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Title: Human cultural diversity in prehistoric Fiji

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The Fiji islands (Fig. 1) were first inhabited approximately 900 B.C. by populations sailing eastward from Island Melanesia¹. Like all the founding populations of western Remote Oceania—from Vanuatu and New Caledonia, to Fiji, Tonga and Samoa—the first Fijians were part of a related group of colonising peoples sharing aspects of language, biology and material culture, including the famous intricately decorated Lapita pottery. Many archaeologists, anthropologists and other scholars suggest that over the last three millennia, these once similar populations diverged from their common origins². Our current research in Fiji has focused on the generation of cultural difference over some three thousand years of human occupation. Specifically, how do we explain the contemporary cultural diversity across Fiji and Remote Oceania? Is cultural divergence the most appropriate model?³

Culture history of Fiji

To measure changes in human cultural diversity we must first generate a representative and precise description of the archaeological record in a region. This has been a primary goal over the last several years in the western islands of the Fiji archipelago. In the Yasawa Islands, the focus of our current research (Fig. 2), chronological variation in the material culture record shares broad similarities with the rest of Fiji.

The Yasawa Islands were first inhabited approximately 700 B.C. and have been home to human populations since then to the present. The initial colonisation and sustained occupation of the Yasawas probably occurred several hundred years after the initial habitation of sites in other parts of Fiji, particularly in the east of the archipelago. The earliest identified occupations of the

Yasawa Islands, at sites such as Olo (Fig. 3) and Qaranicagi, is indicated by pottery with vessel forms and decorative attributes similar to the so-called “terminal Lapita”⁴ deposits found at other sites in Fiji and Remote Oceania. The earliest inhabitants of the Yasawas lived in small communities on the coasts, but probably also spent time in the uplands including caves and ridges. A lack of research on early settlement patterns and mobility forces us to speculate about this aspect of life in the islands. The earliest inhabitants also left a record of both artefacts and food remains indicating heavy reliance on marine resources, but the earliest inhabitants of the Yasawas also consumed chickens as well as plant resources that were probably grown in garden. Modified shells from Olo may have been used as root peelers, while hammer-stones may have been used to extract the kernels from nuts. Evidence for a reliance on marine resources occurs throughout the Yasawa Islands sequence, shown by fishbone and marine shell in deposits of all ages. Other animal resources appear at different times during the cultural sequence, for example, pig, turtle, fruit bat, and a variety of lizards are present in the Olo and Qaranicagi deposits.

Over time, subsistence and settlement systems in the Yasawa Islands changed, although perhaps not as greatly as on the larger islands of Fiji⁵. While agriculture was certainly practiced in the Yasawas, there is little direct archaeological evidence of this, unlike other areas of Fiji⁶ and Remote Oceania. By A.D. 500 there are increasing numbers of inland, possibly defensive, settlements on the larger Fijian islands. This settlement change appears to occur later in the Yasawa Islands, with settlements protected by annular ditch and bank defences and located on mountain tops (Figs. 4 and 5) appearing from around A.D. 1400.

Pottery is the most abundant category of artefact recovered in the Yasawa Islands and it displays a range of decorative and formal variation which is used to divide Fijian prehistory into a number of phases or periods of relative cultural homogeneity. Like all archaeological phases, those used in Fiji chop a record of continuous temporal and spatial variation into convenient

packages.⁷ Yasawa Islands pottery, like pottery throughout Fiji, is described by the following phases:

- **Sigatoka phase** (900 – 500 B.C.) pottery assemblages comprise sherds that are often intricately decorated and known by the archaeological term Lapita⁴. These assemblages contain a diverse array of vessel shapes, including carinated bowls, pot-stands, water-jugs, and various types of cooking pots.
- **Navatu phase** (500 B.C. – A.D.1000) pottery assemblages begin with the loss of Lapita pottery and contain ceramics that initially show very little decoration, called Polynesian Plainware. Later Navatu assemblages contain increasing numbers of sherds decorated by grooves and ridges impressed into the vessel surface. These are formed beating the wet clay vessel with a carved wooden paddle prior to final firing. In general Navatu phase deposits contain fewer vessel shapes than earlier assemblages, however, at least one new cooking vessel form develops during this phase. Interestingly, several archaeologists^{8,9} argue that during the Navatu phase, some novel pottery variants are an indication of new populations arriving in Fiji from the west.
- **Vuda phase** (A.D. 1000-1800) assemblages contain fewer carved-paddle impressed sherds than Navatu phase assemblages and include sherds with incised, punctate, and appliqué decorations.
- **Rā phase** (A.D. 1800-1900) assemblages are characterised by ceramics with increasingly complex incised and appliqué patterns.

There is little evidence for large-scale craft specialisation associated with pottery manufacture in Fiji. Most pottery appears to have been made by households that were not

integrated into larger specialised production systems, but no systematic research has investigated the possibility of specialised ceramic production.

Archaeologists have long argued that similarities in pottery decoration and vessel shape across a region may reflect interaction between producers of the pottery¹⁰. Yasawa Islands pottery assemblages are similar to those found throughout Fiji described by the phases above, thus it appears that people in the Yasawas were interacting with populations throughout Fiji, sharing information about pottery at similar intensities throughout prehistory. However, the decorative and vessel shape similarities between pottery in the Yasawas and the rest of Fiji may not precisely measure interaction between different groups. Other potential measures of interaction, including language^{11, 12}, show great differences across the archipelago and suggest that Fijian populations may have interacted less frequently than implied by these pottery data.

Fijian cultural diversity: new questions and methods

Our current research in Fiji is based on a framework of evolutionary and ecological theory within which human diversity is explained as the result of interaction and transmission of ideas between individuals, environmental and ecological variability, adaptation, and convergence¹³. If contemporary cultural diversity in Fiji is at least partly a product of variation in the spatial scale and frequency of human interaction in prehistory, what aspects of pottery variation might help us track any such changes in interaction? Provenance analyses of artefacts are one method for tracking interaction in prehistoric populations. Artefact provenance typically refers to the geographic location where an artefact was made. By comparing artefact provenance with the location of the artefact's final deposition in the archaeological record, we can estimate the geographic range covered by the people involved in the manufacture and use of the artefact. Changes in the geographic ranges of populations over time may indicate changes in the spatial

extent of interaction. Cochrane and Neff¹⁴ recently conducted geochemical provenance analyses of archaeological pottery from sites in the Yasawa Islands to compare the likely location of pottery manufacture with the location of its ultimate deposition.

We generated geochemical provenance data for 260 sherds from sites throughout the Yasawa Islands using laser-ablation inductively coupled plasma mass-spectrometry (LA-ICP-MS)¹⁵. The chemical data for each pot sherd were subsequently analysed using multivariate statistical techniques to define groups of pot sherds with similar compositions and thus probably from pots made from the same, or similar, clay sources. By studying the geology of the Yasawa Islands, we were able to link sherd compositional groups to general geographic areas. Finally, after examining the varying proportions of sherd compositional groups present in Yasawa Islands assemblages over time, we could track the changing geographic scale of geological clay deposits used by the island inhabitants.

The results of the LA-ICP-MS work indicate the shifts in clay resources used by Yasawa Islands populations and, therefore, the likely changes in the spatial dimension of human interaction (with interaction measured by the use of clay resources). For the first several hundred years of occupation in the Yasawas, people used vessels manufactured from clay deposits throughout the Yasawa islands and probably the Mamanuca islands to the south. This suggests that the earliest individuals in the Yasawa Islands interacted within a population spread across the Yasawa and Mamanuca Islands. However, the proportions of Yasawa Islands clays and Mamanuca Islands clays in some of the early pottery assemblages indicate people most often used vessels manufactured from clays nearest them (Fig. 6). Thus for the earliest populations, the frequency of interaction across space appears to decrease with increasing distance. Perhaps 1000 years later, at roughly A.D. 500, the pottery assemblage at the southern Yasawas site of Qaranicagi (levels 17-14) on Waya Island contains similar proportions of sherds made from

Yasawa Islands clays and sherds made from Mamanuca Islands clays. This suggests that by A.D. 500, Waya Island inhabitants equally used pottery made from clay deposits across the Yasawa Islands and Mamanuca Islands and, therefore, were part of an interaction system that stretched across the Yasawa-Mamanuca island arc. This widespread interaction ends by approximately A.D. 1000 as also indicated by pottery assemblages at the Qaranicagi site (levels 12-4). For the remainder of the prehistoric sequence, Yasawa Islands clays account for approximately 80% or more of all ceramic assemblages. Thus for the last 1000 years of prehistory, Yasawa Islands inhabitants were no longer part of a pan-Yasawa-Mamanuca Islands interaction system, but were relatively confined to interaction only with the Yasawa Islands.

Our provenance analyses paint a fairly complicated picture of prehistoric interaction in the islands of western Fiji. The geochemical data document a previously unrecognized expansion and subsequent contraction in the spatial extent of interaction within the Yasawa and Mamanuca Islands as measured by clay raw material use. At present, explanations for these changes are unclear. The contraction in the spatial scale of interaction sometime after approximately A.D. 1000 may be related to environmental changes affecting the resource base of the islands¹⁶ around this same time. Hunt's¹² analysis of linguistic data for the Yasawa Islands also suggests deepening community isolation and an increase in linguistic diversity at some point in the prehistoric sequence that may be explained by the interaction changes presented here. Research during summer 2006 with students from the Institute of Archaeology will concentrate on identification and excavation of sites in the previously unexplored Mamanuca Islands. Pottery assemblages collected from these sites will be incorporated into the ongoing provenance analyses to refine our initial conclusions. Our fieldwork in the Mamanucas will also begin to generate data on paleoenvironmental and natural resource change, as well as possible correlated shifts in human subsistence practices and inter-group competition as measured through the chronology of

defensive settlements. Through this work we hope to clarify the processes generating human cultural diversity in the region.

Notes

1. Island Melanesia encompasses the islands west of Fiji (i.e., New Caledonia, Vanuatu, the Solomons, the Bismarks, and the Admiralties), excluding New Guinea.
2. P.V. Kirch, R.C. Green, *Hawaiki, Ancestral Polynesia: an Essay in Historical Anthropology* (Cambridge: Cambridge University Press, 2001).
3. A model of cultural divergence, or a phylogenetic model, assumes that human cultural diversity arises through a process of cultural branching. Cultural daughter-populations branch off from ancestral populations in much the same way that species evolution is characterised. Cultural daughter-populations retain some of the similarities of their ancestral "parents," but acquire new traits through innovation, inhabiting new environments, and chance.
4. Lapita pottery marks the first human presence in Remote Oceania and is found in Vanuatu c. 1100 B.C., New Caledonia c. 1000 B.C., and Fiji, Tonga and Samoa, c. 900 B.C. The earliest Lapita pottery in these islands is decorated with intricate stamped patterns and comprised of complexly shaped vessels. After a few hundred years, however, Lapita decoration and vessel shapes become more simple and are known by the term "terminal Lapita."
5. Current research by Cochrane et al. on isotopic diet of prehistoric Fijians indicates that Yasawa Islands populations relied on marine resources throughout prehistory, while populations on the main island of Viti Levu incorporated a more agricultural diet over time.
6. J. Field, "Environmental and climatic considerations: a hypothesis for conflict and the emergence of social complexity in Fijian prehistory", *Journal of Anthropological Archaeology* **23**, 79-99, (2004).
7. T.L. Hunt, "Conceptual and Substantive Issues in Fijian Prehistory", in: P.V. Kirch, (ed.), *Island Societies: Archaeological Approaches to Evolution and Transformation*, Cambridge University Press, Cambridge, 1986, pp. 20-32.
8. S. Best, *Lapita: a View from the East* (Auckland: New Zealand Archaeological Association, 2002).
9. D.V. Burley, "Mid-Sequence Archaeology at the Sigatoka Sand Dunes with Interpretive Implications for Fijian and Oceanic Culture History", *Asian Perspectives* **44**, 320-348, (2005).
10. F. Plog, "Measurement of Prehistoric Interaction Between Communities", in: K.V. Flannery, (ed.), *The Mesoamerican Village*, Academic Press, New York, 1976, pp. 255-272.
11. P.A. Geraghty, *The History of the Fijian Languages* (Honolulu: University of Hawaii Press, 1983).

12. T.L. Hunt, "Patterns of Human Interaction and Evolutionary Divergence in the Fiji Islands", *Journal of the Polynesian Society* **96**, 299-334, (1987).

13. E.E. Cochrane, "Explaining the Prehistory of Ceramic Technology on Waya Island, Fiji", *Archaeology in Oceania* **37**, 37-50, (2002).

14. E.E. Cochrane, H. Neff, "Investigating Compositional Diversity among Fijian Ceramics with Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS): Implications for Interaction Studies on Geologically Similar Islands", *Journal of Archaeological Science* **33**, 378-390, (2006).

15. LA-ICP-MS instruments are capable of making very precise measurements of the element proportions in a sample (parts per billion range), anything from seawater to tooth enamel to archaeological ceramics. We used a laser system to vaporise spot samples of archaeological pot sherds to introduce the clay portion, minus tempers, into the ICP-MS. The ICP-MS atomises the introduced sample via a plasma torch. Individual atoms are separated by mass or charge and sent to the detector (i.e., mass spectrometer or MS) so that relative abundances of each element in the sample are generated. See, R.J. Speakman, H. Neff, "The Application of Laser Ablation-ICP-MS to the Study of Archaeological Materials -- an Introduction", in: R.J. Speakman, H. Neff, (eds.), *Laser Ablation-ICP-MS in Archaeological Research*, University of New Mexico Press, Albuquerque, 2005, pp. 1-14.

16. P.D. Nunn, "Illuminating sea-level fall around AD 1220-1510 (730-440 cal yr BP) in the Pacific Islands: implications for environmental change and cultural transformation", *New Zealand Geographer* **56**, 46-54, (2000).

Figure Captions

1. Map of the southwest Pacific showing major island groups and the boundary between Near and Remote Oceania. Small square on Fiji expanded in Figure 2.

2. Map of western Fiji showing the Yasawa and Mamanuca Island groups, and some principal sites in the Yasawa Islands.

3. Southern Waya island. The Olo site is just inland from the beach in the foreground. View to southwest.

4. Plan view of the hillfort settlement Druidrui on Nacula Island.

5. The site Druidrui is located atop the rocky hilltop in the middle-ground, central Nacula island. View to northeast.

6. Grouped bar chart showing proportions (with 95% confidence intervals) of sherd compositional groups in Yasawa Islands assemblages. Assemblages in general chronological order on Y-axis.