

Dietary shifting in the Nasca Region as inferred from the carbon- and nitrogen-isotope compositions of archaeological hair and bone

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ABSTRACT

The topography of the Andean Region results in short travelling distances among ecologically distinct production zones. As such, it is possible to infer relative changes in residence based on the spatial variability in the isotopic composition of food resources. Here, we determine long-term diet through carbon- and nitrogen-isotope analysis of bone collagen for twenty-nine individuals from Cahuachi, an important ceremonial centre in the Nasca Region. We also reconstruct the temporal sequence of change in dietary isotopic compositions along hair samples for seventeen individuals buried at Cahuachi and the neighbouring site of Huaca del Loro.

The collagen isotopic data for individuals buried at Cahuachi indicate that the average diet was a mix of C₃ and C₄ plant foods with greater reliance on maize, and included the variable consumption of plant-derived protein and terrestrial animals. Sequential isotopic analyses of hair reveal distinctive patterns of dietary shifting that distinguish seasonally changing diets from access to multiple production zones. We argue that short-term dietary heterogeneity in this context can be interpreted to represent flexibility as a risk-minimising strategy through the interaction between food acquisition and participation in local mobility among the Nasca.

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1. Introduction

Palaeodiet reconstruction in the Andes through carbon- and nitrogen-isotope analysis of archaeological human tissues has been used to investigate seasonality, socially- and politically-mediated differences in diet, animal foraging and foddering strategies, and economic networks and subsistence practices (Finucane, 2007; Finucane et al., 2006; Horn et al., 2009; Kellner and Schoeninger, 2008; Knudson et al., 2007; Slovak and Paytan, 2011; Tomczak, 2003; Williams, 2005; Williams and Katzenberg, 2012). The Andean Region is characterised by an extreme topography, resulting in relatively short traveling distances among isotopically and ecologically distinct production zones (Edwards, 2010; Murra, 1972; Tieszen et al., 1979; Tomczak, 2003; Yacobaccio et al., 2009). Therefore, isotopic reconstruction of long-term diets and short-term dietary shifting can be used to explore residential mobility (Fernandez et al., 1999; Knudson et al., 2012; White et al., 2009;

Wilson et al., 2007b), arguably a central component of many Andean societies, and can provide insight into the relationship between individuals and the social and physical landscapes.

Previous isotopic research in the Nasca Region has focused on residential mobility. Strontium, oxygen and/or carbon isotopic data from tooth enamel were used to investigate the presence of “foreigners” or nonlocal members of burial populations (Buzon et al., 2011; Conlee et al., 2009; Henry, 2008), to characterise childhood geographic origins of individuals transformed into trophy heads (Knudson et al., 2009), and to assess the geographic scale of influence of the ceremonial centre Cahuachi (Webb et al., 2011). In addition to the context-specific interpretations made in each study, considerable variation was observed within the oxygen-isotope datasets (Buzon et al., 2011; Henry, 2008; Knudson et al., 2009; Webb et al., 2011). This variability indicates that drinking water was obtained from sources with widely varying oxygen isotopic compositions. Environmental water baseline isotopic data (Buzon et al., 2011; Webb et al., 2011) were used to assess natural spatial variation in the oxygen-isotope composition of water, and together, human and water oxygen isotopic data indicate a range of possible places of origin distributed throughout the Rio Grande de Nasca drainage. Kellner and Schoeninger (2008) also reconstructed diet and assessed dietary variation using bone carbon- and

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nitrogen-isotope data for a well-documented sample of individuals from cemeteries near Huaca del Loro (c. AD 650–1000). Their study demonstrated differences in diet that were not strictly dictated by status, time period, age or sex.

The goal of the present study is to evaluate diversity in food acquisition practices among the Nasca individuals described here. First, we expand previous isotopic research in the Southern Nasca Region by providing additional dietary information from archaeological human bone samples from the ceremonial site, Cahuachi. Second, we reconstruct the temporal sequence of change in carbon and nitrogen isotopic compositions along hair samples (dietary shifting) from individuals buried at Cahuachi and near Huaca del Loro. Such data should facilitate differentiation between patterns of dietary shifting consistent with a seasonally changing food supply (i.e., dietary change mediated by the agricultural cycle) versus exploitation of multiple agropastoral production zones. Third, we explore the use of dietary shifting as a means of assessing local mobility within this regional context and speculate on motivations or behaviours underlying different patterns of dietary behaviour.

2. Archaeological background

The Rio Grande de Nasca drainage extends north to the Ica drainage and includes the Las Trancas river valley to the south (Fig. 1). The Southern Nasca Region includes the Nasca, Taruga and Las Trancas river valleys, and has been the focus of extensive archaeological and bioarchaeological research (Carmichael, 1988, 1995; Edwards, 2010; Kellner, 2002; Orefici and Drusini, 2003; Schreiber and Lancho Rojas, 2003; Silverman, 1993; Vaughn, 2009; Williams et al., 2001). Archaeological surveys throughout the Nasca Region (Proulx, 1999; Reindel, 2009; Schreiber and Lancho Rojas, 2003; Silverman, 2002) have located a considerable number of Nasca settlements from all chronological periods along the river valleys from the desert coast into the highlands. These sites range in size from small villages to more extensive population centres.

The Nasca polity, a dispersed alliance of interacting chiefdoms (Carmichael, 1988, 1995; Silverman, 1993, 2002; Vaughn, 2009), existed in the Rio Grande de Nasca drainage along the south-central Peruvian coast during the Early Intermediate Period (c. AD 1–750) and into the Middle Horizon (c. AD 750–1000). During the Early

Nasca period (c. AD 1–450), the ceremonial centre of Cahuachi emerged as an ideologically important site, where rituals, feasting and other activities took place and served to integrate the widespread communities that comprised ancient Nasca society (Silverman, 1993; Vaughn, 2005, 2009; Vaughn and Neff, 2004; Vaughn and Van Gijsegem, 2007). Silverman (1993) and Silverman and Proulx (2002) proposed that Cahuachi was a pilgrimage centre analogous to the Late Intermediate Period site of Pachacamac, periodically attracting pilgrims from across the Nasca Region. Over time, new construction at Cahuachi diminished, but throughout the environmentally and socially turbulent Middle and Late Nasca periods (c. AD 450–550 and c. AD 550–750) and the Middle Horizon, burials, deposition of trophy heads and other ritual activities continued at Cahuachi (Silverman, 1993:190–226). The Wari polity expanded into Nasca c. AD 750, marking the beginning of the Middle Horizon (locally the Loro Period, AD 750–1000), and Wari settlements were established throughout the Southern Nasca Region. The local population of the northern river valleys decreased as Nasca people moved south to the Las Trancas river valley where a large local centre, Huaca del Loro, was established. This centre flourished and became the largest settlement in the Southern Nasca Region during the Middle Horizon (Schreiber, 2005; Silverman, 2002). This population movement may demonstrate resistance to Wari rule by the local Nasca populace, or may instead represent a form of Wari control (Conlee and Schreiber, 2006; Schreiber, 2005). A recent archaeological survey (Edwards, 2010) also indicates that the Wari made important changes to the landscape of the upper and mid-valleys of the Southern Nasca Region, establishing several settlements and constructing roads that linked the headwaters of the Nasca river tributaries with the coastal plains.

Ecologically, the Nasca Region is composed primarily of desert coast below 500 m.a.s.l. (“chala”) and lower foothills between approximately 500–2300 m.a.s.l. (“yunga”) (ONERN, 1971). At higher elevations, highland pasturage (“puna”) was also accessible to the Nasca. *Lomas*, winter fog meadows found in pockets in the upper valleys and near the coast, were likely exploited for camelid grazing, as well as the small oases in the lower Grande and Ica valleys (Silverman and Proulx, 2002). Coastal Peru experiences both periodic climatic perturbations and long-term environmental and geological processes, including El Niño–Southern Oscillation events, tectonic activity and droughts (Dillehay and Kolata, 2004). During the Middle Nasca period, the typically unstable Andean climate became even more unpredictable because of a series of severe droughts (Eitel et al., 2005; Thompson et al., 1985). Because of the low river volume and inconsistent availability of surface water, the Nasca people developed a system of wells and irrigation canals (*puquios*) to access more reliable subterranean water and thereby allow increased agricultural production in the dry middle valleys (Schreiber and Lancho Rojas, 1995). Towards the end of the Early Intermediate Period, evidence of damaging El Niño effects has been observed, notably flooding at Cahuachi (Orefici and Drusini, 2003) and along the Ica river to the north (Beresford-Jones et al., 2009). The detrimental impact of these events may have been exacerbated in some areas by anthropogenic modification of riparian zones for agricultural purposes (e.g., canals) and removal of huarango trees, which are thought to have helped maintain both physical stability of floodplains and soil quality (Beresford-Jones et al., 2009).

Because relatively few Nasca habitation sites have been excavated, we have a limited understanding of Nasca subsistence economy. That said, the fairly short distances among different production zones in the Nasca drainage (Edwards, 2010:74–76) would enable easy access by smaller social groups through the establishment of temporary residences in or by traveling among various zones (i.e., local mobility). Several production zones, traditionally associated with different agropastoral uses, are within a few

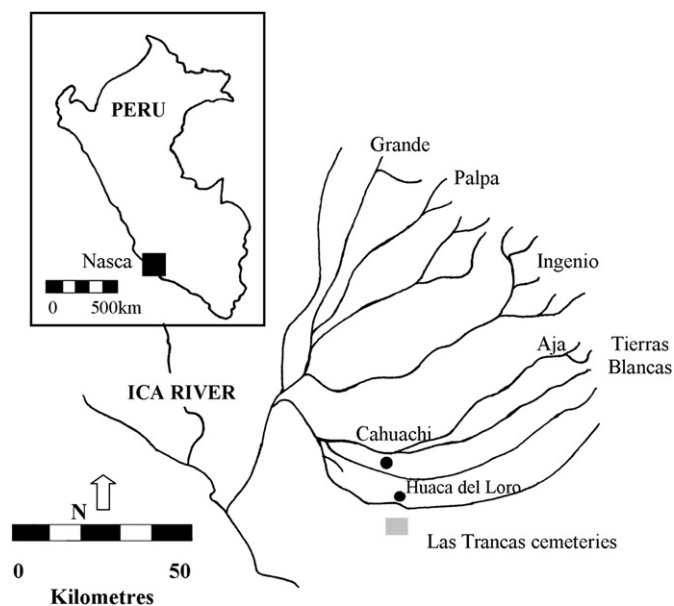


Fig. 1. Map of the Rio Grande de Nasca drainage.

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