

# One Hundred New Dates from Tutuila and Manu'a: Additional Data Addressing Chronological Issues in Sāmoan Prehistory

David J. Addison<sup>1</sup> and Tautala S. Asaua<sup>2</sup>

<sup>1</sup>G) a cUb'Gh X]Yg' bgh]h iYz5a Yf]Wb'G) a cU'7ca a i b]m7'c'Y[Y & 7 YbfY'Zf'G) a cUb'Gh X]Ygz'HAY'BU]cbU'I b]j Yfg]m'cZG) a cU

## Abstract

H\]g'dUdYf' dFYgYb]g' a cFY' h.Ub' %\$\$ '7' XU]b[ 'fYgi' t'g'Zf'Hi hi ]U'UbX' A Ubi D] H\Y' fYgi' t'g' UXXfYgg' U' bi a VYf'cZW' ffYbh]cd]M]g' ]b'G) a cUb' UfVU'UYc'c[ nā'8Yd'cg]h]cb'cZ] c'Wb]WUg\ 'cb' h.Y' <c'cWbY' @YcbY' J c'Wb]M]g' fH) Z bU'D'U]b'V' b]h]bi YX' t'c' Uh'YUgh' % 'cf' % ( 'Wb]h' f]Yg'6D'WfUa ]M]i bXYf' h.Yg'Y' Ug\ g'fU]U' gi [ [ YghcWV' dU]h]cb' cZU' U] U' UbXg'WdY'Zf'i d' t'c' +\$\$' mYUfg' d]f'c'f' t'c' h.Y' UG' ZU'g' " A cXY' c'Z'W'fUa ]W' W'gg]h]cb' ]b'G) a cU' UfY' X]g]W'ggYX' ]b' ] [ \h'cZ'Yk' XU]b[ 'fYgi' t'g' "7 cUg]U' U]U]g' cb' Hi hi ]U' U[ [ fUXYX' UbX' #c'f' d'f'c[ fUXYX' g] ] b]U]Wb]h]m]b' h.Y' d'cgh' % \$\$ '6D' dYf'cXz'WYU]b[ 'a U]b]m]Yk' m\ U]U]U'V'Y' UfYUg' " Hk c' gY'W' fY' m'XU]YX' " ]h]W]a Ubi ZU]M' fY' g]h]Yg' XU]b[ ' t'c' \* \$\$E' +\$\$ '6D' UfY' X]g]W'ggYX' " # UbX' gY]h]Ya Yb]h]cb' Hi hi ]U' ]g' X]g]W'ggYX' UbX' VY[ Ub' Vm]U]h'YUgh' & \$\$\$ '6D' " G\Y' " V'fUW'Y' t'g' UbX' XYV' fUYX' d'c]h]f]m]UfY'Z'c' bX' ]b' fY' U]j Y'm]UfY' V' b]h]i t'g' f] % \$\$E' % \$\$ '6D' "

**KEYWORDS.** G) a cUz' Hi hi ]Uz' A Ubi D]z' UfVU'UYc'c[ nā' W'fUa ]M]z' V'Ug]U' [ Yca cfd\c'c[ nā' 5bW'g'fU' Dc'ntbY]Ub'Gc'V]Y'h]z' <c'cWbY' j c'Wb]M]g'

#h'k Ug' XYV]YX' YUf'mcb' ]b'G) a cUb' UfVU'UYc'c[ m]t'c' fYg]h]h.Y' fYa dU]h]cb' t'c' X]j ]XY' h.Y' gYei YbW' ]b]t'c' W' h' fU' mXYU]bYX' dYf'cXgz' UgdYV]t]z' d\UgYg' c'f' g]U]Yg] f] fYyb' UbX' 8U] ]Xgcb' % + ( .8%&&' H\]g' V' b]g]V]c' i' Yg'W]Yk ]b[ ' cZ' U' W' h' fU' \]g]t'c]f]W' Z'Ua Yk c'f' \Ug' g\UdYX' gi VgYei Ybh' fYgYUfV\ ]b' h.Y' UfVU' ]dY'U[ c' " ; fYyb' f&\$\$&&' fYW' b]h]m]b]c]h]X' h.Uha cgh]UfVU'UYc'c[ ]W' fYgYUfV\ ]b'G) a cU' \Ug' V' b]h]bi YX' t'c' VY' XcbY' ]b' U' gY]h]Ya Yb]h]dU]h]f]b' Z'Ua Yk c'f' " '5g; fYyb' g]U]h]g]z' h.]g' bUff]U]j Y' Udd'f'c'UW\ \Ug' ]g'f'YggYX' V' b]h]bi ]m]U]bX' W]U]b[ Y' k ]h.]b'G) a cU' f&\$\$&&' %&+ " H\]g' Y] d' ]W]h' UbXg'WdY' Udd'f'c'UW\ \Ug' U] c]X]YX' U' g]U]h]cb'U' ] ]Yk' cZG) a cUb' d'fY' ]g]t'c]f]m]k \YfY' ]a d'c]f]U]b]h]U]b[ Y' ]g' gY]b' U]g' c'WV' f]b[ ' U]h]h]Y' V'c' bXU]f]Yg' cZ] ]b]Y'f]U' m\ 'a c] Y' b]c' i' g' d\UgYg' c'f' g]U]Yg' " F U]h]Y' f]z' fYbXg' UbX' d'f'c'W'ggYg' \U] Y' VY]b' Ya d\Ug]YX' " K Y' ZY' " h.]g' \Ug' VY]b' VY]bY'U]U' t'c' h.Y' XY' Y' cda Yb]h]cZUfVU'UYc'c[ m] ]b'G) a cUz' UbX' ]h] ]g' b]c]h]c' f' [ cU' \YfY' t'c' dYf'cX]gY'G) a cUb' d'fY' ]g]t'c]f]m]i ' U' d'f'c'W'gg' h.U]h' k' Y' h.]b' V'z' ' X' VY' d'fYa U]h' fY' UbX' d'f'c'VU' m' i' b\Y'dz' "

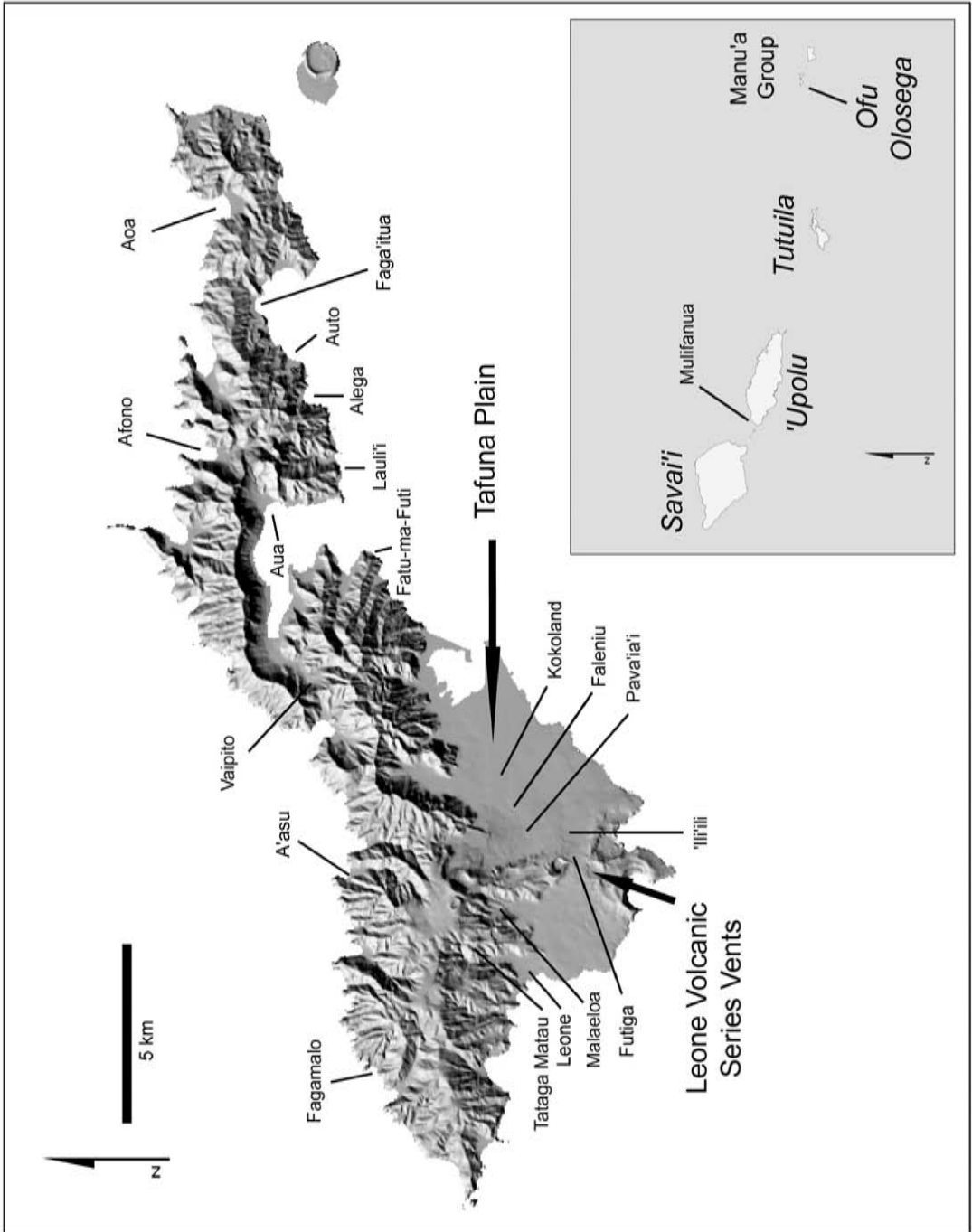
#h'k ]g' dUdYf'z' k Y' dFYgYb]h'U' V' f' d' i' g' cZ' fUX]c'W]fV'cb' XY]Y'fa ]b]U]h]cb]g [ YbY'fU]YX' c] Yf' h.Y' dUg]h' ZYk' nYUfg' Vm]h]Y' UfVU'UYc'c[ m]d'f'c[ fUa a Y' cZ'h]Y' 5a Yf]Wb'G) a cU'D'ck Yf' 5i' h'c]f]m]f'5GD5' " % ' h.Y' gY' XU]Yg' UfY' [ 'YU]bYX' Z'ca ' d'f'c'Y'W]g' Uf'c' bX' Hi hi ]U' UbX' A Ubi D] f]g]Y' : [ i' fY' % UbX' 5ddYbX] ' % UbX' &&' 8Y]U]g' cZ'h]Y' f' V' b]h]i h'k ]' Udd'YUf' ]b' Z'c]h]V'z'a ]b[ ' fYd'c]f]t'g' " C' i' f' d]f]a Uf'm]d' i' f' d'c]gY' \YfY' ]g' t'c' a U\_Y' h.Y' gY' XU]b[ ' fYgi' t'g' U] ]U]V'Y' t'c' c'h]Y' f' fYgYUfV\Yf'g' " K Y' U'g'c' \] [ \] [ \] h'g]Y' YfU' h'fYbXg' k Y' gY' ]b' h.Y' XU]U' " F YUXYf'g' ]b]h]fYg]h]Y' ]b' V'f'cUXYf' fY] ]Yk' g' cZG) a cUb' W'f'c]b'c'c[ m]a U]m]V'z'bg' ]h' ; fYyb' f&\$\$&&' UbX' 6' i' fYm' UbX' 7' Uf' f&\$\$' " "

## Ceramic Bearing Sites Capped by Red Ash

H\Y' fYX! Ug\ 'UnYf' c] YfU]b[ ' W'fUa ]M]W]Uf]b[ 'XYd'cg]t'g' U]f'g]h]XYb]h]UYX' U]h]G]Y' 5GE' %E%+ % ]b' DU]j U]U]g] f' bX]g]cb' Y]hU' " &\$\$' 'L' Ug'b'ck' VY]b'Z'c' bX' U]h'c]h]Y'f'g]h]Y'g' ]b' h.Y' j ]M]b]m]h'k' ? % ' &+ f] % -- ' %6D' E' V'z'a Yg'

<sup>1</sup> K Y' U]W'b'ck' YX[ Y' h.Y' Z'f]Yg] [ \h'cZ'z'fa Yf' 5GD5' 79C' ] h' ] 5VY' A UUY' UbX' Z'fa Yf' 5GD5' 7CC' : c]b]c]t' D' DYfY' ]b' ]b' WYU]h]b[ ' UbX' Z'c]g]f]b[ ' Ub' ]b[ ' a]c]i' gY' UfVU'UYc'c[ m]d'f'c[ fUa a Y' U]h]5GD5' " K Y' h.U]h]Y'a UbX' fYV' [ b]n]Y' h.U]h]Y' fYgi' t'g' fYd'c]f]t'g' \YfY' k' c' i' X' b]c]h]U]j Y' VY]b' d'c]g]Y' Y' k' ]h'c' h]h]Y' f' V' b]h]bi U' ]g' d' d'c]f]U]bX' Yb]V'z' fU]Y' a Yb]h]h.]g' dUdYf' ]g' XYX]W]h]X' t'c' h.Y' gY' h'k c' UbY' YUXYf'g'

<sup>2</sup> 5' " fYgi' t'g' fYd'c]f]t'g' \YfY' k' YfY' d'f'c'W'ggYX' Vm]h]Y' ]b] ]Yf]g]m]cZK U]U]t'c' F U]X]c'W]fV'cb' @U]c]f]U]t'c]f]m] 8UYg' ]b' h.]g' dUdYf'UfY' Y] d'fYggYX' U]g' ]V'z'bg] Yb]h]cb'U' U] Y] U]g' dYf'G]h' ] Yf'UbX' D'c'UW' f] % ++/h.U]h]g]z' V' f'fY'W]X' Z'f' ]g]c]h]d]M]Z'U]W]c]b]U]h]cb' UbX' Y] d'fYggYX' ]b' nYUfg' VY]Z'f'Y' 58' % ) \$E' 8UYg'k' YfY' W]W' U]YX' i' g]b]h]Y' @]V]m]U]Z' ]Z' cZ' ) \* , nYUfg' E' i' c]h]Y' g]U]bX]U]fY' f'c]f'g' UfY' % g]U]bX]U]fY' X]Y' ]U]h]cb' X] Y' t'c' V'z' b]h]b[ ' g]U]h]g]h]V'g' a' i' ]j' ]YX' Vm]U]b' Y] dYf]a Yb]U' m]X]Y]Y'fa ]b]YX' @U]c]f]U]t'c]f]m]9'f'f'c' A' i' ]j' d]Yf' cZ' % h.Y' ]g]c]h]d]M]Z'U]W]c]b]U]h]cb' f] \* 7' E' ]g' Y] d'fYggYX' U]g' k' h]D'86' ; fU]d'g' cZ]U]h]b[ ' fYgi' t'g' k' YfY' d'fYdUfYX' i' g]b[ ' C] I' 7' U' j' " % \$ f'f'c]b' \_F' Ua' gYm] & \$ \$ ) " 6Y]W]U' gY' G) a cU' ]Ygi' bXYf' c'f' bYUf' h.Y' G'c' h' DUM]U]W'7' c]b] Yf] Yb]W' N'c]bY' f'GD7' N'z'Z'f'a' i' W' cZ]YUW' nYUf' f'UbX' dU]g]h]U]Yg' cZ'h]Y' UG'7' N' c'W]h]cb' UfY' i' b' \_b'c]k' b'k' Y' Z'c'k' A' W' cfa U]W]hU' " f&\$\$ ( . % \$ , , ' E' UbX' i' gY' h.Y' W' fY]b]h]B'c]h]Y'f]b' < Ya ]g]d\YfY' W]U]f]U]h]cb' W' f] Y' f] Y' a Yf' Y]hU' " &\$\$ ( E



Zca`U`WfUa`JWYUf]b`W`h`fU`XYdcg]hf]bW`X]b`XYVt`fUfYX`d]YVWg`VWddYX`VmFYX`Ug`UbX`Zci`bX`r`&`a`i`bXYf`h`Y`malae`cZDUj`UgUg]J`U`[`Y`K`?`%`&`f%`+`-`%`6DE`Zca`5GE`%E`%`%`]:`UYb]i`]g`Zca`U`fYX!`Ug`WddYX`WfUa`JWYUf]b`W`h`fU`XYdcg]hr`\*`\$`Vā`VY`ck`h`Y`gi`fZUW`":`fca`U`X]ZfYfbhdUfncZ`:`UYb]i`ž`K`?`%`'`(%`f%`%`-`%`6DE`UbX`K`?`%`'`%`f%`&`-`%`6DE`UFY`Zca`UFY`ZUhi`fYg`UggcVWUfYX`k`]h`U`WfUa`JWYUf]b`XYdcg]hU`WddYX`VmFYX`Ug`"K`?`%`&`f%`%`-`%`6DE`]g`Zca`U`WfUa`JWYUf]b`XYdcg]hfk`]h`XYVt`fUfYX`d]YVWg`VWddYX`VmFYX`Ug`bYUf`h`Y`Vc`fYf`cZ`:`UYb]i`UbX`DUj`UgUg]`

H`Y`U`HYf`h`fY`XUfYg`UWVt`f`k`Y`k`]h`h`Y`]b]hU`XUfYg`Zc`f`h`Y`fYX`Ug`Zca`G]Y`5GE`%E`%`%`H`Y`c`h`Yf`fk`c`Yi`h`bX`h`Y`dYf]cX`cZ`h`Y`dYf!`Ug`c`VW`dU]hcb`]b`h`]g`UFYU`Vmi`d`h`c`&\$`nY`Ufg`UbX`di`g`Yg`]h`VUW`Ug`YUf`mUg`Ubm`UfW`UYc`c`]`JW`XUfYg`cb`h`Y`<`c`VW`bY`j`c`VWb]WXYdcg]hg`cZ`h`Y`@`YcbY`J`c`VWb]W`GYfYg`":`Gc`ZUf`bc`dfY!`&\$`\$`6D`XUfYg`Uj`Y`VYyb`Zci`bX`cb`h`Y`UFYU`cZ`h`Y`@`YcbY`J`c`VWb]W`]g`f]bW`X]b`h`Y`H`]`Z`b`U`D`U]b`":`K`Y`k`cb`XYf`]Z`h`]g`UFYU`k`Ug`i`b]b]UV]hUVY`VY`Zc`f`r`&\$`\$`6D`Xi`Y`h`Vt`b]h]bi`]b`Uj`U`U`ck`UW]j`]m`

5b`i`ddYf`XUfY`cb`h`Y`fYX`Ug`]g`gi`[[`Y`g`fYX`VmK`?`%`-`,\*`f%`\$`(-`6DE`Zca`U`ga`U`W`UfVt`U`Vt`bW`b]hU]cb`U`h`h`Y`]b]hYfZUW`cZ`h`Y`fYX`Ug`U`UnYf`]b`:`UYb]i`ž`UbX`K`?`%`-`,\*`f%`%`-`%`6DE`Zca`U`W`UfVt`U`Vt`bW`b]hU]cb`r`%`\$`Vā`U`Vcj`Y`U`fYX`Ug`U`UnYf`]b`:`UYb]i`"K`?`%`(-`f%`&`-`%`6DE`UbX`K`?`%`(-`f%`\$`)-`%`6DE`UFY`Zca`UFY`ZUhi`fYg`U`h`k`c`c`VW]hcbg`]b`DUj`UgUg]h`U`h`k`Y`fY`Xi`[`h`fci`[`h`h`Y`fYX`Ug`Zca`U`[`Y`f`g`fUfU`"h`k`c`XUfYg`f`k`?`%`%`ž`&`-`%`6D`/`UbX`K`?`%`%`ž`-`\*`(-`6DE`Zca`h`Y`Vt`h`c`c`Z`UFY`Z`U`h`fYg`]b`h`k`c`X]ZfYfbh`:`UYb]i`"c`VW]hcbg`Zca`r`E`%`\$`Vā`U`Vcj`Y`h`Y`fYX`Ug`U`UnYf`fVi`h`dfc`VU`m`Xi`[`Zca`U`[`Y`f`i`d`h`Y`g`fU]h`fUd`n`h`dcg]hUfY`h`Y`fYX`Ug`XYdcg]hcb`"K`?`%`-`(-`f`(+`(-`6DE`]g`Zca`X]gdYfgYX`W`UfVt`U`]b`U`g`fU`h`a`U`Vcj`Y`h`Y`fYX`Ug`]b`:`UYb]i`"

6UgYX`cb`h`Y`]a`]fYX`XUfYg`Uj`U]UVY`U`h`h`Y`]h`a`Yž`5XX]gcb`Yh`U`"f`&\$`\$`\*`E`Vt`i`X`gi`[[`Y`g`hcb`m`h`U`h`h`Y`fYX`Ug`XYdcg]hcbU`Yj`Ybh`UddYbYX`gca`Y]h`a`Y`UZfY`h`Y`dYf]cX`58`&`(\$`\*`(\$`"Bck`ž`k`]h`%`+`XUfYg`Zca`Vch`VY`ck`UbX`Uvcj`Y`h`Y`fYX`Ug`ž`UbX`Zca`U`r`%`\_`a`X]Ua`YfYf`UFYUž`k`Y`UFY`Vt`a`Zc`fU`Y`VY]b`[`a`cfY`gdYVW]UW`h`Y`W`fYb]hYj`]X`YbW`gi`[[`Y`g`f`h`U`h`h`Y`fYX!`Ug`XYdcg]hcbU`Yj`Yb]f]g`c`VW`fYX`fci`[`m`%`c`f`%`[`W`b]h`f]Yg`U`c`"`f`g`l`ci`X`VY`bchYX`h`U`h`h`Y`fYX`Ug`]g`Vt`j`YfYX`Vmi`d`h`c`\*`\$`Vā`cZ`Ug`!`XYf]j`YX`gc`]g`f`a`U]b`m`DUj`UgUg]GYfYg`E`UbX`h`U`h`XYdcg]hcb`cZ`UbY`dmc`fWUgh]Wa`UfYf]U`h`fci`[`j`c`VWb]WYfi`d]hcbg`a`Um`Uj`Y`Vt`b]h]bi`YX`Zc`f`gca`Y`Vt`bg]X`Y`fU`VY`dYf]cX`UZfY`h`Y`fYX`Ug`XYdcg]hcb`"5`gc`bchYk`c`f`h`m]g`h`Y`]b]X]W]hcb`cZi`d`h`c`r`+`\$`nY`Ufg`cZi`gY`cZ`k`U`h`a`i`gh`Uj`Y`VYyb`U`fi`[[`YX`Uj`U`UbXgWdY`df]c`f`h`c`h`Y`fYX`Ug`fUbX`gi`VgYei`YbhUg]E`XYdcg]hcb`"

**Tutuila Coastal Geomorphology: Post-1600 BP Coastal Flats**

5fW`UYc`c`]g]g`]b`G`a`cU`Uj`Y`cb`[`fYVt`[`b]nYX`h`Y`]a`dcfU`bW`cZi`bXYfgh]bX]b`[`[`Yca`cfd`c`c`]m]`f]bW`X]b`[`i`a`Ub]b]Xi`W`X`E`W`Ub]Yg`]b`fYVt`bgh]f`W]b`[`dfY`]g]c]f]W`UbXgWdYg`UbX`]b]hYfdYf]b`[`h`Y`gdU]h`U`dU`hYf]b`[`cZ`UfW`UYc`c`]m]`fYa`U]bg`fY`ž`:`fYb`UbX`8Uj`]Xgcb`%`+`(/`?)`fW`UbX`<i`bh`%`-`/`7`Uf`%`-`\*/`7`Uf`\_`UbX`A`]W`c]j`]Wf%`-`\*/`<i`bh`UbX`?`]fW`%`-`+`/`8]W]b]gcb`UbX`:`fYb`%`-`,"`"h`Y`UW]W]X`Yb]h`X]g]v`j`Yfmc`Z`h`Y`gi`Va`Yf]YX`@Ud]hU]g]Y`U`h`a`i`]Z]bi`Uži`dci`k`Ug`h`Y`UfghYj`]X`YbW`]b`G`a`cU`cZ`h`Y`]a`d]W]hcbg`cZ`W`Ub]Yg`]b`fY`U]j`Y`gYU`Yj`Y`Zc`f`UfW`UYc`c`]m]`g]hYg`]b`G`a`cU`"

5h`i5cU`cb`Hi`h`i`Už`7`Uf`\_`UbX`A`]W`c]j`]Wf%`-`\*`E`XcW`a`YbhYX`U`"ž`\$`\$`nYUf`gYei`YbW`cZ`W`Ub]Yg`]b`Vt`UghU`[`Yca`cfd`c`c`[`mfYgi`h]b`[`]b`Ub`cdYb`Ya`V`U`h`a`YbhVY]b`[`Vt`bj`YfYX`h`c`U`VUW]VYUW`gk`Ua`d#`a`Uf]g`h`U`h`U`Yf`U`YX`k`]h`h`Yf]f]Ybci`g`gYX]a`Yb]g`"7`YfUa`JWYUf]b`XYdcg]hg`k`YfY`Zci`bX`U`h`k`U`h`k`ci`X`Uj`Y`VYyb`h`Y`YX`Yg`cZ`h`Y`dU`UYc]Ya`V`U`h`a`Ybh`"

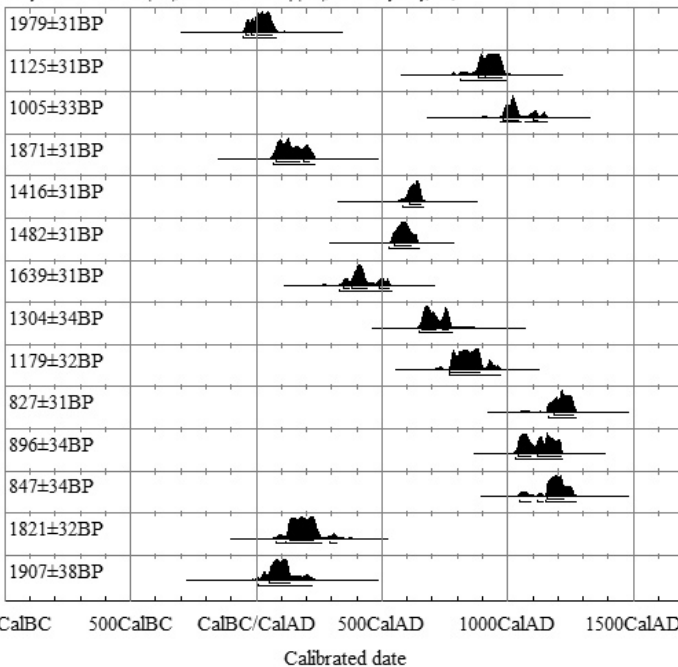
?`]fW`UbX`<i`bh`f%`-`E`Zci`bX`dfcZci`bX`W`Ub]Yg`]b`Vt`UghU`[`Yca`cfd`c`c`[`m]`]b`h`Y`f`fYVt`bgh]f`W]cb`cZ`h`Y`U`]g]c]f]W]Vt`c`[`mc]Yf`h`Y`dUgh`ž`\$`\$`nYUfg`U`h`h`c`U]Už`I`C`"h`h`Y`gY`W`Ub]Yg`]b]W`YX`Yj`]X`YbW`gi`ddc]f]b`[`U`U`[`Y`f`fY`U]j`Y`gYU`Yj`Y`h`U`h`g]hU]j`nYX`h`c`h`Y`a`cXYfb`dcg]hcb`]gca`Y`h`a`Y`VYh`Yb`%`\$`\$`UbX`&\$`\$`6D`i`fk`i`bh`UbX`?`]fW`%`-`+`%`[`E`k`]h`gi`VgYei`YbhVt`UghU`dfc`fUXU]hcb`"5fW`UYc`c`]m]`XYdcg]hg`Vt`b]hU]b]b`[`dchYf`m`k`YfY`fYg]f]W`X`h`c`U`ncbY`U`cb`[`h`Y`]b]hYf]c`f`cZ`h`Y`Vt`UghU`hYfUW`k`]h`"U`Yf`bcb]W`fUa`]W`XYdcg]hg`ZUf`h`Yf`gYUk`UfX`fk`i`bh`UbX`?`]fW`%`-`+`%`&`E`"

<sup>1</sup> 8YVt`fUf]cb`U`h`h`Y`gY`h`k`c`g]hYg`Vt`bg]g]g`cZa`]b`c`f`UbX`W]i`XY`]b]W]b]b`[`UbX`]a`dfYgg]b`[`cb`cf`bYUf]f]a`g`"  
<sup>2</sup> 5b`UXX]hcbU`XUfYž`K`?`%`-`),`f%`&%`-`&`6DE`Zca`X]gdYfgYX`W`UfVt`U`]b`U`XUf`"UnYf`VY`ck`h`Y`fYX`Ug`k`Ug`bchUggcVWUfYX`k`]h`dcfU`Y`U`fY`ZUW]ž`ck`Yj`Yfž`k`Y`h]b]h`Y`X]gdYfgYX`W`UfVt`U`gi`[[`Y`g`f`h`i`a`Ub`UW]j`]m]b]h`Y`]a`YX]Uf`UFYU`UbX`cZfY`]h]b]g]i`ddc]f]Zc`f`h`Y`]X`YU`h`U`h`Y`fY`k`Ug`Ub`Yi`h`b`YX`dYf]cX`cZi`a`Ub]i`gY]b`:`UYb]i`#DUj`UgUg]df]c`f`h`c`h`Y`fYX`Ug`XYdcg]hcbU`Yj`Yb]g`"5`h`ci`[`h`bchUggcVWUfYX`k`]h`fYX`Ug`ž`K`?`%`&`[`f%`%`ž`,"`6DE`Zca`U`Z`U`h`i`fY`]b]hYfdYf]h`Ug`Ub`YU`h`c`j`Yf]b`:`UYb]i`f]b]b]Z`fW`g`h`Y`]X`YU`cZ`U`cb]`dYf]cX`cZ`dfY!`Ug`i`gY`]b`h`]g`UFYU`"  
<sup>3</sup> DYUf]g`fY`W`bhdUdYf`fDYUf`&\$`\$`E`cb`[`Yca`cfd`c`c`]m]`W`Ub]Y`U`h`5]b]g]i`ž`h`i`]U`XYU`g`k`]h`h`Y`U`ghr`+`\$`nYUfg`UbX`]g`]h`a`dcfU`m`i`bYf`U`YX`h`c`h`Y`d`Y`bca`YbU`k`Y`X]gW]gg`]b`h`]g`gYV]cb`"

HUVY% ``8UYg'VY'ck `UbX'UVcj Y'fYX'Ug\ `]b'DUj U[UD]UbX': U'Yb]i

Below red ash	
K ?% ' &+	% +- -' %6D
K ?% ' &\$	% +%-' %6D
K ?%* -, )	% &%-' &'6D
K ?%( )' &	%* )+- , '6D
K ?% ' &%	%* - -' %6D
K ?% , ( (	%* %- ' &'6D
K ?% , ( &	%%&-' %6D
K ?% ' %	% ( , &- ' %6D
K ?% ' % (	% ( %* -' %6D
Above red ash	
K ?%* -, *	% \$(- ' ( '6D
K ?%* -, +	%%+- -' &'6D
K ?% , (-	%%&)-' %6D
K ?%* &(*	%\$* * -' ) '6D
K ?% , ('	%\$%) -' ' '6D
K ?% ' %+	, - * -' ( '6D
K ?%* -, (	, ( + -' ( '6D
K ?% ' %*	, &+ -' %6D

Atmospheric data from Reimer et al (2004), OnCal v3.10, Brook Runway (2005), sub #5 sd.12 prob usg[thms]



: ]i fY% ``CI 7U' [ fUd\ `cZXUYg'VY'ck `UbX'UVcj Y'fYX'Ug\ `]b'DUj U[UD]UbX': U'Yb]i

BYK'Yj ]XYbW'Zca 'Hi hi ]U'gi [ [ Ygtrg'h.UhVtUgfu'UUhgz]b'Uh'YUghgca Y'dUftrg'cZk.Y'Jg'UbXz  
a UmVY'cb'm%&E%( 'Wbhi f]Yg'cX'' H\]g'gi [ [ Ygtrg'h.UhghUv]nUh]cb'cZfY'Uhfj Y'gYU'Yj Y''UddYbYX'cb'  
Hi hi ]U'hc'k UfX'k.Y'a ]XX'Y'cf YbX'cZk.Y'dYf]cX' d'fcdcgYX'Vm<i bhUbX'? ]fW' fV\$\$\$E&\$\$\$'6D' 'Ci f'  
XUH'g'Vt'a Y'Zca 'h.Y''ck YghW'hi fu'XYd'cg]hg'Uh'bYUf!VYUW'g]H'g'Uh'Uj Y'j ]U' [Yg'k ]XY'mX]gfr]M'fY'cb'  
h.Y'Jg'UbX''

H.Y'XUfYg'Uf[ Y'mZU''k ]h.]b'h.Y'dYf]cX'%'&E%(\$\$'6D''5h: Uh !a U! : i h]z'k c'XUfYg'UfY'Zca '  
h.Y' d'fY'W'X]b[ 'h'c' Wbhi f]Yg' fHUV'Y' &E'' H\]g'a UmVY'Xi Y'hc'h.Y'f'c'X'k ccX'i' d\Ybca Ybcb' fU'U'cZ  
gUa d'Yg'k YfY' bch]XYbhi]UYX'Ec'f']h'a Umh.Uh'h.Y'g'Y'XUH'g'UWV'fU'h'm'fY'U'V'W'h.Y'U'f'gh'i a Ub'i g'Y'cZU'bYk' m'  
Z'fa YX'Vt'Ugfu'U'U'h''b'h.]g'g'Y'Vt'bX'g'W'bUf]cZ' ]b'W'Y'Ug]b[ 'i gY' ]b'h.Y'Z''ck ]b[ 'Wbhi f]Yg'k'ci 'X'U'U'j Y''Y'Zi  
fY'U'h]j Y'm'a c'fY'W'U'f'Vt'U'f'k.Y'b'W'k.Y'Vi ''cZ'h.Y'XUH'g'VY]b[ 'g'] [ \h'm'U'f'f'e''Z'f'i Y'Z'h.]g'k'ci 'X'a Y'Ub'h.U'h  
ga U'Y'f'gUa d'Y'g]h'Y'Uh'h.Y'c'h.Y'f'j ]'U' [Yg'\Ug'a ]ggY'X'h.Y'Y'U'f]Y'f'f'UbX'f'U'f'f'e'W'U'f'Vt'U''

F Y [ UfX'Ygg'cZk \]W' g'W'bUf]c' ]g'U'W'V'fU'h'Zk Y'gi [ [ Ygh'h.U'h'h.Y'f'Y'f'Y' ]b'X]W'h]cb'g'cZg] [ b]U'W'bhi  
W'U'U' [Yg' ]b'Vt'Ugfu' [ Yca c'f'd'c'c' ]m'c'j Y'f'a i W'c'Z'Hi hi ]U' ]b'h.Y' d'cg]h'E%' \$\$'6D'd'Y'f]cX'' : c'f' : Uh !a U!  
: i h]z'k ]h' +) a '\*cZ'g'f'U]h] f'U'd\ ]W'Y' W]j U'h]cb'z'k Y'U'f'Y'Vt'b'U'X'Y'b'h'h.U'h'h.Y'Y'U'f]Y'g'h'W'hi fu'XYd'cg]hg'f'Y'U'f'Y'X'  
hc'h.Y' W'f'f'Y'b'h'VY'U'W' f]X[ Y'U'j Y'V'Y'b'Z'i bX'' 7i f'f'Y'b'h'm'h.]g' ]g'h.Y'cb'm'Vt'Ugfu' ]g]Y'cb'Hi hi ]U'k ]h'  
gi V'g'f'U'h]j'U'Y'i W]j U'h]cb'UbX'U'f'c'Vi gh'g'Y'h'c'Z'XUH'g'' 5'h'ci [ \h.Y' d'cg]V] ]m'Yi ]g'h'Z'f'X'Y'Y'd'm'Vi f]Y'X'g]H'g'  
U'h'h.Y'V'U'W'cZ' : Uh !a U! : i h]f'g]a ]U'f'hc'hc'W] [ U'z'k Y'h.]b'\_'h.U'h'h.Y'j'Y'f'm']a ]h'X'g]h'Y'cZ'h.Y' : Uh !a U! : i h]  
Vt'Ugfu'f'Y'f'U'W'U'f[ i Yg'U' [U]b'g'h'h.]g''

: ci f'XUfYg'Z'f'i5i hc'z'U'i ]U'UbX' : U[ Ua U'c'U'g'c'Vt'a Y'Zca 'VUgU'W'hi fu'XYd'cg]hg'cb'c'f'bYU'f'  
h.Y'a c'X'Y'f'b'VY'U'W' f]X[ Y''K'Y'UbX' ]h]b'f] [ i ]b[ 'h.U'h'h.Y'XUH'g'Z'f'h.Y'g'Y'XYd'cg]hg'gc'Vt'c'g'Y'm'a U'h'h'h.Y'  
VUgU'XYd'cg]hg'Uh: Uh !a U! : i h]'' : i f'h.Y'f'XUH]b[ 'cZ'XYd'cg]hg'U'h'h.Y'g'Y'j ]'U' [Yg'W'b'W'U'f]Z'm'k \Y'h'Y'f'h.]g'  
]g'U'Vt' ]b'W'X'Y'b'W'V'U'g'Y'X'cb'g'a U''g'Ua d'Y'g]h'Y'Z'c'f'k \Y'h'Y'f'h.Y' : Uh !a U! : i h]d'U'h'f'b' ]g'a c'fY' [Y'b'Y'f'U'm'  
Udd' ]W'V'Y'U'W'c'g]h'hi ]U''

H\Y' i5Z'c'bc'XUH'g'Vt'a Y'Zca 'h.Y' ]b'f'Y'Z'W'c'Z'U'XYd'Vt' 'i j ]U'XYd'cg]h'UbX'U'Z'ca Y'f'a U'f'g' \#  
gk'Ua d'' 'K'Y' ]b'h'Y'f'd'f'Y'h'h.Y'a 'Ug' d'f'Y'XUH]b[ 'h.Y' ]b'U'' ]b[ 'cZ'U'Z'ca Y'f'V'U'W'!VY'U'W' a U'f'g' \#gk'Ua d' ]b'U'  
g'W'bUf]c'g]a ]U'f'hc'h.U'h'd'f'cd'cgYX'Z'f'i5'c'U'f'U'f'\_'UbX'A ]W'c'j ]W%' - \*E''

H.Y' Udd'Y'U'f'U'W'c'Z'W'hi fu'XYd'cg]hg'cb'k \Uh'Udd'Y'U'f'hc' \U'j Y'V'Y'b' bYk' m'Z'fa YX'VY'U'W'  
f]X[ Yg'Uh'U'f'ci bX' %&E%(\$\$'6D'Uh'Z'ci f'k ]XY'm'X]g'd'Y'f'g'YX'c'W'h]cb'g'cb'Hi hi ]U'gi [ [ Yg'g'U'W'U'U' [ Y' ]b'  
fY'U'h]j Y'g'YU'Y'j Y''''; ccX'k ]b'UbX'; f'cgga Ub'f'&E%' E'Z'i bX'Y'j ]XY'b'W'Z'f'g] [ b]U'W'b'h'd'f'c[ f'U'XUH]cb'UbX'  
U[ [ f'U'XUH]cb'cb'h.Y'g'ci h'Vt'U'g'h'c'Z'i d'c'i 'VY[ ]b'b]b[ 'U'hr' %&E%'6D'UbX'gi [ [ Ygh'U' d'cg]V'Y'ck'Y'f]b[ ]b'  
fY'U'h]j Y'g'YU'Y'j Y'' ]b'h.]g'd'Y'f]cX'' '' H\Y'f'XUH]b[ 'f'Y'gi 'h'g' \U'X' \] [ \Y'f'g'U'b'X'U'f'X'Y'f'f'c'f'g'h'U'b'ci fg'UbX'i g'Y'X'  
c'X'Y'f'W' ]V'f'U'h]cb'a Y'h'c'X'g'' F'Y'W' ]V'f'U'h]cb'cZ'h.Y'f'XUH'g'UbX' ]b'h'Y'f'd'f'Y'U'h]cb'Uh'k'c'g'U'b'X'U'f'X'Y'j ]U'h]cb'g'  
gi [ [ Yg'g'U'g]a ]U'f'd'Y'f]cX'Z'f'ci f'Hi hi ]U'Y'j ]XY'b'W'UbX'hc[ Y'h'Y'f'Vt'i 'X'V'Y'h.Y'g] [ b'U'h'f'Y'cZ'U'f'Y' ]cb'U'  
d'U'h'Y'f'b''

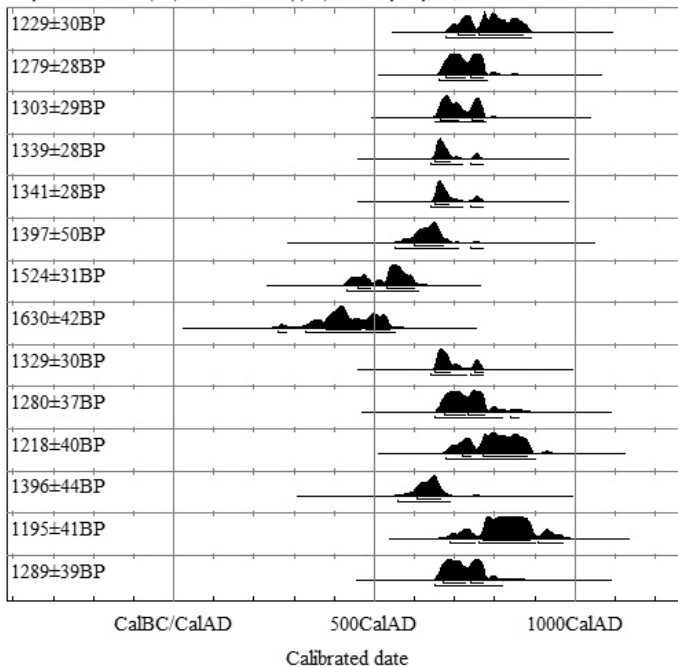
5'Y'f'b'U'h]j Y'n'h'h.U'h'h.Y'h'a ]b[ 'Vt' ]b'W'Y'X'g'k ]h'h.Y'f'Y'X'U'g' \XYd'cg]h]cb'U'Y'j Y'h]b'D'U'j U'g]U'g'UbX'  
: U'Y'b] 'Y'U'X'g' i g'hc'k'cb'X'Y'f'k \Y'h'Y'f'h.Y'f'Y'k'U'g'g'ca Y'c'W' ]h'X'Y' i d' ]Z'h'U'g'g'V'U'f'X'k ]h'h.Y'j'c'W'b]W'  
U'W'V] ]m'h'h.U'h'd'f'c'Xi W'X'h.Y'f'Y'X'U'g' \ 'Gi W' [ Y'c'c' [ ]W'X]g'h'f'U'U'W'g'Vt'i 'X'U'g'c' \U'j Y'V'Y'b'f'Y'g'd'c'g]V'Y'  
Z'f'X'Y'g'h'U'V] ]n]b[ 'h.Y'g'c'd'Y'g'Uh'i5Z'c'bc'f'Y'gi 'h]b[ ]b'h.Y'Vt' 'i j ]U'XYd'cg]h]cb'h.U'h'U'Y'X' ]hg'Z'fa Y'f'a U'f'g' \#  
gk'Ua d''

\* 5'gc'bc'f'Y'h.U'h'h.Y' [Y'c'c' ]g'h? Y'U'f'U'X'k'cc'X'c'V'U'j]b'Y'X'U'X'U'Y'c'Z'%' \$-) f'V'Y'Z'f'Y'%) \$i b'Vt'f'f'Y'W'X'k' ]b'U'g]a ]U'f'Vt'b'h'i' h'f'd'i V' ]g' ]Y'X'  
]b; f'U'h'h'U'f'c'f'U'X'f'U'Z'Y'f'%' \*' E''

HUVY & '6UgU'XUHYg Zca 'WtUgtU'g]HYg'cb Hi hi ]U

Fatu-ma-Futi	
K ?% ) & )	f%&&- ' \$ '6DŁ
K ?% ) &-	f%&+- -& '6DŁ
K ?% ) & ,	f% \$' -&- '6DŁ
K ?% ) &* ,	f% ' - -& '6DŁ
K ?% ) &&	f% ( %-& '6DŁ
K ?% \$\$\$&	f% - +-) \$ '6DŁ
K ?%* - ' &	f%& &(- ' %6DŁ
K ?% \$\$\$%	f%* ' \$-( &6DŁ
Auto	
K ?% ' & )	f% &- ' \$ '6DŁ
Lauli'i	
K ?% ' & ' ,	f%& , \$-' + '6DŁ
Fagamalo	
K ?%& \$+ ,	f%&% Ž ( \$ '6DŁ
K ?%& \$* ,	f% - * Ž ( ( '6DŁ
Afono	
K ?%& \$%	f%& ) Ž ( %6DŁ
K ?%& \$\$	f%& , - Ž' - '6DŁ

Atmospheric data from Reimer et al (2004),OxCal v3.10 Bronk Ramsey (2005), sub r5 sd.12 prob usg[shom]



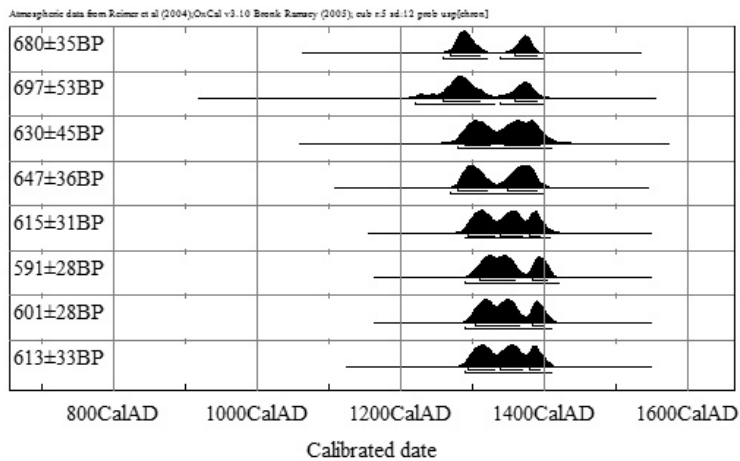
: ] [ i fy' & ' 'C I 7 U' [ fUd\ 'cZVUgU'XUHYg Zca 'WtUgtU' g]HYg'cb Hi hi ]U

**Lithics**

Hi hi ]U`Ug`VYb`fYVt[ b]nYX`Ug`Ub`ja dcfUbh`]h.]Wa Ubi ZVM fY`cWU]cb`]b`h.Y`fY[ ]cbZ`UbX`bi a Yfci`g`ei`Uff]Yg`UbX`]h.]Wa Ubi ZVM fY`UfYUg`UfY`gWUHY`fYX`Ufci`bX`h.Y`]g`UbX`fV`Uf`\_%`-`\*`L`"GYW`fY`mXUHYX`]h.]Wa Ubi ZVM fY`g]hYg`cb`h.Y`]g`UbX`UfY`Zk`fY`Y`7`Uf`\_`f%`-`'`E`Z`f`S`Y[`Uz`@YUW`YhU`"`f%`-`,'`E`Z`f`HUKU[`U`A`Uhu`z`UbX`K`]b`hY`f`cZZ`YhU`"`f&,\$\*\$`E`Z`f`A`U`UY`c`Ue`"``<`YfY`k`Y`fY`dcfhi`XUHY`g`Zca`'k`c`a`c`fY`]g]`g`k`]h`""]h.]Wa Ubi ZVM fY`XYVf]g`]b`VW`Uf`ghfU]h[`fUd\`]WU`b`b`hY`h`U`bX`gYV`fY`mXUHYX`"+`  
 :`Uhi`!`a`U!:`i`h`]UbX`J`U]d]`h`c`Z`U`j`Y`g`h`fU]h[`fUd\`]WU`m`X`]g`WY`h`""]h.]Wa Ubi ZVM fY`UfYUg`h`U`h`XUHY`h`c`h`h`Y`d`Yf]cX`\*`\$`E`+`\$`\$`6`D`"``@`h`]Vg`U`h`V`c`h`"c`W`U]h`c`b`g`UfY`h`Y`U`b`Y!`[`fU]b`YX`"``[`|`e`i`U`]m`i`V`U`g`U`h`Z`f`k`"``]W`Hi`hi`]U`]g`\_`b`c`k`b`"``H`Y`g`Y`'`h`k`c`""]h.]Wa Ubi ZVM fY`UfYUg`a`U`m`k`Y`"``fY`U`fY`h`c`h`h`Y`Hi`hi`]U`V`U`g`U`h`Y`i`d`c`f`h`]b`X`i`g`h`f`m`U`b`X`'`h`i`g`XUHY`U`d`Yf]cX`c`Z`k`]X`Y!`f`U`b`[`]b`[`G`a`c`U`b`]b`h`Y`f`U`M]cb`]b`h`h`Y`f`Y[ ]cb`f`Z`f`Y`i`U`a`d`Y`Z`g`Y`Y`G`U`b`X`h`]g`j`c`i`a`Y`Z`6`Y`g`h`Y`h`U`"``%`-`&/`7`Uf`\_`Y`h`U`"``%`-`+`/`K`Y`]g`Y`f`%`-`'`E`

HUVY`"``8`UHY`g`Zca`""]h.]Wa Ubi ZVM fY`ghfU]cb`Hi`hi`]U`

Vaipito	
K ?%&- - &	ff, \$- )`6DŁ
K ?%&- - (	ff - +- )`6DŁ
K ?%&- - )	ff`\$-( )`6DŁ
K ?%&- - +	ff ( +- *`6DŁ
Fatu-ma-Futi	
K ?% ) &	ff % -`6DŁ
K ?% ) &(	f) - %& ,`6DŁ
K ?% ) &+	ff \$%&- ,`6DŁ
K ?% )`\$	ff % -`6DŁ



: ]i`f`Y`"``C`I`7`U`[`fUd\`c`ZXUHY`g`Zca`""]h.]Wa Ubi ZVM fY`ghfU]cb`Hi`hi`]U`

+`G`h`f`U`h`k`]h`U`i`b`X`U`b`h`]h.]Wa Ubi ZVM fY`XYVf]g`c`W`V`f`U`h`U`[`U`c`"``H`Y`g`Y`g`h`f`U`h`k`Y`f`b`c`h`X`]f`Y`V`m`X`U`H`Y`Z`V`i`h`U`f`Y`g`h`f`U`h`[`fUd\`]WU`m`U`v`c`j`Y`XUHY`g`c`Z`%`%`-`(\$`6`D`f`k`?`%`%`\$`+`E`U`b`X`%`-`\*`-(`6`D`f`k`?`%`%`\$`\*`E`

**Inland Settlement**

@ja ]HYX'YI WJj UHjcb Uhih fYf f]X[ Y! hcd'g]HYg\Ug'dfcXi W'X'XUH'Yg'fUb[ ]b[ Z'ca ' %\$-&, '6D'f6YHU%' (' & 'E' h'c'+&\$-('\$'6D'f6YHU%' '%' )L'DYUF'UF[ i Yg'h.Uhg'rcbY'Zci bXUHjcbg'k YfY'UfghVi ]hcb'h.YgY'f]X[ Y'hcdg' ]b'h.Y'dYf]cX'58 '%&+\$E%' %\$'fDYUF'&\$\$(.' ' -'E'

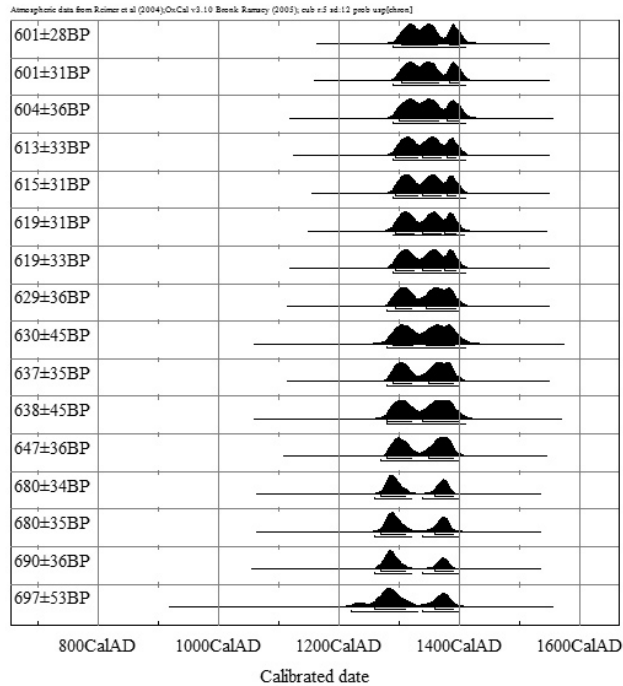
K Y bchY'h.Uh]b'UbX'fU'h'ci [ \ bchf]X[ Y'hcd'c'VW'dUHjcb'c'VW'fg'VY[ ]b]b[ 'r &\$\$\$'6D'UhJ'U]d]h'c' UbX'h.Y'DUj U]g]E: U'Yb]i 'UFYU' "H.Y'gY'XUH'Y'g'U'fY'fci [ \m%\$\$\$'nY'U'fg'UZ'Y'f'h.Y' ]b]h]U'g'Y'h'Ya'Y'bh'c'Z' Hi'hi ]U'z'UbX' ]h]g'bch]b'V'z'bw'W' ]U'V'Y'h.Uh'dcdi' U'h]cbg'k'ci 'X'U'j'Y' [ f'ck'b'h'c'U'g'nY'f'Yei'f]b[ 'i'h]h'U'h]cb'c'Z' ]b'UbX'UFY'U'g'Xi'f]b[ 'h' ]g' %\$\$\$'nY'U'f'dY'f]cX' "H.U'h'h.Y'DUj U]g]E: U'Yb]i 'UFYU'k'U'g'dfc'V'U'V'm'U'f'Y'U'h]i'Y'm' Z'Y'g' UbX' ]b'U'cg'd]H'U'V'Y'U'j'U'Ub'X'g'W'd'Y'gi [ [ Y'g'h'g'h.Uh'h.Y'f'Y'k'U'g'g'ca'Y'd'f'Y'g'gi'f'Y'V'm'r'&\$\$\$'6D'h'c' ]b'U'V]h'Y'g'g]h.Ub]c'd]h]a'U'd'U'f]g'c'Z'h.Y' ]g'UbX"

: fca'ci'f'V'c'X'm'c'Z'X'U'Y'g'z' ]Z'k'Y'V'z'bg]X'Y'f'c'b'm'h'c'g'Y'k' ]h'V'z'bj'Y'bh]cb'U'U' ]Y'g'c'Z'\*\$E\*\$--'6D'z' k'Y'g'Y'Y'j' ]X'Y'bw'c'Z'i'g'Y'c'Z'V'h' ]b'UbX'UbX'V'z'U'g'h'U'UFY'U'g' ]b'h.Y'd'Y'f]c'X'h.Uh'DYUF'gi [ [ Y'g'h'g'U'k'h.Y' ]b]h]U'V'z'bg'f'i'V]cb'c'Z'g'rcbY'Zci bXUHjcbg'cb'f]X[ Y'hcdg' "K Y' ]b]h]Y'f'f'Y'h'ci'f'V'z'f'di'g'c'Z'X'U'Y'g'U'g' ]b]X' ]W'h]b[ ' a'c'f'Y'c'f'!Y'g'g'V'z'bh]bi'U' ]g'Y'c'Z'a' ]V'c'Z'h.Y' ]g'UbX' "A'c'f'Y'V'f'c'bc'c' ]W'U'X'U'U'UFY' b'Y'Y'X'X'Z'ca'f]X[ Y'hcd'g' ]h'g'h'c'W'U'f]Z'm'k' \Y'h'Y'f'f]X[ Y'hcd'g'Y'h'i'Ya'Y'bh]g'k'Y'f'Y' ]b]h]U'm'f'V'z'bh]U[ ]ci'g'm'Y'g'h'U'V' ]g'Y'X' ]f'Y'U'f'&\$\$(.' ('E' Xi'f]b[ 'h' ]g'd'Y'f]c'X'z'c'f'k' \Y'h'Y'f'f'Y'Z'U'h'f'Y'g'U'a'd'Y'X'V'm'DYUF'k'Y'f'Y'h.Y'U'Y'f'a'Ub]Z'g'h'U'h]cbg'c'Z'U'cb[ ! h'Y'fa'd'f'c'W'g'g'c'Z'f]X[ Y'hcd' ]g'Y'h.U'h'V'Y[ Ub'a' ]V'Y'U'f]Y'f'

K Y bchY'h.Uh'U'h]U'U]d]h'c' ]b]b'Ub'X'Ub'X': U'h'!a'U!: i'h]f'V'z'U'g'h'U'k'h.Y'g'U'a'Y' ]b]X'c'Z'U'W' ]h]m'k'U'g' \U'dd'Y'b]b[ 'f]h]h'W'a'U'bi'Z'U'V'h'f'Y'c'U'h'h' ]g'd'Y'f]c'X' "H.Y'UF[ i'a'Y'bh'h.Uh'h.Y'f'c'b[ Ub'g' \U'X'X'f]i'Y'b'h.Y'G' }a'c'U'b' dcdi'U'h]cb' ]b]h'c'f'Y'Z' [Y' ]b'h.Y'a'ci' b]U' ]b]g'Y'Ya'g'g'h'f'Y'h'W'X' "C'f'd'Y'f'U'd'g'f'c'b[ Ub'g'k'Y'f'Y'f'c'f'Xi'V]b[ 'U'X'N'Y'g' U'h'V'c'h'd'U'W'g' "K Y'ei'Y'g'h]cb'k' \Y'h'Y'f'U'd'd'f'c'f]U'h]cb'c'Z'h.Y'Hi'hi ]U'V'U'g'U'h'Y'i' d'c'h]b]Xi'g'h'm'k'U'g'b'ch'h.Y' ]a'd'Y'hi'g'z'c'f'h.Y'f'c'b[ Ub' ]b]U'g]cb' "7'ci'X' ]h'U'j'Y'V'Y'Y'b'f'c'b[ Ub'g'Ub'X'b'ch]G' }a'c'U'bg'h.U'h'k'Y'f'Y'f'Y'g'd'c'bg]V'Y'Z'f'h.Y'k' ]X'Y'X' ]g'h]V'i'h]cb'c'Z'Hi'hi ]U'V'U'g'U'h]b'h.Y'd'c'g'h'E'\*\$'6D'd'Y'f]c'X'3' 'A' ]V'k'c'f'\_'f'Ya'U' ]b]g'h'c'V'Y'X'cb'Y'cb'h' ]g' ]a' d'c'f'U'bh'd'Y'f]c'X' ]b'Hi'hi ]U'd'Y'f' ]g'h'c'f'h'

HUV'Y'(' '8UH'Y'g'Z'ca' ]b'Ub'X'Ub'X'V'z'U'g'h'U' ]g' ]h'Y'g'c'b'Hi'hi ]U'\*\$E\*\$--'6D'

K ? % ' %	* %-' %6D	: U'Yb]i	UbX
K ? %& (	* -\$-' *'6D	: U'Yb]i	UbX
K ? %&- ,	* \$(-' *'6D	? c_c'UbX	UbX
K ? %)' \$' (	* &- -' *'6D	? c_c'UbX	UbX
K ? %)' &%	*' , -()'6D	: i h]U	UbX
K ? %&- -)	*' \$-()'6D	J U]d]h'c	UbX
K ? %&- - +	* (+-' *'6D	J U]d]h'c	UbX
K ? %&- - &	* , \$-' )'6D	J U]d]h'c	UbX
K ? %&- - (	* - +-' )'6D	J U]d]h'c	UbX
K ? %)' &+	* %&-&, '6D	: U'h'!a'U!: i'h]	7cUg'h'U'
K ? %)' \$	* % -' )'6D	: U'h'!a'U!: i'h]	7cUg'h'U'
K ? %)' &'	* % -' )'6D	: U'h'!a'U!: i'h]	7cUg'h'U'
K ? %)' -' *	* % -' )'6D	: U'h'!a'U!: i'h]	7cUg'h'U'
K ? %)' -' '	* % -' )'6D	: U'h'!a'U!: i'h]	7cUg'h'U'
K ? %)' - &-	*' +Z' )'6D	]i'U'D'c'h'c' ]b[	7cUg'h'U'
K ? %)' *, '	* , \$-' ( '6D	]5Z'bc	7cUg'h'U'



: ]i fY`(`C I 7 U`[ fUd`c ZXUHYg`Zca` ]b`UbX`UbX`Vt`UghU`g]HYg`cb`Hi`h` ]U`\*`\$\$E`\*-`-`'6D`

**Shell Bracelets and Decorated Pottery**

G\Y`VfUW`Yhg`UbX`XYVt`fUHYX`dchYfm`Uj`Y`VYYb`i`gYX`Ug`hml]W]`a`Uf`Yfg`cZYUfmXYdcdg]hg`]b`G`a`cU`fH`Uh]gZ`VY`Zc`fY`r`&\$\$\$`6D`E`cf`Ug`]bX]W]h]`Y`cZg]HYg`XUH]b[` ]c`h`Y`dYf]cX`cZ5bW`grfU`Dc`nbYg]Ub`GcV]Yfm`f5DG]`K`Y`fYdcfh`YfY`h`Uh`Vch`\_]bXg`cZ`UfHYZM]g`Uj`Y`VYYb`Zc`bX`cb`Hi`h` ]U`]b`fY`UH]`Y`mi`UHY`Vt`bHY`hg`

`-bV]gYX`dchYfm`Uh`h`Y` :`U`Yb]i`#DUj`U]U]V`VcfXYf`XUHYg` ]c`%`-`-`%`6D`fK`?`%`'`&%]`G\Y`VfUW`Yh]ZU[`a`Yb]g`Uj`Y`VYYb`Zc`bX`Uhs`i` ]c`]b`U`g`fU]h`a`XUH]b[` ]c`%`&`-`'`\$`6D`fK`?`%`'`&`E`Ug`k`Y`Ug`Uhi`Uhi`!`a`U!` :`i`h]`5`h`ci`[`h`Y`cbYg`Zca` :`Uhi`!`a`U!` :`i`h]`UfY`Zca` :`i`bXUHYX`Vt`bHY`hg`Z`h`Y`mi`UfY`Zca`Vt`bHY`hg`UVcj`Y`g]fU]U`XUH]X` ]c`r`%`\$\$E`%`(\$`6D`fUg`bcfHYX`YUf]Yfz`h`Y`c`XYghVUgU`XUHYg`Uhi`Uhi`Ea`UE` :`i`h]`UfY`cb`mi`U`Vt`i`d`Y`cZM]b]h`f]Yg`YUf]Yfz`UbX`Y`bW`dfcj`XY`U`a`U!`]a`i`a`dcgg]Y`U[`Y`Zc`f`h`Y`VfUW`Yh]ZU[`a`Yb]g]`

?`]fVX`UbX` ;`fYYb`f\$\$\$%`i`gYX`h`Y`f]U]b[`i`UH]cb`a`Yh`cX` ]c`V`UfUW]f]hY`5bW`grfU`Dc`nbYg]Ub`GcV]Yfm`f5DG]`7`YUfmi`XY`UbYX`UfVX`UYc`c[`]W]`Vt`fY`UHYg`fYa`U]b`Y`i`g]Y`fGa`]h`&\$\$&Z`Vi`h`5DG`fYa`U]b]g`Ub`]b]h`fYg]h]b[`Y`i`f]g]W]h]c`Zc`f`h`]b`]b[`UVci`h`K`Ygh`Dc`nbYg]Ub`dfY`]g]h`fmi`5`Z`h`fY`U]h`Y`b]h`cZ5DG`]g`VYnc`bX`h`Y`gVt`d`Y`cZ]h`]g`d`UdYfz`Vi`h`k`Y`gi`[[`Ygh`h`U]z`U`h`ci`[`X`YVt`fUHYX`dchYfm]UbX`g`Y`VfUW`Yhg`a`Um]VY`UggcV]UHYX`k`]h`5DG]Z`h`Y`mi`Vt`b]h]bi`YX`]b`i`gY`cb`Hi`h` ]U`Zc`f`gY`YU`W`b]h`f]Yg`fU]bX`dYf`Udg`U`a`Y`]b]b]`a`Zc`f`h`Y`VfUW`Yhg]UbX`a`Um]bchVY`[`cX`a`Uf`Yfg`cZ5DG`]g]HYg`cb`Hi`h` ]U`

**Late Ceramics**

I`g]b[`Yj`]XYbW`Zca`1`dc`i`z` ;`fYYb`UbX`8`Uj`]Xgcb`f%`+`(.`&`E`cf]`]bU`mgi`[[`Ygh`YX`h`Uhd`chYfm]g]h`cddYX`VY]b[`i`gYX`]b`G`a`cU`58`r`'`\$\$\$`?`]fVX`UbX`<`i`bh]f%`-`'`&`\$E`%`E`Zc`i`bX`Yj`]XYbW`Zca` ]c`E]U`c]b`I`C`Z` ]c`YI`h`Y`bX`dchYfm]i`gY` ]c`58`'`(\$`\$E`\$`fH`Y`gY` ]c`c`k`Y`fYZf` ]c`Ug`h`Y` ]h`U]h]cbU`a`cXY`I`E`7`Uf`UbX`A`]W`c]`]W]f%`-`\*`E`Uj`Y`Uf`[`YX`h`Uh`U]h]5`c`U`f`Hi`h` ]U`E`dchYfm]i`gY`Vt`b]h]bi`YX` ]c`58`%`\$\$`fk`Y`fYZf` ]c`h`]g`Ug`h`Y` ]U`h`a`cXY`I`E`7`Uf`f%`-`\*`(`)%`E`gi`[[`Ygh]g`h`Y`Zc`ck`]b[`dcgg]M]`]h]m]Zc`f`G`a`cU`

9WYfhUbX`DYUf]U`W`fYb]hdfc`V]h]Uh5[`UbcUz`Hi`h` ]Uz`k`Ug`Yi`d`]h]m]XYg]`bYX` ]c`YI`W]U`Uf`Ub`5DG`j` ]U[`Y`UbX`a`Um]Y`d`VU]f]Zm`h`Y`]gg]`Yg`k`Y`fU]gY`]b`h`]g`gY]f]cb`

% DcHfYfmk Ug'k jX'Y'mi gYX'j'b'G} a cU'h'fci [ \ h'Y'U'fgh\U'ZcZ'h'Y'U'fgha ]'Ybb'ji a '58/  
 & DcHfYfmi gY'XYWj'BYX'c'j Yf'h'Y'b'YI h'Z'k 'W'bh'i f]Yg'z'X]gUdd'YUf]b[ 'j'b'gca Y'c'W]h'cbg/  
 ' ' 5'Z'Y'f'58 '%\$\$'dchfYfmk Ug'i bV't'a a cb'j'b'G} a cU'UbX'UVgYbh'Z'ca 'a UbmUfYUg/  
 (" 6'Y'h'YYb'58 '% \$\$' UbX' % \$\$' dchfYfmVY'W'a Y' fUfY' UbX' k Ug' fYfU]b'YX' ]b'j' Yfm'ga U''  
 Ua ci b]g'j'b'j Yfm'Z'k 'c'W]h'cbg/  
 )" 6mU'Vci h58 '% \$\$'dchfYfm\UX'VY'Yb'UVUbX'cb'YX'h'fci [ \ci h'h'Y'j'g'UbX'g'

K cf\_cj Yf'h'Y'U'gh'g'Yj Yb'm'Y'U'fg'Uh5GD5'U'g'Zci bX'a Ubm'b'Yk 'W'f'Ua ]W'g]Y'g'h'U'ha Um'U'X'f'Y'g'g'  
 h'Y'V't'b'U]W]b[ 'j'X'Y'U'g'U'V'ci h'W'g'g'U]h'cb'c'Z'W'f'Ua ]W'j'g'Y'j'b'G} a cU''C'i f'Y'j ]X'Y'b'W' c'Z'dchfYfm]b'k'Y''U'X'U'Y'X'z'  
 i bX]g'di h'Y'm'd'f]a U'f'n'z'V't'b'Y'I h'g'U'h'D'U'j'U'g'U'g'U'UbX' : U'Y'b]i 'f'U'g'k'Y''U'g'j'U'd]h'c'c'b'Hi h'j'U'gi d'dc'f'g'dc]b'g'  
 %h'f'ci [ \ ' ' U'V'c'j'Y''DchfYfm]b'ei Y'g'h'cb'U'V'Y'g'h'f'U]f'U'd\]W'UbX'W'f'c'bc'c[ ]W'V't'b'Y'I h'V't'b'j'bi Y'g'f'c'V'Y'  
 Z'ci bX'cb'Hi h'i ]U'UbX'a U'n'z'c'f'a U'm'b'c'h'z'd'Y'f'U]b'f'c'dc]b'g'('UbX' )''

G'Y'j'Y'f'U' 'W'f'Ua ]W'g]Y'g' \U'j'Y' V'Y'Y'b'Z'ci bX'cb'h'Y'H'j'z'bu'D'U]b'k'V'f'Y'z'U'g'bc'h'Y'X'Y'U'f'Y'f'z'  
 g'Y'X]a Y'bh'g'U'f'Y' [ Y'b'Y'f'U'm'g'U'c'k' UbX'X]g'h'f'V'Y'X'h'f'ci [ \ d'Y'f'U'd'g' h'k'c'a ]'Y'Y'bb]U'c'Z [ U'f'Y'Y'b]b[ 'UbX'  
 X'ca Y'g'h]W'U'W]j'j'Y'g''<Y'f'Y'z'h'Y'cb'mi b'Yei ]j'c'W'W'mi bX]g'h'f'V'Y'X'W'f'Ua ]W'X'Y'd'c'g]h'g'c'W'W'f'i b'X'Y'f'h'Y'f'Y'X'  
 U'g'U'U'n'Y'f'UbX'X'U'Y'f'c'h'Y'Y'U'f'm'U'f'g'h'a ]'Y'bb]i a '58''C'h'Y'f'W'f'Ua ]W'g]Y'g'U'f'Y'j'h'Y'f'c'V'j'c'i g'm'X]g'h'f'V'Y'X'  
 c'f'i b'X'U'Y'X'f'f'c'W'f'U'b'Y'Y'h'U''&\$\$( /g'Y'Y'U'g'c'g'j'a i f'U'UbX'f'c'i Y'f'h'j'g'j'c'i a Y'E'Z'f'U'G'U'j'U]g'g'UbX'g]h'Y'f'  
 K'Y'f'Y'V't' b]n'Y'h'U'h'Y'f'Y'j'g'W'f'U'f'f'm]b'U'f'i ]b[ 'h'U'h'c'b'm'X'Y'd'c'g]h'g'V'Y'c'k'Ub'c'V'j'c'i g'm'i bX]g'h'f'V'Y'X'  
 W'f'c'bc'c[ ]W'V'a U'f'Y'f'h'Y'f'Y'X'U'g'U'V'W'b'V'Y'V't'b'g]X'Y'f'Y'X'U'g'j'b'd'f]a U'f'm'V't'b'Y'I h'U'UbX'i g'Y'X'f'c'X'U'Y'W'f'Ua ]W'  
 i g'Y'z'k'j'W'j'g'h'Y'b'j'b'h'f'b'U'f'i Y'X'U'g'X'U]b[ 'h'Y'Y'b'X'c'Z'W'f'Ua ]W'j'g'Y'cb'h'Y'j'g'UbX'' ; ]Y'b'h'Y'g'U'c'k'  
 X'Y'd'c'g]h'g'UbX'cb[ 'i'g'Y'\]g'h'f'm'c'Z'h'Y'U'f'Y'U'c'Z'h'Y'@Y'c'b'Y'j'c'W'b]W'z'k'Y'g'i [ [ Y'g'h'i'U'h'i'g'U'f'Y'U'a U'm'b'c'h'  
 V'Y'\Y'd'z' ]'b'U'X'f'Y'g]b[ 'h'Y'W'g'g'U]h'cb'c'Z'W'f'Ua ]W'j'g'Y'cb'Hi h'i ]U'U'Y'W'f'Ua ]W'g]b'h'j'g'U'f'Y'U'W'b'U'k'U'ng'  
 V'Y'd'U'i'g'U'm'U'f'i Y'X'f'c'V'Y'j'g'Y'V't'b'X'U'f'm'V't'b'Y'I h''

K'Y'g'i [ [ Y'g'h'i'U'h'i'k'c'c'h'Y'f'g'h'f'U]h'Y'X'UbX'k'Y''X'U'Y'X'g]h'Y'g'gi d'dc'f'h'h'Y'f'U'X]h'c'bu''a c'X'Y''  
 c'Z'W'f'Ua ]W'W'g'g'U]h'cb'j'b'G} a cU'f'h'U'h'j'g'z'U'g'U'f'i Y'X'V'mi; f'Y'Y'b'UbX'8'U'j'X'g'cb'% +(z'UbX'? ]f'W'UbX'  
 <i'bh%'-'E''h'Y'j'U'd]h'c'g]h'f'f'5G'E&) E\$\*) E'U'U'g'h'k'c'a ]'Y'Y'bb]U'c'Z'g'i W'W'g]g]Y'f'f'f'U'W'Vi ]X]b[ 'd'U'g'Y'g'  
 gi d'Y'f]a d'c'g'Y'X'cb'Y'U'W'c'h'Y'f''h'Y'f'Y'U'f'Y'U'Vi b'X'U'bh'W'f'Ua ]W'g]b'W'U'f'd'f]a U'f'm'X'Y'd'c'g]h'c'bu'V't'b'Y'I h'  
 U'h'h'Y'V'c'h'c'a 'c'Z'h'j'g'Y'ei Y'b'W'f'U'Y'X'f'c'U'f'c'&\$\$\$'6'D'z'UbX'c'cb'Y'j'b'gi V'g'Y'ei Y'bh'g'f'U'U''h'j'g'gi d'dc'f'g'  
 7'U'f'g'dc]b'g'g'z'UbX''UbX'j'g'b'c'h]b'V't'b'g]g'Y'bh'k ]h'h'Y'f'U'X]h'c'bu''a c'X'Y''

H'Y' : U'h'! a U'i : i h'j'g]Y'f'5G'E&) E\$\* &E'U'g'U' %z' \$'n'U'f'f'c'f'd'Y'f'U'd'g'U'V't'i d'Y'c'Z'W'bh'i f]Y'g'  
 Y'U'f'Y'f'c'g'Y'ei Y'b'W'c'Z'g'i d'Y'f]a d'c'g'Y'X'g'h'f'U'U''f'g'ca Y'+) 'a \*c'Z'Y'I W'j'U]h'c'bu'a i W'h'Y'j'X'Y'b'W'c'Z'X'ca Y'g'h]W'  
 i g'Y'k'U'g'X'c'W'a Y'bh'Y'X'f'Y''z'd'U'j'Ya Y'bh'g'z'd'c'g'h'c'Y'g'z'a ]X'Y'b'z'Vi f]U'g'k'n'Y'h'bc'W'f'Ua ]W'g]k'Y'f'Z'ci b'X''K'Y'  
 ]b'Z'f'h'j'g'f'c'a Y'Ub'h'U'h'W'f'Ua ]W'g]k'Y'f'Y'bc'cb[ Y'f'j'b'V't'a a cb'i g'Y'f'c'f'k'Y'f'Y'U'V'g'Y'bh'c'cb'Hi h'j'U'U'h'h'Y'  
 h'j'a Y'c'Z'h'Y'Y'U'f'Y'g'h'W'hi f'U'X'Y'd'c'g]h'g'U'h' : U'h' E'a U'E' : i h''5[ U]b'z'h'j'g'V't'b'g]g'Y'bh'k ]h'7'U'f'g'dc]b'g'g'z'  
 &z'UbX''z'Vi h'bc'h]b'V't'b'g]g'Y'bh'k ]h'h'Y'f'U'X]h'c'bu''a c'X'Y''K'Y'g'i [ [ Y'g'h'i'U'h'Z'j'g]h'j'b[ 'dc]b'g''UbX'('k']  
 V'Y'X]Z'W'h'

5g]h'Y'U'g'Z'ci f'm'Y'U'fg'U'c'z' : f'Y'Y'b'bc'h'Y'X'U'f'a ]X]g'Y'ei Y'b'W' [ U'd]b'h'Y'U'f'W'U'Y'c'c[ ]W'f'Y'V't'f'X'i Z'f'  
 G} a cU'UbX'V'Ya c'U'BY'X'f'g'h'c'k'd'c'c'f'c'i f'Y'j ]X'Y'b'W'j'g'Z'f'h'Y'h'j'a Y'V'Y'h'Y'b'W'V'f'W'58'(\$\$E) \$\$'UbX'58'  
 %\$\$E%\$\$f'f'f'Y'Y'b'&\$\$\$%(\$E''h'Y'g'Y'G} a c'U'b'f'8'U'f'5[ Y'g'i \U'j'Y'V'Y'Y'b'bc'h'Y'X'V'm'c'h'Y'f'g'U'g'k'Y''f'Y''z'  
 8'U'j'X'g'cb'% + /? ]f'W'&\$\$\$.&&&/6i f'Y'm'UbX'7'U'f'&\$\$\$'&(\$E''K'Y'c'd'Y'h'U'h'h'Y'f'Y'g'i h'g'f'Y'd'c'f'Y'X'Y'f'Y'  
 d'f'c'j'X'Y'U'h'Y'U'g'h'U'j'a a Y'f'c'Z][ \h'c'b'h'j'g'd'Y'f'c'X/U'h'c'i [ \h'j'g'd'U'd'Y'f'U'g'f'U]g'Y'X'Z'f'a c'f'Y'ei Y'g'h'cb'g'  
 h'U'b'h'U'g'U'bg'k'Y'f'Y'X''5[ U]b'z'c'i f'a U]b'U]a ]b'h'j'g'd'U'd'Y'f'k'U'g'f'c'a U'Y'X'U]h'j'b'f'Y'g'i h'g'U]U]U'Y'f'c'h'Y'f'g'  
 UbX'f'c'cb'm'f'Y'U'm'V't'a a Y'bh'c'b'g'ca Y'c'Z'h'Y'f'Y'b'X'g''F'Y'd'c'f'g]b'd'f'Y'd'U'f'U]h'c'bu'Uh5GD5'k']U'X'X'Y'f'U]g'c'Z'  
 V't'b'Y'I h'U'UbX'j'bh'f'd'f'Y'f'U]h'c'bu''h'j'g]b'X'Y'Y'X'Ub'Y'I W]h'j'b'h'a Y'f'c'V'Y'j'c'j'Y'X'j'b'U'f'W'U'Y'c'c[ ]W'f'Y'g'Y'U'f'W'j'b'  
 G} a cU''a U'bm'U'U'g]U'ei Y'g'h'c'bc'Z'W'f'c'bc'c[ n'z'a U'Y'f'f'U'W'hi f'Y'z'UbX'X]g'h'f'U'h'j'c'b'c'Z'g]h'g'V'c'h'g'd'U]U'm'  
 UbX'Y'a d'c'U'm'f'Y'a U]b'f'c'V'Y'U'X'X'Y'g'g'Y'X'j'b'h'Y'U'f'W'j'd'Y'U'c''<ck'Y'j'Y'f'z'k'Y'g'Z'Y'U'V'f][ \h'z'hi f'Y'UbX'Z'Y'  
 V't'b'U'X'Y'bh'h'U]h'j'b'h'Y'b'Y'I h'X'Y'W'X'Y'g'c'Z'f'Y'g'Y'U'f'W'V'm'h'Y'Y'a Y'f'j'b[ [ Y'b'Y'f'U]h'c'bc'Z'f'Y'f'U'g'k'Y''U'g'h'c'g'Y'  
 U'f'Y'U'X'm'Y'g'h'U'f'j'g'Y'X'E'a U'bm'c'Z'h'Y'c'i h'g'h'U'X]b[ 'ei Y'g'h'c'g'k']V'Y'[ ]b'f'c'V'Y'U'bg'k'Y'f'Y'X''

**Acknowledgements**

K'Y'\Y'f'U'W'b'c'k'Y'X[Y'c'i f'X'Y'V'h'c'h'Y'd]c'b'Y'f]b[ 'U'f'W'U'Y'c'c[ ]W'f'k'cf\_]j'b'G} a cU'c'Z'>Ub'Y'h'8'U'j'X'g'cb'  
 UbX'f'c'Y'f' : f'Y'Y'b''K'Y'h'U'b'h'Y'a'Z'f'h'Y'f'f'm'Y'U'fg'c'Z'g'i d'dc'f'h'UbX'Y'b'V't'i f]U'Ya Y'bh''6'c'h'c'Z'h'Y'a'  
 \U'j'Y'g'c'k'b'V'c'h'c'Z'i g'z'Z'ca'c'i f'Y'U'f'Y'g'h'X'U'ng'U'g'[ cc'Z'i] f'U'X'i U'Y'g'h'i X'Y'bh'z'h'Y'i i h'a c'g'h'f'Y'g'd'Y'V'h'UbX'

Vt`Y[ ]U]m/k Y \Uj Y fYW] YX`a cFY`\_]bXbYgg`Zca`hYa`hUb`]g`ci fXi Y`  
: ]cbU`DYfWm`cZ`hY`I`b] Yfg]m`cZ`K`U`Uhc`F`UX]cWfVcb`8`U]b[ `@UvcfUrcfm`Ug`VYyb`U`  
VtbgfUbhgci fW`cZ]bZ`fa`U]cb`cb`fUX]cWfVcb!XU]b[ !fY`UH`X`a`UHYfg`K`Y`hUb`\_`Yf`Zc`f`Yf`Y`d`UbX`  
Yf`Vt`Y[ ]U`U]h`h`XY`

K`Y`Ugc`h`Ub`\_5GD5`5fW`UYc`c[ mWYk`a`Ya`VYfg`G]U`J`U`Y`Z`h`]di`Uj`U]HU]`cZ`>YZYfm`h`c`Uz`  
UbX`Gcbbm`H`Uca`]U`Zc`f`h`Y]f`\_YYb`]b`YfYg]z`X][`YbWz`h`c`fci`[ \bYggz`UbX`XYX]W]h]cb`

H`Y`fYgi`h`g`fYdcfYX`Y`fY`k`ci`X`bch`Uj`Y`VYyb`d`cgg]V`Y`k`]h`ci`h`h`Ya`" `Hc`h`Y`UbX`c`k`b`Yfg`  
UbX`c`W`d`U`b`g`]b`h`Y`UfY`Ug`k`Y`fY`k`Y`Uj`Y`k`cf`\_Y`Z`k`Y`Yi`h`Y`b`X`ci`f`[ fU]h`XY`Zc`f`h`Y]f`d`U]h`Y`b`W`UbX`  
\_]b`X`b`Y`gg`

>UbYh`8`Uj`]Xgcbz`F`c[`Yf`;`fYybz`>YZYfm`7`Uf`z`7`f]g`h`c`d`Y`G`UbXz`:]cbU`DYfWm`nā`UbX`9`h`Ub`  
7`c`W`f`Ub`Y`fY`UX`Y`Uf`Y]f`XfU]z`g`c`Z`h`]g`d`UdYf`" `K`Y`Udd`fY`W]U`Y`h`Y]f`Vt`a`a`Y`b`h`g`UbX`gi`[ [`Y`g]h]cbg`/`Y`f`c`f`g`  
f`Ya`U]b`ci`f`c`k`b`

References

5XX]gcbz`8`">`z`H`HU]`cZ`>`" `Hc`cU`UbX`9`" `DYUf`h`fY`Yz`&\$`\$`" `7`YfUa`]WXY`d`c`g]h`VY`c`k` `) `h`!\*`h`7`Ybh`fm`  
58`j`c`W`b]W`U`g`Z`U`U`h`D`Uj`U`g]U]z`h`i`h`]U`-`g`UbXz`5a`Yf]W`b`G`Ua`cU`DfY`ja`]b`Ufmi`fYgi`h`g`" `New`  
Zealand`Journal`of`Archaeology`,`&+.)`!`%`"

6Yg]z`G`z`D`" `G`Y`dd`U`f`X`Z`F`" `7`";`fYyb`UbX`F`" `D`U`f`\_`Y`f`%`-`&`" `B`Y`W`i`c`a`U`b`V`b`[`h`Y`g`h`c`b`Y`. `5`f`W`U`Y`c`c`[`]`g`h`g`UbX`  
5`X`n`Y`g`]b`G`Ua`cU`" `The`Journal`of`the`Polynesian`Society`,`%\$`%`(!`,`),`)"

6i`fYnā`8`" `UbX`>`" `H`7`Uf`z`&\$`\$`" `H`Y`Uf`W`U`Y`c`c`[`m`c`Z`:]`#`K`Y`g`h`D`c`n`b`Y`g]U`]b`h`Y`d`c`g`h`@`Ud]`h`U`Y`f`U`  
`&`7`" `G`U`b`X`f`Y`X`" `Pacific`Archaeology: `Assessments`and`Prospects. `Proceedings`of`the`  
International`Conference`for`the`50th`anniversary`of`the`first`Lapita`excavation. `Kone-`  
Noumea`2002`" `B`c`i`a`YU`8`Yd`Uf`Y`a`Y`b`h`5`f`W`U`Y`c`c`[`]`Y`Z`G`Y`f`]`W`X`Y`G`A`i`g`Y`Y`g`Y`h`X`i`D`U`f`j`a`c`]b`Y`Z`  
`d`d`&`)!`\*`" `

7`Uf`z`;"`Z`&\$`\$`5`X`n`Y`g`c`Z`&`Y`f`U`W]`h`c`b`G`Ua`c`U`b`6`U`g`U`h`5`f`Y`Z`U`W]`g`]b`:]`" `&`G`" `6`Y`X`z`f`X`z`7`" `G`U`b`X`z`UbX`8`" `J`  
6i`fYm`fY`X`g]z`Fifty`Years`in`the`Field. `Essays`in`Honour`and`Celebration`of`Richard`Shutler`  
Jr's`Archaeological`Career`" `5`i`U`UbX`. `B`Y`K`N`Y`U`UbX`5`f`W`U`Y`c`c`[`]`W`5`g`g`c`V`U]`h]c`b`A`c`b`c`[`f`Ud`  
&`z`d`d`&&`+`!`,"`"

7`Uf`z`>`H`z`%`-`" `D`f`Y`]`g`h`c`f`m`c`Z`5`Y`[`U`z`h`i`h`]U`-`g`UbXz`5a`Yf]W`b`G`Ua`c`U`Z`U`g`a`U`" `f`Y`g`X`Y`b`h]U`UbX`V`U`g`U`h`  
]b`X`i`g`f]U`j`U`Y`r`n`" `New`Zealand`Journal`of`Archaeology`,`%`\*`+`,`\*`" `

7`Uf`z`>`H`z`%`-`\*`" `G`Ua`c`U`b`D`f`Y`]`g`h`c`f`m]b`F`Y`j`Y`k`" `&`>`A`" `8`Uj`]Xgcbz`;"`f`k`]b`z`:"`@`Y`U`W`z`5`" `D`U`k`Y`nā`UbX`  
8`" `6`f`c`k`b`f`Y`X`g]z`Oceanic`Culture`History: `Essays`in`Honour`of`Roger`Green. `B`Y`K`N`Y`U`UbX`  
>`c`i`f`U`c`Z`5`f`W`U`Y`c`c`[`m`G`d`Y`W]U`Di`V`]W]h]c`b`z`d`d`" `(!`)\*`\$`"

7`Uf`z`>`H`z`9`" `K`f][`h`UbX`8`">`" `<`Y`f`X`f]W`z`%`-`+`" `&`Y`f`U`W]`h]c`b`g`k`]h]b`UbX`V`Y`n`c`b`X`h`Y`G`Ua`c`U`b`  
5`f`W`U`Y`c`c`[`c`9`]`X`Y`b`W`Z`ca`V`U`g`U`h`W`f`c`W`[`Y`c`W`Y`a`]g`f`m`i`&`A`" `="`K`Y`]g`Y`f`f`Y`X`" `Prehistoric`  
Long-distance`Interaction`in`Oceania: `An`Interdisciplinary`Approach`" `5`i`U`UbX`. `B`Y`K`N`Y`U`UbX`  
5`f`W`U`Y`c`c`[`]`W`5`g`g`c`V`U]`h]c`b`A`c`b`c`[`f`Ud`z`d`d`" `\*`,`!`,`("`"

7`c`W`f`Ub`Y`z`9`" `9`z`A`" `H`7`U`f`g`c`b`UbX`>`G`" `5`h`Y`b`g`f`Y`X`g]z`&\$`\$`(" `Archaeological`Inventory`Survey`for`  
the`Tualauta`County`Phase`Iib`Sewerline`Project,`Tutuila,`American`Samoa`" `<`c`b`c`i`i`.  
&`Y`f`b`U]`h]c`b`U`5`f`W`U`Y`c`c`[`]`W`F`Y`g`Y`U`f`W`&`g]h`h`h`Y`z`&`W`

8`Uj`]Xgcbz`>`A`z`%`+`" `G`Ua`c`U`b`UbX`H`c`b`[`U`" `&`>`8`" `>`Y`b`b]b`[`g`f`Y`X`" `The`Prehistory`of`Polynesia`  
7`Ua`V`f]X`[`Y`<`U`f`U`f`X`I`b]`Y`f`g]m`D`f`Y`g`z`d`d`"`,`&`%`\$`-`"

8]W]YbgcbzK "F " UbX'F "7"; fYybZ% -, "; YcUfWUYc'c[ ]W]`Vt'bhYI hcZ<c'cWbY'gi Vg]XYbWV`UhH.Y` : Yffm6YfH' @Ud]H]g]H'Z'A i` ]Zubi UZl dc'i žGua cU" *Geoarchaeology*, % .& -!\*" "

; ccXk ]bz "8" UbX'9"9"; fcgga Ubz &\$ \$' "A ]XX'Y'hc'`UfY' <c'cWbY'`Vt'UgH'U'Yj ci' h]cb'U'cb[ 'h.Y'gci h' Vt'UgHicZI dc'i 'g'UbXz'Gua cU" *Marine Geology*, '&\$&.%%' "

; fUbH'HUmcfzH'@'UbX'H'5" F UZYfz% \* &"BYk 'NYU'UbX'fUX]cW]fVcb'U[ 'Y'a YUgi fYa Ybh) " *New Zealand Journal of Geology and Geophysics* ) . ' %& ) - "

; fYybZ'F "7"ž&\$&\$&'5'F YfHcgdYV]j Y'j ]Yk 'cZGYhYa YbhDUHfYfb'Gh X]Yg' ]b'Gua cU" @H'B" @UXYz[ YX' UbX' A "K " " ; fUj Yg' fYXgžž *Pacific Landscapes Archaeological Approaches* " @cg' Cgcg' 6YUfgj ]'Y'DfYggždd"(%&!) &"

; fYybZ'F "7" UbX'>"A "8Uj ]Xgcbz% + (" *Archaeology in Western Samoa, Volume II* "5i W] UbX. 5i W] UbX' @g]H' h' UbX'A i gYi a ž6i `Y]b' +"

< i bhž H'@' UbX' D'J " ? ]fWž % - + " H'Y' < ]g]cf]W]`9W'c[ mcZCZ ] 'g'UbXz'5a Yf]W]b'Gua cU. ' '\$\$\$'6D' hc' h.Y' DfYgYbh' @' D'J " ? ]fW' UbX' H'@' < i bhfYXgžž *Historical Ecology of the Pacific Islands: Prehistoric, Environmental and Landscape Change* "BYk ' <Uj Yb. MU'Y' i b] ]Yfg]m'DfYggždd" (%\$) !& " "

? ]fWž D'J "ž&\$&\$&" *On the Road of the Winds: An Archaeological History of the Pacific Islands before European Contact* 6Yf\_Y'Ym' i b] ]Yfg]m'cZ7 U' ]z'fb]U'DfYgg"

? ]fWž D'J " UbX' F "7"; fYybZ &\$ \$%' *Hawaiki: Ancestral Polynesia* "7 Ua Vf]X[ Y. 7 Ua Vf]X[ Y' i b] ]Yfg]m' DfYgg"

? ]fWž D'J " UbX' H'@' < i bhfYXgžž % - ' " " *The To'aga Site: Three Millennia of Polynesian Occupation in the Manu'a Islands, American Samoa* "6Yf\_Y'Ym'7 5. i b] ]Yfg]m'cZ7 U' ]z'fb]U'5fWUYc'c[ ]W]` F YgYUfW : UW] ]mBc" ) % "

@YUWž < " UbX' 8 " K ]HYfz% - \$' : i fH'Yf' ]b] Yg]H[ U]h]cbg'UhH'Y' HUH[ U'A UH' i ]g]H'z'5a Yf]W]b'Gua cU" *New Zealand Journal of Archaeology*, (%&.) %& , " "

A W' cfa UWž : ; "ž 5" ; " < c[ [ ž D' ; " 6' UW]k Yžž 7 "9" 6i Wž H' ; " < [ \ Ua ' UbX' D' > " F Y]a Yfz &\$ \$ ( " G < 75 @ \$ ( ' Gci h.Yfb' < Ya ]gd\YfY' W] ]fU]h]cbz \$! % \$ \$' W]` \_nf' 6D' *Radiocarbon*, ( \* fl Ł % \$ , +! - & "

DYUfž : "6ž&\$ \$ ( " H'Y' W'fcb'c'c[ mcZa ci b]U]b'gYhYa Ybh]c'cb'Hi h' ]Už5a Yf]W]b'Gua cU" *Journal of the Polynesian Society*, % f( Ł ' ' %& ( , " "

DYUfž : "6ž&\$ \$ \* " @HY' <c'cWbY'`UbXgW]dY'Yj ci' h]cb'UbX'`UbX!i gY'YI dUbg]cb' ]b'Hi h' ]Už5a Yf]W]b'Gua cU" *Asian Perspectives*, ( ) f%Ł ( , ! \* , " "

F Y]a Yfz D' > ž A " ; "@' 6U] ]Yž 9" 6UfXž 5" 6Um]ggž > k " 6YWž 7 " > < " 6YffU'Xz' D' ; " 6' UW]k Yžž 7 "9" 6i Wž ; " G " 6i ffz ? "6" 7i hYfz D' 9" 8Ua cbz F "@' 9Xk UfXgž F " ; " : U]fU]b\_gžA " : f]YXf]Wž H'D' ; i ]XYfgcbz 5" ; " < c[ [ ž ? "5" < i [ \ Ybž 6" ? fca Yfz : ; " A W' cfa UWž G'K " A Ubb]b[ ž 7 "6" F Ua gYnž F "K " F Y]a Yfz G' F Ya a Y'Yž > F " Gci h]cbz A " Gh' ] Yfz G' H'U'Ua cž : "K " HUmcfz > " j Ub' XYf D' ]W'hUbX' 7 "9" K Ym'Yba Ym'Yfz &\$ \$ ( " @h7 U\$ ( ' h'ffYg]H'U' fUX]cW]fVcb'U[ 'Y'W] ]fU]h]cbz &\* ! \$ W]` \_nf' 6D' *Radiocarbon*, ( \* fl Ł % \$ , +! - & "

Ga ]hž 5 "ž &\$ \$ & " *An Archaeology of West Polynesian Prehistory* " HYffU' 5i g]fU' ]g' % " 7 UbVYffU' D'UbX'Ubi g'DfYgg 5B1 " "

Gh j] YfzA ""UbX`<"5"Dc`UWž% ++"8]gWgg]cb. F Ydcff]b[ `cZ%( 7`XUHU`Radiocarbon,%&.' ) )!\*' "

K Y]g`Yfz A "ž% -' "" 7\Ya ]W`WUfUWf]nU]cb`UbX`dfcj YbUbW`cZA Ubi DU`UXnY`a UYf]U`i g]b[ `bcb! XYg]fi W]j Y`L!fUmŪ cfYgWbW"" b`D`J""? ]fW`UbX`H@`<i bh fYXgtž *The To'aga Site: Three Millennia of Polynesian Occupation in the Manu'a Islands, American Samoa*" 6Yf\_Y`Ym7 5. I b] Yfg]mcZ7 U]žfb]U`5fVWUYc`c[ ]W`F YgYUfW` : UW] ]mBc") %ždd""%\* +!, +"





⑥UV'bc'	@cWU]cb'	7cbjYbh]cbU' 5[Y'f6Dl'	7U''', & i' d'fcVUV]jhm'	7U''-')( i' d'fcVUV]jhm'	*7	7cib]b]b' HiaY fia]b]i]n]gk'	GUad'Y AUNYfU'	2%_a' :b'UbX'
Y SFĪJUH	Úæçæpæpæ	JFFA+HĪĀ	Fēīēēōōŋŋīēōāānīēēōō	Fēhēēōōŋŋīēīāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Qjæpæjæ	GĪJA+HĪFĀ	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Qjæpæjæ	FHĪĀ+HĪGĀ	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	FFĪJA+HĪGĀ	īīēēōōŋŋējēāānīēēōō	īīēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	FHEĪĪ+HĪĪĀ	īīēēōōŋŋējēāānīēēōō īīēēōōŋŋējēāānīēēōō	īīēēōōŋŋējēāānīēēōō īīēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	FĪGFĀ+HĪGĀ	FHĪēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	īīĪĪ+HĪĪĀ	FFĪēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	īĪĪĪ+HĪGĀ	FFĪēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	īīēēĪ+HĪFĀ	Fēēōōŋŋējēāānīēēōō FFĪēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	Ý
Y SFĪJUH	Øæç'É { æð' çā	GĪGĪ+HĪFĀ	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	ŌŪ / • j' æ' ʻæ ʻ)ā [ææ]	
Y SFĪJUH	Øæç'É { æð' çā	ĪFJA+HĪFĀ	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	
Y SFĪJUH	Øæç'É { æð' çā	īĪĪĪ+HĪGĀ	FFĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō FĪēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	
Y SFĪJUH	Øæç'É { æð' çā	JĪĪJA+HĪFĀ	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō Fēēōōŋŋējēāānīēēōō	EGĪĒ + ēēg s	æTÙ	&@æi&[æ] ç' )āb	

④UVBc	④cUW]cb	7cbjYb]cbU' 5[Y'6Dc	7U''*, & i 'dfcVUV]hm	7U''- ) ( i 'dfcVUV]hm	*7	7cib]b] Hiay fia]b]h'gl	GUad'Y AUNYJU'	2%_ a -b UbX
Y SF I JHH	Øæc'É { æBØ' cÅ	ÎFJA'HHÅ	FGJ'ÛCÖKÖGËI'ÄDNFHG'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNFHI'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNFHJ'ÛCÖÅ	FGJ'ÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	
Y SF I JHG	Øæc'É { æBØ' cÅ	F I G I A'HFÅ	ÏJÛCÖKÖGËI'ÄDNFJÛCÖÅ ÏJÛCÖKÖGËI'ÄDNFJÛCÖÅ	ÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	
Y SF I JHF	Øæc'É { æBØ' cÅ	FJHH'HFÅ	FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ	FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	
Y SF I JHE	Øæc'É { æBØ' cÅ	FËI'Ä'HFÅ	JÛCÖKÖGËI'ÄDNFJÛCÖÅ JÛCÖKÖGËI'ÄDNFJÛCÖÅ	JÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	
Y SF I JGU	Ûæc'æ	ÎHIA'HHÅ	FGJ'ÛCÖKÖGËI'ÄDNFHG'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNFHJÛCÖÅ	FGJ'ÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	GJIG	&@æi& [æ] ç' }æbD	
Y SF I GI	Úæcæaia]å	FËI'Ä'HHÅ	JÛCÖKÖGËI'ÄDNFJÛCÖÅ JÛCÖKÖGËI'ÄDNFJÛCÖÅ	JÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y
Y SF I GI	Øæ'Ä' } : Ä	ÏFË'Ä'IGÅ	FFJÛCÖKÖGËI'ÄDNFJÛCÖÅ FFJÛCÖKÖGËI'ÄDNFJÛCÖÅ	FFJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	GJII	&@æi& [æ] ç' }æbD	Y
Y SF I GI	Øæ'Ä' } : Ä	ÏJË'Ä'HHÅ	FGJ'ÛCÖKÖGËI'ÄDNFHG'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNFHJÛCÖÅ	FGJ'ÛCÖKÖGËI'ÄDNF'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	GJII	&@æi& [æ] ç' }æbD	Y
Y SF I GI	Øæ'Ä' } : Ä	ÏJË'Ä'HHÅ	FGGÛCÖKÖGËI'ÄDNFJÛCÖÅ FGGÛCÖKÖGËI'ÄDNFJÛCÖÅ	FGGÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y
Y SF I I	Úæcæaia]å	ÏJIA'HHÅ	FHE'ÛCÖKÖGËI'ÄDNFHG'ÛCÖÅ FHI'ÛCÖKÖGËI'ÄDNFHJÛCÖÅ	FGJ'ÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	GJIG	&@æi& [æ] ç' }æbD	Y
Y SF I I	Úæcæaia]å	HÏI'Ä'HHGÅ	FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ	FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y
Y SF I I	Úæcæaia]å	IËH'Ä'HHÅ	FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ	FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y
Y SF I I	Úæcæaia]å	GËË'Ä'HFÅ	FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ	FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y
Y SF I I	Úæcæaia]å	GGI'Ä'HHGÅ	FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ FÏJÛCÖKÖGËI'ÄDNFÏJÛCÖÅ	FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ FÏJÛCÖKÖGËI'ÄDNF'ÛCÖÅ	EGËI' + €G\$	ÛTÙ	&@æi& [æ] ç' }æbD	Y

④UV'bc	@cWU]cb'	7cbjYb]cbu <sup>5</sup> [Y'6Dl'	7U''*, & i' d'fcvUVU]hm'	7U''*-) ( i' d'fcvUVU]hm'	*7	7cib]b[ HjaY fia]b]i]ngl'	GUad'Y AUNYJU'	2%_a :b'ubX'
Y SFÍÍ IJÁ	Úacqaz]azpá	FFG ÍÁÁ HFA	Ì ÍÍ (CÓ)ŦFHEÍ ÁD]JÉÍ (CÓÁ JFÉCÓŦÍÍÉÁD]JÍÍ (CÓÁ	Ì FÉCÓŦJÉÍ ÁD]FÉCÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Úacqaz]azpá	Ï HÍÁÁ HGA	FG ÍÍ (CÓ)ŦÍÉG ÁD]FGJÉCÓÁ	FGGÉCÓŦJÉÍ ÁD]FHECÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Úacqaz]azpá	H ÍFÁÁ HGA	F ÍÍ (CÓ)ŦGJÉÍ ÁD]FÍHECÓÁ F ÍÍ (CÓ)ŦGHÉÍ ÁD]FÍHECÓÁ	F ÍÍ (CÓ)ŦJÉÍ ÁD]FÍ (CÓÁ	EGÍÉF + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Úacqaz]azpá	Ï FFAÁ HFA	FG ÍÍ (CÓ)ŦÍÉG ÁD]FGJÍ (CÓÁ	FGÍ (CÓ)ŦGHÉÍ ÁD]FHFÉCÓÁ FHI (CÓ)ŦFGÉÁ D]FHJÉCÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Úacqaz]azpá	Ï HÍÁÁ HFA	FG ÍÍ (CÓ)ŦÍÉG ÁD]FGJÍ (CÓÁ	FGFÉCÓŦJÉÍ ÁD]FHFÉCÓÁ FHI (CÓ)ŦJÉÁ D]FHJÉCÓÁ	EGÍÉ + ÉG \$	HÍÍ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Úacqaz]azpá	F ÍFÁÁ HGA	IHECÓŦÍÍÉG ÁD]ÍÍ (CÓÁ	I (CÓ)ŦŦJÉÍ ÁD]ÍÍ (CÓÁ	EGÍÉH + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IHÁ	Úacqaz]azpá	FÉÉ ÍÁÁ HHH	JÍ (CÓ)ŦÍÍÉÍ ÁD]FÉÍ (CÓÁ FFÉCÓŦGHÉÍ ÁD]FFGÉCÓÁ	JÍ (CÓ)ŦJÉJ ÁD]FÉÍ (CÓÁ FÉÍ (CÓ)ŦGHÉÍ ÁD]FFÍ (CÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IGA	Úacqaz]azpá	F ÍFGÁ HFA	IHECÓŦÍÍÉG ÁD]ÍÉ (CÓÁ	IHECÓŦJÉÍ ÁD]ÍHECÓÁ	EGÍÉH + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IFÁ	Úacqaz]azpá	H ÍÁÁ HFA	F ÍÍ (CÓ)ŦÍÉÍ ÁD]FÍ (CÓÁ F ÍÍ (CÓ)ŦFÍÉÍ ÁD]FÍ (CÓÁ	F ÍÍ (CÓ)ŦJÉÍ ÁD]FÍHECÓÁ F ÍÍ (CÓ)ŦHÉÍ ÁD]FÍ (CÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ JÉÁ	Æ-Í) ÍÁ	FG ÍÁÁ HIA	ÍÍ (CÓ)ŦJÉJ ÁD]Í (CÓÁ ÍÍ (CÓ)ŦGHÉÁ D]ÍÍ (CÓÁ	ÍÍ (CÓ)ŦGHÉÍ ÁD]ÍÍ (CÓÁ ÍJÉCÓŦFÉÍ ÁD]ÍFÉCÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IJÁ	Æ-Í) ÍÁ	HF ÍÁÁ HIA	F ÍÍ (CÓ)ŦÍÉÍ ÁD]FÍ (CÓÁ F ÍÍ (CÓ)ŦFÍÉÍ ÁD]FÍ (CÓÁ	F ÍÍ (CÓ)ŦJÉÍ ÁD]FÍ (CÓÁ	EGÍÉJ + ÉG \$	GJÍG	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Æ-Í) ÍÁ	FÉÍ ÍÁÁ HIA	JÉCÓŦJÉH ÁD]JÉCÓÁ JÍ (CÓ)ŦJÉJ ÁD]FÉGÉCÓÁ	ÍJÉCÓŦJÉÍ ÁD]FHECÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Æ-Í) ÍÁ	FÉÍ ÍÁÁ HIA	ÍJÍ (CÓ)ŦGGÉÍ ÁD]JGÍ (CÓÁ JÍ (CÓ)ŦÍÉÍ ÁD]JÍ (CÓÁ	ÍJÉCÓŦJÉÍ ÁD]FHECÓÁ	EGÍÉJ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý
Y SFÍÍ IÁ	Æ-Í) ÍÁ	FGG ÍÁÁ HHH	ÍÍ (CÓ)ŦGHÉÍ ÁD]ÍÍ (CÓÁ ÍÍ (CÓ)ŦÍÉÍ ÁD]ÍÍ (CÓÁ	ÍÍ (CÓ)ŦJÉÍ ÁD]JÉCÓÁ	EGÍÉ + ÉG \$	ÆTÙ	&@az&[æ] ç~}áæD	Ý



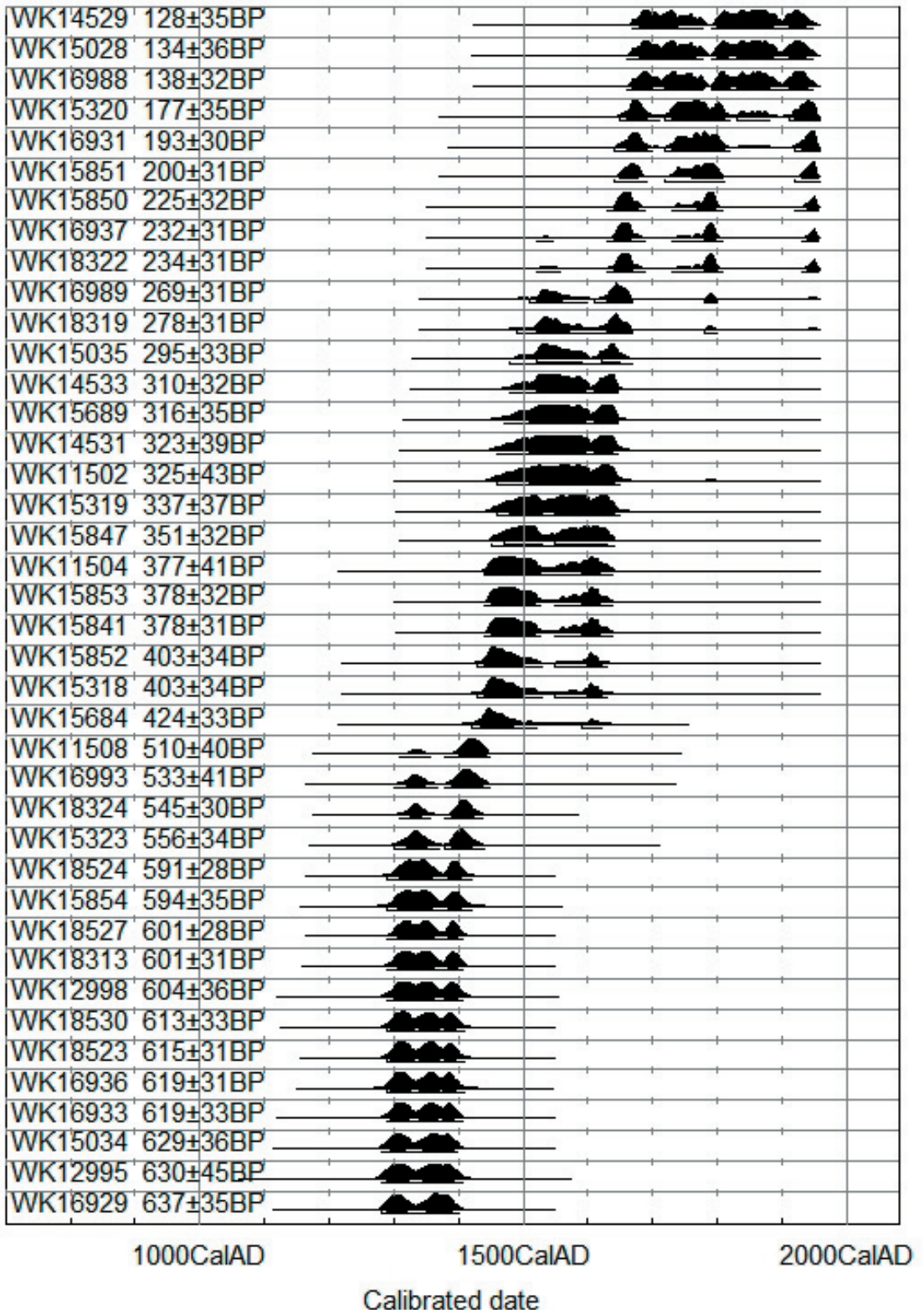
⑥UV'Bc	@cWU]cb'	7cbjYbh]cbU' 5[Y'f6Dc'	7U''', & i' d'fcvUVU]hm'	7U''-'') ( i' d'fcvUVU]hm'	*7	7cib]b]b' HiaY fia]b]b]b]g'	GUad'Y AUNYJU	2%_a'ib'UbX'
Y SF í eHIÁ	S[ \ [æ]á	ÍGJÁHÁHÁ	FGJ[ÚEÓ]GÍEFÁDÍFHGEÚÓÁ FHIÍÚEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	FGÍÚEÓ]GÍEFÁDÍFHGEÚÓÁ	EGÍEÍ † ÉEG \$	GJÍ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHHÁ	Xæá ]á [Á	GFFJÁHÁHÁ	GÉEÓ]GÍEFÁDÍGHJUÍÚEÓÁ ÍEÓ]GÍEFÁDÍHGEÚÓÁ	HÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ GFÉEÓ]GÍEFÁDÍHGEÚÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHGÁ	Xæá ]á [Á	FJÍÍHÁHÁ	ÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ GÉEÓ]GÍEFÁDÍHGEÚÓÁ ÍEÓ]GÍEFÁDÍHGEÚÓÁ	ÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FEÉEÓ]GÍEFÁDÍHGEÚÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHFÁ	Xæá ]á [Á	GÉEÍHÁHÁ	ÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FGÉEÓ]GÍEFÁDÍHGEÚÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHEÍ	Xæá ]á [Á	GÉIFHÁHÁ	FFÉEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eGJÁ	Xæá ]á [Á	GFÍGHÁHÁ	HÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ GÍEÓ]GÍEFÁDÍHGEÚÓÁ	HÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eGÍÁ	Væ' ]á	FHIÁHÁHÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FJFÉEÓ]GÍEFÁDÍHGEÚÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	GJÍE	&@æi& [æ] ç' )ááá	Ý
Y SF í eHIÁ	U' ʘU] [ ʘ' æá	FFEÍHÁHÁ	ÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ JHIÚEÓ]GÍEFÁDÍHGEÚÓÁ	ÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ ÍEÓ]GÍEFÁDÍHGEÚÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHHÁ	U' ʘU] [ ʘ' æá	HFEÍHÁHÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	HJÍ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHGÁ	Úæçæçæçæçá	FÍÍHÁHÁ	GÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ HGÉEÓ]GÍEFÁDÍHGEÚÓÁ ÍEÓ]GÍEFÁDÍHGEÚÓÁ	GÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	IFFÍ	&@æi& [æ] ç' )ááá	Ý
Y SF í eHFÁ	U' ʘU] [ ʘ' æá	HGHÁHÁHÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	GJÍG	&@æi& [æ] ç' )ááá	Ý
Y SF í eHEÍ	Xæá ]á [Á	GÉÍHÁHÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	GFÉEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	ÆTÚ	&@æi& [æ] ç' )ááá	Ý
Y SF í eGJÁ	U' ʘU] [ ʘ' æá	FGÍHÁHÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ FJFÉEÓ]GÍEFÁDÍHGEÚÓÁ	FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ FÍEÓ]GÍEFÁDÍHGEÚÓÁ FÍEÓ]GÍEFÁDÍGHJUÍÚEÓÁ	EGÍEÍ † ÉEG \$	GJÍG	&@æi& [æ] ç' )ááá	Ý

@UV'bc'	@cWU]h'cb'	7cbj'Yb]h'cbU' 5[Y'ieDz'	7U''*, & i' d'fcvUVU]j'm'	7U''-') ( i' d'fcvUVU]j'm'	'* 7	7ci]h]b]t' HiaY fia]b]h]Yg'	GUad'Y AUhY]U'	2%_ a :b'UbX'
Y SFH'EEG'	Øæ* 'É { æØ' çá	FHJ]t]t]í'É	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]H'EG'Ä]h]í'EEÖÄ í'EEÖÖ]ç]EG'Ä]h]í'EEÖÄ	EGJFG + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	
Y SFH'EEF'	Øæ* 'É { æØ' çá	Fí'Éh]t]í'G	H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ í'EEÖÖ]ç]EG'Ä]h]í'EEÖÄ	Gí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ H'HEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	
Y SFH'EEÉ	S \ [ ]æ ]á	FGF]t]t]í'Á	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]G'EG'Ä]h]í'EEÖÄ J'EEÖÖ]ç]G'EG'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	I]H]	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	S \ [ ]æ ]á	FGí'Éh]t]í'F	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGJFí + ÉEG \$	GJí'É	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	S \ [ ]æ ]á	í'Éh]t]t]í'Á	F'HEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	FGJ'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	GJí'É	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	Xæ] ]æ [ ]Á	í'í'Á]t]t]í'Á	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	GJí'É	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	Xæ] ]æ [ ]Á	GF'É]t]t]í'G	Fí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	Hí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ GF'ÉÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	Xæ] ]æ [ ]Á	í'Éh]t]t]í'Á	FGJ'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	I]I]H	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]J'	Xæ] ]æ [ ]Á	í'J]t]t]í'í'H	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	FGG'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	I]J]H	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]H	Xæ] ]æ [ ]Á	Fí'í'F]t]í'G	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ í'HEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	Ý
Y SFG]J]G	Xæ] ]æ [ ]Á	í'í'É]t]t]í'Á	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	FGí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	GJí'í	&@æ]i& [æ] ç' ) :áð	Ý
Y SFF ]í'É]Á	Øæ* æ { æ ]í'Á	í'í'É]t]t]í'É	Fí'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ F'H]í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	Ý
Y SFF ]í'É]Á	Øæ* æ { æ ]í'Á	FGF]t]t]í'É	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	Ý
Y SFF ]í'É]Á	Øæ* æ { æ ]í'Á	FHJ]t]t]í'Á	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	í'EEÖÖ]ç]í'Ég'Ä]h]í'EEÖÄ	EGí'É + ÉEG \$	ÆTÜ	&@æ]i& [æ] ç' ) :áð	Ý

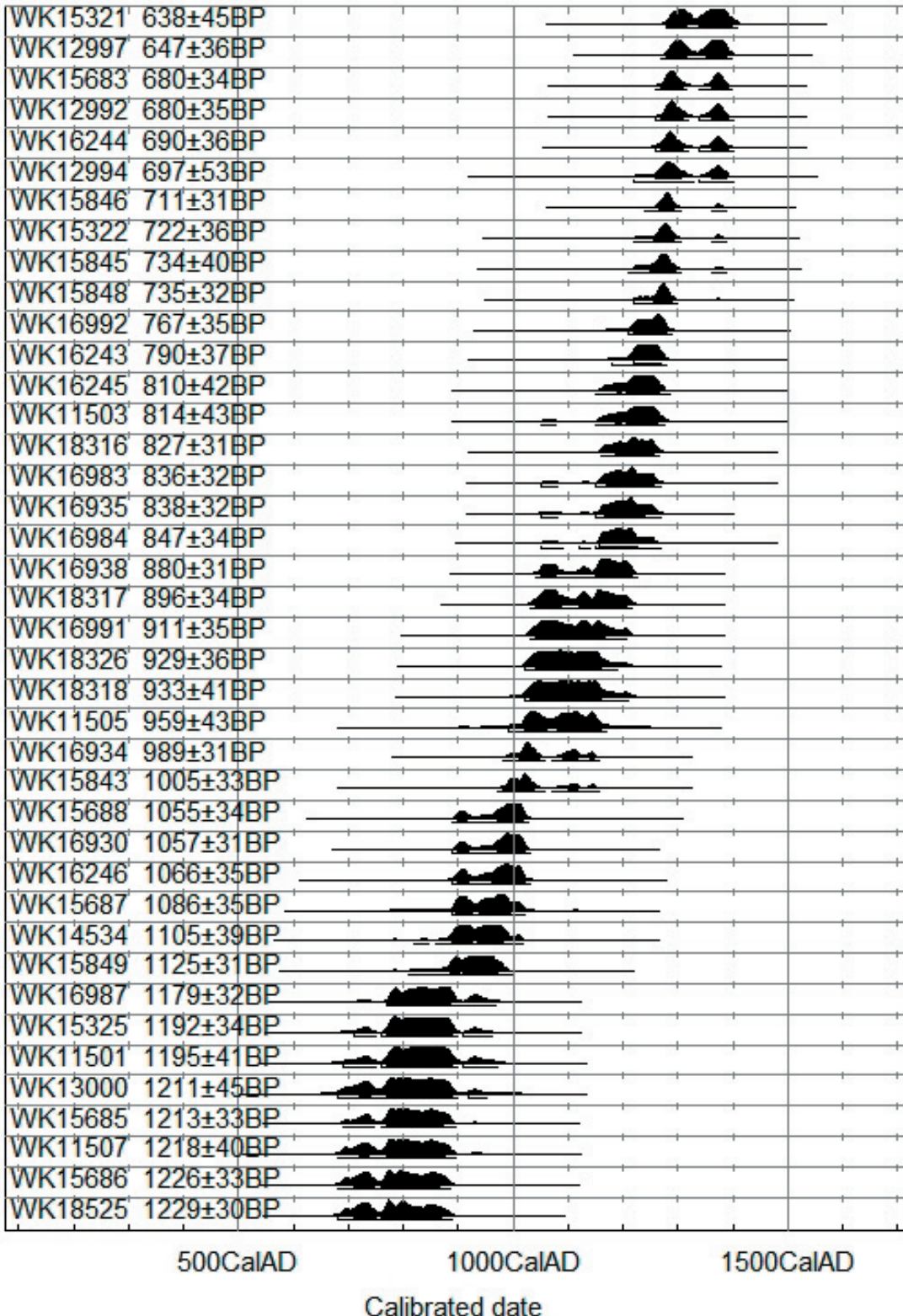
@UV' Bc'	@cWU]cb'	7cbjYb]cbU'' 5 [Y'16Dc'	7U''', & i' d'fcvUVU]']m'	7U''') ( i' d'fcvUVU]']m'	'7	7c i b]j b]' H]aY fi a]j b] h]ygl'	GU ad'Y AUNY]JU'	2%_ a :b UbX'
Y SFF f e]A	œ-1} [A	J J A H A I H A	F E G E O A Q G F F A D H F e] e O A F e] e O A Q I T F A D H F F e] e O A	J J e] e O A Q J e] e I A D H F F e] e O A	E G I E J + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	
Y SFF f e]A	œ-1} [A	H I T A H A I F A	F I e] e O A Q J e] e I A D H F I e] e O A F I e] e O A Q F I e] e I A D H F I e] e O A	F I e] e O A Q J e] e I A D H F I e] e O A	E G I F E + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	
Y SFF f e]A	œ-1} [A	I F I A H I H A	F F I e] e O A Q J e] e I A D H F e] e O A F G e] e O A Q I e] e I A D H F G I e] e O A	F e] e] e O A Q F e] e I A D H F e] e O A F F I e] e O A Q H e] e I A D H F G I e] e O A	E G I F H + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	
Y SFF f e]A	œ-1} [A	H G I A H A I H A	F I e] e O A Q I e] e A D H F I e] e O A F I e] e O A Q J e] e I A D H F I e] e O A	F I e] e O A Q J e] e I A D H F I e] e O A	E G I E I + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	
Y SFF f e]A	œ-1} [A	F F J I A H I F A	I I e] e O A Q I e] e A D H I e] e O A	I J e] e O A Q F F e] e I A D H I e] e O A I I e] e O A Q I e] e I A D H I e] e O A J F e] e O A Q I e] e I A D H J I e] e O A	E G I E I + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	
Y SFF f e]A	œ-1} [A	F G I J A H H J A	I I e] e O A Q G e] e I A D H I G I e] e O A I I e] e O A Q G e] e I A D H I I e] e O A	I I e] e O A Q J e] e I A D H I G e] e O A	E G I F F + e] e G S	œ T U	œ @ œ i & [ œ ] ç' } a b D	

**Appendix 2**

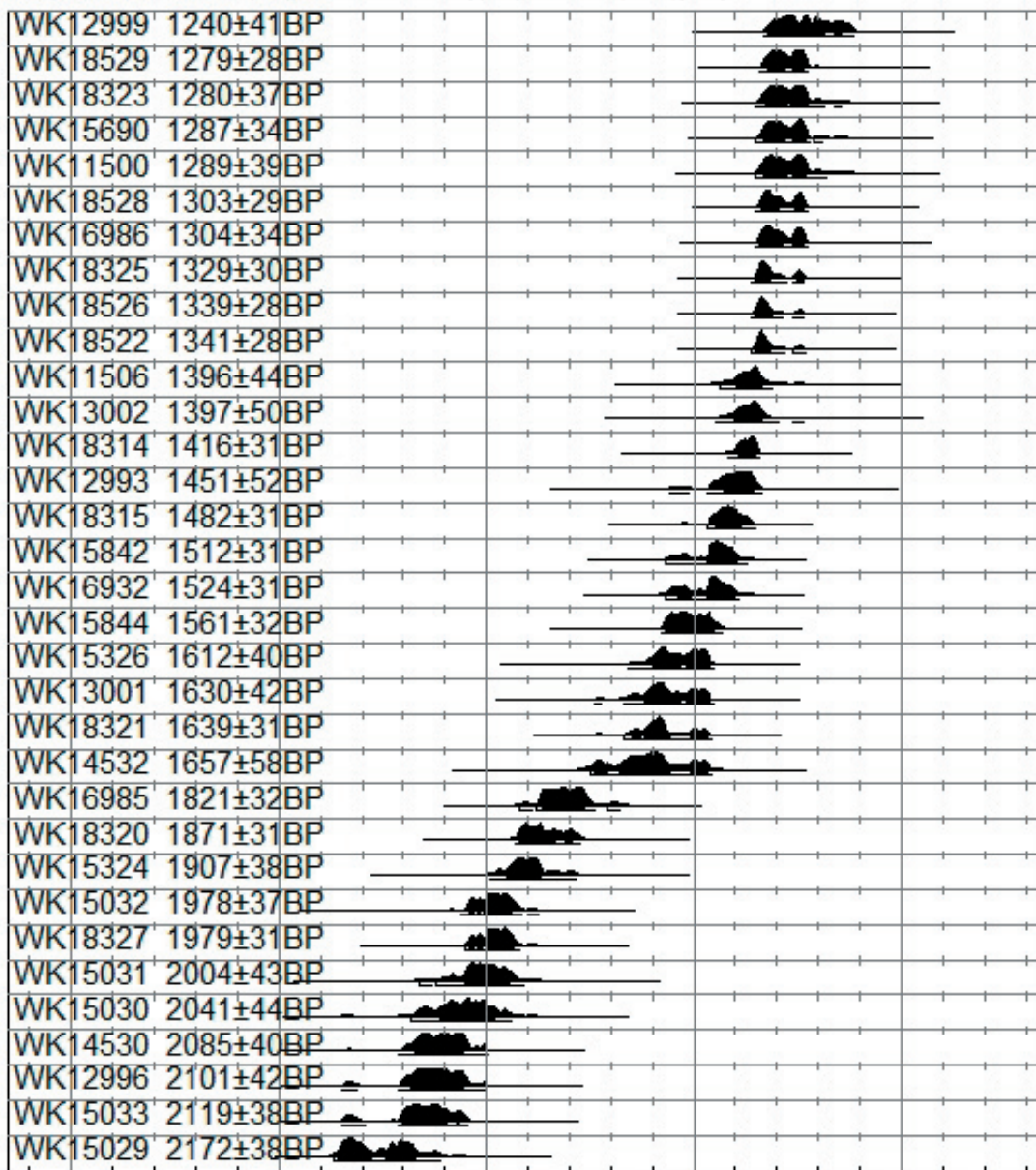
Atmospheric data from Reimer et al (2004); OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]



Atmospheric data from Reimer et al (2004); OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]



Atmospheric data from Reimer et al (2004); OxCal v3.10 Bronk Ramsey (2005); cub r:5 sd:12 prob usp[chron]



1000CalBC    500CalBC    CalBC/CalAD    500CalAD    1000CalAD  
 Calibrated date

