Supplementary Information for

Language continuity despite population replacement in Remote Oceania

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Archaeological Information

Talasiu, Tonga (TON001, TON002, TON004/CP30). The Talasiu site (TO-Mu-2), Tongatapu, Kingdom of Tonga, is located on the shoreline of the Fanga 'Uta Lagoon, ~2.5km south of the Nukuleka site which is regarded as the place of initial human landfall in Tonga[1]. Talasiu contains a dense shell midden deposit ~90cm thick covering some 450m^2 that includes fire features and burials[2]. In 2008, a concentration of burned and partially burned human bone eroding from a road cut was excavated, revealing a mortuary context with partially heated and incomplete skeletal remains of four individuals[3]. In 2011, new adult inhumations were again found eroding from the road cut. As the area was about to be intensively gardened a rescue archaeology project to recover human remains was directed by Frederique Valentin (CNRS) and Geoffrey Clark (ANU) in 2013-2014 and 2016 with the support of the Ministry of Internal Affairs (Kingdom of Tonga) and funded by the French Government (MEAE, Commission des fouilles à l'étranger). In total the excavations identified 19 burial contexts holding early human remains of one or more individuals.

Radiocarbon ages were obtained on human bone from articulated burials (n=6), coconut endocarp (n=5), unidentified charcoal (n=2) and worked shell grave goods (n=3). All calibrated results fall between 2,750 and 2,150 calibrated years before present (y BP, 95% probability range) with charcoal and bone results between 2,600 and 2,300y BP influenced by curve flattening resulting in wide age ranges (Hallstatt Plateau). A high-resolution chronology based on U-Th dating of coral files and AMS determinations on charcoal - a material with minimal inbuilt age - demonstrates that the Lapita period on Tongatapu spanned 2,860-2,680y BP[1]. As Lapita ceramics occur throughout the Talasiu deposits it is probable that the midden and burials at Talasiu date to ~2,700-2,600y BP[2] and are of late Lapita age. This is supported by a new U-Th result on a coral file from the Talasiu deposits as well as intact lenses of shell midden and fire features that sealed several burial contexts, which demonstrate that interments were made as the midden was accumulating.

The Talasiu burials represent the oldest human remains found so far in Polynesia and provide the first opportunity to understand the origins, health and mortuary practices of the first people to colonize the eastern islands of Remote Oceania[3-5]. Ancient DNA had previously been obtained from the right petrous bone from a single primary interment of an adult female SK10[5]. The results indicated that this female, like three other Lapita (~2,900y BP) individuals from Teouma site in Vanuatu derived from an East Asian population that no longer exists in unmixed form. The initial aDNA result suggested that later population movements must have spread Papuan ancestry in the South Pacific region after the period of Lapita colonization[5]. Ancient DNA employed in this paper was successfully obtained from two more Talasiu burials. One contained the remains of two individuals who were buried simultaneously (context SK3) in which SK3.1, an old female was sampled (TON001), and the second sample (TON002) was from a male skull (SK6) that had been reburied in an abandoned oven. Finally we report new mtDNA data of individual SK10 (from a molar TON004 and a petrous bone CP30) from whom genome-wide data was previously published[5] and assigned to haplogroup B4a1a1a (Supplementary table 11).

J09, Tongatapu, Tonga (LHA001). The J09 site is a royal tomb (*langi*) called 'Tauatonga' located in Lapaha village on Tongatapu Island just south of the Talasiu (TO-Mu-2) site[6]. In 2012, an excavation through the fill of J09 to recover charcoal to radiocarbon date a tomb, identified a burial in pre-tomb sediments. A fragment of a distal humerus was AMS dated at the Waikato Radiocarbon Dating Laboratory in New Zealand and returned an age of 955 ± 25 ^{14}C years BP (Wk-36401). The bone sample was well-preserved with a C:N ratio of 3.26 and a ^{13}C value of -15.63 indicating a diet with a significant marine contribution (marine contribution estimated as 54%). The calibrated age result of 780-550y BP (Table 1) and the burial location indicates that the individual lived during the inception of the ancient Tongan state when the Tu'i Tonga lineage began to rule the Tonga Islands – an event which was manifested by the construction of a monumental centre at Lapaha and an extensive set of maritime networks[7,8]. A tooth from the skeleton beneath J09 was sampled for aDNA (LHA001).

Rockshelter excavations of Tanna and Futuna, Vanuatu. Skeletal material from the islands of Tanna was excavated in 1963-1964 by Richard and Mary Shutler. The Shutler's were sent to the New Hebrides (it became Vanuatu at independence in 1980) as part of an initiative of the Pacific Science Congress of 1961, under the auspices of the Bishop Museum. During fieldwork on Tanna and Futuna, the Shutlers excavated a number of rockshelter sites, which contained human burials and other materials, as well as some open sites[9].

After the Shutlers' pioneering work, there was a hiatus of nearly 50 years with little or no additional archaeological fieldwork carried out on Futuna and Tanna until very recently. Archaeologists supported by the Australian Research Council and the French Ministry of Foreign Affairs (MEAE, commission des fouilles) are currently revisiting the materials and sites excavated by the Shutlers, in addition to excavating new sites on Futuna, Tanna, and the neighbouring Polynesian Outlier Aniwa[10]. Part of this current study focuses on the long-term history of human interactions in the area of southern Vanuatu, including the skeletal, genetic, and isotopic signatures of human migration. One of the key dynamics for the two Polynesian Outliers, Futuna and Aniwa, is the timing and nature of the Polynesian settlement, presumably some time between 1,000-500y BP[11].

TaRS and Lowenpakal , Tanna, Vanuatu (TAN001 and TAN002). The skeletal material reported here from Tanna was excavated from two cave sites. One was from TaRS3 located on the west coast of Tanna Island, near the present-day village of Bethel. Tanna is a volcanic island that has been tilting to the south and east due to the active volcano Iasur. As a result, much of the west coast of the island is composed of upraised limestone reef terraces containing rockshelters[12]. TaRS3 is located on an uplifted reef terrace, has an opening approximately 27.5m wide and encompasses a cave that is 12 x 6m in area. The site was excavated completely by the Shutlers down to bedrock. A full skeleton (TAN001) was excavated from the cave. It was an extended burial in prone position, located 1.5m below the surface, with the skull facing to southwest. The Shutlers excavated a further burial from the nearby cave site of TaRS1 but an attempt to extract collagen from this skeleton was not successful..

The other Tanna sample (TAN002) comes from a 1 x 1m testpit excavation carried out in 2016 in a cave site located at Lowenpakel, at the very north coast of Tanna. The excavation was carried out as part of the new South Vanuatu Archaeological Survey program in a location seen as having high potential for early settlement. Excavation revealed deeply stratified deposits. Charcoal from a hearth feature at 1.13mbd returned a date of 900-720y BP and two dates from a lower layer (1.27-1.50mbd) returned 970-830y BP and 1,230-1,010y BP. Scattered human bone including the petrous bone investigated here were found in these lower cultural levels of the testpit. The dating of the petrous bone is much older (2,630-2,350y BP) than other dates from the site but it may originate from earlier deposits that were disturbed by later occupations. Pottery was also found at these levels which tends to lend support to the earlier date for the human bone, since it has been firmly established that on other islands in the south of Vanuatu pottery disappeared around 2,000y BP.

FuRS, Futuna, Vanuatu (FUT001, FUT002, FUT006, FUT007, FUT008). Futuna is a small island roughly 5km long that rises steeply to the highest point 666m above sea level. The island is a *makatea* (raised coral) island and presents an extensive system of rockshelters on former reef terraces. The Shutlers recorded a large number of rockshelters on Futuna, and excavated several of them[9]. The skeletal samples analyzed in this study came from rockshelters FuRS1A and FuRS12. These rockshelters are located on the limestone slopes of the northeastern Ipau district of Futuna. FuRS12 is 13.7m long by 3.6m wide. Excavations uncovered 15 inhumations buried in various positions close to the bedrock towards the back of the rockshelter, many of which were rock-lined or covered with rocks and included grave goods[13]. Samples from four adult burials 1, 7, 8-9 and 12 were investigated in this study (FUT001, FUT002, FUT007 and FUT008). FuRS1A is a roughly 12 x 6m area. It contained the buried remains of two partial individuals, one of which was analyzed here (FUT006), as well as a variety of artifacts including an adze fragment and a sandstone abrader. All five individuals are radiocarbon dated to an interval between to 970 and 1,270y BP, a time period corresponding roughly to the first major Polynesian dispersals to the east to Eastern Polynesia and to the west to Melanesia that occurred around 1,000 BP[11]. In this study we obtained genome-wide and mtDNA data from four individuals (FUT001, FUT002, FUT006, FUT007) and only mtDNA data from the upper incisor of one individual (FUT008) from FuRS12 in burial 12 and newly radiocarbon dated here to 1,376 ± 29 ^{14}C years BP (MAMS-29689).

Urupiv and Vao, Malakula, Vanuatu (MAL001, MAL002, MAL004, MAL006, MAL007, MAL008). The samples from Malakula, northern Vanuatu, come from excavations undertaken on two small islands (c. 2km^2), Uripiv and Vao, located on the north-east coast[14,15]. Excavations on these islands began in 2001 and continued intermittently until 2011 (2002-2004 on Vao; 2001-2002, 2005, 2009-2011 on Uripiv). The sites comprised deeply stratified deposits that encompassed the entire period of human occupation on the respective islands, 3,000 years from Lapita through to the Historic period. During those excavations a total of 7 burials were identified on Vao and 38 on Uripiv. This series of burials offers the rare opportunity to explore changes over time in mortuary behavior, health, diet and migration through different markers including burial features, morphological characteristics, palaeopathological indicators, isotopic data as well as ancient DNA[16,17].

Only accessible petrous bones were selected for this study preferentially sampling skeletons that were previously directly dated[17]. Together with two additional radiocarbon dates (MAL001 and MAL002) the burials included here correspond well with their archaeological contexts. The sample MAL001 is from Vao Island while all others, MAL002, MAL004, MAL006, MAL007 and MAL008 come from Uripiv Island. MAL001, of Post-Lapita age, was retrieved from a dispersed collection of human bones in a single 1 x 1m test-pit. All of the samples analyzed from Uripiv came from in-situ burials dating to a ~500 years interval, ranging from circa 2,500 to 2,000y BP, which were uncovered during large aerial excavations. These burials represent a variety of mortuary situations. MAL002 is a near complete 18 month old infant (Burial 1) lying on its left side and back. It is of Late Lapita age, buried in the natural beach sand, 1.5m below the current ground surface. MAL004 (Burial 8) is a Late Lapita age young child, buried on its back again in the beach sand. MAL006 (Burial 15) is a Lapita burial of an infant who died in the perinatal period. The body was placed on its left side with the upper limbs extended, hands close to the face and covered with white beach sand. MAL007 (Burial 18) is a post-Lapita burial of a female adult lying in a semi-seated position, with the lower limbs tightly flexed, feet against the pelvis, in a pit dug into a black sediment rich in charcoal and coral gravel. MAL008 (Burial 23) is again a post-Lapita burial of a male adult placed in a seated position in a small sepulchral pit dug into the sand and filled up with dark sediment.

Taputapuātea site, Ra'iātea, French Polynesia (TAP001, TAP002, TAP003, TAP004). The Taputapuātea ceremonial complex on Ra'iātea island (Society Islands, French Polynesia) is of central importance in Polynesian cosmology of the Society Islands. This significance for Polynesian identity justified its inscription in 2017 to the UNESCO World Heritage List. The site is located on the east coast of the island, east of Opoa village, on the flat wide point named *Matahiratera'i*. Extending over a surface of five hectares, this ceremonial complex is dedicated to the cult of several Polynesian deities, and comprises a number of monuments and periods of construction. The great *marae* Taputapuātea dated to the 17th century[18], is surrounded by five other *marae*, including *marae* Hauviri and *marae* Hititai, along with other constructions and enclosures.

Since its first visits by early voyagers such as Joseph Banks in 1769[19], the site has been described by several archaeologists such as Emory and Sinoto[18,20] who mentioned the presence of human remains at various points of the monuments surfaces. Restorations were engaged twice[21,22]. In 1994-1995 the Centre Polynésien des Sciences Humaines[22] recovered burials and concentrations of human remains on *marae* Taputapuātea, Hauviri and Hititai. The studied remains (TAP001, TAP002, TAP003, TAP004) represent individuals deposited at the monuments during funerary ceremonies. Inhumations with the head placed in the vicinity of the main upraised stone is a main mortuary feature at *marae* Hauviri (TAP003) while skulls secondary deposited seems to distinguish *marae* Hititai (TAP004). These events, based on direct dating of human remains, occurred at the earliest in the beginning of the eighteenth century (1710-1730 AD / 1800-1950 AD, Wk-40993) at *marae* Hauviri and more certainly during the nineteenth century (1810-1950 AD, Wk-40995). Three individuals (TAP002, TAP003, TAP004) provided mtDNA and genome-wide data (Table 1) while only mtDNA was obtained from individual TAP001 *(marae* Hauviri), whose mtDNA sequence was assigned to haplogroup B4a1a1 (Supplementary table 11).

Ria-rockshelter, Malaita, Solomon Islands (MAI002, MAI003). The archaeological investigations at the dwelling site and burial place 'Ria-rockshelter' within the research project "Settlement History of Melanesia – Prehistory of the Solomon Islands" are conducted in close cooperation with the National Museum Honiara and the Ministry of Culture and Tourism, Solomon Islands. The rock overhang 'Ria' is located in the province East Are in southern Malaita and was formed by an isolated natural limestone cliff. The overhang could have served as a shelter for one to two families. The archaeological potential of the site was suspected during a survey in the region in 2011 and finally confirmed through archaeological excavations between 2013 and 2017.

The 'Ria-rockshelter' shows evidence of human presence in prehistoric times. The excavations under the shelter disclosed cultural deposits and features and a large collection of knapped stone tools, shells and faunal remains. In the upper layers besides several fire places a pavement made from accurately placed pebbles (*hau poro*) – all affected by heat - was unearthed, possibly indicating an earth oven (*umu*). The set of lithic consists of a great variety of flake adzes, serrated and denticulated pieces, unmodified flakes and cores. As ornaments diverse shell pectoral pendants were found. In the shelter's rear two extended supine burials (Individuals I and II) were discovered under the pebble pavement. Individuals I (MAI001) is an adult of around 25-30 years old assigned to female sex while Individual II (MAI002) is a child of around 11-13 years old. During the excavation in 2015 the remains of a third individual (Individual III, MAI003) came to light, an infant circa 4-5 yeas old. Radiocarbon dating was performed for all three remains providing the following results: Individual I (MAI001): 502 ± 37 ^{14}C years BP (Erl-20179), Individual II (MAI002): 460 ± 30 ^{14}C years BP (Beta-433422) and Individual III (MAI003): 640 ± 30 ^{14}C years BP (Beta-451930). Beside mtDNA and nuclear DNA data from MAI002 (Table 1), an mtDNA sequence assigned to haplogroup B4a1a1a was retrieved for individual MAI003 (Supplementary table 11).

Radiocarbon Dating and Isotopic Analyses

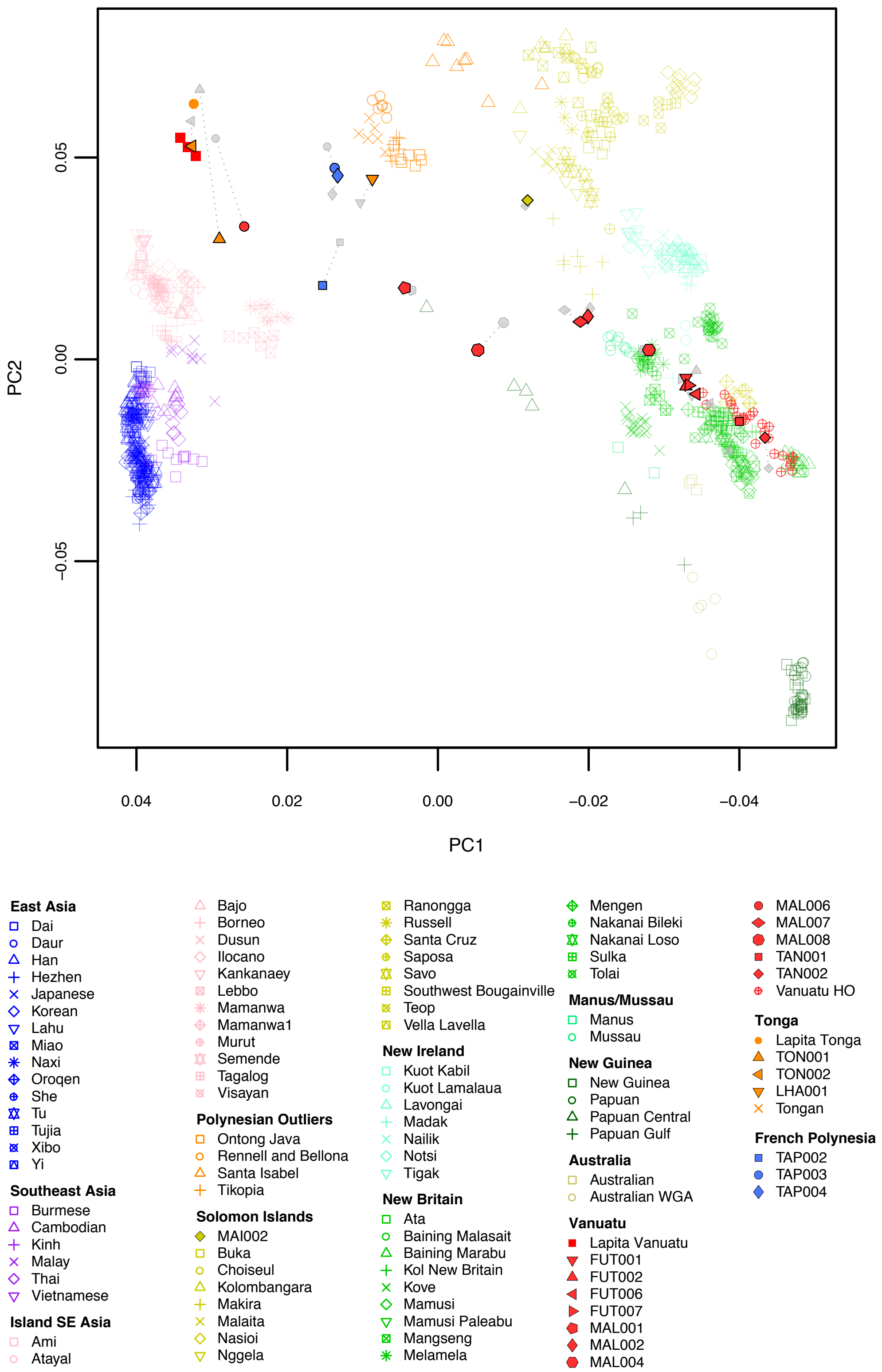
Dates on sampled individuals were undertaken at three different laboratories (University of Heidelberg [MAMS-], University of Waikato [Wk-]) and Beta Analytic [Beta-]), either newly generated (13 dates) or previously published (5 dates) as indicated in Supplementary table 2 for individuals who provided genome-wide data. For individuals who provided only mtDNA data 2 new non-calibrated radiocarbon dates (FU008 and MAI003) are reported within the Supplementary Text section of each site. Supplementary table 2 lists the skeletal elements subjected to stable isotope and dating analyses as well as the protocol followed by each dating laboratory. Prior to conversion to a calendar age it was important to determine whether there were any dietary offsets that could influence the calibrated ages. To enable comparison across the different individuals and results from different dating laboratories stable carbon and nitrogen isotopes from the sampled individuals were measured (Supplementary table 12). Samples of bone or dentine were collected from the skeletal element available for each individual. Bone samples were subsequently cleaned using an air abrasive system with 5 μm aluminium oxide powder and then crushed. Dentine was obtained as a powder from the crown of the tooth using a diamond-tipped drill. Collagen was then extracted following standard procedures[23]. Approximately 500mg of pre-cleaned bone was demineralized in 10ml aliquots of 0.5M HCL at 4°C, with changes of acid until CO_2 stopped evolving. The residue was then rinsed three times in deionized water before being gelatinized in pH3 HCl at 75°C for 48 hours. The resulting solution was filtered, with the supernatant then being lyophilized over a period of 24 hours.

Purified collagen samples (1mg) were analysed at the Department of Archaeology, Max Planck Institute for the Science of Human History in duplicate by EA-IRMS on a ThermoFisher Elemental Analyser coupled to a ThermoFisher Delta V Advantage Mass Spectrometer via a ConFloIV system. Accuracy was determined by measurements of international standard reference materials within each analytical run. These were USGS40 $\delta^{13}C_{raw}$ = -26.4 ± 0.1, $\delta^{13}C_{true}$ = -26.4 ± 0.0, $\delta^{15}N_{raw}$ = -4.4 ± 0.1, $\delta^{15}N_{true}$ = -4.5 ± 0.2; IAEA N2 $\delta^{15}N_{raw}$ = 20.2 ± 0.1, $\delta^{15}N_{true}$ = 20.3 ± 0.2; IAEA C6 $\delta^{13}C_{raw}$ = -10.9 ± 0.1, $\delta^{13}C_{true}$ = -10.8 ± 0.0. In addition, a homogenised bovid bone extracted and analysed within the same batch as the samples produced the following values; $\delta^{13}C$ = -20.1 ± 0.1; $\delta^{15}N$ = 6.8 ± 0.2. The overall mean value among 30 separate extracts of this bone sample produced values of $\delta^{13}C$ = -20.2 ± 0.1; $\delta^{15}N$ = 6.8 ± 0.2.
In all cases, stable isotope ratios are expressed as 'per mil' or parts per thousand (‰). The difference in the $^{13}C/^{12}C$ ratio between the sample and the internationally defined standard AIR (atmospheric air) in ‰ units is referred to as $\delta^{13}C$, and $\delta^{15}N$ refers to the difference in $^{15}N/^{14}N$ ratio between the sample and the internationally defined standard, VPDB (Vienna Peedee Belemnite Limestone). The reported ratios are calculated using the equation: $\delta X = ((R_{sample} - R_{standard})/ R_{standard}) \times 1000$. The full $\delta^{13}C$ and $\delta^{15}N$ results for all samples analysed can be found in Supplementary table 12. All of the samples have C:N ratios within the acceptable range (2.9-3.6)[24] and collagen yields above 1%[25] (Supplementary table 12).
Based on $\delta^{13}C$ and $\delta^{15}N$ measurements of modern flora and fauna from the Pacific[26-28] a percent marine carbon (%MarineC) contribution to the diet was estimated for the human bone (this ranged between 3 and 67%). All radiocarbon dates were calibrated using OxCal v4.2[29] with a mixture of the Marine13 and Intcal13 curves[30] as determined by the calculated %MarineC. A marine reservoir correction (ΔR) value was applied based on pre-AD 1950 shell values for each island group[31].

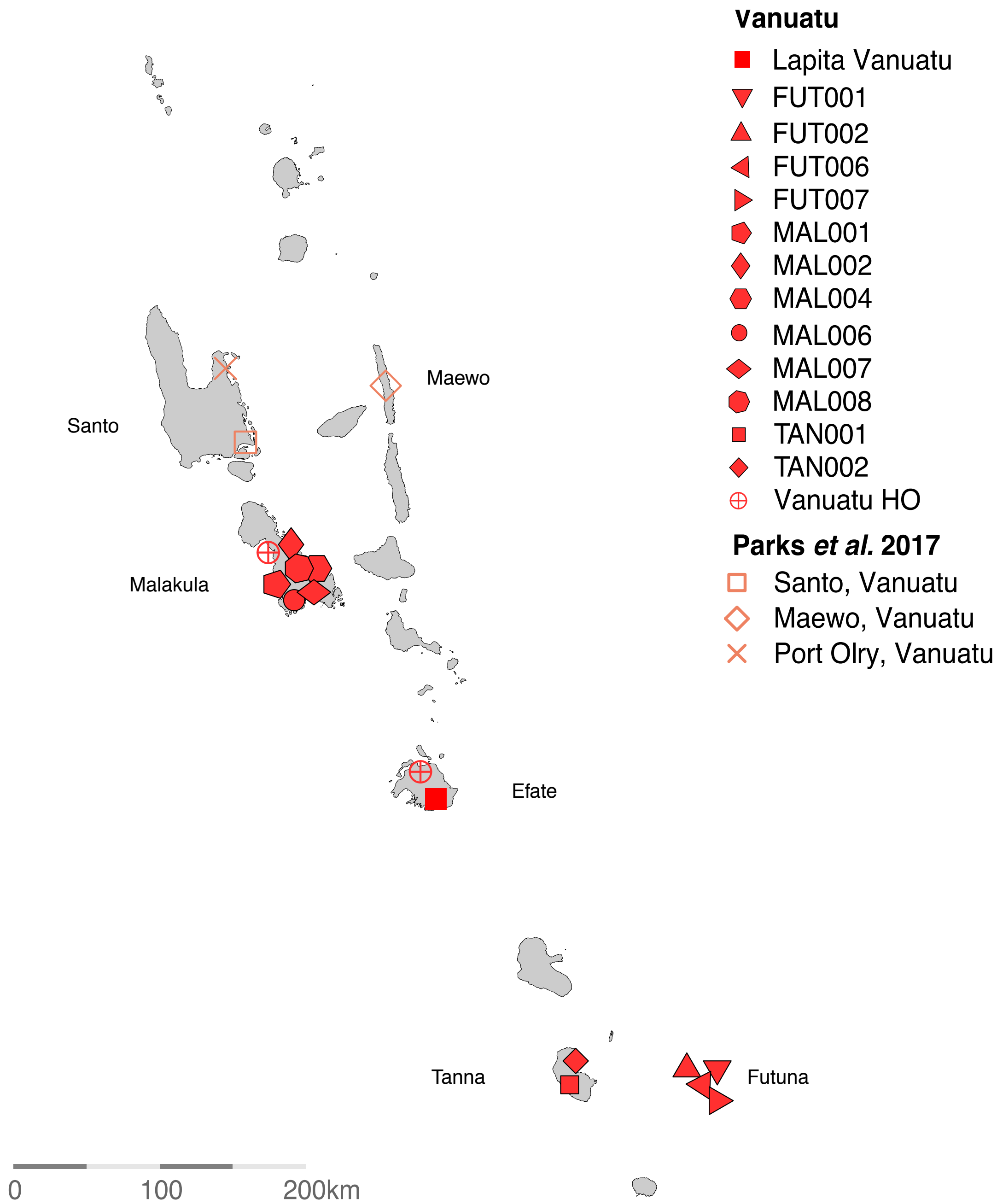
The radiocarbon determinations, and their calibrations before and after the application of the resulting reservoir and dietary effects can be found in Supplementary table 2 and Table 1, respectively. For the majority of the samples this correction does not make a substantial different. However, in all cases the corrected calibrated dates with the reservoir correction applied during calibration have been used in further data interpretation within the paper.

Supplementary Figures

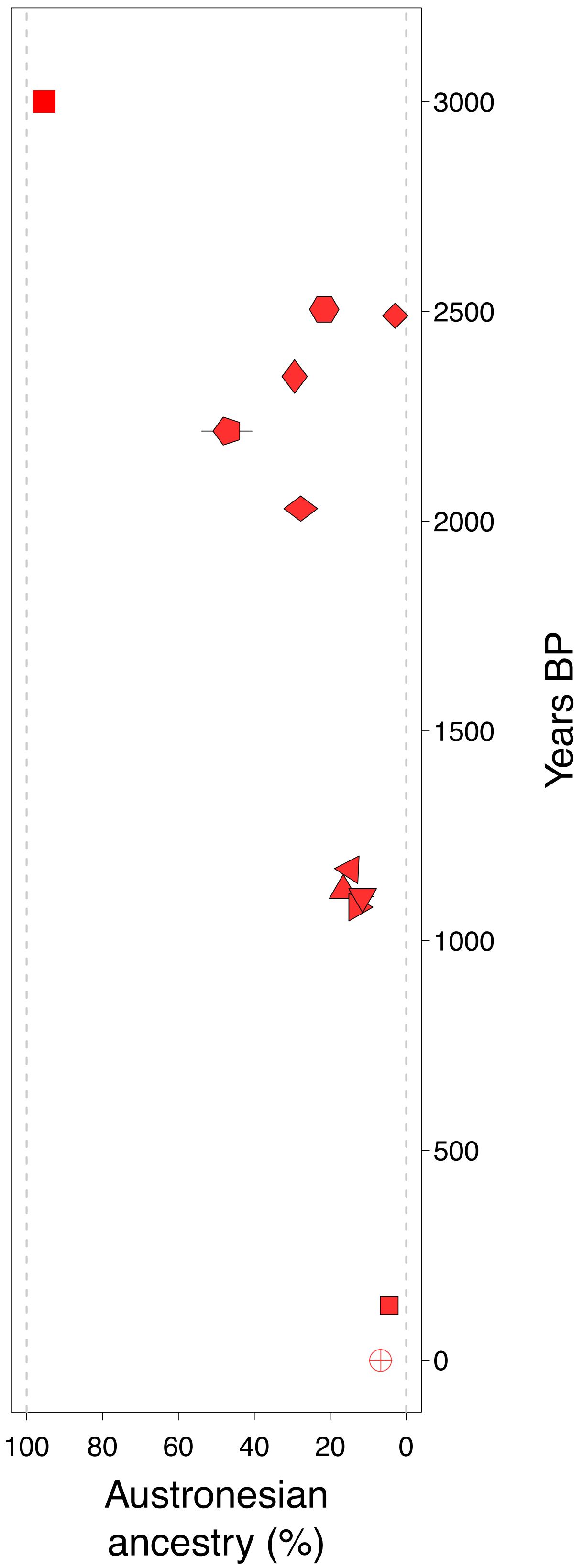
Supplementary figure 1. Principal component analyses of modern-day East Asian and Oceanian populations genotyped on the *Affymetrix Human Origins Array*, with ancient individuals projected before (color filled symbols) and after (grey filled symbols) the restriction to damaged DNA fragments, supposedly of ancient origin. Each individual's pre- and post-filtering symbol is connected with a grey dotted line.



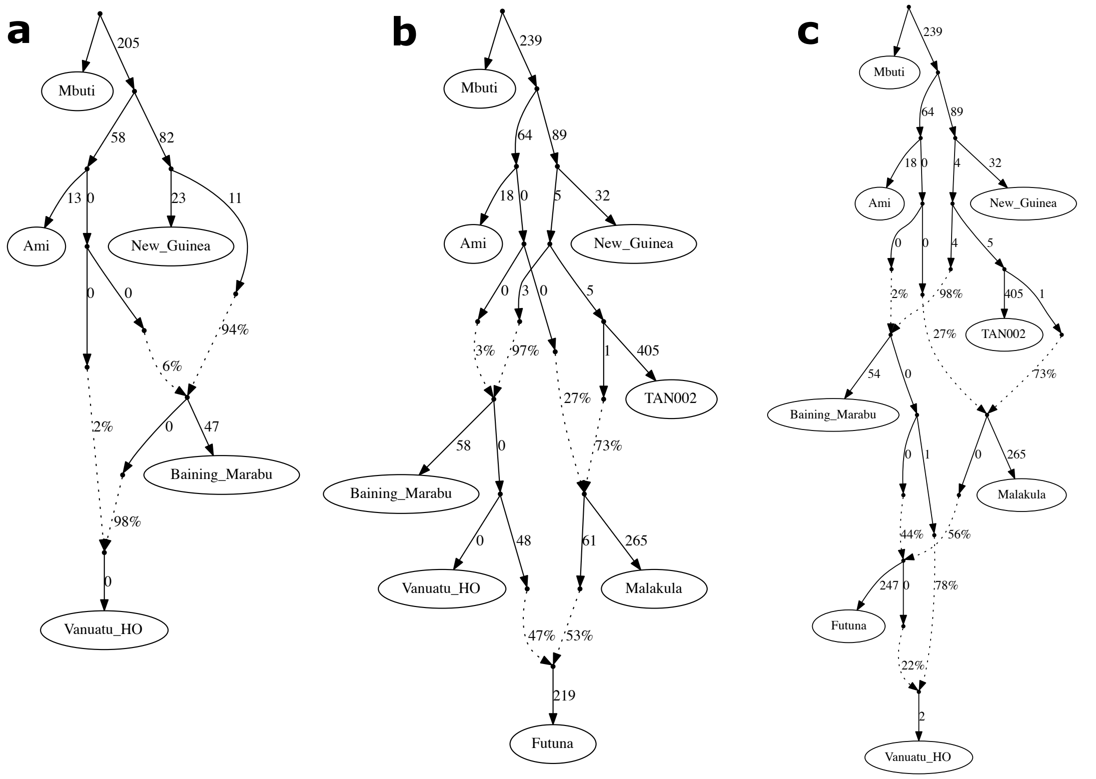
Supplementary figure 2. Map of Vanuatu, showing approximate locations of ancient individuals and modern sampling locations from this study and Parks *et al.*[32].



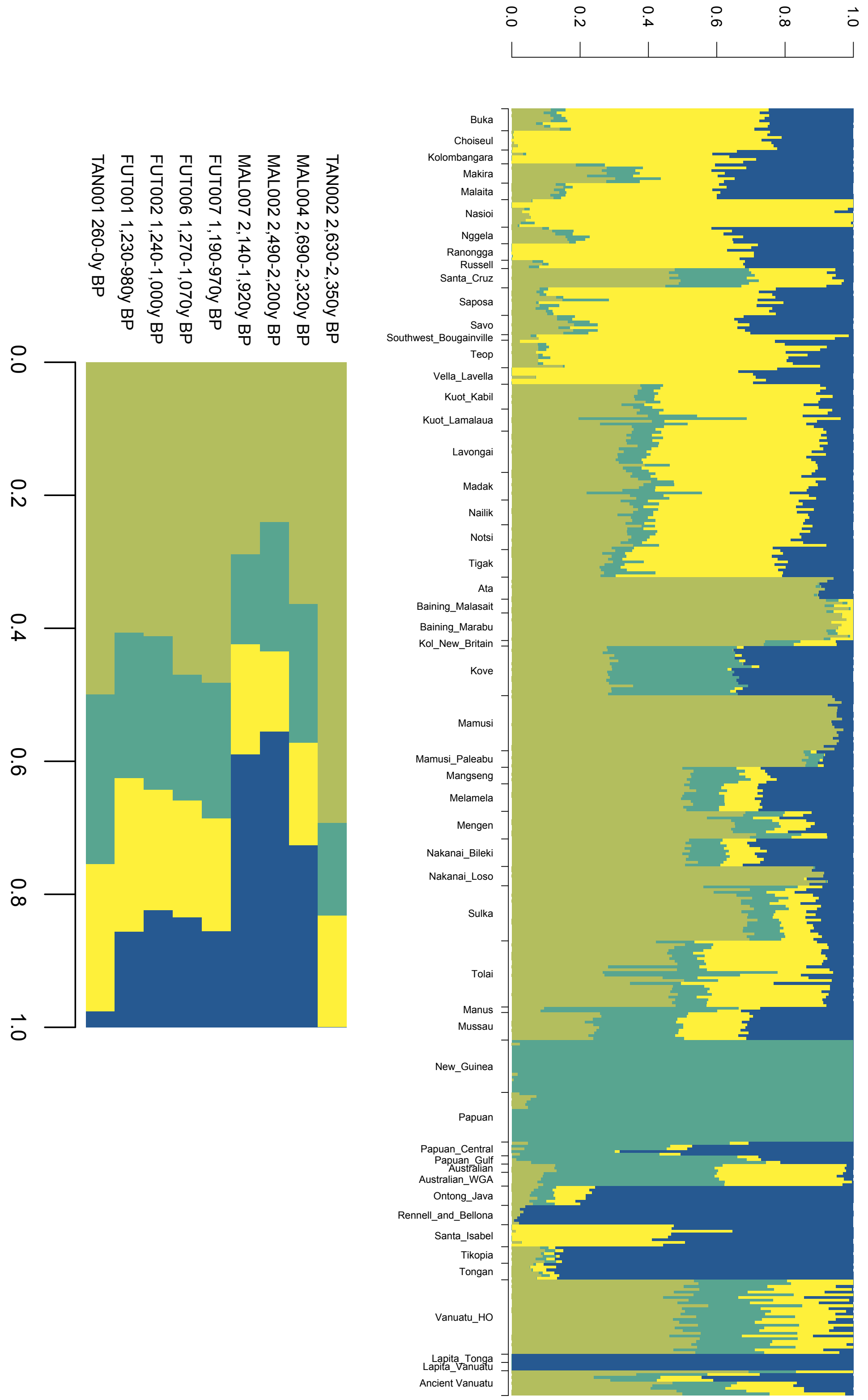
Supplementary figure 3. *qpAdm* analyses on the down-sampled SNPs of the HO dataset modeling the Austronesian ancestry proportion (represented by Ami population) in ancient individuals (filled symbols) and 27 present-day individuals grouped together (unfilled symbol) from Vanuatu. Standard errors are shown as black lines if larger than the sample symbol (legend in Fig. 1).



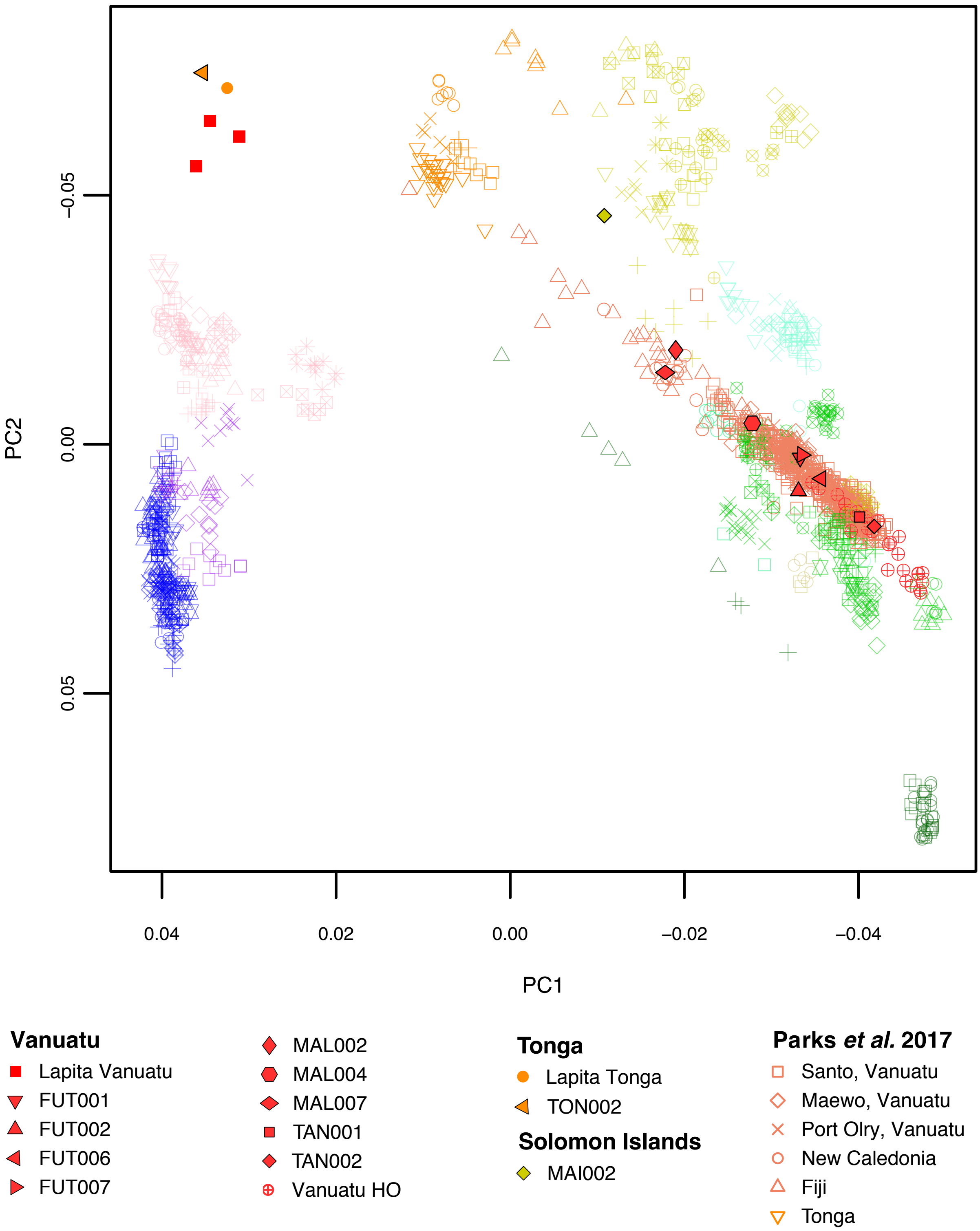
Supplementary figure 4. *qpGraph* analyses modelling population relationships for present-day HO Vanuatu individuals. Vanuatu HO is modelled as **(a)** admixed between modern populations related to Ami and Baining Marabu (Z: 2.3); **(b)** a sister group of Baining Marabu (Z: 6.0); and **(c)** admixed between Baining Marabu and an ancient Futuna-related lineage (Z: 5.2).



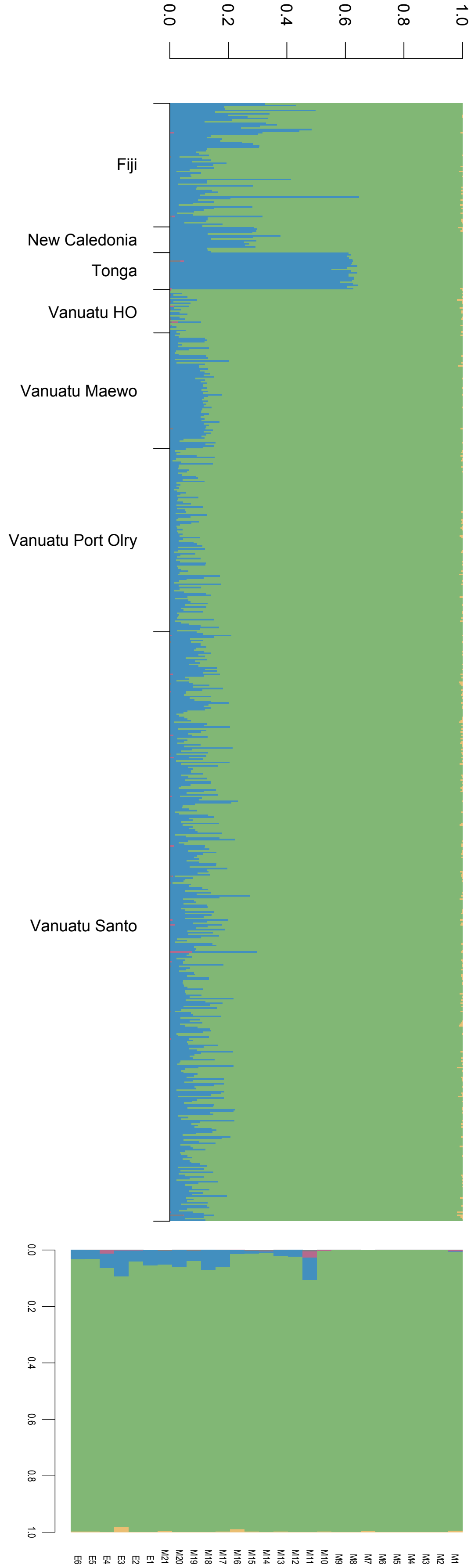
Supplementary figure 5. Unsupervised *ADMIXTURE* analyses (*K*=4) on a regional selection of HO data comprising 454 modern-day Near and Remote Oceanian individuals, 4 previously published Lapita-associated individuals[5] and 9 ancient individuals from Vanuatu (both in the right figure and enlarged on the left).



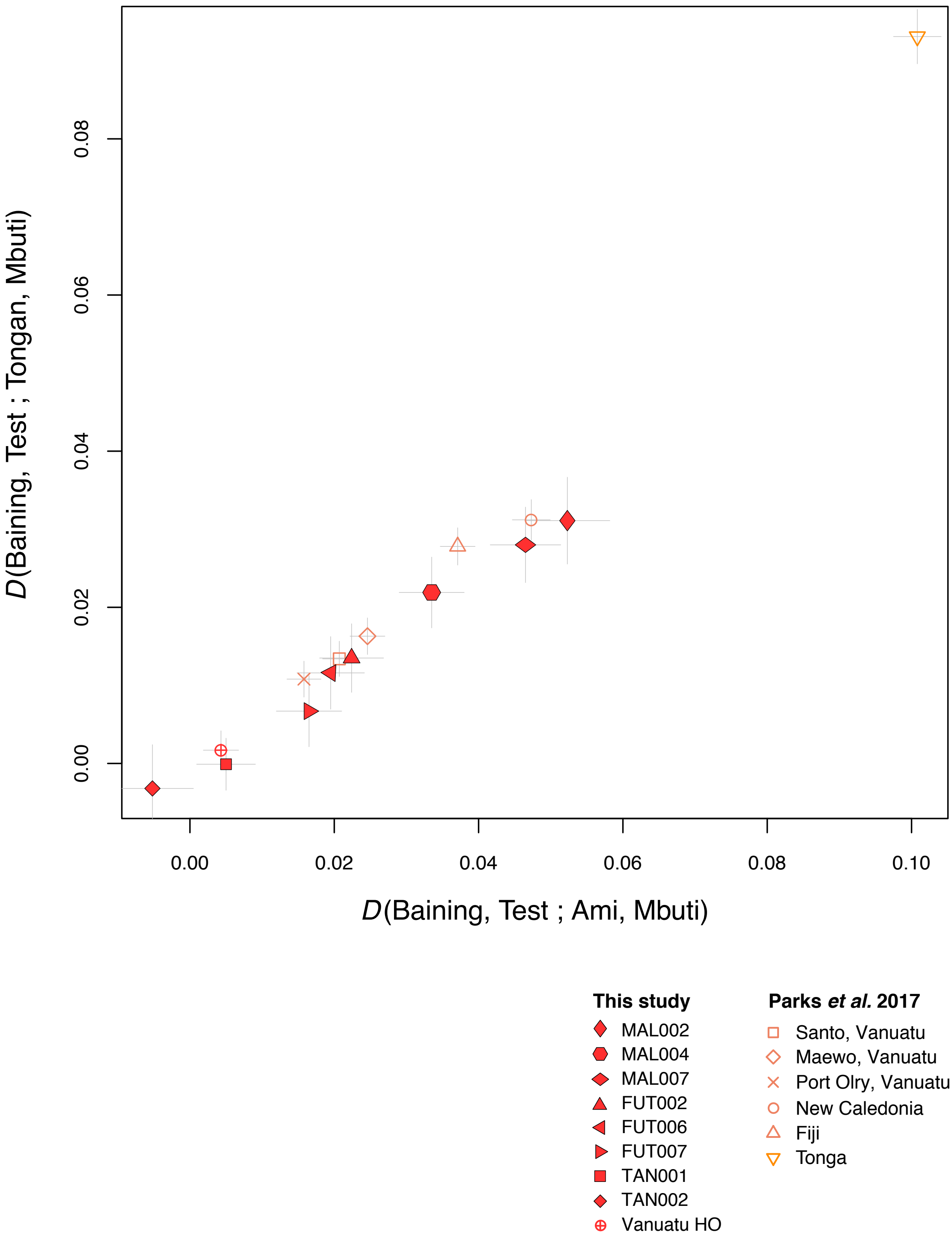
Supplementary figure 6. 15 ancient and 669 modern-day individuals from New Caledonia, Vanuatu, Fiji and Tonga from Parks *et al.*[32] projected onto principal components 1 and 2, computed using the overlapping ~50k SNPs of the HO populations reported in Fig. 1 and Supplementary figure 1.



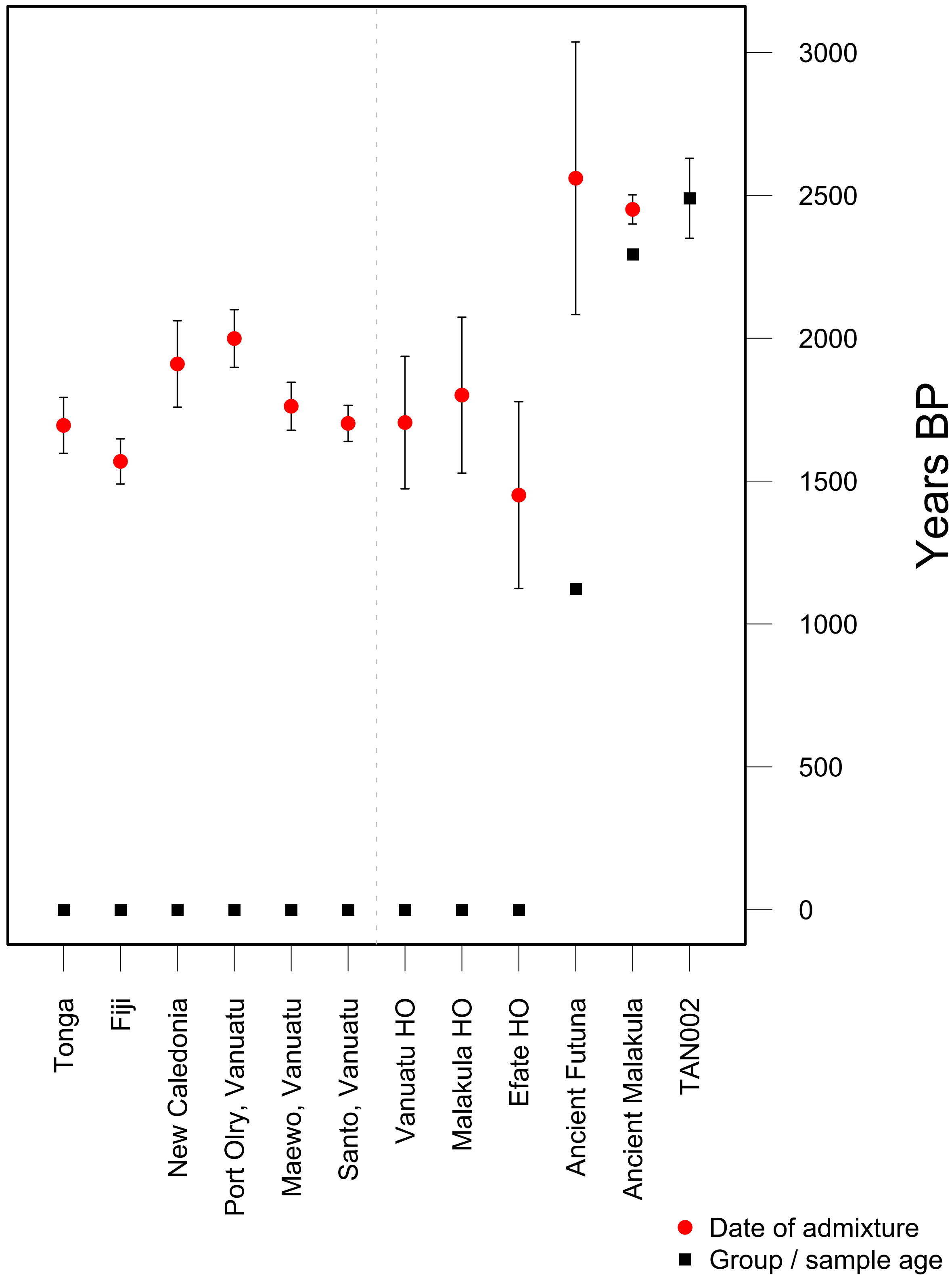
Supplementary figure 7. Unsupervised *ADMIXTURE* analyses on the ~50k SNPs overlapping between 669 individuals from Parks *et al.*[32] and 27 Vanuatu (Malakula and Efate) individuals genotyped on the HO array (both above and enlarged at the bottom).



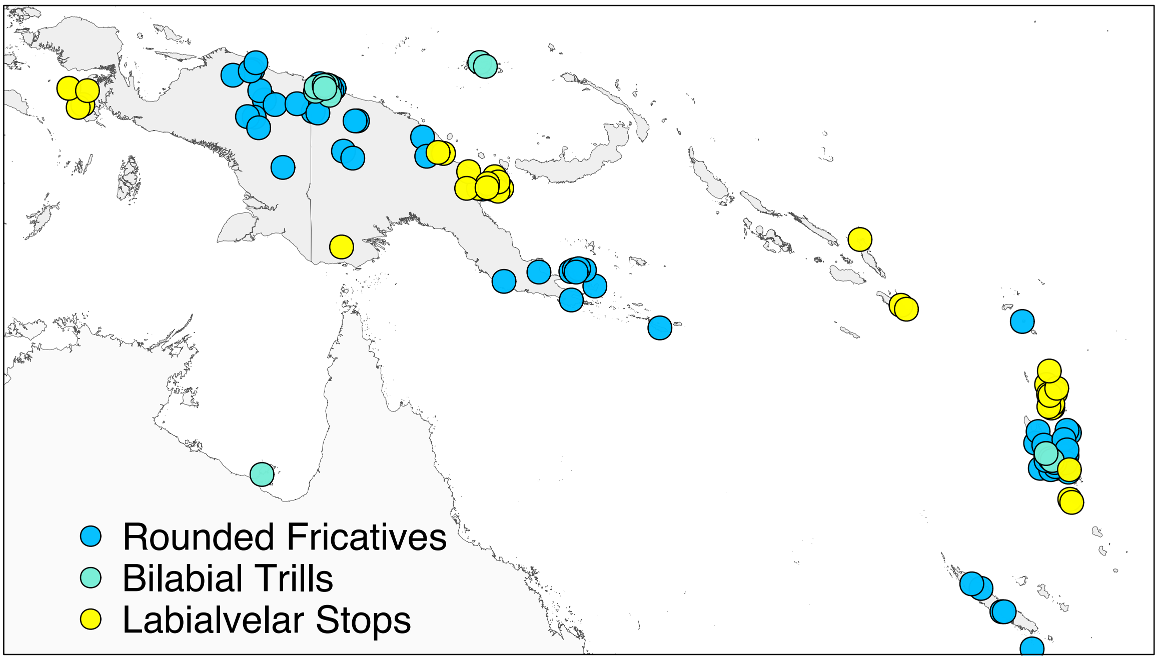
Supplementary figure 8. *D*-statistics in the form *D(Baining, Test ; Ami, Mbuti)* and *D(Baining, Test ; modern Tongan, Mbuti)* plotted against each other, where *Test* is *Fiji*, *Tonga*, *Maewo (Vanuatu)*, *Port Olry (Vanuatu)*, *Santo (Vanuatu)* and *New Caledonia* populations from Parks *et al.*[32], modern-day Vanuatu HO individuals and ancient Malakula, Futuna and Tanna individuals from this study. Standard errors for each point are shown in both dimensions as gray lines.



Supplementary figure 9. *ALDER* analyses estimating the date of Papuan and East Asian admixture, converted into years with a generation time of 28.1 years. Populations investigated derive from Parks *et al.*[32] (left of the dashed gray line), the newly HO genotyped Vanuatu individuals, either grouped together Vanuatu HO (*n*=27) or divided as Malakula HO (*n*=21) and Efate HO (*n*=6), and ancient Futuna (*n*=3) and Malakula (*n*=3). Standard error bars are shown for date estimates, while sample ages for the two ancient groups (Futuna and Malakula) are averaged radiocarbon dating confidence interval (CI) midpoints. As the earliest ancient Vanuatu individual with unadmixed Near Oceanian ancestry, *TAN002* is included for age comparison, with error bar indicating the 95.4% radiocarbon dating CI.



Supplementary figure 10. Rare linguistic features shared between Papuan languages of Near Oceania and the languages of Vanuatu.



Supplementary Tables

Supplementary table 1. Archaeological information of 19 individuals providing genome-wide data reported in this study.

Sample Name	Country, Island	Site	Burial	Archaeological assignment	Latitude	Longitude
FUT001	Vanuatu, Futuna	FURS 12	Burial 7	n/a	19°31'10.80"S	170°13'33.98"E
FUT002	Vanuatu, Futuna	FURS 12	Burial 8-9	n/a	19°31'10.80"S	170°13'33.98"E
FUT006	Vanuatu, Futuna	FURS1A	Burial 1	n/a	19°31'15.01"S	170°13'48.23"E
FUT007	Vanuatu, Futuna	FURS 12	Burial 4	n/a	19°31'10.80"S	170°13'33.98"E
LHA001	Tonga, Tongatapu	Lapaha	J09	n/a	21°10'35.67"S	175°06'55.75"W
MAI002	Solomons, Malaita	Ria Cave	Individual II, RS1	n/a	9°15'15.5"S	161°13'21.7"E
MAL001	Vanuatu, Malakula	Vao	Burial 7	Post-Lapita	15°54'3.00"S	167°18'16.71"E
MAL002	Vanuatu, Malakula	Uripiv	Burial 1	Late Lapita	16°04'25.97"S	167°26'52.03"E
MAL004	Vanuatu, Malakula	Uripiv	Burial 8	Late Lapita	16°04'25.97"S	167°26'52.03"E
MAL006	Vanuatu, Malakula	Uripiv	Burial 15	Lapita	16°04'25.97"S	167°26'52.03"E
MAL007	Vanuatu, Malakula	Uripiv	Burial 18	Post-Lapita	16°04'25.97"S	167°26'52.03"E
MAL008	Vanuatu, Malakula	Uripiv	Burial 23	Post-Lapita	16°04'25.97"S	167°26'52.03"E
TAN001	Vanuatu, Tanna	TaRS 3	Burial I	n/a	19°33'22.36"S	169°16'56.51"E
TAN002	Vanuatu, Tanna	Lowenpakal	TP5	Late Lapita	19° 19' 59"S	169°20'37"E
TAP002	French Polynesia, Ra'iatea	Taputapuatea	Taputapuatea complex	n/a	16°50'10.50"S	151°21'30.86"W
TAP003	French Polynesia, Ra'iatea	Taputapuatea	Marae Hauviri	n/a	16°50'10.50"S	151°21'30.86"W
TAP004	French Polynesia, Ra'iatea	Taputapuatea	Marae Hititai	n/a	16°50'10.50"S	151°21'30.86"W
TON001	Tonga, Tongatapu	Talasiu	Sk3.1	Late Lapita	21°10'37.63"S	175°06'32.68"W
TON002	Tonga, Tongatapu	Talasiu	Sk6	Late Lapita	21°10'37.63"S	175°06'32.68"W

Supplementary table 2. Radiocarbon dating details for the 19 individuals with nuclear DNA data analyzed here. * indicates that date is not direct but from associated archaeological layer.

Sample Name	absolute dating AMS (uncal)	Lab code-number date	C:N	C [%]	Collagen [%]	Material dated	Protocol	Publication
FUT001	1284 ± 20	MAMS-29775	2.9	36.2	3.7	L petrous	Ultrafiltered gelatin	New
FUT002	1377 ± 20	MAMS-29686	3	35.9	3.1	R petrous	Ultrafiltered gelatin	New
FUT006	1306 ± 20	Wk-44199	3.35	42.57	0.91	L scapula	Ultrafiltered gelatin	New
FUT007	1303 ± 20	MAMS-29688	3	35.5	1.1	R petrous	Ultrafiltered gelatin	New
LHA001	965 ± 25	Wk-36401	3.26	43.61	0.67	R Humerus	Ultrafiltered gelatin	New
MAI002	460 ± 30	Beta-433422	n/a	n/a	n/a	L humerus	Alkali Collagen extraction	New
MAL001	2320 ± 23	MAMS-29692	n/a	n/a	1.7	L petrous	Ultrafiltered gelatin	New
MAL002	2482 ± 26	MAMS-29693	n/a	n/a	0.5	L petrous	Ultrafiltered gelatin	New
MAL004	2515 ± 28	Wk-30882	3.4	42.71	0.9	Rib	Ultrafiltered gelatin	Kinaston et al.2014
MAL006	2608 ± 30	Wk-27489	3.4	43.9	0.4	Rib	Ultrafiltered gelatin	Kinaston et al.2014
MAL007	2111 ± 30	Wk-30883	3.3	42.88	0.8	Foot phalanx	Ultrafiltered gelatin	Kinaston et al.2014
MAL008	2310 ± 33	Wk-30885	3.3	42.93	1.7	Rib	Ultrafiltered gelatin	Kinaston et al.2014
TAN001	228 ± 20	MAMS-29690	3.2	39.8	0.5	L petrous	Ultrafiltered gelatin	New
TAN002	2610 ± 17, 2471 ± 17	MAMS-31124, Wk-46423	3,4	16,5	0,4	R petrous	Ultrafiltered gelatin	New
TAP002	236 ± 18	MAMS-30075	4,1	45,1	4,1	Molar	Ultrafiltered gelatin	New
TAP003	318 ± 18	MAMS-30076	3,8	43,3	3,7	Molar	Ultrafiltered gelatin	New
TAP004	257 ± 19	MAMS-30077	3,8	40,7	1,6	Molar	Ultrafiltered gelatin	New
TON001	2594 ± 20*	WK-41883*	3.4	45.3	0.4	Fibula SK10	Ultrafiltered gelatin	Skoglund et al. 2016
TON002	2594 ± 20*	WK-41883*	3.4	45.3	0.4	Fibula SK10	Ultrafiltered gelatin	Skoglund et al. 2016

Supplementary table 3. Ancient DNA statistics for *1240K* capture libraries. Library type column refers to UDGhalf (UDGh) and non-UDG (nUDG) treatments. Endogenous DNA is reported before capture as the percentage of DNA fragments mapping against the human reference sequence *hg19* (End. DNA Shotgun). All subsequent values refer to the *1240K* capture libraries. End. DNA Capture indicates the percentage of reads overlapping the targeted *1240K* capture SNPs.

Sample Name	Country, Island	Library type	End. DNA Shotgun (%)	# of Raw Reads	Dedup Mapped Reads	Duplication Factor	End. DNA Capture (%)	DMG 1st Base 5' (%)	Average length (bp)
FUT001	Vanuatu, Futuna	nUDG	6.12	41,392,080	4,668,165	3.96	29.2	17.4	57.4
FUT002	Vanuatu, Futuna	nUDG+UDGh	9.36	70,233,017	10,666,919	3.18	29.6	11.3	60.4
FUT006	Vanuatu, Futuna	UDGhalf	8.56	91,420,714	3,487,664	5.94	28.8	13.4	51.5
FUT007	Vanuatu, Futuna	nUDG+UDGh	8.12	46,308,005	4,525,691	4.35	27.0	21.4	57.0
LHA001	Tonga, Tongatapu	UDGh	0.24	24,149,883	967,978	3.48	8.7	26.9	46.0
MAI002	Solomons, Malaita	nUDG	13.96	26,305,390	11,947,705	1.25	32.7	26.9	67.7
MAL001	Vanuatu, Malakula	nUDG	0.07	66,233,021	285,473	4.18	1.1	51.5	51.5
MAL002	Vanuatu, Malakula	nUDG+UDGh	1.54	42,073,018	2,241,947	3.98	13.0	37.9	53.2
MAL004	Vanuatu, Malakula	nUDG+UDGh	3.23	66,970,084	8,752,963	2.44	20.9	37.9	55.0
MAL006	Vanuatu, Malakula	nUDG	0.04	39,240,200	114,561	7.07	1.4	34.9	56.7
MAL007	Vanuatu, Malakula	nUDG+UDGh	1.74	41,715,211	2,453,036	4.33	17.6	35.1	51.5
MAL008	Vanuatu, Malakula	nUDG	0.11	35,130,215	242,876	5.30	2.4	45.2	49.5
TAN001	Vanuatu, Tanna	UDGh	4.19	74,290,450	4,300,891	3.62	28.9	3.44	53.6
TAN002	Vanuatu, Tanna	nUDG+UDGh	0.62	50,924,133	2,079,462	4.09	11.6	39.5	55.8
TAP002	Tahiti, Raiatea	noUDG	0.07	11,069,616	244,934	3.57	5.5	29.2	67.6
TAP003	Tahiti, Raiatea	nUDG+UDGh	0.31	3,745,562	534,951	1.59	16.1	29.3	67.9
TAP004	Tahiti, Raiatea	nUDG	0.05	17,335,921	167,739	3.93	2.7	30.8	63.0
TON001	Tonga, Tongatapu	nUDG	0.49	15,071,679	829,569	3.01	9.9	31.9	57.4
TON002	Tonga, Tongatapu	nUDG	2.97	37,681,096	3,378,089	3.52	20.0	41.0	52.0

Supplementary table 4. Nuclear contamination estimate for the X-chromosome of male individuals performed only on UDGhalf libraries when both library types were available.

Sample Name	Country, Island	Contamination X chromosomes	Std. err.	X-chr SNPs covered twice
FUT006	Vanuatu, Futuna	0.013	6.50E-03	902
FUT007	Vanuatu, Futuna	0.008	6.62E-03	548
MAL004	Vanuatu, Malakula	0.006	3.35E-03	2071
TAN001	Vanuatu, Tanna	0.012	4.73E-03	1671
TAN002	Vanuatu, Tanna	0.019	2.05E-02	138
TAP002	Tahiti, Raiatea	0.091	5.60E-02	84
TAP003	Tahiti, Raiatea	0.021	2.59E-02	99
TAP004	Tahiti, Raiatea	0.060	6.91E-02	37
TON002	Tonga, Tongatapu	0.080	1.38E-02	1220

Supplementary table 5. Details on present-day individuals from Malakula (M#) and Efate (E#) genotyped for the *Human Origins* array (*n*=27) and shotgun sequenced (*n*=8).

Sample Name	Country	Island	Sex	SNPs HO	End. DNA Shotgun (%)	Mean coverage 1240K	SNPs 1240K
M1	Vanuatu	Malakula	Male	594,008			
M2	Vanuatu	Malakula	Male	597,009			
M3	Vanuatu	Malakula	Male	596,726			
M4	Vanuatu	Malakula	Male	596,673			
M5	Vanuatu	Malakula	Male	597,093			
M6	Vanuatu	Malakula	Male	596,165			
M7	Vanuatu	Malakula	Male	596,300			
M8	Vanuatu	Malakula	Male	596,455	43.7	2.64	1,115,485
M9	Vanuatu	Malakula	Male	595,743	24.8	1.05	756,253
M10	Vanuatu	Malakula	Male	596,725	14.9	0.72	531,519
M11	Vanuatu	Malakula	Male	596,699	32.3	2.03	985,442
M12	Vanuatu	Malakula	Female	596,345			
M13	Vanuatu	Malakula	Male	596,197	47.6	1.92	950,843
M14	Vanuatu	Malakula	Female	596,300			
M15	Vanuatu	Malakula	Male	596,276			
M16	Vanuatu	Malakula	Male	596,955			
M17	Vanuatu	Malakula	Male	596,821			
M18	Vanuatu	Malakula	Male	596,532	22.6	1.43	869,874
M19	Vanuatu	Malakula	Female	596,404			
M20	Vanuatu	Malakula	Male	595,483			
M21	Vanuatu	Malakula	Female	596,265	12.7	0.62	535,583
E1	Vanuatu	Efate	Male	596,506			
E2	Vanuatu	Efate	Female	596,302			
E3	Vanuatu	Efate	Male	596,610			
E4	Vanuatu	Efate	Female	591,273			
E5	Vanuatu	Efate	Male	596,073	52.3	3.04	1,146,888
E6	Vanuatu	Efate	Female	596,160			

Supplementary table 6. Number of individuals retained and removed for each population in the Parks *et al.* dataset[32] based on a threshold of non-local ancestry above 2% estimated in *ADMIXTURE* analyses (Supplementary figure 7).

Population	**Number individuals retained**	**Number individuals removed**
Vanuatu_Port_Olry	114	3
Vanuatu_Maewo	72	11
Vanuatu_Santo	366	44
Fiji	78	3
New_Caledonia	16	15
Tonga	23	9
Total	669	85

Supplementary table 7. *qpWave* analyses on the HO dataset, to test whether the ancient (*n=8*) and modern (*n*=27) Vanuatu individuals are consistent with deriving from two streams of admixture represented by Papuan and Ami, using the following populations as outgroup: Mbuti, Denisovan, Sardinian, English, Yakut, Chukchi, Mala, Japanese, Ju_hoan_North, Mixe, Onge, Yoruba. In all cases rank *n-1* cannot be rejected (p>0.05).

Vanuatu individuals	**f4rank: 1**
TAN002	0.40
MAL002	0.92
MAL004	0.47
MAL007	0.44
FUT002	0.43
FUT007	0.09
FUT006	0.57
TAN001	0.36
Modern Vanuatu HO	0.08

Supplementary table 8. *qpAdm* analyses on the *1240K* capture dataset, for the three Vanuatu Lapita individuals from Skoglund *et al.*[5], ancient Vanuatu individuals from this study (*n*=10), and the shotgun sequenced present-day individuals from Malakula and Efate grouped together (*n*=8).

Ancient Vanuatu	**Austronesian ancestry autosome**	**STD error**	**Austronesian ancestry Xchr**	**STD error**	**Xchr-autosome Austronesian ancestry**
Lapita_Vanuatu	0.970	0.039	-	-	-
TAN002	0.009	0.024	0.101	0.129	0.092
MAL004	0.222	0.022	0.719	0.072	0.497
MAL002	0.31	0.026	0.407	0.369	0.097
MAL001	0.459	0.066	-	-	-
MAL007	0.297	0.023	0.505	0.07	0.208
FUT006	0.139	0.021	0.595	0.134	0.456
FUT002	0.169	0.022	0.01	0.047	-0.159
FUT001	0.130	0.028	-	-	-
FUT007	0.112	0.021	0.134	0.131	0.022
TAN001	0.046	0.019	0.039	0.12	-0.007
Modern Vanuatu shotgun	0.05	0.009	0.24	0.037	0.19

Supplementary table 9. *D-statistics* in the form *D*(*Pop1*, *Pop2* ; *Pop3*, *Outgroup*). Three individuals are grouped together for the analyses of Futuna (*FUT002*, *FUT006*, *FUT007*) and Malakula (*MAL002*, *MAL002*, *MAL007*). *TAN002* affinity to Baining compared to Papuan New Guinea populations can be caused neither by shared Austronesian (Ami) ancestry nor by Denisovan differential admixture.

Pop1	Pop2	Pop3	Outgroup	Dstat	Zscore	SNPs	Interpretation
Baining_Marabu	New_Guinea	Futuna	Mbuti	0.0122	4.335	454736	Ancient Vanuatu individuals have higher affinity to Baining_Marabu and Baining_Malasait than New_Guinea
Baining_Marabu	New_Guinea	Malakula	Mbuti	0.011	3.876	415565	
Baining_Marabu	New_Guinea	TAN002	Mbuti	0.0136	2.923	94557	
Baining_Marabu	New_Guinea	Lapita_Vanuatu	Mbuti	0.0071	2.432	247385	
Baining_Marabu	New_Guinea	TAN001	Mbuti	0.0069	1.87	336854	
Baining_Malasait	New_Guinea	Malakula	Mbuti	0.0158	4.937	412532	
Baining_Malasait	New_Guinea	Futuna	Mbuti	0.0144	4.623	451250	
Baining_Malasait	New_Guinea	TAN002	Mbuti	0.0192	3.796	93940	
Baining_Malasait	New_Guinea	TAN001	Mbuti	0.0139	3.509	334551	
Baining_Malasait	New_Guinea	Lapita_Vanuatu	Mbuti	0.0055	1.615	245945	

Pop1	Pop2	Pop3	Outgroup	Dstat	Zscore	SNPs	Interpretation
TAN002	New_Guinea	Baining_Malasait	Mbuti	0.0141	2.125	93940	Baining_Malasait and Baining_Marabu are genetically closer to TAN002 than New_Guinea with more than 2 standard deviations
TAN002	New_Guinea	Baining_Marabu	Mbuti	0.0121	1.966	94557	
TAN002	Baining_Marabu	New_Guinea	Mbuti	-0.0015	-0.251	94557	
TAN002	Baining_Malasait	New_Guinea	Mbuti	-0.0051	-0.816	93940	

Pop1	Pop2	Pop3	Outgroup	Dstat	Zscore	SNPs	Interpretation
Lapita_Vanuatu	New_Guinea	Ami	Mbuti	0.1384	35.165	247494	TAN002 forms a clade with New_Guinea in comparisons to Ami. All later Vanuatu individuals show higher affinity to Ami.
Malakula	New_Guinea	Ami	Mbuti	0.0504	15.353	415781	
Futuna	New_Guinea	Ami	Mbuti	0.0306	9.845	455021	
Baining_Marabu	New_Guinea	Ami	Mbuti	0.0098	4.252	592591	
TAN001	New_Guinea	Ami	Mbuti	0.0144	3.809	337036	
Baining_Malasait	New_Guinea	Ami	Mbuti	0.0099	3.733	586950	
TAN002	New_Guinea	Ami	Mbuti	0.0039	0.704	94608	

Pop1	Pop2	Pop3	Outgroup	Dstat	Zscore	SNPs	Interpretation
TAN001	New_Guinea	Denisovan	Mbuti	0.0041	0.779	336968	Equal Denisovan admixture levels in TAN002 and New_Guinea
TAN002	New_Guinea	Denisovan	Mbuti	-0.0038	-0.494	94589	
Baining_Malasait	New_Guinea	Denisovan	Mbuti	-0.0027	-0.839	586824	
Baining_Marabu	New_Guinea	Denisovan	Mbuti	-0.0056	-1.905	592465	
Malakula	New_Guinea	Denisovan	Mbuti	-0.0106	-2.582	415692	
Futuna	New_Guinea	Denisovan	Mbuti	-0.0107	-2.635	454929	
Lapita_Vanuatu	New_Guinea	Denisovan	Mbuti	-0.0454	-7.641	247446	

Pop1	Pop2	Pop3	Outgroup	Dstat	Zscore	SNPs	Intepretation
LHA001pmd	Tongan	Choiseul	Mbuti	-0.0307	-2.937	19290	Modern-day Tongans genetically closer to some modern-day Solomon populations than a 780-550y BP Tongan individual
LHA001pmd	Tongan	Savo	Mbuti	-0.0302	-3.038	19290	

Supplementary table 10. *qpAdm* analyses modeling present-day Tongan individuals as a two-way admixture between Ami and present-day and ancient Solomon Islanders. Mbuti, Denisovan, Sardinian, English, Yakut, Chukchi, Mala, Japanese, Ju_hoan_North, Mixe, Onge, Yoruba are used as outgroup populations with the addition in subsequent runs of Papuan and Papuan plus Baining Marabu, respectively. Models given in red are rejected at rank *n-1* ($p<0.05$).

In-group: Ami +	Outgroups	Outgroups + Papuan	Outgroups + Papuan + Baining_Marabu
Makira	0.5181	0.2742	0.3211
Malaita	0.5429	0.0703	0.0957
MAI002	0.9068	0.7190	0.6037
Nasioi	0.1680	0.0004	0.0005
Choiseul	0.2384	0.0001	0.0001

Supplementary table 11. Ancient DNA statistics for mtDNA capture libraries. mt/nuclear DNA ratio refers to the relative proportion of mtDNA molecules compared to nuclear DNA in shotgun sequencing. Library type column refers to UDGhalf (UDGh) and non-UDG (nUDG) treatments. All subsequent values refer to mtDNA capture libraries. "End. DNA Capture" indicates the percentage of reads overlapping the targeted mtDNA reference sequence (rCRS). Consensus sequence assembly with different likelihood filters (q) and contamination estimate was performed with *schmutzi* and haplogroup assignment with *HaploGrep2*.

Sample name	mt/nuclear DNA ratio	Library type	# of Raw Reads	Dedup Mapped Reads	End. DNA Capture (%)	Mean coverage	DMG 1st Base 5' (%)	Average length (bp)	Contamination estimate	Haplogroup	q filter
FUT001.A0101	55	nUDG	2,442,852	35,441	51.8	115.6	22.3	54.0	0.01 (0-0.02)	P1d2a	q30
FUT002.A0102	45	UDGh	3,525,324	36,623	49.1	132.6	6.2	60.0	0.01 (0-0.02)	M28b1	q30
FUT006.A0101	65	nUDG	727,518	31,897	58.5	105.0	32.0	54.5	0.02 (0.01-0.03)	P1d2a	q20
FUT007.A0101,2	57	nUDGh	46,308,005	3630	0.011	11.8	23.6	53.9	0.01 (0-0.02)	M28b1	q0
FUT008.A0101	986	nUDG	629,122	17,252	52.0	51.2	36.4	49.2	0.02 (0.01-0.03)	P1d2a	q30
LHA001.A0101	58	nUDG	192,550	5,519	11.3	17.2	19.9	51.5	0.03 (0.02-0.04)	B4a1a1	q30
MAI002.A0101	74	nUDG	1,828,034	166,900	43.3	628.2	32.2	62.4	0.01 (0-0.02)	B4a1a1a	q30
MAI003.A0101	n/a	nUDG	507,558	6,524	9.2	24.5	31.0	62.3	0.04 (0.03-0.05)	B4a1a1a	q30
MAL001.A0101		nUDG	463,490	4,359	26.8	13.0	53.0	49.3	0.03 (0.02-0.04)		
MAL001.A0102	180	nUDG	401,588	3,519	21.3	10.4	55.7	48.9	0.03 (0.02-0.04)	B4a1a1	q30
MAL001.A0103		nUDG	461,714	3,254	18.4	9.5	55.9	48.4	0.03 (0.02-0.04)		
MAL002.A0102	67	UDGh	632,870	15,061	45.6	46.3	22.5	50.9	0.01 (0-0.02)	B4a1a1a	q30
MAL004.A0101	31	nUDG	759,638	51,837	50.8	160.4	50.8	51.3	0.01 (0-0.02)	B4a1a1a	q30
MAL006.A0101		nUDG	703,402	3,279	24.1	10.5	45.7	53.3	0.04 (0.03-0.05)		
MAL006.A0102	247	nUDG	2,285,598	3,837	21.7	12.4	47.5	53.6	0.04 (0.03-0.05)	B4a1a1a11b	q30
MAL006.A0103		nUDG	1,982,940	4,002	24.6	13.2	41.3	54.5	0.04 (0.03-0.05)		
MAL007.A0102	99	UDGh	1,083,436	33,703	48.7	102.7	24.9	50.5	0.01 (0-0.02)	B4a1a1a	q30
MAL008.A0101		nUDG	590,796	2,353	21.7	6.6	51.9	46.7	0.09 (0.07-0.11)		
MAL008.A0102	n/a	nUDG	511,046	1,715	24.0	4.9	44.7	46.9	0.09 (0.07-0.11)	B4a1a1a	q30
MAL008.A0103		nUDG	1,686,192	1,628	14.9	4.6	41.6	47.3	0.09 (0.07-0.11)		
TAN001.A0101	63	nUDG	801,460	62,114	49.1	213.0	22.3	56.8	0.01 (0-0.02)	P1d1	q30
TAN002.A0102	36	UDGh	1,034,876	12,490	36.9	40.3	20.7	53.5	0.01 (0-0.02)	Q2a	q30
TAP001.A0101	34,880	nUDG	487,136	37,437	31.6	152.1	25.5	67.3	0.02 (0.01-0.03)	B4a1a1	q30
TAP002.A0101	4,545	nUDG	628,286	54,537	40.6	210.6	34.7	64.0	0.02 (0.01-0.03)	B4a1a1m1	q30
TAP003.A0102	2,596	UDGh	657,580	51,692	40.2	200.4	8.3	64.2	0.01 (0-0.02)	B4a1a1c	q30
TAP004.A0101	16,114	nUDG	3,130,100	171,911	33.7	675.8	22.9	65.1	0.01 (0-0.02)	B4A1a1+16126	q30
TAP004.A0102		UDGh	1,626,690	126,500	47.9	485.7	6.7	63.6	0.01 (0-0.02)		
TON001.A0101	48	nUDG	439,574	7,305	17.9	21.8	46.0	49.4	0.06 (0.04-0.08)	B4a1a1a	q30
TON001.A0102		UDGh	812,702	4,566	18.4	13.6	47.1	49.4	0.06 (0.04-0.08)		
TON002.A0101	59	nUDG	537,478	29,963	43.2	88.3	46.3	48.8	0.02 (0.01-0.03)	B4a1a1	q30
TON002.A0102		UDGh	3,321,464	44,330	55.1	132.3	46.3	49.4	0.02 (0.01-0.03)		
TON004.A0101	368	nUDG	455,234	851	13.5	2.5	40.4	47.9	0.11 (0.08-0.14)	B4a1a1a	q30
CP30	n/a	nUDG	1,357,664	22,386	36.2	63.1	46.9	46.7	0.02 (0.01-0.03)		

Supplementary table 12. Stable $\delta^{13}C$ and $\delta^{15}N$ measurements on collagen from samples analyzed in this study including duplicate analysis and averages of each sample, C:N ratios, collagen yields, and % of marine protein in an individual's diet based on equations developed by Petchey *et al* [33].

Sample	$\delta^{13}C$ i	$\delta^{13}C$ ii	$\delta^{13}C$ av	SD	$\delta^{15}N$ i	$\delta^{15}N$ ii	$\delta^{15}N$ av	SD	C:N i	C:N ii	C:N av	Collagen yield	Diet 1 % marine	Diet 2 % marine
FUT001	-18.3	-18.4	**-18.4**	0.1	9.0	8.9	**9.0**	0.1	3.1	3.1	**3.1**	**3.7%**	**16.0**	**28.9**
FUT002	-16.5	-16.5	**-16.5**	0.0	11.9	12.0	**12.0**	0.1	3.1	3.1	**3.1**	**3.1%**	**24.0**	**37.8**
FUT006	-18.6	-18.5	**-18.6**	0.1	9.8	9.6	**9.7**	0.1	3.5	3.4	**3.5**	**10.0%**	**35.0**	**50.0**
FUT007	-17.6	-17.6	**-17.6**	0.0	10.5	10.4	**10.4**	0.1	3.1	3.1	**3.1**	**1.1%**	**33.3**	**48.1**
MAI002	-20.4	-20.4	**-20.4**	0.0	9.6	9.6	**9.6**	0.0	3.1	3.3	**3.2**	**3.1%**	**44.6**	**60.7**
MAL001	-17.4	-17.5	**-17.5**	0.1	11.4	11.2	**11.3**	0.1	3.4	3.4	**3.4**	**1.3%**	**-3.9**	**6.8**
MAL002	-16.8	-16.7	**-16.8**	0.0	11.6	11.6	**11.6**	0.0	3.4	3.5	**3.5**	**2.1%**	**12.7**	**25.2**
MAL004	-17.2	-17.3	**-17.3**	0.1	9.8	10.0	**9.9**	0.2	3.5	3.7	**3.6**	**3.0%**	**27.4**	**41.6**
MAL006	-15.3	-14.9	**-15.1**	0.3	11.8	11.9	**11.8**	0.1	3.4	3.5	**3.5**	**2.3%**	**31.0**	**45.6**
MAL007	-17.0	-17.0	**-17.0**	0.0	9.0	8.8	**8.9**	0.1	3.1	3.2	**3.2**	**6.6%**	**-2.5**	**8.3**
MAL008	-15.3	-15.5	**-15.4**	0.1	10.1	9.8	**10.0**	0.2	3.5	3.3	**3.4**	**1.9%**	**32.3**	**47.0**
TAN001	-18.7	-18.8	**-18.7**	0.0	8.8	8.8	**8.8**	0.0	3.4	3.4	**3.4**	**2.3%**	**48.9**	**65.4**
TAN002	-18.4	-18.4	**-18.4**	0.0	7.0	7.0	**7.0**	0.0	3.5	3.6	**3.6**	**3.1%**	**12.5**	**25.0**
TAP002	-16.4	-16.5	**-16.4**	0.1	12.6	12.6	**12.6**	0.0	3.0	3.0	**3.0**	**4.1%**	**16.0**	**28.9**
TAP003	-15.1	-15.0	**-15.0**	0.1	14.6	14.6	**14.6**	0.0	3.0	3.0	**3.0**	**3.7%**	**-7.5**	**2.8**
TAP004	-15.9	-16.0	**-16.0**	0.1	14.3	14.2	**14.2**	0.1	3.0	3.0	**3.0**	**1.6%**	**30.0**	**44.4**
TON001	-15.4	-15.7	**-15.5**	0.2	12.2	12.2	**12.2**	0.0	3.2	3.3	**3.3**	**6.8%**	**46.0**	**62.2**
TON002	-16.6	-16.7	**-16.7**	0.1	11.1	11.1	**11.1**	0.0	3.5	3.5	**3.5**	**4.2%**	**21.5**	**35.0**

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