

Human occupations of caves of the Rove peninsula, southwest Viti Levu island, Fiji

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ABSTRACT

Geoarchaeological investigations of limestone caves along the Rove Peninsula, where several Lapita-era (1150-750 BC) sites dating from the earliest period of Fiji's human history have been found, was undertaken by a team from the University of the South Pacific and the Fiji Museum. Surface collection and excavation in the largest cave – Qaranibourewa – was hindered by large amounts of ceiling collapse and no trace of human occupation earlier than about AD 1000 was found. The second-largest cave – Qaramatatolu – had a cave fill 190 cm thick but this was determined to be all of recent origin, having accumulated as a result of being washed down through a hole in the cave roof from a settlement above that probably existed AD 750-1250. The shell faunal remains from the Qaramatatolu excavation all suggest an open-coast location, quite different from the mangrove forest that fronts the area today. This mangrove forest probably formed only within the last few hundred years.

Keywords: cave, geoarchaeology, Fiji, pottery, excavation, environmental change.

1 INTRODUCTION

The Rove Peninsula in southwest Viti Levu Island, Fiji, is a low-relief promontory, about 3 km² in area, composed of bedrock limestone and associated sedimentary rocks belonging to the Cuvu Group. Lapita pottery, marking the earliest period of known human settlement in the Fiji Islands (approximately 3100-2700 cal yr BP or 1150-750 BC¹), was discovered at Rove Beach on the Peninsula in 2002 (Kumar and Nunn 2003; Kumar *et al.* 2004). Lapita pottery was subsequently found in several other places along the coasts of the Peninsula and on what were – at the time of human settlement – smaller islands offshore. Three seasons of excavation and mapping have been undertaken (Nunn *et al.* 2004, forthcoming; Figure 1).

As part of Phase 2 of the Rove geoarchaeological research project (November-December 2004), several caves within the limestone of the area were surveyed, and some test excavations made within them. It is assumed that caves would have served as important refuges for the Lapita (and later) inhabitants of the Rove Peninsula, particularly during and after storms, and that the cave sediments might contain an informative record of the history of their human occupation.

In support of this assumption it was noted that, although most Lapita settlements in Fiji are located close to the shore, one inland (late) Lapita cave occupation has been found on Viti Levu Island at Qara-i-Oso (properly Qwara-i-Oho), about 25 km northwest of Rove (Anderson *et al.* 2000). Rockshelters were occupied during the Lapita history of Viti Levu, notably at Yanuca Island, about 15

km east of Rove (Hunt 1980), and at Qaqaruku in the northeast of the island (Kumar and Nunn 2003). Rockshelters were also occupied during Lapita times on Lakeba and Mago islands in eastern Fiji (Best 2002; Clark *et al.* 2001).

The purpose of this paper is to report the locations of the caves of the Rove Peninsula and the results of their geoarchaeological survey in 2004. This study is part of a larger initiative that seeks to understand the age and the nature of the Lapita-era occupation of the Rove Peninsula, where it is likely that the first human settlement in the Fiji Islands was located.

2 CAVES OF THE ROVE PENINSULA

The dry climate and low relief of the Rove Peninsula might be presumed to militate against the formation of large epiphreatic (water-table) or vadose-zone caves. Yet some large caves – with at least 40 m vertical relief and extending laterally for as much as 120 m – do occur in the area. It is possible that they formed during wetter climate conditions, such as might have occurred in the middle Holocene (6000-3000 years BP). Alternatively, these caves may have formed when the relative relief of the area was much greater, as it was when sea level was 120 m lower during the Last Glacial Maximum about 18,000 years BP (Nunn 1999).

Whatever their age and origin, it is clear that these caves would have existed and would probably have been readily apparent to the Lapita occupants of the Rove Peninsula, who arrived there as much as 3210 cal yr BP (1260 BC), more plausibly about 3100 cal yr BP (1150 BC).

¹ years BP are years “Before Present”, where present is the year AD 1950. The term “cal yr BP” shows that the age (range) BP has been calibrated to account for variations in atmospheric ¹⁴C through time. Such dates are very precise and can be readily converted into years BC (BCE) or AD (CE).

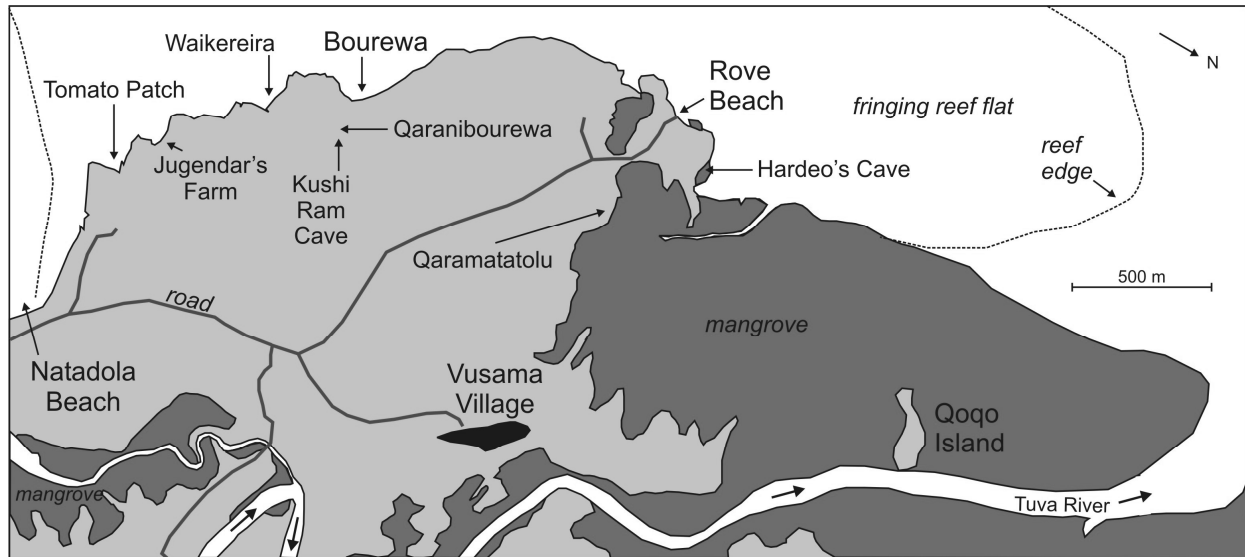


Figure 1. Map of the Rove Peninsula showing locations mentioned in the text.

Survey methods involved

- Surface collection of potsherds from within and around these caves with the aim of finding decorated pieces that would allow the age and duration of the human occupation of these areas to be estimated. Surface collection was undertaken by the research team across the entire area.
- Excavation of 1 m by 1 m test pits was carried out in the places where it was considered likeliest (from augering and cave morphology) that a deep cultural deposit would be preserved. All excavated material was sieved through a 1 cm mesh and subsequently washed and analysed.

2.1 QARANIBOUREWA²

Qaranibourewa (also named Ram Lal Cave) is located 200 m inland of the largest and earliest Lapita settlement on the Rove Peninsula at Bourewa (see Figure 1). The main entrance has become filled with soil washed off the surrounding farmland so that today one needs to stoop to enter the cave. Probably during Lapita times, the entrance would have been considerably larger and, owing to the higher sea level (+1.5 m about 3000 cal yr BP - Nunn and Peltier 2001), closer to the shore.

The main chamber, entered after passing through the entrance, is roughly circular (diameter 40 m) and as much as 3.2 m high. There is a side chamber 15 m to the northwest of the main chamber and three narrow sinuous passages just large enough for a person to pass through. The longest of these passages runs for about 80 m north-northeast from the side chamber.

Near the ends of two passages, where roof collapse has blocked them, water could be heard dripping and flowing, and it is thought that the passages changed in these areas

from being sub-horizontal to steeply sloping in nature. As is common in caves elsewhere, it is possible that fresh water collects in certain places in Qaranibourewa, although no confirmation of this could be obtained. The issue is important because the surrounding area, being underlain by permeable rocks, has no surface fresh water today. The situation was undoubtedly the same in Lapita times and the people who lived on coastal flats, unless they dug wells or collected rainwater, would probably have sought caves such as Qaranibourewa for supplying fresh water.

The main chamber is used today by the Indian farmers living in the area for shelter during severe storms, and associated detritus is commonplace. The large numbers of potsherds scattered through the accessible caves (including a few in the passages) testifies to earlier human occupations of the cave.

Since it is the largest cave in the Rove area, and that closest to the earliest Lapita settlement, Qaranibourewa was given special attention. 142 potsherds were found during surface collection and, although none of these appeared to be more than about 1000 years old, we were encouraged enough to excavate two test pits (1 m by 1 m square). The first of these (Pit M1) was in the main chamber, the other (Pit R1) in the side chamber. Both were located so as to avoid conspicuous areas of fallen roof rock yet both proved disappointing in that little cultural material was retrieved except in the top 20-30 cm and much of the floor was underlain by collapsed pieces of fallen roof rock in various conditions of freshness (Figure 2).

Pit M1 reached a depth of 120 cm but most of it was cut through weathered collapsed roof material, less resistant than that encountered in Pit R1 but largely archaeologically sterile. A similar situation was found in Pit R1 but here excavation could reach only 40 cm, bedrock from the cave ceiling being encountered at 20 cm. Auger holes were made at the bottom of Pits M1 and R1 to see whether there was any discernible change in the stratigraphy, but none was found. Subsequent augering

² Qara is the Fijian word for cave. Qara-ni-Bourewa means the cave at/of Bourewa.

elsewhere in Qaranibourewa failed to locate anywhere where a thick sedimentary sequence existed, so no more test pits were dug here.

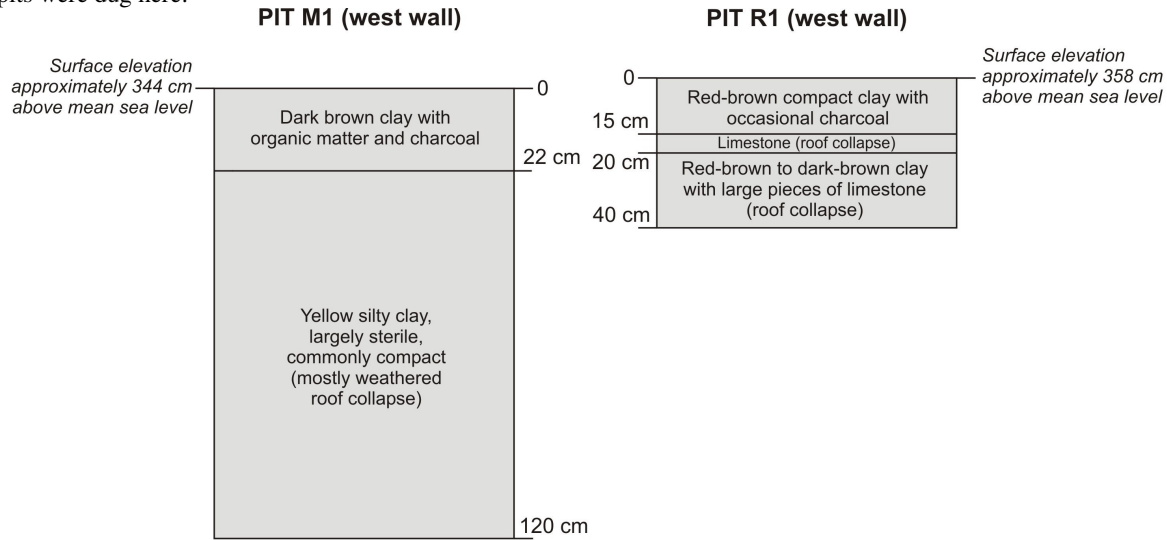


Figure 2. Stratigraphic records for Pits M1 and R1 in Qaranibourewa.

Table 1. Numbers and types of potsherds from surface collection, and by 10-cm spits from Pits M1 and R1 in Qaranibourewa.

<i>Surface collection or Pit</i>	<i>Spit</i>	<i>Plain body sherds</i>	<i>Decorated body sherds</i>	<i>Plain rims</i>	<i>Decorated rims</i>	<i>Total body sherds</i>	<i>Total rims</i>	<i>Total sherds</i>
Surface collection		422	9	34	6	431	40	471
Pit M1	0-10 cm	68	1	0	0	69	0	69
Pit M1	10-20 cm	144	0	0	0	144	0	144
Pit M1	20-30 cm	7	0	0	1	7	1	8
Pit M1	30-40 cm	3	0	0	0	3	0	3
Pit M1	40-50 cm	1	0	0	0	1	0	1
Pit M1	50-60 cm	0	0	0	0	0	0	0
Pit M1	60-70 cm	1	0	0	0	1	0	1
Pit M1	70-80 cm	0	0	0	0	0	0	0
Pit M1	80-90 cm	0	0	0	0	0	0	0
Pit M1	90-100 cm	0	0	0	0	0	0	0
Pit M1	100-110 cm	0	0	0	0	0	0	0
Pit M1	110-120 cm	0	0	0	0	0	0	0
Pit M1	Totals	224	1	0	1	225	1	226
Pit R1	0-10 cm	128	0	6	0	128	6	134
Pit R1	10-20 cm	93	2	0	0	95	0	95
Pit R1	20-30 cm	38	0	1	0	38	1	39
Pit R1	30-40 cm	0	0	1	0	0	1	1
Pit R1	Totals	259	2	8	0	261	8	269

Table 1 shows the numbers and classification of potsherds recovered from Pits M1 and R1. In Pit M1, only 2 decorated sherds (1 body sherd and 1 rim) out of 226 sherds in total were found. In Pit R1, only 2 (body) sherds out of 269 collected were decorated. The resulting proportions of decorated sherds (both <1%) are far less than found during excavations at the nearby Bourewa site (12% in 2004, 17% in 2003) so we conclude that the

deposits excavated in Qaranibourewa did not include Lapita-era material.

It is still likely that the Lapita inhabitants of nearby Lapita settlements (described by Nunn *et al.* forthcoming) at Bourewa (200 m away), Waikereira-Covularo (450 m away), Jugendar's Farm (1 km away) and Tomato Patch (1.3 km away) utilized Qaranibourewa for shelter, refuge and fresh-water supply besides other things. But no trace of their presence was found there during our 2004 survey.

It seems likely that post-Lapita roof collapse, perhaps helped by the movement of tractors and other vehicles overhead, together with the large amounts of terrigenous sediment washed into the cave, particularly after the land was first developed for agriculture about 100 years ago, have been the main causes of earlier cultural layers being obscured.

2.2 QARAMATATOLU³

The second-largest cave in the Rove Peninsula, and the only other apart from Qaranibourewa (see above) that could have sheltered 10-15 people, is named Qaramatatolu and occurs in the limestone cliff that today faces the 7.3-km² mangrove swamp at the mouth of the Tuva River (see Figure 1).

The floor of Qaramatatolu slopes gently upwards past its dome-shaped entrance into the first chamber, which is shaped like a half-circle, 10 m in diameter, and averages 1.3 m high. There is an inner chamber about twice the area and slightly higher, in the ceiling of which there is a hole that gives access to the ground on the cliff top. There are signs that this hole - through which a person can pass easily - has increased in size recently.

There are no side passages, and the cave is considerably smaller than Qaranibourewa. Augering revealed a thick cultural deposit in the floor of the cave entrance. This observation, coupled with the large amount of pottery and edible shell remains collected from the talus slope below the cave entrance, encouraged us to excavate a test pit there (Pit M4).

The upper 20 cm of Pit M4 went through organic material (Figure 3) that was interpreted as the remains of successive fires made in the cave entrance to cook food, probably seafood, by people who did not live permanently within the cave. Below 20 cm, the pit was in silty clay that was probably introduced through the hole in the cave ceiling upslope of the entrance. From 38-190 cm, abundant potsherds and edible shell fragments were found. Given the small size of Qaramatatolu, it seems unlikely that large numbers of pottery-using shellfish-eating people occupied it for long enough (perhaps 1000 years) to have produced such a deposit. More likely is it that (most of) this deposit was washed into the cave through the hole in its ceiling and is indicative of an occupation on the top of the cliff rather than in the cave itself. The two radiocarbon dates on charcoal near the bottom of the pit are both within the last millennium and - in support of the external origin and associated mixing of the cave fill - are in reverse stratigraphic order (the younger date is below the older). This would not be expected had the deposit originated entirely within this cave.

In support of this scenario, there are traces of a former settlement on the barren land above the cliff in which Qaramatatolu exists. There are the remains of at least four house platforms (*yavu*). Other houses were possibly built on accumulations of angular fragments of the bedrock limestone that pepper the ground surface in the area. There are accumulations of shell and potsherds locally. No oral traditions regarding a settlement in this location were found.

We interpret the Qaramatatolu cave-fill deposit as deriving almost wholly from a settlement on the cliff top, and entering the cave through the hole in its roof. We infer that the rate of cave-fill accumulation may have accelerated towards the end of the existence of this settlement as the hole in the cave roof became larger.

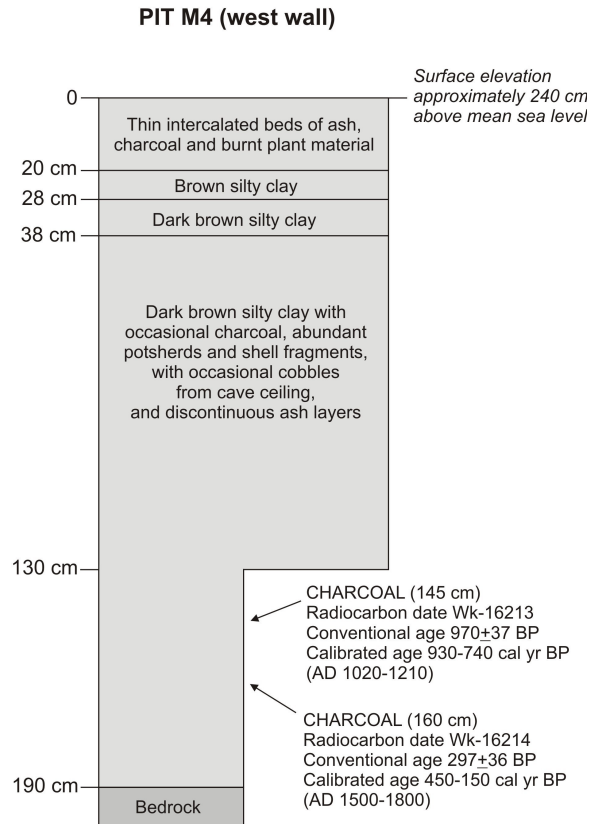


Figure 3. Stratigraphic records and radiocarbon dates for Pit M4 in Qaramatatolu.

We suggest that this cliff-top settlement was a coastal settlement, typical of many that existed along the Fiji coast during the Little Climatic Optimum (AD 750-1250). It may also have been occupied, perhaps intermittently, during the Little Ice Age (approximately AD 1350-1800) and became finally abandoned as intertribal conflict waned and settlements were amalgamated during the 19th century (Nunn 2003). The cave has been used intermittently within the last 100 years or so for temporary shelter and food processing/cooking.

The edible shells found in the Qaramatatolu cave fill are all open-coast and/or reef species. The largest individuals include *Trochus niloticus* and *Tectus pyramis*. Other common types included species of *Anadara*, *Conus*, *Gafrarium*, *Strombus* and *Turbo*. What is particularly interesting about this observation is that the cave today faces an extensive mangrove swamp where such shells do not live. This observation is the same as for the Lapita settlement on Qoqo Island (3 km away within the same mangrove swamp), and suggests that at the time the Lapita people occupied Qoqo, and later people occupied the cliff-top settlement above Qaramatatolu, mangrove was far less extensive in the area.

³ Literally translated as "cave with three entrances". In the local (Nadrogā) dialect, 'mata' means 'entrance'.

We envisage that Qaramatatolu (cave and cliff-top settlement) would have been established atop a bluff marking the left bank of the Tuva River estuary. Coral-reef growth would have been subdued because of the fresh water from the Tuva River, but some of these shell species (particularly the smaller ones) would have been living on the estuarine shore flats. Such a scenario requires that the mangrove swamp here formed only quite recently, and the same has been argued for that around the mouth of the Ba River in northern Viti Levu Island (Nunn 2005).

It is suggested that extensive mangrove swamps formed around the mouths of many of Fiji's larger rivers only within the past few hundred years, primarily because of shoaling associated with sharply-increased fluvial sediment loads. These loads had increased primarily because of the large-scale movement of people inland from island coasts following the environmental crisis about AD 1300 (Nunn 2000, forthcoming) and the associated land clearance for agriculture; a well-argued case study was given for the Sigatoka Valley, 35 km east of the Rove Peninsula, by Kumar *et al.* (forthcoming). The development of mangrove swamps in the Qaramatatolu area, perhaps around AD 1500-1700, would have reduced the availability of shellfish and associated seafood and may have led to the abandonment of the cliff-top settlement.

2.3 OTHER CAVES

Two other caves were located in the Rove Peninsula, and another was alternately rumoured and denied as existing.

The first cave – actually two adjoining caves – is named Hardeo's Cave and lies alongside the same mangrove swamp as Qaramatatolu (see above), but closer to the sea, only about 200 m from the Lapita site at Rove (Kumar *et al.* 2004; Nunn *et al.* 2004). The caves are too small to admit humans, except horizontally, and were probably never any larger. For this reason, we did not excavate them. A surface collection of pottery from the adjoining talus slopes and mangrove forest and shore flat revealed no sign of a Lapita-era occupation.

The entrance to the second cave, named Kushi Ram Cave and located in the cliff beneath Kushi Ram's house, is 50 m from the entrance to Qaranibourewa. Rocks and rubbish that we did not attempt to clear blocked the entrance. The cave is reportedly in the form of a passage that can be followed for only about 10 m.

We heard tales from some of the Indian farmers that another, large cave existed in the area, but that its entrance had been purposely blocked about 100 years ago, and no-one had tried to enter it since. Unfortunately, no-one knew exactly where this cave might be (although informants were adamant that it was not Qaranibourewa), although one said that its entrance is in the side of the hill on which the burnt mosque is prominently located. When the Fijian inhabitants of the area were asked about this cave, they denied emphatically that it existed. Given the ease of landscape visibility across the Rove Peninsula, we incline to the latter view; if such a cave existed, its location would probably be well-known.

3 IMPLICATIONS OF THIS RESEARCH

Although the results of cave survey and excavation may justifiably be regarded as somewhat inconclusive with respect to the area's intensive Lapita-era occupation, they do show how profound even a small degree of human impact has been on cave environments. It is possible that some mechanical form of excavation would reveal a Lapita-era occupation at Qaranibourewa, although the existence of such an occupation remains supposition. It is possible that the Lapita people living at Bourewa eschewed cave occupation for reasons about which we can only speculate.

The role of external sediment inputs into caves is shown well by the excavation in Qaramatatolu, where perhaps only the upper 20 cm (from 190 cm) is autochthonous. An excavation at the back of this cave's inner chamber may have revealed an older human occupation, although this was not attempted because of the low ceiling. Details of the history of the Qaramatatolu cliff-top settlement and the palaeogeography of the surrounding area are consistent with what has been determined for elsewhere in Fiji (Nunn 2005) and the Pacific Islands (Nunn 2003).

4 CONCLUSIONS AND FUTURE RESEARCH

Cave surveys were completed throughout the Rove Peninsula and, while somewhat inconclusive, show why similar surveys should be conducted in association with open-coast Lapita and/or early-period settlements elsewhere in the tropical Pacific Islands. Being generally closed systems, caves often contain - in contrast to most open-landscape locations - uncommonly complete records of environmental change and human impact. Cave records elsewhere in Fiji and the region have the potential for considerably illuminating the landscape changes that followed the first arrival of people and, more importantly from a geoarchaeological standpoint, of enabling that time to be dated accurately.

Within Fiji, it is likely that other early-period settlement sites exist in the southwest of the island, and that examination of some of the caves near the coast in this area could reveal the kinds of highly-informative sedimentary archives that were sought during this study. Beyond Fiji, there are many areas in Vanuatu and Tonga where cave-sediment records might be examined with a view to illuminating the islands' earliest human history.

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