

# **Supporting Material for**

## **The Holocene Evolution of a Sedimentary Carbon Store in a Mid Latitude Fjord.**

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Supplementary Table 1. Radiocarbon data

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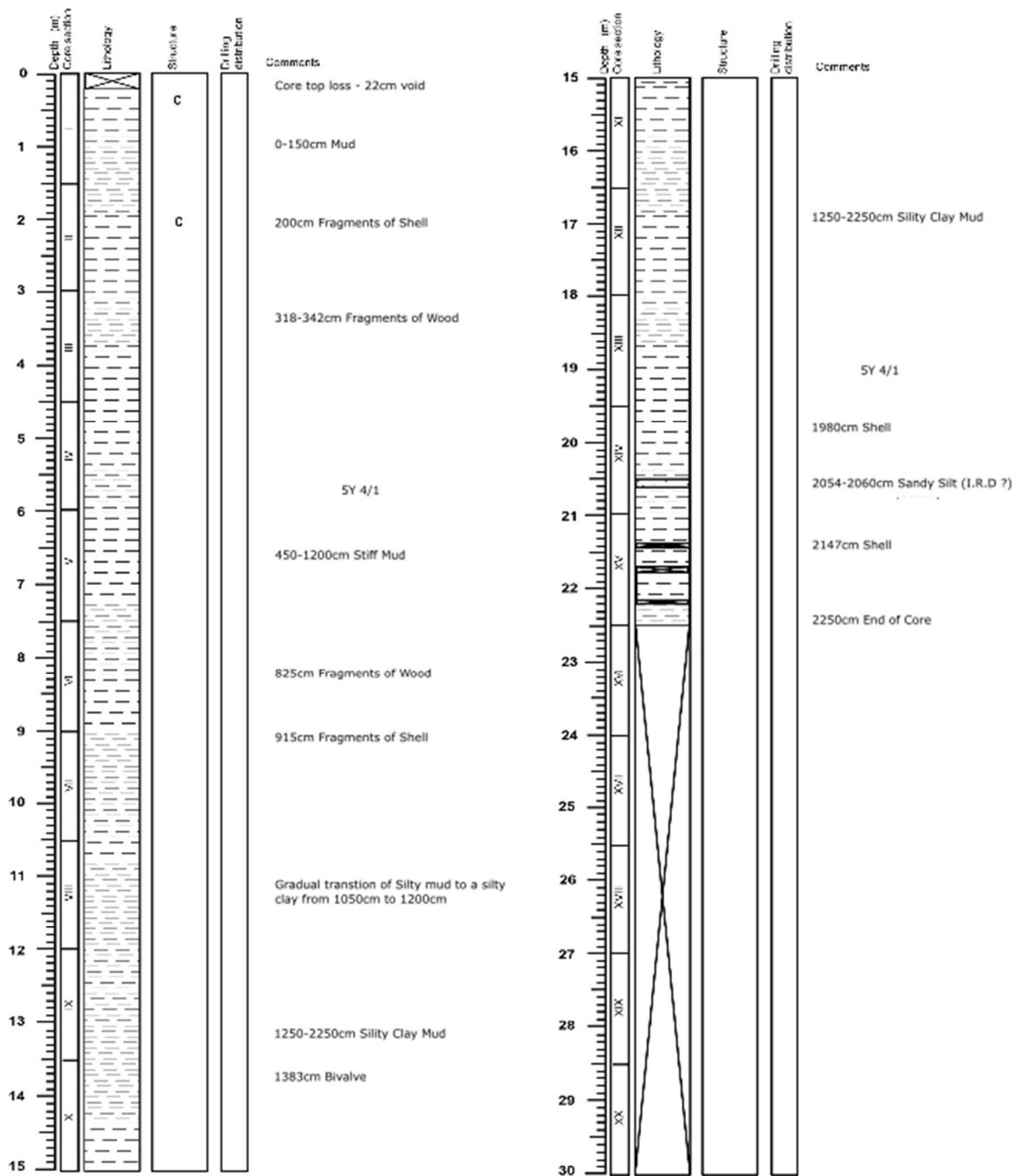
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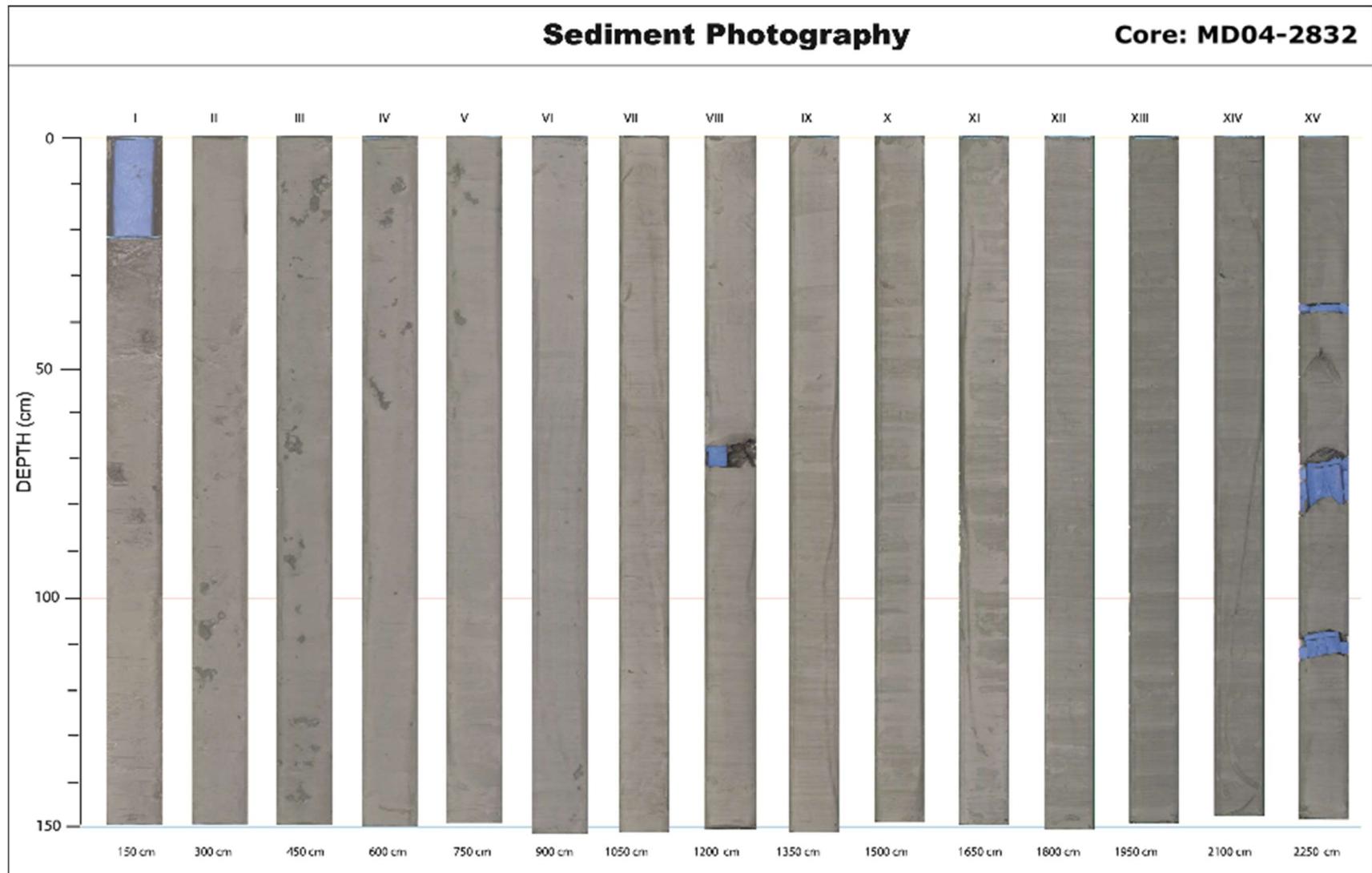
Data File - *Excel*

## Sediment Description

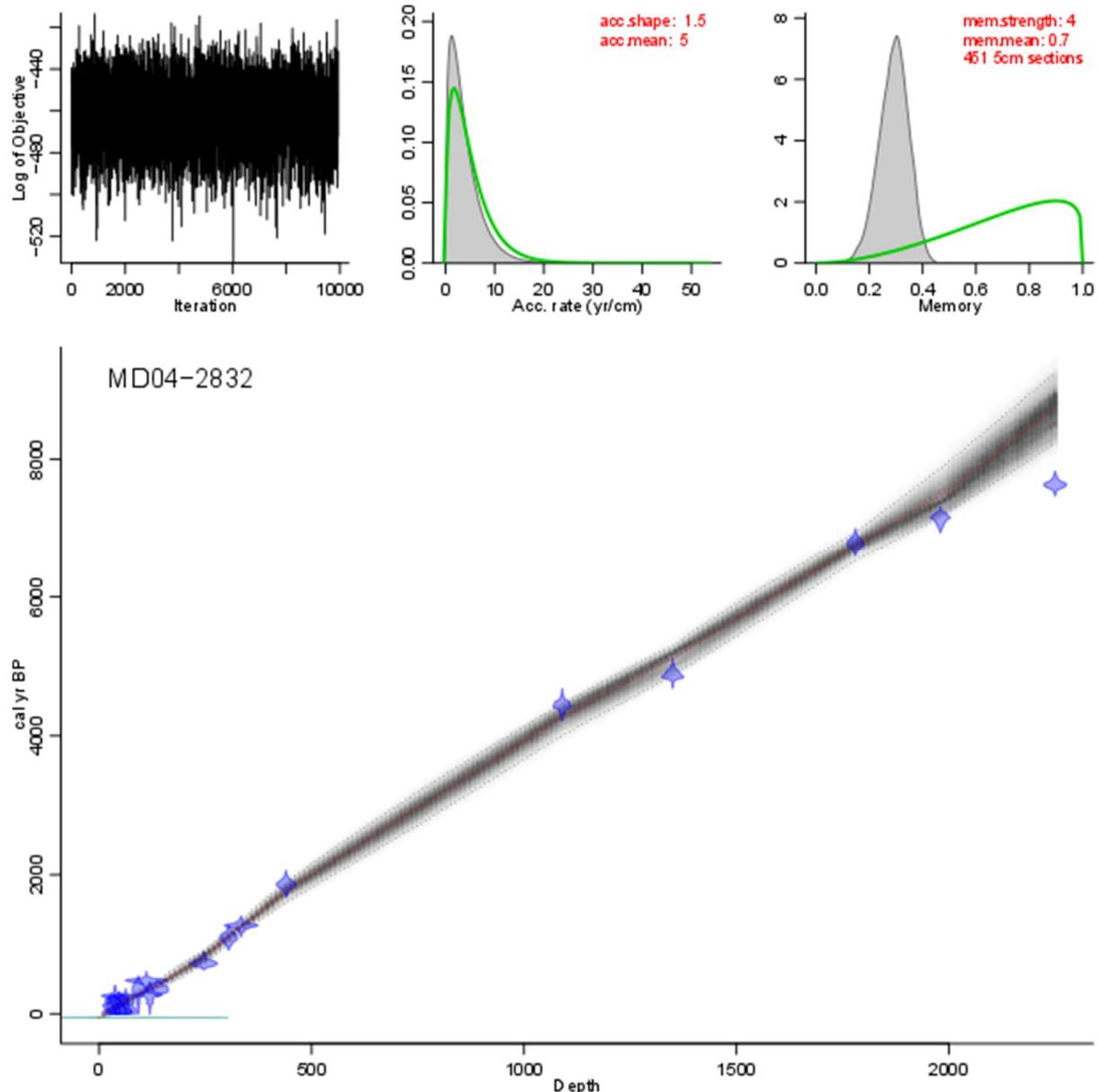
Core MD04-2832



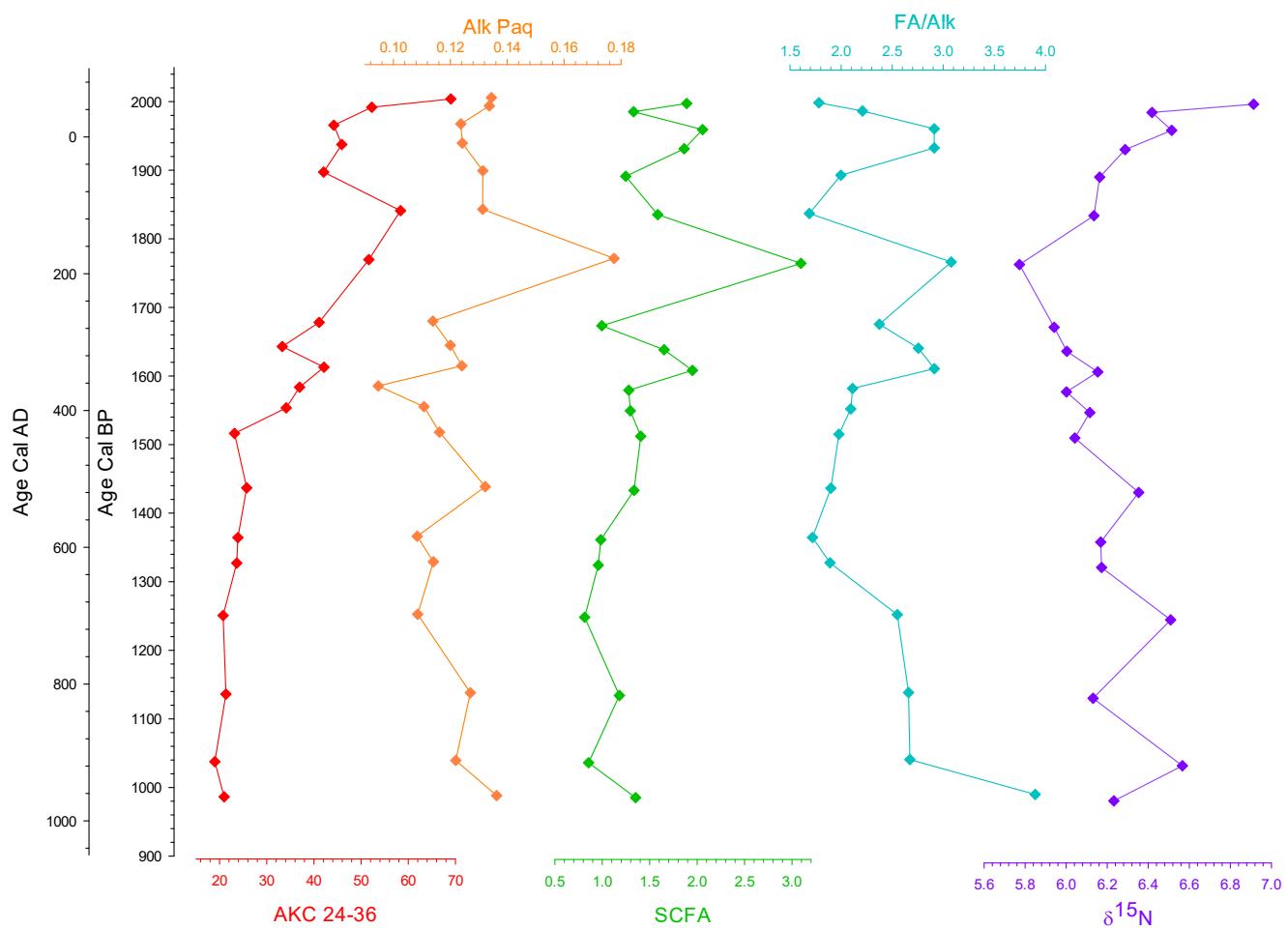
Supplementary Figure 1. Sedimentological log and description of core MD04-2832



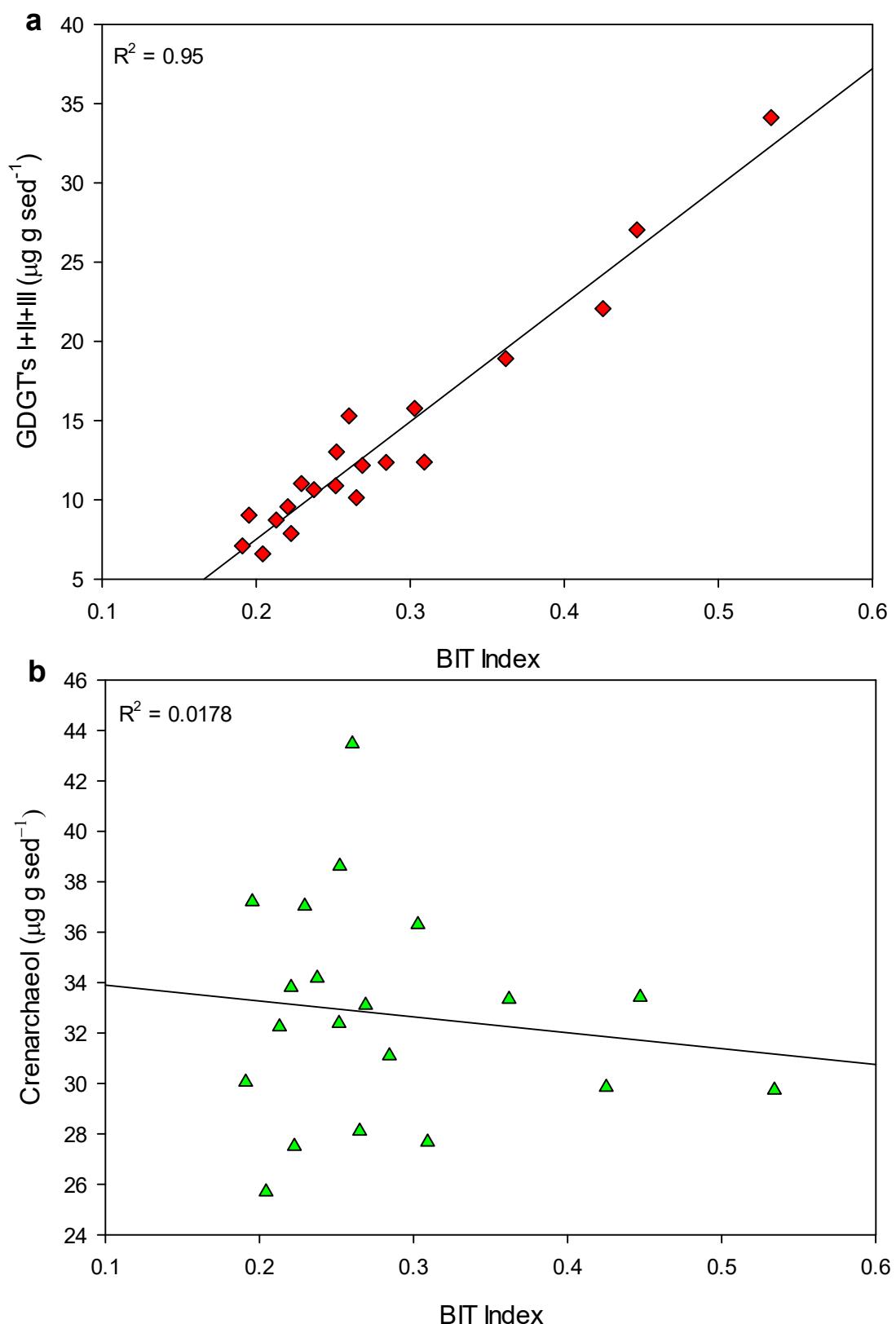
**Supplementary Figure 2.** Photographs of sediment core MD04-2832



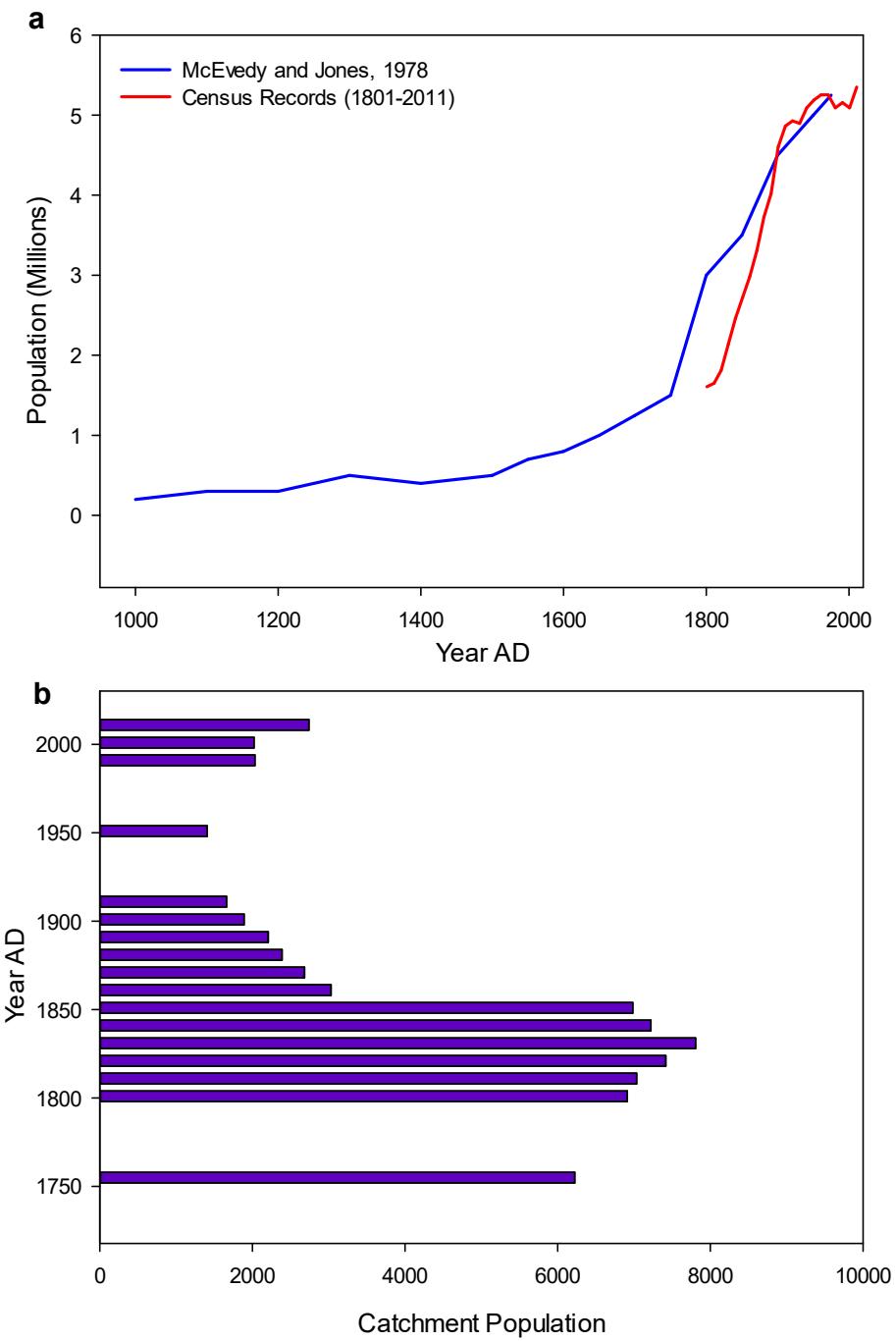
**Supplementary Figure 3.** Bayesian age model for the based on  $^{14}\text{C}$  and  $^{210}\text{Pb}$  data from cores MD04-2832, PM06-GC01 and PM06-MC01 produced using BACON (Blaauw and Christensen, 2011). Where the upper panels depict the MCMC iterations, the prior (green curves) and posterior (grey histograms) distributions for the accumulation rate and memory.



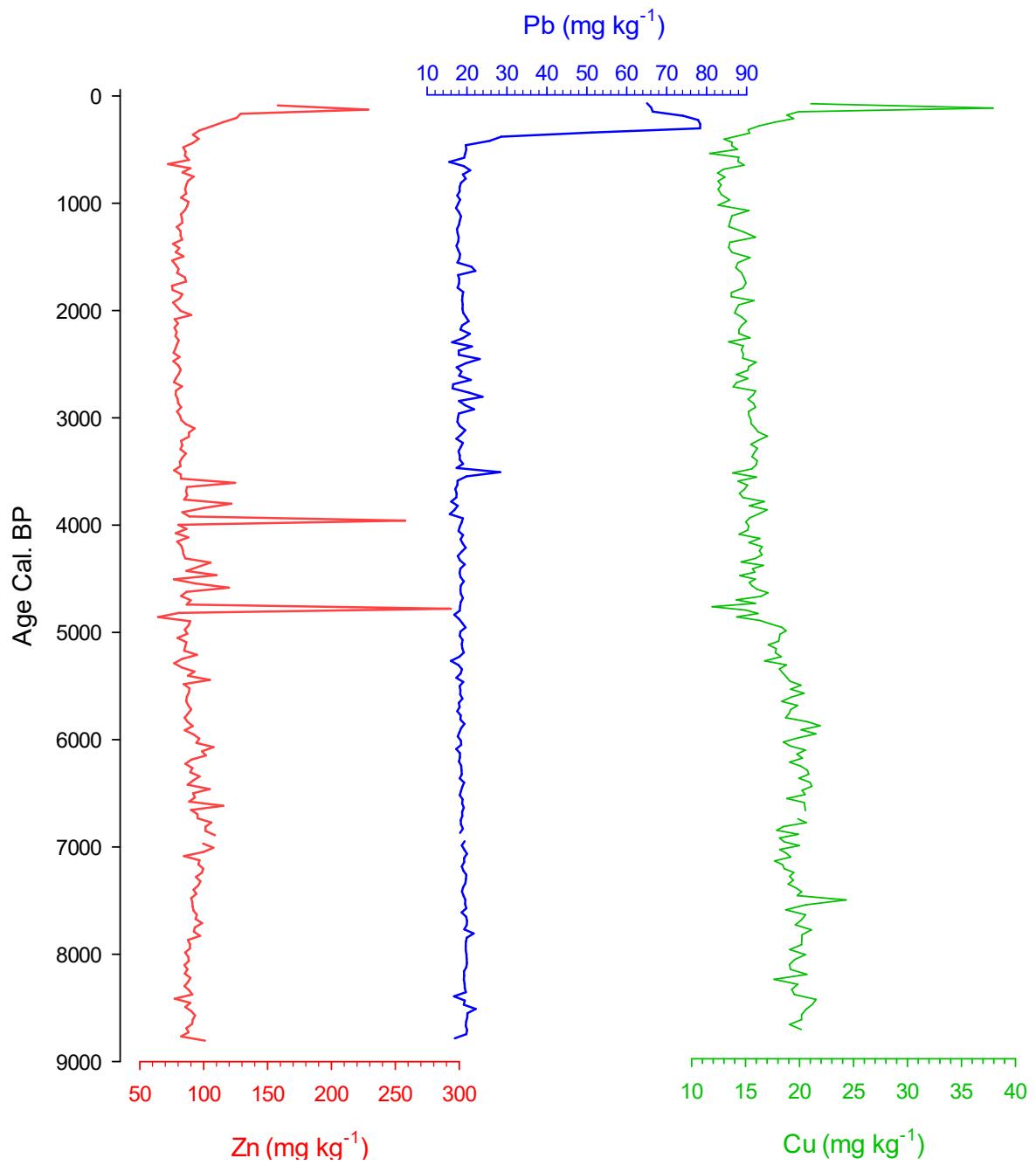
**Supplementary Figure 4.** Additional down core biomarker and stable isotope profiles for core MD04-2832 for the last millennium.



**Supplementary Figure 5.** BIT index regression plots (a) BIT Index vs GDGT's I+II+III ( $\mu\text{g g sed}^{-1}$ ) (b) BIT Index vs Crenarchaeol ( $\mu\text{g g sed}^{-1}$ ).



**Supplementary Figure 6.** Estimates of the total population of (a) Scotland for the last millennium, (McEvedy and Jones, 1978) illustrated alongside 1801-2011 census data (National Records of Scotland). (b) Loch Sunart catchment population 1755 to 2011. 1755 record derived from Webster's Analysis of population, 1755. 1801-1951 data accessed from the National Records of Scotland ([www.nrscotland.gov.uk/research/guides/census-records](http://www.nrscotland.gov.uk/research/guides/census-records)). 1991-2011 data accessible from Scotland's census (<http://www.scotlandscensus.gov.uk/>).



**Supplementary Figure 7.** MD04-2832 down core profiles of the metals (Zn; Zinc, Pb; Lead) mined and those associated with the mined ore (Cu; Copper) from the catchment from the early 1700's. Measured using ICP-MS.

Sample ID	Core	Depth (cm)	$^{14}\text{C}$ age, yr BP	Error ( $\pm$ )
<i>In-situ Paired Bivalves</i>				
AAR-11340	PM06-MC01	28.5	476	25
AAR-11332	MD04-2832	35.5	485	24
AAR-11341	PM06-MC01	37.5	568	27
AAR-11342	PM06-MC01	44.5	408	22
AAR-11343	PM06-MC01	47.5	532	31
AAR-11333	MD04-2832	52.5	427	32
AAR-11345	PM06-GC01	62.5	550	25
AAR-11334	MD04-2832	63.5	428	26
AAR-11346	PM06-GC01	92.5	674	76
AAR-11347	PM06-GC01	111.5	818	24
AAR-11336	MD04-2832	119.5	604	37
AAR-11337	MD04-2832	137.5	686	25
AAR-11338	MD04-2832	246.5	1167	24
AAR-11339	MD04-2832	334.5	1687	28
SUERC-12137	MD04-2832	1090	4285	35
SUERC-12138	MD04-2832	1350	4625	35
SUERC-10444	MD04-2832	1780	6296	39
SUERC-7316	MD04-2832	1980	6590	35
SUERC-10443	MD04-2832	2250	7142	40
<i>Mixed Benthic Foraminifera</i>				
SUERC-12424	MD04-2832	305	1511	35
SUERC-12426	MD04-2832	440	2231	35

**Supplementary Table 1.** Radiocarbon ages from Loch Sunart cores MD04-2832, PM06-GC01 and PM06-MC01.

Depth Interval (cm)	$^{210}\text{Pb}$ age (year)	Date (year AD)
0.5 – 1.0	1 $\pm$ 1	2005 $\pm$ 1
9.5 – 10.0	15 $\pm$ 10	1991 $\pm$ 10
19.0 – 20.0	30 $\pm$ 19	1976 $\pm$ 19
30.0 – 31.0	47 $\pm$ 30	1959 $\pm$ 30
36.0 – 37.0	56 $\pm$ 36	1950 $\pm$ 36
37.0 – 38.0	58 $\pm$ 37	1948 $\pm$ 37

**Supplementary Table 2.**  $^{210}\text{Pb}$  age and standard deviation errors measured on bulk sediments from PM06-MC01. The methods outlined in Appleby and Oldfield (1992) and Appleby (2001) were applied to the  $^{210}\text{Pb}$  data.

<b>Source</b>	<b><math>\delta^{13}\text{C}_{\text{org}} (\text{\textperthousand})</math></b>	<b><math>\delta^{15}\text{N} (\text{\textperthousand})</math></b>	<b>OC (%)</b>	<b>N (%)</b>	<b>C:N</b>
Soil	-27.90 ± 0.43	3.52 ± 1.78	20.51 ± 8.52	1.46 ± 0.65	20.17
Vegetation	-28.61 ± 0.35	2.21 ± 2.44	45.97 ± 0.39	2.51 ± 0.01	29.47
Terrestrial (Soil +Veg)	-28.33 ± 0.70	2.52 ± 1.77	35.11 ± 9.56	1.84 ± 1.02	26.75
Terrestrial (Land Cover)	-28.08 ± 0.1	2.99 ± 0.2	18.54 ± 1.6	0.99 ± 0.07	25.79
Marine	-19.50 ± 0.58	4.24 ± 0.37	32.89 ± 3.01	5.36 ± 0.30	8.14

**Supplementary Table 3.** Catchment specific carbon source and their end-member values as used with mixing models (Smeaton and Austin, 2017).

## References

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