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The Age of the Yanuca Lapita Site, Viti Levu, Fiji

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ABSTRACT

The Yanuca site, excavated by Lawrence and Helen Birks in 1965–66, contained a Lapita ceramic assemblage that is often considered one of the earliest in Fiji. Attempts to date the site by radiocarbon in the 1960s and with thermoluminescence in the 1980s failed to provide an accurate time frame for the Lapita deposits. Five new shell dates run on samples collected by the Birks from levels containing dentate-stamped pottery suggest an early Lapita presence at the site that might pre-date 2900 cal BP and a later occupation at 2800–2700 cal BP. If so, then the most restrictive Lapita period of 2800–2700 cal BP suggested by Anderson and Clark (1999) would require broadening.

Key words: LAPITA, COLONISATION, FIJI, ARCHAEOLOGY, RADIOCARBON.

INTRODUCTION

The age of sites containing dentate-stamped ceramics has become a key issue in Lapita research because of the implications of differing chronologies for questions about dispersal behaviour, the length of Lapita tenure, human impact on hitherto pristine environments and rates of change in material culture. All are concerned, ultimately, with attempting to understand the nature of this important colonisation movement in Pacific prehistory. In the early stages of research, the number of dates and sites was relatively small and it was feasible to use all the radiocarbon determinations from the entire Lapita range to establish a broad chronological framework (Golson 1971; Green 1979; Groube 1971), an approach which peaked with the important reviews of Kirch and Hunt (1988) and Spriggs (1990).

In recent years, as the number of determinations has grown significantly, archaeologists have investigated the Lapita chronology on an archipelago by archipelago basis. The aim has been to pinpoint the Lapita span to as narrow and accurate a time frame as possible. In the process, known colloquially by the term "chronometric hygiene" — coined by Wilfred Shawcross in the late 1980s — the margins are progressively tightened by the systematic discard of results which fail to meet certain criteria (detailed, *inter alia*, in Spriggs and Anderson 1993). The result has been to establish a tight core of determinations, which indisputably represent Lapita presence, for the known western limit in the Bismarck

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Archipelago (Specht and Gosden 1997) and close to its eastern limit in Tonga (Burley *et al.* 1999), with New Caledonia (Sand 1997) and Fiji (Anderson and Clark 1999) in between.

It is a commonly acknowledged possibility that some determinations which fail to meet the criteria of retention might, in fact, be accurate measures of age for cultural activity that is otherwise not apparent in the archaeological data (e.g., determinations which fall outside contact with any other results at 2SD are commonly discarded as outliers). Similarly, conclusions about the determinations retained in an archipelagic chronology tend to emphasise the central age range exhibited in the data, rather than its marginal results. In order to be confident that these procedures do not reject unfairly data that might indicate different conclusions, it is important to revisit each chronology as new dates arise.

In the present case, the issue is whether new radiocarbon determinations, reported here, from the Lapita site at Yanuca, suggest that we need to reconsider the conclusion that the Fijian Lapita chronology, dating 2900–2600 cal BP on acceptable determinations, "might have been almost encompassed within the century 2800–2700 cal BP" (Anderson and Clark 1999: 37). This was based on a small sample — 14 acceptable determinations from 5 sites — remaining from a database of 55 determinations (66% rejected) from 11 dated sites. Given the small sample size of acceptable determinations, it would take only a few new and acceptable results that were significantly different to move the general conclusion about the likely chronological span of Lapita occupation in one direction or the other. In this matter, three sites stand out as containing ceramics which are stylistically early in the Lapita series and which might date rather earlier than the others: Naigani, Natunuku and Yanuca.

Naigani is reasonably well dated to the currently-assumed Lapita span in Fiji (Anderson and Clark 1999), and we must await the results of recent excavation there to see whether this remains the case. Natunuku and Yanuca have defied adequate dating despite both having been re-excavated since the original work in the 1960s. Natunuku is especially enigmatic because the level producing its very early result (GaK-1218, CRA = 3240 ± 100 BP) has unusual characteristics and has not been relocated subsequently. There are other problems, also, in defining and interpreting the radiocarbon dates from Natunuku (Davidson and Leach 1993; Anderson and Clark 1999). At Yanuca (Hunt 1980), there is also one unusually early age (GaK-1226, CRA = 2980 ± 90 BP). Here, fortunately, it is possible to test the chronology further. Marine and freshwater shell from the basal levels of Yanuca, collected by Lawrence and Helen Birks in 1965–66, was located in the collections of the Fiji Museum (Suva) and approval given to date five of the samples. This paper reviews the earlier and new age estimates for Yanuca's Lapita deposit and discusses implications for dating the Lapita chronology.

THE YANUCA SITE (VL16/81)

The Yanuca site is located 11 km west of the Sigatoka River on the north coast of Yanuca Island (Fig. 1). The small island, about 41 ha in area, is composed of limestone overlain by sandy or clayey soils and is separated from Viti Levu by a tidal channel roughly 180 m wide. Archaeological investigations began on the island in 1965 with a series of test pits in rock overhangs on the northwest side of the island and surface collections of pottery. The latter included a dentate-stamped sherd with applied nubbins from a cultivated area near the centre of the island (Palmer 1966). Soon after, a bulldozer forming an access road between the limestone cliffs and the shore cut through a deposit containing dentate-stamped

and paddle-impressed ceramics in front of the western sector of a limestone rock shelter. The remaining deposit between the shelter wall and the road cut was excavated by the Birks in eight rectangular trenches, each 5 x 10 ft (1.52 x 3.05 m) in size, divided by baulks which were also removed resulting in a substantial excavation area of more than 45 square metres. Trenches 1–4 were parallel with, and close to, the interior shelter wall, with the second row of Trenches 1A–4A in front of the first row and separated by a baulk 3 ft (90 cm) wide. Excavation was in three inch (7.6 cm) spits and the sediments were not sieved.

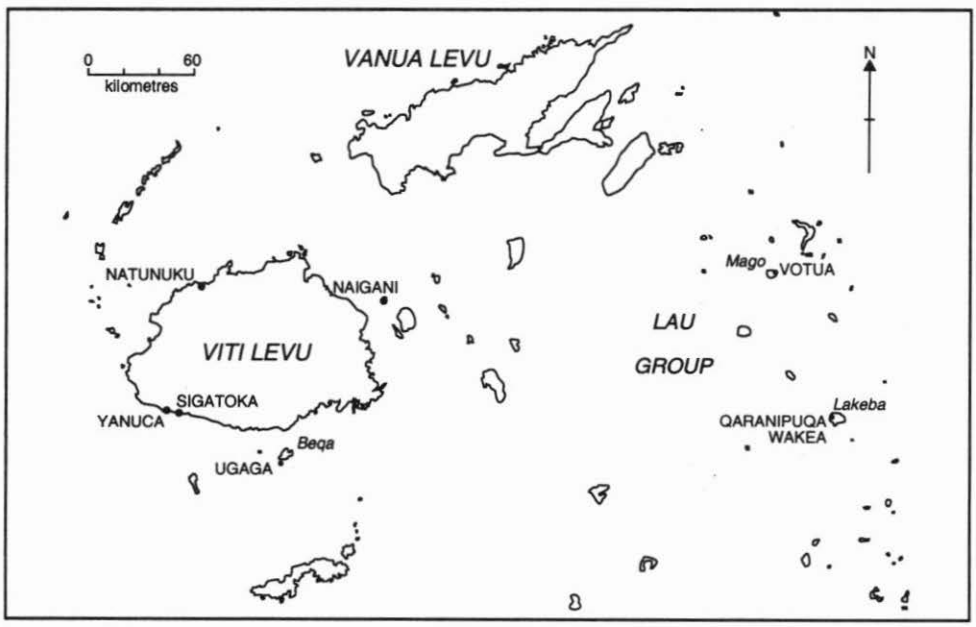


Figure 1: Map of Fiji showing the location of the Yanuca site and Lapita localities mentioned in the text.

In 1978 Terry Hunt mapped the site and excavated two test pits in the eastern sector of the rock shelter, around five metres from the Birks's excavations, to obtain samples for dating and midden analysis. However, the deposits there were shallow and did not contain Lapita ceramics (Hunt 1980: 47). It appears that the Yanuca Lapita deposits were concentrated in a small area of the rock shelter less than 15 m long and 5 m wide (after the road cut) and were largely, if not completely, removed by the 1960s excavations.

NATURAL AND CULTURAL STRATIGRAPHY

An initial description of the stratigraphy of the Yanuca site was published in 1967 and a more detailed account in 1978 (Birks and Birks 1967, 1978). The following description is based on the 1978 report using the layer designations given in it. The depth of the Yanuca deposits was greatest in Trenches 2–2A and 3–3A where Layer F — composed of loose and

cemented limestone above the limestone floor — dipped to form a small hollow around 2.7 m below the ground surface (Fig. 2). The limestone floor sloped upward to the east and west restricting the total depth of deposit to 0.5 m in Trench 1 and 1.5 m in Trench 4. Above the rock floor was a loosely packed sandy calcareous sediment with fragments of shell and coral about 60 cm thick (Layer E) which covered the hollow except near the shelter wall where a dark grey-to-black loam (Layer D) occurred. The top of Layer E was 160 cm above the modern high tide level and could represent either storm debris or a former high sea level. It had evidently replaced most of the dark loamy layer shortly after human use of the shelter began since pottery, charcoal and shell were found in Layer D, but the marine deposit abutting Layer D was largely devoid of any reworked cultural material. Layer E was not recorded in Trenches 1 and 4 which had limestone floors higher than those of Trenches 2 and 3. Near the shelter wall at 180–150 cm, layer D graded into Layer B, which was a grey-to-brown humic soil that contained the bulk of the artefactual remains and had a maximum depth of 178 cm. Layer B continued almost to the surface, which was marked by a thin layer less than 2 cm thick called Layer A. Intruding into the lower part of Layer B was a discontinuous deposit of red-brown clay, thickest in the north and east, which was interpreted as slope wash from the western incline adjacent to the rock shelter (Layer C). Limestone fragments, lenses and areas of light and dark ash were found in Layer B and were concentrated in Trench 3 (Fig. 2).

The Birks divided the cultural stratigraphy into three zones based on the similarity of the Yanuca ceramics to those recovered from levels of the nearby Sigatoka site (VL 16/1). Ceramics with complex vessel forms and dentate stamping were almost exclusively confined to the 40–50 cm of deposit above Layer E. Zone 2 contained all the pottery from the remaining deposit (about 135 cm), with paddle-impressed sherds comparable to Sigatoka Level 2 ceramics midway up Zone 2 with plain pottery above. The Lapita vessel forms were described by Birks and Birks (1973) and the dentate-stamped designs by Mead (1973). Subsequently, Hunt (1980) analysed in depth a complete ceramic sample from Zones 1–3 of Trenches 3, 3A and trench baulk 2–3.

The restriction of most of the Lapita deposit to the limestone hollow suggests that prehistoric activity was focused in an area where the floor-to-shelter ceiling height was greatest. Thus, although the eastern sector test pitted by Hunt and Trenches 1–1A excavated by the Birks were in areas with the largest depth of shelter overhang they also have high limestone floors and were used less. The extent of the Yanuca site cannot now be determined since shoreward beach deposits have been removed by road construction and erosion. However, levels containing Lapita remains might still survive on Yanuca contained in depressions along the base of the north-trending limestone cliff.

YANUCA AGE ESTIMATES

The age of the Yanuca layers containing dentate-stamped pottery has been estimated using radiocarbon and thermoluminescence. Radiocarbon estimates were made at the Gakushuin Laboratory (Gakushuin University) in the 1960s (Birks and Birks 1967) and the Quaternary Dating Centre (Australian National University) in 2001. Thermoluminescence dating of pottery using the fine grain technique was carried out at the Department of Physics (University of Adelaide) between 1979 and 1982.

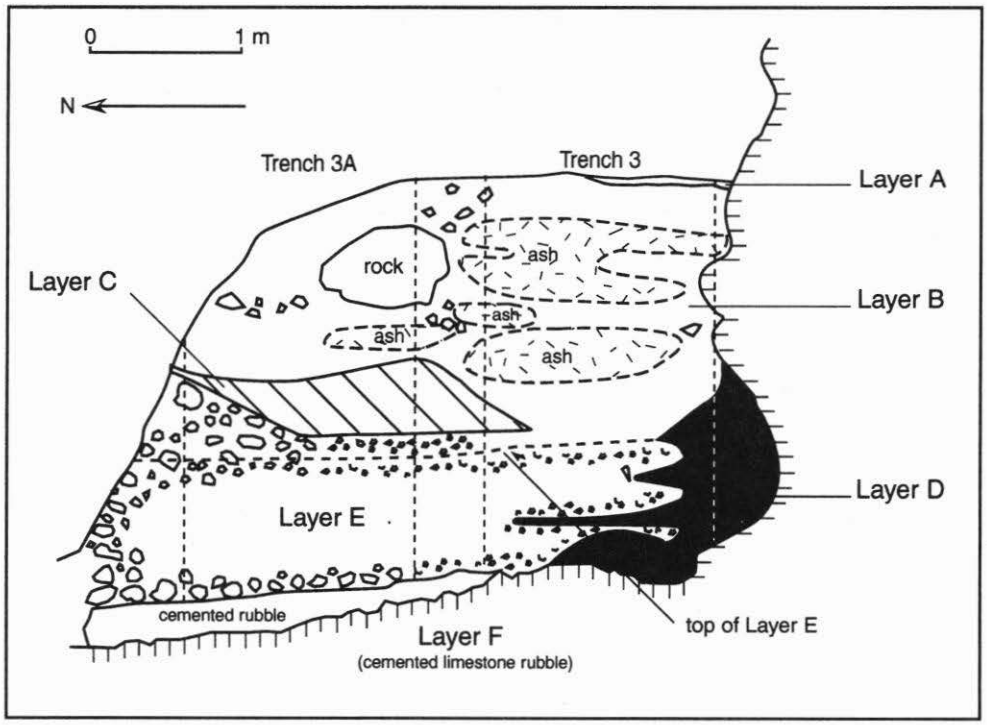


Figure 2: Cross-section of Yanuca Trench 3 and 3A (after Birks and Birks 1978).

Radiocarbon dates on charcoal and shell were calibrated at two standard deviations with CALIB 4.1.2 using the conventions given in Anderson and Clark (1999). A marine reservoir value of 38 ± 16 has been calculated for Viti Levu on coral rings (Toggweiler *et al.* 1991) but it is unclear whether it is applicable to the southwest Viti Levu region. Shell dates were instead calibrated with Δ R set at 0, as has been done by Spriggs (1990) amongst others. Paired shell-charcoal C_{14} results from several Fijian sites such as Navatu and Votua suggest that a Δ R value set at 0 is a reasonable figure with which to calibrate shell samples in the absence of a series of location-specific correction factors for the Fiji Islands (Clark 1999; Clark *et al.* in press).

PREVIOUS RADIOCARBON RESULTS

Birks and Birks (1978) submitted four charcoal samples from Trench 3A to the Gakushuin Laboratory, one of which (Gak-1226) from the basal ceramic Zone 3, returned a Conventional Radiocarbon Age (CRA) of 2980 ± 90 BP. At two standard deviations it has a calibrated range of 3380–2870 BP, which is substantially earlier than the maximum range of 2900–2600 cal BP suggested by Anderson and Clark (1999).

Dates from the Gakushuin Laboratory run in the 1960s and early 1970s are routinely rejected on the grounds that they are often anomalous when compared with results from similar or identical contexts processed by other laboratories, and that specific dates lacking such corroboration are therefore unreliable (Spriggs 1990). Gakushuin results from Sigatoka (Birks 1973) have, however, been paralleled by recent determinations (Best 1989; Burley *et al.* 1999), and as a reason for completely rejecting the only C_{14} result for Zone 3, a Gakushuin origin is, by itself, insufficient. However, since the sample was composed of small, dispersed charcoal fragments collected from over most of the trench area, its cultural association is uncertain, as is the sample's species composition. The possibility that it contains a proportion of 'old wood' that has become incorporated into the site cannot be dismissed. Spriggs (1996: 420) also notes that Gakushuin CRAs might need to be recalculated from the original counting statistics (see Davidson *et al.* 1990: 155). Gak 1226 is therefore considered unlikely to provide an accurate age of the Lapita component at the site.

A second date, Gak-1227 (2660 ± 90 BP), is sometimes included in Lapita date lists (Kirch and Hunt 1988; Spriggs 1990) and has a calibrated age of the expected magnitude (Table 1). Since the sample derives from a spit above those with Lapita pottery and is not directly associated with dentate-stamped sherds (see Hunt 1980: Table 4.2) it must be rejected, although as Golson (1974: 562) notes, stratigraphic displacement from the underlying Lapita deposits could have occurred.

THERMOLUMINESCENCE RESULTS

In a pioneering attempt to date prehistoric ceramics from Oceania directly, and thereby provide a fine-grained and independent chronology of stylistic change, Prescott *et al.* (1982) dated four sherds from Yanuca (Table 1). Two samples (TL 9, TL 11) were paddle impressed, one was dentate stamped (TL 10) and the fourth was described as late-Lapita plain (TL 14). All sherds were from Trench 3 and were from the Zone 3 deposit. TL 9 contained a pyroxene temper and did not return a result, but the three remaining samples had median dates ranging from 2800 to 2250 BP (Table 1). The precise depth of the TL samples in Zone 3 was not reported but TL 10 was the deepest, with the paddle impressed sherd TL 11 above it. Sherd TL 14, which gave the oldest date range, was the highest sample and was collected a few centimetres below GaK 1227, which suggests a location near the transition between Zone 3 and Zone 2, or about 130 cm deep (1982: 146).

The TL results suggested temporal separation between paddle-impressed and dentate-stamped ceramics in Fiji, which was an important finding given the debate about the origin and timing of stylistic variation in the Fijian sequence (Hunt 1980, 1986; Rechtman 1992). As paddle-impressed sherds were found in Zone 3, the TL dates also indicate mixing and reworking of the site's Lapita levels (Hunt 1980), as does the date inversion of TL 10 and TL 14. The two TL results on Lapita sherds for Zone 3 are, however, less useful for determining the age of initial occupation since although they cover the expected span of Lapita occupation, they have large errors, and the result from TL 10 is suspect since it had low levels of TL with spurious TL evident at the high temperature end of the curve (Prescott *et al.* 1982: 143).

TABLE 1
Yanuca age determinations

Lab No	Sample Type	Sample Context	Depth below surface
GaK-1229	Charcoal	Tr.3A, Z2, Spit 3	25.4 cm
GaK-1228	Charcoal	Tr.3A, Z2, Spit 10	76.2 cm
GaK-1227	Charcoal	Tr.3A, Z2, Spit 16	121.9 cm
GaK-1226	Charcoal	Tr.3A, Z3, Spit 5	167.6 cm
ANU-11415	*Tonna sulcosa* (40.0 g)	Tr.3A, Z3, Spit 4	167.6 cm
ANU-11413	*Trachycardium* sp. (30.5 g)	Tr.4, Z3, Spit 2	152.4 cm
ANU-11416	*Anadara antiquata* (59.7 g)	Tr.3, Z3, Spit 7	190.5 cm
ANU-11417	*Cyprea tigris* (89.5 g)	Tr.2–2A, Z3, Spit 3	160.0 cm
ANU-11414	*Batissa violacea* (75.0 g)	Tr.2A, Z3, Spit 4	167.6 cm

Lab No	Conventional Age (BP)	Calibrated Age (2SD)	$\delta^{13}C$ Value
GaK-1229	modern	-	?
GaK-1228	2060 ± 100	2330 (2000) 1820	?
GaK-1227	2660 ± 90	2950 (2760) 2490	?
GaK-1226*	2980 ± 90	3380 (*3210-3080) 2870	?
ANU-11415	2300 ± 50	2030 (1900) 1800	1.5 ± 2.0
ANU-11413	2650 ± 50	2450 (2330) 2210	-12.3 ± 0.2
ANU-11416	2940 ± 60	2820 (2730) 2600	3.8 ± 2.0
ANU-11417	3050 ± 80	3000 (2790) 2700	2.7 ± 5.7
ANU-11414	3150 ± 60	3100 (2930) 2770	-12.3 ± 2.0

Sample	TL Age (BP)	TL Range (BP)	Sample Context	Sherd description
TL 10	2500 ± 300	2800–2200	Tr.3, Zone 3, Spit 3	Dentate stamped
TL 11	2250 ± 150	2400–2100	Tr.3, Zone 3, Spit 3	Paddle impressed
TL 14	2800 ± 400	3200–2400	Tr.3, Zone 3, Spit 3	Plain Late Lapita

*GaK-1226 has multiple intercepts between 3210 and 3080 cal BP.

SHELL RESULTS

Birks and Birks (1978: 11–12) recovered marine shell midden, associated with pottery in all excavation spits above Layer E. This material can no longer be located in the Fiji Museum except for a small collection that included seven shells from Zone 3, five of which were dated. Since Trenches 1–1A and 4–4A were on the periphery of the Lapita deposit, only one sample from the base of Trench 4 was dated (ANU-11413). The four remaining shells were from the central excavation Trenches 3, 3A, 2A and the 2–2A trench baulk. Three shells came from a depth of 160–170 cm, just above the surface of Layer E, and one (ANU-11416) was from the transition between the top of Layer E and the basal cultural layers 191 cm below surface (Table 1).

Shell dates include a fractionation correction from the measured $\delta^{13}C$ value, and were examined for recrystallisation with X-ray diffraction, which identified the samples as 100% aragonite. Shell samples were cleaned in an ultrasonic bath before cleaning of surfaces with a dental drill and returning samples to the ultrasonic bath.

The five shell species are found in Lapita sites elsewhere in Fiji, particularly the bivalve *Batissa violacea* and the univalve *Cyprea tigris*, which appear to have had a dual function as a food item and as a tool/ornament (Best 1984; Clark *et al.* in press; Hunt 1980: 168). However only the *Anadara antiquata* valve (ANU-11416) exhibited definitive modification on its posterior margin.

The shell determinations have median results ranging from 1900 to 2930 cal BP with three dates between 2730 and 2930 cal BP. Of the younger dates, ANU-11413 (2450–2210 cal BP) from Trench 4 supports the view that the Lapita presence was confined to the area with the low limestone floor and did not appreciably extend into Trenches 1–1A and 4–4A. The other determination which is clearly out of phase despite its basal context is ANU-11415 from Trench 3A with a range of 2030–1800 cal BP. Like the thermoluminescence results from Trench 3, the existence of paddle-impressed sherds in Zone 3, and conjoined sherds representing vertical movement of up to 40 cm in Trenches 3 and 3A (Hunt 1980: 88, 91, 95), ANU-11415 demonstrates disturbance of the Lapita zone and the incorporation of younger material from overlying deposits. Counterbalancing the picture of low stratigraphic integrity is the distribution of the dentate-stamped sherds, which are confined to Zone 3 (Hunt 1980: 91, 95). As with a number of Lapita coastal sites in Fiji, such as those on Ugaga (Fig. 1) and Cikobia Island (north of Udu Point, Vanua Levu), the Yanuca Lapita deposit has been disturbed to a point where the depositional sequence though blurred has not been completely obscured. If so, then the three remaining dates might well date the Lapita occupation.

Two of these have similar median values of 2730 and 2790 cal BP (ANU-11416, ANU-11417) while the third is older at 2930 cal BP (ANU-11414). All samples were on complete shells exhibiting no evidence of having been water rolled and their status as midden or artefactual material, rather than natural shell derived from the sterile Layer E (which was not retained), appears reasonable. Of these dates, the oldest with a span of 3100–2770 cal BP is the most difficult to exclude, since it is on a shell that was almost certainly brought into the site by people. The large valve of *Batissa violacea* weighed 75 g and as the species apparently favours the lower reaches of large rivers (Best 1984: 458; and see Meehan 1982: 62–63) might have been collected from the Sigatoka River. If so, and the *Batissa* determination was not on a sub-fossil specimen and it does not incorporate a 'hard water' effect then the shell results, using for convenience the median ages, suggest a span for the Lapita Yanuca deposit of 2930–2730 cal BP.

The hard water effect can render radiocarbon ages of shellfish from estuaries, rivers and lakes where limestone forms the bedrock too old. Ground water and runoff can incorporate dissolved carbon from limestone and in sufficient quantities the C_{14} activity of the water will be depleted, resulting in an artificially old radiocarbon result of up to several centuries (Spennemann and Head 1998). As it is dependant on local factors, the hard water effect is not quantifiable and the approach taken is to evaluate the age offset using recent specimens of the same species from the same locality as the sample (Bowman 1990: 26). We have not applied this methodology, because a Sigatoka River origin for the *Batissa* sample, while likely, cannot be confirmed. Thus, the *Batissa* result needs to be treated with some caution. It is worth noting that as most of Fiji's Lapita sequence is based on determinations on wood charcoals unidentified to species and on marine shellfish from islands with substantial limestone formations, the majority of 'Lapita' determinations could also potentially incorporate an older 'inbuilt' sample age of 100 years or so. Identification of wood charcoals and dating of archaeological and modern shell species from the same location are needed to

resolve this issue, but in the meantime a working assumption, and one that might well need to be revised in the future, is that determinations meeting basic and assessable criteria provide a reasonably accurate span for the Lapita settlement of Fiji (Anderson and Clark 1999). In the case of the *Batissa* shell (ANU-11414), the sample was 100% aragonite, fractionation was measured, and the sample has an apparently acceptable cultural association.

DISCUSSION AND CONCLUSION

The Yanuca site is distinguished in the central Pacific by having three series of age results, each dating a different material (charcoal, shell, pottery), with most samples dating Zone 3. Plots of the date series with the C_{14} results at two standard deviations and TL results with their standard error are shown in Figure 3. In each, the youngest median results are between 1900 and 2330 BP, which probably reflects, in the case of the TL result and the two shell dates, mixing of the younger Zone 2 deposits with those of Zone 3. The remaining seven dates extend to a generally accepted range for the Lapita dispersal as a whole of 2600 to 3380 BP. There is no obvious plateau or pattern to them except that in each series there is a gap between the two oldest Zone 3 determinations of a century or more. Clearly, the oldest Lapita age results for each series cannot all be correct and in the case of the TL and C_{14} charcoal there are a number of valid reasons to suspect that they are out of phase with the shell dates. Nonetheless, even if the age values are inconsistent with one another it is pertinent to ask whether the accumulating early ages suggest that there was an earlier-than-expected Lapita occupation at Yanuca, and whether evidence of that might also be found at other Lapita sites in Fiji.

Two sites with adequate stratigraphic integrity and radiocarbon dates to examine this are Naigani Island (VL 25/1) east of Viti Levu and Qaranipuqa (101/7/197) on Lakeba, both excavated by Simon Best (1981, 1984). Naigani, along with Natunuku and Yanuca, is considered to be one of the oldest Lapita sites on the basis of a high frequency of ceramic decoration and the presence of Talasea obsidian. The site has two marine-shell dates from the base of the cultural deposit (NZ 5615, CRA = 3070 ± 30 BP, NZ 5616, CRA = 3080 ± 40 BP) and two from the top (NZ 5617, CRA = 2970 ± 40 BP, NZ 5618, CRA = 2940 ± 40 BP). Basal dates suggest arrival between 2900 and 2800 cal BP while the upper dates are a century later. On Lakeba there is a single acceptable shell determination from Layer W of the Qaranipuqa rock shelter with a probable age of 2850 cal BP (NZ 4590, CRA = 3080 ± 50 BP) separated by a 0.5 m band of sterile sand from Layer T above it which is dated to 2750–2650 cal BP (NZ 4589, CRA = 2860 ± 40 BP), both layers containing dentate-stamped ceramics. At Sigatoka (VL 16/1) also there is a stylistically older ceramic collection (NZA 4789, CRA = 2630 ± 60 BP) in the vicinity of a younger Lapita assemblage (Birks 1973; Burley *et al.* 1999; Petchey 1995).

There are several intriguing aspects to these data, sketchy though they are. First, at several sites there is an early Lapita presence identifiable in either or both the ceramic and C_{14} results that appears to be brief, transient and relatively small in scale based on current indications of site area. Best (1984: 640), for instance, describes the Layer W remains from Qaranipuqa on Lakeba as indicative of a settlement pattern lasting 100–200 years that was either "seasonal or intermittent with the faunal resources, some of which were very vulnerable, not showing any evidence of over-exploitation". An occupation that was relatively

small or short term has been put forward to explain the earliest deposits at Natunuku, Naigani and Sigatoka (Best 1981; Davidson *et al.* 1990: 152; Petchey 1995).

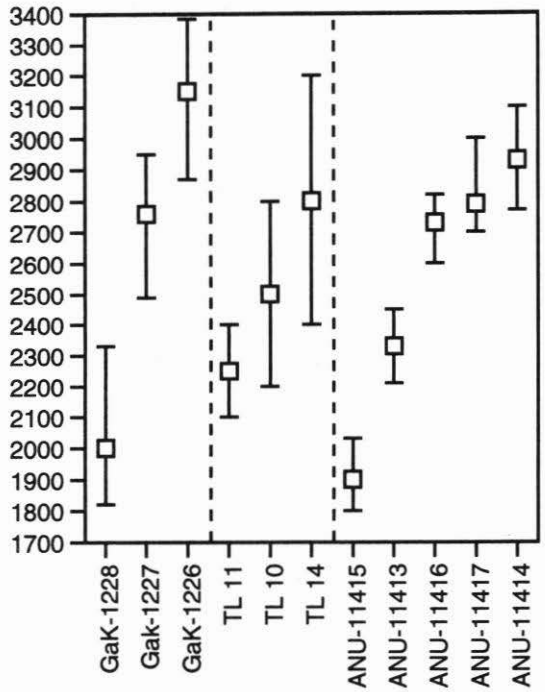


Figure 3: Plot of Yanuca age determinations (see Table 1 and text for details).

This pattern does not appear to represent an early isochronous movement of Lapita through the Fiji Islands followed by a later phase of territorial backfilling. Radiocarbon dates and ceramics both point to a hiatus in western Fiji before settlement of the Lau Group, as well as substantial ceramic variation between early western sites in Fiji (Clark and Anderson in press). Rather, what might be described is penetration of new regions marked initially by transient, exploratory camps and later by evidence of sustained, widespread and substantial occupation. Disentangling an early from a later Lapita occupation is going to be difficult, therefore, when an early, ephemeral occupation characterised by a low density of artefactual and faunal remains is intermixed with material from a more substantial late-Lapita occupation. Best (1981: 9), for example, recorded a maximum sherd number of only 28 per m^2 for the early levels at Naigani compared with a value of 2500 sherds per m^2 for the Lapita deposit on Lakeba.

Returning to the Yanuca shell dates, acceptance of the oldest determination (ANU-11414) is not conditional on the existence of an early and a late Lapita phase at some Fijian sites, although the site's C_{14} results are not inconsistent with this emerging result. A better method for assessing the reliability of all three Yanuca dates is through aspects of the ceramics

since, if the dates are correct, they imply an early pottery group dating to perhaps 2900 cal BP and a later group around 2750 cal BP.

The nature of Fiji's late Lapita ceramics about 2750–2600 BP is reasonably well understood from Qaranipuqa and Votua in Lau and Level 1 at Sigatoka on Viti Levu. In vessel form these assemblages are dominated by jars with collar rims and sub-globular bodies followed by simple shallow bowls. Other vessel forms like carinated jars, inverted-rim bowls, narrow-orifice water vessels and pot 'stands' are also present but comprise a relatively small portion of the total. Dentate stamping is a numerically insignificant proportion of these assemblages (<2% of sherds) and surface modification commonly comprises rim notching or the addition of a red slip.

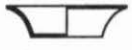
Keeping in mind Yanuca's disturbed stratigraphy, is there any ceramic evidence of an early and a late Lapita occupation, the latter characterised by an assemblage containing a high proportion of jars with collar rims and bowls, and the former by vessel forms such as flat-based dishes and carinated vessels decorated with dentate-stamping and three dimensional design elements (applied nubbins and bars, cut-out lip notching)? Or is the Zone 3 ceramic assemblage homogeneous and indicative either of a highly disturbed deposit in which sets of early and late Lapita pottery can no longer be separated or a single phase of occupation, in which case the oldest determination would appear out of step with ANU-11416 and ANU-11417.

Table 2 lists by excavation spit the Yanuca vessel forms recorded by Hunt (1980) in Trenches 3–3A and trench baulk 2–3 using the Birks' vessel types and with Hunt's attribute numbers in brackets (Birks and Birks 1973; Hunt 1980). No Type D vessels were recorded in Hunt's sample but the Birks note at least three of these were present. The majority of identifiable dentate-stamped vessel remains are from Zone 3, spits 3–6 (160–180 cm below surface), including the flat-based dishes and carinated dishes which are rare or absent from late-Lapita assemblages. Collar rim jars and bowls are a component of the basal assemblage but their frequency increases dramatically between spits 3/3 and 2/18 where they make up a significant proportion of Yanuca ceramics. A large dentate-stamped bowl with a convex base and inverted rim (Type C), otherwise known from Sigatoka Level 1, occurs in spit 3/2 and is also suggestive of a late Lapita presence.

The ceramic data support the existence of a Lapita assemblage pre-dating 2750 cal BP at Yanuca which, until good cause is given to reject it, might be dated by ANU-11414 with a calibrated range of 3100–2770 BP. Provisional acceptance of the Yanuca result invites reconsideration of a date on a large *Trochus niloticus* shell from Ugaga Island near Beqa (Beta 107953, CRA = 3150 ± 70), rejected because it was not directly associated with dentate-stamped sherds and its status as midden shell was questioned (Anderson and Clark 1999). The shell came from the deepest cultural deposit, a grey sand with sparse midden and pottery, which is similar to the description of the lowest W1, X1 cultural layers on Lakeba (Best 1984: 67). The date has a range of 3140–2760 cal BP which is almost identical to the oldest Yanuca result. Most of the dentate-stamped and incised Ugaga sherds are late Lapita in style but indications of an early Lapita presence, that might be dated by Beta 107953, are a flat-based dentate-stamped vessel with similar motifs to one from Yanuca and rim sherds from a vessel likely to be imported from Udu Point in Vanua Levu, marked with multiple, closely spaced rows of dentate stamping (Clark 1999: Vessel 237, Figure 27a; Hunt 1986: Fig. 3.2).

A germane aspect of prehistoric colonisation behaviour raised by Graves and Addison (1995) in the case of the settlement of Hawaii was that it might be characterised by three

TABLE 2
Distribution of diagnostic vessel sherds at Yanuca recorded by Hunt (1980)

Vessel Form	Dentate stamped and Plain 	Dentate stamped 	Dentate stamped 	Dentate stamped 	Plain 	Plain 
Zone/Spit	Type A (29, 68)	Type B + Type G (69, 74)	Type C (70)	Type E + Type F (72, 72a, 73)	Collar Rim (49)	Bowl (60/62/75)
2/17					2	13
2/18	1				25	14
3/1				1	11	22
3/2			1	2	21	18
3/3	2	3			10	4
3/4	2			1	5	
3/5	6	1		3	5	5
3/6	5	1		2	1	

sequential components which they termed exploration, colonisation and establishment. These could be ranked according to their archaeological visibility, with exploration the most difficult to authenticate and establishment the simplest.

In Fiji, most Lapita sites are undated but contain ceramics attributable to a late-Lapita phase marked by relatively few complex vessel forms and a low frequency of dentate-stamping and linear incision. As far as current information extends, such sites (about 28 in total) are distributed throughout the archipelago over an area of approximately 220,000 sq km (Clark and Anderson in press), suggesting population establishment using Graves and Addison's term (1996: 5). Sites with stylistically older ceramics are few and currently confined to several locations on Viti Levu and adjacent islands (recognising the small amount of work on Vanua Levu), which has two important implications given the suggestion above that initial Lapita entry into a region was generally smaller in scale, more transitory, or both, than later occupation. First, the archaeological visibility and ability to date early sites are likely to be significantly reduced by several factors, including the low density of cultural remains, as at Naigani, the apparent small size of early sites like Natunuku and Yanuca (noting the uncertainty of achieving an absolute figure for any site because of the removal and disturbance of an unknown proportion of the deposits by natural and cultural activities), and the potential for early deposits, particularly datable materials, to be mixed with larger sets of more recent age. Second, it is feasible that a Lapita chronology based largely on a widespread and numerically abundant Lapita phase representing population establishment might well underestimate the age of initial colonisation because older dates tend to be disregarded as anomalous alongside a larger set of determinations from the more numerous younger sites.

The most restrictive span for the production of dentate-stamped pottery in Fiji is 2800–2700 cal BP (Anderson and Clark 1999), which seems too short considering that three basal dates, two from Naigani and one from Qaranipuqa, have median ages of around 2850 cal BP (NZ 5615, NZ 5616, NZ 4590). The broader span of 2900–2600 cal BP might also require extension downward in light of the C_{14} determinations from Yanuca and perhaps Ugaga, that put initial colonisation between 2950 and 2900 cal BP. Such a conclusion needs to be further tested by locating and dating new and already known sites containing early ceramic assemblages and using AMS to directly date charcoal inclusions in dentate-stamped pottery from sites like Natunuku and Yanuca where the early assemblage has been inextricably mixed with later materials or removed altogether.

An older Lapita chronology than has previously been envisaged for Fiji could well be duplicated in other parts of Remote Oceania and several sites which have the highest frequency of dentate-stamped decoration, like the sites on Malo Island in Vanuatu, To. 2, Lifuka and Niuatoputapu in Tonga and Mulifanua in Samoa, could stand more dating. Whether such work eventually supports the gradual, staged view of Lapita dispersal currently conceived (Green and Kirch 1997: 30; Sand 1997: 307) or favours an alternative, the re-dating of the Yanuca site illustrates the difficulty of isolating and dating incipient Lapita arrival.

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