Quaternary International xxx (2016) 1–11

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Potters and herders at the southern edge of the Andean world: Risk management and mobility in Northwestern Mendoza, Argentina

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Agro-pastoralism
Risk-management
Petrography
Camelid osteometry
Environmental complementarity
Mobility

ABSTRACT

This study addresses the risk-management activities of Andean pastoralists in northwestern, Mendoza. We compare data from one high-altitude site, Agua de la Cueva, located near a spring and an excellent hunting ground, and a domestic pit house at the site San Ignacio in a nearby mountain valley. We analyze data from roughly contemporaneous contexts dating to 1100–1400 cal BP. Osteometric measurements of camelid post-cranial bones and comparisons to modern camelids with multivariate statistics confirmed the presence of wild guanacos and vicuñas as well as castrated and uncastrated domestic llamas. Hence, this is one of the southernmost areas where Andean pastoralism was practiced. Petrographic analysis of pottery and comparisons to local geology suggest strong similarities between the sites. Similar fabrics suggest a closely-connected group that probably made effective and complementary use of these two environments. Previous studies have established the presence of vessels from the other side of the Andes indicating long-distance contacts between populations on both sides of the Andes. These contacts may have been made via caravans that included castrated llamas, which are ethnographically preferred among drovers. The possibility of caravans is a hypothesis to be tested with future research. Our data suggest these groups participated in seasonal and perhaps long-distance movements in addition to other activities such as hunting, herding, and storing food. The combination of these risk-management strategies provided a stable economic base for the potters and herders of northwestern Mendoza. This case can be broadly compared to better-known archaeological and ethnographic examples from other parts of the Andes.

1. Introduction

Pastoral adaptations to the high-altitude environments of the Andes have been crucial for millennia. This stable human-environmental relationship in a sometimes unpredictable environment extended throughout the Andes to the southern edge of the Andean cultural world in northwestern Mendoza, Argentina. One of the key strategies for ancient pastoralists in the Andes and Mendoza was mobility. Seasonal mobility was necessary to maintain healthy llama herds in addition to possibly less frequent and longer trade caravans. Both types of movement made it possible to exploit different environments that varied with altitude and season.

The objective of the present study is to assess risk-management strategies, with a focus on mobility. We use both faunal and pottery data from two contemporary archaeological occupations to generate a more complete picture of short- and long-distance movements. First, faunal data show a predominance of camelid bones from either wild or domestic camelids, both of which imply different types of risk management and mobility. The family Camelidae is currently made up of four species, two wild: Guanaco (*Lama guanicoe*) and vicuña (*Vicugna vicguna*) and two domestic: Llama (*Lama glama*), alpaca (*Vicugna pacos*). To distinguish between them, we made osteometric measurements and compared them to modern camelid with multivariate statistics. Second, we evaluated the pottery fabrics and the geological provenance of their inclusions. The combination of these two data sets made it possible to better evaluate how these pastoralists moved through southern Andean landscapes and managed risk.

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http://dx.doi.org/10.1016/j.quaint.2016.02.032
1040-6182/

2. Risk management among Andean pastoralists

There is an intimate connection between Andean pastoralists and the environments they occupy, which leads to the combination of strategies to reduce risk (Tomka, 2001). People and animals who manage risk do not tend to behave optimally (Bettinger, 1991; Smith and Winterhalder, 1992; Winterhalder and Kennett, 2006). Pastoralists consistently favor avoiding risk, so their strategies do not optimize or maximize production (Browman, 1987; Yacobaccio et al., 1998; Kuznar, 2001; Nielsen, 2001; Tomka, 2001).

Unpredictable climatic conditions in the Andes present a number of challenges to a reliable economic system. There can be significant variation in the occurrence and intensity of precipitation and freezing temperatures. Climate varies temporally and spatially on multiple scales, making it impractical to rely on a single productive strategy, such as agricultural fields in a single environment. Risk is not something external to pastoral logic, but instead is incorporated into production systems. The main concern is to improve resource management. This has led to a highly reliable system in which the focus is on the probabilities of damages occurring rather than the damages themselves (Roe et al., 1998). In many cases this involves consciously choosing the best of bad options (Göbel, 2001). Andean pastoralists avoid risk through a spectrum of strategies such as economic diversification, storage, exchange, sharing, and mobility (Browman, 1987; Halstead and O'Shea, 1989; Winterhalder et al., 1999). They combine economic practices such as maintaining mixed herds, horticulture, storage, transhumance, irrigating natural pastures, and organizing trade caravans (Browman, 1987).

Previous research in northwestern Mendoza has suggested that one of the principal strategies was seasonal movement between the highlands and lowlands (Durán and García, 1989), following the pattern of modern goat pastoralists (Gambier, 1986; Gasco et al., 2016). Lithic data have shown that groups acquired raw materials in the highlands and then refined and maintained tools along their trajectory to the lowlands (Chiavazza and Cortegoso, 2004; Cortegoso, 2004, 2006, 2008). These studies form a framework for our analysis using different data sets to evaluate a wider spectrum of mobility and risk-management strategies.

3. Archaeological sites and ecological setting

Northwestern Mendoza has a number of ecozones that vary by altitude. There are low-altitude deserts, high-altitude valleys, and rocky terrain in local mountain ranges, the Precodillera, and Cordillera of the Andes (Fig. 1).

The archeological site Agua de la Cueva is located in the highlands at 2900 masl (Fig. 1). It is a multicomponent site that was occupied since the Late Pleistocene (Durán and García, 1989; García et al., 1999; Lucero et al., 2006). It is a rock shelter located within a high-altitude system of basins and gorges along the edge of the Pampa de Canota in the Precordillera (Abraham, 2000). It is the largest natural rock shelter in the region and sits adjacent to a fresh-water spring (Fig. 2). The climate is steppe-like with no glaciers or permanent snow and perennial bushes.

The second archeological site, San Ignacio, is located in the Potrerillos Valley along the Mendoza river, at 1400 masl (Fig. 1). The Mendoza river is the largest river in the region and has water even during dry seasons and periods, making it a key feature in a fundamentally arid environment. The temperature in the valley is temperate, so it is a very suitable location for human settlement. The site includes a pit house and four underground earth ovens (see detail in Durán et al., 2002; Gasco et al., 2011) (Fig. 3). This type of pit house has been found at other lowland sites in the region (Gambier, 1977, 1988; Durán et al., 2002; Cortegoso, 2006; Gasco et al., 2011; Marsh and Cortegoso, 2014; Chiavazza, 2015).

Deep gorges connect Agua de la Cueva to the Potrerillos Valley to the south, the Uspallata Valley to the west, and the large desert plains to the east. Travel times to these areas are estimated to be eight, five, and 9 h, respectively, based on Tripcevich (2007) ethnographic estimates of llama caravan travel speed in mountainous terrain. These estimates show that the distance between Agua de la Cueva and San Ignacio could be traversed in less than a day's journey. Travel times are important to consider in discussions of potential connections and movements between these very different environments.

3.1. Local geology

Agua de la Cueva is located within the Buitre geological formation, composed primarily of metamorphic rocks (Folguera et al., 2004). In the surrounding area, greenish-gray phyllites, thinly laminated schists, and quartz are abundant. The petrographic composition of the samples from around Agua de la Cueva was mostly homogenous (Fig. 4 a). Mostly schists and phyllites were identified, while in some cases slates were present, and in very low percentages, rhyolite, quartz, and feldspar were also identified (Table 1).

The closest formation to San Ignacio is the Mal País formation in the Choiyoi Group, composed mainly of extrusive volcanic rocks (andesite, dacite, basalt, and rhyolite) (Folguera et al., 2004). San Ignacio is located on alluvial and coalluvial deposits of the Mendoza River. Sand and clay samples from this area are mineralogically diverse, but principally consist of quartz and feldspar. They have mostly extrusive volcanic rocks: andesite, dacite, basalt, rhyolite and to a lesser degree metamorphic, sedimentary, and granitic rocks (Fig. 4 b; Table 1).

3.2. Chronology

The two faunal and pottery assemblages analyzed for this study are roughly contemporaneous. They are both from levels dated to around 1100–1400 BP, which falls within the temporal range of the regional Agro-ceramic Period. Agua de la Cueva has a very long occupational sequence, but this article only includes material from occupational component 3, which is dated by three radiocarbon dates (Lucero et al., 2006, Table 1): 1220 ± 70 (LP-1627), 1330 ± 60 (LP-1621), and 1390 ± 50 (LP-1586). These dates' calibrated medians are 1270, 1300, and 1360 cal BP, respectively, estimated with the SHCal13 curve (Hogg et al., 2013) in OxCal 4.2 (Bronk Ramsey, 2009). This offers a fairly well-constrained chronology for a deep stratum that is dense with material. The chronology of San Ignacio is based on a single radiocarbon date from the interior of the pit house, URU-0301 (1310 ± 40 BP), calibrated to 1200 cal BP (1280-1070, 95% probability). The house was probably only occupied for 20 years (or less than 40 years, with a 68% probability), based on a Bayesian model of the site's four dates (Marsh and Cortegoso, 2014, pp. 69–71). The material from this context is likely from 1130 to 1250 cal BP (Marsh and Cortegoso, 2014, pp. 71). This period would have included the deposition of primary domestic refuse and some material that filled the pit house shortly after abandonment (Gasco et al., 2011). Hence data from both sites date to a similar span of a few centuries.

4. Material and methods

4.1. Osteometric analysis

The principal goal of the osteometric analysis was to identify each bone specimen as belonging to a wild or domestic camelid. To

Please cite this article in press as: Frigolé, C., Gasco, A., Potters and herders at the southern edge of the Andean world: Risk management and mobility in Northwestern Mendoza, Argentina, Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2016.02.032