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DESCRIPTION OF THE STONE- TOOL GRINDING FLOOR AT QARANISUI, MOTURIKI ISLAND, CENTRAL FIJI

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Introduction

In the course of fieldwork on Moturiki Island, central Fiji, the village of Savuna was visited. Having acquired the permission of the Tui Savuna to carry out field observations in the area, he told me about a “cave” named Qaranisui which lay along the coast to the north of the village. This then formed our first area of observation, and it proved to be of exceptional interest and significance.

Qaranisui is the general name for an emerged shoreline notch stretching about 250 m along the coast north of Savuna Landing. There are some shallow caves within or otherwise associated with this notch line, one of the caves being also named Qaranisui and allegedly being at least 20 m in length and containing bones and fragments of earthenware pottery. I was unable to locate this cave, even with guides from Savuna, and it may have been obscured by a recent collapse of its roof.

Of more interest was the large “grinding floor” exposed within the emerged notch named Qaranisui for at least 150 m of its length and continuing onto the shore platform north of the place where the notch ended. A “grinding floor” is basically a place where, at some time in the past, people have taken either fist-sized blocks of rock and fashioned them into tools by rubbing them repeatedly against the smooth bedrock or blunt stone tools and sharpened them by rubbing them repeatedly along a groove in the rock floor. In the Pacific Islands grinding floors are generally found close to where large numbers of people were living.

The numbers of “grinding facets” (or grinding marks) exposed in the 160 m² grinding floor at Qaranisui suggest that it was used for a considerable

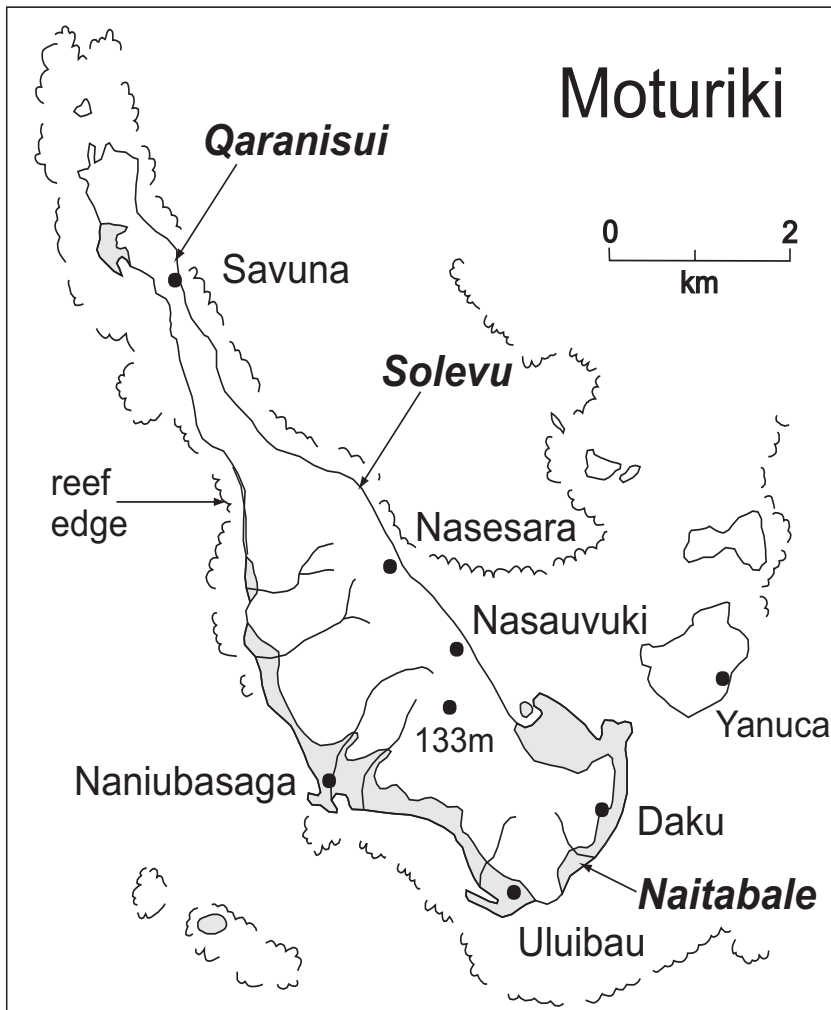


Figure 1. Moturiki Island, Fiji, showing the main settlements, the two Lapit-age (2600–3000 years old) settlement sites at Naitabale (Naturuku) and Solevu, and the site of the Qaranisui grinding floor described in this paper. Shaded areas are coastal lowlands.

period of time and/or by a large number of people at a time when the sea level was significantly higher than it is today.

The apparent intense utilisation of the grinding floor at Qaranisui suggests that it may also have been linked to a nearby site where stone tools were quarried. Prehistoric quarry sites are unknown in Fiji, although they must certainly have existed, such was the likely demand for stone tools.

This paper describes for the first time the Qaranisui site and attempts to make connections between similar sites elsewhere in Fiji and the tropical Pacific Islands.

Geology of the study area

The island Moturiki is part of the Lovoni Volcano, from which the adjoining island Ovalau is also made (Coulson 1976). Most of the rocks in this volcano belong to the andesitic group; most are volcanoclastic (fragmentary) rather than lavas, although these are exposed in the Savuna area of Moturiki. The island of Moturiki is a downfaulted part of the Lovoni Volcano, the centre of which is in the crater in the centre of Ovalau Island where the village of Lovoni now lies. This volcano was active more than 4 million years ago and is considered one of the most stable parts of the Fiji Islands (Nunn 2000).

Most of the volcanic rocks exposed on Moturiki Island are of volcanoclastic origin. This means that they are composed from rock fragments of various grades (from cobbles and pebbles to sand) which were welded together when hot following ejection from the volcano. For practical purposes, this means that these rocks are of little use for making stone tools because they are not massive rocks but rather composed of different size grades. In addition many of the Moturiki volcanoclastic rocks are highly vesicular, with pockets of gas still trapped inside them. Again this is unsuitable for making stone tools; when ground, the rocks will naturally tend to develop irregular edges which will inhibit their optimal use for cutting and tree-felling, for example.

Yet, near Savuna are found the only exposures of volcanic lava on Moturiki (Coulson 1976). These lavas are exposed on some of the inland cliffs along the sides of the path between Nasesara and Savuna (Figure 1). These lavas are dense and suitable for stone-tool making. Although none of the exposures seen are sufficiently large it seems to be a likely quarry site. It is possible that in the Savuna area, much of which is overgrown and inaccessible, there is a much larger quarry face which was once utilised for the quarrying of large blocks which were eventually sharpened at Qaranisui.

Grinding floors in the tropical Pacific Islands: significance and lithology

Not much attention has been paid to the location of grinding floors in the tropical Pacific Islands. This is largely because of the apparent impossibility of dating the grinding floors (which are erosional rather than aggradational) and therefore demonstrating where and how they fitted into the human history of a particular place. For most authors the fact of a grinding floor (or isolated areas of grinding facets) existing indicates the prehistoric use of a particular place but not much can be said otherwise.

One exception is the huge area of grinding facets, both in the river and in beachrock along the coast at Leone, associated with the Tataga Matau quarry, on Tutuila Island in American Samoa (Leach and Witter 1987, 1990). It has been learned that in prehistoric times, so-called “preforms” were cut from the Tataga Matau quarry face. These preforms were large crude lumps of rock of a size suitable to be ground into a usable tool. These preforms were taken down to the nearby river or to the sea where they are believed to have been systematically ground into usable shapes by people especially employed for that purpose. Once ready the stone tools (adzes) were traded throughout Oceania; geochemical tracing has been used to establish that stone tools from Tataga Matau reached Tonga, Fiji and the southern Cook Islands AD 1000–1500 (Weisler and Kirch 1996).

The marks on the rocks formed during the manufacture of stone tools from preforms are commonly ovoid in shape, reflecting the elliptical back-and-forth motion employed. Other manufacturing marks, probably depending on the purpose for which the stone tool was to be employed, are almost circular. However the most common marks in grinding floors and smaller isolated areas of grinding facets in the tropical Pacific Islands are the narrow elongate variety, thought to represent existing tools being sharpened after they have lost their edge. These types of grinding marks do not therefore mean that the quarry from which they originated is close by. The tools may have been transported great distances before being used and requiring re-sharpening.

This is what is believed to be the case on Totoya Island in southeast Fiji, where no quarry site was found (despite a deliberate search) yet where there are many areas of coastal grinding facets. Most of these are of the elongate variety, suggesting that adzes were not manufactured on Totoya, only imported there and resharpened when necessary. This interpretation is supported by the presence on Totoya of adzes from Tataga Matau and elsewhere in Fiji, probably the Wainibuka Valley on Viti Levu island (Clark *et al.* 1999).

Archaeologists recognise that Tataga Matau was a highly successful quarry site because of the suitability of the rock type there. This is a dense non-porphyrtyc basalt associated with the Taputapu Volcano at the western end of Tutuila Island (Keating 1992).

Another area of grinding facets described in Fiji is from the shores of Talaulia Bay in western Kadavu (Nunn 1999b). Here there are several large areas of grinding facets in beachrock covered by the sea at high tide. Photographs were shown in the article by Nunn (1999b) who also suggested that there was an ancient quarry site visible in the cliffs behind Tawava Village.

Relationship between active grinding floors and running water

All the grinding floors or individual areas of isolated grinding facets in the tropical Pacific Islands appear to have been regularly washed with water. The variety of grinding facet locations on Tutuila in American Samoa is a good example. In the river valley below Tataga Matau most of the grinding facets are on boulders in the river bed. It is thought that the afternoon rains, common in this location, would have washed out the fines from these facets every day, either through directly falling rain or when the river rose. Along the Leone coast on the same island the grinding facets in beachrock are all within the intertidal zone and have their fines washed out at every high tide.

Most grinding facets in the Pacific Islands appear to be in similar locations. These include all the areas of grinding facets known to the author in Fiji, namely on western Kadavu (Nunn 1999b), Mana Island (Mamanucas) and Totoya. What is different about the Qaranisui grinding floor is that it is now well beyond the reach of the high tide, so it is unlikely to have been used while the sea was at its present level. This observation makes it probable that the land has emerged relative to the sea (in other words, the sea could have fallen) since the time when the Qaranisui grinding floor was active. This makes it possible to speculate about the age of this grinding floor.

The Qaranisui site

The Qaranisui area includes an emerged shoreline notch, similar in both form and origin to those which form along many similar coasts today. For notches on Beqa and elsewhere in Fiji it has been suggested that these coastal landforms are much larger than their modern counterparts because they were formed at a time when there was no coral reef at the surface offshore. In other words, a “high energy window” was open (Nunn 1990, 1994). The height of the Qaranisui emerged notch supports this interpretation, namely that it formed during the Holocene sea-level maximum about 4000–3000 years ago in Fiji when sea level was around 1.5 m higher than it is today (Nunn and Peltier 2001).



Figure 2. The main (southern) part of the Qaranisui notch in which the grinding floor and loose grinding stones are found. The floor of the notch is 1.1–1.2 m above mean high-tide level, well beyond the reach of waves under normal conditions today.

At present the floor of the Qaranisui emerged notch in its central part is around 1.1–1.2 m above mean high-tide level, which is well beyond the reach of waves under normal conditions (Figure 2). The fact reported by the people of nearby Savuna Village that they used to shelter in caves in this notch during tropical cyclones suggests that even at such times there are few waves coming into the notch.

Around 3000 years ago when the sea level was 1.5 m or so higher, water would have entered the notch every high tide. In fact the notch would have been forming by seawater solution and physical abrasion at this time. The innermost point of such notches (also known as the retreat point) is usually at mean high-tide level.

Below the level of the emerged notch, in which all the grinding facets occur, is a small cliff then a platform cut in the pyroclastic (volcaniclastic) bedrock at this point. Then there is another small cliff and below that is another pyroclastic-

rock platform. It is believed that erosion during emergence (sea-level fall) picked out the weaker rock layers giving this coast its step-like appearance. Below the lowest rock platform is another small cliff then the beach which is strewn with boulders and cobbles of volcanic rock surrounded by calcareous beach sand through which emerged reef is sometimes visible. This reef, which is exposed around much of the Moturiki coast, has been dated and forms the basis of a local Holocene sea-level history (Nunn 2000).

This sequence extends for around 250 m along the coast, broken in places by promontories of harder rock. At its southern end it is replaced by a cliff without an emerged notch. At its northern end, it loses height and runs into an area of mangroves. Offshore of these in one place is a small area of grinding facets.

The grinding facets within the Qaranisui emerged notch are mostly of the narrow elongate type, suggesting that it was mainly a site for sharpening tools (Figure 3). However there are also ovoid facets demonstrating that the grinding floor was also used for shaping stone tools, perhaps from a nearby quarry. An example is shown in Figure 4. Most grinding facets are in the bedrock on the floor of the emerged notch (see Figures 3 and 4) but there are also a few isolated boulders on the floor in which grinding facets are prominent. An example is shown in Figure 5.

Age of the Qaranisui grinding floor

The grinding floor at Qaranisui all now lies at least 1.1 m above the mean high-tide level, which suggests that even at high tide the sea water never gets even close to the notch line. This suggests in turn that the grinding floor was not in use while the ocean has been at its present level. In fact the notch is similar to notches which formed during the higher sea level around 3000 years ago throughout the tropical Pacific (Nunn 1995). There is no reason to suppose that the emerged notch at Qaranisui is younger than this. It is therefore suggested that the grinding marks on the notch floor were made at a time when sea level was falling from this level but still reached into it at high tide.

The most recent estimates of sea-level changes in Fiji during the past 10,000 years were given by Nunn and Peltier (2001). In their graphs of sea-level changes it seems likely that the sea level was falling from its maximum level (1.5 m above the present) between about 3000 and 2000 years ago. If this is correct then it is inferred that the grinding floor was actively used during that period, which includes the Lapita era in Fiji, 3000–2600 years ago (Anderson and Clark 1999).

A similar line of reasoning was used to argue for a Lapita age (3000–2600 years ago) for the paintings on the cliffs at Naura (or Dainaba) on Vatulele



Figure 3. Detail of a 20 metre stretch of the Qaranisui grinding floor at the site shown in Figure 2 being cleared of leaves and vegetation by the author.

Island in southwest Fiji (Nunn 1988). The paintings are now all well beyond the reach of someone standing on the beach yet around 3000 years ago, when the sea level was around 1.5 m above its present level, all the paintings would have been within the reach of a person of average height. It was therefore argued that the paintings were most probably created at the time around 3000 years ago when people are first likely to have visited Vatulele Island. This suggestion received confirmation from Ewins (1995) who found that the paintings had indeed been created during Lapita times, a conclusion he reached from analysing their style and comparing it to known Lapita-age rock art elsewhere in the tropical Pacific Islands.



Figure 4. Detail of grinding facets on the Qaranisui grinding floor a few metres north of where the author is standing in Figure 3. Most of the grinding facets are linear and narrow, only a few are ovoid in shape.

There are of course many reasons why this inferred age for the use of the Qaranisui grinding floor could be wrong. It could simply be that the grinding floor was closer to high-tide level more recently than 2000 years ago. It could be that the people who used the grinding floor sluiced it out using water carried from the sea. But, as a possible indicator of the age of this grinding floor, I consider this suggestion to be probable rather than just possible.

Some speculations about Lapita-age connections of the Qaranisui site

While accepting that I could be incorrect in assigning a Lapita-age (or immediate post-Lapita age) to the use of the Qaranisui grinding floor, this assumption still provides a basis for further discussion given our knowledge about Lapita settlement pattern in this area.

There are, on Moturiki Island, two known Lapita settlements. The first at Solevu (first named as Saulevu by Nunn 1999a) is known from only a few sherds



Figure 5. A loose grinding stone at the southern (left) end of the Qaranisui notch shown in Figure 2.

collected at the surface. It is a narrow 700 m² beach flat about 1 km northwest of Nasesara Village (see Figure 1), about 2.5 km southeast of Qaranisui. An isolated rock on the foreshore, covered by water at high tide, has an assortment of about 10 grinding facets on it. Solevu is unlikely to have been a major Lapita-age settlement (Nunn 1999a) and there is nothing to suggest that the rock with the grinding facets was contemporary with this settlement.

The second Lapita site on Moturiki, described by Kumar (2003), is at Naitabale (Naturuku) about 0.5 km northeast of Uluibau Village in the south of the island. This site is about 6 km from Qaranisui and is thought to have been one of the earliest Lapita sites in Fiji, settled perhaps a little more than 3000 years ago. This was a major site, perhaps a “gateway site” in the sense of Clark (1999), from which other settlements were founded. Among the other settlements associated with the Naitabale site I include the Solevu (Moturiki) site, the Lapita site at Taviya on Ovalau (known from just one Lapita potsherd [Kumar 2003]), and perhaps the well-studied Lapita site at Matanamuani on Naigani Island (Best 1981).

A possible scenario is that, for whatever reason, the Naitabale Lapita site was the first to be occupied in this region. The people there had a need for stone tools. Finding a lack of suitable rock material in the immediate area they searched the whole of Moturiki Island and found that the only suitable rocks were in the Savuna area. They established a quarry, as yet undiscovered, and shaped and sharpened the stones from the quarry at Qaranisui. The stone tools manufactured at Qaranisui were used at Naitabale and, perhaps at a later stage, at the other sites colonised from this gateway site.

There is insufficient evidence at the moment to support this scenario. However it is one which is plausible and it is hoped the publication of this paper will stimulate further research and thinking on this matter.

Conclusions

In this paper I describe a grinding floor from the place called Qaranisui on the island of Moturiki in central Fiji. The description of the site is of interest in its own right. I know of no other similar grinding floor anywhere else in Fiji.

The site is also of interest because:

- it is a large site, covering such a great area that it is considered to have been a place where stone tools were manufactured for supply and trade with other communities who did not have access to such resources,
- the site lies within an emerged sea-level notch, thought to have been emerged beyond the reach of the high tide 2000 or more years ago.
- the last observation allows us to speculate that the age of the use of the grinding floor was perhaps during or immediately after the Lapita era (3000-2600 years ago) and therefore to suggest its place in the Lapita settlement pattern of the area.

For future work it would be interesting to try and locate a ancient quarry site in the hinterland of Savuna from which rocks were quarried to be shaped and sharpened at Qaranisui. It would also be of interest to find out whether any of the stone tools recovered from Lapita-age excavations in Fiji came from the Savuna area.

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