RADIOCARBON, Vol 47, Nr 2, 2005, p 295–354

AN ASSESSMENT OF RADIOCARBON DATES FROM PALAU, WESTERN MICRONESIA

Jolie Liston

International Archaeological Research Institute, Inc., 2081 Young Street, Honolulu, Hawaii 96826, USA.
Email: jliston@iarii.org.

ABSTRACT. Archaeological investigations in the Republic of Palau, Micronesia, have produced 409 radiocarbon age determinations from cultural contexts, indicating a range of Palauan occupation from about 3000 yr ago into the modern era. However, these dates are scattered among numerous sources (many difficult to obtain) and are presented in a number of different formats and calibrations. The goal of this paper is to compile a usable, systematic database of all of these Palauan cultural ^{14}C assays. This database will be suitable for developing and evaluating chronological models, an effort being undertaken as a separate paper. Prior to constructing prehistoric colonization and cultural chronologies for Palau, the validity of each assay and the relative adequacy in sample size per cultural and environmental zones must be examined. After systematic recalibration, the reliability of the dates is evaluated in light of sample material, cultural context, and site formation processes. A method for dating monumental earthwork complexes through site formation analysis is presented. Sets of 237 valid and 58 potentially valid ^{14}C dates remain to develop chronological models. The representation of Palau's environmental zones, site types, and regions within the dating pool is examined and compared to ensure meaningfulness in these chronological models. Newly obtained ^{14}C age determinations are also provided.

INTRODUCTION

The Republic of Palau is an archipelago of some 350 islands scattered along a 150-km north-south arc in the Western Carolines of Micronesia (Figure 1). Babeldaob is the largest of the islands; its 331 km^2 comprise 80% of Palau's landmass. Volcanic in origin, Babeldaob has a heavily weathered central mountain system that reaches a maximum elevation of 242 m asl with steep-sided valleys and associated ridges. Low, rolling hills circle the base of the uplands, while in limited places beaches form thin strips of bottomlands. Thick mangrove forests encircle much of the island. Small uplifted coralline islands, referred to locally as the Rock Islands, stretch about 30 km from the south tip of Babeldaob to the low platform island of Peleliu. Composed of generally steeply sloped, bowed ridges reaching elevations up to 200 m asl, these islands have long, rocky shorelines, numerous limestone caves and solution notches, but relatively few beach deposits. Ten km southeast of Peleliu is the low platform island of Angaur, while about 600 km southwest are the moderately uplifted reef flats and atoll composing the Southwest Islands.[1] Kayangel and Ngeruangel, two classic coral atolls, are about 30 km to the north of Babeldaob. A wide, shallow lagoon separates Babeldaob, the Rock Islands, and Peleliu from the surrounding fringing and barrier reefs.

Recent archaeological investigations in Palau have increased dramatically the number of radiocarbon age determinations to over 400, the largest suite of dates in Micronesia except for Guam. These ^{14}C assays, particularly those that push human occupation of Palau to over a millennia earlier than previously thought, provide substantial fodder for debates on the timing and origin of initial settlement and patterns of cultural development in the west Pacific (Athens and Ward 2001; Clark and Wright 2003; Fitzpatrick 2003; Clark, forthcoming). Discussions of Palau's role in the Austronesian expansion from island Southeast Asia into the Pacific and construction of a prehistoric cultural chronology must rely on a standardized, reliable, and complete suite of ^{14}C assays.

Palau's ^{14}C age determinations were first standardized and assessed by Masse in 1984 (1984, 1989, 1990). Most of his 81 dates were from sites in the Rock Islands, presenting a limited view of Palauan

[1]The Southwest Islands—Sonsorol, Fana, Pulo Anna, Merir, Tobi, and Helen Reef—have a combined landmass of about 6 km^2.

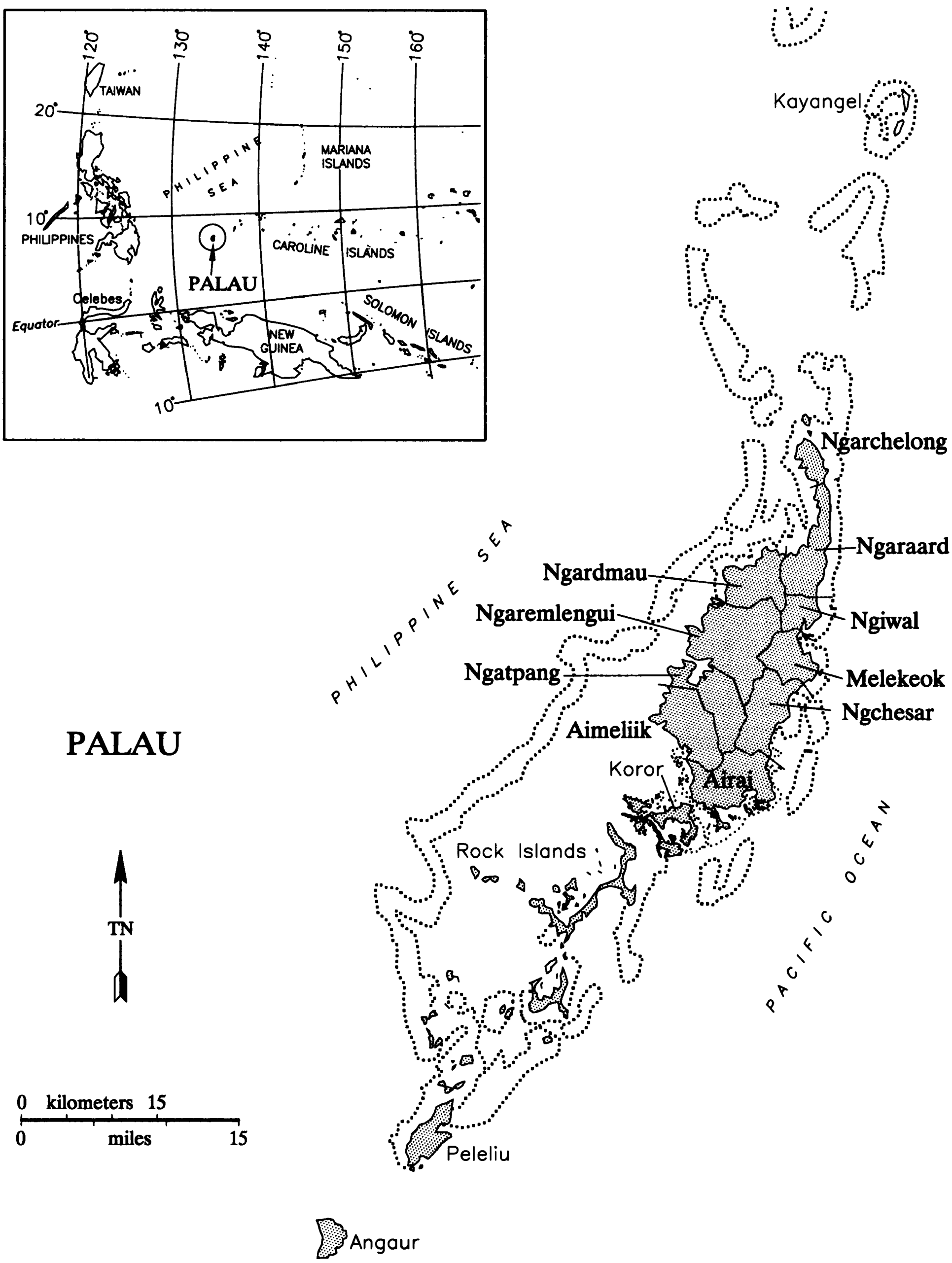

Figure 1 Map of the Republic of Palau

prehistory. The subsequent escalation in the number of ^{14}C dates is a result of compliance by various development projects with historic preservation statutes[2] (e.g. Beardsley 1997; Wickler et al. 1998;

[2]This is largely due to cultural resource management studies conducted by International Archaeological Research Institute, Inc. (IARII), in support of the US Army Corps of Engineers-designed Palau Compact Road, an 85-km road circling Babeldaob.

Liston 1999) and academically sponsored research (Fitzpatrick 2002; Clark and Wright 2002; Phear 2004). The 409 ^{14}C dates from cultural contexts are derived from wood charcoal ($n = 266$), marine shell ($n = 99$), pottery ($n = 21$), bone ($n = 16$), pottery residue ($n = 6$), and a sponge spicule, and provide the baseline data for constructing chronological models of Palau's colonization and prehistoric settlement pattern and elucidating temporal changes to subsistence practices and social organization. Recently, Phear et al. (2003) reviewed some of these ^{14}C determinations and constructed such a model.

This paper aims to present, standardize, and assess the validity of this suite of ^{14}C dates, then determine the meaningfulness of the resulting data set in constructing Palauan colonization and cultural chronologies. Evaluating the reliability of the ^{14}C assays is a multifold process that takes into account suitability of sample material, collecting and processing protocols, and cultural context (Anderson 1991; Spriggs and Anderson 1993). Not isolated from these difficulties are the geographic variables, climatic conditions, and archaeological site types that generate complex site formation processes. To accurately assess the corpus of dates, conditions specific to Palau must be factored in. The meaningfulness of a suite of dates in constructing models is dependent on an adequate sample size from each of Palau's environmental zones, site types, and regions. Construction of a prehistoric Palauan cultural chronology is not the task of this paper; rather, the goal is to provide a complete, standardized, and valid database of ^{14}C assays to use in developing such models.

METHODS

The 409 Palauan ^{14}C dates that are associated with archaeological materials were compiled from cultural resource management reports, theses, and journal articles. They are summarized in Appendices A, B, and C. The primary resource base was supplied by excavation reports and field notes containing comprehensive excavation details, sample context, and methodologies employed.[3]

In addition to the 409 cultural ^{14}C dates, there are 62 assays from paleoenvironmental cores (Hunter-Anderson 1992; Athens and Ward 2002, 2005) and 2 from sediment samples (Hunter-Anderson 1992). These are presented in Appendix D in order to provide a comprehensive list of Palauan ^{14}C date ranges, but these are not reviewed in the present paper because dates from these contexts require evaluation based on a different set of assumptions, methods, and interpretations than those used in the investigations of cultural contexts, and this is beyond the scope of this paper.

Masse's (1984, 1989) adjustments to Palau's first 81 assays were not retained due to uncertainties regarding his ΔR value of –63 (W B Masse, personal communication, 2005). The samples were standardized by recalibrating them to 2 σ with the IntCal98 and MARINE98 calibration curve (Stuiver et al. 1998) using OxCal v 3.9 (Ramsey 2003). No ΔR value was applied to the marine shell and fish bone samples. Human bone samples were calibrated using a mixed calibration curve of 70% marine and 30% terrestrial components. The calendrical age range is provided rather than the median calibrated date due to the multimodality of the calibration curve.

The dates are assessed for their utility in building Palauan cultural chronologies. Though useful information might be garnered from all 409 dates, only those that can meaningfully contribute to these models are retained in the evaluation. Each assay is evaluated on a case-by-case basis, with the criteria listed below used as a guideline in the assessment. Elaboration on some of the points is presented in the manuscript. Seldom is one factor sufficient in itself to unequivocally support classifi-

[3]Excavation reports are available at the Palau Bureau of Arts and Culture and from archaeological contract firms.

cation of a date, but with corroborating evidence from a number of criteria their credibility, or lack of, is established.[4] As identifying the origin of stratigraphic units and the relationship of associated cultural material is essential to the assessment, site formation analysis is integrated into many of the criteria. Results, with the ^{14}C date ranges categorized as eliminated (n = 114, 28%), possible (n = 58, 15%), or accepted (n = 237, 57%), are given in Appendices A, B, and C, organized by laboratory number.

Criteria for Elimination from the Database:

A. Assays that obviously pre-date colonization of Palau and modern dates are discarded as irrelevant to constructing prehistoric and early historic Palauan chronologies. Timing of colonization is not firmly established, but it is highly improbable that the archipelago was occupied before 4000 BC;
B. Assays justifiably dismissed by the excavator (e.g. lab errors or statistical outliers);
C. Assays with a 2-σ range of 900 yr are rejected due to their limited usefulness when working in a time depth of less than half a millennium;
D. Stratigraphically inverted dates that are not interpretable by site formation analysis and cannot be meaningfully applied in a cultural chronology;
E. Assays with an unclear or nonexistent cultural association (e.g. not clearly or directly associated with contemporaneous artifactual material) that cannot be meaningfully used to interpret anthropogenic site formation;
F. Assays from dispersed charcoal samples, unless originating in a discrete feature or accompanied by other mitigating circumstances;
G. Assays that do not corroborate with others in a feature, deposit, or site (unless the site is shown to contain several cultural horizons);
H. Assays from disturbed contexts—crab burrowing, gardening, World War II activities, deposits subject to tidal inflows or storm waves, or early assays associated with recent historic artifacts (unless sample is charcoal identified as non-endemic to ecological setting);
I. Problems with age determinations on sample material (e.g. pottery).

Criterion for Classification as Possible Cultural Date:

J. Dates that cannot be adequately assessed due to inadequate field data or language barriers, or problematical assays that are potentially credible. Individual assays that are potentially post-bomb.

Criteria for Acceptance:

K. A series in stratigraphic order;
L. Corroboration with a different fraction of the same sample or with a different sample from the same feature, cultural stratum, or small-scale site;
M. Assays on wood taxa identified as non-endemic to ecological setting (e.g. coconut or mangrove species on ridge and hill tops);
N. Assays on identified charcoal of short-lived taxa in a discrete subfeature, or assays from a discrete subfeature;
O. Assays suitable for interpretation in site formation analysis only (e.g. a sample of anthropogenic origin in terrace fill or erosion).

[4]It is unfeasible to provide a strict set of decisive factors that can both operate in isolation and be applied to every situation. Tacked on to each criterion should be "unless accompanied by other mitigating circumstances." It is of fundamental importance to know and understand the nature of Palauan site types and their deposits in order to evaluate the dates with combinations of criteria.

SAMPLE MATERIAL

Intensive weathering of Babeldaob's basalt-andesite breccias has resulted in the formation of clayey soils, over 70% of which are lateritic. These acidic latosols are not conducive to the preservation of perishable items such as bone, shell, and uncarbonized wood, and the latosols treat ceramics harshly. According to Pregill and Steadman (2000:138), the "scarcity of rich, fossiliferous sediment in Palau is thus far unequalled for tropical Pacific islands." Thus, datable material other than charcoal is rare on Babeldaob, limited primarily to beach deposits, caves, or some densely packed depositional conditions. In the limestone Rock Islands, preservation of a variety of datable materials is generally far superior to that of Babeldaob.

Shell

Marine shell is the source of 99 ^{14}C determinations, 75% of which are from Rock Island sites. As marine shell is naturally abundant on Palau's shorelines and is easily redeposited by tidal movements and storm waves, a secure cultural context must be established before a shellfish date becomes meaningful.

A primary obstacle to using shellfish as a dating source is the lack of a localized correction factor for the marine reservoir effect. ΔR values ranging from zero (Fitzpatrick 2002; Clark 2004) to 115 ± 50 (Beardsley 1996, 1997) have been applied to Palauan shellfish samples. Masse (1984, 1989) employed a "tentative" ΔR value of -63 ± 4 after considering associated charcoal/shell assays, surface equatorial seawater ^{14}C transects, and a chronological gap between stonework villages on the Rock Islands and Babeldaob. ΔR correction factors from regions relatively near Palau are close to the global ocean's apparent age of approximately 400 ^{14}C yr. Three marine shell samples from the Philippines have produced ΔR values of 89 ± 70, -41 ± 70, and -61 ± 50; one value from Nauru Island is 6 ± 14; and 9 samples from Guam, Eniwetok Atoll, Okinawa, and Ishigaki Island (Japan) produced a west subtropical Pacific mean value of -94 ± 46 (Reimer and Reimer 2004). An additional sample from Guam has a ΔR value of 115 ± 50 (Athens 1986). These low tropical Pacific values, taken in conjunction with Masse's calculated negative value, suggest that application of a ΔR factor of zero to Palauan shellfish samples is reasonable until a precise localized correction factor is established through the dating of known-age shellfish collected prior to atmospheric bomb testing.[5] Clark's excavations at Ulong have led him to believe that marine shell dates might not require a significant ΔR correction factor (2004:30), while Fitzpatrick (2002) has suggested that the local effects might be in the magnitude of –200 or –300 yr based on the disparity between an early shell date and associated metal tools. Masse's recent comparison of his revised marine shell ^{14}C dates with the new archaeological data tentatively suggest a ΔR of –200 to –300 yr (Masse et al., forthcoming).

Five sites have assays on stratigraphically contemporaneous charcoal/shell pairs: a ~170-cm-thick midden in Uchularois Cave (Masse 1989),[6] deposits on Ulong Beach (Clark and Wright 2003; Clark 2004, forthcoming), the Chelechol ra Orrak and Omis Cave Yapese stone money quarries (Fitzpatrick 2002, 2003b), and the ~150-cm-thick Roischemiangel midden (Beardsley 1997). None of

[5]Though it is possible that ΔR values will be variable between islands in the Palauan archipelago due to differences in ocean currents and upwellings (S Fitzpatrick, personal communication, 2005), one study found that equatorial waters exhibit a roughly uniform ^{14}C enrichment (as compared with higher latitudes) due to geostrophic upwelling (Quay et al. 1983). The determination of a Palauan ΔR value is further complicated by decadal temperature fluctuations in the Pacific Ocean which have caused a decrease in upwelling of about 25% in an equatorial strip between 9°N and 9°S since the 1970s (McPhaden and Zhang 2002).

[6]The Uchularois Cave midden was excavated by depths below surface rather than natural strata due to the uniformity of the soil in the feature (Masse 1989).

the excavations aimed to match pairs for dating, and various site interpretations are made for vertical movement of the samples because of loose midden and coarse sediment, impacts by tidal action or storm waves, and stratigraphic disturbance due to burial activities and the quarrying of stone money. Taking the potential lack of a secure cultural context into consideration, by applying no ΔR value 9 of the 10 contemporaneous sets assessed as valid or possibly valid produce consistent dates.

The shellfish taxon used as datable material should be the primary component of midden assemblages, in order to reduce error from variations in molluscan feeding behavior and habitat effect (see Hogg et al. 1998). Calculated by relative abundance (MNI), the dominant mollusks found as food refuse in those Peleliu and Rock Island middens analyzed south of Babeldaob are *Strombus gibberulus* and *Atactodea striata* (Carucci 1992; Osborne 1979). Two Rock Island midden assemblages between Babeldaob and Koror show higher MNIs of Tellinacea and *Anadara* spp., though by weight one assemblage is dominated by Tridacnidae (Fitzpatrick 2003a).[7] These taxa are deposit feeders commonly inhabiting sandy intertidal beaches; shallow, protected sand flats; and murky lagoon embayments. A potential exclusion from the dating pool is some members of the *Tridacna* spp., which is found in Palau's coastal sites. This taxon is long-lived, sometimes fossilized, as a tool material is often recycled, and can become an heirloom to be passed down for many generations (Masse 1989:334).[8]

Bone

The suite of Palau ^{14}C dates includes 16 derived from bone (1 fish and 15 human). Bone assays rely primarily on the degree of diagenesis, as a poorly preserved sample will not produce an accurate date regardless of the chemical fraction dated or the purity of that fraction (Stafford et al. 1991; Hedges and van Klinken 1992; van Klinken 1999). Generally on Babeldaob, the acidic sediments produce high rates of degradation to datable material, but some proveniences have produced datable bone. Ten bone samples were collected from sand deposits in limestone caves (Fitzpatrick 2003b), three upon limestone in a cave (Reith and Liston 2001), and three from beach deposits (Titchenal et al. 1998; Ikehara, forthcoming.). Of these samples, 14 were dated at Stafford Research Lab, Inc. and the University of Arizona AMS facility, laboratories whose chemical pretreatment protocols are ranked as highly reliable (Stafford et al. 1991).

It is unnecessary to discard determinations due to the inability to separate diagenetic and indigenous carbonate in the inorganic bone matrix (as done by Phear et al. 2003:256), because ^{14}C assays derive from organic (collagen) rather than inorganic bone carbon. Furthermore, the absorption of calcium carbonate from the surrounding matrix—in this case, beaches and limestone caves—by inorganic bone carbon does not impact the ^{14}C dates on the collagen (T W Stafford, personal communication, 2004). Humic acid, which along with fulvic acid is the predominate contaminate, is not a factor when samples are collected from deep limestone caves, the small entrances of which do not allow the intrusion of organics, as is the case with the Ngermereues Ridge burial cave (Reith and Liston 2001).

Exploitation of littoral and marine resources for dietary protein introduces the ocean reservoir effect into human bone collagen. The relative lack of indigenous terrestrial vertebrates (Pregill and Steadman 2000); an abundance of easily accessible marine resources in the large, shallow lagoon; and the dietary habits recorded in ethnographic accounts (Keate 1788; McCluer 1792) are strong indicators

[7]Variations in midden assemblages have been attributed to the ready accessibility of different marine habitats (O'Day 1999) and cultural differences in dietary or technological preferences (Fitzpatrick 2003a:121).

[8]Tridacna can live for 8 to 200 yr depending on the species. The clams form seasonal growth bands in their shells, making it possible to age sections of dead shells (Delbeek and Sprung 1994).

of a subsistence strategy dependent on seafood[9] for protein—perhaps in the range of ≥70%.[10] Faunal analysis of midden from the Rock Islands (Osborne 1979; Masse 1989; Carucci 1992; Fitzpatrick 2003a) and from Babeldaob (O'Day 1999) record deposits composed almost exclusively of marine organisms. However, analysis of Rock Island middens may not accurately reflect the entirety of indigenous dietary habits, as land/sea birds, bats, lizards, or other terrestrial vertebrates were not as common as on Babeldaob and could be easily overexploited. An accurate reconstruction of prehistoric subsistence based on faunal analysis is difficult due to the scarcity of Babeldaob middens. Stable isotope analysis will thus need to complement faunal analysis to establish the relative importance of marine and terrestrial protein in the prehistoric diet (Lanting and van der Plicht 1998; Richards and Hedges 1999). The weighted average of the 10 available prehistoric Palauan values for $\delta^{13}C$ (–15.7‰) is only slightly higher than the suggested end-point values of –12‰ and –13.2‰ (Hobson and Collier 1984; Quinn 1990) for purely marine protein consumers in the Pacific. Once Palau's ΔR value is established, dietary reconstruction becomes crucial to obtaining valid bone assays.

Pottery

Twenty-one pottery assays are included in the Palau ^{14}C suite (Osborne 1979; Beardsley and Basilius 2002; S K Wickler, personal communication, 2004). Dating of pottery is undeniably problematic, as indicated by Masse (1984, 1989) and Osborne (1979), due to the presence of old carbon in grog-tempered sherds. Additionally, Phear et al. (2003:261) suggest that assays might be skewed due to "preserved plant remains in clays collected from swamp or slump deposits." A recent study by Anderson et al. (2005) compares paired samples of charcoal and pottery assays. Until the dating issues are resolved, all ^{14}C age determinations from pottery are eliminated from the dating pool.

Charcoal

^{14}C assays on carbonized wood number 266 with an additional six on pottery residue. The majority of the charcoal samples are taxonomically identified ($n = 134$), 41 are determined to be woody taxa unidentifiable to species[11] and the remaining 91 simply recognized as "charcoal." Identification of carbonized remains to taxon determines fitness for ^{14}C dating by reducing the error caused by long-lived taxa, eliminating historical introductions or foreign driftwood, and ensuring fossil fuels are removed from the sample.[12] Microscopic analysis can also differentiate anaerobically blackened wood from charcoal (G M Murakami, personal communication, 2004). As information on the longevity of taxa native to Palau is sparse, one of the better choices for ^{14}C assays is the short-lived coconut endocarp (*Cocos nucifera*).

Taxonomic identification of wood samples provides another level of credibility to ^{14}C assays by identifying species excavated from non-endemic habitats. Presence of a taxon in a non-native environment strongly suggests the anthropogenic origin of the sample. For example, *Rhizophora* spp. and *Bruguiera* spp. only grow in mangrove forests along the shore and *Cocos nucifera* is endemic

[9]The consumption of seabirds and shorebirds who feed on marine organisms contributes to the percent of marine protein found in collagen.

[10]For prehistoric Marianas populations, Ambrose et al. (1997) suggest that fish and shellfish comprised 20–50% of the protein source.

[11]This includes bark, charred plant tissue, and seed kernels.

[12]Minor deposits of lignite are interbedded with Airai clay and found in scattered patches on west and south Babeldaob (Corwin et al. 1956:53, 259).

to the sandy back beach,[13] but carbonized samples of these are found in upland deposits, indicating human intervention.

Small-scale excavations in Palauan earthworks often do not encounter cultural horizons or in situ features. In several of these cases, charcoal fragments scattered across a single stratum were combined in order to obtain a sample large enough to date the deposit. This dispersed sample will not affect the assay's standard error range but would expand the potential for error due to such factors as long-lived taxa and contamination. Furthermore, these samples do not date a specific point in time but are relative to the surrounding strata. In this context, the dispersed charcoal dates could provide meaningful data, but when taken in conjunction with the other complicating factors, they are not considered reliable unless collected in a single small-scale feature or if accompanied by other mitigating factors.

STRATIGRAPHIC AND CULTURAL CONTEXT

Once material suitability has been determined, sample context must be considered in assessing the validity of ^{14}C assays. Accepted as credible are samples originating from a discrete archaeological feature or forming tight, stratigraphically correct series. This universal protocol is technically sound but requires careful consideration in regard to the local site formation processes of Palau. Geologic, climatic, and anthropogenic events heavily impact primary site deposits in Palau. Identifying the origin of stratigraphic units and the relationship of associated cultural material is the key to dating Palauan archaeological sites.

On the Rock Islands site, disturbance occurs from storm waves, tidal action, downward infiltration of cultural material through the coarse sediment, and bioturbation. Masse (1989:288) found it "obvious that surface artifacts do not necessarily (if at all) represent the actual living surfaces of the original sites." He attributes the mixing of archaeological material to tree roots, crab scavenging, pig or rat disturbance, and megapodes constructing large mounds. Palau, just below the Pacific typhoon corridor, is directly hit or substantially impacted about every quarter of a century. The resulting storm waves are of such magnitude as to wash out, mix, and redeposit foreshore and reef flat environments far inland. In these highly disturbed deposits, artifacts from several cultural horizons can form what appear to be primary cultural deposits. Disturbances to Rock Island sites also occur as a result of engineering efforts related to Yapese stone money production and probably burial activities (Fitzpatrick 2002, 2003a).

Without the benefit of deeply penetrating primary forest roots, Babeldaob's clayey sediments are prone to slope-wash in the heavy tropical rains. Dramatic erosional episodes probably first occurred during land clearing for dryland agriculture[14] and again during subsequent earthwork construction and maintenance. Downslope soil displacement resulting from this destabilization of the terrain washed away some sites, deeply covered others, and produced substantial sedimentation of the shoreline. Less than 20% of Babeldaob's coast is sandy beach, with the remainder being mangrove forests that proliferated as a result of this sedimentation. Some of the natural vertical movement of cultural material on Babeldaob is the result of the shrinking and subsequent cracking open of these dense clays in drought conditions. Scavenging by wild boars, rats, and domesticated pigs also results in site disturbance. Disturbed deposits in caves are attributed to their use as Yapese stone money

[13] It is possible, but highly unlikely, that a coconut tree could be naturally transplanted on a hilltop through a long sequence of nuts falling and regenerating upslope.

[14] With a dramatic erosional event, it can safely be assumed there was a cultural event upslope. Natural erosion can of course occur but it will not be so severe.

quarries (Fitzpatrick 2002) and as World War II Japanese defensive positions, storage areas, or hide-outs (Clark and Wright 2003; Pregill and Steadman 2000).

Site Formation Processes: Earthworks

Two types of monumental archaeological remains dominate Babeldaob: a sculpted landscape and large stonework villages. The immense earthworks, forming complexes of crowns, wide gullies, deep ditches, and varied forms of step-terraces, are found scattered across the landscape, on ridge-lines and hills, across savannahs, and in dense forest. Their patterning is suggestive of their functioning as a means to define distinct areas of property, create defensible terrain, and to form symbols of individual chiefly or polity power (Liston 1999:412; Liston and Tuggle, forthcoming). More mundane functions for individual terraces within a complex include agriculture, habitation, and ceremonial and burial grounds. It is probable that a contemporaneous and integrated system of terrace functions was in effect from the onset of their construction, although their long duration of use suggests functional roles evolving to suit the needs of the changing communities (Liston and Tuggle 1998; Liston 1999). Earthworks cover about 20% of the island, with their impact on the landscape perhaps double that due to the intensive erosion resulting from their construction.

Palauan earthworks are created by complex cut-and-fill techniques. Within an overall architectural plan that relies on both the topography and the ultimate function of the feature, construction requires the procurement of fill material from near the site. Each donor site has its own depositional history, potentially including cultural horizons. These occupational surface(s) can be stripped off during construction episodes and redeposited to create seemingly primary cultural strata or be buried in intentional fill or erosional material. Ascertaining what event an assay is actually dating is dependent on careful stratigraphic analysis and interpretation of site formation processes in this heavily altered landscape. Redeposited layers are not always clearly recognizable, especially the heavily mottled units that are easily misinterpreted as basal saprolite. Combined fill and erosional material, as observed by the author, can be from 2 to 30 distinct strata, each ranging in thickness from ~20 cm to a meter.

Determining chronologies for the monumental earthworks is difficult due to: 1) construction methods that produced a complicated depositional history; 2) episodic maintenance or additions to the original structure; 3) the sheer size of the earthworks, creating a daunting task for archaeological excavation; and 4) multifunctional and functionally evolving components requiring extensive rather than localized investigation of even a single complex for accurate interpretation. Dating is based, where possible, on assays derived from features associated with the various occupational surfaces. Features representing ultimate use are often buried by slope-wash or aeolian deposits, unrecognizable due to weathering of the early stone architecture, or actually a byproduct of continued activity in the area not associated with the terraces themselves. Creating a timeline for the construction and use of the earthworks, and for prior cultural activity on the landscape, requires integrating ^{14}C assays originating from secondary depositional units with securely dated features.

A chronology for terrace construction is established by the ^{14}C dating of several fill episodes, avoiding the assumption that greater depth equals older age. As datable material collected in a secondary context must derive from an event prior to its deposition, charcoal from a fill or erosional stratum gives a *terminus ante quem* for that layer since it could not have been deposited before that date. This same assay does not provide a *terminus post quem* for the stratum since the layers below are from various donor sites or in situ deposits of lesser or greater antiquity. Additionally, strata above the single assay might be younger or older. Therefore, dating of several fill or erosional episodes tightens the construction chronology considerably, with the youngest assay in the sequence providing the last period of terrace (re)construction and the oldest assay indicating anthropogenic activity in the area whether or not associated with the earthworks. Since a thick erosional deposit is probably anthropogenically induced, a ^{14}C date from the deposit indicates upslope cultural activities possibly related to deforestization or earthwork construction. Identification of the charcoal sample to a taxon foreign to the local habitat confirms human presence. However, in establishing construction chronologies it is irrelevant whether the charcoal samples are associated with cultural material, or even cultural in origin, since they are producing relative rather than specific ^{14}C age determinations.

DISCUSSION

A meaningful depiction of Palauan prehistory can only be developed when all the environmental zones, site types, and regions are adequately represented in the suite of ^{14}C assays. Each reveals temporal and spatial aspects in the transformations of Palau's settlement patterns, subsistence practices, and social organization. Despite the large quantity of reliable Palauan ^{14}C determinations, examination and comparison of their provenience disclose the relative inadequacy of the sample size in most of the regions and some ecozones and site types. The majority of Palau's assays are from areas of Babeldaob where cultural resource management regulations required archaeological research prior to construction projects. These investigations, specifically work on the Compact Road, provided a rare opportunity to sample a wide distribution of site types broadly dispersed throughout Palau. ^{14}C assays concluded to be valid are listed by site type and environmental zone in Table 1 and by region in Table 2.

Table 1 Palauan ^{14}C dates assessed as valid, listed by site type, number of sites (in parentheses), and environmental zone.[a]

Environmental zones	Stonework village	Earthwork complex	Earthworks with stonework	Island midden/cave	Other	Total
Peleliu/Angaur	—	—	—	12 (2)	2 (1)	14 (3)
Rock Islands	10 (4)	—	—	46 (5)	—	56 (9)
Southwest Islands	5 (3)	—	—	—	—	5 (3)
Coastline (Babeldaob)	33 (6)	—	—	—	5 (2)	38 (8)
Lowlands	23 (4)	51 (11)	4 (4)	—	—	78 (19)
Uplands	—	8 (2)	37 (7)	—	1 (1)	46 (10)

[a]The list does not include all the Palauan site types but only those with valid ^{14}C determinations.

Containing over 50% of the valid dates ($n = 128$) and almost 50% of the number of sites ($n = 25$), the data set is heavily weighted in the Ngaraard and Rock Island regions.[15] Ten of the 15 regions are each represented by less than 9 ^{14}C dates, five of those having none or only one. Almost a third of the assays are from stonework village sites, with the remainder fairly evenly distributed across the earthwork complex, earthwork with stonework, and Rock Island or Peleliu midden and cave site types. It is evident that many locales either not in the path of the Compact Road or specifically targeted for academic research require further investigations to attain a suitably representative data set.

The coastal zone encompasses Babeldaob's 157-km-long shoreline, 125 km of which is mangrove forests. Once largely sandy beach, Babeldaob's coastal margin with its abundant resources is more

[15]On Babeldaob, the regions are equivalent to Palau's modern political states, once traditional districts, which are largely environmentally definable by mountain ridges and drainages. Palau's islands are divided into 4 categories due to the great expanse of ocean separating the Southwest Islands from the others and the biological and geological differences between the Rock Islands, Peleliu, Angaur, and Kayangel.

Table 2 Palauan ^{14}C dates assessed as valid in archaeological sites listed by region.

Region	Nr of assays (nr of sites)
Aimeliik	4 (1)
Airai	1 (1)
Kayangel	0
Koror	6 (3)
Melekeok	9 (2)
Ngaraard	72 (16)
Ngarchelong	3 (3)
Ngardmau	0
Ngaremlengui	0
Ngatpang	40 (4)
Ngchesar	1 (1)
Ngiwal	26 (6)
Peleliu/Angaur	14 (3)
Rock islands	56 (9)
Southwest islands	5 (3)
Total	**237 (52)**

suitable for habitation than the Rock Islands and was the location of initial Palauan settlement. Stonework villages are commonly located in the coastal zone behind a protective band of mangrove forest. All but three of the assays from this ecozone originate inland of the mangroves, not from back beach or shoreline deposits, while the earliest ^{14}C determinations are derived from deposits underlying the stonework villages[16] at Eoulbeluu (cal AD 70–390, WK-5938) and Ngerdubech (cal AD 1–250, WK-6466), the latter date being only potentially valid. The lack of early dates from Babeldaob's coastal zone is not surprising as evidence of these sites is difficult to locate due to an initially small population, sea-level change, progradation, sedimentation resulting in mangrove growth, and deterioration of bone and shell. Cultural properties found behind the sandy coastal plains in Melekeok, Ngiwal, Ngaraard, and Ngarchelong are not represented by ^{14}C age determinations. Shorelines of large, deep inlets that can provide a wide range of resources and protection from encroaching storm waves and attacks by adversarial villages have a high probability of containing early sites.[17] Only a focused area of stonework villages in Ngeremeduu Bay and a Rock Island inside Airai Bay has been investigated.

A third of Palau's valid ^{14}C assays are from the lowlands, a strip of land between the coastal zone and the base of the interior ridges. Circling the majority of Babeldaob, this zone is composed of low, gently rolling hills often covered in savanna and is the location of most of the monumental earthworks. Though the ecozone and site type are well represented in the dating pool, regions within the zone are not. Of the 78 ^{14}C determinations from the lowlands, 59 of them originate in Ngatpang, Ngaraard, and Ngiwal. Aimeliik and Ngaremlengui (with two of the largest earthwork and village complexes on Babeldaob), Ngardmau, and the Badrulchau region of Ngarchelong have been minimally tested. Eighteen assays are from villages represented by early stone architecture found associated with some earthworks. Seven crown sites, 5 sets of step-terraces, and 3 earthwork complexes are represented in the lowland earthwork assays. There are few assays from the broad, low step-ter-

[16]These early dates are not associated with the stonework structures and indicate occupation of the area prior to the development of stonework villages (Liston 1999).

[17]These include Ngemai, Ngerchemiangl, Ngeremeduu, and Airai bays, particularly the latter two.

race sites such as those found along Airai's east coast. The diverse types of earthworks require additional investigations in the various regions.

All 46 of the ^{14}C determinations from the upland ridge systems, which extend the length of Babeldaob, are concentrated along the narrow neck of the island in Ngaraard. These dates are only from sites in the northern half of this ~4.5-km-long monumental earthwork complex, which is composed of crowns, various forms of step-terraces, ditches, gullies, earth platforms, and early stone architecture. The earliest date recorded thus far in Palau, 1520–1260 cal BC (WK-13974), is from an upland deposit. An anthropogenic origin of the carbonized sample of *Cynometra ramiflora* is indicated by its presence in a non-endemic habitat. This ecozone, the least investigated of the 3 Babeldaob zones, contains previously unrecorded earthwork sites, early stone architecture, dense artifact scatters, and ridgeline trail systems.

As a region and an environmental zone, the Rock Islands are well represented in Palau's suite of ^{14}C assays, a reflection of both the number of investigations conducted there and the superior quality of preservation in sand and cave deposits. These islands were originally sites for fishing parties, burial grounds, temporary camps, and other short-term activities, although their use later expanded to encompass permanent habitation sites. Some of Palau's earliest ^{14}C assays have been unearthed at Chelechol ra Orrak (1000–830 cal BC, OS-33568) and Ulong Island (950–350 cal BC, ANU-11933).

Kayangel has no ^{14}C dates assessed as valid. Several large storms have sent waves completely across the narrow islands that encompass the atoll and it may be difficult to locate undisturbed deposits. Both archaeological sites excavated in Peleliu are shell middens and the one in Angaur is a habitation site. As in Kayangel, intact prehistoric cultural deposits are likely intermittent, as Angaur was heavily mined for phosphate and both islands were occupied by Allied forces in World War II, with Peleliu being home to one of the major battles of the Pacific. The 5 Southwest Island dates are from a cultural deposit, earth-oven refuse, and an earth platform mound, all associated with village habitation.

Palau's 237 reliable ^{14}C dates are considerably more than found in most Micronesian islands and much can be proposed about colonization, settlement patterns, and cultural change. However, to encompass the entire span of prehistory in Palau's chronological models, to ensure its meaningfulness the dating pool needs to be augmented by assays originating outside of Ngaraard's upland earthwork complex, the stonework villages of Ngatpang, and the Ngiwal ridgeline. Sites in Aimeliik, Airai, Melekeok, Ngarchelong, Ngardmau, and Ngchesar, particularly those found along the coast and inner bays and the upland ridge system as well as the massive earthwork and village complexes should be investigated. Additional ^{14}C determinations are needed from Babeldaob and Rock Island stonework villages, as despite the large quantity of assays from these sites, only 17, or 7%, of potentially over 235 villages[18] have been tested. Grant-funded research, not limited to work inside construction parcels, has the freedom to enlarge the corpus of dates from specific areas that have not been adequately investigated. Despite the need for a broader range of ^{14}C dates, this study has provided a solid foundation on which colonization and cultural chronologies for Palau can be developed.

Temporal horizon markers, independent of ^{14}C dates, serve as a reference point for dating. Architectural types—large earthwork complexes and early stone architecture, both prior to stonework villages—provide only a basic temporal horizon marker in Palauan prehistory. While previous studies

[18]In 1910, Krämer (1919) counted 235 stonework villages on Babeldaob and Koror, including 151 that had been abandoned.

(Osborne 1966; Snyder 1989) were unable to establish a chronometric timeline for ceramic styles, enough data are now available to develop such a model (Clark 2004, forthcoming; Desilets et al. 1999; Liston, forthcoming a, b). Until there is a reliable and comprehensive ceramic sequence, Palauan chronologies must rely almost solely on ^{14}C dates as reference points, a "system of data generation that is inherently flawed by a lack of meaningful checks" (Tuggle and Tuggle 1997:74). The establishment of a relative ceramic chronology to serve as an independent temporal horizon marker is essential for continued archaeological work in Palau.

ACKNOWLEDGMENTS

This paper is based largely on research carried out by International Archaeological Research Institute, Inc. for the US Army Corps of Engineers, Pacific Ocean Division, as part of the historic preservation actions associated with the construction of the Compact Road in the Republic of Palau, from 1996 through 2004. For the opportunity to carry out this work, I am indebted to Chuck Streck of the US Army Corps of Engineers, to Vicky Kanai (Chief) and Rita Olsudong (Senior Archaeologist) at the Palau Bureau of Arts and Culture, and to the people of Palau. For permission to include ^{14}C determinations that are not yet published, I thank Atholl Anderson, Geoff Clark, Scott Fitzpatrick, Sarah Phear, Steve Wickler, and Duncan Wright. I am grateful to Tom Dye, Fiona Petchey, Emma Power, Tim Rieth, and Dave Tuggle for their valuable assistance and helpful comments on this paper and to Scott Fitzpatrick for providing his detailed and careful review of the manuscript. I am greatly indebted to all the field and lab archaeologists who worked on the Compact Road project over the years. Although many contributed to the research, the mistakes, interpretations, and conclusions presented in this manuscript are those of the author.

REFERENCES

Addison DJ. 1997. Survey Area D report. In: Wickler SK, Welch DJ, Tomonari-Tuggle MJ, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase I. Volume II: area survey reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 435–550.

Ambrose SH, Butler BM, Hanson DB, Hunter-Anderson RL, Krueger HW. 1997. Stable isotopic analysis of human diet in the Marianas archipelago, western Pacific. *American Journal of Physical Anthropology* 104:343–61.

Anderson AJ. 1991. The chronology of colonization in New Zealand. *Antiquity* 65:767–95.

Anderson AJ, Chappell G, Clark G, Phear S. 2005. Comparative radiocarbon dating of pottery and charcoal samples from Babeldaob Island, Republic of Palau. *Radiocarbon* 47(1):1–9.

Athens JS. 1986. Archaeological investigations at Tarague Beach, Guam [report prepared for Base Civil Engineering, Anderson Air Force Base, Guam]. Honolulu: International Archaeological Research Institute, Inc.

Athens JS, Ward JV. 2001. Paleoenvironmental evidence for early human settlement in Palau: the Ngerchau core. In: Stevenson CM, Morin FJ, editors. *Pacific 2000: Proceedings of the Fifth International Conference on Easter Island and the Pacific*. Los Osos: Easter Island Foundation. p 165–78.

Athens JS, Ward JV. 2002. Holocene paleoenvironmental investigations on Ngerekebesang, Koror, South Babeldaob, and Peleliu islands, Palau [report prepared for Palau National Communications Corporation, Palau]. Honolulu: International Archaeological Research Institute, Inc.

Athens JS, Ward JV. 2005. Palau Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, phase I: intensive archaeological survey. Volume IV: Holocene paleoenvironment and landscape change [report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Beardsley FR. 1996. Fragments of paradise: archaeological investigations in the Republic of Palau, Palau rural water system survey and testing [report prepared for Winzler and Kelly, Consulting Engineers, Palau]. Honolulu: International Archaeological Research Institute, Inc.

Beardsley FR. 1997. Fishponds, taro patches and shell middens: archaeological investigations on Peleliu, Republic of Palau, data recovery and monitoring for the Palau rural water system program [report prepared for Winzler and Kelly, Consulting Engineers, Palau]. Honolulu: International Archaeological Research Institute, Inc.

Beardsley FR. Forthcoming. Archaeological monitoring for the Palau National Communication Corporation: Airai and Koror, Republic of Palau [draft report prepared for Palau National Communications Corporation]. Honolulu: International Archaeological Research Institute, Inc.

Beardsley FR, Basilius U. 2002. Sengall Ridge, Belau: burials, spirit walks, and painted pottery. *Indio-Pacific Prehistory Association Bulletin: Melaka Papers* 6(22):147–51.

Butler BM. 1985. New radiocarbon dates from Palau. *The Outrigger: Newsletter of Micronesian Archaeology* 4(2):2–3. Carbondale: Southern Illinois University.

Carucci J. 1992. Cultural and natural patterning in prehistoric marine foodshell from Palau, Micronesia [PhD dissertation]. Carbondale: Southern Illinois University.

Clark G. 2004. Radiocarbon dates from the Ulong site in Palau and implications for western Micronesian prehistory. *Archaeology in Oceania* 39:26–33.

Clark G. Forthcoming. A 3000-year culture sequence from Palau, western Micronesia. *Archaeology in Oceania.*

Clark G, Wright D. 2002. Report on excavations at Angaur and Ulong, Republic of Palau [typescript]. Palau Bureau of Arts and Culture Library.

Clark G, Wright D. 2003. The colonization of Palau: preliminary results from Angaur and Ulong. In: Sand C, editor. *Pacific Archaeology: Assessments and Prospects*. Les Cahiers de l'Archéologie en Nouvelle-Calédonie 15. Nouméa: Musee de Nouvelle-Calédonie. p 85–94.

Clark G, Wright D. Forthcoming. On the periphery? Archaeological investigations at Ngelong, Angaur Island, Palau. *Micronesica.*

Corwin CG, Rogers CL, Elmquist PO. 1956. Military geology of Palau Islands, Caroline Islands [military report]. Intelligence Division, Office of the Engineer. Headquarters US Army Forces Far East.

Delbeek JC, Sprung J. 1994. *The Reef Aquarium: Volume One*. Coconut Grove, Florida, USA: Ricordea Publishing.

Desilets M, Liston J, Tuggle HD. 1999. Ceramic analysis. In: Tomanari-Tuggle MJ, Tuggle HD, Liston J, Welch DJ, editors. Archaeological data recovery for the Compact Road, Babeldaob Island, Republic of Palau. Volume V: lab analysis, synthesis, and recommendations [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 181–230.

Dye TS. 1997. Survey Area A report. In: Wickler SK, Welch DJ, Tomonari-Tuggle MJ, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase I. Volume II: area survey reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 19–98.

Fitzpatrick SM. 2002. A radiocarbon chronology of Yapese stone money quarries in Palau. *Micronesica* 34(2):227–42.

Fitzpatrick SM. 2003a. Shellfish assemblages from two limestone quarries in the Palau Islands. *Journal of Ethnobiology* 23(1):101–23.

Fitzpatrick SM. 2003b. Early human burials in the western Pacific: evidence for a c. 3000-year-old occupation on Palau. *Antiquity* 77(298):719–31.

Fitzpatrick SM, Boyle JE. 2002. The antiquity of pearl shell (*Pinctada* sp.) burial artifacts in Palau, western Micronesia. *Radiocarbon* 44(3):691–9.

Hayakawa S. 1979. Archaeological investigation of PAKR-3 in the Palaus. In: Kusakabe F, editor. *Cultural Anthropological Research on the Folk Culture in the Western Caroline Islands of Micronesia in 1977*. Tokyo: Tokyo University of Foreign Studies. p 73–8.

Hedges REM, van Klinken GJ. 1992. A review of current approaches in the pretreatment of bone for radiocarbon dating by AMS. *Radiocarbon* 34(3):279–91.

Henry JD, Haun AE, Kirkendall MA. 1996. Archaeological mitigation program: Palau rural water system projects in Chol and Ngkeklau villages, Ngaraard State, Republic of Palau [draft report prepared for Monterey Mechanical]. Hilo, Hawai'i: Paul H Rosendahl, PhD, Inc.

Hobson KA, Collier S. 1984. Marine and terrestrial protein in Australian aboriginal diets. *Current Anthropology* 25:238–40.

Hogg AG, Higham TFG, Dahm J. 1998. Radiocarbon dating of modern marine and estuarine shellfish. *Radiocarbon* 40(2):975–84.

Hunter-Anderson RL. 1992. Archaeological investigations in the Southwest Islands of Palau (Tobi, Merir, Pulo Ano, Sonsorol, Fana) [prepared for the Republic of Palau via The Nature Conservancy, Pacific Region]. Micronesian Archaeological Research Services, Guam.

Intoh M, Ono R. 2004. Reconnaissance archaeological research on Tobi Island, Hatohobei State, Palau [report prepared for Palau National Historic Preservation Office].

Ito M, Ono M, Nakamura T. 1997. Preliminary report on excavation and radiocarbon dating of ked in Palau (Part 1). Summaries of research using AMS at Nagoya University (VIII-March 1997). Nagoya: Dating and Materials Research Center, Nagoya University.

Ito M, Ono M, Nalamura T. 1998. Preliminary report on excavation and radiocarbon dating of ked in Palau (Part 8). Summaries of research using AMS at Nagoya University (IX-March 1998). Nagoya: Dating and Materials Research Center, Nagoya University.

Ikehara R. Forthcoming. Ngiwal human burials. In: Liston J, editor. Archaeological testing and monitoring for the Palau National Communication Corporation: Angaur, Babeldaob, Kayangel, and Peleliu, Republic of Palau [draft report prepared for Palau National Communications Corporation]. Honolulu: International Archaeological Research Institute, Inc.

Kaschko MW. 1997. Survey Area C report. In: Wickler SK, Welch DJ, Tomonari-Tuggle MJ, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase I. Volume II: area survey reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 329–434.

Kaschko MW. 1998a. Ngaraard site reports. In: Liston J, Tuggle HD, Tomanari-Tuggle MJ, Desilets M, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume I: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 134–50.

Kaschko MW. 1998b. Ngiwal site reports. In: Liston J, Desilets M, Tuggle HD, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume II: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 25–110.

Keate G. 1788. *An Account of the Pelew Islands, Situated in the Western Part of the Pacific Ocean, Composed from the Journals and Communications of Captain Henry Wilson, and Some of His Officers, Who, in August 1783, Were There Shipwrecked, in* The Antelope, *A Packet Belonging to the Honourable East India Company*. London: G Nicol.

Krämer A. 1919. Palau ethnography. In: Thilenius G, editor. Ergebnisse der Südsee-Expedition 1908–1910. II. Ethnographie; B. Mikronesien. Band 3, Teilband 2. Friederichsen, Hamburg [typescript]. Human Relations Area File typescript, translated by Anonymous.

Lanting JN, van der Plicht J. 1998. Reservoir effects and apparent ¹⁴C ages. *The Journal of Irish Archaeology* IX:151–65.

Liston J. 1998. Ngatpang site reports. In: Liston J, Desilets M, Tuggle HD, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume II: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 111–22, 237–53.

Liston J. 1999. Archaeological data recovery for the Compact Road, Babeldaob Island, Republic of Palau. Volume V: lab analysis, synthesis, and recommendations [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Liston J. Forthcoming a. Palau Compact Road, archaeological investigations, Babeldaob Island, Republic of Palau. Phase III: archaeological monitoring. Volume X: field reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Liston J. Forthcoming b. Palau Compact Road, archaeological investigations, Babeldaob Island, Republic of Palau. Phase III: archaeological monitoring. Volume XI: laboratory analysis and comprehensive project synthesis [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Liston J, Kaschko MW, Welch DW. 1998. Archaeological inventory survey of the capital relocation site, Melekeok, Republic of Palau [report prepared for Architects Hawaii, Inc]. Honolulu: International Archaeological Research Institute, Inc.

Liston J, Tuggle HD. 1998. The terraces of Palau: new information on function and age. Paper presented at the 63rd Meeting of the Society for American Archaeology, Seattle, Washington, 25–29 March 1998.

Liston J, Tuggle HD. Forthcoming. Prehistoric warfare in Palau. In: Arkush E, Allen MW, editors. *Archaeology of Warfare: Prehistories of Raiding and Conquest*. Gainesville: University Press of Florida.

Lucking LJ. 1984. An archaeological investigation of prehistoric Palauan terraces [PhD dissertation]. Minneapolis: University of Minnesota.

Magnuson CM, Liston J. 1998. Archaeological inventory survey, Palau Peninsula resort, Ngerekebesang Island, Koror, Republic of Palau [draft report prepared for Haas and Haynie, South San Francisco, California]. Honolulu: International Archaeological Research Institute, Inc.

Mangieri TM. 1998a. Ngaraard site reports. In: Liston J, Tuggle HD, Tomanari-Tuggle MJ, Desilets M, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume I: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 212–314.

Mangieri TM. 1998b. Ngatpang site reports. In: Liston J, Desilets M, Tuggle HD, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume II: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 163–236.

Mangieri TM. Forthcoming. Ngaraard site reports. Palau Compact Road, archaeological investigations, Babeldaob Island, Republic of Palau. Phase III: archaeological monitoring. Volume IX: emergency data recovery [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Masse WB. 1984. Radiocarbon dating in the Palau Islands, Micronesia [typescript]. Carbondale: Center for Archaeological Investigations, Southern Illinois University.

Masse WB. 1989. The archaeology and ecology of fishing in the Beleu Islands, Micronesia [PhD dissertation]. Carbondale: Southern Illinois University.

Masse WB. 1990. Radiocarbon dating, sea-level change, and the peopling of Belau. In: Hunter-Anderson R, editor. *Micronesica Supplement* 2:213–30.

Masse WB, Snyder D. 1982. The final report of the 1981 field season of the Southern Illinois University Palau archaeological project [report prepared for Historic Preservation Office, US Trust Territory of the Pacific Islands, Saipan]. Carbondale: Center for Archaeological Investigations, Southern Illinois University.

Masse WB, Liston J, Carucci J, Athens JS. Forthcoming. Evaluating the effects of climate change on environment, resource depletion, and culture in the Palau Islands between AD 1200 and 1600. *Quaternary International.*

McCluer J. 1792. Voyage to the Pelew Islands in the H C *Snow Panther* [typescript]. Palau Museum (typescript 1974).

McPhaden MJ, Zhang D. 2002. Slowdown of the meridional overturning circulation in the upper Pacific Ocean. *Nature* 415(7):603–8.

O'Day S. 1999. Invertebrate faunal remains. In: Liston J, editor. Archaeological data recovery for the Compact Road, Babeldaob Island, Republic of Palau. Volume V: lab analysis, synthesis, and recommendations. [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 115–25.

Olmo RK. 1998. Archaeological research of the terrace site for the concrete plant in Ngersung area, Ngerusar, Airai State, Republic of Palau [report prepared for Surangel & Sons Co., Palau]. Honolulu: International Archaeological Research Institute, Inc.

Osborne D. 1966. *The Archaeology of the Palau Islands, An Intensive Survey.* BP Bishop Museum Bulletin 230. Honolulu: Bishop Museum Press. 494 p.

Osborne D. 1979. Archaeological test excavations, Palau Islands, 1968–1969. *Micronesia Supplement 1.*

Pantaleo J. 2000. Archaeological data recovery procedures for the proposed Palau capital relocation project, phase I-A, Ngerulmud Hill, Melekeok State, Republic of Palau [draft report prepared for Palau Capital Improvements Project Office, Division of Public Works, Palau]. Honolulu: Jeffrey Pantaleo Consultants, LLC.

Phear S. 2003. Painted pottery in Palau: new evidence challenges past interpretations [WWW document]. *Antiquity* Project Gallery 7(296). URL: <http://antiquity.ac.uk/ProjGall/phear/phear.html>. Accessed 17 May 2004.

Phear S. 2004. The monumental earthworks of Palau, Micronesia: a landscape perspective [PhD dissertation]. Canberra: Australia National University.

Phear S, Clark G, Anderson A. 2003. A radiocarbon chronology of Palau. In: Sand C, editor. *Pacific Archaeology: Assessments and Prospects*. Les Cahiers de l'Archéologie en Nouvelle-Calédonie 15. Nouméa: Musee de Nouvelle-Calédonie. p 255–63.

Pregill GK, Steadman DW. 2000. Fossil vertebrates from Palau, Micronesia: a resource assessment. *Micronesica* 33(1/2):137–52.

Quay PD, Stuiver M, Broecker WS. 1983. Upwelling rates for the equatorial Pacific Ocean derived from the bomb ^{14}C distribution. *Journal of Marine Research* 41:769–92.

Quinn CJ. 1990. Stable isotopes and diet: indications of the marine and terrestrial components in the diets of prehistoric populations from New Zealand and the Pacific [MA thesis]. Dunedin: University of Otago.

Reimer PJ, Reimer R. 2004. Marine reservoir correction database [WWW document]. URL: <http://calib.org/marine/>. Accessed 11 June 2004.

Richards MP, Hedges REM. 1999. Stable isotope evidence for similarities in the types of marine foods used by late Mesolithic humans at sites along the Atlantic coast of Europe. *Journal of Archaeological Science* 26:717–22.

Rieth TM, Liston J. 2001. Archaeological data recovery at Ngermereues Ridge, Ngesaol, Koror, Republic of Palau [report prepared for Winzler and Kelly, Consulting Engineers, Palau]. Honolulu: International Archaeological Research Institute, Inc.

Snyder D. 1983. Archaeological surveys in Ngardmau and Ngchesar, Republic of Palau [typescript]. Carbondale: Center for Archaeological Investigations, Southern Illinois University.

Snyder D. 1989. Towards chronometric models for Palauan prehistory: ceramic attributes [PhD dissertation]. Carbondale: Southern Illinois University.

Spriggs M, Anderson A. 1993. Late colonization of east Polynesia. *Antiquity* 67(255):200–17.

Stafford TW Jr, Hare PE, Currie L, Jull AJT, Donahue DJ. 1991. Accelerator radiocarbon dating at the molecular level. *Journal of Archaeological Science* 18: 35–72.

Stuiver M, Reimer PJ. 1993. Extended ^{14}C database and revised CALIB 3.0 ^{14}C age calibration. *Radiocarbon* 28(2B):1022–30.

Stuiver M, Reimer PJ, Bard E, Beck JW, Burr GS, Hughen KA, Kromer B, McCormac G, van der Plicht J, Spurk M. 1998. IntCal98 radiocarbon age calibration, 24,000–0 cal BP. *Radiocarbon* 40(3):1041–83.

Takayama J. 1979. Archaeological investigations of

PATT-2 in the Palaus: an interim report. In: Kusakabe F, editor. *Cultural Anthropological Research on the Folk Culture in the Western Caroline Islands of Micronesia in 1977*. Tokyo: Tokyo University of Foreign Studies. p 81–103.

Takayama J, Intoh M, Takasugi H. 1980. The brief archaeological survey on Kayangel and Angaur, in the Palaus. *Pacific Archaeological Survey Report VII*. Nara City: Tezukayama University.

Titchenal P, Drolet R, Pantaleo J. 1998. Ngiwal: archaeological data recovery and monitoring in a rural village on Babeldaob in the Republic of Palau [draft report prepared for Palau Capital Improvements Projects Office, Division of Public Works, Palau]. Honolulu: Garcia and Associates.

Tuggle HD. 1998a. Ngaraard site reports. In: Liston J, Tuggle HD, Tomanari-Tuggle MJ, Desilets M, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume I: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 81–129, 150–97, 314–424.

Tuggle HD. 1998b. Ngatpang site reports. In: Liston J, Desilets M, Tuggle HD, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase II. Volume II: fieldwork reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 126–46.

Tuggle HD. Forthcoming. Palau Compact Road, archaeological investigations, Babeldaob Island, Republic of Palau. Phase III: archaeological monitoring. Volume IX: emergency data recovery [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Tuggle HD, Tomonari-Tuggle MJ. 1997. Synthesis of cultural resource studies of the Ewa Plain. Task 1a: archaeological research services for the proposed cleanup, disposal, and reuse of Naval Air Station Barbers Point, Oahu, Hawaii [report prepared for Belt Collins Hawaii]. Honolulu: International Archaeological Research Institute, Inc.

van Klinken GJ. 1999. Bone collagen quality indicators for paleodietary and radiocarbon measurement. *Journal of Archaeological Science* 26:687–95.

Wickler SK. 1997. Survey Area B report. In: Wickler SK, Welch DJ, Tomonari-Tuggle MJ, editors. Compact Road archaeological investigations, Babeldaob Island, Republic of Palau, historic preservation investigations phase I. Volume II: area survey reports [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc. p 99–328.

Wickler SK, Welch DJ, Tomonari-Tuggle MJ, Liston J, Tuggle HD. 1998. Intensive archaeological survey for the Palau Compact Road, Babeldaob Island, Republic of Palau, historic preservation investigations phase I. Volume I: scope, background, results, evaluation, and recommendation [draft report prepared for US Army Corps of Engineers, Pacific Ocean Division]. Honolulu: International Archaeological Research Institute, Inc.

Wickler SK. 2001. Preliminary field report: Palau 2000 Project, Babeldaob, Republic of Palau [typescript on file with the author]. Tromsø: Tromsø University Museum, Norway, and The Centre for Archaeological Research at the Australian National University Canberra.

Appendix A Eliminated Palauan cultural dates.

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
AA-40958*[b]	Omis Cave, OR-1:35, TU1, II, (0-20)	*Chlamys* sp.	1.8	2379 ± 39	1.2	160 BC–AD 50	Fitzpatrick 2002	E & H - highly disturbed from Yapese stone money quarrying, samples potentially (re)deposited by tidal action/storm waves - cave at sea level and TU ~2.5 m inland from edge of "area partially filled in during high tides," cultural association ambiguous; all 4 BC dates on shell were of 7 charcoal dates, all modern/post-bomb/historic except 1 at AD 410–610
AA-40959*	Omis Cave, OR-1:35, TU1, I, (20–30)	charcoal	0.5	96 ± 37	–25.2	AD 1800–1960 (67.0%), AD 1670–1760 (28.4%)	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958; potential post-bomb date
AA-40960*	Omis Cave, OR-1:35, TU1, III, (20–30)	charcoal	0.8	1559 ± 45	–25.6	AD 410–610	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958
AA-40961*	Omis Cave, OR-1:35, TU1, III, (20–30)	Cardiidae	15.3	2398 ± 39	2.1	170 BC–AD 30	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958
AA-40962*	Omis Cave, OR-1:35, TU2, II, (20–30)	Strombidae	12.8	2519 ± 40	3.3	350–130 BC	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958
AA-40963*	Omis Cave, OR-1:35, TU2, III, (30–40)	charcoal	0.6	147 ± 36	–26.2	AD 1660–1890 (79.0%), AD 1910–1960 (16.4%)	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958; potential post-bomb date
AA-40964*	Omis Cave, OR-1:35, TU2, IV, (50–60)	*Anadara* sp.	7.0	616 ± 37	2.2	AD 1630–1810	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958
AA-40965*	Omis Cave, OR-1:35, TU3, I, (20–30)	charcoal	2.7	Post-bomb	–26.7	Modern	Fitzpatrick 2002	A
AA-40966*	Omis Cave, OR-1:35, TU3, II, (30–40)	charcoal	0.6	202 ± 37	–26.6	AD 1720–1820 (52.5%), AD 1640–1700 (26.3%)	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958
AA-40967*	Omis Cave, OR-1:35, TU3, II, (60–70)	charcoal	0.6	46 ± 58	–27.6	AD 1800... (69.1%), AD 1670–1760 (26.3%)	Fitzpatrick 2002	E & H - refer to comments on Sample AA-40958; potential post-bomb date
AA-40968*	Omis Cave, OR-1:35, ST1	*Tridacna* sp.	7.3	Post-bomb	1.9	Modern	Fitzpatrick 2002	A
AA-40976	Omis Cave-upper, OR-1:35, surface	*Lambis* sp.	13.2	1420 ± 46	2.2	AD 880–1070	Fitzpatrick, pers. comm.	E & H - refer to comments on Sample AA-40958; J; 1000-yr-old date from surface on shell

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
AA-40977	Omis Cave, OR-1:35, surface	Lucinidae	12.2	480 ± 37	3.8	AD 1795... (84.7%), AD 1720–1790 (10.7%)	Fitzpatrick, pers. comm.	E & H - refer to comments on Sample AA-40958; sample from surface; potential post-bomb date; J
AA-43053*	Chelechol ra Orrak, IR-1:23, TP1, VIII, (80–90)	human bone	0.3	3860 ± 360	–17.1	3000–1000 BC	Fitzpatrick 2003b	C; B - "statistical outlier"
AA-43055*	Chelechol ra Orrak, IR-1:23, TP2, I, (10–20)	charcoal	0.9	916 ± 36	–27.1	AD 1020–1210	Fitzpatrick, pers. comm.	D - sandy deposits subject to vertical movement but unclear what date represents; E
AA-43056*	Chelechol ra Orrak, IR-1:23, TP2, IV, (20–30)	charcoal	1.1	122 ± 34	–26.5	AD 1800–1960 (60.3%), AD 1670–1780 (35.1%)	Fitzpatrick, pers. comm.	Potential post-bomb; D - sandy deposits subject to vertical movement but unclear what date represents; G - with only other assay in deposit
AA-43057*	Chelechol ra Orrak, IR-1:23, TP2, V, (40–50)	*Conus pulicari*	3.3	2128 ± 42	2.51	AD 130–350	Fitzpatrick, pers. comm.	D - sandy deposits subject to vertical movement but unclear what date represents; E
AA-43059*	Chelechol ra Orrak, IR-1:23, TP3, I, (0–10)	charcoal	2.2	Post-bomb	–26.1	Modern	Fitzpatrick, pers. comm.	A
ANU-11404	Iuang/Mengloi village area, IR-5:7/8, East Rock Overhang, ST4, (55–65)	unident. shell	—	2260 ± 70	–0.3 ± 2.0	80 BC–AD 260	Phear et al. 2003	E - sample recovered from shovel test - lack of stratigraphic control
ANU-11405 B-1.1	Ngerdubech village, NT-3:9a, Pit 1, TP2, (70–80), (TR9)	pottery	—	2880 ± 130	–25.9 ± 0.2	1400–800 BC	SK Wickler, pers. comm.	G - with date on same sample soluble fraction (ANU-11405 B-1.2); I
ANU-11405 B-1.2*	Ngerdubech village, NT-3:9a, Pit 1, TP2, (70–80) (TR9)	pottery	—	1230 ± 10	–25.9 ± 0.2	AD 760–880 (74.0%), AD 710–750 (20.2%)	SK Wickler, pers. comm.	G - with date on same sample insoluble fraction (ANU-11405 B-1.1); I
ANU-11406 B-1.1	Ngerdubech village, NT-3:9a, Pit 1, TP2, (80–90), (TR9)	pottery	—	5120 ± 140	–26.0 ± 0.2	4250–3600 BC	SK Wickler, pers. comm.	A; G - with date on same sample soluble fraction (ANU-11406 B-1.2); I
ANU-11406 B-1.2*	Ngerdubech village, NT-3:9a, Pit 1, TP2, (80–90), (TR9)	pottery	—	3610 ± 10	–26.0 ± 0.2	2030–1910 BC	SK Wickler, pers. comm.	G - with date on same sample insoluble fraction (ANU-11406 B-1.1); I
ANU-11407 B-1.1	Ngerdubech village, NT-3:9a, Pit 1, TP1, (60–70), (TP3 and TR8)	pottery	—	9630 ± 260	–26.9 ± 0.2	10,000–8200 BC	SK Wickler, pers. comm.	A; G - with date on same sample soluble fraction (ANU-11407 B-1.2); I

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
ANU-11407 B-1.2*	Ngerdubech village, NT-3:9a, Pit 1, TP1, (60–70), (TP3 and TR8)	pottery	—	6230 ± 10	–26.9 ± 0.2	5290–5200 BC (49.5%), 5180–5140 BC (27.6%), 5120–5070 BC (18.2%)	SK Wickler, pers. comm.	A; G - with date on same sample insoluble fraction (ANU-11407 B-1.1); I
ANU-11408 B-1.1	Earthworks, NT-3:10, TP1, Spit 10, (160–170)	pottery	—	10,870 ± 190	–26.5 ± 0.2	11,500–10,200 BC	SK Wickler, pers. comm.	A; G - with date on same sample soluble fraction (ANU-11408 B-1.2); I
ANU-11408 B-1.2*	Earthworks, NT-3:10, TP1, Spit 10, (160–170)	pottery	—	7450 ± 10	–26.5 ± 0.2	6390–6230 BC	SK Wickler, pers. comm.	A; G - with date on same sample insoluble fraction (ANU-11408 B-1.1); I
ANU-11582 A.1	Rois terraces, NA-4:6, TR4	pottery	—	13,260 ± 190	–26.4 ± 0.2 estimated	14,700–12,900 BC	SK Wickler, pers. comm.	A; C; I
ANU-11582 A.2	Rois terraces, NA-4:6, TR4	pottery	—	13,300 ± 200	–24.0 ± 2.0	14,800–12,900 BC	SK Wickler, pers. comm.	A; C; I
ANU-11583 A	Rois terraces, NA-4:6, TR4	pottery	—	15,240 ± 290	–28.1 ± 0.1	17,200–15,400 BC	SK Wickler, pers. comm.	A; C; I
ANU-11611	Toi Meduu, NA-4:12, TR5, VII	charcoal	—	1500 ± 190	–28.9 ± 0.2	AD 100–1000	Phear et al. 2003	C
ANU-11641-1*	Ngemeduu, NA-4:11, TR1, VI	charcoal	—	540 ± 40	–24.0 ± 2.0 estimated	AD 1380–1450 (60.3%), AD 1300–1370 (35.1%)	SK Wickler, pers. comm.	B - sample contamination
ANU-11641-2*	Ngemeduu, NA-4:11, TR1, VI	charcoal	—	1960 ± 40	–24.0 ± 2.0 estimated	50 BC–AD 130	SK Wickler, pers. comm.	B - sample contamination
ANU-11658	Ngemeduu, NA-4:11, TR1a, VIII	charcoal	—	1510 ± 200	–24.0 ± 2.0 estimated	AD 50–1000	Phear 2003	C
ANU-11659	Ngemeduu, NA-4:11, TR1i, Posthole 2	charcoal	—	1770 ± 210	–24.0 ± 2.0	400 BC–AD 700	Phear et al. 2003	C
ANU-11762*	Ulong, OR-15:5, TU1, V, (150–160)	pot residue	—	4330 ± 90	–26.8 ± 0.2	3350–2650 BC	Clark 2004	B - "lab contamination"
ANU-11763*	Ulong, OR-15:5, TU3, V, (150–160)	charcoal	—	3450 ± 130	–26.7 ± 0.2	2150–1400 BC	Clark 2004	B - "lab contamination"
ANU-11765*	Ulong, OR-15:5, TU3, IV, (120–130)	pot residue	—	3150 ± 90	–24.0 ± 0.2	1700–1100 BC	Clark 2004	B - "lab contamination"

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
ANU-11766	**Ulong[c], OR-15:5, TU3, V, (210–220)	Lambis Lambis	—	3200 ± 50	2.3 ± 0.2	1200–900 BC	Clark and Wright 2003	E & H - sample potentially redeposited by tidal action/storm waves as is in "intertidal zone"; "sherd edges exhibiting minor to substantial rounding" Clark 2004:28, cultural association ambiguous; substantial mixing of material evident as correlates with 2 of 5 dates in 2 layers above (+130 cm); L - with 2 shell dates of same deposit
ANU-11792*	Ulong, OR-15:5, TU3, IV, (120–130)	charcoal	—	3790 ± 80	–24.0 ± 2.0 estimated	2470–2020 BC (94.1%), 2000–1970 BC (1.3%)	Clark, forth.	B - "lab contamination"
ANU-11836*	Ngemeduu, NA-4:11, TR1i, Fea. 1, (111)	charcoal	—	2640 ± 310	–24.0 ± 2.0 estimated	1600 BC–AD 1	SK Wickler, pers. comm.	C
ANU-11837*	Earthworks, NT-3:10, TP1, Spit 10, (160–170)	charcoal	—	2060 ± 210	–17.6 ± 2.0 estimated	800 BC–AD 500	SK Wickler, pers. comm.	C
ANU-11838	Earthworks w/stonework, NA-1i, A1, I-II, (20–40)	charcoal	—	Modern	–24.0 ± 2.0 estimated	Modern	SK Wickler, pers. comm.	A
ANU-11855	Ngerdubech village, NT-3:9a, Pit 1, TP2, (20–30), (TR9)	charcoal	—	99.6 ± 1.1	–24.0 ± 2.0 estimated	Modern	SK Wickler, pers. comm.	A
ANU-11910*	Ulong, OR-15:5, TU1, V, (150–160)	pot residue	—	2450 ± 200	–24.0 ± 2.0 estimated	1050–1 BC	Clark, forth.	C
ANU-11930*	**Ulong, OR-15:5, TU3, II, (70–80)	charcoal	—	1790 ± 190	–24.0 ± 2.0 estimated	200 BC–AD 650	Clark, forth.	G - does not corroborate with 3 others of same deposit or any others at site; large 2-σ range
ANU-11931*	Ulong, OR-15:5, TU1, V, (150–160)	pot residue	—	2330 ± 180	–24.0 ± 2.0 estimated	850 BC–AD 50	Clark 2004	C; duplicate sample sent to different lab (OZG-274)
ANU-11934	**Ulong, OR-15:5, TU3, V, (210–220)	*Tridacna* sp.	—	3100 ± 60	0 ± 2.0 estimated	1070–790 BC	Clark 2004	E & H - sample potentially redeposited by tidal action/storm waves as is in "intertidal zone," "sherd edges exhibiting minor to substantial rounding" Clark 2004:28, cultural association ambiguous; I - date on potential long-lived, heirloom taxon; L - with pot residue 3 shell dates of same deposit, substantial mixing of material evident as correlates with all 5 dates in 2 layers above (+130 cm)

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-8090	Second Tmachel village, NC-1:1, TP5, (20–22)	charcoal	—	380 ± 220	1.76	AD 1250–2000	Snyder 1983; Masse 1989	Potential modern/post-bomb date; large 2-σ range; possible erosional material
B-54789	Sonsorol, Faremau, SU-3:1:13, ST2, II, (40–42)	charcoal	—	110 ± 60	—	AD 1670–1960	Hunter-Anderson 1992	E - sample recovered from a shovel test - lack of stratigraphic control; potential post-bomb date
B-59470	Fana, SU-2:1, ST3, III, (80–100)	*Spondylus* sp.	—	870 ± 70	+1.8 0/00	AD 1330–1610	Hunter-Anderson, pers. comm. 2005	E - sample recovered from a shovel test at 80–100 cmbs - lack of stratigraphic control
B-81508	Roischemiangel, BE-2:7, TU, IV	charcoal	—	140 ± 80	–26.3	AD 1640–1960	Beardsley 1996	B - "historic intrusion"; G - with 11 of 12 site dates; N; potential post-bomb date
B-92157	Earthworks, NA-1:4, EU2, II/1, (10–20)	charcoal	—	320 ± 90	–27.2	AD 1400–1850 (92.9%), AD 1900–1950 (2.5%)	Henry et al. 1996	D - EUs 1, 2, and 4 same deposits and no indication of earthwork construction; potential post-bomb date
B-92158	Earthworks, NA-1:4, EU4, II/5, (160)	charcoal	—	620 ± 30	–26	AD 1290–1410	Henry et al. 1996	D - EUs 1, 2, and 4 same deposits and no indication of earthwork construction; stratigraphy and cultural associations unclear as EU descended to 100 cmbs but sample collected at 160 cmbs
B-92159	Earthworks, NA-1:4, EU1, II/6, (50–60)	charcoal	—	1010 ± 40	–26.5	AD 960–1070 (69.3%), AD 1080–1160 (23.5%), AD 900–920 (2.6%)	Henry et al. 1996	D - EUs 1, 2, and 4 same deposits and no indication of earthwork construction; G - all site dates from L.II; H - bullet in matrix
B-100008*	Stonework, IM-5:5, Fea. 2, TP1, III/3 (20–30)	*Cocos nucifera*, *Garcinia* sp., +14 other taxa	1.46	1350 ± 70	–27.2	AD 540–870	Dye 1997	F
B-100018*	Ngetcherong village, NA-4:4, Fea. 73, TP1, I/7, (58–69)	*Rhizophora* sp., +3 other taxa	0.64	1780 ± 70	–26.0	AD 80–420	Addison 1997	G - with any of 10 other charcoal dates at site; F; O
B-100020*	Ngerchemlil village, NA-2:8, Profile, V, (100–180)	*Rhizophora* sp., *C. nucifera*, +1 other taxon	3.19	730 ± 70	–25.5	AD 1160–1410	Addison 1997	E; F

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-100022*	Earthworks w/stone-work, NA-1i, Fea. 1, TP1, II/5, (48–58)	*C. nucifera*, *Bruguiera gymnorhiza*, Musa, +11 other taxa	0.75	170 ± 60	–27.4	AD 1640–1960	Kaschko 1997	Potential post-bomb date; B - "stratification in this site is unusual, and may have been subject to disturbance...contamination seems quite possible"; E; F - scattered charcoal from erosional deposit; G
B-100023*	Eoulbeluu, NA-1:10, TP1, IIb/9, (90–100)	not large enough to be studied	0.03	2500 ± 70	–27.2	800–410 BC	Kaschko 1997	G - unidentified, very small sample collected from screen with 2 charcoal dates; same deposit producing later date
B-143445	Omis Cave, OR-1:35, TU2, III, (30–40)	*H. hippopus* (juvenile)	51.5	2550 ± 70	–2.3	400–80 BC	Fitzpatrick 2002	E & H - Highly disturbed from Yapese stone money quarrying, samples potentially (re)deposited by tidal action/storm waves - cave at sea level and TU ~2.5 m inland from edge of "area partially filled in during high tides, "cultural association ambiguous; all 4 BC dates on shell were of 7 charcoal dates, all modern/post-bomb/historic except 1 at AD 410–610
B-143446	Omis Cave, OR-1:35, TU2, IV, (40–50)	charcoal	1.4	100.63 ± 1.12	–25.0	Modern	Fitzpatrick 2002	A
CAMS-25800*	Sengall Ridge, OR-1:18, --	"charred organic" in potsherd	—	2630 ± 60	—	930–750 BC (78%), 700–540 BC (17.4%)	Beardsley and Basilius 2002	I
DIC-2068	Ngerullak village, IR-2:11, Fea. 3	charcoal	—	Modern	—	Modern	Masse 1989	A
DIC-2528	Ngeruluobel village, IR-3:2, EU19S-18E, (22)	charcoal	—	200 ± 70	—	AD 1620–1960 (89.0%), AD 1520–1590 (6.4%)	Masse and Snyder 1982; Masse 1989	B - "charcoal not related to a specific event," "could be intrusive"; potential post-bomb date
DIC-2533	Ngeburch village, ME-6:1, Fea. 15, EU-72S/22W, (10–15)	unident. burned seeds or nuts	—	3330 ± 85	—	1780–1420 BC (91.6%), 1880–1840 BC (2.8%)	Masse and Snyder 1982; Masse 1989	B - "statistical outlier"
I-11-953	Earthworks, IM-6:1, TP1, (40–50)	charcoal	—	1230 ± 220	—	AD 400–1300	Lucking 1984	C
I-11-957	Uluang village, NM-2:2, TP2, (7–10)	charcoal "dispersed sample"	—	285 ± 75	—	AD 1400–1950	Lucking 1984	F; potential post-bomb date

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
I-11-959	Uluang village, NM-2:2, TP2, (15–20)	charcoal	—	430 ± 75	—	AD 1390–1650	Lucking 1984	H - sample taken in area of "frog caves" where unit closed at 20 cmbs due to disturbance
N-3113	Ngerengchol Beach, OR-14:1, TP8, V	Arcidae	—	1010 ± 60	2.00 ± 2.0 estimated	AD 1280–1450	Takayama 1979; Masse, pers. comm., 2005	E - deposit of fine white sand starting at 60 cmbs, "units on beach where ca. AD 1420–1650 storm surges removed beach then reformed…" Masse 1989:335
N-3114	Ngerengchol Beach, OR-14:1, TP12, VI, (170)	*Tridacna* sp.	—	555 ± 75	2.45 ± 2.0 estimated	AD 1645…	Takayama 1979; Masse, pers. comm., 2005	Potential post-bomb date; E - natural/storm deposit - light grayish white sand, branch corals, few artifacts present are waterworn; I - date on potential long-lived, heirloom taxon
N-3282	Roischemiangel, BE-2:7, TP1, II	*Tridacna* sp.	—	480 ± 75	2.45 ± 2.0 estimated	AD 1700…	Takayama in Masse 1989; Masse, pers. comm., 2005	G - with 11 of 12 site dates - possibly due to date on potential long-lived, heirloom taxon; N; potential post-bomb date
N-3285	Ngerengchol Beach, OR-14:1, TP7, III, (128)	*Tridacna* sp.	—	1030 ± 75	2.45 ± 2.0 estimated	AD 1230–1460	Takayama 1979; Masse, pers. comm., 2005	E - deposit of fine white sand, "units on beach where ca. AD 1420–1650 storm surges removed beach then reformed…" Masse 1989:335; I - date on potential long-lived, heirloom taxon
N-3286	Ngerengchol Beach, OR-14:1, TP7, IV, (140)	*Tridacna* sp.	—	1070 ± 75	2.45 ± 2.0 estimated	AD 1190–1440	Takayama 1979; Masse, pers. comm., 2005	E - deposit of fine white sand, branch corals, "units on beach where ca. AD 1420–1650 storm surges removed beach then reformed..." Masse 1989: 335; I - date on potential long-lived, heirloom taxon
N-3287	Ngerengchol Beach, OR-14:1, TP10, II, (75)	*Tridacna* sp.	—	350 ± 65	2.45 ± 2.0 estimated	AD 1800…	Takayama 1979; Masse, pers. comm., 2005	Potential post-bomb date; E - deposit of "white coarse sand; H - crab burrows, possible storm surges; I - date on potential long-lived, heirloom taxon
N-3288	Ngerengchol Beach, OR-14:1, TP10, III, (103)	*Tridacna* sp.	—	355 ± 80	2.45 ± 2.0 estimated	AD 1800... (89.8%), AD 1750–1790 (4.8%), AD 1720–1740 (1.8%)	Takayama 1979; Masse, pers. comm., 2005	Potential post-bomb date; E - natural/storm deposit of "white coarse sand"; I - date on potential long-lived, heirloom taxon; same assay at 2 layers below (+30 cm)

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
N-3289	Ngerengchol Beach, OR-14:1, TP10, V, (130)	*Lambis* sp.	—	420 ± 80	2.00 ± 2.0 estimated	AD 1720... (10.1%)	Takayama 1979; Masse, pers. comm., 2005	Potential post-bomb date; E - natural/storm deposit-layer of "white course sand," artifacts are waterworn; same assay as 2 layers above (–30 cm)
N-3290	Ngidech Beach, OR-14:2, TP5, I	*Tridacna* sp. (burned)	—	2170 ± 85	2.45 ± 2.0 estimated	AD 1–410	Takayama in Masse 1989; Masse, pers. comm., 2005	D - "a fossil beach shell...collected and used by the more recent occupants" Masse 1990:220; I - date on potential long-lived, heirloom taxon; J
N-3307	Ngermid village, OR-1:1, TU1, III, (30–35)	*Tridacna* sp.	—	195 ± 70	2.45 ± 2.0 estimated	AD 1850…	Hayakawa 1979; Masse, pers. comm., 2005	Potential post-bomb date; I - date on potential long-lived, heirloom taxon
N-3369	Ngardimes village, NH-1:1, Fea. 20, TP3, II, (30–60)	"marine snails and bivalves"	—	1450 ± 65	2.00 ± 2.0 estimated	AD 790–1070	Takayama et al. 1980; Masse, pers. comm., 2005	E - storm event, associated with "numerous branch corals"
N-3370	Ngardimes village, NH-1:1, Fea. 20, TP3, IV, (100–120)	*Tridacna* sp. (young)	—	1860 ± 70	2.45 ± 2.0 estimated	AD 400–680	Takayama et al. 1980; Masse, pers. comm., 2005	E - storm event, associated with "sparse water-worn small sherds"
NZ-6247	Ikulauol, OR-17:8, EU1, (0–10)	*Strombus gibberulus* (composite)	—	1020 ± 40	4.00 ± 0.03	AD 1300–1420	Masse 1989; pers. comm., 2005	H - WWII, historic gardening
NZ-6291	Mariar village, OR-15:1, Fea. 3, EU4, (60–70)	*Tridacna crocea*	—	2260 ± 40	2.52 ± 0.02	20 BC–AD 190	Masse 1989; pers. comm., 2005	B - "attempting to date the formation of the Shioya sand beach deposit" Masse 1990:220; E - collected in "pre-cultural deposits"
NZ-6311	Mariar village, OR-15:1, EU6, (40–50)	*Tridacna squamosa*	—	648 ± 35	2.37 ± 0.07	AD 1560–1710	Masse 1989; pers. comm., 2005	B - "expected...to be non-cultural in origin, thus dating some aspect of beach formation" Masse 1990:328; E - sand coarse and compact, not in cultural horizon; I - date on potentially long-lived, heirloom taxon
UCLA-1762F	Ked ra Ikirong terraces, NC-3:1, TP4, II/3	charcoal	—	800 ± 80	—	AD 1030–1310 (93.6%)	Osborne 1979	B - "tree burn in unit and recent burn in area"; "tree roots"
UCLA-1762G	Melekeok village terraces, ME-2:1, Coconut grove, II, (12–36)	charcoal "combined sample"	—	1055 ± 80	—	AD 770–1170	Osborne 1979	F - "combined sample" from a ~40–60-cm-thick midden eroded from above
UCLA-1762K	Badrulchau, NE-4:4, TR by monolith, II	*Barringtonia asiatica*	—	285 ± 80	—	AD 1400–1950	Osborne 1979	B - due to stratigraphy problems; F; J; M - though dispersed sample?

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
UCLA-1855	Ngermengot, NE-9:7, Slope, II/3	pottery	—	5710 ± 400	—	5500–3700 BC	Osborne 1979	A; B; C; I
UCLA-1855B	Melekeok village terraces, ME-2:1, M, Face, II	pottery	—	4300 ± 400	—	4000–1800 BC	Osborne 1979	B; C; I
UCLA-1855BB	Badrulchau, NE-4:4, Alter, Strat-I	pottery	—	1840 ± 400	—	800 BC–AD 1000	Osborne 1979	B; C; I
UCLA-1855FF	Badrulchau, NE-4:4, Platform, Strat-I	pottery	—	6250 ± 400	—	6000–4300 BC	Osborne 1979	A; B; C; I
UCLA-1855H	Ulong, OR-15:5, Wall Strat-2	pottery	—	1420 ± 400	—	400 BC–AD 1400	Osborne 1979	B; C; I
UCLA-1855I	Ulong, OR-15:5, Wall Strat-2	pottery	—	4630 ± 400	—	4400–2200 BC	Osborne 1979	A; B; C; I
UCLA-1855J	Ulong, OR-15:5, Wall Strat-2	pottery	—	3070 ± 400	—	2500–200 BC	Osborne 1979	B; C; I
UCLA-1855K	Ulong, OR-15:5, F-E, Layer 8, 9	pottery	—	3780 ± 400	—	3400–1200 BC	Osborne 1979	B; C; I
UCLA-1855Q	Melekeok village terraces, ME-2:1, G, Face, II	pottery	—	2575 ± 400	—	1700 BC–AD 300	Osborne 1979	B; C; I
WK-5894	Ngerdubech village, NT-3:9a, Fea. 5, TU1, I/2, (18–20)	1 taxon unident. woody species	6.73	Modern	–25.4 ± 0.2	Modern	Mangieri 1998b	A
WK-5895*	Ngerdubech village, NT-3:9a, Fea. 5, TU1, II/2, (30–40)	*C. nucifera* nutshell	0.21	Modern	–24.0 ± 0.2	Modern	Mangieri 1998b	A
WK-5896*	Ngerdubech village, NT-3:9a, Fea. 39, TR4, II, SFea. 7 (40)	1 taxon unident. woody species	1.14	Modern	–26.5 ± 0.2	Modern	Mangieri 1998b	A
WK-5900*	Ngerdubech village, NT-3:9a, Fea. 4, TU2, Facing 1, VI/2, (114–122)	1 taxon unident. woody species	0.08	9240 ± 68	–26.6 ± 0.2	8630–8280 BC	Mangieri 1998b	A
WK-5904*	Ngerdubech village, NT-3:9a, TR8, X, (100–110), (TP3 and Pit 1-TP1)	*C. nucifera* nutshell	0.02	2994 ± 79	–26.6 ± 0.2	1420–1000 BC	Mangieri 1998b	G - with any of the 19 other site dates; potential statistical outlier; in terrace fill layer associated with sherds
WK-5908*	Obichang earthworks, NA-5:9, TU1, I, (0–5)	Pandanus key, cf. *C. nucifera*, palm (partially charred)	1.78	Modern	–26.3 ± 0.2	Modern	Tuggle 1998a	A; F

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-5909*	Obichang earthworks, NA-5:9, Fea. 3, TU1, III, (25–35)	cf. *C. nucifera*	0.09	Modern	–29.0 ± 0.2	Modern	Tuggle 1998a	A; M
WK-5921*	Rois terraces, NA-4:6, TR2, SFea. 1, (80)	sponge spicules	15.31	910 ± 67	–16.7 ± 0.2	AD 1000–1260	Tuggle 1998a	I
WK-5923*	Ngimis village, NT-2:1, Fea. 18a, TU2b, II, (19–29)	1 taxon unident. woody species	0.26	Modern	–26.2 ± 0.2	Modern	Tuggle 1998b	A
WK-5924*	Ngimis village, NT-2:1, TR10W, Midden 1, I/1, (66 bd)	*C. nucifera* nutshell	0.14	Modern	–24.4 ± 0.2	Modern	Tuggle 1998b	A; N
WK-5927*	Earthworks w/stone-work, NI-2a, Fea. 1, TR1, SU1, III, (120–145)	1 taxon unident. woody species	0.03	852 ± 67	–24.0 ± 0.2	AD 1030–1280	Kaschko 1998b	B - "mixing of samples could have occurred"… "slope wash sediment deposition" above; G - with 12 of 13 other site dates nor any of the other 9 ridge-line dates; I - small sample size collected from screen in area disturbed by WWII defensive position
WK-5937*	Earthworks w/stone-work, NI-1:10, Fea. 5, TR1, SU1, Ib, (290–305)	seed kernel	0.07	3050 ± 73	–28.1 ± 0.2	1450–1050 BC	Kaschko 1998b	E & H - "highly worked soil" might be erosional; no associated artifacts
WK-6464*	Ngerdubech village, NT-3:9a, Fea. 39, TR4, III, (46)	1 taxon unident. woody species	0.87	Modern	–24.9 ± 0.2	Modern	Mangieri 1998b	A
WK-6465*	Ngerdubech village, NT-3:9a, Fea. 5, TU1, II/3, (40–50)	1 taxon unident. woody species, possibly *Cerbera* sp.	0.13	Modern	–24.8 ± 0.2	Modern	Mangieri 1998b	A
WK-8109*	Ngirboktereng village /earthworks, NM-4:7, Fea. 4, SFea. 2 (28)	*C. nucifera* nutshell	0.49	35,110 ± 390	–22.6 ± 0.2	>10,000	Mangieri, forth.	A
WK-13961*	Earthworks w/stone-work, NI-2a, TR5, V, (36)	*Pandanus* sp.	0.15	986 ± 45	–24.7 ± 0.2	AD 970–1180	Liston, forth.	B - "statistical outlier"; G - with 12 of 13 other site dates nor any of the other 9 ridgeline dates
WK-13969*	Earthworks, NT-3:10, Profile 3, SFea. 4, IIs, (210)	*Ficus* sp.	1.17	855 ± 42	–24.7 ± 0.2	AD 1110–1280 (78.7%), AD 1030–1100 (16.7%)	Liston, forth.	B - "statistical outlier," does not correspond with 14 others from site or two from associated SFea.

Appendix A Eliminated Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-14146*	Traditional cultural deposits/stonework, NA-2b, Profile 2, VII, (93)	*Pandanus* sp.	0.07	442 ± 38	–26.0 ± 0.2	AD 1400–1520 (91.5%), AD 1590–1620 (3.9%)	Liston, forth.	E - probable post-depositional disturbance due to large boulder and/or slope failure

[a] Radiocarbon dating laboratories: AA - NSF Arizona AMS Facility; ANU - ANU Radiocarbon Dating Laboratory; B - Beta Analytic, Inc.; CAMS - Lawrence Livermore National Lab; DIC - Dicarb Radioisotope Company; I - Teledyne Isotopes, Inc.; N - Japan Radioisotope Association; NZ - New Zealand Institute of Nuclear Sciences; OS - National Ocean Sciences Accelerator Mass Spectrometry Facility; OZG - Australian Nuclear Sciences and Technology Organization; SR - Stafford Research Laboratory; UCLA - Isotopes Laboratory, Institute of Planetary Geophysics and Planetary Physics, University of California; WK - Waikato Radiocarbon Dating Laboratory.

[b] * = AMS.

[c] ** = 2003 excavations at the Ulong site (OR-15:5) produced additional, yet unreported, ^{14}C assays that solve some of the stratigraphic problems associated with those recorded here (G Clark, personal communication, 2004).

Appendix B Possible Palauan cultural dates.

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
AA-43047*[b]	Chelechol ra Orrak, IR-1:23, TP1, II, (0–20)	charcoal	2.3	96 ± 33	−26.5	AD 1800–1960 (68.4%), AD 1680–1740 (27.0%)	Fitzpatrick 2003b	Potential post-bomb; K
AA-43061*	Chelechol ra Orrak, IR-1:23, TP4, X, (80–90)	human bone	1.5	3658 ± 65	−16.5	1900–1540 BC	Fitzpatrick 2003b	Human bone sample that produced an early date and is outside range of all other site dates. Questionable until confirmed.
AA-43062*	Chelechol ra Orrak, IR-1:23, TP4, X, (70-80)	human bone	1.8	3164 ± 51	−16.5	1290–990 BC	Fitzpatrick 2003b	Human bone sample that produced an early date that statistically overlaps with 1 charcoal date from same deposit and is several hundred years older than other site burials. Questionable, though potentially valid until confirmed.
AA-45888*	Ngeraus village, NC-6:1, no data	charcoal	nd	123 ± 38	−25.7	AD 1800–1960 (58.7%), AD 1670–1780 (36.7%)	Fitzpatrick, pers. comm.	Potential post-bomb date; J
AA-45889*	Ngeraus village, NC-6:1, no data	charcoal	nd	732 ± 39	−27.4	AD 1210–1310 (84.1%), AD 1350–1390 (11.3%)	Fitzpatrick, pers. comm.	J
ANU-11610*	Toi Meduu, NA-4:12, TR5, IV	charcoal	—	770 ± 20	−17.0 ± 0.2	AD 1220–1290	SK Wickler, pers. comm.	J
ANU-11685	Ngemeduu, NA-4:11, TR1a, VIII	charcoal	—	2030 ± 30	−26.2 ± 0.2	120 BC–AD 60 (94.2%), 150–130 BC (1.2%)	Phear 2003	G - with charcoal date of same deposit; O
ANU-11687*	Ngemeduu, NA-4:11, TR1a, VIII	charcoal	—	1630 ± 30	−28.7 ± 0.2	AD 380–540 (88.4%), AD 340–370 (7.0%)	Phear 2003	G - with charcoal date of same deposit; O
ANU-11767	**Ulong[c], OR-15:5, TU1, V, (150–160)	*Trochus niloticus*	—	2730 ± 60	0 ± 2.0 estimated	710–360 BC	Clark and Wright 2003	E - sample collected in "lens of unbound coral rubble in the intertidal zone" (~1.5–1.7 m depth) Clark 2004:28; H - substantial mixing of material evident as correlates with 4 of 5 dates in 2 layers above (+80 cm); L - with pot residue, charcoal & 3 shell dates of same deposit

Appendix B Possible Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
ANU-11769	**Ulong, OR-15:5, TU3, V, (150–160)	*Tridacna* sp.	—	2950 ± 50	–4.7 ± 0.2	890–660 BC	Clark 2004	E - sample collected in "lens of unbound coral rubble in the intertidal zone" (~1.5–1.7 m depth) Clark 2004:28; H - substantial mixing of material evident as correlates with all 5 dates in 2 layers above (+80 cm); I - date on potential long-lived, heirloom taxon; L - with charcoal, pot residue, & 3 shell dates of same deposit
B-8091	Ngerach, NR-2:2, TP3, (25–35)	*Strombus luhuanus*	—	110 ± 80	1.78 ± 0.62 estimated	AD 1850…	Snyder 1983; Masse 1989; pers. comm., 2005	Potential post-bomb date; N
B-54785	Merir, SU-4, Imweribungtohoh, TR, I, (102–104)	charcoal	—	60 ± 60	—	AD 1800… (66.5%), AD 1670–1780 (28.9%)	Hunter-Anderson 1992	Potential post-bomb date; N
B-100009*	Earthworks w/stonework, IR-4:5, Fea. 19, TP3, II/3, (17–25)	*B. gymnorhiza*, *C. nucifera*, +1 other taxon	1.93	250 ± 60	–29.1	AD 1470–1700 (62.4%), AD 1720–1820 (24.4%), AD 1910–1960 (6.5%), AD 1840–1880 (1.9%)	Dye 1997	F - scattered charcoal in terrace fill layer; J; M; O
B-100012	Ngimis village, NT-2:1, Fea. 1, TP3, III/5, (60)	Palm species, *B. gymnorhiza*	5.74	400 ± 40	–25.9	AD 1430–1530 (67.3%), AD 1550–1640 (28%)	Wickler 1997	F; L - with all 3 other charcoal dates at site
B-100013*	Ngermedangeb, NT-2:2, TP1, II/5, (40–50)	*B. gymnorhiza*, *Garcinia* sp., *C. nucifera*, +5 other taxa	5.5	1400 ± 70	–23.8	AD 530–780 (94.3%), AD 460–500 (1.1%)	Wickler 1997	F; L - with 1 of 6 other site dates; O
B-100014	Ngerumlol village, NT-2:5, TP2, II/3, (20–30)	unident. woody species (+5 taxa)	11.54	190 ± 30	–25.5	AD 1720–1820 (57.7%), AD 1640–1700 (21.9%), AD 1910–1960 (15.8%)	Wickler 1997	F; N; potential post-bomb date
B-100021*	Earthworks, ME-8:2, TP6, V/12, (95–105)	*C. nucifera*, +1 other taxon	0.11	1680 ± 70	–26.7	AD 210–540	Kaschko 1997	F; O; stratigraphy and cultural associations unclear

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix B Possible Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-116306	Ngersung area, IR-2:15, TRW, East Face, SFea. 1	*C. nucifera* man-grove species, *Pandanus* sp.	8.00	1840 ± 60	–25.5	AD 50–350	Olmo 1998	F; N
DIC-2067	Ngerullak village, IR-2:11, Fea. 11, (64–81)	charcoal	—	160 ± 70	—	AD 1640–1960	Masse 1989	Potential post-bomb date; collected in screen; N
GX-30426	Chelechol ra Orrak, IR-1:23, E2S1, I, (0–20)	charcoal	5.3	116 ± 0.8	–26.6	AD 1830–1890 (72.9%), AD 1690–1700 (10.3%)	Fitzpatrick, pers. comm.	J
GX-30427	Chelechol ra Orrak, IR-1:23, E2S1, IV, (40–50)	charcoal	—	960 ± 50	–26.3	AD 990–1210	Fitzpatrick, pers. comm.	J
GX-30428	Chelechol ra Orrak, IR-1:23, E3S1, Va, (30–40)	charcoal	5.8	1210 ± 60	–25.9	AD 680–980	Fitzpatrick, pers. comm.	J
N-3291	Ngidech Beach, OR-14:2, TP5, II	misc. unident. shell species	—	935 ± 85	2.00 ± 2.0 estimated	AD 1280–1550	Takayama in Masse 1989; Masse, pers. comm., 2005	J
N-3292	Ngidech Beach, OR-14:2, TP5, III	misc. unident. shell species	—	1110 ± 60	2.00 ± 2.0 estimated	AD 1280–1400	Takayama in Masse 1989; Masse, pers. comm., 2005	J
N-3293	Ngidech Beach, OR-14:2, TP6, IV	*Tridacna* sp.	—	1210 ± 85	2.45 ± 2.0 estimated	AD 1280–1550	Takayama in Masse 1989; Masse, pers. comm., 2005	J; I - date on potential long-lived, heirloom taxon
N-3368	Ngardilong village, NH-1:2, Fea. 25, TP2, I, (0–20)	"marine snails"	—	300 ± 75	2.00 ± 2.0 estimated	AD 1800…	Takayama et al. 1980; Masse, pers. comm., 2005	Potential post-bomb date
NUTA-4499	Euidelked, IM-2:6, no data	charcoal	—	480 ± 80	–28.9	AD 1300–1530 (81.2%), AD 1550–1640 (14.2%)	Ito et al. 1997	J
NUTA-4500	Euidelked, IM-2:6, no data	charcoal	—	590 ± 80	–25.8	AD 1270–1450	Ito et al. 1997	J
NUTA-5725	Euidelked, IM-2:6, no data	charcoal	—	2940 ± 100	–24.8	1450–900 BC	Ito et al. 1998	J
NUTA-5726	Euidelked, IM-2:6, no data	charcoal	—	1290 ± 80	–27.4	AD 610–900 (92.7%), AD 920–960 (2.7%)	Ito et al. 1998	J

Appendix B Possible Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
NUTA-5727	Euidelked, IM-2:6, no data	charcoal	—	800 ± 90	–28.0	AD 1020–1310 (91.6%), AD 1350–1390 (3.8%)	Ito et al. 1998	J
NUTA-5728	Euidelked, IM-2:6, no data	charcoal	—	1970 ± 80	–26.3	170 BC–AD 230	Ito et al. 1998	J
OZG-274*	**Ulong, OR-15:5, TU1, V, (150–160)	pot residue	—	2580 ± 40	–14.2	780–480 BC (84.6%), 470–410 BC (10.8%)	Clark, forth.	E - sample collected in "lens of unbound coral rubble in the intertidal zone" (~1.5–1.7 m depth) Clark 2004:28; H - substantial mixing of material evident as correlates with 4 of 5 dates in 2 layers above (+80 cm); L - with charcoal & 3 shell dates of same deposit
OZG-341*	**Ulong, OR-15:5, TU3, V, (150–160)	charcoal	—	2450 ± 40	–29.4	600–400 BC (55.2%), 770–610 BC (40.2%)	Clark, forth.	E - sample collected in "lens of unbound coral rubble in the intertidal zone" (~1.5–1.7 m depth) Clark 2004:28; H - substantial mixing of material evident as correlates with 4 of 5 dates in 2 layers above (+80 cm); L - with pot residue & 2 shell dates of same deposit
OZG-342*	**Ulong, OR-15:5, TU3, IV, (120–130)	charcoal	—	2820 ± 40	–24.9	1130–890 BC (90.0%), 880–830 BC (5.4%)	Clark, forth.	L - with both shell dates of same deposit; E & H - substantial mixing of material evident as correlates with 3 of 6 assays in layer below (–90); "might represent…displacement by wave action" Clark 2004:30
WK-5893*	Ngetcherong village, NA-4:4, Fea. 59, TR7, III, (140–155)	*C. nucifera* nutshell	0.01	1485 ± 70	–24.0 ± 2.0	AD 420–670	Mangieri 1998a	G - with any of 10 other charcoal dates at site; O
WK-5901	Ngerdubech village, NT-3:9a, TR9, IIb, (60–80), (TP2)	*C. nucifera* nutshell	1.49	280 ± 100	–25.0 ± 0.2	AD 1400–2000	Mangieri 1998b	L - with 3 dates associated SFea. and 13 same site; potential post-bomb date
WK-5912	Melii/Tund, NA-3:1, TU1b, IIb, (60–70)	*C. nucifera* nutshell	2.00	610 ± 75	–24.7 ± 0.2	AD 1270–1440	Tuggle 1998a	M; O; might be anomalous date, dependent on interpretation of construction activities

Appendix B Possible Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-5939*	Earthworks w/stonework, NA-1i, Fea. 1, SU1, II, (80–95)	cf. mangrove species	0.23	2091 ± 68	–25.0 ± 0.2	260 BC–AD 60 (85.7%), 360–280 BC (9.7%)	Kaschko 1998a	E - due to likely erosional nature of deposit; G - though other date eliminated; H - on sloped terrain, where "stratification in this site is unusual, and may have been subject to disturbance"
WK-5941*	Earthworks w/stonework, NI-1:10, Fea. 3, TR1, IIc, (110–120)	1 taxon unident. woody species	0.95	2459 ± 67	–27.3 ± 0.2	780–400 BC	Kaschko 1998b	F; K; O
WK-6062	Ngerchemai village, OR-3:1, TP1-7, Ped 1, L12, III	*Anadara* sp.	100.24	410 ± 40	0.8 ± 0.2	AD 1834…	Beardsley, forth.	J; potential post-bomb date
WK-6063	Airai village, IR-1:1, DS3, Ped 16a, D1	*Lambis* sp.	94.49	600 ± 40	1.6 ± 0.2	AD 1640–1820	Beardsley, forth.	J
WK-6064	Ngetkib village, IR-4:1, BR2, Ped 4, M1	*Anadara* sp.	100.56	520 ± 40	0.4 ± 0.2	AD 1690–1910 (88.4%), AD 1920… (7.0%)	Beardsley, forth.	J; potential post-bomb date
WK-6065	Ngerekebesang village, OR-12:6, AE3, Ped 5, L.III	*Anadara* sp.	54.70	450 ± 40	1.0 ± 0.2	AD 1801… (94.0%), AD 1762–1781 (1.4%)	Beardsley, forth.	J
WK-6066	Ngerbodel village, OR-3:5, TP1, Ped 12, G9, III	*Anadara* sp.	105.64	450 ± 40	—	AD 1801… (94.0%), AD 1762–1781 (1.4%)	Beardsley, forth.	J; potential post-bomb date
WK-6067	Koror State, TP1-15, Peds 13-1, mid, III	*Anadara* sp.	100.09	600 ± 40	1.5 ± 0.2	AD 1640–1820	Beardsley, forth.	J
WK-6068	Ngetkib village, IR-4:1, BR2, Ped 3, N1, III	*Anadara* sp.	100.09	400 ± 40	–0.4 ± 0.2	AD 1839…	Beardsley, forth.	J; potential post-bomb date
WK-6069	Iebukel village, OR-4:1, TP4-9, Ped 1, V33A, II	*Anadara* sp.	100.46	520 ± 40	1.1 ± 0.2	AD 1690–1910 (88.4%), AD 1920… (7.0%)	Beardsley, forth.	J
WK-6070	Ngerbodel village, OR-3:5, TP1-16, Ped 1, H3, III	*Anadara* sp.	100.48	490 ± 40	0.5 ± 0.2	AD 1721…	Beardsley, forth.	J; potential post-bomb date
WK-6071	Ngerusar village, IR-2:1, AR3, Ped 5, S12, III	*Anadara* sp.	100.37	550 ± 40	0.7 ± 0.2	AD 1670–1890	Beardsley, forth.	J

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix B Possible Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conv. age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-6072	Airai village, IR-1:1, DS3, Ped 16a, D1	*Anadara* sp.	100.61	440 ± 45	–0.1 ± 0.2	AD 1800... (93.2%), AD 1757–1784 (2.2%)	Beardsley, forth.	J; potential post-bomb date
WK-6073	Ngerusar village, IR-2:1, AR3, Ped 3, III	*Anadara* sp.	35.29	460 ± 45	0.5 ± 0.2	AD 1795... (87.6%), AD 1720–1790 (7.8%)	Beardsley, forth.	J; potential post-bomb date
WK-6466*	Ngerdubech village, NT-3:9a, Fea. 4, TU2, Facing 1, VI/2, (114–120)	*C. nucifera* nutshell	0.25	1897 ± 56	–24.8 ± 0.2	AD 1–250	Mangieri 1998b	G - with any of the 19 other site dates; K; O
WK-6467*	Imengel, NA-2:22, Fea. 1, TU3, III/2, (45–48)	unident. woody species (3 taxa)	0.03	2474 ± 67	–26.5 ± 0.2	790–400 BC	Tuggle 1998a	F; K
WK-8110*	Ngetcherong village, NA-4:4, Fea. 61, TU2, SFea. 2, L.III, (18)	cf. *C. nucifera* wood	1.68	340 ± 120	–26.2 ± 0.2	AD 1300–2000	Mangieri, forth.	L - with 8 of 10 other charcoal dates at site; N; potential post-bomb date
WK-8111*	Ngetcherong village, NA-4:4, Fea. 61, TU2, IV, (32)	1 taxon unident. woody species	0.69	560 ± 65	–25.8 ± 0.2	AD 1290–1450	Mangieri, forth.	I - potential problems due to lab error, Waikato feels 80% sure is correct; K; L - with 7 of 10 other charcoal dates at site; O
WK-8112*	Ngetcherong village, NA-4:4, Fea. 42, TU1, SFea. 1, (60)	cf. *Rauvolfia insularis*	2.38	360 ± 55	–26.4 ± 0.2	AD 1440–1640	Mangieri, forth.	I - potential problems due to lab error, Waikato feels 80% sure is correct; L - with 6 of 10 other charcoal dates at site; N
WK-8114*	Ngetcherong village, NA-4:4, Fea. 29, TU2, SFea. 2, (42)	*Casuarina equisetifolia*	0.22	560 ± 60	–26.5 ± 0.2	AD 1290–1440	Mangieri, forth.	I - potential problems due to lab error, Waikato feels 80% sure is correct; L - with 7 of 10 other charcoal dates at site; N

[a] Radiocarbon dating laboratories: AA - NSF Arizona AMS Facility; ANU - ANU Radiocarbon Dating Laboratory; B - Beta Analytic, Inc.; CAMS - Lawrence Livermore National Lab; DIC - Dicarb Radioisotope Company; I - Teledyne Isotopes, Inc.; N - Japan Radioisotope Association; NZ - New Zealand Institute of Nuclear Sciences; OS - National Ocean Sciences Accelerator Mass Spectrometry Facility; OZG - Australian Nuclear Sciences and Technology Organization; SR - Stafford Research Laboratory; UCLA - Isotopes Laboratory, Institute of Planetary Geophysics and Planetary Physics, University of California; WK - Waikato Radiocarbon Dating Laboratory.

[b] * = AMS.

[c] ** = 2003 excavations at the Ulong site (OR-15:5) produced additional, yet unreported, ^{14}C assays that solve some of the stratigraphic problems associated with those recorded here (G Clark, personal communication, 2004).

Appendix C Valid Palauan cultural dates.

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
AA-40957*[b]	Chelechol ra Orrak, IR-1:23, TP1, IX, (90–100)	human bone	3.0	2680 ± 40	–15.7	740–400 BC	Fitzpatrick and Boyle 2002	L - bone fragment intrusion from adjacent L.VIII where 2 dates correlate, correlates with burial activity in TP2 and TP4; K - where L.IX truncates L.VIII
AA-40969*	Metuker ra Bisech, IR-2:24, TU1, II, (20–30)	charcoal	1.7	116 ± 36	–27.6	AD 1800–1960 (61.6%), AD 1670–1780 (33.8%)	Fitzpatrick 2002	Potential post-bomb date; E & H - Yapese stone money quarrying; L - all 7 dates from site post-date AD 1660
AA-40970*	Metuker ra Bisech, IR-2:24, TU1, VI, (50–60)	charcoal	1.1	143 ± 36	–29.4	AD 1660–1960	Fitzpatrick 2002	Potential post-bomb date; E & H - Yapese stone-money quarry; L - all 7 dates from site post-date AD 1660
AA-40971*	Metuker ra Bisech, IR-2:24, TU2, II, (20–30)	*Cypraea* sp.	12.3	423 ± 37	1.9	AD 1833…	Fitzpatrick 2002	Potential post-bomb date; E & H - Yapese stone money quarry; L - all 7 dates from site post-date AD 1660; associated with metal blade tools
AA-40972*	Metuker ra Bisech, IR-2:24, TU4, I, (0–10)	*Anadara* sp.	9.0	509 ± 36	0.6	AD 1700–1910 (85.6%), AD 1920… (9.8%)	Fitzpatrick 2002	Potential post-bomb date; L - all 7 dates from site post-date AD 1660, with 3 shell dates in 40-cm-thick midden; N
AA-40973*	Metuker ra Bisech, IR-2:24, TU4, I, (10–20)	*Cypraea* sp.	12.0	446 ± 36	1.2	AD 1818…	Fitzpatrick 2002	Potential post-bomb date; L - all 7 dates from site post-date AD 1660, with 4 shell dates in 40-cm-thick midden; N
AA-40974*	Metuker ra Bisech, IR-2:24, TU4, III, (20–30)	*Anadara* sp.	11.3	529 ± 38	2.1	AD 1680–1900 (91.6%), AD 1930… (3.8%)	Fitzpatrick 2002	Slight potential post-bomb date; L - all 7 dates from site post-date AD 1660, with 3 shell dates in 40-cm-thick midden; N
AA-40975*	Metuker ra Bisech, IR-2:24, TU4, III, (30–40)	*Venus* sp.	9.1	565 ± 47	2.0	AD 1650–1890 (94.4%), AD 1940... (1.0%)	Fitzpatrick 2002	Slight potential post-bomb date; L - all 7 dates from site post-date AD 1660, with 3 shell dates in 40-cm-thick midden; N
AA-43048*	Chelechol ra Orrak, IR-1:23, TP1, IV, (30–40)	charcoal	1.4	1306 ± 36	–25.4	AD 650–780	Fitzpatrick 2003b	L - with charcoal date from deposit below - potential vertical mixing; K - where L.IX truncates L.VIII
AA-43049*	Chelechol ra Orrak, IR-1:23, TP1, VI, (40–50)	charcoal	1.1	1253 ± 36	–25.4	AD 680–890	Fitzpatrick 2003b	L - with charcoal date from deposit below - potential vertical mixing; K - where L.IX truncates L.VIII

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
AA-43050*	Chelechol ra Orrak, IR-1:23, TP1, IX, (100–110)	unident. fish bone (burned)	1.1	2220 ± 40	–12.6	AD 40–240	Fitzpatrick and Boyle 2002	L - with associated dates on in situ burial and *Pinctada* sp. scraper; K - where L.IX truncates L.VIII; N
AA-43051*	Chelechol ra Orrak, IR-1:23, TP1, IV, (20–30)	*Anadara* sp.	4.1	1245 ± 54	1.57	AD 1040–1270	Fitzpatrick 2003b	K - where L.IX truncates L.VIII
AA-43052*	Chelechol ra Orrak, IR-1:23, TP1, VII, (60–70)	*Conus litteratus*	1.4	2881 ± 43	3.02	790–550 BC	Fitzpatrick 2003b	L - with burial activity deposit below, likely represents vertical mixing; K - where L.IX truncates L.VIII
AA-43054*	Chelechol ra Orrak, IR-1:23, TP1, IX, (80–90)	human bone (primary burial)	0.8	2030 ± 40	–15.4	AD 130–340	Fitzpatrick and Boyle 2002	L - with dates on associated *Pinctada* sp. scraper and fish bone; K - where L.IX truncates L.VIII; N
AA-43058*	Chelechol ra Orrak, IR-1:23, TP2, IV, (30–40)	human bone	3.3	2735 ± 48	–15.3	790–480 BC	Fitzpatrick 2003b	D - inverted stratigraphy likely due to vertical mixing; is a human bone date that correlates with burial activity in TP1 and TP4 - 4 human bone dates; G - with only other assay in deposit
AA-43060*	Chelechol ra Orrak, IR-1:23, TP3, X, (60–70)	*Mactra* sp.	1.5	2737 ± 46	2.11	700–370 BC	Fitzpatrick 2003b	L - with a charcoal and 2 bone dates of same deposit
AA-43063*	Chelechol ra Orrak, IR-1:23, TP4, X, (60–70)	human bone	3.3	2607 ± 46	–15.7	600–350 BC (93.2%), 660–610 BC (2.2%)	Fitzpatrick 2003b	L - with a bone and a shell date of same deposit, and with burial activity in TP1 and TP2
AA-43064*	Chelechol ra Orrak, IR-1:23, TP4, IV, (20–30)	charcoal	0.3	1692 ± 40	–27.1	AD 240–430	Fitzpatrick, pers. comm.	K; L - with shell date of same deposit
AA-43065*	Chelechol ra Orrak, IR-1:23, TP4, IV, (30–40)	Cardiidae	4.1	2084 ± 54	2.70	AD 160–430	Fitzpatrick, pers. comm.	K; L - with charcoal date of same deposit
AA-45890*	Chelechol ra Orrak, IR-1:23, TP1, VIII, --	human bone	1.6	2641 ± 49	–15.4	730–380 BC	Fitzpatrick 2003b	L - with bone sample in adjacent L.IX deposit and with burial activity in TP2 and TP4, older charcoal date of same deposit, possibly explained by burial pit fill; K - where L.IX truncates L.VIII
AA-45891*	Chelechol ra Orrak, IR-1:23, TP4, X, --	human bone	2.7	2522 ± 48	—	450–200 BC	Fitzpatrick 2003b	L - with a bone and a shell date of same deposit, and with burial activity in TP1 and TP2

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
ANU-11391 B-1	Ngerdubech village, NT-3:9a, Pit 1, TP2, Sample 2, (TR9)	charcoal	—	600 ± 60	–26.0 ± 2.0 estimated	AD 1290–1430	Phear et al. 2003	L - with 1 charcoal date of same SFea. (WK-5898), with same sample but soluble fraction (ANU-11391 B-2), and 13 same site; N
ANU-11391 B-2	Ngerdubech village, NT-3:9a, Pit 1, TP2, Sample 2, (TR9)	charcoal	—	570 ± 40	–24.0 ± 2.0	AD 1300–1440	SK Wickler, pers. comm.	L - with 1 charcoal date of same SFea. (WK-5898), with same sample but soluble fraction (ANU-11391 B-1), and with 13 same site; N
ANU-11506 A	Ngurang village, NA-3:3, TP1, II, (80–100)	unident. shell	—	600 ± 50	2.0 ± 0.1	AD 1590–1870	Phear et al. 2003	H & D - vertical movement through loose midden and crab burrowing indicated by all 3 shell dates stratigraphically inverted in >1-m-thick, dense midden; L - with 1 of 2 other dates in feature; N
ANU-11507 A	Ngurang village, NA-3:3, TP1, II, (100–120)	unident. shell	—	470 ± 50	1.6 ± 0.1	AD 1720…	Phear et al. 2003	H & D - vertical movement through loose midden, crab burrowing, slumping in unit due to water table at 105 cmbs indicated by stratigraphic inversion of all 3 shell dates in >1-m-thick, dense midden; L - with 1 of 2 other dates in Fea.; N; potential post-bomb date
ANU-11508 A	Ngurang village, NA-3:3, TP1, (20)	unident. shell	—	940 ± 50	1.8 ± 0.1	AD 1320–1480	Phear et al. 2003	H & D - vertical movement through loose midden and crab burrowing indicated by stratigraphic inversion of all 3 shell dates in >1-m-thick, dense midden; G - with other 2 dates in Fea.; N
ANU-11684	Earthworks, NT-3:10, Profile 3, SFea. 3b/1, (170)	cf. *Pterocarpus indicus*	—	1520 ± 140	–27.9 ± 2.0	AD 100–850	Phear et al. 2003	L - duplicate sample sent to different lab (WK-14030) and with 2 dates of associated feature; N
ANU-11686	Ngemeduu, NA-4:11, TR1a, VII	charcoal	—	1420 ± 30	–27.8 ± 0.2	AD 560–670	SK Wickler, pers. comm.	O

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
ANU-11768	**Ulong[c], OR-15:5, TU3, IV, (140–150)	*Tridacna* sp.	—	2890 ± 50	2.5 ± 0.2	800–540 BC	Clark and Wright 2003	L - with shell and charcoal dates of same deposit; E & H - substantial mixing of material evident as correlates with both in layer above (+50 cm) & 5 of 6 in layer below (–70); I - date on potential long-lived, heirloom taxon
ANU-11932	**Ulong, OR-15:5, TP1, I, (10–20)	*Tridacna* sp.	—	1070 ± 70	0.0 ± 2.0 estimated	AD 1200–1440	Clark, forth.	K; I - date on potential long-lived, heirloom taxon
ANU-11933	**Ulong, OR-15:5, TU3, IV, (120–130)	*Conus* sp.	—	2890 ± 110	0.0 ± 2.0 estimated	950–350 BC	Clark, forth.	L - with shell and charcoal dates of same deposit; E & H - substantial mixing of material evident as correlates with both assays in layer above (+30 cm) & all 6 in layer below (–90)
ANU-12025	Ngelong, NG-1:1, TR1, II, (40–50)	*Anadara* sp.	—	850 ± 80	0.0 ± 2.0 estimated	AD 1340–1640	Clark and Wright, forth.	K; L
ANU-12095	Ngelong, NG-1:1, TR1, I, (0–10)	*Hippopus* sp.	—	560 ± 60	0.0 ± 2.0 estimated	AD 1650–1910 (90.4%), AD 1920… (5.0%)	Clark and Wright, forth.	Slight potential post-bomb date; K; L
ANU-12096	**Ulong, OR-15:5, TP1, II, (20–30)	*Hippopus* sp.	—	1400 ± 60	0.0 ± 2.0 estimated	AD 880–1160	Clark, forth.	K; L - with charcoal and pot residue dates of same deposit
ANU-12097	**Ulong, OR-15:5, TP1, II, (20–30)	charcoal	—	660 ± 150	–24.0 ± 2.0 estimated	AD 1000–1650	Clark, forth.	K; L - with shell and pot residue dates of same deposit
ANU-12107	**Ulong, OR-15:5, TU1, III, (70–80)	*Tridacna* sp.	—	2830 ± 70	0.0 ± 2.0 estimated	780–410 BC	Clark, forth.	L - with date on same shell species of same deposit; E & H - substantial mixing of material evident as correlates with 7 of 9 assays in the 2 layers below (–140 cm); I - date on potential long-lived, heirloom taxon
ANU-12108	**Ulong, OR-15:5, TU1, III, (80–90)	*Tridacna* sp.	—	2820 ± 80	0.0 ± 2.0 estimated	780–390 BC	Clark, forth.	L - with date on same shell species of same deposit; E & H - substantial mixing of material evident as correlates with 7 of 9 assays in the 2 layers below (–130 cm); I - date on potential long-lived, heirloom taxon

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-100010	Ngimis village, NT-2:1, Fea. 8, TP1, IIa, SFea. 1, (78–84)	*B. gymnorhiza*, *C. nucifera*, +5 other taxa	1.84	350 ± 60	–28.4	AD 1440–1650	Wickler 1997	F; L - with all 3 other charcoal dates at site; N
B-100011	Ngimis village, NT-2:1, TP2, Midden 1, II/4, (39–44)	*C. nucifera*, *B. gymnorhiza*, +10 other taxa	5.06	530 ± 80	–27.7	AD 1280–1520 (93.9%), AD 1590–1620 (1.2%)	Wickler 1997	F; L - with charcoal date of same feature; N
B-100015	Ngerdubech village, NT-3:9a, Fea. 13, TP1, II/5, (40–50), (TR7, SFea.2)	*C. nucifera*, *B. gymnorhiza*, +11 other taxa	3.61	430 ± 50	–28.5	AD 1400–1530 (76.2%), AD 1550–1640 (19.2%)	Wickler 1997	F; L - with charcoal date of same SFea. and 15 same site; N
B-100016*	Ngerdubech village, NT-3:9a, TP3, II/7, (56–65), (TR8 and Pit-TP1)	Palm species, *C. nucifera*, +10 other taxa	1.06	910 ± 70	–21.7	AD 1000–1270	Wickler 1997	F; K - where deposit is beneath associated TR8 III and V; L - slightly older but still correlates with 8 charcoal dates on site
B-100017	Melii/Tund, NA-3:1, TP1, IV/V, (76–89)	*B. gymnorhiza*, +9 other taxa	4.2	1220 ± 50	–27.4	AD 680–900 (90.4%), AD 920–960 (5.0%)	Addison 1997	F; L - with 8 charcoal dates of same terrace; O
B-100019*	Ngetcherong village, NA-4:4, Fea. 12, TP2, III/6, (55–65)	*C. nucifera*	0.09	620 ± 70	–24.0	AD 1270–1430	Addison 1997	L - with 7 of 10 other charcoal dates at site; O
B-10625	Ngeruudes, IM-4:8, Pit Feature 3	charcoal	—	610 ± 50	—	AD 1290–1420	Butler 1985	L - with 3 charcoal dates of same site; N
B-10626	Ngeruudes, IM-4:8, Pit Feature 1	charcoal	—	510 ± 50	—	AD 1380–1480 (74.2%), AD 1300–1370 (21.2%)	Butler 1985	L - with 3 charcoal dates of same site; N
B-10627	Ngeruudes, IM-4:8, TU, midden, basal layer	charcoal	—	460 ± 60	—	AD 1390–1530 (78.5%), AD 1550–1640 (13.3%), AD 1320–1350 (3.7%)	Butler 1985	L - with 3 charcoal dates of same site; N
B-10628	Ngeruudes, IM-4:8, Pit Feature 2	charcoal	—	480 ± 50	—	AD 1380–1520 (87.4%), AD 1320–1360 (6.2%)	Butler 1985	L - with 3 charcoal dates of same site; N

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-117387	Earthworks w/stonework, OR-12:10, Fea. 5, TR5, II, (20)	1 taxon uni-dent. woody species	0.46	840 ± 50	–25.7	AD 1110–1290 (81.7%), AD 1040–1100 (13.7%)	Magnuson and Liston 1998	O
B-140185*	Ngerulmud Hill, ME-11:1, CAP-11, TU1, I/3; (40–50)	charcoal	4.7	310 ± 40	–23.9	AD 1480–1660	Pantaleo 2000	K; O
B-140186	Ngerulmud Hill, ME-11:1, CAP-11, TU1, II/2, (80–90)	charcoal	13.68	2220 ± 60	–25.0	400–150 BC (93.5%), 140–110 BC (1.9%)	Pantaleo 2000	K; L - with date on same deposit (Test 1)
B-140187	Ngerulmud Hill, ME-11:1, CAP-14, TU1, II/2, (30–40)	charcoal	36.74	1790 ± 60	–25.0	AD 120–400 (92.6%), AD 80–110 (2.8%)	Pantaleo 2000	K; L - with 2 charcoal dates on site
B-54787	Pulo Ana, Fariyaul, SU-1:7, TR, I, (70)	charcoal	—	130 ± 50	—	AD 1660–1960	Hunter-Anderson 1992	L - with charcoal date in lower deposit (–30 cm); N; potential post-bomb date
B-54788	Pulo Ana, Fariyaul, SU-1:7, TR, (102–104)	charcoal	0.5	290 ± 80	—	AD 1400–1950	Hunter-Anderson 1992	L - with charcoal date in upper deposit (+30 cm); N; potential post-bomb date; extended count
B-54791	Hatohobei, Ranirogi, TO-1:31, Mound 3, TR, (90–94)	charcoal	0.5	210 ± 70	—	AD 1620–1960 (85.3%), AD 1510–1600 (10.1%)	Hunter-Anderson 1992	Potential post-bomb date; L - with 2 charcoal dates on same island; N
B-81507	Roischemiangel, BE-2:7, TU, IV	*Strombus* sp.	—	940 ± 50	3.7	AD 1320–1480	Beardsley 1997	L - with 9 shell dates on same feature and nearby midden BE-2:30; N
B-81509	Roischemiangel, BE-2:7, TU, VI	*Strombus* sp.	—	1150 ± 60	3.9	AD 1110–1350	Beardsley 1997	L - with 9 shell dates on same feature and nearby midden BE-2:30; N
B-81510	Roischemiangel, BE-2:7, TU, VI	*Strombus* sp.	—	1200 ± 60	4.0	AD 1070–1310	Beardsley 1997	L - with 9 shell dates on same feature and nearby midden BE-2:30; N
B-81511	Roischemiangel, BE-2:7, TU, VII	*Strombus* sp.	—	1160 ± 40	3.8	AD 1170–1310	Beardsley 1997	L - with 9 shell dates on same feature and nearby midden BE-2:30; N
B-92160	Bukl, NA-5:7, EU4, Fea. B, (61–66)	charcoal	—	950 ± 80	–29.7	AD 960–1260 (94.2%), AD 900–920 (1.2%)	Henry et al. 1996	K - feature dug into L.III (B-92162); N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-92162	Bukl, NA-5:7, EU4, III/1, (42)	charcoal	—	1390 ± 100	–26.3	AD 430–880	Henry et al. 1996	L - with charcoal date of same deposit (EU3 II); O
B-92163	Bukl, NA-5:7, EU2, III-IV/13, (60–65)	charcoal	—	1140 ± 40	–24.7	AD 770–990	Henry et al. 1996	L - with 3 charcoal dates of same step-terrace; O
B-92164	Bukl, NA-5:7, EU3, III/9, (50–55)	charcoal	—	1600 ± 50	–27.3	AD 340–600	Henry et al. 1996	K; O
B-92165	Bukl, NA-5:7, EU3, II/8, (40–45)	charcoal	—	1260 ± 50	–25	AD 660–890	Henry et al. 1996	K; L - with charcoal date of same deposit (EU4 III); O
B-92173	Roischemiangel, BE-2:7, TUA, III/6, (68–75 bd)	*Strombus* sp.	107.68	1120 ± 60	3.4	AD 1170–1400	Beardsley 1997	L - with 9 shell dates of same feature and nearby midden BE-2:30; N
B-92174	Roischemiangel, BE-2:7, TUB, III/6, (55–65 bd)	*Strombus* sp.	104.18	1100 ± 60	3.6	AD 1190–1410	Beardsley 1997	L - with 9 shell dates of same feature and nearby midden BE-2:30; N
B-92175	Roischemiangel, BE-2:7, TUB, III/10, (95–105 bd)	*Strombus* sp.	108.45	1120 ± 60	3.5	AD 1170–1400	Beardsley 1997	L - with 9 shell dates of same feature and nearby midden BE-2:30; N
B-92176	Roischemiangel, BE-2:7, TUB, IIIb/16, (155–173 bd)	*Strombus* sp.	115.79	950 ± 60	3.4	AD 1310–1480	Beardsley 1997	L - with 9 shell dates of same feature and nearby midden BE-2:30; N
B-92177	BE-2:30, Midden 8, III	*Lambis* sp.	87.95	1180 ± 80	1.8	AD 1040–1350	Beardsley 1997	L - with shell date of same feature and nearby midden BE-2:7; N
B-92178	BE-2:30, Midden 8, III	*Conus* sp.	109.05	1220 ± 60	3.5	AD 1060–1300	Beardsley 1997	L - with shell date of same feature and nearby midden BE-2:7; N
B-96305*	Ngerulmud Hill, ME-11:1, CAP-11, Test 1, III, (70–84)	1 taxon unident. woody species	1.02	2180 ± 60	–27.6	390–90 BC (93.6%), 80–60 BC (1.8%)	Liston et al. 1998	K; L - with date on same deposit (TU1, II/2)
B-96306	Ngerulmud Hill, ME-11:1, CAP-14, posthole, (70–80)	Palm species, cf. *Intsia. bijuga*, unident. woody species	18.59	1670 ± 90	–28.2	AD 130–600	Liston et al. 1998	F; K; L - with associated cultural horizon; M (one taxon); N
B-96307	Ngerulmud Hill, ME-11:1, CAP-14, Test 2, IV, (65–70)	cf. *I. bijuga*, cf. *Pongamia pinnata*, cf. *Sonneratia alba*	7.18	1770 ± 110	–25.9	AD 1–550	Liston et al. 1998	F; K; L - with charcoal date on associated SFea.; M
B-no data	Ngermechau settlement, NI-1:18, B7	human bone (primary burial)	—	360 ± 70	—	AD 1693…	Titchenal et al. 1998	L - with 2 human bone dates on primary burials same site; N; potential post-bomb date

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
B-no data	Ngermechau settlement, NI-1:18, B5 or associated burial	human bone (primary burial)	—	490 ± 70	—	AD 1520–1890 (91.8%), AD 1920... (3.6%)	Titchenal et al. 1998	L - with 2 human bone dates on primary burials of same site; N; potential post-bomb date
DIC-2387	Uchularois Cave, OR-17:10, Midden, TU1, N. ext, (90–100)	charcoal	—	1070 ± 40	—	AD 890–1030	Masse and Snyder 1982; Masse 1989	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches 2 charcoal and 2 shell dates; N; collected in screen
DIC-2388	Uchularois Cave, OR-17:10, Midden, TU1, N. ext., (163–175)	*S. gibberulus*	—	1110 ± 50	4.15 ± 1.07	AD 1200–1390	Masse and Snyder 1982; Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches 2 shell and 2 charcoal dates; N
DIC-2529	Rois village, OR-17:--, EU1, (20–30)	*S. gibberulus* (composite)	—	650 ± 50	4.15 ± 1.07 estimated	AD 1520–1760	Masse and Snyder 1982; Masse 1989; pers. comm., 2005	L - with 4 shell dates on same island group
DIC-2530	Ngemelis village, OR-17:6, EU1, (40–50)	*S. gibberulus* (composite)	—	600 ± 45	4.15 ± 1.07	AD 1620–1850	Masse and Snyder 1982; Masse 1989	L - with 2 shell dates on same rock island
DIC-2531	Ngeanges Island, OR-16:6, Midden 16-EU1, Fea. 17, (10–20)	*S. luhuanus* (composite)	—	550 ± 35	2.41 ± 0.62 estimated	AD 1670–1870	Masse and Snyder 1982; Masse 1989; pers. comm., 2005	N; L - with 2 shell dates of another midden on island
DIC-2532	Mariar village, OR-15:1, Fea. 7, EU8, (20–40)	*S. luhuanus* (composite)	—	600 ± 40	2.41 ± 0.62 estimated	AD 1640–1820	Masse and Snyder 1982; Masse 1989	L - with 2 other shell dates associated with stonework on island
I-11-955	Earthworks, IR-2:3, TP1, (43)	charcoal	—	785 ± 75	—	AD 1030–1310 (92.0%), AD 1350–1390 (3.4%)	Lucking 1984	O
I-11-956	Ngetkud earthworks, NE-4:5, TP1, II, (16–17)	charcoal	—	1140 ± 110	—	AD 660–1050 (91.9%), AD 1080–1160 (3.5%)	Lucking 1984	O
N-3283	Roischemiangel, BE-2:7, TP1, III	misc. unident. shell	—	1070 ± 75	2.00 ± 2.0 estimated	AD 1190–1440	Takayama in Masse 1989; pers. comm., 2005	L - with 9 shell dates of same feature and nearby midden BE-2:30; N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
N-3284	Roischemiangel, BE-2:7, TP1, IV	misc. unident. shell	—	1150 ± 60	2.00 ± 2.0 estimated	AD 1110–1350	Takayama in Masse 1989; pers. comm., 2005	L - with 9 shell dates on same feature and nearby midden BE-2:30; N
NZ-5637	Uchularois Cave, OR-17:10, Midden, TU1, N. ext., (70–80)	charcoal	—	1270 ± 60	–24.3	AD 650–900	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches 2 charcoal dates; N; collected in screen
NZ-5638	Uchularois Cave, OR-17:10, Midden, TU1, N. ext, (110–120)	charcoal	—	1165 ± 85	–25.6	AD 680–1020	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches 1 shell and 2 charcoal dates; N; "depth not so great as appears as in crevice"; collected in screen
NZ-5639	Uchularois Cave, OR-17:10, Midden, TU1, N. ext., (40–45)	charcoal	—	395 ± 133	–26.0	AD 1250–1950	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches 2 shell and 1 charcoal date; N; potential post-bomb date
NZ-5640	Uchularois Cave, OR-17:10, Midden, TU1, (30–40)	charcoal	—	634 ± 79	–26.8	AD 1250–1440	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - matches charcoal and 2 shell dates; N; collected in screen
NZ-6245	Tmasch village, OR-17:1, Midden, EU1, (0–10)	*S. luhuanus* (composite)	—	848 ± 35	2.42 ± 0.06	AD 1430–1520	Masse 1989; pers. comm., 2005	L - with 2 shell dates in 80-cm-thick midden; N
NZ-6246	Tmasch village, OR-17:1, Midden, EU1, (30–40)	*S. gibberulus* (composite)	—	745 ± 31	3.70 ± 0.02	AD 1500–1640	Masse 1989; pers. comm., 2005	L - with 2 shell dates in 80-cm-thick midden; N
NZ-6253	Tmasch village, OR-17:1, Midden, EU1, (70–80)	*S. gibberulus* (composite)	—	747 ± 32	5.82 ± 0.07	AD 1490–1640	Masse 1989; pers. comm., 2005	L - with 2 shell dates in 80-cm-thick midden; N
NZ-6254	Mariar village, OR-15:1, Fea. 3, EU4, (0–10)	*S. luhuanus* (composite)	—	1300 ± 35	2.69 ± 0.05	AD 1030–1190	Masse 1989; pers. comm., 2005	L - with shell date on same ~40-cm-thick midden; N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
NZ-6290	Mariar village, OR-15:1, Fea. 3, EU4, (30–40)	*S. luhuanus* (composite)	—	1310 ± 40	2.33 ± 0.05	AD 1020–1190	Masse 1989; pers. comm., 2005	L - with shell date of same ~40-cm-thick midden; N
NZ-6295	Mariar village, OR-15:1, Fea. 48, EU10, (10–20)	*S. luhuanus* (composite)	—	690 ± 35	1.77 ± 0.02	AD 1530–1680	Masse 1989; pers. comm., 2005	L - with 2 other shell dates associated with stonework on island
NZ-6296	Mariar village, OR-15:1, Fea. 33, EU12, (10–20)	*S. luhuanus* (composite)	—	871 ± 35	2.34 ± 0.03	AD 1420–1520	Masse 1989; pers. comm., 2005	L - with 2 other shell dates associated with stonework on island; N
NZ-6312	Ngeanges Island, OR-16:6, Midden 14-EU1, (10–20)	*S. gibberulus* (composite)	—	923 ± 35	3.37 ± 0.06	AD 1350–1480	Masse 1989; pers. comm., 2005	L - with shell date of same midden and shell date of another midden on island; N
NZ-6313	Ngeanges Island, OR-16:6, Midden 14-EU1, (10–20)	*S. luhuanus* (composite)	—	824 ± 43	2.47 ± 0.08	AD 1420–1580	Masse 1989; pers. comm., 2005	L - with shell date of same midden and shell date of another midden on island; N
NZ-6320	Ngeanges Island, OR-16:7, Midden 15-EU1, (20–30)	*S. luhuanus* (composite)	—	1225 ± 40	2.32 ± 0.02	AD 1080–1280	Masse 1989; pers. comm., 2005	L - with shell date of same midden; N
NZ-6345	Ngeanges Island, OR-16:7, Midden 15-EU2, (0–10)	*S. luhuanus* (composite)	—	774 ± 35	2.33 ± 0.01	AD 1470–1630	Masse 1989; pers. comm., 2005	L - with shell date of same midden and 2 from another midden on island; K; N
NZ-6350	Ngeanges Island, OR-16:7, Midden 15-EU2, (40–50)	*S. luhuanus* (composite)	—	998 ± 36	2.46 ± 0.02	AD 1310–1430	Masse 1989; pers. comm., 2005	L - with shell date of same midden and 2 shell dates of another midden on island; N
NZ-6351	Uchularois Cave, OR-17:10, Midden, TU1, N. ext., (90–100)	*S. gibberulus*	—	1345 ± 49	3.87 ± 0.04	AD 970–1190	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - with 2 shell and 3 charcoal dates; N
NZ-6352	Uchularois Cave, OR-17:10, Midden, TU1, N. ext., (90–100)	*S. luhuanus*	—	1125 ± 40	3.59 ± 0.04	AD 1080–1280	Masse 1989; pers. comm., 2005	Eight dates in ~130-cm-thick shell midden in cave 30 m asl. D - many dates inverted, vertical movement through loose midden; L - with 2 shell and 4 charcoal dates; N
OS-33447*	Chelechol ra Orrak, IR-1:23, TP1, IX, (100–110)	*Pinctada margaritifera*	1.6	2140 ± 50	0.36	AD 100–360	Fitzpatrick and Boyle 2002	L - with associated dates on in situ burial and a fish bone; K - where L.IX truncates L.VIII; N
OS-33568*	Chelechol ra Orrak, IR-1:23, TP1, VIII, (100–110)	charcoal	0.1	2770 ± 30	–25.9	1000–830 BC	Fitzpatrick 2003b	L - slightly older charcoal date of same deposit, possibly explained by burial pit fill; K - where L.IX truncates L.VIII

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
OS-34566*	Chelechol ra Orrak, IR-1:23, TP4, X, (80–90)	charcoal	0.9	2650 ± 35	–25.9	900–780 BC	Fitzpatrick 2003b	L - with a bone and a shell date of same deposit
OZG-276*	**Ulong, OR-15:5, TU3, II, (50–60)	pot residue	—	940 ± 50	–23.2	AD 1010–1220	Clark, forth.	K; L - with charcoal and shell dates of same deposit
SR-5459*	Ngermereues Ridge, OR-3:30, Fea. 1, Chamber 1, surface	human bone	5.0	1350 ± 40	—	AD 860–1030	Reith and Liston 2001	N
SR-5461*	Ngermereues Ridge, OR-3:30, Fea. 2, surface	human bone	5.0	2480 ± 40	—	390–200 BC	Reith and Liston 2001	N
SR-5480*	Ngermereues Ridge, OR-3:30, Fea. 1, Chamber 6, surface	human bone	6.6	1720 ± 40	—	AD 490–670	Reith and Liston 2001	N
SR-6379*	Ngermechau settlement, NI-1:18, TR2, (70–100)	human bone (primary burial)	—	485 ± 35	^{13}C 14.89, ^{15}N 11.49	AD 1640–1810	Ikehara, forth.	L - with 2 human bone dates on primary burials of same site; N
UCLA-1762A	Ngermid village, OR-1:1, TR2, Level 1	charcoal	—	165 ± 80	—	AD 1630–1960 (93.6%), AD 1520–1560 (1.8%)	Osborne 1979	Potential post-bomb date; K; N
UCLA-1762B	Ngermid village, OR-1:1, TR2, Level 4	charcoal	—	320 ± 80	—	AD 1400–1850 (94.1%), AD 1900–1950 (1.3%)	Osborne 1979	K; N; iron artifact in deposit
UCLA-1762E	Ked ra Ikirong terraces, NC-3:1, TR1, III, (37–43)	charcoal	—	1480 ± 80	—	AD 410–690	Osborne 1979	O
UCLA-1762I	Badrulchau, NE-4:4, Hill Test, IIB, charcoal concentration	charcoal	—	1800 ± 80	—	AD 60–420	Osborne 1979	O
WK-5889*	Rois terraces, NA-4:6, TR2; SFea. 5, (247 bd)	Poaceae/ grass	0.03	1723 ± 68	–24.0 ± 2.0	AD 120–440	Tuggle 1998a	K; L - with all 3 other charcoal dates of same feature complex; N
WK-5890*	Ngetcherong village, NA-4:4, Fea. 61, TU4, SFea. 3, (20–26)	*C. nucifera* nutshell	1.04	320 ± 60	–24.0 ± 2.0	AD 1440–1670	Mangieri 1998a	K; L - with 7 of 10 other charcoal dates at site; N
WK-5891*	Ngetcherong village, NA-4:4, Fea. 61, TU4, IIb/4, (75–85)	*C. nucifera* nutshell	0.21	954 ± 73	–24.0 ± 2.0	AD 960–1250	Mangieri 1998a	K; L - with 2 of 10 other charcoal dates at site; O
WK-5892*	Ngetcherong village, NA-4:4, Fea. 68, TR4, SFea. 6, (75–85)	*C. nucifera* nutshell	0.03	629 ± 67	–24.0 ± 2.0	AD 1270–1430	Mangieri 1998a	K; L - with 7 of 10 other charcoal dates at site; N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-5897*	Ngerdubech village, NT-3:9a, Fea. 4, TU2, Facing 1, IIb/1, (39)	cf. legume	1.14	528 ± 66	–24.7 ± 0.2	AD 1290–1480	Mangieri 1998b	K; L - with 16 charcoal dates of same site
WK-5898	Ngerdubech village, NT-3:9a, TR9, Facing 2, II, SFea. 9, (78-96), (TP2)	Bark	2.23	570 ± 80	–28.3 ± 0.2	AD 1280–1470	Mangieri 1998b	L - with 2 charcoal dates of same SFea. (ANU-11391 B-1, B-2) and 14 from same site; N
WK-5899*	Ngerdubech village, NT-3:9a, Fea. 13, TR7, SFea. 2, (50–75), (TP1, II/5)	*C. nucifera* nutshell	0.79	226 ± 70	–23.7 ± 0.2	AD 1490–1890 (85.4%), AD 1910–1960 (10.0%)	Mangieri 1998b	L - with a charcoal date of same SFea. and 7 same site; N; slight possibility of post-bomb date
WK-5902*	Ngerdubech village, NT-3:9a, TR8, III, (40–70), (TP3 and Pit 1-TP1)	*C. nucifera* nutshell	1.05	444 ± 72	–24.5 ± 0.2	AD 1390–1640	Mangieri 1998b	K - where III is above associated V and TP3 II/7; L - with 16 charcoal dates of same site
WK-5903*	Ngerdubech village, NT-3:9a, TR8, V, (70–80), (TP3 and Pit 1-TP1)	*C. nucifera* nutshell	0.35	621 ± 72	–24.6 ± 0.2	AD 1270–1440	Mangieri 1998b	K - where V is sandwiched between III and TP3 II/7; L - with 15 charcoal dates of same site
WK-5905*	Bischerad, NE-4:8, TU2, III, (45–55)	*C. nucifera* stem	0.02	1888 ± 67	–26.2 ± 0.2	50 BC–AD 260	Tuggle 1998a	M; O
WK-5906*	Imengel, NA-2:22, Fea. 1; TU3, III/1, (35–45)	*C. nucifera* nutshell	0.06	2060 ± 66	–25.4 ± 0.2	240 BC–AD 90	Tuggle 1998a	K; L - with 32 of 44 accepted ridgeline assays; M
WK-5907*	Earthworks w/stonework, NA-5:12, Fea. 4, TU3, SFea. B, (65–85)	*C. nucifera* nutshell	0.16	751 ± 68	–25.2 ± 0.2	AD 1150–1330	Tuggle 1998a	M; N
WK-5910*	Melii/Tund, NA-3:1, TU1b, IIb, (20–30)	*C. nucifera* nutshell	0.09	1210 ± 66	–24.4 ± 0.2	AD 680–980	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5911*	Melii/Tund, NA-3:1, TU1b, IIb, (40–50)	*C. nucifera* nutshell	0.08	1209 ± 66	–24.2 ± 0.2	AD 680–980	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5913*	Melii/Tund, NA-3:1, TU1b, IV, (85)	*C. nucifera* nutshell	0.23	1306 ± 57	–26.7 ± 0.2	AD 640–890	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5914*	Melii/Tund, NA-3:1, TU2, II, (40–50)	cf. *Bruguiera* sp.	0.14	1243 ± 66	–26.2 ± 0.2	AD 660–900	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5915*	Melii/Tund, NA-3:1, TU2, II, (80–90)	*C. nucifera* nutshell	0.24	1312 ± 66	–25.0 ± 0.2	AD 610–890	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5916*	Melii/Tund, NA-3:1, TU2, II, (100–110)	*C. nucifera* nutshell	0.11	1187 ± 66	–24.7 ± 0.2	AD 680–990	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5917*	Melii/Tund, NA-3:1, TU1c, VI, (118–133)	Palm species	1.08	1678 ± 66	–26.4 ± 0.2	AD 210–540	Tuggle 1998a	K; O
WK-5918*	Melii/Tund, NA-3:1, TU2, II, (90–100)	1 taxon unident. woody species	0.44	1243 ± 67	–26.1 ± 0.2	AD 660–900	Tuggle 1998a	L - with 8 charcoal dates of same terrace; O

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-5919*	Melii/Tund, NA-3:1, TU1b, VI, (140)	1 taxon unident. woody species	1.64	1303 ± 66	–26.1 ± 0.2	AD 620–890	Tuggle 1998a	L - with 8 charcoal dates of same terrace; M; O
WK-5920*	Rois terraces, NA-4:6, TR NW, SFea. Y, (45–55)	cf. *Casuarina litorea*	0.55	2015 ± 68	–27.0 ± 0.2	200 BC–AD 130	Tuggle 1998a	K; L - with 2 of 3 other charcoal dates of same feature complex; N
WK-5922*	Rois terraces, NA-4:6, TUW, III/1, (35)	cf. *Rhizophora* sp.	0.53	1772 ± 67	–26.6 ± 0.2	AD 120–420	Tuggle 1998a	K; L - with all 3 other charcoal dates of same feature complex; M
WK-5925	Ngimis village, NT-2:1, TR10W, Midden 1, II, (50–59)	*C. nucifera* nutshell	1.74	480 ± 80	–24.7 ± 0.2	AD 1300–1530 (81.2%), AD 1550–1640 (14.2%)	Tuggle 1998b	L - with charcoal date of same feature; N
WK-5926*	Earthworks, NT-3:10, TR1, IX, (200)	cf. *Macaranga carolinensis*	0.17	2809 ± 72	–26.6 ± 0.2	1130–810 BC	Liston 1998	L - with 5 charcoal dates in step-terrace; O
WK-5928*	Earthworks/Japanese defensive features, NI-1:15, Fea. 10, TR1, SU1, I, (25–40)	*C. nucifera* nutshell	0.05	2053 ± 70	–24.2 ± 0.2	230 BC–AD 90 (91.2%)	Kaschko 1998b	K; L - with dates on 2 other ridge-line sites; M
WK-5929*	Earthworks/Japanese defensive features, NI-1:15, Fea. 10, TR1, SU6, III, (95–107)	*C. nucifera* nutshell	0.02	2222 ± 69	–24.0 ± 0.2	410–90 BC	Kaschko 1998b	K; L - with dates on 2 other ridge-line sites; M
WK-5930	Earthworks w/stonework, NI-1:4, Fea. 3, TR1, SU2, IId, (205–210)	cf. legume	4.18	1530 ± 60	–25.4 ± 0.2	AD 410–650	Kaschko 1998b	O; legume potentially associated with cultivation
WK-5931	Engoll Hill, ME-6:9, TR2, SU1, IIIa, (70–85)	*C. nucifera* nutshell	2.30	1690 ± 80	–25.1 ± 0.2	AD 130–540	Kaschko 1998b	L - with charcoal date on same deposit and on infilling in associated ditch; M
WK-5932*	Engoll Hill, ME-6:9, TR2, SU2, IIIa, (60)	cf. *C. nucifera*	1.28	1746 ± 72	–26.4 ± 0.2	AD 120–440	Kaschko 1998b	L - with charcoal date on same deposit and on infilling in associated ditch; M
WK-5933	Engoll Hill, ME-6:9, TR2, SU5, IIb, (310–325)	*C. nucifera* nutshell	1.59	1640 ± 100	–25.1 ± 0.2	AD 100–650	Kaschko 1998b	L - with 2 charcoal dates on associated cultural horizon; M; O
WK-5934	Earthworks w/stonework, NI-1:10, Fea. 3, TR1, SU1, Ia, (30–45)	*C. nucifera* nutshell	3.07	370 ± 60	–24.5 ± 0.2	AD 1430–1650	Kaschko 1998b	K; M
WK-5935*	Earthworks w/stonework, NI-1:2, Fea. 3, TR2, SU2, IIIa, (170–175)	1 taxon unident. woody species	1.75	1313 ± 67	–25.6 ± 0.2	AD 610–890	Kaschko 1998b	L - with charcoal date on adjacent trench
WK-5936*	Earthworks w/stonework, NI-1:2, Fea. 3, TR1, SU1, Ib, (30–45)	cf. *Bruguiera* sp.	0.20	1165 ± 67	–25.8 ± 0.2	AD 690–1000	Kaschko 1998b	L - with charcoal date on adjacent trench; O

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-5938*	Eoulbeluu, NA-1:10, SU1, II, (25–40)	*C. nucifera* nutshell	0.42	1807 ± 67	–24.6 ± 0.2	AD 70–390	Kaschko 1998a	L - with charcoal date of same deposit
WK-5940*	Eoulbeluu, NA-1:10, SU4, II, (85–105)	*C. nucifera* stem and nutshell	0.54	1719 ± 68	–27.5 ± 0.2	AD 130–440 (94.4%), AD 500–530 (1.0%)	Kaschko 1998a	L - with charcoal date of same deposit
WK-6463*	Rois terraces, NA-4:6, TR2, SFea.2, (137–172)	1 taxon uni-dent. woody species	0.69	1695 ± 56	–27.2 ± 0.2	AD 220–470	Tuggle 1998a	K; L - with 2 of 3 other charcoal dates of same feature complex; N
WK-6468*	Earthworks, NT-3:10, TR1, V, (85–90)	1 taxon uni-dent. woody species	0.12	2717 ± 58	–24.1 ± 0.2	1000–790 BC	Liston 1998	L - with 5 charcoal dates in step-terrace; O
WK-6469*	Earthworks, NT-3:10, TR1, VIII, (140–145)	Palm species, +1 other taxa	0.21	2334 ± 60	–26.7 ± 0.2	800–200 BC	Liston 1998	F; L - with 5 charcoal dates in step-terrace; O
WK-8113*	Ngetcherong village, NA-4:4, Fea. 29, TR1, TU1, SFea. 1, (33)	*C. nucifera* nutshell	1.64	102.5 ± 1.3	–24.5 ± 0.2	AD 1690–1730 (36.5%), AD 1810–1840 (35.9%), AD 1870–1890 (14.5%), AD 1900–1920 (8.4%)	Mangieri, forth.	L - with 3 of 10 other charcoal dates at site; N
WK-8279*	Toi Meduu, NA-4:12, Fea. 3, TR1b, III, (60)	*Pandanus* sp.	0.55	1940 ± 60	–25.3 ± 0.2	60 BC–AD 240	Tuggle, forth.	L - with 1 charcoal date of same deposit, 1 same feature, and 2 other dated features on site
WK-8280*	Toi Meduu, NA-4:12, Fea. 3, TR1e, III, (38)	cf. *Canarium hirsutum*	2.09	1960 ± 60	–26.2 ± 0.2	110 BC–AD 220	Tuggle, forth.	L - with only 2 other charcoal dates of same feature and 2 other dated features on site
WK-8281*	Toi Meduu, NA-4:12, Fea. 3, TR1b, III, (60)	cf. *P. indicus*	0.53	2010 ± 60	–24.0 ± 0.2	170 BC–AD 130	Tuggle, forth.	L - with 1 charcoal date of same deposit, 1 same feature, and 2 other dated features on site
WK-8282*	Tabelmeduu, NA-4:15, Fea. 1, FAC1, III/H2, (45)	cf. *C. nucifera*	0.05	2000 ± 60	–25.0 ± 0.2	170 BC–AD 130	Tuggle, forth.	K; L - with 9 of 10 other charcoal dates of same site; M
WK-8283*	Tabelmeduu, NA-4:15, Fea. 1, TR1d, II, (21)	cf. *X. granatum*	0.95	2070 ± 60	–27.0 ± 0.2	350 BC–AD 70	Tuggle, forth.	K; L - with 1 charcoal date of same deposit and 9 same site; M
WK-8285*	Tabelmeduu, NA-4:15, Fea. 1, TR1a, II, (15–20)	*D. ferrea*	0.07	1980 ± 70	–26.7 ± 0.2	170 BC–AD 220	Tuggle, forth.	K; L - with 1 charcoal date of same deposit and 8 same site
WK-8286*	Tabelmeduu, NA-4:15, Fea. 4, TR4, II/2, (41)	cf. *X. granatum*	0.69	1960 ± 60	–25.8 ± 0.2	110 BC–AD 220	Tuggle, forth.	L - with charcoal date of same deposit and 8 same site; M

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-8287*	Tabelmeduu, NA-4:15, Fea. 4, TR4, II/2, (23)	cf. *X. granatum*	0.69	1860 ± 60	–26.0 ± 0.2	AD 20–340	Tuggle, forth.	L - with charcoal date of same deposit and 6 same site; M
WK-8288*	Tabelmeduu, NA-4:15, Fea. 4, TR10, SFea. E, (35)	cf. *C. nucifera*	2.16	1970 ± 60	–25.3 ± 0.2	160 BC–AD 220	Tuggle, forth.	L - with charcoal date adjacent SFea. and 8 same site; M; N
WK-8289*	Tabelmeduu, NA-4:15, Fea. 6, FAC, II, (70)	cf. *P. indicus*	0.52	1940 ± 60	–24.7 ± 0.2	60 BC–AD 240	Tuggle, forth.	K; L - with charcoal date of same deposit and 8 same site
WK-8290*	Tabelmeduu, NA-4:15, Fea. 6, FAC, II, (80)	cf. *B. gymnorhiza*	0.64	2080 ± 60	–25.3 ± 0.2	360 BC–AD 60	Tuggle, forth.	K; L - with charcoal date of same deposit and 9 same site; M
WK-8291*	Tabelmeduu, NA-4:15, Fea. 6, FAC, IV, (75)	*D. ferrea*	0.53	2320 ± 60	–27.8 ± 0.2	800–200 BC	Tuggle, forth.	K; L - with 6 charcoal dates of same site; O
WK-8292*	Tabelmeduu, NA-4:15, Fea. 6, FAC, V, (90)	1 taxon unident. woody species	0.45	2150 ± 60	–27.0 ± 0.2	380–40 BC	Tuggle, forth.	K; L - with 9 charcoal dates of same site
WK-8293*	Roisengang, NA-2:5, Fea. 6, TR1b, SFea. B, (100)	cf. *B. gymnorhiza*	0.32	1380 ± 60	–26.4 ± 0.2	AD 540–780	Tuggle, forth.	L - with charcoal date of same SFea., 2 charcoal dates of same feature; M; N
WK-8294*	Roisengang, NA-2:5, Fea. 6, TR1c, SFea. B, (103)	cf. *B. gymnorhiza*	0.32	1520 ± 60	–27.1 ± 0.2	AD 420–650	Tuggle, forth.	L - with charcoal date of same SFea., 2 charcoal dates of same feature; M; N
WK-8295*	Roisengang, NA-2:5, Fea. 6, TR7, SFea. D, (124)	cf. *C. nucifera*	0.11	1310 ± 70	–24.0 ± 0.2	AD 610–890	Tuggle, forth.	L - with 3 charcoal dates of same feature; M; N
WK-8296*	Roisengang, NA-2:5, Fea. 6, TR10, II, (52)	cf. *C. nucifera*	0.02	1200 ± 60	–23.2 ± 0.2	AD 680–980	Tuggle, forth.	L - with 3 charcoal dates of same feature; M
WK-8297*	Tabelmeduu, NA-4:15, Fea. 4, TR10, SFea. I, (30–50)	1 taxon unident. woody species	0.12	2140 ± 60	–26.5 ± 0.2	380–40 BC	Tuggle, forth.	L - with charcoal date of adjacent SFea. and 8 of same site; N
WK-12908	Hatohobei, TO-1, TOMF, TU1, III, (20)	charcoal	—	345 ± 40	—	AD 1450–1650	Intoh and Ono 2004	L - with charcoal date on same island; few associated cultural remains
WK-12909	Hatohobei, Iper, TO-1:1, TU1, III, (66)	charcoal	—	439 ± 43	—	AD 1400–1530 (87.0%), AD 1580–1630 (8.4%)	Intoh and Ono 2004	L - with charcoal date on same island; N; sample from top of sterile layer beneath cultural deposit, indicating vertical movement through sand matrix
WK-13959*	Earthworks, NT-3:10, Profile 3, SFea. 4/2, (300)	*Rhizophora* sp.	0.14	1851 ± 47	–25.5 ± 0.2	AD 60–260 (92.2%), AD 300–330 (3.2%)	Liston, forth.	L - with charcoal date from associated SFea.; N; M

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-13960*	Earthworks w/stonework, NA-1b, Fea. 7a, TR2, II, (46)	cf. gourd	0.07	2056 ± 44	–25.7 ± 0.2	180 BC–AD 30 (93.6), AD 40–60 (1.8%)	Liston, forth.	L - with charcoal date of same site; gourd associated with cultivation
WK-13962*	Traditional cultural deposits/stonework, NA-2b, Profile 1, SFea. 2, (147)	cf. palm/fern	0.06	984 ± 41	–24.6 ± 0.2	AD 980–1170	Liston, forth.	N
WK-13963*	Toi Meduu, NA-4:12, Fea. 8, TR2, SFea. 3, (75)	cf. *Artocarpus* sp.	0.58	1861 ± 50	–24.9 ± 0.2	AD 20–260 (92.9%), AD 300–320 (2.5%)	Liston, forth.	K; L - with all 5 other charcoal date of same feature and 2 other dated features on site; M; N
WK-13964*	Ngemeduu, NA-4:11, Profile 2, SFea. 2, (199)	cf. *C. nucifera*	0.46	2188 ± 43	–24.7 ± 0.2	390–110 BC	Liston, forth.	L - with charcoal date of same SFea.; M; O
WK-13965*	Ngemeduu, NA-4:11, Profile 2, SFea. 2, (150)	cf. *B. gymnorhiza*	0.17	2025 ± 51	–24.2 ± 0.2	170 BC–AD 80	Liston, forth.	L - with charcoal date of same SFea. and associated Profile; M; O
WK-13966*	Earthworks w/stonework, NA-4a, Profile 2, SFea. 2, (62)	cf. *I. bijuga*	0.41	1981 ± 43	–24.9 ± 0.2	60 BC–AD 130 (93.7%), 100–70 BC (1.7%)	Liston, forth.	L - with 2 charcoal dates of same site; M; N
WK-13967*	Toi Meduu, NA-4:12, Fea. 8, TR1, VII b, (82)	*Hibiscus tiliaceus*	0.08	1919 ± 45	–25.3 ± 0.2	20 BC–AD 230	Liston, forth.	K; L - with all 5 other charcoal dates of same feature and 2 other dated features on site; M
WK-13968*	Earthworks, NT-3:10, Profile 3, SFea. 4/1, (150)	1 taxon unident. woody species	0.10	1805 ± 43	–25.1 ± 0.2	AD 120–350 (93.3%), AD 80–110 (2.1%)	Liston, forth.	L - with charcoal date from associated SFea.; N
WK-13970*	Earthworks w/stonework, NA-4a, Fea. 3, TR5, IVb, (54)	cf. *Cynometra ramiflora*	0.75	1920 ± 41	–25.3 ± 0.2	AD 1–220	Liston, forth.	L - with 2 charcoal dates of same site; M; N
WK-13971*	Earthworks, NT-3:10, Fea. 4, SFea. 1, VI, (104)	cf. *Campnosperma brevipetiolata*	0.21	2450 ± 43	–27.5 ± 0.2	770–400 BC	Liston, forth.	L - with 5 charcoal dates in step-terrace; O
WK-13972*	Earthworks, NT-3:10, Fea. 4, SFea. 2, IX, (160)	cf. *B. gymnorhiza*	0.11	2750 ± 43	–25.0 ± 0.2	1000–810 BC	Liston, forth.	L - with 5 charcoal dates in step-terrace; M; O
WK-13973*	Earthworks w/stonework, NA-1b, TR4, IV, (45)	cf. *C. nucifera*	0.10	1868 ± 41	–25.4 ± 0.2	AD 50–250	Liston, forth.	L - with charcoal date of same site; M

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-13974	Toi Meduu, NA-4:12, Profile 2, SFea. 1, V, (284)	*C. ramiflora*	3.63	3139 ± 52	–25.9 ± 0.2	1520–1260 BC (93.6%), 1280–1260 BC (1.8%)	Liston, forth.	M; O
WK-13975*	Earthworks w/stonework, NI-1:4, Profile 1, IX, (270)	cf. *C. equisetifolia*	4.07	2247 ± 43	–26.8 ± 0.2	400–200 BC	Liston, forth.	L - with 1 charcoal date of same site and dates on 2 other ridgeline sites; O
WK-14019*	Earthworks w/stonework, NI-1:4, Fea. 6, TR4, III, (20)	cf. *I. bijuga*	1.71	2111 ± 45	–26.8 ± 0.2	240 BC–AD 10 (87.1%), 360–290 BC (8.3%)	Liston, forth.	L - with 4 charcoal dates of same site and dates on 2 other ridgeline sites; M
WK-14020	Earthworks w/stonework, NI-1:4, Fea. 7, TR7, SFea. 1, (32)	cf. *Artocarpus* sp.	3.28	1787 ± 41	–25.0 ± 0.2	AD 120–350 (94.1%), AD 360–380 (1.3%)	Liston, forth.	L - with 3 charcoal dates of same site and dates on 2 other ridgeline sites; M; N
WK-14021*	Earthworks w/stonework, NI-2a, TR9, XV, (48)	cf. *Diospyros ferrea*	0.02	1767 ± 44	–26.2 ± 0.2	AD 130–390	Liston, forth.	L - with 9 charcoal dates of same site and dates on 2 other ridgeline sites
WK-14022*	Earthworks w/stonework, NI-2a, TR6, VIb, (74)	Palm species	0.14	1921 ± 44	–27.3 ± 0.2	20 BC–AD 220	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites
WK-14023*	Earthworks w/stonework, NI-2a, TR9, IV, (40)	Palm species - Pritchardia type	0.32	1867 ± 41	–24.8 ± 0.2	AD 50–250	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites
WK-14024*	Earthworks w/stonework, NI-2a, TR2, III, (40)	cf. *Calophyllum inophyllum*	0.08	1972 ± 40	–25.9 ± 0.2	50 BC–AD 130	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites; O
WK-14025*	Earthworks w/stonework, NI-2a, TR5, XV, (28)	cf. *I. bijuga*	0.20	2005 ± 42	–25.1 ± 0.2	120 BC–AD 90 (94.3%), AD 100–120 (1.1%)	Liston, forth.	L - with 8 charcoal dates of same site, 2 on associated SFeas., and dates on 2 other ridgeline sites; M
WK-14026*	Earthworks w/stonework, NI-2a, TR6, VIII, (52)	*C. nucifera*	0.13	1933 ± 40	–24.9 ± 0.2	40 BC–AD 140 (91.2%), AD 150–180 (2.3%), AD 190–220 (1.9%)	Liston, forth.	K; L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites; M
WK-14027*	Earthworks w/stonework, NI-2a, TR2, XXIX, (108)	cf. *D. ferrea*	0.09	1977 ± 46	–28.1 ± 0.2	60 BC–AD 130 (93.3%), 100–70 BC (2.1%)	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites; O

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-14028	Earthworks w/stonework, NI-2a, TR5, SFea. 10, (80)	cf. *I. bijuga*	9.42	1983 ± 32	–25.5 ± 0.2	50 BC–AD 90 (94.3%), AD 100–120 (1.1%)	Liston, forth.	L - with 9 charcoal dates of same site, 1 SFea. in same unit, and dates on 2 other ridgeline sites; M; N
WK-14029*	Earthworks w/stonework, NI-2a, TR5, SFea. 6, (60)	cf. *D. ferrea*	0.11	2012 ± 39	–30.6 ± 0.2	120 BC–AD 80	Liston, forth.	L - with 8 charcoal dates of same site, 1 SFea. in same unit, and dates on 2 other ridgeline sites; N
WK-14030*	Earthworks, NT-3:10, Profile 3, SFea. 3b/1, (170)	cf. *P. indicus*	2.55	1473 ± 38	–27.1 ± 0.2	AD 530–660 (94.3%), AD 460–490 (1.1%)	Liston, forth.	L - duplicate sample sent to different lab (ANU-11684) and with 2 dates on associated feature; N
WK-14031*	Earthworks, NT-3:10, Profile 3, SFea. 3b, IIIi, (110)	cf. *C. equisetifolia*	0.13	1431 ± 39	–28.5 ± 0.2	AD 540–670	Liston, forth.	L - with charcoal dates on associated SFea. and on same feature; O
WK-14032*	Ngermedangeb, NT-2:2, Profile 1, XXV, (220)	cf. *Maytenus palauica*	0.26	1707 ± 38	–25.2 ± 0.2	AD 240–420	Liston, forth.	K - with all 6 on profile
WK-14033*	Ngerdubech village, NT-3:9a, Profile 1, XXXIV, (80)	cf. *C. equisetifolia*	0.21	620 ± 38	–25.0 ± 0.2	AD 1290–1410	Liston, forth.	K; L - with 5 charcoal dates of same profile and 10 of same site; O
WK-14034*	Ngerdubech village, NT-3:9a, Fea. 47, TR2, Burial 1, (60)	*Artocarpus* sp.	2.90	201 ± 42	–26.2 ± 0.2	AD 1720–1820 (49.7%), AD 1630–1710 (25.7%), AD 1910–1960 (14.3%), AD 1830–1890 (5.7%)	Liston, forth.	L - with 5 charcoal dates of same site; N; slight possibility post-bomb date
WK-14060	Toi Meduu, NA-4:12, Fea. 8, TU1b, Ia, (13)	cf. *B. gymnorhiza*	4.34	1821 ± 38	–24.8 ± 0.2	AD 120–330 (91.8%), AD 80–110 (3.6%)	Liston, forth.	K; L - with all 5 other charcoal dates of same feature and 2 other dated features on site; M
WK-14061*	Roisengang, NA-2:5, Profile 2, Pit, I, (80)	1 taxon unident. woody species	0.49	1218 ± 43	–26.8 ± 0.2	AD 680–900 (93.0%), AD 920–940 (2.4%)	Liston, forth.	L - with all 4 other charcoal dates of same site; N
WK-14062*	Earthworks w/stonework, NI-1:4, Fea. 6, TR1, SFea. 1, (37)	*Buchanania* sp.	2.31	1894 ± 41	–27.2 ± 0.2	AD 20–240	Liston, forth.	L - with 3 charcoal dates of same site, 1 on associated cultural deposit, and dates on 2 other ridgeline sites; M; N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-14063*	Earthworks w/stonework, NI-1:4, Fea. 6, TR1a, Vb, (35)	1 taxon unident. woody species	0.18	2017 ± 39	–27.4 ± 0.2	120 BC–AD 80 (93.7%), 150–130 BC (1.7%)	Liston, forth.	L - with 3 charcoal dates of same site, on associated SFea., and dates on 2 other ridgeline sites
WK-14064*	Earthworks w/stonework, NI-2a, TR12, III, (98)	1 taxon unident. woody species	0.24	1825 ± 39	–30.6 ± 0.2	AD 80–260 (87.8%), AD 280–330 (7.6%)	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites
WK-14065*	Earthworks w/stonework, NI-2a, TR8, SFea. 1, (40)	cf. *D. ferrea*	0.16	1979 ± 39	–30.2 ± 0.2	60 BC–AD 130	Liston, forth.	L - with 10 charcoal dates of same site and dates on 2 other ridgeline sites; N
WK-14066*	Ngermedangeb, NT-2:2, Profile 1, SFea. 1, (240)	charred plant tissue	3.70	1727 ± 39	–27.6 ± 0.2	AD 230–420	Liston, forth.	K - with all 6 on profile; L - with 1 charcoal date of same cultural horizon and an associated SFea.; N
WK-14067*	Ngermedangeb, NT-2:2, Profile 1, XXXIV, (190)	cf. *Rhizophora* sp.	0.14	1800 ± 39	–24.8 ± 0.2	AD 120–350	Liston, forth.	K - with all 6 on profile; L - with 2 charcoal dates on associated SFeas.
WK-14068*	Ngermedangeb, NT-2:2, Profile 1, SFea. 2, (304)	cf. *Dodonaea viscosa*	0.10	1907 ± 39	–27.7 ± 0.2	AD 20–230	Liston, forth.	K - with all 6 on profile; L - with charcoal date on associated cultural horizon and on associated SFea.; N
WK-14069*	Toi Meduu, NA-4:12, Fea. 8, TR1a, RV10, (63)	1 taxon unident. woody species	0.80	1884 ± 39	–27.1 ± 0.2	AD 50–240 (94.0%), AD 30–40 (1.4%)	Liston, forth.	K; L - with all 5 other charcoal dates of same feature and 2 other dated features on site; N
WK-14070*	Toi Meduu, NA-4:12, Fea. 8, TR2, III, (22)	1 taxon unident. woody species	0.10	1727 ± 44	–27.2 ± 0.2	AD 210–430	Liston, forth.	K; L - with all 5 other charcoal dates of same feature and 2 other dated features on site
WK-14071*	Earthworks w/stonework, NA-4a, Fea. 3, SFea. 3, II, (66)	charred plant tissue	1.85	1811 ± 39	–28.1 ± 0.2	AD 120–340 (93.7%), AD 80–110 (1.7%)	Liston, forth.	L - with 2 charcoal dates of same site; N
WK-14072*	Toi Meduu, NA-4:12, Fea. 8, TR1, II, (40)	cf. *Syzygium* sp.	0.58	1851 ± 45	–25.7 ± 0.2	AD 60–260 (92.6%), AD 300–320 (2.8%)	Liston, forth.	K; L - with all 5 other charcoal dates of same feature and 2 other dated features on site
WK-14073*	Ngemeduu, NA-4:11, Profile 1, II, (190)	*Buchanania* sp.	0.82	1931 ± 48	–26.7 ± 0.2	50 BC–AD 220	Liston, forth.	L - with charcoal date associated Profile (2); O

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-14074*	Earthworks, NT-3:10, Profile 3, SFea. 2, IIm, (304)	1 taxon unident. woody species	0.09	1656 ± 39	−27.6 ± 0.2	AD 320–470 (78.5%), AD 250–300 (9.0%), AD 480–540 (7.9%)	Liston, forth.	O
WK-14075*	Earthworks, NT-3:10, Profile 3, SFea. 2, IIh, (334)	*Syzygium* sp.	0.06	2202 ± 45	−28.8 ± 0.2	390–160 BC (94.4%), 130–120 BC (1.0%)	Liston, forth.	L - with 2 of 6 charcoal dates on associated step-terraces; O
WK-14076*	Earthworks, NT-3:10, Profile 3, SFea. 3b, IIIg, (385)	1 taxon unident. woody species	0.22	1342 ± 41	−26.7 ± 0.2	AD 620–780	Liston, forth.	L - with charcoal dates on associated SFea. and on same feature; O
WK-14077*	Earthworks, NT-3:10, Fea. 4, SFea. 5, II, (60)	cf. *Xylocarpus granatum*	0.19	2821 ± 41	−26.7 ± 0.2	1130–890 BC (89.9%), 880–830 BC (5.5%)	Liston, forth.	L - with 5 charcoal dates in step-terrace; M; O
WK-14078*	Tabelmeduu, NA-4:15, Profile 4, Pit B, (122)	1 taxon unident. woody species	0.17	1861 ± 44	−26.7 ± 0.2	AD 50–260 (94.0%), AD 300–320 (1.4%)	Liston, forth.	L - with 8 charcoal dates of same site (uphill); N
WK-14079*	Ngermedangeb, NT-2:2, Profile 1, SFea. 3, (78)	Palm species	1.44	1209 ± 38	−26.0 ± 0.2	AD 680–900 (92.1%), AD 920–950 (3.3%)	Liston, forth.	K - with all 6 on profile; L - with 1 charcoal date of same site; N
WK-14080*	Ngermedangeb, NT-2:2, Profile 1, IX, (142)	1 taxon unident. woody species	0.19	1817 ± 39	−26.4 ± 0.2	AD 120–340 (92.5%), AD 80–110 (2.9%)	Liston, forth.	K - with all 6 on profile
WK-14081*	Toi Meduu, NA-4:12, Fea. 1, TR1, SFea. 5, V, (68)	1 taxon unident. woody species	0.21	1745 ± 43	−26.6 ± 0.2	AD 210–420 (91.4%), AD 170–200 (2.1%), AD 130–160 (1.8%)	Liston, forth.	L - with 2 charcoal dates, same SFea. types on feature and 2 other dated features on site; N
WK-14082	Toi Meduu, NA-4:12, Fea. 1, TR1, SFea. 5, VII, (82)	*Rhizophora* sp.	2.87	1792 ± 38	−25.8 ± 0.2	AD 120–350	Liston, forth.	L - with 2 charcoal dates of same SFea. types on feature and 2 other dated features on site; N; M
WK-14083*	Earthworks w/stonework, NI-1:4, Fea. 5, TR8, pit, IV, (85)	1 taxon unident. woody species	0.15	1993 ± 44	−25.0 ± 0.2	100 BC–AD 130	Liston, forth.	L - with 4 charcoal dates of same site and dates on 2 other ridgeline sites; N

Appendix C Valid Palauan cultural dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range, 2 σ	Source	Comments
WK-14085*	Ngerdubech village, NT-3:9a, Profile 1, IV, (78)	1 taxon unident. woody species	0.18	622 ± 38	−25.2 ± 0.2	AD 1290–1410	Liston, forth.	K; L - with 5 charcoal dates of same profile and 10 of same site; O
WK-14086*	Ngerdubech village, NT-3:9a, Profile 1, XXVI, (129)	1 taxon unident. woody species	0.07	488 ± 43	−24.8 ± 0.2	AD 1390–1490 (90.0%), AD 1320–1350 (5.4%)	Liston, forth.	K; L - with 5 charcoal dates of same profile, 10 of same site; O
WK-14087*	Ngerdubech village, NT-3:9a, Profile 1, SFea. 2, (75)	1 taxon unident. woody species	0.20	678 ± 38	−24.8 ± 0.2	AD 1270–1330 (50.1%), AD 1340–1400 (45.3%)	Liston, forth.	K; L - with charcoal date on SFea. of same profile, 4 of same profile, and 5 of same site; N
WK-14145	Earthworks w/stonework, NA-4b, Profile 1, SFea. 2, (60)	*Rhizophora* sp.	8.01	2057 ± 42	−25.9 ± 0.2	180 BC–AD 30 (94.0%), AD 40–60 (1.4%)	Liston, forth.	M; N
WK-14147*	Toi Meduu, NA-4:12, Fea. 1, TR2, SFea. 12, (40)	*H. tiliaceus*	2.12	1709 ± 39	−25.6 ± 0.2	AD 240–420	Liston, forth.	L - with 2 charcoal dates of same SFea. types on feature and 2 other dated features on site; M; N
WK-14148*	Ngerdubech village, NT-3:9a, Fea. 47, TR1, VII, (42)	*Rhizophora* sp.	0.11	692 ± 43	−26.2 ± 0.2	AD 1250–1400	Liston, forth.	L - with 14 charcoal dates of same site; O
WK-14149*	Ngerdubech village, NT-3:9a, Profile 1, SFea. 1, (35)	cf. *C. nucifera*	1.94	387 ± 38	−24.5 ± 0.2	AD 1430–1530 (60.5%), AD 1550–1640 (34.9%)	Liston, forth.	K; L - with charcoal date on SFea. of same profile, 4 of same profile, and 11 of same site; N
WK-14150*	Ngerdubech village, NT-3:9a, Profile 1, XXXXI; (78)	1 taxon unident. woody species	0.23	572 ± 38	−27.5 ± 0.2	AD 1300–1430	Liston, forth.	K; L - with 5 charcoal dates of same profile and 10 of same site; O

[a] Radiocarbon dating laboratories: AA - NSF Arizona AMS Facility; ANU - ANU Radiocarbon Dating Laboratory; B - Beta Analytic, Inc.; CAMS - Lawrence Livermore National Lab; DIC - Dicarb Radioisotope Company; I - Teledyne Isotopes, Inc.; N - Japan Radioisotope Association; NZ - New Zealand Institute of Nuclear Sciences; OS - National Ocean Sciences Accelerator Mass Spectrometry Facility; OZG - Australian Nuclear Sciences and Technology Organization; SR - Stafford Research Laboratory; UCLA - Isotopes Laboratory, Institute of Planetary Geophysics and Planetary Physics, University of California; WK - Waikato Radiocarbon Dating Laboratory.

[b] * = AMS.

[c] ** = 2003 excavations at the Ulong site (OR-15:5) produced additional, yet unreported, ^{14}C assays that solve some of the stratigraphic problems associated with those recorded here (G Clark, personal communication, 2004).

Appendix D Palauan bulk sediment or paleoenvironmental core ^{14}C dates.

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range (BP), 1 σ	Source
WK-8329	Aimeliik, Nekken Core 11, II, (172–174)	sediment	2.04	1620 ± 80	–25.3 ± 0.2	1590–1409	Athens and Ward 2005[b]
WK-5999*[c]	Aimeliik, Nekken Core 11, II, (188–190)	fern-like plant material	0.77	3905 ± 75	–31.6 ± 0.2	4418–4230	Athens and Ward 2005
WK-6000*	Aimeliik, Nekken Core 11, III, (371)	possible fruit case	0.22	4653 ± 58	28.8 ± 0.2	5456–5304	Athens and Ward 2005
WK-6001*	Aimeliik, Nekken Core 11, IV, (519–521)	non-wood plant material, possible fern	0.86	8322 ± 65	–28.4 ± 0.2	9427–9220	Athens and Ward 2005
WK-6002*	Aimeliik, Nekken Core 11, V, (620–621)	non-wood plant material, possible fern	0.16	6114 ± 67	–28.1 ± 0.2	7148–6886	Athens and Ward 2005
B-098629*	Airai, Yano Farm, Core 1, V, (167+)	wood (twig)	0.03	3090 ± 50	–31.0	3376–3209	Athens and Ward 2005
B-098630*	Airai, Yano Farm, Core 1, VI, (260–262)	wood	1.55	3460 ± 60	–26.5	3825–3592	Athens and Ward 2005
B-098631*	Airai, Yano Farm, Core 1, VI, (356–357)	wood	1.79	4180 ± 50	–28.9	4834–4552	Athens and Ward 2005
B-095510*	Airai, Yano Farm, Core 1, VIII, (500–502)	wood	0.62	5650 ± 50	–26.1	6487–6358	Athens and Ward 2005
B-98632*	Airai, Yano Farm, Core 1, XI, (726–728)	peat	1.09	5740 ± 60	–29.9	6637–6455	Athens and Ward 2005
B-098633	Airai, Yano Farm, Core 1, XII, (905–909)	wood	13.64	6130 ± 70	–29.0	7163–6911	Athens and Ward 2005
B-54784	Fana, SU-2:1, ST3, III, (95–100)	bulk soil	—	101.4 ± 0.7	—	AD 1950 (modern)	Hunter-Anderson 1992
B-54792	Hatohobei, Farihatsetsih Taro Patch, TO-1:33, Paleocore, (32–47)	bulk soil	—	250 ± 50	—	AD 1650–1750	Hunter-Anderson 1992
B-54790	Hatohobei, Iper, TO-1:1, East Profile, (154)	bulk soil	—	230 ± 80	—	AD 1640–1800	Hunter-Anderson 1992
WK-6317*	Irikl pondfield, OR-11:4, Core 1, I, (71)	leaf	0.06	868 ± 51	–32.1	879–693	Athens and Ward 2002
WK-6318*	Irikl pondfield, OR-11:4, Core 1, III, (123)	wood	0.28	2425 ± 73	–26.6	2710–2347	Athens and Ward 2002

https://doi.org/10.1017/S0033822200019780 Published online by Cambridge University Press

Appendix D Palauan bulk sediment or paleoenvironmental core ^{14}C dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range (BP), 1 σ	Source
WK-6719*	Irikl pondfield, OR-11:4, Core 1, Va, (311–312)	humic sediment	3.37	3112 ± 57	–27.2	3381–3213	Athens and Ward 2002
B-145636*	Irikl pondfield, OR-11:4, Core 1, Va, (362)	wood, probably not root	0.11	3210 ± 40	–27.0	3451–3361	Athens and Ward 2002
WK-8125*	Irikl pondfield, OR-11:4, Core 1, Va, (367–369)	sediment	14.79	2810 ± 60	–28.5	2997–2784	Athens and Ward 2002
B-145637*	Irikl pondfield, OR-11:4, Core 1, Va, (422)	wood, probably not root	0.43	5000 ± 40	–29.0	5848–5662	Athens and Ward 2002
WK-6319*	Irikl pondfield, OR-11:4, Core 1, Va, (442)	wood, seed capsule	0.17	4995 ± 58	–27.4	5858–5657	Athens and Ward 2002
WK-6320*	Irikl pondfield, OR-11:4, Core 1, Vb, (752)	wood, possibly bark or covering for pneumatophore	0.45	6205 ± 72	–31.2	7211–6990	Athens and Ward 2002
B-95502*	Melekeok, Lake Ngerkok, Core 5, II, (121–122)	Pandanus key	2.19	690 ± 60	–26.6	670–562	Athens and Ward 2005
B-95503*	Melekeok, Lake Ngerkok, Core 5, IV, (178–180)	peat	0.10	800 ± 40	–28.1	737–670	Athens and Ward 2005
B-95504	Melekeok, Lake Ngerkok, Core 5, IV, (280–286)	sediment	32.60	880 ± 150	–28.6	949–666	Athens and Ward 2005
B-95505*	Melekeok, Lake Ngerkok, Core 5, VI, (330–336)	sediment	48.65	1600 ± 60	–20.7	1539–1409	Athens and Ward 2005
B-95506*	Melekeok, Lake Ngerkok, Core 5, VIII, (450–451)	sediment	3.74	2860 ± 60	–26.8	3136–2857	Athens and Ward 2005
B-95507*	Melekeok, Lake Ngerkok, Core 5, IX, (508–509)	sediment	5.99	2570 ± 70	–27.5	2752–2401	Athens and Ward 2005
B-95508*	Melekeok, Lake Ngerkok, Core 5, X, (543–544)	charcoal	0.08	2780 ± 60	–32.6	2954–2779	Athens and Ward 2005
B-95509*	Melekeok, Lake Ngerkok, Core 5, XI, (700)	wood	0.15	2980 ± 50	–28.2	3240–3002	Athens and Ward 2005
B-96499*	Melekeok, Lake Ngerkok, Core 5, XII, (731–732)	sediment	3.06	3140 ± 60	–27.8	3435–3268	Athens and Ward 2005
B-96500*	Melekeok, Lake Ngerkok, Core 5, XIV, (806–808)	wood	0.17	2920 ± 60	–29.0	3161–2957	Athens and Ward 2005

Appendix D Palauan bulk sediment or paleoenvironmental core ^{14}C dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range (BP), 1 σ	Source
B-54786	Merir, SU-4, Fasohwur Taro Patch, Paleocore, (50–60 and 52–62)	bulk soil	—	1110 ± 60	—	AD 780–900	Hunter-Anderson 1992
WK-6412*	NA-2:24, Ngerchau Core 14, II, (136–137)	wood, possible *Ficus* sp.	0.10	2576 ± 62	–27.2	2751–2542	Athens and Ward 2005
WK-6413*	NA-2:24, Ngerchau Core 14, III, (142–143)	wood, unident.	0.15	2460 ± 58	–28.2	2715–2357	Athens and Ward 2005
WK-8330*	NA-2:24, Ngerchau Core 14, III, (148–150)	peat	0.68	2850 ± 60	–28.7	3028–2853	Athens and Ward 2005
B-127286*	NA-2:24, Ngerchau Core 14, III, (200–201)	peat	1.60	3840 ± 90	–27.4	4411–4023	Athens and Ward 2005
WK-6414*	NA-2:24, Ngerchau Core 14, III, (244–245)	peat, including possible steles from a fern or monocotyledon	1.41	5203 ± 62	–26.9	6023–5912	Athens and Ward 2005
WK-6720*	NA-2:24, Ngerchau Core 14, III, (302–302.5)	peat	1.12	3902 ± 60	–28.1	4418–4181	Athens and Ward 2005
WK-6415*	NA-2:24, Ngerchau Core 14, IV, (414)	wood, possibly bark, unident.	0.84	3847 ± 57	–26.8	4401–4147	Athens and Ward 2005
WK-6721*	NA-2:24, Ngerchau Core 14, IV, (540–541)	peat	3.49	4008 ± 57	–28.2	4565–4416	Athens and Ward 2005
WK-5997*	NM-7d, Olbed 2, Core 9, II, (95)	wood (possible fruit case)	0.11	3938 ± 74	–29.4	4504–4269	Athens and Ward 2005
B-97705	NM-7d, Olbed 2, Core 9, III, (161–165)	wood (bark)	8.21	5000 ± 80	–29.2	5889–5622	Athens and Ward 2005
B-97706*	NM-7d, Olbed 2, Core 9, IV, (226–228)	sediment	4.60	5540 ± 60	–29.2	6405–6283	Athens and Ward 2005
B-108277*	NM-7g, Olbed 1, Core 8, III, (85–87)	peaty/loam	8.54	880 ± 40	–29.9	880–733	Athens and Ward 2005
B-98416*	NM-7g, Olbed 1, Core 8, III, (142)	wood (bark)	0.45	1380 ± 60	–23.2	1316–1269	Athens and Ward 2005
B-182400*	NM-7g, Olbed 1, Core 8, III, (237)	wood (bark)	—	3650 ± 40	–29.5	4058–3873	Athens and Ward 2005
B-181927	NM-7g, Olbed 1, Core 8, III, (276–277)	peat/loam	2.36	4200 ± 40	–27.7	4836–4589	Athens and Ward 2005

Appendix D Palauan bulk sediment or paleoenvironmental core ^{14}C dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range (BP), 1 σ	Source
B-108278*	NM-7g, Olbed 1, Core 8, III, (318–320)	peaty/loam	7.04	3890 ± 40	–29.7	4414–4181	Athens and Ward 2005
B-98417*	NM-7g, Olbed 1, Core 8, III, (605)	wood (bark)	0.18	7060 ± 70	–22.8	7918–7767	Athens and Ward 2005
WK-5998*	NT-2:4, Core 6, IV, (103–104)	peaty sediment	2.01	3027 ± 75	–27.9 ± 0.2	3343–3080	Athens and Ward 2005
WK-6244*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, V, (167–169	wood, possibly fern	0.50	2207 ± 76	–28.6	2330–2075	Athens and Ward 2002
WK-6245*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VIb, (207–208)	wood	0.26	2491 ± 57	–28.6	2719–2362	Athens and Ward 2002
WK-6246*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VIb, (259–260)	wood, cf. *Cocos* stem	0.28	3554 ± 57	–25.5	3956–3695	Athens and Ward 2002
WK-8124*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VIb, (295)	wood, mangrove sp.	0.13	4370 ± 70	–13.8	4950–4844	Athens and Ward 2002
WK-6247*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VIc, (340)	wood	0.16	5419 ± 57	–31.1	6284–6122	Athens and Ward 2002
WK-6248*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VII, (363–364)	wood, possible pneumatophore	0.62	5237 ± 66	–29.5	6169–5918	Athens and Ward 2002
WK-6249*	Omeklechelel (Ngikel) Pondfield, OR-12:46, Core 1, VII, (382)	wood, possible pneumatophore	0.07	5147 ± 58	–26.9	6019–5757	Athens and Ward 2002
B-97707*	Peleliu, Ngebungel Swamp, Core 1, I, (95)	wood, cf. fern caudex	0.22	2920 ± 50	–26.9	3159–2958	Athens and Ward 2002
B-95452*	Peleliu, Ngebungel Swamp, Core 1, I, (98)	wood, monocot but not coconut	0.15	1700 ± 100	–28.7	1710–1422	Athens and Ward 2002
WK-6315*	Peleliu, Ngebungel Swamp, Core 1, I, (118–119)	wood, possibly pneumatophore	0.34	3295 ± 58	–27.0	3632–3413	Athens and Ward 2002

Appendix D Palauan bulk sediment or paleoenvironmental core ^{14}C dates. *(Continued)*

Lab nr[a]	Provenience	Material	Weight (g)	Conventional age (BP)	^{13}C	Calibrated ^{14}C age range (BP), 1 σ	Source
B-95451*	Peleliu, Ngebungel Swamp, Core 1, I, (174–175)	peat	0.56	950 ± 80	–28.1	949–741	Athens and Ward 2002
WK-6316*	Peleliu, Ngebungel Swamp, Core 1, IIa, (175–179)	peat, tubular, possible root mass	0.49	1619 ± 60	–27.9	1557–1412	Athens and Ward 2002
B-95453	Peleliu, Reburs Ra Rois Eaur Swamp, Core 1, II, (48–53)	Strombidae	24.30	1420 ± 50	+3.2	916–753	Athens and Ward 2002

[a] Radiocarbon dating laboratories: AA - NSF Arizona AMS Facility; ANU - ANU Radiocarbon Dating Laboratory; B - Beta Analytic, Inc.; CAMS - Lawrence Livermore National Lab; DIC - Dicarb Radioisotope Company; I - Teledyne Isotopes, Inc.; N - Japan Radioisotope Association; NZ - New Zealand Institute of Nuclear Sciences; OS - National Ocean Sciences Accelerator Mass Spectrometry Facility; OZG - Australian Nuclear Sciences and Technology Organization; SR - Stafford Research Laboratory; UCLA - Isotopes Laboratory, Institute of Planetary Geophysics and Planetary Physics, University of California; WK - Waikato Radiocarbon Dating Laboratory.

[b] Athens and Ward (2002, 2005) were calibrated using the Calib 3.0.3 computer program of Stuiver and Reimer (1993).

[c] * = AMS.