



Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 17025:2005 Accredited Test Results: Testing results recognized by all Signatories to the ILAC Mutual Recognition Arrangement

September 24, 2018

Xiaoming Zhang
Kunming Institute of Zoology, CAS
No. 32, Jiaochengdong Road
Wuhua District
Yunnan, China

RE: Radiocarbon Dating Results

Dear Xiaoming Zhang,

Enclosed is the radiocarbon dating result for one sample recently sent to us. The report sheet contains the Conventional Radiocarbon Age (BP), the method used, material type, and applied pretreatments, any sample specific comments and, where applicable, the two-sigma calendar calibration range. The Conventional Radiocarbon age has been corrected for total isotopic fractionation effects (natural and laboratory induced).

All results (excluding some inappropriate material types) which fall within the range of available calibration data are calibrated to calendar years (cal BC/AD) and calibrated radiocarbon years (cal BP). Calibration was calculated using one of the databases associated with the 2013 INTCAL program (cited in the references on the bottom of the calibration graph page provided for each sample.) Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric ^{14}C contents at certain time periods. Looking closely at the calibration graph provided and where the BP sigma limits intercept the calibration curve will help you understand this phenomenon.

Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference and consistent with all past Beta Analytic radiocarbon dates. When counting statistics produce sigmas lower than ± 30 years, a conservative ± 30 BP is cited for the result. The reported $\delta^{13}\text{C}$ was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS $\delta^{13}\text{C}$ which would include fractionation effects from natural, chemistry and AMS induced sources.

All work on this sample was performed in our laboratories in Miami under strict chain of custody and quality control under ISO/IEC 17025:2005 Testing Accreditation PJLA #59423 accreditation protocols. Sample, modern and blanks were all analyzed in the same chemistry lines by professional technicians using identical reagents and counting parameters within our own particle accelerators. A quality assurance report is posted to your directory for each result.

Our invoice has been sent separately. Thank you for your prior efforts in arranging payment. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely ,



Digital signature on file



Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Xiaoming Zhang

Report Date: September 24, 2018

Kunming Institute of Zoology, CAS

Material Received: September 10, 2018

Laboratory Number

Sample Code Number

Conventional Radiocarbon Age (BP) or
Percent Modern Carbon (pMC) & Stable Isotopes

Calendar Calibrated Results: 95.4 % Probability
High Probability Density Range Method (HPD)

Beta - 503629

GXBS-GM

2490 +/- 30 BP

IRMS $\delta^{13}C$: -25.4 o/oo

(95.4%)

781 - 511 cal BC

(2730 - 2460 cal BP)

Submitter Material: Wood

Pretreatment: (wood) acid/alkali/acid

Analyzed Material: Wood

Analysis Service: AMS-Standard delivery

Percent Modern Carbon: 73.35 +/- 0.27 pMC

Fraction Modern Carbon: 0.7335 +/- 0.0027

D14C: -266.53 +/- 2.74 o/oo

$\Delta^{14}C$: -272.54 +/- 2.74 o/oo(1950:2,018.00)

Measured Radiocarbon Age: (without $\delta^{13}C$ correction): 2500 +/- 30 BP

Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the ^{14}C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. $\delta^{13}C$ values are on the material itself (not the AMS $\delta^{13}C$). $\delta^{13}C$ and $\delta^{15}N$ values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: $\delta^{13}\text{C} = -25.4$ o/oo)

Laboratory number **Beta-503629**

Conventional radiocarbon age **2490 \pm 30 BP**

95.4% probability

(95.4%) 781 - 511 cal BC (2730 - 2460 cal BP)

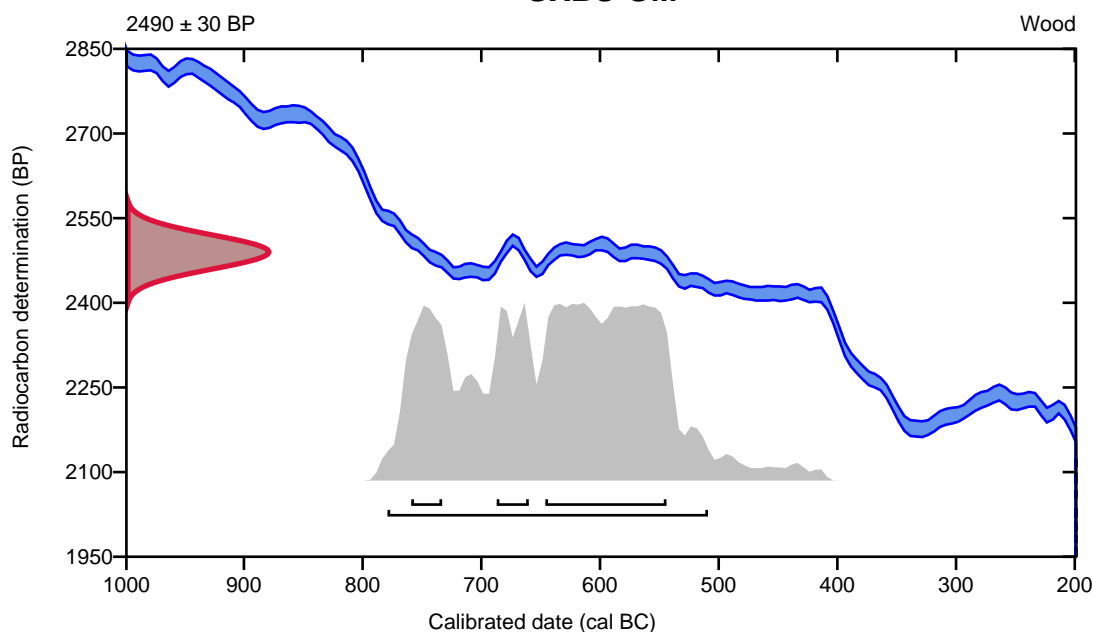
68.2% probability

(45.9%) 648 - 546 cal BC (2597 - 2495 cal BP)

(11.4%) 761 - 735 cal BC (2710 - 2684 cal BP)

(10.9%) 689 - 662 cal BC (2638 - 2611 cal BP)

GXBS-GM



Database used
INTCAL13

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL13

Reimer, et.al., 2013, Radiocarbon55(4).