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Dietary isotope patterns and their social implications in a prehistoric human population from Sigatoka, Fiji

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ABSTRACT

The late-1980s excavation of a well organized cairn-burial cemetery at the Sigatoka Sand Dunes site on Viti Levu, Fiji, recovered a population that is closely grouped in time with individuals coming from a nearby Fijian Plainware Phase village (1435–1300 cal BP). Analysis of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) stable isotopes from a sample of 22 of these individuals provides insight into village-level diet and its variation across the population. Results indicate a mixed diet high in C_3 plant resources but with a key marine component. Variation in diet based on sex does not occur. Differential treatment of the dead through interment in large coral rock cairns versus pit burials in the cemetery, speaks to rank in Fijian antiquity. Individuals interred in cairns trend toward elevated carbon values, suggesting access to marine proteins as a potential correlate for status in the burial population. Isotopic measurements for a late prehistoric individual from Sigatoka and measurements from nine faunal samples also are presented. The latter, with other faunal measurements from Fiji, provides a food web for comparative interpretation of human diet.

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1. Introduction

The analyses of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotopes in human, faunal and plant tissues for reconstructing past diets, food webs and the intersecting issues of human social and economic behaviors has become commonplace in contemporary archeology (Pearson et al., 2015; Waterman et al., 2015; Pate and Owen, 2014). Throughout the widely dispersed islands of Oceania, Kinaston and Buckley (2013:98–99) provide a list of 46 projects that, up to 2013, cumulatively involved isotopic measurement of bone samples from 441 individuals ranging in time from 3000 years ago into the historic era. They concede, however, that the majority of studies are able to present only “... broad interpretations of diet, usually concluding that populations were consuming, unsurprisingly, both terrestrial and marine food resources” (Kinaston and Buckley, 2013: 102). They consequently highlight the need for additional site-specific isotope data for the Pacific islands to facilitate insight into social patterns embedded in diet. More recent papers have taken up this call (Kinaston et al., 2013; Stantis et al., 2015).

In the following paper we, too, are concerned with understanding diet as a reflection and indicator of social relationships. We present an analysis of stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotopes for 23 individuals excavated between 1986 and 1996 from the Sigatoka Sand Dunes archeological complex on the southwest coast of Viti Levu, Republic of Fiji (Fig. 1). Twenty-two of these individuals come from an

organized cemetery associated with a mid-sequence (1435–1300 cal BP) Fijian Plainware village excavated by Burley (2005). Bayesian modeling of radiocarbon dates for the village indicate an occupation span of 86 years or less (Burley and Edinborough, 2014). The burial population, thus, is closely grouped in time, no doubt interrelated, and it provides an exceptional opportunity to examine dietary patterns at the level of a Fijian village. As an isotopic frame of reference for dietary interpretation, we also measured and present $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values for nine faunal samples from nearby, contemporary village excavations, these including domesticated as well as locally available terrestrial and marine species. Second, and of equal importance, we examine these data as they potentially reflect upon cultural protocols for dietary variation. The Sigatoka cemetery incorporates adult females and males who were differentially interred in well constructed and elaborate cairns of coral rock, or alternatively placed in pits with or without smaller scale coral rock features in association. Cross correlating burial type, sex and dietary reconstruction through $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotopic measurement potentially provides insight into food-ways, gender and personal rank in Fijian antiquity.

2. The Sigatoka Sand Dunes burial context

The Sigatoka Sand Dunes are located at the mouth of the Sigatoka River on the southwest coast of Viti Levu, the largest of 332 islands with the Fijian island group. The dunes are formed from upriver iron sands that are transported by river to the coast. The freshwater discharge inhibits fringing reef development at the river mouth, resulting

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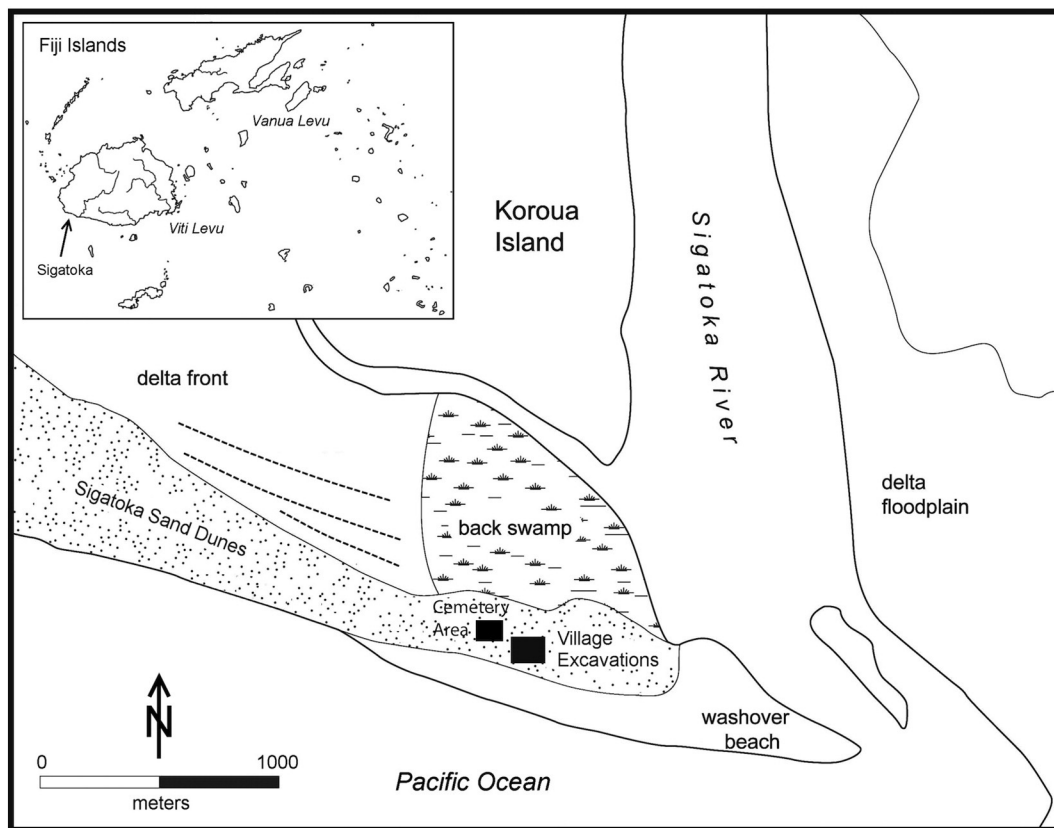


Fig. 1. Sigatoka Sand Dunes cemetery and Fijian Plainware village excavation areas, Viti Levu, Republic of Fiji.

in a strong surf surge that pushes the sediment onshore. The result is a 5 km long dune field with elevations of up to 60 m above mean sea level. As the Sigatoka River delta and sand dunes formed over the past three millennia, archaeological remains from human occupation in the river mouth area were periodically buried. The dunes, however, are parabolic. They continuously erode and move inland over time exposing archeological deposits and creating a literal series of “snap shots” into Fijian prehistory. Excavation and documentation of archeological materials at Sigatoka have been substantial since the late 1940s (Gifford, 1951; Birks, 1973; Marshall et al., 2000; Burley, 2005).

Eroding human skeletal remains have been a commonplace occurrence at Sigatoka since initial reporting of the site (Gifford, 1951:251). Surface exposure occurs quickly through wind removal of overlying sands. Once uncovered, skeletal elements desiccate from the sun, erode further by blowing sand, and ultimately break down into small calcined-like fragments and then into powder. The full process can occur within a matter of months, and it results in many burials being documented only by tooth scatters in drift sand. Low mounds of coral rock began to be exposed on the eastern end of the sand dunes near the river mouth in 1984. Preliminary investigations of these features by staff of the Fiji Museum in 1986 identified this area as a defined cemetery in which coral rock cairns had been constructed for single and multiple interments. Subsequent excavations by Best (1987, 1989) in 1987 and 1988 exposed 15 major cairns with additional burials having smaller coral rock features or pit interment without rocks (Fig. 2). In total, 55 individuals were recovered including both sexes and all ages.¹ Detailed osteological study and comparative analysis of these burials were carried out by Visser (1994) and Pietrusewsky et al. (1994). Pietrusewsky et al. (1994:ii) note that adults (79%) greatly

outnumber subadults (21%) with life expectancy at birth being 36.9 years. Combined with other demographic statistics, they infer that the population does not indicate age and sex profiles “consistent with a normal population”. A second notable aspect of this cemetery is the consistency of body placement within the graves (Fig. 2). Individuals are dominantly oriented east/west with head to the west, having only a limited degree of variation in body axis. With two exceptions, burials are supine with legs pulled up either in a flexed or semi-flexed position. The few contexts where differences occur do so on the site periphery, leading Best (1989:52) to argue variable treatment at death resulting from social stratification.

Burley's (2005) studies at Sigatoka additionally involve excavations at a Fijian Plainware phase occupation site a short distance east of the cemetery. In its location, context and content, it is inferred to be the village from which the burial population derives. Bayesian modeling of radiocarbon dates provides a 95.4% range of 1435–1300 cal BP for the village with an estimated duration of up to four to five generations (0–86 years) (Burley and Edinborough, 2014:299). We believe this occupation interval is congruent with the number of individuals buried in the cemetery and on its periphery. The village was located on the eastern side of a small freshwater slough or branching stream of the Sigatoka River that separated it from the cemetery (Burley, 2012). The cemetery accordingly was positioned on a higher elevation overlooking the village and ocean (Best, 1989). A second occupation deposit stratigraphically above but separated from the Fijian Plainware village by a layer of sand also is present. Ceramic design and form associate this group with the Navatu phase, an occupation taking place sometime between 1330 and 1265 cal BP (95.4%) with a maximum duration of 36 years (Burley and Edinborough, 2014:299). The short-lived Navatu phase economy focused on the trans-evaporation of sea water to produce salt for inland trade (Burley et al., 2011). The Navatu peoples also buried their dead in the vicinity of the village. One Navatu pit burial excavated by Burley (1997:43) in 1996 incorporated three individuals

¹ Best (1989:12) identifies the number of excavated individuals as 55 in his field report; Pietrusewsky et al. (1994:ii) however, were able to conduct analysis on 52 only. Why there is a discrepancy is unknown.

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