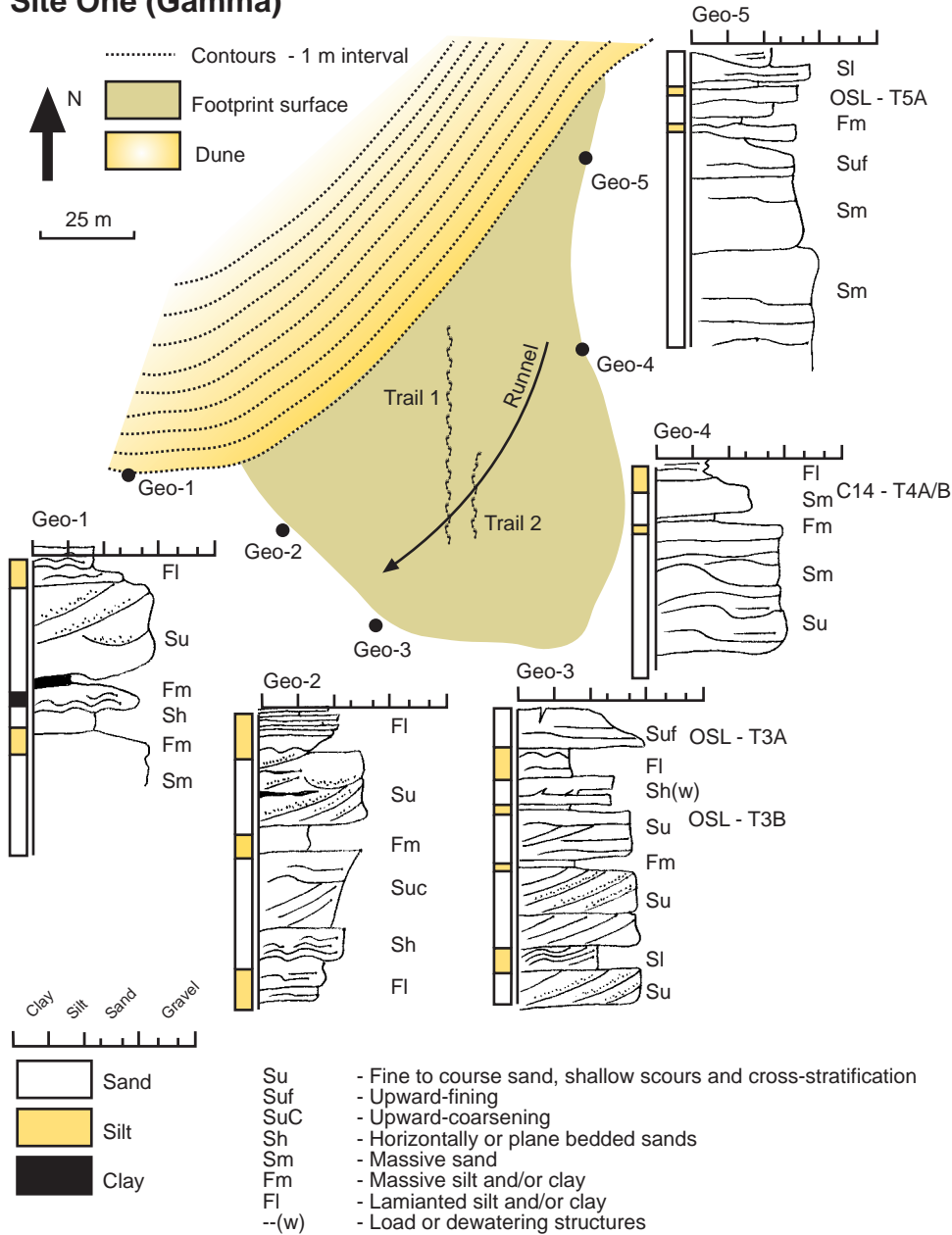


Site One (Gamma)



C14 dates are reported in Morse et al. (2013), OSL dates in Bennett et al. (2014)



REPORT OF RADIOCARBON DATING ANALYSES

Dr. Matthew Bennett

Report Date: 10/5/2010

Bournemouth University

Material Received: 9/15/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 284574 SAMPLE : Sample #1 MB Walvis Bay ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (shell): acid etch 2 SIGMA CALIBRATION : Cal AD 680 to 890 (Cal BP 1280 to 1060)	1380 +/- 40 BP	-0.7 o/oo	1780 +/- 40 BP
			<i>Shell midden/zeta (Site2)</i>
Beta - 284575 SAMPLE : Sample #2 MB Walvis Bay-ORGANICS ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (organic material): acid washes 2 SIGMA CALIBRATION : Cal AD 1320 to 1350 (Cal BP 630 to 600) AND Cal AD 1390 to 1440 (Cal BP 560 to 510)	430 +/- 40 BP	-18.6 o/oo	530 +/- 40 BP
			<i>C14 T4A Gamma (Site1)</i>
Beta - 284576 SAMPLE : Sample #3 MB Walvis Bay ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (shell): acid etch 2 SIGMA CALIBRATION : Cal AD 550 to 700 (Cal BP 1400 to 1240)	1510 +/- 40 BP	+0.6 o/oo	1930 +/- 40 BP
			<i>Shell midden/zeta (Site2)</i>
Beta - 285609 SAMPLE : Sample #2 MB Walvis Bay-Charcoal ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1460 to 1660 (Cal BP 490 to 290)	370 +/- 40 BP	-28.0 o/oo	320 +/- 40 BP
			<i>C14 T4B/Gamma (Site1)</i>

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by " ". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28;lab. mult=1)

Laboratory number: **Beta-285609**

Conventional radiocarbon age: **320±40 BP**

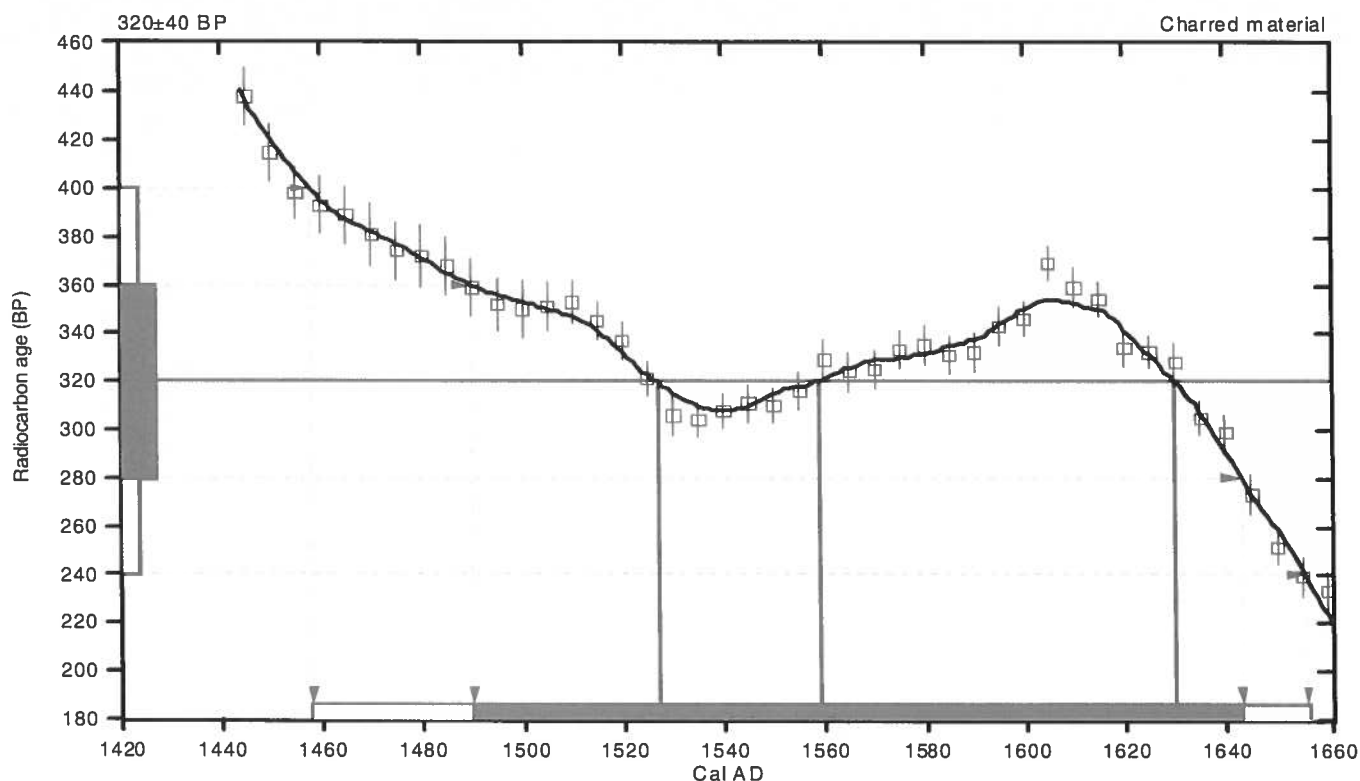
2 Sigma calibrated result: Cal AD 1460 to 1660 (Cal BP 490 to 290)
(95% probability)

Intercept data

Intercepts of radiocarbon age
with calibration curve:

Cal AD 1530 (Cal BP 420) and
Cal AD 1560 (Cal BP 390) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated result: Cal AD 1490 to 1640 (Cal BP 460 to 310)
(68% probability)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.6:lab. mult=1)

Laboratory number: **Beta-284575**

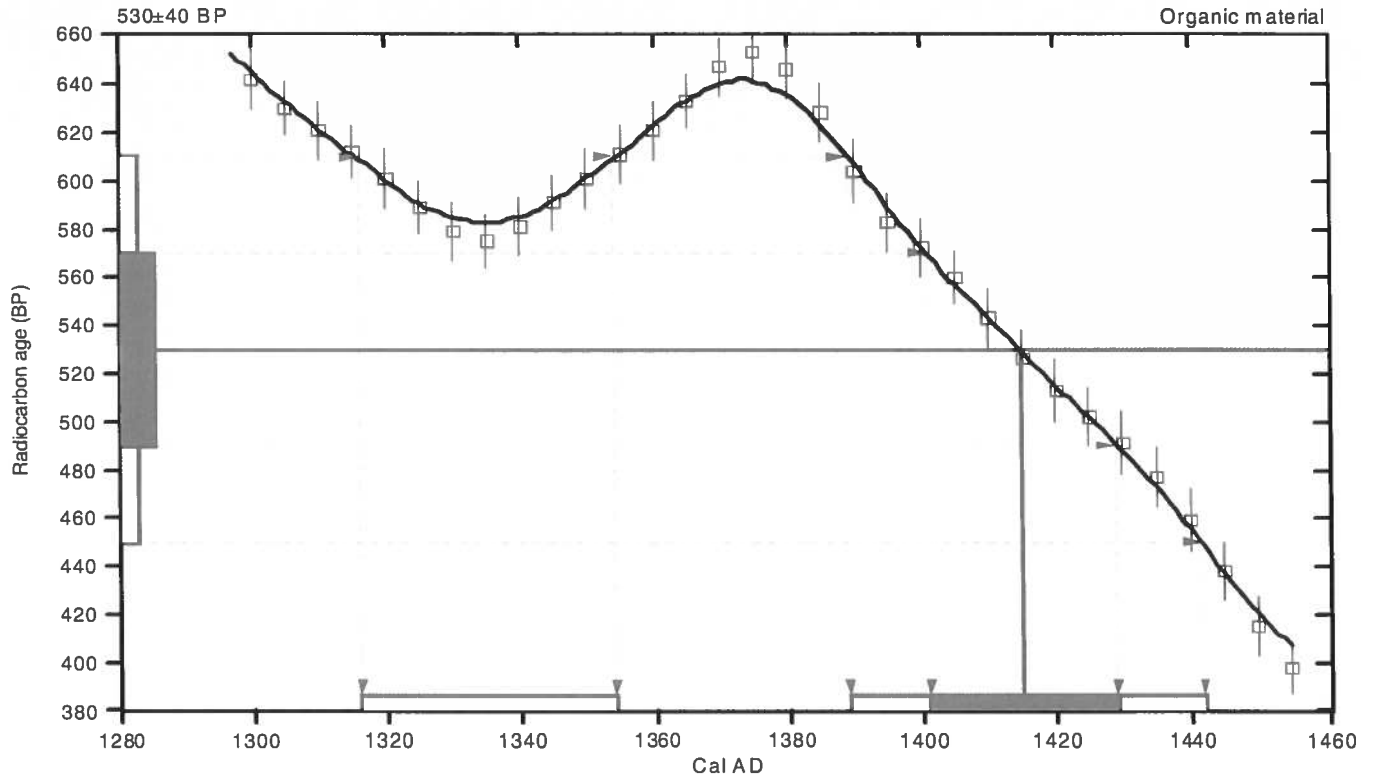
Conventional radiocarbon age: **530±40 BP**

2 Sigma calibrated results: **Cal AD 1320 to 1350 (Cal BP 630 to 600) and
(95% probability) Cal AD 1390 to 1440 (Cal BP 560 to 510)**

Intercept data

Intercept of radiocarbon age
with calibration curve: **Cal AD 1420 (Cal BP 540)**

1 Sigma calibrated result: **Cal AD 1400 to 1430 (Cal BP 550 to 520)**
(68% probability)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-0.7:Delta-R=159±31:Glob res=-200 to 500:lab. mult=1)

Laboratory number: Beta-284574

Conventional radiocarbon age: 1780±40 BP

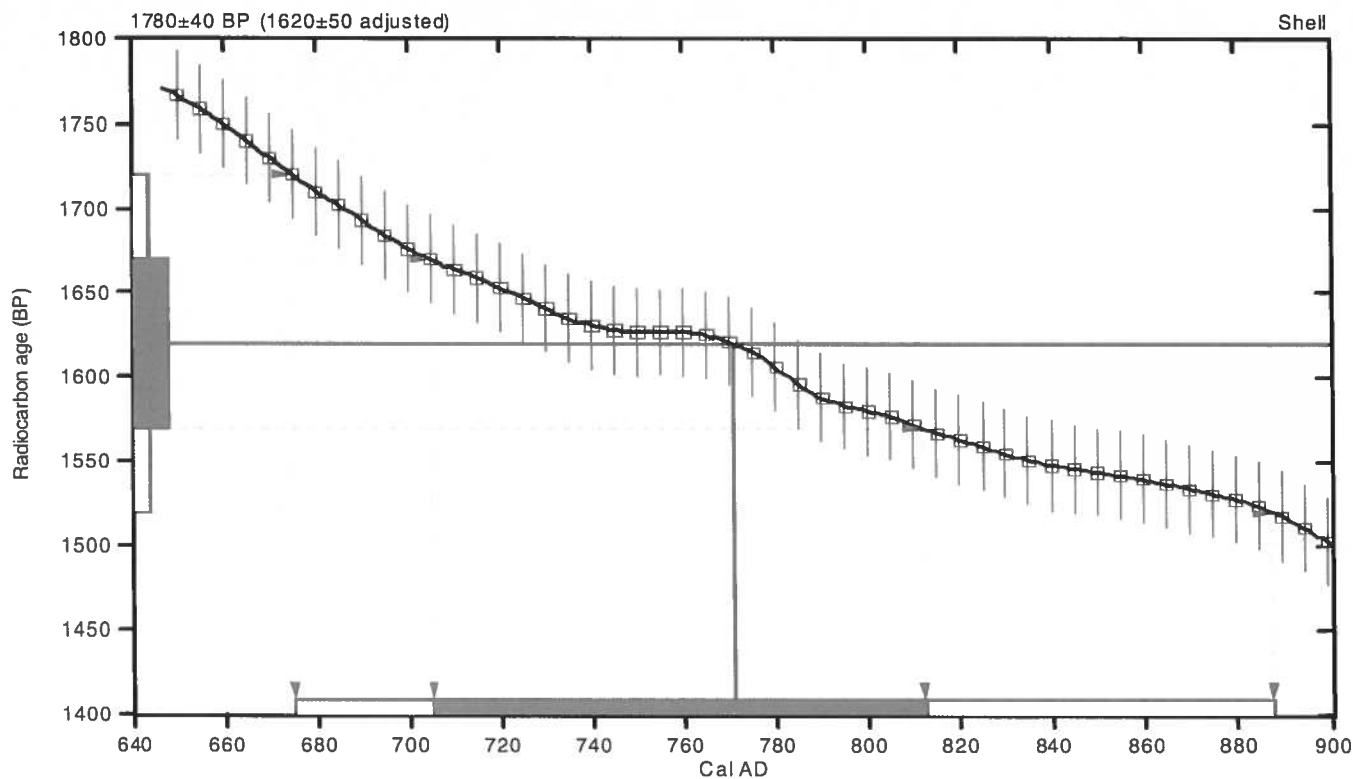
(1620±50 adjusted for local reservoir correction)

**2 Sigma calibrated result: Cal AD 680 to 890 (Cal BP 1280 to 1060)
(95% probability)**

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 770 (Cal BP 1180)

1 Sigma calibrated result: Cal AD 700 to 810 (Cal BP 1240 to 1140)
(68% probability)



References:

Database used

MARINE04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=0.6:Delta-R=159±31:Glob res=-200 to 500:lab. mult=1)

Laboratory number: **Beta-284576**

Conventional radiocarbon age: **1930±40 BP**

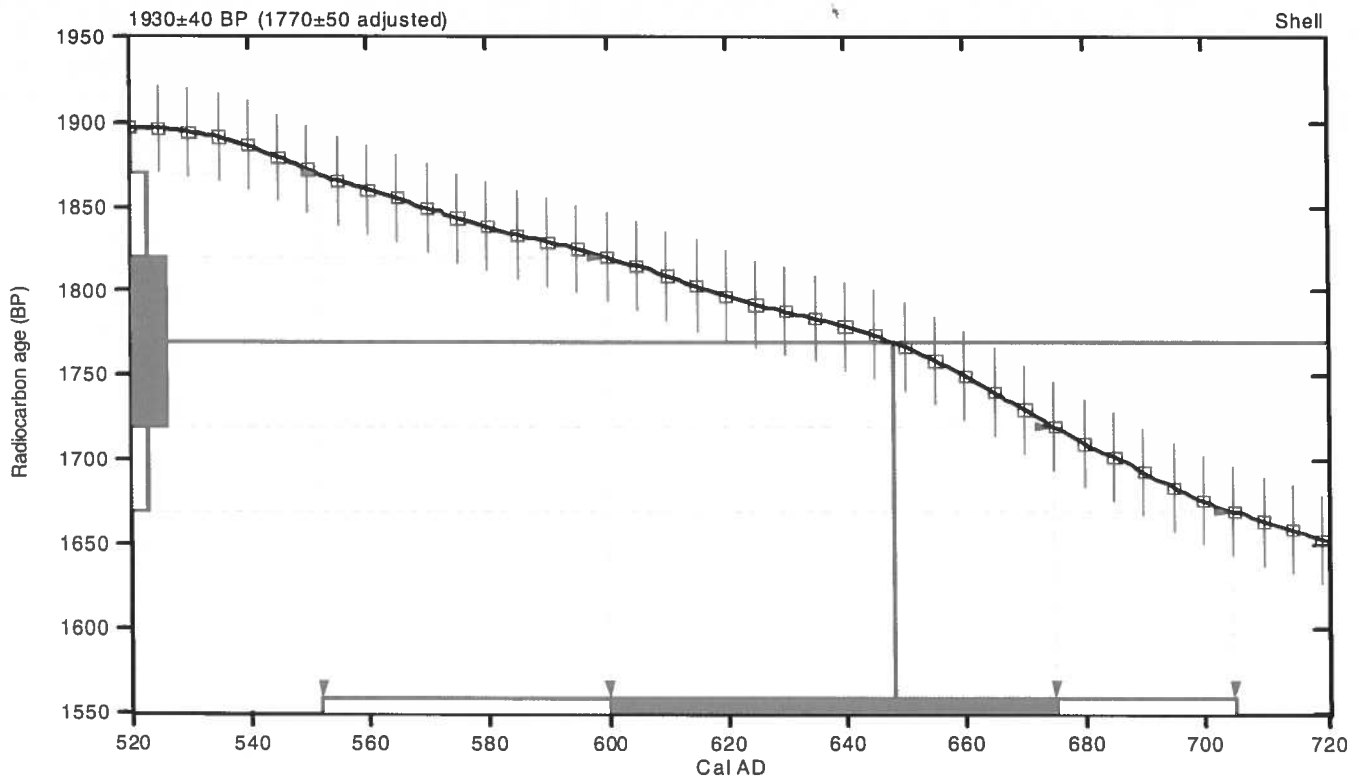
(1770±50 adjusted for local reservoir correction)

2 Sigma calibrated result: Cal AD 550 to 700 (Cal BP 1400 to 1240)
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 650 (Cal BP 1300)

1 Sigma calibrated result: Cal AD 600 to 680 (Cal BP 1350 to 1280)
(68% probability)



References:

Database used

MARINE04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

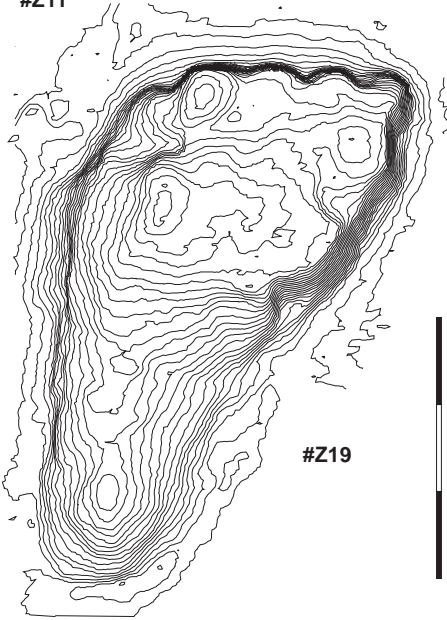
A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

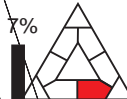
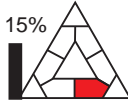
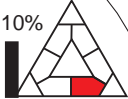
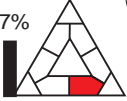
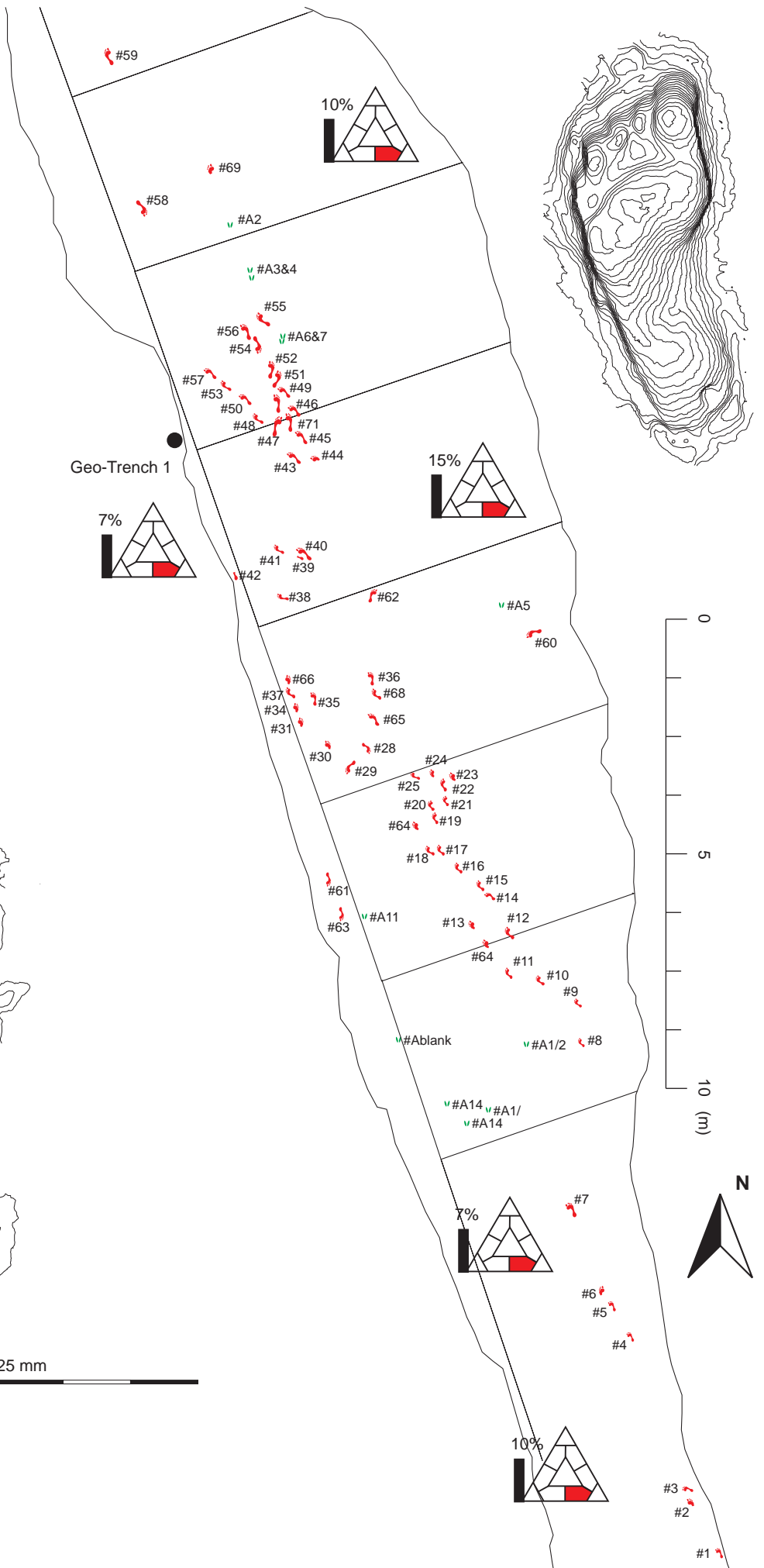
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#Z11



#Z19

25 mm



25 mm

25 mm

25 mm

0
5
10 (m)

N

#3
#2

#1

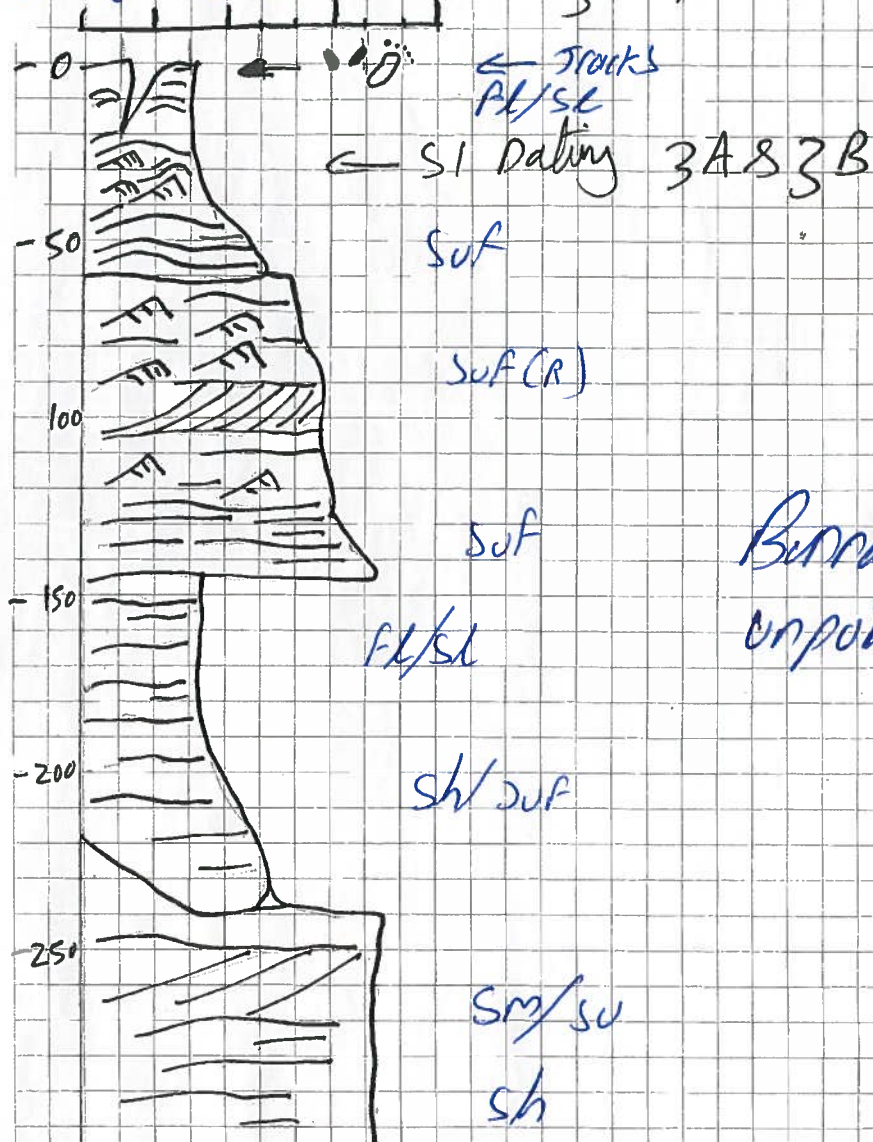
Site 2

July 2010

MRB

Zeta / Grottoch.

(cm) clay silt sand gravel



Bennett et al. (2014)
unpublished field log.