Supplementary information

Elucidating the sustainability of 700 years of Inuvialuit beluga whale hunting in the Mackenzie River Delta, Northwest Territories, Canada

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Supplementary figures

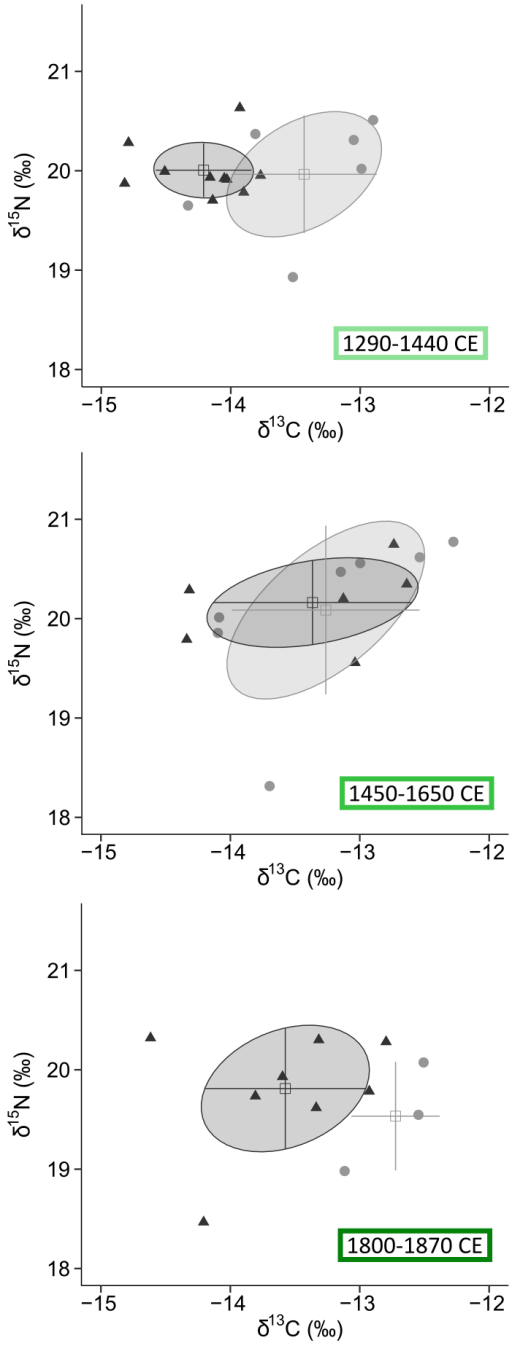

Figure S1 Bone collagen $\delta^{13}C$ and $\delta^{15}N$ data for the three historic time periods. Female (light gray dots) and male (dark gray triangles) belugas for each time period 1290-1440 CE (nF = 6, nM = 10), 1450-1650 CE (nF = 7, nM = 6), and 1800-1870 CE (nF = 3, nM = 8). Solid circles indicate standard ellipse areas encompassing 40% of the data; no ellipse was estimated for females in the lower panel due to small sample size. Mean (square) and SD (error bars) are indicated.

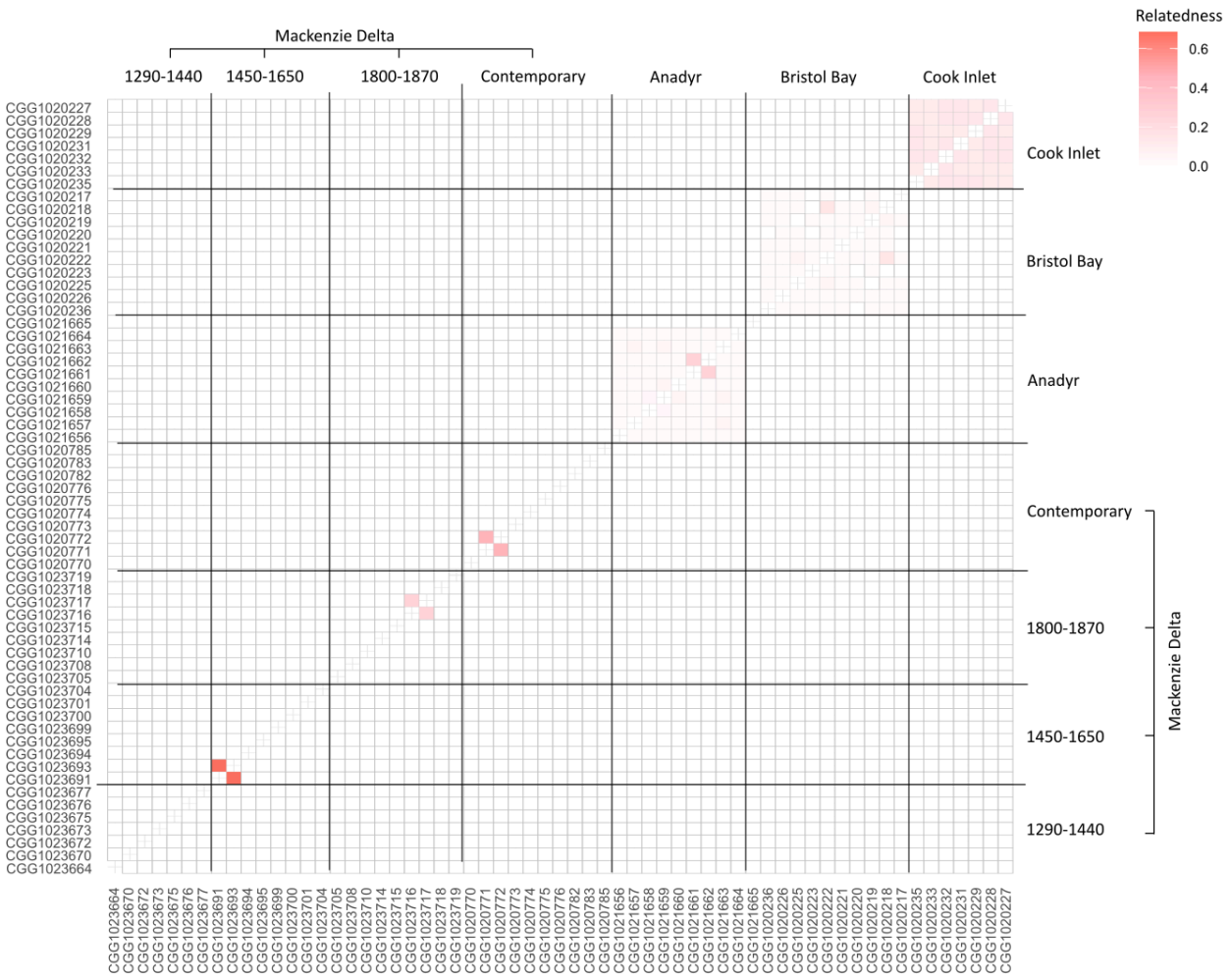

Figure S2 Heatmap of pairwise relatedness coefficients of 61 belugas from the Mackenzie delta and adjacent populations. For pairs with relatedness coefficients (r) above 0.3, the individual with the lowest coverage was excluded from the nuclear analyses. This led to the exclusion of two individuals; individual CGG102393 from 1450-1650 CE, which was related to CGG102391 (r=0.68), and individual CGG1020771 from contemporary Mackenzie Delta, which was related to CGG1020772 (r=0.46).

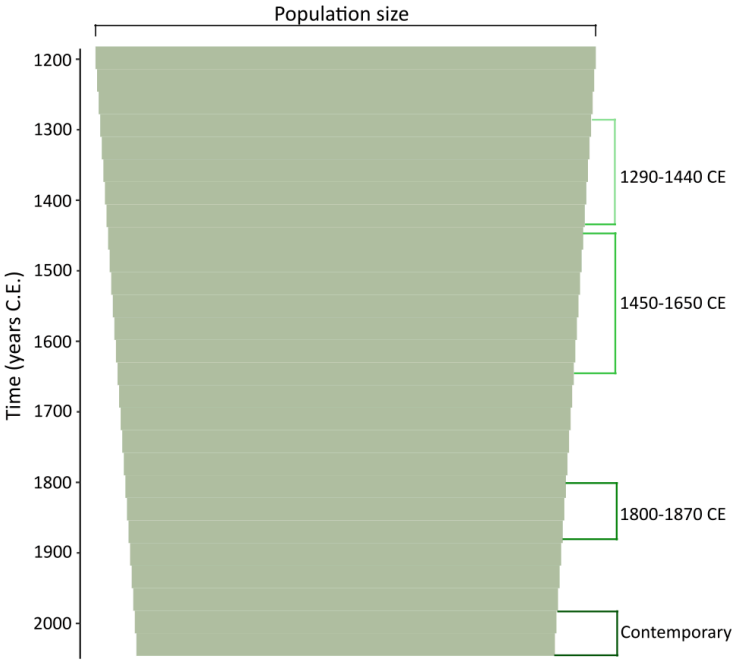

Figure S3 Schematic representation of our genetic simulations. We used a slendr (1) model to simulate the effect of hunting on the beluga demographic history. The starting size of the population was always 40.000. The number of individuals removed from the population each generation due to hunting is indicated by each “step” decrease in population size.

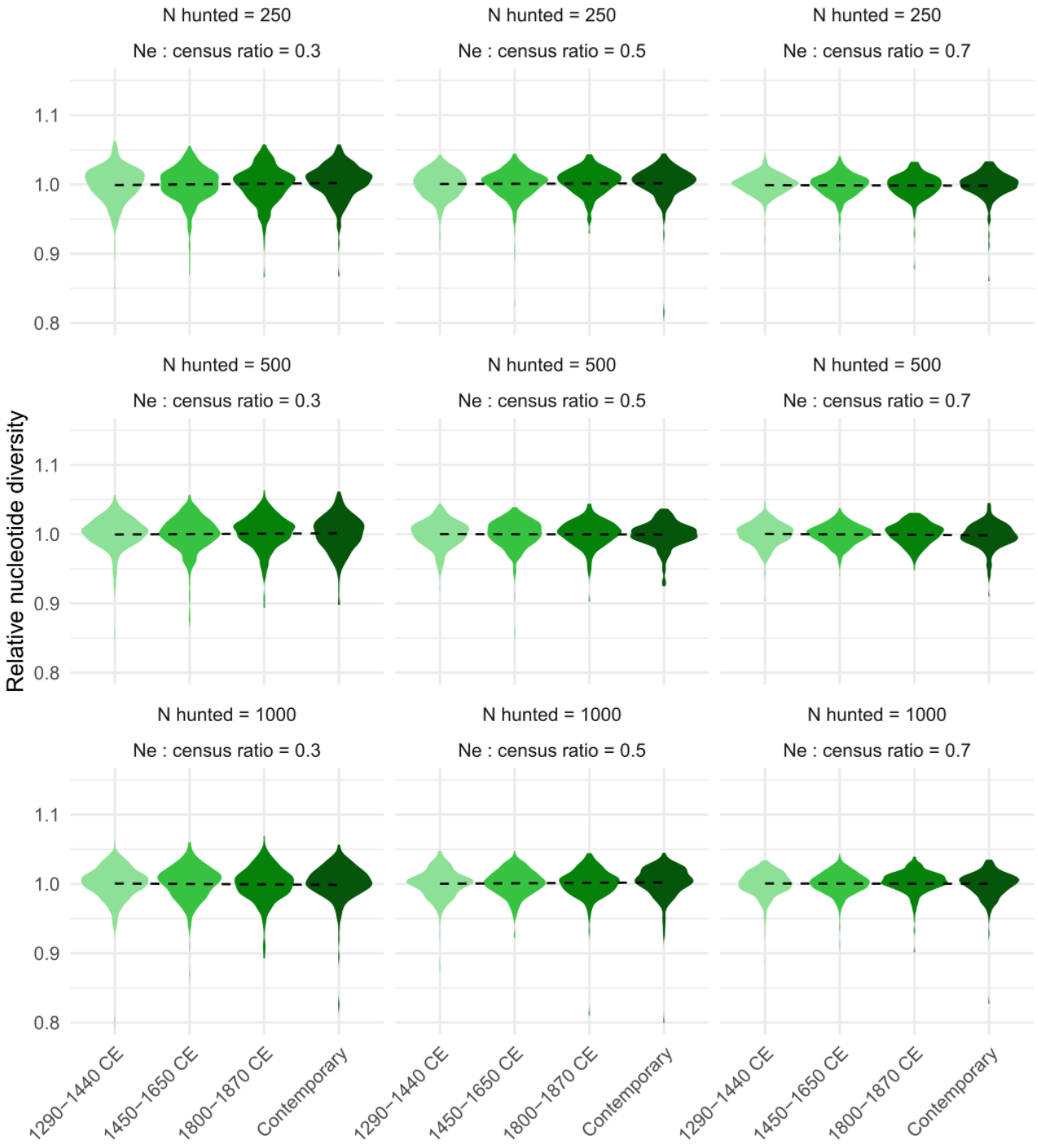

Figure S4 Distributions of nucleotide diversity across four temporal snapshots of a simulated beluga population, corresponding to our empirical data. Each panel displays results from individual simulation scenarios. The starting size of the population is always 40.000 individuals. The number of individuals removed from the population each generation due to hunting is indicated at the top of each panel, as is the ratio used to convert these two quantities to the N_e simulated in each scenario. Nucleotide diversity at each time point is normalized by the mean diversity in the first time period. The black dashed line indicates a linear regression fit of nucleotide diversity as a function of time in each simulated scenario. Table S5 shows the p-value, the R2 (variance explained) and the slope of each linear model.

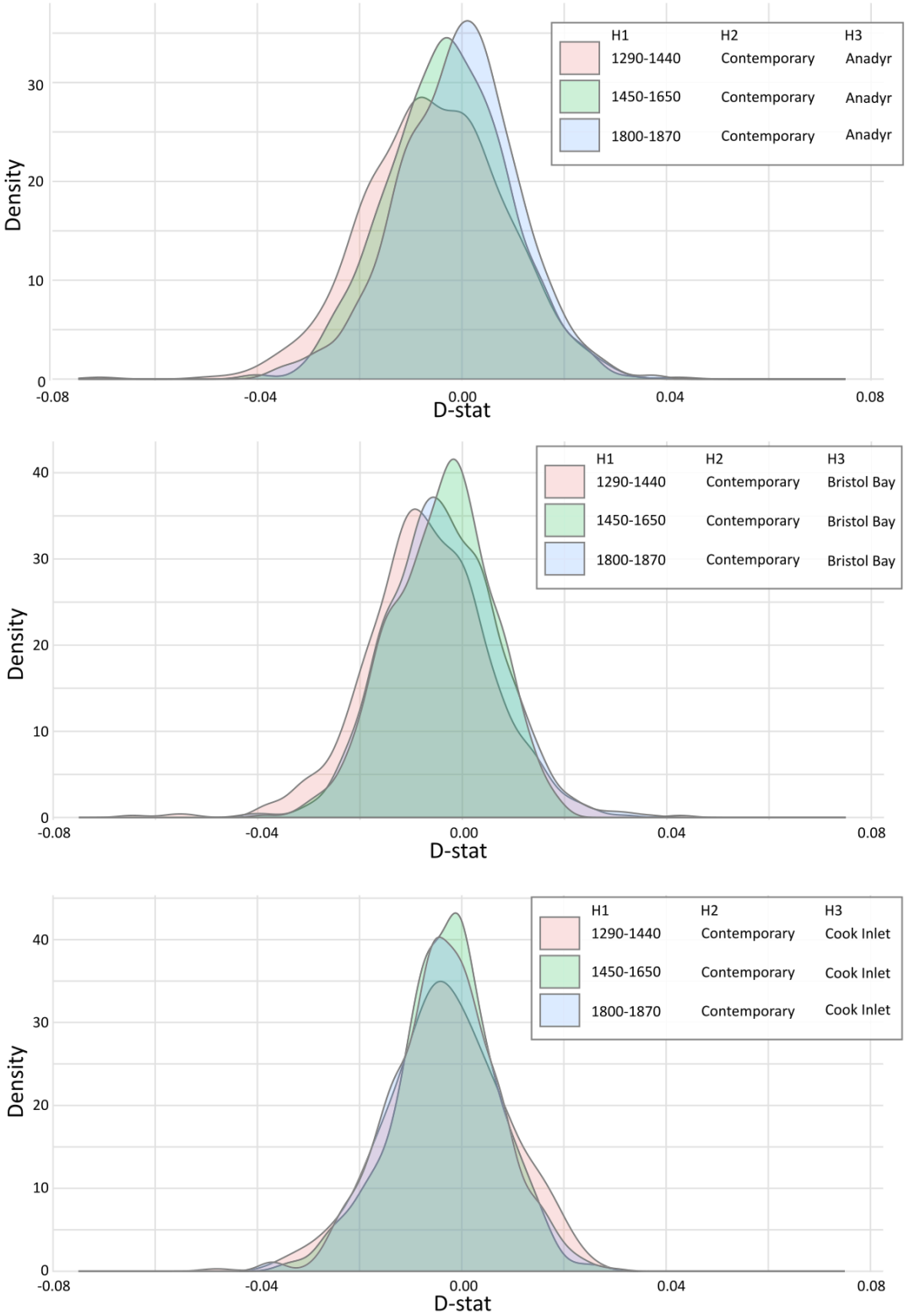

Figure S5 D statistics summary. Overview of D statistics estimated for all combinations of individuals (D[H1-Zooarchaeological, H2-Contemporary, H3-Adjacent, Outgroup]) from the four time periods from Mackenzie Delta – comprising three zooarcaheological and one contemporary –, and the three adjacent contemporary populations (Anadyr, Bristol Bay, and Cook Inlet).

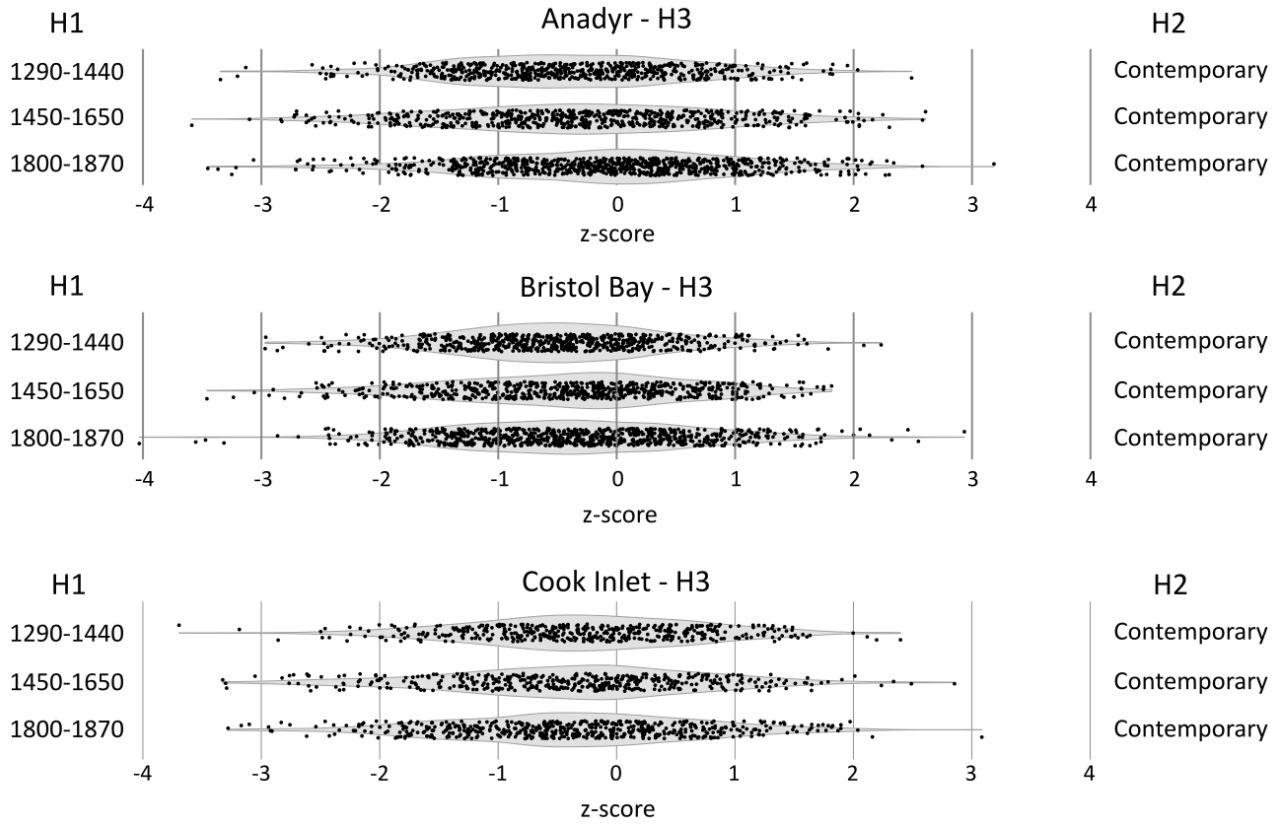

Figure S6. **Z scores from the beluga whale D statistics presented in Figure S5.** Each dot is a z score value from a D[H1-Zooarchaeological, H2-Contemporary, H3-Adjacent, Outgroup] comparison. The violin plots indicate the distribution of z scores.

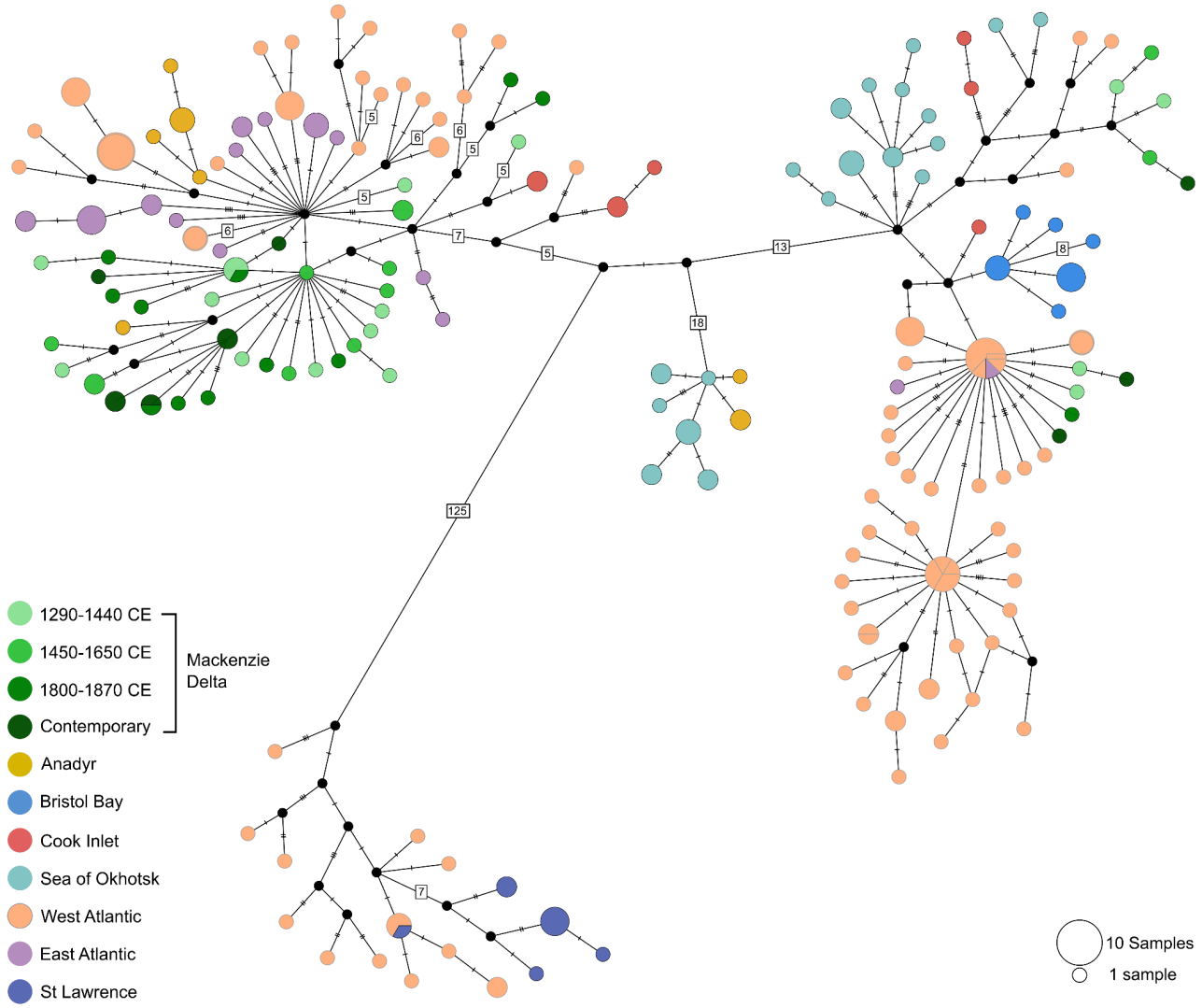

Figure S7. Global phylogeography of belugas. Network of the Mackenzie Delta belugas relative to the global dataset of beluga mitochondrial genome haplotypes from Skovrind et al 2021. A total of 164 mitochondrial haplotypes are found among 246 mitochondrial genome sequences. Relative circle size indicates the number of individuals sharing a haplotype. Number of substitutions among haplotypes are indicated by hashes, or by numbers for >4. Black dots indicate haplotypes not found in the dataset. Of note, lengths of branches between haplotypes are not drawn to scale. The Mackenzie belugas, shown in shades of green, do not share haplotypes with any other localities.

Supplementary tables

Table S1 Radiocarbon dates from relevant contexts at the Cache Point and Kuukpak sites in Mackenzie River Delta, Northwest Territories, Canada. Sixteen dates were new to this study. Dates were calibrated using OxCal 4.4.

Radiocarbon ID	Context	Species sampled	14C age (BP)	±	Calibrated age range CE, 2 sigma	Reference
UCIAMS 225625	Cache Point F6	Dall sheep	585	20	1310-1409	this study
UCIAMS 225626	Cache Point F6	Moose	545	20	1326-1426	this study
BETA 201281	Cache Point F6	Caribou	620	40	1290-1405	Friesen 2009
UCIAMS 225627	Cache Point F8	Caribou	530	20	1329-1436	this study
UCIAMS 225630	Cache Point F8	Caribou	505	20	1406-1441	this study
UCIAMS 225639	Kuukpak A3H5	Caribou	350	25	1465-1635	this study
UCIAMS 225640	Kuukpak A3H5	Caribou	355	20	1465-1633	this study
UCIAMS 225641	Kuukpak A3H5	Caribou	305	20	1506-1648	this study
UCIAMS 225642	Kuukpak A3H5	Caribou	360	20	1459-1632	this study
UCIAMS 225643	Kuukpak A3H5	Caribou	370	20	1455-1630	this study
UCIAMS 225644	Kuukpak A3H5	Caribou	370	20	1455-1630	this study
UCIAMS 225645	Kuukpak A3H5	Caribou	355	20	1465-1633	this study
UCIAMS 225646	Kuukpak A3H5	Moose	315	20	1499-1644	this study
UCIAMS 225647	Kuukpak A3H5	Caribou	375	20	1453-1625	this study
UCIAMS 225632	Kuukpak A5H1	Caribou	300	25	1500-1655	this study
UCIAMS 225637	Kuukpak A5H1	Moose	345	20	1475-1635	this study
UCIAMS 225638	Kuukpak A5H1	Caribou	140	20	1673-1944	this study

Table S2 Sample overview of the beluga whale specimens analyzed. For all samples, we include specimen ID (CGG numbers registered at the Globe Institute, University of Copenhagen), sample provider ID, locality, age, sampling time, mtDNA coverage, nuclear coverage, X chromosome to autosomal coverage ratios, and NCBI accession number. For the 45 zooarchaeological specimens, we also include time period, TEAL (laboratory ID at the University of Trent, Canada), and Collagen yield (%), δ13C, δ15N, C:N Atomic ratio.

CGG ID	Sample provider ID	Teal ID	Locality	Age	Sampling dd/mm/yyyy	House	Collagen yield (%)	δ13C	δ15N	C:N Atomic	mtDNA coverage	nuclear DNA coverage	X chromosome to autosomal coverage ratios	Genetic sex	Accession
CGG1023664	NhTs-2-1	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	NA	-14.79	20.29	3.5	221.72	0.55	0.59	M	ERS18420459
CGG1023665	NhTs-2-2	2958	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	3.3	-13.81	20.37	3.4	127.55	0.02	1.04	F	ERS18420460
CGG1023666	NhTs-2-3	2959	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	10.3	-14.33	19.65	3.3	105.76	0.02	1.08	F	ERS18420461
CGG1023667	NhTs-2-4	2960	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	3.2	-14.82	19.88	3.5	3.30	0.02	0.68	M	ERS18420462
CGG1023668	NhTs-2-5	2961	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	6.3	-14.05	19.93	3.4	144.99	0.04	0.57	M	ERS18420463
CGG1023669	NhTs-2-6	2962	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	6.5	-14.03	19.92	3.2	15.95	0.04	0.58	M	ERS18420464
CGG1023670	NhTs-2-7	2963	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	5.5	-13.93	20.64	3.2	194.98	0.49	0.58	M	ERS18420465
CGG1023671	NhTs-2-8	2964	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	6.3	-14.51	20	3.3	24.78	0.13	0.58	M	ERS18420466
CGG1023672	NhTs-2-9	2965	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1998	H6	7.4	-12.99	20.02	3.3	111.13	0.84	1.04	F	ERS18420467
CGG1023673	NhTs-2-10	2966	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	3.1	-12.9	20.51	3.2	72.66	0.41	1.04	F	ERS18420468
CGG1023675	NhTs-2-12	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	NA	-14.16	19.94	3.5	187.97	0.95	0.56	M	ERS18420469
CGG1023676	NhTs-2-13	2967	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	8.7	-13.77	19.96	3.3	32.59	0.20	0.58	M	ERS18420470
CGG1023677	NhTs-2-14	2968	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	NA	-13.52	18.93	3.2	87.17	0.61	1.06	F	ERS18420471
CGG1023680	NhTs-2-17	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	NA	NA	NA	NA	87.76	0.03	0.60	M	ERS18420472
CGG1023683	NhTs-2-20	2969	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	3.6	-13.05	20.31	3.2	7.56	0.03	1.05	F	ERS18420473
CGG1023685	NhTs-2-22	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/2015	H8	NA	-14.14	19.71	3.3	164.50	0.02	0.59	M	ERS18420474
CGG1023688	NhTs-2-25	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	NA	NA	NA	NA	95.46	0.01	0.59	M	ERS18420475
CGG1023690	NhTs-2-27	NA	Mackenzie Delta, Cache Point	1290-1440	NA/NA/1999	H8	NA	-13.9	19.79	3.4	158.96	0.01	0.59	M	ERS18420476
CGG1023691	NiTs-1-1	2970	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	4.3	-12.64	20.41	3.4	497.71	0.73	1.03	F	ERS18420477
CGG1023692	NiTs-1-2	2971	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	2	-13	20.62	3.2	21.63	0.09	1.03	F	ERS18420478
CGG1023693	NiTs-1-3	2972	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	3	-14.1	19.9	3.5	299.42	0.65	0.96	F	ERS18420479
CGG1023694	NiTs-1-4	2973	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	2.3	-12.28	20.84	3.2	216.18	1.83	1.05	F	ERS18420480
CGG1023695	NiTs-1-5	2974	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	4.7	-14.32	20.35	3.1	659.84	3.86	0.56	M	ERS18420481
CGG1023696	NiTs-1-6	2975	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	2.2	-14.34	19.84	3.3	10.65	0.11	0.48	M	ERS18420482
CGG1023697	NiTs-1-7	2976	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	2.4	-12.74	20.82	3.2	38.12	0.08	0.55	M	ERS18420483
CGG1023698	NiTs-1-8	2977	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2014	A3H5	2.6	-13.13	20.26	3.2	25.84	0.09	0.55	M	ERS18420484
CGG1023699	NiTs-1-9	2978	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2016	A3H5	0.9	-13.15	20.53	3.2	233.11	1.11	1.01	F	ERS18420485
CGG1023700	NiTs-1-10	2979	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2016	A3H5	2.9	-13.04	19.06	3.3	158.09	1.78	0.53	M	ERS18420486
CGG1023701	NiTs-1-11	2980	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2016	A3H5	0.5	-13.7	18.32	3.4	311.55	2.65	1.07	F	ERS18420487
CGG1023702	NiTs-1-12	2981	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2016	A3H5	1.3	-14.09	20.06	3.6	24.45	0.13	1.03	F	ERS18420488
CGG1023704	NiTs-1-14	2982	Mackenzie Delta, Kuukpak	1450-1650	NA/NA/2016	A3H5	6.1	-12.54	20.68	3.3	234.99	1.07	1.07	F	ERS18420489
CGG1023705	NiTs-1-15	2983	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	6	-12.51	20.13	3.3	93.22	0.39	1.11	F	ERS18420490
CGG1023706	NiTs-1-16	2984	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	6.9	-13.12	19.01	3.3	31.97	0.10	1.05	F	ERS18420491
CGG1023707	NiTs-1-17	NA	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	NA	NA	NA	NA	52.03	0.10	1.08	F	ERS18420492

CGG1023708	NiTs-1-18	NA	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	NA	NA	NA	NA	230.15	1.30	0.59	M	ERS18420493
CGG1023709	NiTs-1-19	2986	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	5.3	-13.81	19.79	3.4	11.82	0.04	0.59	M	ERS18420494
CGG1023710	NiTs-1-20	2987	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	4.4	-13.34	19.67	3.3	411.06	1.25	0.58	M	ERS18420495
CGG1023711	NiTs-1-21	NA	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	NA	NA	NA	NA	0.00	0.00	0.99	F	ERS18420496
CGG1023713	NiTs-1-22	2989	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	6.5	-13.6	19.99	3.2	28.82	0.06	0.57	M	ERS18420497
CGG1023714	NiTs-1-24	2990	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	1.6	-14.21	18.49	3.4	156.58	0.89	0.57	M	ERS18420498
CGG1023715	NiTs-1-25	2991	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	3.4	-13.32	20.37	3.3	216.99	1.10	0.56	M	ERS18420499
CGG1023716	NiTs-1-26	2992	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	7	-12.93	19.84	3.3	338.48	1.70	0.57	M	ERS18420500
CGG1023717	NiTs-1-27	2993	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	2.9	-12.8	20.35	3.2	180.06	0.95	0.55	M	ERS18420501
CGG1023718	NiTs-1-28	2994	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	3.4	-12.55	19.59	3.3	232.19	1.64	1.05	F	ERS18420502
CGG1023719	NiTs-1-29	NA	Mackenzie Delta, Kuukpak	1800-1870	NA/NA/2017	A5H1	NA	-14.62	20.39	3.5	346.65	1.11	0.56	M	ERS18420503
CGG1020770	HI-05-27	NA	Mackenzie Delta, Hendrickson Island	Contemporary	NA/NA/2005	NA	NA	NA	NA	NA	1009.20	0.95	1.05	F	ERS18420504
CGG1020771	HI-04-01	NA	Mackenzie Delta, Hendrickson Island	Contemporary	03/07/2004	NA	NA	NA	NA	NA	917.90	0.96	0.55	M	ERS18420505
CGG1020772	HI-04-1B	NA	Mackenzie Delta, Hendrickson Island	Contemporary	03/07/2004	NA	NA	NA	NA	NA	695.11	0.96	0.55	M	ERS18420506
CGG1020773	HI-04-02	NA	Mackenzie Delta, Hendrickson Island	Contemporary	04/07/2004	NA	NA	NA	NA	NA	695.83	0.85	1.00	F	ERS18420507
CGG1020774	HI-04-05	NA	Mackenzie Delta, Hendrickson Island	Contemporary	05/07/2004	NA	NA	NA	NA	NA	858.99	1.15	0.54	M	ERS18420508
CGG1020775	HI-04-06	NA	Mackenzie Delta, Hendrickson Island	Contemporary	08/07/2004	NA	NA	NA	NA	NA	1032.24	0.66	0.55	M	ERS18420509
CGG1020776	HI-04-07	NA	Mackenzie Delta, Hendrickson Island	Contemporary	08/07/2004	NA	NA	NA	NA	NA	457.88	0.78	0.52	M	ERS18420510
CGG1020782	MDHI97-11	NA	Mackenzie Delta, Hendrickson Island	Contemporary	01/08/1997	NA	NA	NA	NA	NA	512.68	0.78	1.02	F	ERS18420511
CGG1020783	MDHI97-12	NA	Mackenzie Delta, Hendrickson Island	Contemporary	25/07/1997	NA	NA	NA	NA	NA	1034.38	0.94	1.00	F	ERS18420512
CGG1020785	MDHI97-16	NA	Mackenzie Delta, Hendrickson Island	Contemporary	26/07/1997	NA	NA	NA	NA	NA	569.27	0.87	0.55	M	ERS18420513
CGG1021656	1430	NA	Anadyr Gulf	Contemporary	NA/NA/2010	NA	NA	NA	NA	NA	690.80	0.82	1.04	F	ERS18420514
CGG1021657	1435	NA	Anadyr Gulf	Contemporary	NA/NA/2010	NA	NA	NA	NA	NA	499.83	0.74	0.53	M	ERS18420515
CGG1021658	1431	NA	Anadyr Gulf	Contemporary	NA/NA/2010	NA	NA	NA	NA	NA	398.22	0.78	1.02	F	ERS18420516
CGG1021659	1432	NA	Anadyr Gulf	Contemporary	NA/NA/2010	NA	NA	NA	NA	NA	1112.09	0.90	0.55	M	ERS18420517
CGG1021660	1437	NA	Anadyr Gulf	Contemporary	NA/NA/2010	NA	NA	NA	NA	NA	949.48	0.98	1.02	F	ERS18420518
CGG1021661	2411	NA	Anadyr Gulf	Contemporary	NA/NA/2011	NA	NA	NA	NA	NA	435.87	0.79	1.05	F	ERS18420519
CGG1021662	2427	NA	Anadyr Gulf	Contemporary	NA/NA/2011	NA	NA	NA	NA	NA	715.12	0.69	1.06	F	ERS18420520
CGG1021663	2441	NA	Anadyr Gulf	Contemporary	NA/NA/2011	NA	NA	NA	NA	NA	2378.93	0.49	0.53	M	ERS18420521
CGG1021664	2408	NA	Anadyr Gulf	Contemporary	NA/NA/2011	NA	NA	NA	NA	NA	694.20	0.98	1.03	F	ERS18420522
CGG1021665	2418	NA	Anadyr Gulf	Contemporary	NA/NA/2011	NA	NA	NA	NA	NA	633.49	0.70	0.54	M	ERS18420523
CGG1020235	34577	NA	Cook Inlet	Contemporary	13/09/2000	NA	NA	NA	NA	NA	379.91	0.79	0.55	M	ERS18420524
CGG1020233	10044	NA	Cook Inlet	Contemporary	22/07/2002	NA	NA	NA	NA	NA	694.54	2.87	1.02	F	ERS18420525
CGG1020232	10921	NA	Cook Inlet	Contemporary	19/06/2000	NA	NA	NA	NA	NA	648.84	1.96	1.05	F	ERS18420526
CGG1020231	10918	NA	Cook Inlet	Contemporary	01/10/1998	NA	NA	NA	NA	NA	940.04	2.31	0.54	M	ERS18420527
CGG1020229	16604	NA	Cook Inlet	Contemporary	NA/NA/NA	NA	NA	NA	NA	NA	436.11	1.23	1.04	F	ERS18420528
CGG1020228	28925	NA	Cook Inlet	Contemporary	15/06/1998	NA	NA	NA	NA	NA	967.54	1.18	0.98	F	ERS18420529
CGG1020227	17296	NA	Cook Inlet	Contemporary	04/08/2003	NA	NA	NA	NA	NA	531.89	0.73	0.55	M	ERS18420530
CGG1020236	49105	NA	Bristol Bay	Contemporary	02/09/2005	NA	NA	NA	NA	NA	176.25	0.45	1.02	F	ERS18420531
CGG1020226	55825	NA	Bristol Bay	Contemporary	20/05/2006	NA	NA	NA	NA	NA	762.33	1.47	1.02	F	ERS18420532
CGG1020225	47964	NA	Bristol Bay	Contemporary	20/05/2005	NA	NA	NA	NA	NA	619.06	1.31	0.54	M	ERS18420533
CGG1020223	33593	NA	Bristol Bay	Contemporary	09/05/2003	NA	NA	NA	NA	NA	408.34	1.13	0.54	M	ERS18420534

CGG1020222	43382	NA	Bristol Bay	Contemporary	21/05/2004	NA	NA	NA	NA	NA	377.74	0.74	0.54	M	ERS18420535
CGG1020221	43392	NA	Bristol Bay	Contemporary	21/05/2004	NA	NA	NA	NA	NA	408.25	0.72	1.07	F	ERS18420536
CGG1020220	43391	NA	Bristol Bay	Contemporary	22/05/2004	NA	NA	NA	NA	NA	309.18	0.61	1.06	F	ERS18420537
CGG1020219	61079	NA	Bristol Bay	Contemporary	NA/09/2006	NA	NA	NA	NA	NA	273.38	0.90	0.99	F	ERS18420538
CGG1020218	61076	NA	Bristol Bay	Contemporary	NA/09/2006	NA	NA	NA	NA	NA	320.67	1.10	0.54	M	ERS18420539
CGG1020217	61075	NA	Bristol Bay	Contemporary	NA/09/2006	NA	NA	NA	NA	NA	400.15	0.93	0.55	M	ERS18420540

Table S3 Stable isotope data summary. Various combinations of sex and time period were analysed as groups. Sample size (n), δ13C and δ15N mean and SD (‰) in each group analyzed.

Sex	Time period	n	δ13C (‰)	δ15N (‰)
F	All	16	-13.2 (0.63)	20.0 (0.71)
M	All	24	-13.8 (0.66)	20.0 (0.45)
F and M	1290-1440 CE	16	-13.9 (0.58)	20.0 (0.40)
F and M	1450-1650 CE	13	-13.3 (0.71)	20.2 (0.68)
F and M	1800-1870 CE	11	-13.3 (0.67)	19.8 (0.59)
F	1290-1440 CE	6	-13.4 (0.56)	20.0 (0.59)
M	1290-1440 CE	10	-14.2 (0.37)	20.0 (0.27)
F	1450-1650 CE	7	-13.3 (0.72)	20.1 (0.87)
M	1450-1650 CE	6	-13.4 (0.77)	20.2 (0.43)
F	1800-1870 CE	3	-12.7 (0.34)	19.6 (0.56)
M	1800-1870 CE	8	-13.6 (0.62)	19.9 (0.62)

Table S4 Simulation summary. Metrics of the linear regression fit of simulated nucleotide diversity as a function of time for each simulation scenario shown in panels in Figure S4.

N_start	N_hunted	census_ratio	p value	r. quared	slope
40000	250	0.3	0.42	3.00E-04	-1.00E-09
40000	250	0.5	0.92	5.00E-06	-3.00E-10
40000	250	0.7	0.25	7.00E-04	-3.00E-09
40000	500	0.3	0.66	1.00E-04	-8.00E-10
40000	500	0.5	0.91	7.00E-06	-2.00E-10
40000	500	0.7	0.32	5.00E-04	-2.00E-09
40000	1000	0.3	0.63	1.00E-04	1.00E-09
40000	1000	0.5	1.00	8.00E-09	-9.00E-12
40000	1000	0.7	0.81	3.00E-05	6.00E-10

Table S5 Mitogenome diversity statistics. Values were estimated for the Mackenzie Delta belugas from each of four time periods, and for the three adjacent populations.

Population	Time period	Samples	segregating sites (S)	Haplotypes (h)	Haplotype diversity (H)	Nucleotide diversity (π)
Mackenzie Delta	1290-1440 CE	16	71	15	0.99	0.0011
Mackenzie Delta	1450-1650 CE	12	52	10	0.97	0.0009
Mackenzie Delta	1800-1870 CE	12	56	12	1.00	0.0007
Mackenzie Delta	Contemporary	10	49	8	0.96	0.0011
Anadyr	Contemporary	10	40	7	0.91	0.0011
Bristol Bay	Contemporary	10	4	5	0.80	0.0001
Cook Inlet	Contemporary	7	51	5	0.91	0.0015

Table S6 Quality control. Standard deviations for the carbon and nitrogen isotopic compositions of the calibration standards used in all the analytical sessions associated with the data presented in this study.

Standard	Material	*n*	δ13C (±1σ)	δ15N (±1σ)
USGS40	Glutamic acid	18	0.04	0.23
USGS41a	Glutamic acid	7	0.04	0.15
USGS63	Caffeine	10	0.07	0.12
USGS66	Glycine	12	0.07	0.3

Table S7 Isotopic reference materials used to monitor internal accuracy and precision. The isotopic compositions used as the accepted values for these internal standards represent long-term averages.

Standard	Material	Mean δ13C (‰, VPDB)	Mean δ15N (‰, AIR)
SRM-1	Caribou bone collagen	−19.39 ± 0.09	+01.85±0.19
SRM-2	Walrus bone collagen	−14.80 ± 0.07	+15.58±0.18
SRM-14	Polar bear bone collagen	−13.63 ± 0.09	+21.56±0.23
SRM-15	Deer bone collagen	−26.89 ± 0.08	+06.91±0.18
SRM-16	Seal bone collagen	−14.78 ± 0.08	+16.93±0.19
SRM-17	Phenylalanine	−12.41 ± 0.10	+03.18±0.22

Table S8 Quality assurance. Summary of the mean and standard deviation of carbon and nitrogen isotopic compositions for all check (quality assurance) standards analyzed alongside the samples presented in this study.

		δ13C (‰, VPDB)	***δ15N (‰, AIR)***
Standard	***n***	**Mean ± 1σ**	**Mean ± 1σ**
SRM-1	5	−19.37 ± 0.02	+1.96 ± 0.07
SRM-2	10	−14.80 ± 0.07	+15.61 ± 0.16
SRM-14	22	−13.67 ± 0.05	+21.55 ± 0.12
SRM-15	13	−26.89 ± 0.04	+6.87 ± 0.20
SRM-16	12	−14.81 ±0.08	+16.77 ± 0.28
SRM-17	8	−12.43 ± 0.03	+3.04 ± 0.18

References

1. M. Petr, B. C. Haller, P. L. Ralph, F. Racimo, slendr: a framework for spatio-temporal population genomic simulations on geographic landscapes. *Peer Community Journal* **3** (2023).