

SUPPLEMENTARY MATERIAL

The age of ambergris

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Abstract

Ambergris, which is a coprolith originating from the sperm whale, has been found only rarely, but for centuries, as jetsam on beaches all over the world. There are no reliable data indicating how long such samples may have remained at sea, with unsubstantiated accounts suggesting maybe decades. Here, we obtained over forty jetsam samples collected on known dates, from mostly known beach locations across the globe. Such an inventory of verified jetsam ambergris is unprecedented. Each sample was characterised by analytical methods such as gas chromatography-mass spectrometry (GC-MS). We then determined the radiocarbon ages of some of the samples by well-described accelerator-MS techniques. Surprisingly, some samples of jetsam have remained in the environment for about a thousand years.

Experimental

Materials

Jetsam ambergris samples were collected from beaches worldwide, including by ourselves, and on receipt were stored in a dry dark cabinet prior to analysis (Rowland and Sutton 2017).

Methods

The methods for GC-MS analysis have been published (Rowland and Sutton 2017). Methods for AMS are well described (Bronk Ramsey 2017). Due to their chemical purity (mean 81% ambrein; Table 1), samples were graphitised (Wacker et al. 2010) without pretreatment and analysed using a MICADAS AMS (Synal et al. 2007).

Figure S1. Example calibration curves for samples from Chile (samples 6-9) and Somalia (sample 10).

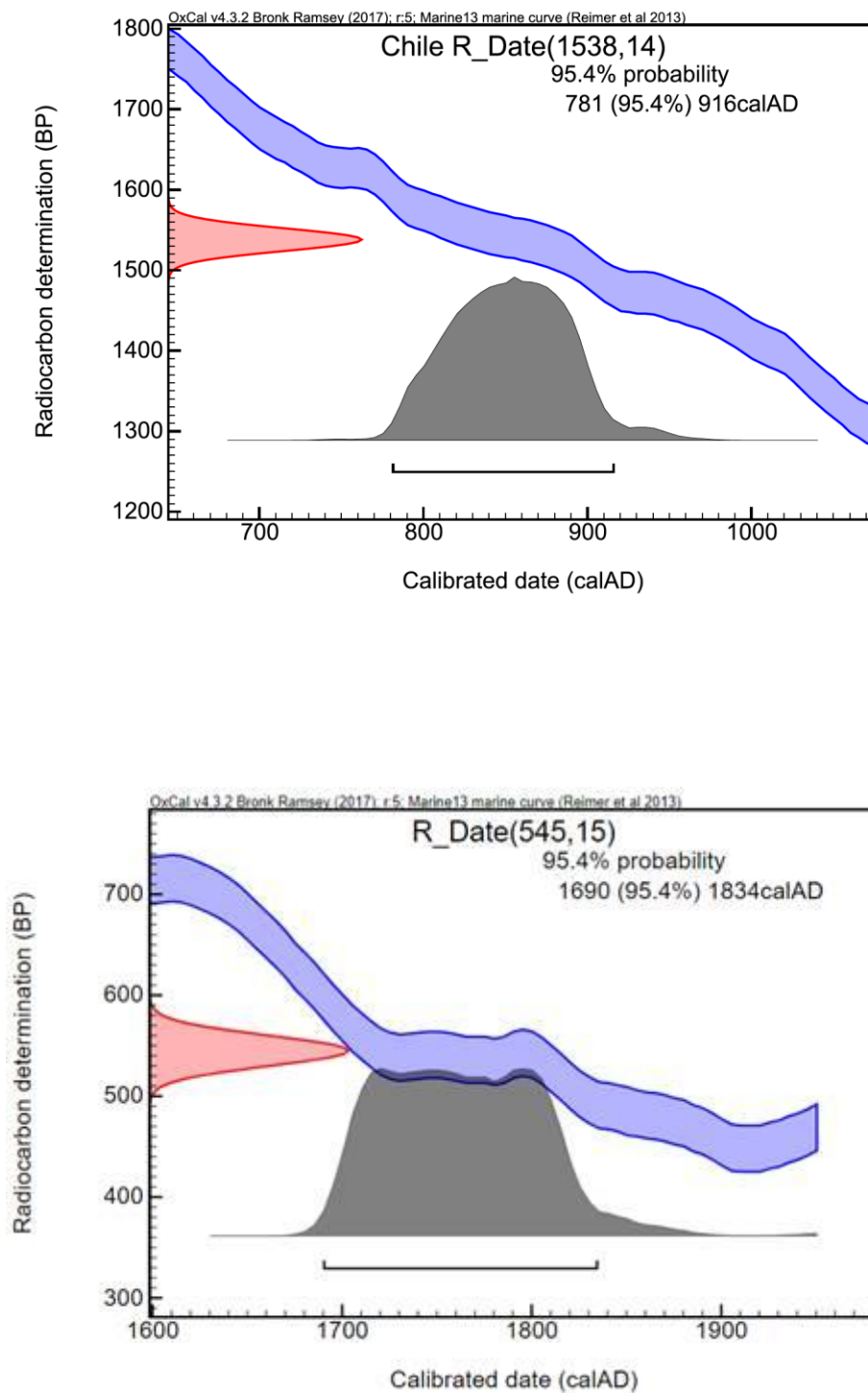


Figure S2. Calibration curve for an additional sample from Mar Brava, Chiloé, Chile

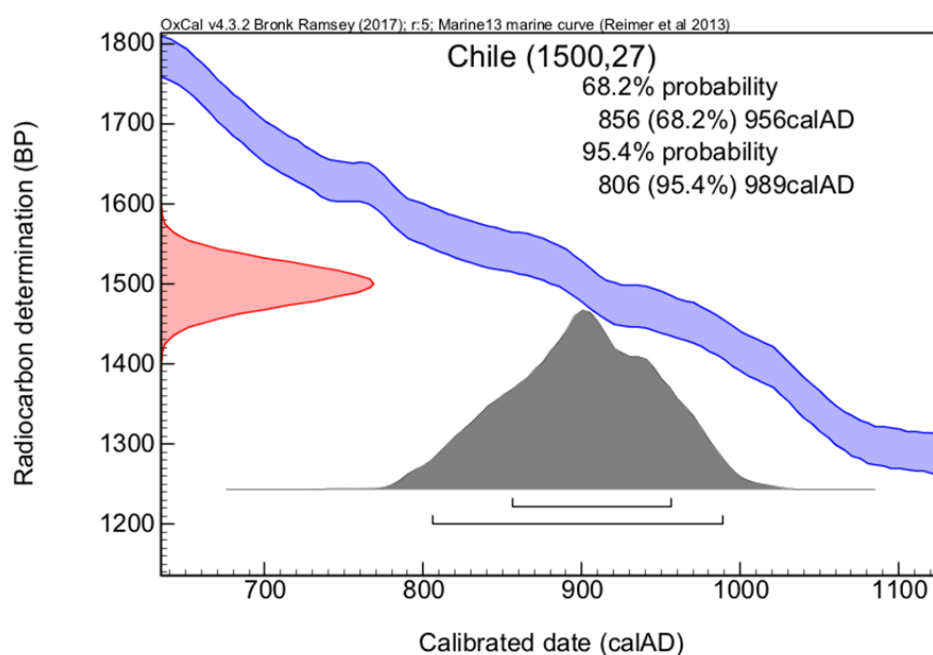


Table S1. Radiocarbon and ^{13}C data for ambergris collected from a dead sperm whale beached on 15 December 2012 at Razende Bol near Texel, Netherlands and archived by the Ecomare Museum, Texel and an additional sample from Chile (calibration for the latter is shown in Figure S2).

Sample Name	$\delta^{13}\text{C}$ (‰)	^{14}C Age (BP)	$F^{14}\text{C}$
Texel 15.12.12	-21.1	-486	1.062±0.003
Mar Brava Chiloé Chile	-21.1	1500	0.829±0.003

References for Supplementary Information

Bronk Ramsey C. 2017. Methods for Summarizing Radiocarbon Datasets. Radiocarbon, 59: 1809-1833.

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Wacker L. Nemec M. Bourquin J. 2010. A revolutionary graphitisation system: Fully automated, compact and simple. Nuclear Instruments and Methods in Physics Research B, 268: 931-934.