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Paleodemography of Late Holocene hunter-gatherers from Patagonia (Santa Cruz, Argentina): An approach using multiple archaeological and bioarchaeological indicators

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ABSTRACT

This paper summarizes and discusses the main results achieved over three decades of research on paleodemographic aspects of Late Holocene hunter-gatherers in Northwestern Santa Cruz (Argentina). Research has been guided by a model of regional settlement that proposes that, as a result of the progressive aridization process recorded in Patagonia during the Late Holocene, human groups would have reduced their residential mobility and concentrated their settlements in low altitude basins with water availability, such as Lake Cardiel and Lake Salitroso. Paleodemographic questions derived from the model relate to population regional continuity and dynamics and were tested using several lines of research at regional and local scales. The assessment of the chronological information and temporal trends of the archaeological record at the regional level allowed for a coarse grain paleodemographic approach, and acted as a mean to support hypotheses related to changes in mobility and land use strategies. Building on this, several lines of bioarchaeological evidence were used to address paleodemographic aspects of the model, including temporal, distributional, and compositional studies of the mortuary record, isotopic, morphometric and DNA analyses and the sex and age structure of the skeletal samples recovered in Lake Salitroso basin. Results point to a biological and cultural population continuity in the region during the Late Holocene. Also, a reduction in residential mobility would have favored a slight population growth of Lake Salitroso populations during the last millennium.

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1. Introduction

Paleodemography is interested in the study of population dynamics through time and the processes that explain these changes. Challenging as its archaeological study might be, the archaeological study of hunter-gatherers paleodemography is even more complicated. The same demographic characteristics of these populations –relatively low fertility rates and small population sizes, as well as their frequently high residential mobility pattern and funerary practices combine to create a sparse archaeological and bioarchaeological record, making it particularly challenging to address demographic research problems. In Northwestern and Central

Santa Cruz Province, Argentina (Fig. 1), the implementation over the past three decades of an approach that took into account different paleoenvironmental, archaeological and bioarchaeological lines of evidence has led to the possibility of discussing some demographic aspects of the Late Holocene peopling of Southern Patagonia by hunter-gatherer groups.

From the outset of this regional archaeological investigation, the core supposition that guided research was that, in Southern Patagonia, colonization and the pattern of human occupation is highly dependent on climatic and environmental conditions (Goñi, 2000). These have undergone important shifts during the Holocene, particularly during the Late Holocene, a period for which a progressive desiccation trend is recorded in the region. Goñi and coauthors (Goñi, 2000, 2010; Goñi et al., 2000–2002, 2005) have presented a model linking these climatic and environmental processes with changes in human groups' mobility and land use strategies, as well as in some of their demographic characteristics.

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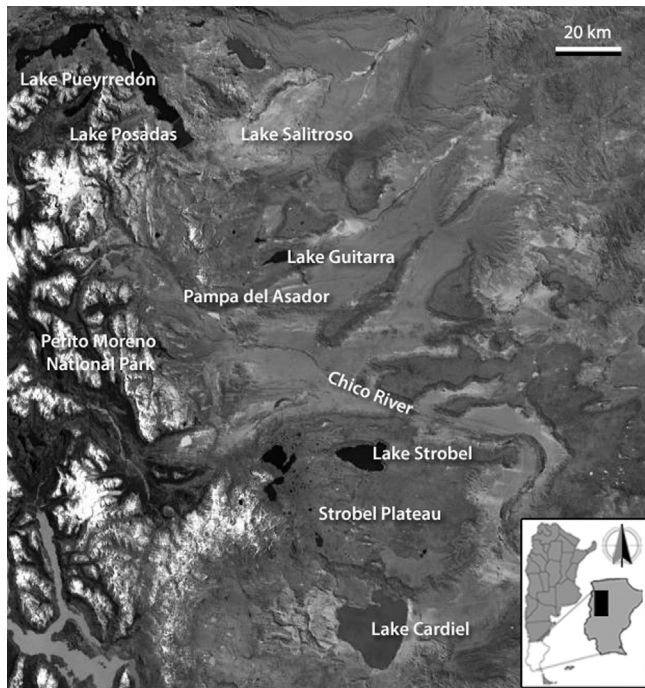


Fig. 1. Satellite Image of northwestern and central Santa Cruz (Patagonia, Argentina).

The model posits, first, that certain spaces in Southern Patagonia were not available for human occupation until the Late Holocene, as during previous times there were large bodies of water covering great land extents (Goñi, 2000, 2010). Second, it postulates that during the last 2500 BP, as the aridization process continued, water became concentrated in certain relict lake basins causing local hunter-gatherer populations to reduce their residential mobility drastically and nucleate their settlements in these loci which offered good habitability conditions (Goñi, 2000, 2010; Goñi et al., 2000–2002; Goñi et al., 2005). As a consequence, certain sectors of the Northwestern and Central Santa Cruz, such as Lake Salitroso and Lake Cardiel Basins (Fig. 1), would have experienced an increase in population size, particularly during periods of particularly low regional humidity (Goñi, 2000, 2010). These changes might have been produced solely by the relocation of local populations, without causing any real changes to population size at a regional level (Goñi et al. 2000–2002), or might have been accompanied by local population growth or decline processes, that might even have compromised population continuity in some sectors.

The main goal of the paleodemographic research presented here was to assess these hypotheses about the population dynamics of hunter-gatherer groups in the study area during Late Holocene times. To achieve this, several lines of research were considered as paleodemographic indicators. The starting point was the assessment of spatial and temporal trends in the composition, frequency and clustering of archaeological record at a regional level. Building on this, several lines of bioarchaeological inquiry, such as the main characteristics of the local funerary record and the sex and age composition and isotopic analysis of the skeletal collections were considered. Each contributed relevant information to the paleodemographic discussion. In the remainder of this paper, the main results of each of these lines will be summarized. As this is mainly a synthesis paper, readers are referred to the original publications or dissertations for further details on methodology and specific discussions of previously presented results.

2. Regional setting and paleoenvironment

The study area (Fig. 1) corresponds to a meso-region that comprises the area between the low altitude basin of Lake Salitroso and Posadas/Pueyrredón to the north ($47^{\circ} 22' S$), the Andes Mountains to the west ($72^{\circ} 19' W$), the Cardiel Chico Plateau to the south ($49^{\circ} 15' S$) and Pampa del Asador Plateau to the east ($70^{\circ} 30' W$). This territory stretches 250 km from north to south and 120 km from east to west, and includes the Perito Moreno National Park (PMNP), Lakes Cardiel and Strobel Basins, and the Strobel Plateau. It is a region of marked environmental contrasts. The landscape is dominated by glacial and tectonic lake basins, separated by Miocene basaltic plateaus (Ramos, 2002) and crossed by the Río Chico River Valley in a northeast – southwest direction.

The current climate is Temperate-Cold, with winds predominantly from the west (Oliva et al., 2001). Precipitation varies from 1000 to 150 mm per year and is concentrated in the winter. There is a marked west to east gradient producing changes in the vegetation structure, which is characterized by sub-Antarctic forests of *Nothofagus* sp. in the west and grass and shrub steppes with low vegetation cover in the east (Oliva et al., 2001). Altitude is one of the key determinants of the Patagonian landscape. Low basins such as Lake Salitroso, Posadas/Pueyrredón, and Lake Cardiel are situated between 100 and 300 m asl and are surrounded by high lands of more than 900 m asl, such as the high lake basins of the PMNP, the plateaus of Pampa del Asador, and the Strobel Plateau.

The available paleoenvironmental information shows that during the Middle Holocene (ca. 6000 BP) an important climatic change occurred involving a shift in the direction of the westerly winds or Southern westerlies, followed by a change in their intensity during the Late Holocene (ca. 1800 BP) (Gilli et al., 2001). As a consequence, a progressive aridization process took place in Patagonia during the late Holocene (Stine and Stine, 1990) reaching its peak during the so-called Medieval Climatic Anomaly (MCA) with its epic droughts dated ca. 1200–600 BP (Stine, 1994). The available information shows that new environmental and ecological conditions were established in the region (e.g. Stine and Stine, 1990, Stine, 1994; Gilli et al., 2001; Markgraf et al., 2003). In particular, various lake basins, which had fluctuated significantly during the Holocene (Stine and Stine, 1990; González, 1992; Horta and Gonella, 2009), experienced a marked decline in their water level during the Late Holocene. This caused the distribution of water, a critical resource in Patagonia, to vary drastically in regional terms and become concentrated in certain particular places, such as low altitude lake basins.

3. A regional model for late Holocene human occupations in Patagonia

Building on this paleoenvironmental information, Goñi et al. (Goñi, 2000, 2010; Goñi et al. 2000–2002, 2005) proposed that during the Late Holocene the heterogeneous distribution of water in the region would have affected human population mobility strategies. Particularly, the concentration of water in low altitude steppe basins, such as Lakes Salitroso/Posadas and Lake Cardiel in Northwestern Santa Cruz (Fig. 1) along with their relatively benign local climatic conditions and availability of other critical resources for human habitation, such as wood and shelter, would have acted as attractors and concentrators of human populations, especially during periods of low regional humidity (Goñi, 2000, 2010; Goñi et al. 2000–2002, 2005). The occurrence of dry spells during which water was distributed more heterogeneously, concentrated in certain points in the landscape with wide extents of dry land between them, would have led hunting-gathering populations to reduce their residential mobility as a strategy to adapt to this new

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