Supplementary material for: Möller P. 2024. A bowhead whale vertebra embedded in marine limit beach sediment on Barentsøya, Svalbard. *Polar Research 43*. Correspondence: Per Möller, Department of Geology/Quaternary Sciences, Sölvegatan 13, Lund University, SE 22362 Lund, Sweden. E-mail: per.moller@geol.lu.se

Methods: ZooMS analysis

Collagen was extracted using the ammonium bicarbonate non-destructive method (van Doorn et al. 2011). In brief, 200 µl 50 mM ammonium bicarbonate (AmBic) was added to a microfuge containing a subsample of the bone. The sample was left in the buffer for 24 hours at room temperature. This removed any surface contamination. After 24 hours, the AmBic was removed and a further 200 µl of 50 mM AmBic was added to the sample, before being incubated at 65°C for 1 hour to gelatinize any available collagen into solution. Following gelatinization, 100 µl of the supernatant was transferred to a new microfuge tube while the remaining sample and 100 µl AmBic was stored at -20°C for further analysis if required.

The collagen extract was digested overnight (ca. 18 hours) with the enzyme trypsin at 37°C and the digestion was stopped with the addition of 5% v/v trifluoroacetic acid (TFA). The resulting peptides were purified using C18 ZipTip pipette tips and eluted in 100 µl of conditioning solution (0.1% TFA in 50:50 ACN: Water). One µl of sample was spotted onto a Bruker ground steel target plate and mixed with 1 µl of matrix (alpha-cyano-4-hydroxycinnamic acid). The sample was spotted in triplicate alongside calibration standards, and the plate was run on a Bruker Ultraflex III MALDI ToF mass spectrometer.

The spectra were analysed using ZooMS, an open-source mass spectrometry tool (Strohalm et al. 2010). The three replicates were averaged, and the resulting averaged spectrum was cropped to 800-3500 m/z and the peaks picked using a signal-to-noise ratio of 6. The peak list was compared to a list of published markers, resulting in the identification of either right whale or bowhead whale (Buckley et al. 2009; Buckley et al. 2014; Kirby et al. 2013).

Supplementary Table S1. Peptide marker values for all whales in the ZooMS reference database at BioArch, Department of Archaeology, University of York, UK (in courtesy provided by Samantha Presslee). On the basis of the main marker differentiating the Balaenidae from all other taxa, the Iladalen vertebra is indicated as having belonged to a member of the right whale family (Balaenidae): see the values in boldface.

Common species name *(scientific name)*	ZooMS peptide markers												Ref.
	α1 508	α2 978	α2 978 (+16)	α2 484	α2 502	α2 292	α2 793	α2 454	α1 586	α1 586 (+16)	α2 757	α2 757 (+16)	
Bowhead whale *(Balaena mysticetus)*	1079.6		1205.6	1453.7	1566.8	**1682.8**	2135.1		2883.4			3023.4	[1]
Right whale *(Eubalaena* spp.*)*	1079.6		1205.6	1453.7	1566.8	**1682.8**	2135.1		2883.4			3023.4	[1, 2]

Common species name *(scientific name)*	ZooMS peptide markers												Ref.
	α1 508	α2 978	α2 978 (+16)	α2 484	α2 502	α2 292	α2 793	α2 454	α1 586	α1 586 (+16)	α2 757	α2 757 (+16)	
Sei whale *(Balaenoptera borealis)*	1079.6		1205.6	1441.7	1550.8	1652.8	2135.1		2883.4			3023.4	[1]
Blue whale *(Balaenoptera musculus)*	1079.6		1205.6	1453.7	1550.8	1652.8	2105.1		2883.4			3023.4	[1]
Fin whale *(Balaenoptera physalus)*	1079.6		1205.6	1453.7	1566.8	1652.8	2135.1		2883.4			3023.4	[1, 2]
Minke whale *(Balaenoptera* spp.*)*	1079.6	1189.6	1205.6	1441.7	1566.8	1652.8	2135.1	2849.4	2883.4	2899.4	3007.4	3023.4	[1, 2, 3, 4, 5]
Gray whale *(Eschrichtius robustus)*	1079.6		1205.6	1453.7	1566.8	1652.8	2135.1			2899.4		3023.4	[2, 6]
Humpback whale *(Megaptera novaeangliae)*	1079.6		1205.6	1453.7	1566.8	1652.8	2135.1		2869.4			3023.4	[1, 2]
Pilot whale *(Globicephala* spp.*)*	1063.6		1205.6	1453.7	1566.8	1638.8	2119.1		2883.4			3023.4	[1, 2]
Orca *(Orcinus orca)*	1079.6	1189.6	1205.6	1453.7	1566.8	1652.8	2119.1	2766.4	2883.4	2899.4	3007.4	3023.4	[1, 2, 5]
False killer whale *(Pseudorca crassidens)*	1063.6		1205.6	1453.7	1566.8	1638.8	2119.1		2883.4			3023.4	[1]
Beluga whale *(Delphinapterus leucas)*	1079.6	1189.6	1205.6	1443.7	1550.8	1652.8	2121.1		2883.4	2899.4	3051.4	3067.4	[1, 2, 4]
Narwhal *(Monodon monoceros)*	1079.6	1189.6	1205.6	1443.7	1550.8	1652.8	2089.1		2883.4	2899.4	3051.4	3067.4	[1, 2, 4]
Sperm whale *(Physeter macrocephalus)*	1079.6	1189.6	1205.6	1453.7	1550.8	1652.8	2133.1		2883.4	2899.4		3039.4	[1, 2, 3, 4, 5]
Bottlenose whale *(Hyperoodon* spp.*)*	1063.6		1205.6	1441.7	1550.8	1638.8	2091.1		2883.4			3023.4	[1]
Sowerby's whale *(Mesoplodon bidens)*	1063.6		1205.6	1441.7	1550.8	1638.8	2091.1		2883.4			3023.4	[1]

[1] Buckley et al. (2014). [2] Kirby et al. (2013). [3] Buckley et al. (2009). [4] Buckley & Collins (2011). [5] Welker et al. (2016). [6] Hufthammer et al. (2018).

Supplementary Table S2. Results of the ZooMS analysis of the Iladalen whale vertebra. The main marker differentiating the Balaenidae from other whales is marker a2 292; the corresponding value from the tested vertebra is shown in boldface.

ZooMS ID	Result	ZooMS peptide markers											
		α1 508	α2 978	α2 978 (+16)	α2 484	α2 502	α2 292	α2 793	α2 454	α1 586	α1 586 (+16)	α2 757	α2 757 (+16)
ZooMS_00278_01	Right/ bowhead whale	1079.6		1205.6	1453.7	1566.8	**1682.8**	2135.1		2883.4			3023.4

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