Table S1: Years and locations of samples for each species, with sample sizes (n) for stable isotope (SI) and fatty acid (FA) analyses.

Type	Common name	Scientific Name	SI n	FA n	Years	Location
Arctic	Bearded seal	*Erignathus barbatus*	8	8	2011	Aappilattoq
	Ringed seal	*Pusa hispida*	9	11	2012	Ittoqqortoormiit
			2	2	2018	Tasiilaq
			17	17	2018	Ittoqqortoormiit
	Walrus	*Odobenus rosmarus*	2	2	2011	Ittoqqortoormiit
	Narwhal	*Monodon monoceros*	17	17	2015	Gåsefjord
			2	2	2018	Melville
sub-Arctic	Harp seal	*Pagophilus groenlandicus*	6	6	2018	Tasiilaq
			4	5	2015	West Ice
	Hooded seal	*Cystophora cristata*	4	5	2015	West Ice
	Harbor porpoise	*Phocoena phocoena*	10	10	2018	Nuuk and Maniitsoq
	White-beaked dolphin	*Lagenorhynchus albirostris*	99	105	2016	Tasiilaq
			0	5	2018	Maniitsoq
	Long-finned pilot whale	*Globicephala melas*	7	9	2016	Sermiligaaq
			13	7	2018	Tasiilaq
	Minke whale	*Balaenoptera acutorostrata*	1	1	2000	Qasigiannguit
			2	3	2013	Maniitsoq
			2	2	2017	Tasiilaq
			1	1	*unk*	Arsuk
			1	1	*unk*	unk
	Humpback whale	*Megaptera novaeangliae*	1	1	2010	Nuuk
			2	2	2011	Paamiut
			2	2	2011	Nuuk
			1	1	2011	Ilulissat
			1	1	2012	Ilulissat
			2	2	2013	Nuuk
			1	1	2013	Qeqertarsuaq
			1	1	2014	Paamiut
			1	1	2015	Nuuk
			1	1	2016	Nuuk
			1	1	*unk*	Narsaq

Table S2: Adapted from Pedro et al. 2020. Fatty acid biomarkers used to compare feeding patterns and calculate niche breadth and overlap of marine mammals in Greenland. Additional fatty acids that are considered to be primarily derived from diet for marine mammals were also included. (Dalsgaard et al. 2003, Kelly & Scheibling 2012)

Biomarker	**Fatty acids**
Calanoid copepods	20:1n9, 20:1n11, 22:1n9 and 22:1n11
Diatom dominance	EPA (20:5n3)
Dinoflagellate dominance	18:4n3 DHA (22:6n3)
Terrestrial plants/green algae; terrestrial input into marine sediments	18:3n3 and 18:2n6
Macroalgae (red algae)	EPA 20:4n6 C_{20}-PUFAS

Table S3: Stable isotope ratios, percentages of carbon and nitrogen, and carbon:nitrogen ratios in paired non-lipid-extracted (non-LE) and lipid-extracted (LE) marine mammal tissues sampled in Greenland primarily from 2010 to 2018. Muscle was used for all species except harbor porpoise, for which only liver was available. Significant differences in isotope ratios ($\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$) after lipid extraction are noted with (*) and bolded. All samples were analyzed at the Ecological Tracers Lab at McGill University for both treatments.

Species	tissue	n	treatment	$\delta^{13}C$	$\delta^{15}N$	$\delta^{34}S$	% C	% N	C:N
Bearded seal	muscle	8	non-LE	-17.94 ± 0.73	13.55 ± 0.54	17.30 ± 0.30	48.35 ± 2.88	13.04 ± 0.85	3.73 ± 0.46
			LE	-17.63 ± 0.29	14.06 ± 0.41	16.57 ± 0.28	45.48 ± 1.29	13.71 ± 0.43	3.32 ± 0.11
			Δ after LE	0.31 ± 0.72	***0.52 ± 0.18**	***-0.74 ± 0.15**	-2.87 ± 2.35	0.68 ± 0.92	-0.41 ± 0.39
Ringed seal	muscle	11	non-LE	-22.38 ± 1.92	13.67 ± 1.15	18.32 ± 0.23	51.93 ± 4.40	11.54 ± 2.01	4.70 ± 1.27
			LE	-21.22 ± 0.97	14.08 ± 1.18	17.47 ± 0.57	46.40 ± 0.90	13.58 ± 0.31	3.42 ± 0.14
			Δ after LE	1.16 ± 1.14	***0.41 ± 0.10**	***-0.85 ± 0.38**	-5.53 ± 3.79	2.03 ± 1.81	-1.28 ± 1.18
Walrus	muscle	2	non-LE	-22.19 ± 1.13	11.50 ± 0.09	17.72 ± 0.01	49.88 ± 2.61	12.35 ± 1.40	4.08 ± 0.67
			LE	-21.48 ± 0.11	11.87 ± 0.09	17.07 ± 0.18	46.26 ± 0.52	13.66 ± 0.11	3.38 ± 0.06
			Δ after LE	0.71 ± 1.03	0.37 ± 0.00	-0.64 ± 0.18	-3.61 ± 2.09	1.31 ± 1.29	-0.69 ± 0.61
Narwhal	muscle	2	non-LE	-18.91 ± 0.01	15.37 ± 0.49	18.79 ± 0.78	45.14 ± 1.21	13.96 ± 0.57	3.23 ± 0.04
			LE	-19.16 ± 0.37	15.82 ± 0.25	17.26 ± 0.87	44.62 ± 0.11	14.12 ± 0.10	3.16 ± 0.03
			Δ after LE	-0.24 ± 0.36	0.45 ± 0.24	-1.53 ± 0.09	-0.52 ± 1.32	0.16 ± 0.47	-0.07 ± 0.01
Harp seal	muscle	5	non-LE	-19.67 ± 0.23	11.99 ± 0.81	17.88 ± 0.30	46.02 ± 0.43	13.72 ± 0.06	3.35 ± 0.04
			LE	-19.97 ± 0.19	12.43 ± 0.86	16.89 ± 0.25	45.16 ± 0.25	13.93 ± 0.10	3.24 ± 0.02
			Δ after LE	-0.31 ± 0.13	0.44 ± 0.12	***-0.99 ± 0.10**	-0.86 ± 0.36	0.21 ± 0.11	-0.11 ± 0.02
Harbor porpoise	liver	10	non-LE	-19.34 ± 0.43	12.16 ± 0.68	18.21 ± 0.18	47.43 ± 1.52	12.91 ± 0.56	3.68 ± 0.26
			LE	-19.27 ± 0.56	12.28 ± 0.60	17.50 ± 0.18	44.96 ± 1.13	13.80 ± 0.55	3.26 ± 0.06
			Δ after LE	0.07 ± 0.68	0.11 ± 0.10	***-0.72 ± 0.17**	-2.47 ± 1.67	0.88 ± 0.83	-0.42 ± 0.26
White-beaked dolphin	muscle	99	non-LE	-19.75 ± 0.38	11.52 ± 0.43	17.79 ± 0.61	48.36 ± 2.33	13.35 ± 0.71	3.64 ± 0.38
			LE	-19.23 ± 0.20	12.11 ± 0.46	17.87 ± 0.48	44.38 ± 1.01	13.66 ± 0.35	3.25 ± 0.04
			Δ after LE	***0.52 ± 0.43**	***0.59 ± 0.18**	0.08 ± 0.73	-3.98 ± 2.69	0.31 ± 0.79	-0.39 ± 0.36
Long-finned pilot whale	muscle	20	non-LE	-19.60 ± 0.70	10.98 ± 0.36	18.46 ± 0.61	49.69 ± 2.08	12.87 ± 0.77	3.88 ± 0.39
			LE	-18.62 ± 0.28	11.53 ± 0.38	17.86 ± 0.25	45.24 ± 0.62	13.93 ± 0.16	3.25 ± 0.04
			Δ after LE	***0.98 ± 0.64**	***0.55 ± 0.10**	-0.60 ± 0.79	-4.45 ± 1.92	1.07 ± 0.79	-0.64 ± 0.38
Minke whale	muscle	4	non-LE	-19.86 ± 0.61	11.24 ± 0.32	17.20 ± 0.29	50.25 ± 3.03	12.59 ± 1.61	4.04 ± 0.60
			LE	-19.06 ± 0.46	11.74 ± 0.66	17.60 ± 0.57	43.82 ± 1.53	13.02 ± 1.60	3.40 ± 0.42
			Δ after LE	0.80 ± 0.96	0.50 ± 0.42	0.40 ± 0.63	-6.43 ± 3.18	0.43 ± 1.01	-0.64 ± 0.53
Humpback whale	muscle	14	non-LE	-19.09 ± 0.53	12.10 ± 1.27	17.41 ± 0.40	49.02 ± 2.07	13.93 ± 0.55	3.52 ± 0.20
			LE	-18.99 ± 0.38	12.44 ± 1.22	17.24 ± 0.58	43.38 ± 0.63	13.16 ± 0.41	3.30 ± 0.08
			Δ after LE	0.10 ± 0.34	0.34 ± 0.52	-0.17 ± 0.51	-5.63 ± 2.27	-0.78 ± 0.68	-0.22 ± 0.15

Table S4: Stable isotope muscle samples used for inter-species comparisons of marine mammals in Greenland. Choices of tissue treatment for each isotope were based on the results of the lipid extraction portion of this study. Whenever possible, lipid-extracted tissue was used for $\delta^{13}C$ and non-lipid-extracted tissue was used for $\delta^{15}N$ and $\delta^{34}S$. All samples analyzed for $\delta^{13}C$ and $\delta^{15}N$ at the University of Copenhagen (U. Cop.) were non-lipid extracted, and three minke whale samples were only analyzed for non-lipid-extracted analysis because of very small amounts of tissue. Samples for which non-lipid-extracted tissue was used for $\delta^{13}C$ are noted and justified.

Species	**n**	**Lab**	**Isotopes analyzed**	**Lipid extracted?**			**Justification for including non-lipid-extracted $\delta^{13}C$**
				$\delta^{13}C$	**$\delta^{15}N$**	**$\delta^{34}S$**	
Bearded seal	8	McGill	CNS	Y	N	N	
Ringed seal	11	McGill	CNS	Y	N	N	
	17	U. Cop	CN	N	N	---	No effect of lipid extraction found on any seal species
Walrus	2	McGill	CNS	Y	N	N	
Narwhal	2	McGill	CNS	Y	N	N	
	17	U. Cop.	CN	N	N	---	Very small effect size of lipid extraction seen for narwhal
Harp seal	5	McGill	CNS	Y	N	N	
	4	U. Cop.	CN	N	N	---	No effect of lipid extraction found on any seal species
Hooded seal	4	U. Cop.	CN	N	N	---	No effect of lipid extraction found on any seal species
White-beaked dolphin	99	McGill	CNS	Y	N	N	
Long-finned pilot whale	20	McGill	CNS	Y	N	N	
Minke whale	4	McGill	CNS	Y	N	N	
	3	McGill	CNS	N	N	N	No effect of lipid extraction found on minke whale
Humpback whale	14	McGill	CNS	Y	N	N	

Table S5: Stable isotope ratios of marine mammal species collected around Greenland, primarily from 2010-2018. $\delta^{15}N$ and $\delta^{34}S$ values were all measured in non-lipid-extracted muscle, while $\delta^{13}C$ was measured in lipid-extracted muscle when possible.

	$\delta^{13}C$			$\delta^{15}N$			$\delta^{34}S$		
Species	**n**	**mean (‰)**	**sd (± ‰)**	**n**	**mean (‰)**	**sd (± ‰)**	**n**	**mean (‰)**	**sd (± ‰)**
Bearded seal	8	-17.63	0.29	8	13.55	0.54	8	17.30	0.30
Ringed seal	28	-21.27	0.63	28	13.84	0.82	11	18.32	0.23
Walrus	2	-21.48	0.11	2	11.49	0.09	2	17.72	0.01
Narwhal	19	-20.48	0.63	19	14.41	0.55	2	18.79	0.78
Harp seal	9	-20.07	0.28	9	12.62	1.02	5	17.88	0.30
Hooded seal	4	-20.07	1.04	4	13.79	0.72	0	--	--
White-beaked dolphin	99	-19.23	0.20	99	11.52	0.43	99	17.79	0.61
Long-finned pilot whale	20	-18.62	0.28	20	10.98	0.36	20	18.46	0.61
Minke whale	7	-19.28	0.77	7	11.73	0.66	7	17.14	0.23
Humpback whale	14	-18.99	0.38	14	12.10	1.27	14	17.41	0.40

Table S6: Mean proportions of the major fatty acids of dietary origin in the blubber of Arctic and sub-Arctic marine mammal species sampled around Greenland primarily from 2010 to 2018. A one-way MANOVA of these seven fatty acids determined that fatty acid profile varies by species. *Post-hoc* Welch's ANOVAs on each fatty acid determined that all individual fatty acids also varied by species. Within each fatty acid, same letters (a-f) indicate species that did not have significantly different mean proportions of that fatty acid.

Species	18:2n6		18:4n3		20:1n11		20:1n9		20:5n3		22:1n11		22:6n3	
Bearded seal	1.29 ±0.13	a	1.05 ±0.21	a	1.32 ±0.45	a	4.17 ±2.33	a	8.64 ±1.76	a	0.88 ±0.44	a	9.84 ±0.72	ab
Ringed seal	1.39 ±0.20	b	2.43 ±0.82	b	1.64 ±0.54	b	6.37 ±2.14	b	9.64 ±1.01	b	1.55 ±1.14	a	7.98 ±0.91	a
Walrus	1.27 ±0.31	-	1.48 ±0.15	-	1.58 ±0.57	-	5.48 ±2.55	-	6.13 ±2.62	-	0.86 ±0.62	-	6.53 ±1.46	-
Narwhal	1.13 ±0.07	a	0.52 ±0.13	c	3.62 ±0.58	c	8.12 ±1.47	bc	2.49 ±0.80	c	4.26 ±1.44	b	1.88 ±0.90	c
Harp/ hooded seal	1.53 ±0.23	bc	2.04 ±0.64	b	2.12 ±0.62	bd	9.36 ±2.45	c	6.44 ±1.90	ad	4.72 ±2.40	b	7.91 ±1.50	ab
Harbor porpoise	1.23 ±0.12	a	0.43 ±0.19	cd	2.81 ±0.64	d	4.64 ±2.32	a	1.97 ±1.08	ce	3.99 ±2.01	b	2.28 ±1.63	cd
White-beaked dolphin	1.74 ±0.13	c	1.47 ±0.27	a	2.91 ±0.43	d	6.24 ±1.13	a	3.08 ±1.45	c	5.58 ±1.33	b	3.71 ±1.43	de
Long-finned pilot whale	1.26 ±0.10	a	0.40 ±0.09	d	6.07 ±1.31	e	8.38 ±0.90	bc	1.48 ±0.29	e	8.94 ±1.44	c	2.78 ±0.48	de
Minke whale	1.26 ±0.49	abc	1.00 ±0.62	abcd	1.87 ±1.11	abcd	11.52 ±6.30	abc	4.45 ±1.75	d	9.45 ±5.94	abc	5.66 ±3.02	bef
Humpback whale	1.45 ±0.24	bc	1.31 ±0.62	a	2.55 ±1.14	bcd	9.19 ±3.36	bc	5.10 ±1.59	ad	6.22 ±2.99	bc	4.71 ±1.27	f

Table S7: Niche breadth of Arctic and sub-Arctic marine mammal species sampled around Greenland primarily from 2010 to 2018 (except one minke whale from 2000 and two humpback whales of unknown year), calculated as probabilistic niche region size (N_R) using stable isotope ratios $\delta^{13}C$, $\delta^{15}N$, and $\delta^{34}S$ using the package nicheROVER (Swanson et al. 2015) in R. N_R were calculated with a probability level of 40%, to be roughly comparable to SEA_C.

Species	N_R (SI, CNS)
Bearded seal	0.30
Ringed seal	0.66
Narwhal	NA
Harp/hooded seal	0.10
Harbor porpoise	NA
White-beaked dolphin	0.51
Long-finned pilot whale	0.49
Minke whale	0.58
Humpback whale	1.68

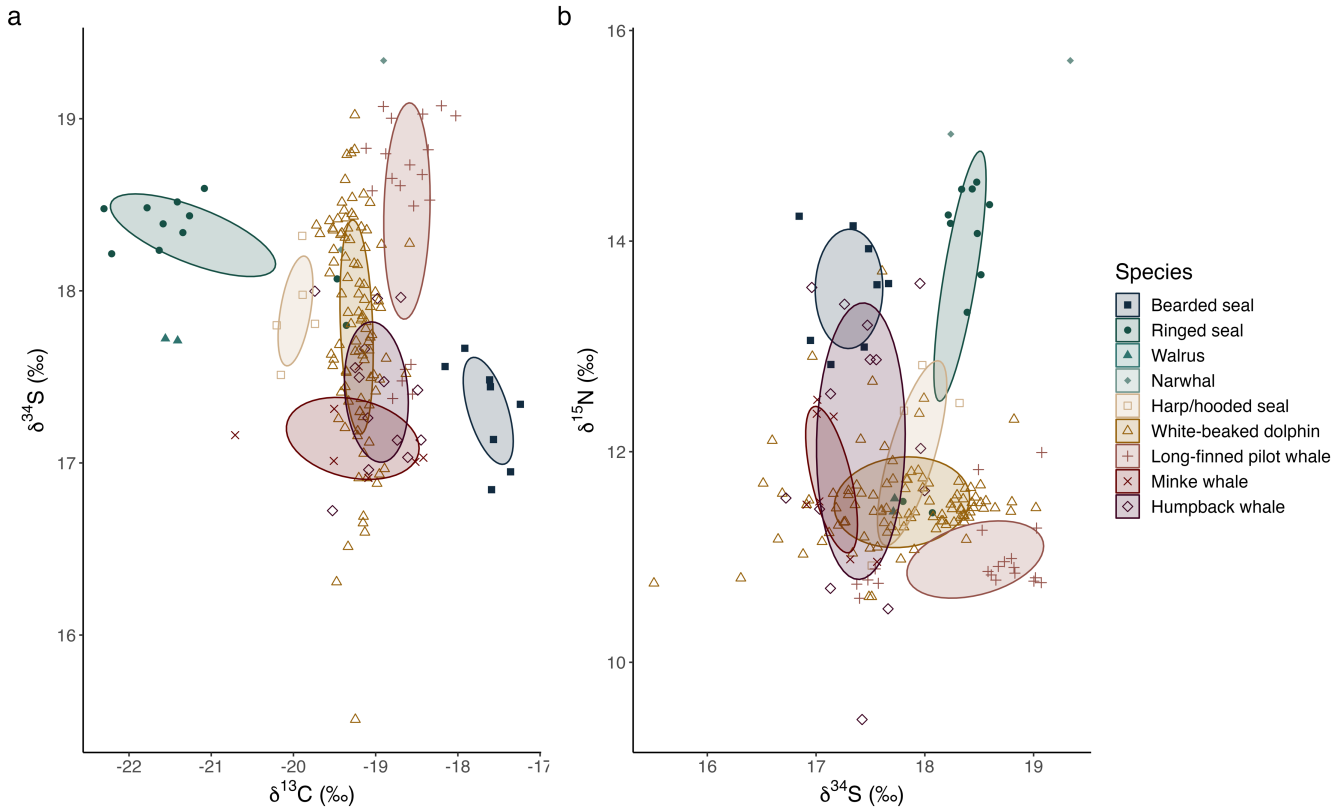

Figure S1: Stable isotope ratio biplots of (a) carbon ($\delta^{13}C$) and sulfur ($\delta^{34}S$) and (b) sulfur ($\delta^{34}S$) and nitrogen ($\delta^{15}N$) in muscle samples of Arctic (filled shapes) and sub-Arctic (open shapes) marine mammal species sampled around Greenland primarily from 2010 to 2018 (except one minke whale from 2000 and two humpback whales of unknown year). Ellipses represent confidence intervals of 0.4 for each species. Harp and hooded seals are grouped based on similar ecology and small sample sizes.

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