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Changes in lithic technology and environment in southern continental Patagonia: The Chico and Santa Cruz River basins

Nora Viviana Franco ^{a,*}, George A. Brook ^b, María Virginia Mancini ^c, Lucas Vetrivano ^d

^a CONICET, and University of Buenos Aires, Saavedra 15, 5th floor, Buenos Aires, 1083, Argentina

^b University of Georgia, Department of Geography, Athens, GA 30602, USA

^c University of Mar del Plata-CONICET, IIMyC, Mar del Plata, Buenos Aires province, 7600, Argentina

^d University of Buenos Aires, Department of Anthropological Sciences, Puán 480, Buenos Aires, 1420, Argentina

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ABSTRACT

Changes in artifact technology and environment during the Holocene are documented, within an organization of technology framework, for three different regions of Patagonia. Possible relationships between environmental changes and changes in artifact technology are explored. We examine past vegetation and geomorphic evidence of Holocene climate conditions in the three regions studied and what technologies were used during particular wetter and drier intervals. Our results suggest that many of the observed changes in technology use occurred at times of rapid climate change, particularly towards much drier conditions.

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1. Introduction

The climate of the Patagonian plateau is temperate semi-arid with autumn–winter rainfall that ranges from 180 mm in the eastern and central parts of the area to 400 mm at the foot of the Andes (Paruelo et al., 2000; Garreaud et al., 2009). In arid and semi-arid environments, water is an important resource for hunter-gatherer populations (e.g. Smith et al., 2005; Veth, 2005). In Patagonia, variations in water availability have been documented over time (e.g. Heusser and Streeter, 1980; Heusser and Rabassa, 1987; Stine and Stine, 1990; Heusser, 1995; Coronato et al., 1999; Paez et al., 1999) and used by different researchers to explain variations in the frequency of occupation of different areas and to discuss the importance of water availability for hunter-gatherers (i.e. Borrero and Franco, 2000; Goñi et al., 2000–2002; Miotti and Salemme, 2004; Brook et al., 2013). However, there has been little research on possible relationships between technology and climate.

The purpose of this paper is to document chronological and spatial relationships between technological and environmental changes in three different regions of Patagonia, within an organization of technology framework. This is considered as a first step to

evaluate the reasons for these changes and by no means implies that we believe there is a direct relationship between changes in human behavior and environmental conditions.

In seeking possible relationships, we will examine the available pollen, sediment, geomorphic and archaeological information at both regional and supra-regional scales. Our time scale is from the earliest to the latest occupations by hunter-gatherers, i.e. from the Pleistocene–Holocene transition until the end of the Holocene. We will not deal here with equestrian hunter-gatherers, present in the area after European contact, because there were changes in mobility and transportability requirements related to horse acquisition (i.e. Kelly, 1995; Goñi, 2000).

2. Methodology

The three regions we will examine are: A) the Southern end of the Deseado Massif (SDM), B) the basaltic plateaus north of the Upper and Middle Santa Cruz River (NSCR), and C) the upper Santa Cruz River basin south of Lake Argentino and the Santa Cruz River (USCRB). To compare the SDM, NSCR and USCRB, we will first summarize the available environmental and technological evidence for each region, in some cases supplementing sparse data with information from nearby areas. New and previously published radiocarbon ages in ¹⁴C years BP (¹⁴C yr BP) were calibrated using CALIB 7.1 (Stuiver and Reimer, 1993) with the Southern Hemisphere (SHcal13) atmospheric calibration curve of Hogg et al. (2013).

* Corresponding author.

E-mail addresses: nvfranco2008@gmail.com (N.V. Franco), gabrook@uga.edu (G.A. Brook), mvmancin@gmail.com (M.V. Mancini), lucasvetri@yahoo.com.ar (L. Vetrivano).

Calibrated ages at the 2σ level are given in calendar years BP (cal yr BP). OSL ages are converted to cal yr BP.

3. Environmental and technological characteristics of the three regions

3.1. The Southern Deseado Massif

3.1.1. Archaeology

The SDM is a morphostructural region shaped by volcanic activity during the Jurassic (De Giusto et al., 1980). The region has mineral veins that penetrate the volcanic and sedimentary bedrock, numerous caves, and excellent raw materials for high-quality flintknapping (e.g. Panza et al., 1998; Cattaneo, 2000; Panza and Haller, 2002; Cattáneo, 2004; Miotti and Salemme, 2004; Echeveste, 2005; Paunero et al., 2007; Hermo, 2008; Paunero, 2009; Skarbun, 2009). Our study area lies in the southern part of the SDM and is characterized by its heterogeneity, with access to high-quality raw materials, caves and rockshelters, and water varying over distances ranging from ca. 2 km to ca. 25 km—such as between La Gruta and Viuda Quenzana—. For example, while La Gruta is dominated by closed depressions in volcanic and sedimentary rocks that may contain seasonal lagoons and occasionally permanent bodies of water, in the locality of Viuda Quenzana (Fig. 1), seasonal lagoons are less frequent, but there are seasonal streams and even a few large canyons with semi-permanent streams and springs. Water is a critical resource in the region today, and so differences in availability and reliability between areas may have influenced hunter-gatherer groups in the past. Also, sinters which provide good quality rocks have been localized some

1 km to the west of La Gruta 1 site and also 3 km to the north, in La Esperanza area. The earliest evidence of human occupation comes from La Gruta 1 (LG1) archaeological site, with dates from ca. 10,800 to 10,400 ^{14}C yr BP (12,800–12,100 cal yr BP) (Franco et al., 2010a; Brook et al., 2014).

Scarce lithic artifacts from archaeological sites consist mostly of internal flakes, including bifacial reduction and resharpening flakes all of small size. The evidence from La Gruta 1, 2 and 3 archaeological sites reveals important discontinuities in occupation (Franco et al., 2010a, 2013; Brook et al., 2014). These discontinuities, which are also apparent at other sites in the SDM (e.g. Paunero et al., 2007; Paunero, 2009; Skarbun, 2009) are consistent with low population densities, as suggested for Patagonia by other researchers (e.g. Borrero, 1989–1990).

The most abundant evidence of occupation for the Early Holocene dates to the period ca. 9000 to 8000 ^{14}C yr BP (10,500–8500 cal yr BP, Aguerre, 2003; Durán et al., 2003). Sites have been discovered in different environments within the SDM, including La Gruta, La Martita and El Verano cave areas (Fig. 1). Bifacial artifacts, which are probably preforms made from a high quality chert, have been recovered from the oldest deposit at La Martita Cave 4, dating to ca. 8000 ^{14}C yr BP (9000 cal yr BP, Aguerre, 2003). The same high-quality chert was also recovered from deposits at El Verano, Cave 1, with dates between 9000 and 8000 ^{14}C yr BP (10,500–8500 cal yr BP, Durán et al., 2003). A cache of mainly bifacial preforms, similar to those found at La Martita and made of the same high quality chert was recovered in La Gruta area, close to LG1 (Franco et al., 2011). The utilization of the same raw material and the similarities in technological characteristics of the three assemblages allow us to attribute them to the same time interval,

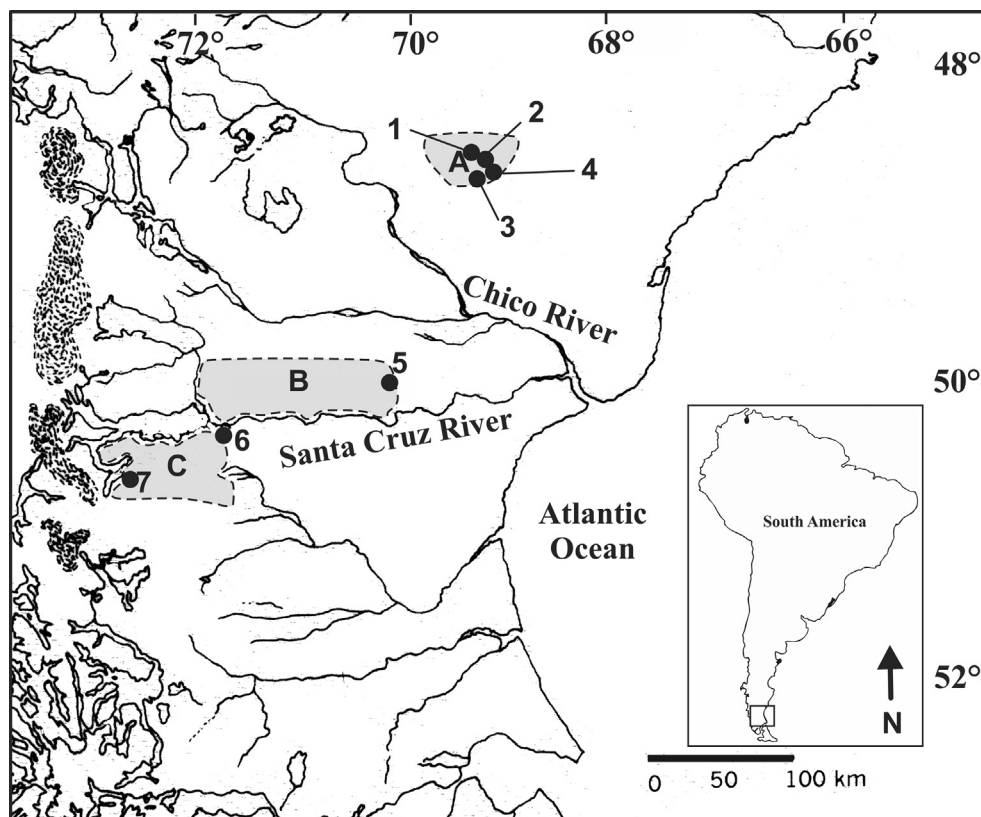


Fig. 1. Map showing main regions and sites mentioned in text. Regions: A. Southern Deseado Massif; B. Basaltic plateaus north of the Upper and Middle Santa Cruz River; C. Upper Santa Cruz River basin south of Lake Argentino and the Santa Cruz River. Sites: 1. La Martita; 2. Viuda Quenzana; 3. La Gruta; 4. El Verano; 5. Yaten Guajen 12 and Mercerat 1; 6. Río Bote 1; 7. Chorrillo Malo 2.

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