25.9	8.2	–	–	4.0
	C173	Su 2010/11	AM	WB	-25.9	6.9	–	–	3.9
	C174	Su 2010/11	AM	WB	-26.1	7.0	–	–	3.9
	C175	Su 2010/11	AM	Hair	-23.2	6.7	-24.8	–	3.4
	C176	Su 2010/11	AM	WB	-26.6	7.2	–	–	3.9
	C177	Su 2010/11	RS	WB	-26.2	7.7	–	–	3.9
	Cr-1	Su 2009/10	RS	Hair	-25.0	7.7	-26.6	–	3.4
	Cr-CR	Su 2009/10	RS	Hair	-24.6	7.6	-26.2	–	3.4
	Cr-2	Su 2009/10	RS	Hair	-25.5	7.3	-27.1	–	3.4

Species	Sample ID	Season	Region	Sample Type	Orig. $\delta^{13}C$ (‰)	Orig. $\delta^{15}N$ (‰)	Corr. $\delta^{13}C$ (‰)	Corr. $\delta^{15}N$ (‰)	Atomic C:N
	CS11-01	Su 2010/11	RS	WB	-25.5	11.9	–	–	4.0
	G001*	F 2001	WAP	Whisker	-19.8	7.1	-21.4	–	3.4
	G003*	F 2001	WAP	Whisker	-22.1	5.3	-23.7	–	3.5
	G004*	F 2001	WAP	Whisker	-21.8	6.7	-23.4	–	3.5
	G005*	F 2001	WAP	Whisker	-21.9	6.6	-23.5	–	3.5
	G006*	F 2001	WAP	Whisker	-24.1	6.2	-25.7	–	3.5
	G007*	F 2001	WAP	Whisker	-21.8	6.4	-23.4	–	3.4
	G008*	F 2001	WAP	Whisker	-22.0	6.8	-23.6	–	3.4
	G009*	W 2001	WAP	Whisker	-23.4	6.2	-25.0	–	3.4
	G010*	W 2001	WAP	Whisker	-22.5	6.5	-24.1	–	3.4
	G012*	W 2001	WAP	Whisker	-21.5	6.8	-23.1	–	3.5
	G013*	W 2001	WAP	Whisker	-21.3	6.7	-22.9	–	3.5
	G014*	W 2001	WAP	Whisker	-21.6	7.6	-23.2	–	3.4
	G015*	W 2001	WAP	Whisker	-22.4	7.3	-24.0	–	3.5
	G016*	W 2001	WAP	Whisker	-21.1	5.9	-22.7	–	3.5
	G017*	F 2002	WAP	Whisker	-21.8	6.8	-23.4	–	3.3
	G018*	F 2002	WAP	Whisker	-24.9	6.5	-26.5	–	3.3
	G019*	F 2002	WAP	Whisker	-24.7	6.6	-26.3	–	3.3
	G020*	F 2002	WAP	Whisker	-24.5	6.6	-26.1	–	3.3
	G021*	F 2002	WAP	Whisker	-22.3	6.7	-23.9	–	3.4
	G022*	F 2002	WAP	Whisker	-20.9	7.9	-22.5	–	3.4
	G023*	F 2002	WAP	Whisker	-24.6	6.4	-26.2	–	3.3
	G024*	F 2002	WAP	Whisker	-21.8	7.2	-23.4	–	3.3
	G026*	F 2002	WAP	Whisker	-23.6	6.5	-25.2	–	3.3
	G027*	F 2002	WAP	Whisker	-22.3	6.9	-23.9	–	3.3
	G028*	F 2002	WAP	Whisker	-22.2	7.1	-23.8	–	3.3
	G029*	F 2002	WAP	Whisker	-21.6	7.2	-23.2	–	3.3
	G030*	F 2002	WAP	Whisker	-22.1	6.9	-23.7	–	3.3
	G031*	F 2002	WAP	Whisker	-21.2	7.5	-22.8	–	3.3
	G032*	F 2002	WAP	Whisker	-23.2	7.0	-24.8	–	3.3
	G033*	W 2002	WAP	Whisker	-21.1	7.5	-22.7	–	3.3
	G034*	W 2002	WAP	Whisker	-21.8	6.7	-23.4	–	3.3
	G035*	W 2002	WAP	Whisker	-21.6	7.0	-23.2	–	3.3
	G036*	W 2002	WAP	Whisker	-21.5	7.3	-23.1	–	3.4
	G038*	W 2002	WAP	Whisker	-22.0	6.9	-23.6	–	3.4
	G039*	W 2002	WAP	Whisker	-22.9	7.3	-24.5	–	3.4
	G040*	W 2002	WAP	Whisker	-23.7	6.5	-25.3	–	3.4
	G041*	W 2002	WAP	Whisker	-22.9	6.7	-24.5	–	3.4
	G042*	W 2002	WAP	Whisker	-21.6	6.9	-23.2	–	3.5
	G043*	W 2002	WAP	Whisker	-22.8	7.4	-24.4	–	3.4
	G044*	W 2002	WAP	Whisker	-21.8	7.1	-23.4	–	3.5
	G045*	W 2002	WAP	Whisker	-22.0	7.6	-23.6	–	3.4
	G046*	W 2002	WAP	Whisker	-21.7	7.8	-23.3	–	3.4
	G047*	W 2002	WAP	Whisker	-21.5	7.1	-23.1	–	3.5
	G102*	F 2007	WAP	Whisker	-23.8	5.3	-25.4	–	na
	G104*	F 2007	WAP	Whisker	-22.7	6.9	-24.3	–	3.4
	G105*	F 2007	WAP	Whisker	-22.3	7.1	-23.9	–	na
	G106*	F 2007	WAP	Whisker	-21.9	7.1	-23.5	–	3.5
	G107*	F 2007	WAP	Whisker	-23.3	6.6	-24.9	–	na
	G108*	F 2007	WAP	Whisker	-21.5	7.5	-23.1	–	3.4
	G110*	F 2007	WAP	Whisker	-23.1	7.9	-24.7	–	na
	G112*	F 2007	WAP	Whisker	-24.0	5.4	-25.6	–	3.4
	G113*	F 2007	WAP	Whisker	-23.3	5.8	-24.9	–	3.5
	W02	Su 2008/09	AM	WB	-26.3	8.5	–	–	4.0
Weddell	W01	Su 2010/11	AM	Hair	-23.2	13.3	-24.6	12.8	3.5
	W02	Su 2010/11	AM	Hair	-23.2	12.6	-24.6	12.1	3.5
	W04	Su 2010/11	AM	Clot	-24.8	12.2	–	–	3.9

Species	Sample ID	Season	Region	Sample Type	Orig. $\delta^{13}C$ (‰)	Orig. $\delta^{15}N$ (‰)	Corr. $\delta^{13}C$ (‰)	Corr. $\delta^{15}N$ (‰)	Atomic C:N
	W06	Su 2010/11	AM	Clot	-24.7	12.2	–	–	3.9
	W10	Su 2008/09	RS	WB	-24.8	11.8	–	–	3.9
	W11	Su 2008/09	RS	WB	-25.2	11.6	–	–	4.0
	W12	Su 2008/09	RS	WB	-25.1	12.3	–	–	3.9
	W14	Su 2008/09	RS	WB	-24.9	12.1	–	–	3.9
	W15	Su 2008/09	RS	WB	-25.3	11.4	–	–	3.9
	W17	Su 2008/09	RS	WB	-25.1	11.9	–	–	4.0
	W19	Su 2008/09	RS	WB	-25.2	12.0	–	–	3.9
	W103	Su 2010/11	AM	WB	-25.7	10.0	–	–	3.9
	W112	Su 2010/11	AM	Hair	-23.2	13.3	-24.6	12.8	3.5
	W113	Su 2010/11	AM	WB	-24.6	12.6	–	–	4.0
	W116	Su 2010/11	AM	WB	-24.5	12.6	–	–	3.9
	W117	Su 2010/11	AM	WB	-24.9	12.0	–	–	4.0
	W118	Su 2010/11	AM	WB	-25.1	12.0	–	–	4.0
	W130	Su 2010/11	AM	WB	-24.4	13.1	–	–	3.9
	W133	Su 2010/11	AM	WB	-24.4	12.5	–	–	3.9
	W136	Su 2010/11	AM	WB	-25.2	11.9	–	–	4.0
	W137	Su 2010/11	AM	WB	-25.1	12.0	–	–	3.9
	W155	Su 2010/11	AM	WB	-24.3	13.2	–	–	4.0
	W157	Su 2010/11	AM	WB	-25.0	13.0	–	–	4.0
	W174	Su 2010/11	AM	WB	-24.6	11.8	–	–	3.9
	W175	Su 2010/11	AM	WB	-24.2	13.1	–	–	4.0
	W176	Su 2010/11	AM	WB	-24.4	13.0	–	–	3.9
	W177	Su 2010/11	AM	WB	-24.5	13.0	–	–	3.9
	W182	Su 2010/11	AM	Hair	-24.1	10.3	-25.5	9.8	3.5
	W185	Su 2010/11	RS	WB	-25.8	11.8	–	–	3.9
	W186	Su 2010/11	RS	WB	-26.2	12.0	–	–	3.9
	W208	Su 2010/11	RS	WB	-25.8	12.6	–	–	3.9
	W209	Su 2010/11	RS	WB	-26.0	12.7	–	–	3.9
	W214	Su 2010/11	RS	WB	-26.3	11.8	–	–	4.0
	W216	Su 2010/11	RS	WB	-25.1	13.2	–	–	4.0
	W219	Su 2010/11	RS	WB	-25.6	11.9	–	–	4.0
	W220	Su 2010/11	RS	WB	-25.0	12.6	–	–	4.0
	W222	Su 2010/11	RS	WB	-25.2	12.2	–	–	3.9
	W223	Su 2010/11	RS	WB	-24.9	13.9	–	–	4.1
	WS10-11	Su 2009/10	RS	RBC	-25.0	12.3	–	12.6	3.9
	WS10-12	Su 2009/10	RS	RBC	-25.0	11.7	–	12.0	3.8
	WS10-13	Su 2009/10	RS	RBC	-24.8	12.0	–	12.3	3.9
	WS10-17	Su 2009/10	RS	RBC	-25.5	11.5	–	11.8	4.0
	WS10-18	Su 2009/10	RS	RBC	-25.3	11.3	–	11.6	3.8
	WS11-11	Su 2010/11	RS	WB	-25.7	11.6	–	–	4.0
	WS11-12	Su 2010/11	RS	WB	-25.5	11.7	–	–	3.9
	WS11-13	Su 2010/11	RS	WB	-24.9	12.4	–	–	3.9
	WS11-14	Su 2010/11	RS	WB	-24.6	12.4	–	–	3.9
	WS11-15	Su 2010/11	RS	WB	-25.7	11.8	–	–	4.0
	WS12-11	Su 2011/12	RS	RBC	-25.0	12.1	–	12.4	3.9
	WS12-12	Su 2011/12	RS	RBC	-25.4	11.9	–	12.2	3.9
	WS12-13	Su 2011/12	RS	RBC	-25.3	12.1	–	12.4	3.9
	WS12-14	Su 2011/12	RS	RBC	-25.3	12.0	–	12.3	3.8
	WS12-15	Su 2011/12	RS	RBC	-25.4	11.8	–	12.1	3.9
	WS12-22	Sp 2012	RS	WB	-24.7	12.4	–	–	4.1
	WS12-23	Sp 2012	RS	WB	-25.9	12.2	–	–	4.3
	WS12-24	Sp 2012	RS	WB	-25.6	12.1	–	–	4.1
	WS12-25	Sp 2012	RS	WB	-25.7	12.9	–	–	4.4
	WS12-26	Sp 2012	RS	WB	-24.8	12.7	–	–	4.0
	G103	F 2007	WAP	Serum	-22.4	13.1	-22.1	12.0	4.3
	G111	F 2007	WAP	Plasma	-22.8	12.3	-22.2	11.6	4.2

Species	Sample ID	Season	Region	Sample Type	Orig. $\delta^{13}C$ (‰)	Orig. $\delta^{15}N$ (‰)	Corr. $\delta^{13}C$ (‰)	Corr. $\delta^{15}N$ (‰)	Atomic C:N
	LW11-03	Su 2010/11	RS	WB	-24.3	12.2	–	–	3.9
	LW11-05	Su 2010/11	RS	WB	-25.7	12.2	–	–	3.9
	LW11-06	Su 2010/11	RS	WB	-25.8	12.0	–	–	3.9
	LW11-07	Su 2010/11	RS	WB	-25.6	12.2	–	–	3.9
	LW11-08	Su 2010/11	RS	WB	-24.9	12.3	–	–	3.9
	LW11-09	Su 2010/11	RS	WB	-25.0	12.3	–	–	3.9
	LW11-10	Su 2010/11	RS	WB	-25.7	11.9	–	–	3.9
	LW11-11	Su 2010/11	RS	WB	-24.1	13.1	–	–	3.9
	LW11-12	Su 2010/11	RS	WB	-25.8	12.0	–	–	3.9
	LW11-13	Su 2010/11	RS	WB	-25.3	12.1	–	–	3.9
	LW11-14	Su 2010/11	RS	WB	-25.5	12.1	–	–	3.9
	LW11-15	Su 2010/11	RS	WB	-25.8	13.0	–	–	4.1
	LW15-01	Sp 2015	RS	WB	-25.8	12.1	–	–	4.2
	LW15-02	Sp 2015	RS	WB	-25.2	12.1	–	–	3.9
	LW15-03	Sp 2015	RS	WB	-25.3	12.1	–	–	3.9
	LW15-04	Sp 2015	RS	WB	-25.3	12.0	–	–	3.9
	LW15-05	Sp 2015	RS	WB	-25.3	12.2	–	–	3.9
	LW15-06	Sp 2015	RS	WB	-25.2	11.8	–	–	4.0
	LW15-07	Sp 2015	RS	WB	-25.3	12.2	–	–	4.0
	LW15-08	Sp 2015	RS	WB	-25.3	11.9	–	–	3.9
	LW15-09	Sp 2015	RS	WB	-25.3	12.0	–	–	3.9
	LW15-10	Sp 2015	RS	WB	-25.1	12.2	–	–	3.9
	LW15-11	Sp 2015	RS	WB	-25.3	12.2	–	–	3.9
	LW15-12	Sp 2015	RS	WB	-25.2	11.9	–	–	4.0
	W006	Su 2009/10	WAP	Whisker	-22.6	10.9	-24.0	10.4	3.4
	W013	Su 2009/10	WAP	Whisker	-21.9	12.1	-23.3	11.6	3.4
	WS10-01**	Su 2009/10	RS	Whisker	-23.3	12.9	-24.7	12.4	na
	WS10-02**	Su 2009/10	RS	Whisker	-22.8	14.5	-24.2	14.0	na
	WS10-03**	Su 2009/10	RS	Whisker	-23.5	13.0	-24.9	12.5	na
	WS10-04**	Su 2009/10	RS	Whisker	-23.0	12.5	-24.4	12.0	na
	WS10-05**	Su 2009/10	RS	Whisker	-22.9	12.4	-24.3	11.9	na
	WS10-06**	Su 2009/10	RS	Whisker	-24.6	13.3	-26.0	12.8	na
	WS10-07**	Su 2009/10	RS	Whisker	-23.3	12.8	-24.7	12.3	na
	WS10-19**	Su 2009/10	RS	Whisker	-23.8	12.5	-25.2	12.0	na
	WS10-20**	Su 2009/10	RS	Whisker	-23.8	12.9	-25.2	12.4	na
	WS10-21**	Su 2009/10	RS	Whisker	-22.9	12.5	-24.3	12.0	na
	WS10-22**	Su 2009/10	RS	Whisker	-23.1	12.4	-24.5	11.9	na
	WS11-03**	Su 2010/11	RS	Whisker	-23.4	12.6	-24.8	12.1	na
	WS11-04**	Su 2010/11	RS	Whisker	-23.5	12.8	-24.9	12.3	na
	WS11-05**	Su 2010/11	RS	Whisker	-23.3	13.5	-24.7	13.0	na
	WS11-06**	Su 2010/11	RS	Whisker	-23.5	14.0	-24.9	13.5	na
	WS11-08**	Su 2010/11	RS	Whisker	-23.3	13.8	-24.7	13.3	na
	WS11-09**	Su 2010/11	RS	Whisker	-24.7	14.2	-26.1	13.7	na
	WS11-17**	Su 2010/11	RS	Whisker	-23.4	12.5	-24.8	12.0	na
	WS11-18**	Su 2010/11	RS	Whisker	-23.6	12.9	-25.0	12.4	na
	WS11-19**	Su 2010/11	RS	Whisker	-23.5	13.4	-24.9	12.9	na
	WS11-21**	Su 2010/11	RS	Whisker	-24.1	12.5	-25.5	12.0	na
	WS11-37**	Su 2011/12	RS	Whisker	-23.0	12.7	-24.4	12.2	na
	WS11-38**	Su 2011/12	RS	Whisker	-23.1	13.5	-24.5	13.0	na
	WS11-39**	Su 2011/12	RS	Whisker	-23.5	12.6	-24.9	12.1	na
	WS11-40**	Su 2011/12	RS	Whisker	-23.7	12.8	-25.1	12.3	na
	WS11-41**	Su 2011/12	RS	Whisker	-23.4	13.6	-24.8	13.1	na
	WS12-01**	Su 2011/12	RS	Whisker	-24.1	12.8	-25.5	12.3	na
	WS12-02**	Su 2011/12	RS	Whisker	-23.7	12.6	-25.1	12.1	na
	WS12-04**	Su 2011/12	RS	Whisker	-23.3	12.7	-24.7	12.2	na
	WS12-05**	Su 2011/12	RS	Whisker	-23.2	13.2	-24.6	12.7	na
	WS12-06**	Su 2011/12	RS	Whisker	-22.7	13.4	-24.1	12.9	na

Species	Sample ID	Season	Region	Sample Type	Orig. $\delta^{13}C$ (‰)	Orig. $\delta^{15}N$ (‰)	Corr. $\delta^{13}C$ (‰)	Corr. $\delta^{15}N$ (‰)	Atomic C:N
	WS12-07**	Su 2011/12	RS	Whisker	-23.2	13.8	-24.6	13.3	na
	WS12-08**	Su 2011/12	RS	Whisker	-22.6	13.7	-24.0	13.2	na
	WS12-09**	Su 2011/12	RS	Whisker	-22.8	13.6	-24.2	13.1	na
	WS12-10**	Su 2011/12	RS	Whisker	-23.6	13.3	-25.0	12.8	na
	WS12-16**	Su 2011/12	RS	Whisker	-24.2	12.7	-25.6	12.2	na
	WS12-17**	Su 2011/12	RS	Whisker	-23.8	12.4	-25.2	11.9	na
	WS12-19**	Su 2011/12	RS	Whisker	-23.4	13.6	-24.8	13.1	na
	WS12-20**	Su 2011/12	RS	Whisker	-23.4	13.2	-24.8	12.7	na
Ross	R01	Su 2008/09	AM	WB	-23.2	8.5	–	–	3.9
	R101	Su 2010/11	AM	WB	-23.9	9.6	–	–	3.9
	R102	Su 2010/11	AM	WB	-23.6	9.0	–	–	4.0
	R103	Su 2010/11	AM	WB	-24.0	9.0	–	–	4.0
	R104	Su 2010/11	AM	WB	-23.7	9.2	–	–	4.0
	R105	Su 2010/11	AM	WB	-23.6	9.2	–	–	4.0
	R106	Su 2010/11	AM	WB	-24.1	8.8	–	–	3.9
	R107	Su 2010/11	AM	WB	-23.6	8.8	–	–	3.9
	R108	Su 2010/11	AM	WB	-24.6	10.0	–	–	4.0
	R109	Su 2010/11	AM	WB	-23.9	9.0	–	–	4.0
	R110	Su 2010/11	AM	Hair	-23.0	10.0	-24.3	8.8	3.5
	R111	Su 2010/11	AM	WB	-23.6	8.8	–	–	4.0
	R112	Su 2010/11	AM	WB	-23.8	9.7	–	–	3.9
	R113	Su 2010/11	AM	WB	-23.7	9.0	–	–	4.0
	R114	Su 2010/11	RS	WB	-23.8	8.6	–	–	4.0

Table S9. Amino acid $\delta^{15}N$ values for crabeater, Ross, and Weddell seals. Values are reported as the mean ± one standard deviation for the injections on the GC/C/IRMS. For crabeater seals, whole blood (C06, C44, C177) and plasma (G112, G105, and G110) samples were analyzed. All Ross seal samples analyzed for amino acid $\delta^{15}N$ values were whole blood. For Weddell seals, whole blood (W185, W220, and WS11-11), plasma (G111), and sample from the first segment nearest the whisker base, 0.0-0.5 cm, (W006 and W013) were used for CSI-AA. Abbreviation: na, not available.

Species	**Sample ID**	**Region**	**Amino Acid**	**Injections**	**$\delta^{15}N$ (‰)**
Crabeater	C06	AM	Alanine	3	13.7 ± 0.3
	C06	AM	Glycine	3	8.5 ± 0.1
	C06	AM	Threonine	3	-21.9 ± 0.6
	C06	AM	Serine	3	7.0 ± 0.5
	C06	AM	Valine	3	14.9 ± 0.3
	C06	AM	Leucine	3	13.9 ± 0.2
	C06	AM	Isoleucine	3	12.8 ± 0.2
	C06	AM	Proline	3	15.7 ± 0.4
	C06	AM	Aspartic	3	11.0 ± 0.3
	C06	AM	Glutamic acid	3	15.1 ± 0.4
	C06	AM	Phenylalanine	3	6.8 ± 0.3
	C06	AM	Lysine	3	5.5 ± 0.6
	G112	WAP	Alanine	3	12.0 ± 0.7
	G112	WAP	Glycine	3	0.6 ± 0.1
	G112	WAP	Threonine	3	-20.7 ± 0.1
	G112	WAP	Serine	3	1.9 ± 0.2
	G112	WAP	Valine	3	13.5 ± 0.2
	G112	WAP	Leucine	3	11.8 ± 0.6
	G112	WAP	Isoleucine	3	11.6 ± 1.0
	G112	WAP	Proline	3	15.5 ± 0.6
	G112	WAP	Aspartic	3	9.9 ± 0.2
	G112	WAP	Glutamic acid	3	15.0 ± 0.4
	G112	WAP	Phenylalanine	3	4.3 ± 0.1
	G112	WAP	Lysine	2	4.5 ± 0.2
	C44	AM	Alanine	3	14.3 ± 0.4
	C44	AM	Glycine	3	4.7 ± 0.4
	C44	AM	Threonine	3	-25.4 ± 0.4
	C44	AM	Serine	3	4.2 ± 0.2
	C44	AM	Valine	3	15.1 ± 0.5
	C44	AM	Leucine	3	13.4 ± 0.5
	C44	AM	Isoleucine	3	12.2 ± 0.1
	C44	AM	Proline	3	14.7 ± 0.3
	C44	AM	Aspartic	3	9.3 ± 0.2
	C44	AM	Glutamic acid	3	15.0 ± 0.2
	C44	AM	Phenylalanine	3	5.8 ± 0.2
	C44	AM	Lysine	3	4.9 ± 0.3
	G105	WAP	Alanine	3	13.3 ± 0.4
	G105	WAP	Glycine	3	1.6 ± 0.3
	G105	WAP	Threonine	3	-19.6 ± 0.4
	G105	WAP	Serine	3	2.5 ± 0.3
	G105	WAP	Valine	3	14.4 ± 0.5

Species	Sample ID	Region	Amino Acid	Injections	$\delta^{15}N$ (‰)
	G105	WAP	Leucine	3	12.7 ± 0.1
	G105	WAP	Isoleucine	3	11.5 ± 0.6
	G105	WAP	Proline	3	16.5 ± 0.5
	G105	WAP	Aspartic	3	10.4 ± 0.0
	G105	WAP	Glutamic acid	3	15.2 ± 0.3
	G105	WAP	Phenylalanine	3	4.7 ± 0.2
	G105	WAP	Lysine	3	5.3 ± 0.5
	C177	RS	Alanine	4	14.6 ± 0.4
	C177	RS	Glycine	4	3.9 ± 0.4
	C177	RS	Threonine	4	-26.1 ± 0.8
	C177	RS	Serine	4	5.2 ± 0.6
	C177	RS	Valine	4	15.7 ± 0.8
	C177	RS	Leucine	4	14.4 ± 0.5
	C177	RS	Isoleucine	4	12.6 ± 0.7
	C177	RS	Proline	4	15.7 ± 0.5
	C177	RS	Aspartic	4	9.8 ± 0.1
	C177	RS	Glutamic acid	4	14.4 ± 0.3
	C177	RS	Phenylalanine	4	5.4 ± 0.4
	C177	RS	Lysine	4	5.1 ± 0.5
	G110	WAP	Alanine	3	13.4 ± 0.1
	G110	WAP	Glycine	3	3.4 ± 0.1
	G110	WAP	Threonine	3	-23.4 ± 0.3
	G110	WAP	Serine	3	4.7 ± 0.5
	G110	WAP	Valine	3	15.8 ± 0.3
	G110	WAP	Leucine	3	13.5 ± 0.2
	G110	WAP	Isoleucine	3	12.3 ± 0.4
	G110	WAP	Proline	3	15.8 ± 0.3
	G110	WAP	Aspartic	3	10.4 ± 0.4
	G110	WAP	Glutamic acid	3	14.8 ± 0.4
	G110	WAP	Phenylalanine	3	4.1 ± 0.5
	G110	WAP	Lysine	3	5.0 ± 0.2
Weddell	G111	WAP	Alanine	3	18.9 ± 0.4
	G111	WAP	Glycine	3	5.0 ± 0.4
	G111	WAP	Threonine	3	-22.1 ± 0.6
	G111	WAP	Serine	3	8.6 ± 0.1
	G111	WAP	Valine	3	22.9 ± 0.5
	G111	WAP	Leucine	3	20.8 ± 0.4
	G111	WAP	Isoleucine	3	19.6 ± 0.6
	G111	WAP	Proline	3	20.8 ± 0.9
	G111	WAP	Aspartic	3	16.7 ± 0.5
	G111	WAP	Glutamic acid	3	20.4 ± 0.5
	G111	WAP	Phenylalanine	3	5.3 ± 0.4
	G111	WAP	Lysine	3	6.7 ± 0.4
	W006	WAP	Alanine	3	20.7 ± 0.2
	W006	WAP	Glycine	3	2.1 ± 0.1
	W006	WAP	Threonine	3	-29.4 ± 0.3
	W006	WAP	Serine	3	6.7 ± 0.2
	W006	WAP	Valine	3	24.0 ± 0.5
	W006	WAP	Leucine	3	21.7 ± 0.4

Species	Sample ID	Region	Amino Acid	Injections	$\delta^{15}N$ (‰)
	W006	WAP	Isoleucine	3	21.4 ± 0.9
	W006	WAP	Proline	3	18.0 ± 0.1
	W006	WAP	Aspartic	3	12.8 ± 0.1
	W006	WAP	Glutamic acid	3	20.8 ± 0.2
	W006	WAP	Phenylalanine	3	5.9 ± 0.5
	W006	WAP	Lysine	1	3.1
	W013	WAP	Alanine	3	22.1 ± 0.1
	W013	WAP	Glycine	3	2.3 ± 0.1
	W013	WAP	Threonine	3	-31.9 ± 0.3
	W013	WAP	Serine	3	8.0 ± 0.2
	W013	WAP	Valine	3	25.5 ± 0.5
	W013	WAP	Leucine	3	23.5 ± 0.1
	W013	WAP	Isoleucine	3	24.0 ± 0.2
	W013	WAP	Proline	3	18.5 ± 0.2
	W013	WAP	Aspartic	3	14.2 ± 0.1
	W013	WAP	Glutamic acid	3	22.2 ± 0.2
	W013	WAP	Phenylalanine	3	5.9 ± 0.1
	W013	WAP	Lysine	2	3.6 ± 0.8
	W185	RS	Alanine	3	22.8 ± 0.1
	W185	RS	Glycine	3	6.9 ± 0.9
	W185	RS	Threonine	3	-29.9 ± 0.4
	W185	RS	Serine	3	9.0 ± 0.5
	W185	RS	Valine	3	24.2 ± 0.4
	W185	RS	Leucine	3	22.6 ± 0.4
	W185	RS	Isoleucine	3	21.7 ± 0.6
	W185	RS	Proline	3	21.0 ± 0.1
	W185	RS	Aspartic	3	17.2 ± 0.2
	W185	RS	Glutamic acid	3	20.7 ± 0.4
	W185	RS	Phenylalanine	3	5.0 ± 0.0
	W185	RS	Lysine	3	5.4 ± 0.4
	W220	RS	Alanine	3	23.1 ± 0.1
	W220	RS	Glycine	3	9.4 ± 0.3
	W220	RS	Threonine	3	-27.9 ± 0.3
	W220	RS	Serine	3	10.9 ± 0.3
	W220	RS	Valine	3	25.0 ± 0.6
	W220	RS	Leucine	3	23.3 ± 0.2
	W220	RS	Isoleucine	3	22.8 ± 1.0
	W220	RS	Proline	3	21.3 ± 0.7
	W220	RS	Aspartic	3	18.6 ± 0.1
	W220	RS	Glutamic acid	3	22.3 ± 0.2
	W220	RS	Phenylalanine	3	6.4 ± 0.1
	W220	RS	Lysine	3	6.8 ± 0.8
	WS11-11	RS	Alanine	3	22.5 ± 0.1
	WS11-11	RS	Glycine	3	7.0 ± 0.9
	WS11-11	RS	Threonine	3	-28.3 ± 0.3
	WS11-11	RS	Serine	3	9.2 ± 0.5
	WS11-11	RS	Valine	3	24.6 ± 0.3
	WS11-11	RS	Leucine	3	22.6 ± 0.3
	WS11-11	RS	Isoleucine	3	21.7 ± 0.9

Species	Sample ID	Region	Amino Acid	Injections	$\delta^{15}N$ (‰)
	WS11-11	RS	Proline	3	20.4 ± 0.9
	WS11-11	RS	Aspartic	3	17.5 ± 0.5
	WS11-11	RS	Glutamic acid	3	21.5 ± 0.3
	WS11-11	RS	Phenylalanine	3	5.6 ± 0.2
	WS11-11	RS	Lysine	3	5.8 ± 0.5
Ross	R101	AM	Alanine	3	20.3 ± 0.3
	R101	AM	Glycine	3	2.9 ± 0.2
	R101	AM	Threonine	3	-29.2 ± 0.2
	R101	AM	Serine	3	4.4 ± 0.7
	R101	AM	Valine	3	21.5 ± 0.1
	R101	AM	Leucine	3	19.9 ± 0.3
	R101	AM	Isoleucine	3	20.1 ± 1.0
	R101	AM	Proline	3	17.3 ± 0.3
	R101	AM	Aspartic	3	15.9 ± 0.1
	R101	AM	Glutamic acid	3	18.3 ± 0.7
	R101	AM	Phenylalanine	3	2.5 ± 0.2
	R101	AM	Lysine	na	Na
	R103	AM	Alanine	3	18.5 ± 0.3
	R103	AM	Glycine	3	5.1 ± 0.4
	R103	AM	Threonine	3	-27.4 ± 0.7
	R103	AM	Serine	3	5.4 ± 0.8
	R103	AM	Valine	3	20.0 ± 0.4
	R103	AM	Leucine	3	18.6 ± 0.3
	R103	AM	Isoleucine	3	15.7 ± 0.6
	R103	AM	Proline	3	16.9 ± 0.6
	R103	AM	Aspartic	3	13.9 ± 0.2
	R103	AM	Glutamic acid	3	17.2 ± 0.6
	R103	AM	Phenylalanine	3	2.6 ± 0.4
	R103	AM	Lysine	3	1.8 ± 0.4
	R106	AM	Alanine	3	18.8 ± 0.1
	R106	AM	Glycine	3	5.7 ± 0.3
	R106	AM	Threonine	3	-27.5 ± 0.3
	R106	AM	Serine	3	5.8 ± 0.4
	R106	AM	Valine	3	19.3 ± 0.4
	R106	AM	Leucine	3	17.9 ± 0.3
	R106	AM	Isoleucine	3	18.8 ± 0.7
	R106	AM	Proline	3	17.3 ± 0.2
	R106	AM	Aspartic	3	14.0 ± 0.2
	R106	AM	Glutamic acid	3	16.9 ± 0.3
	R106	AM	Phenylalanine	3	1.9 ± 0.2
	R106	AM	Lysine	3	2.5 ± 0.4
	R111	AM	Alanine	3	18. 6 ± 0.3
	R111	AM	Glycine	3	5.2 ± 0.1
	R111	AM	Threonine	3	-28.0 ± 0.1
	R111	AM	Serine	3	5.7 ± 0.3
	R111	AM	Valine	3	19.7 ± 0.3
	R111	AM	Leucine	3	18.2 ± 0.3
	R111	AM	Isoleucine	3	18.4 ± 0.7
	R111	AM	Proline	3	16.4 ± 0.9

Species	Sample ID	Region	Amino Acid	Injections	$\delta^{15}N$ (‰)
	R111	AM	Aspartic	3	13.6 ± 0.2
	R111	AM	Glutamic acid	3	17.6 ± 0.3
	R111	AM	Phenylalanine	3	1.9 ± 0.1
	R111	AM	Lysine	3	3.4 ± 0.2
	R112	AM	Alanine	3	19.2 ± 0.5
	R112	AM	Glycine	3	4.8 ± 0.5
	R112	AM	Threonine	3	-28.0 ± 0.7
	R112	AM	Serine	3	4.7 ± 0.4
	R112	AM	Valine	3	19.7 ± 0.1
	R112	AM	Leucine	3	18.2 ± 0.1
	R112	AM	Isoleucine	2	17.7 ± 0.6
	R112	AM	Proline	3	17.1 ± 0.6
	R112	AM	Aspartic	3	14.3 ± 0.4
	R112	AM	Glutamic acid	3	17.6 ± 0.5
	R112	AM	Phenylalanine	3	3.9 ± 0.2
	R112	AM	Lysine	3	3.1 ± 0.4
	R114	RS	Alanine	3	17.6 ± 0.4
	R114	RS	Glycine	3	5.9 ± 0.3
	R114	RS	Threonine	3	-25.9 ± 0.2
	R114	RS	Serine	3	5.9 ± 0.8
	R114	RS	Valine	3	19.0 ± 0.4
	R114	RS	Leucine	3	17.5 ± 0.4
	R114	RS	Isoleucine	na	Na
	R114	RS	Proline	3	18.1 ± 0.8
	R114	RS	Aspartic	3	12.9 ± 0.2
	R114	RS	Glutamic acid	3	17.5 ± 0.8
	R114	RS	Phenylalanine	3	3.1 ± 0.3
	R114	RS	Lysine	2	3.3 ± 0.1

Table S10. Results of one-way ANOVA Bonferroni post-hoc comparisons for amino acid $\delta^{15}N$ data for the three seal species. Significant *p*-values are < 0.05.

Amino Acid	**ANOVA Post-hoc *p*-values**	**Comparison**
Ala	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	0.003	Ross vs. Weddell
Gly	–	Crabeater vs. Ross
	–	Crabeater vs. Weddell
	–	Ross vs. Weddell
Thr	0.01	Crabeater vs. Ross
	0.006	Crabeater vs. Weddell
	–	Ross vs. Weddell
Ser	–	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	0.002	Ross vs. Weddell
Val	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Leu	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Ile	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Pro	0.03	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Asp	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	–	Ross vs. Weddell
Glu	<0.001	Crabeater vs. Ross
	<0.001	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Phe	<0.001	Crabeater vs. Ross
	–	Crabeater vs. Weddell
	<0.001	Ross vs. Weddell
Lys	0.009	Crabeater vs. Ross
	–	Crabeater vs. Weddell
	0.005	Ross vs. Weddell

Table S11. Bulk $\delta^{13}C$ and $\delta^{15}N$ values of crabeater, Weddell, and Ross seals from the literature. Note, bulk $\delta^{13}C$ and $\delta^{15}N$ values are reported for the original measurement (Orig.) and with a correction to whole blood (Corr.) if the sample is a tissue type with a significant isotopic offset from whole blood. Isotopic offset between whole blood and the given sample type are reported in Tables S4 and S6, above. Abbreviations: RBCs, red blood cells; F, female; M, male; na, information not available; NDR, no dive records; RS, Ross Sea; AS, Amundsen Sea; WAP, West Antarctic Peninsula; *n*, sample size.

Species	**Sample Type**	***n***	**Sex**	**Age Class**	**Area**	**Orig. $\delta^{13}C$ (‰)**	**Orig. $\delta^{15}N$ (‰)**	**Corr. $\delta^{13}C$ (‰)**	**Corr. $\delta^{15}N$ (‰)**	**Source**
Ross	Serum	21	M	na	RS/AS	24.3 ± 0.4	10.6 ± 0.6	-24.0 ± 0.4	9.5 ± 0.4	Zhao et al. (2004)
	Serum	12	F	na	RS/AS	-24.0 ± 0.4	10.0 ± 0.5	-23.7 ± 0.4	8.9 ± 0.5	Zhao et al. (2004)
	Hair	1	M	na	RS	-22.3	10.4	-23.6	9.2	Aubail et al. (2011)
Weddell	Serum	17	M	na	RS/AS	-24.6 ± 0.6	13.3 ± 0.8	-24.3 ± 0.6	12.2 ± 0.8	Zhao et al. (2004)
	Serum	16	F	na	RS/AS	-25.3 ± 0.9	12.5 ± 1.1	-25.0 ± 0.9	11.4 ± 1.1	Zhao et al. (2004)
	Serum	22	na	Adult	RS/AS	-24.9 ± 0.8	13.0 ± 0.9	-24.6 ± 0.8	11.9 ± 0.9	Zhao et al. (2004)
	Serum	4	na	Subadult	RS/AS	-25.5 ± 0.9	11.5 ± 1.1	-25.2 ± 0.9	10.4 ± 1.1	Zhao et al. (2004)
	Serum	6	na	Juvenile	RS/AS	-24.8 ± 1.0	13.1 ± 1.0	-24.5 ± 1.0	12.0 ± 1.0	Zhao et al. (2004)
	Serum	1	na	Pup	RS/AS	-25.2	13.4	-24.9	12.3	Zhao et al. (2004)
	Plasma	12	na	Adult	RS	-25.5 ± 0.1	13.1 ± 0.2	-24.9 ± 0.1	12.4 ± 0.2	Burns et al. (1998)
	Plasma	6	na	Deep-diving yearling	RS	-25.4 ± 0.2	12.6 ± 0.2	-24.8 ± 0.2	11.9 ± 0.2	Burns et al. (1998)
	Plasma	4	na	NDR yearling	RS	-25.1 ± 0.2	12.9 ± 0.1	-24.5 ± 0.2	12.2 ± 0.1	Burns et al. (1998)
	Plasma	4	na	Shallow-diving yearling	RS	-23.5 ± 0.1	13.3 ± 0.1	-22.9 ± 0.1	12.6 ± 0.1	Burns et al. (1998)
	Plasma	16	na	Pup	RS	-26.0 ± 0.2	13.8 ± 0.1	-25.4 ± 0.2	13.1 ± 0.1	Burns et al. (1998)
	Hair	12	na	na	RS	-23.2 ± 0.1	13.5 ± 0.2	-24.6 ± 0.1	13.0 ± 0.2	Aubail et al. (2011)
	Whisker	14	na	na	WAP	-21.6 ± 0.6	12.7 ± 0.7	-23.0 ± 0.6	12.2 ± 0.7	Botta et al. (2018)
	RBCs	116	na	na	RS	-25.2 ± 0.3	12.0± 0.3	-25.2 ± 0.3	12.3 ± 0.3	Goetz et al. (2017)
Crabeater	Serum	26	M	na	RS/AS	-26.7 ± 0.9	8.2 ± 0.5	-26.4 ± 0.9	7.1 ± 0.5	Zhao et al. (2004)
	Serum	15	F	na	RS/AS	-26.5 ± 1.2	8.4 ± 0.4	-26.2 ± 1.2	7.3 ± 0.4	Zhao et al. (2004)
	Serum	30	na	Adult	RS/AS	-26.5 ± 1.0	8.4 ± 0.6	-26.2 ± 1.0	7.3 ± 0.6	Zhao et al. (2004)
	Serum	4	na	Subadult	RS/AS	-26.1 ± 1.2	8.4 ± 0.3	-25.8 ± 1.2	7.3 ± 0.3	Zhao et al. (2004)
	Serum	3	na	Juvenile	RS/AS	-27.2 ± 1.2	8.0 ± 0.1	-26.9 ± 1.2	7.9 ± 0.1	Zhao et al. (2004)
	Serum	4	na	Pup	RS/AS	-27.4 ± 0.4	7.7 ± 0.1	-27.1 ± 0.4	6.6 ± 0.1	Zhao et al. (2004)
	Hair	33	na	na	RS	-24.3 ± 0.1	7.7 ± 0.1	-25.9 ± 0.1	7.7 ± 0.1	Aubail et al. (2011)
	Whisker	13	na	na	WAP	-23.0 ± 0.6	7.0 ± 0.8	-24.6 ± 0.6	7.0 ± 0.8	Botta et al. (2018)

REFERENCES

Aubail A, Teilmann J, Dietz R, Rigét F, Harkonen T, Karlsson O, Rosing-Asvid A, Caurant F (2011) Investigation of mercury concentrations in fur of phocid seals using stable isotopes as tracers of trophic levels and geographic regions. Polar Biol 34:1411-1420

Botta S, Secchi ER, Rogers TL, Prado JH, de Lima RC, Carlini P, Negrete J (2018) Isotopic niche overlap and partition among three Antarctic seals from the Western Antarctic Peninsula. Deep Sea Res II 149:240-924

Burns JM, Trumble SJ, Castellini MA, Testa JW (1998) The diet of Weddell seals in McMurdo Sound, Antarctica as determined from scat collections and stable isotope analysis. Polar Biol 19:272-282

Goetz KT, Burns JM, Hückstädt LA, Shero MR, Costa DP (2017) Temporal variation in isotopic composition and diet of Weddell seals in the western Ross Sea. Deep Sea Res II 140:36-44

Hückstädt LA, Burns JM, Koch PL, McDonald BI, Crocker DE, Costa DP (2012a) Diet of a specialist in a changing environment: the crabeater seal along the western Antarctic Peninsula. Mar Ecol Prog Ser 455:287-301

Zhao L, Castellini MA, Mau TL, Trumble SJ (2004) Trophic interactions of Antarctic seals as determined by stable isotope signatures. Polar Biol 27:368-373