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Guest Editorial

Palaeodemography in Southern South America

Demographic processes are of special interest in the study of human dynamics throughout space and time, and for many different disciplines other than geography (e.g., biology, genetics, and historical sciences) (Vaupel and Kohler, 2000; Chamberlain, 2006). Although these processes have always been in the background of the archaeological agenda (Borrero, 1989), addressing them has become increasingly important during the last twenty years since radiocarbon databases began to offer high-resolution chronology for large regions. Ever since the seminal publication of John Rick (1987), radiocarbon dates, and over the last years, summed probability plots produced with radiocarbon data, have been used as proxy record of prehistoric occupations (Williams, 2012) and, therefore, as some kind of parameter of large-scale prehistoric population history (Steele, 2010). Large databases, together with the increased precision and smaller sample requirements of AMS dating, upgraded the opportunity to utilize ^{14}C data in palaeodemographic analysis (Chamberlain, 2006). Extensive datasets became a new and useful resource for modeling the past, and allowed archaeologists to asses a broad spectrum of population dynamic processes such as human migrations (Collard et al., 2010), colonization/population/depopulation processes (Steele, 2010; Jones and DeWitte, 2012), origin and spread of innovations (Shennan et al., 2013; Russell et al., 2014), intensity of occupations (Fiedel and Kuzmin, 2007), and relations between environmental and cultural fluctuations (Gamble et al., 2004; Michczynska et al., 2007), among others. These studies have been coupled with renewed methodological perspectives on how to deal with the formation of the radiocarbon record by addressing issues such as chronometric hygiene and taphonomic loss (Fitzpatrick, 2006; Surovell and Brantingham, 2007; Williams, 2012).

In the case of South America, and more than two decades after the paper by Rick (1987) was published, a special issue of *Quaternary International* (Bueno et al., 2013) renewed the discussion on the early peopling in light of chronological data from Late Pleistocene-early Holocene sites. Through compiling all the available dates earlier than 7000 BP, that volume offered a complete picture of the current debate on how and when humans reached the different parts of the continent, and also outlined the main interpretative issues and unresolved scientific questions for the archaeology of the region (Bueno et al., 2013). The present volume of *Quaternary International* stands as a continuity of that previous issue. In this case, our focus turned to a narrower spatial scale of the Southern Cone, and the set of papers considered here report on a much broader chronological scale, including case studies in different time frames extending to the Holocene. The papers in question are the outcome of a Symposium held during the spring of 2012 at the *XIX Congreso Nacional de Arqueología Chilena* held in Arica (Chile) and cover a vast spatial scale, and a wider time frame. Several topics were discussed, among which we can highlight: the reliability of using ^{14}C datasets for paleodemography, comparisons between ^{14}C datasets and environmental trends, the use of thermoluminescence datasets, and the effect of scientific and taphonomic biases on the regional archaeological signals. As dates cannot be considered as a straightforward proxy for demography, our aim was to discuss the usefulness of compiling such data for assessing long-term regional trends in human dynamics. This volume offers data for discussing dispersal episodes and demographic models for the Southern Cone of South America, along with providing systematized radiocarbon datasets coupled with geographic information.

The volume consist of ten papers which represent most of the archaeological areas of the Southern Cone of South America: northern Chile (Gayó et al.), Central Chile and Central-West Argentina (Méndez et al.; Falabella et al.), Southern Chile (Campbell and Quiroz), Northeast of Argentina and Southeast of Brasil (Bonomo et al.), Pampas of Argentina (Berón; Martínez et al.), and Patagonia (Barberena et al.; Zubimendi et al.; García Guraieb et al.). A total of 3454 dates, from more than 1280 sites were compiled in the volume as a whole. The authors thoroughly selected dates at different spatial scales and mostly calibrated them with the latest available calibration curve for the Southern Hemisphere (Hogg et al., 2013) with updated calibration programs.

The paper by Gayó et al. aims to analyze major trends in human populations for the South Central Andes from Perú, Chile, and Bolivia. The database used for this study incorporates 1701 radiocarbon dates from 519 sites spanning the past 13,950 cal BP. They used time-series analyses based on the assumption that long-term sustainability of human populations is a density-dependent process, coupling large amount of resource appropriation with high demographic levels, and vice-versa. This phenomenon, following the authors, leaves more chronologically traceable evidence. From the sum-probability results, low-levels of population are inferred from ~13,000–4000 cal BP, then a period of population expansion between 3500 and 700 cal BP, followed by a decline from 700 cal BP onwards. The authors highlight that the pattern for coastal Atacama Desert is different from that of other regions, showing a seesawing pattern, reflecting expansion/decline cycles. In contrast, the inland population and the Bolivian Altiplano display multi-millennial fluctuation, portraying a contrast between the coast and inland population dynamics.

Méndez et al. provide an assessment of the chronological trends from archaeological sites from Central Chile and Central Western Argentina, a significant area for understanding the fluctuations in climate because of its location in the southernmost area of

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influence of the Pacific Anticyclone. They focus on the role played by a major drought between 7800 and 5700 cal BP on population dynamics as expressed in the ^{14}C behavior. The authors explicitly gather chronological information from areas east and west of the Andean mountain range and address the fact that this immense barrier must have been permeable to mobile hunter-gatherers and as such used with different intensities through time. Peaks and troughs on summed probability plots at different spatial scales are used to compare environmental bands along the Andes. As a preliminary assessment, the authors suggest that the high Andes may have offered alternative and more stable resources, and thus they were effectively occupied in a relatively inverse pattern with regards to the other environmental bands.

Though Falabella et al. investigate a common area with the previous paper, they move towards a more restricted spatial and time scales and analyze trends in the thermoluminiscence record obtained from pottery shreds from the Angostura microregion of Central Chile. This is a novel approach towards providing statistical analyses that may be comparable to those more widely used time-series analyses employed with radiocarbon records. The authors compile 152 assessments from 44 clusters of domestic artifacts which cover a time span of around 1500 years. Their results show different chronological trends expressed by the behavior of contemporaneous archaeological populations. In their region, not only did the chronological curves differ, but the specific settlement selection varied over time depending on economic decisions (i.e. horticultural practices), local climate fluctuations (i.e. availability of surface water), and the proximity within settlements.

Campbell and Quiroz gather chronological information from sites in Southern Chile by integrating radiocarbon, thermoluminescence, and obsidian hydration methods. The authors address the biases produced by research decisions at the temporal and spatial scales by acknowledging the role of archaeologists in building the chronological record, for instance the inclined interest favoring the coast. Considering this, their paper shows a very tenuous archaeological signature since the late Pleistocene into the early Holocene, after which sites start appearing, especially in littoral settings. From 3400 cal BP to around 2350 cal BP they point out a major chronological gap, after which a regional incremental trend was recorded encompassed with the regional appearance of pottery, as well probable horticultural practices. The authors illustrate an agenda focused on points in time and space in order to improve the chronological record and thus to expand the knowledge of the long history of Southern Chile's human occupation.

The paper by Bonomo et al. studies the temporal and spatial distribution of the archaeological sites of the Guaraní, an extended linguistic family of the lowlands of South America. They analyze the expansion of this people along the Atlantic coast and La Plata river basin from 0 to AD 1780. On the basis of 144 dated sites, which considered 249 dates, the authors modeled (Digital Elevation Model, Dispersion Routes Model, and Temporal Visualization Model) information in a regional spatial scale. These maps were useful for displaying the Guaraní expansion routes, and to recognize the major expansion pulses in time. This allowed the authors to identify a potential early area in the Upper Paraná River; from this source area, seven main dispersion routes were modeled. The Temporal Visualization Model also allowed reconstructing the expansion timing, identifying two main pulses (0–300 AD and 1000–1780 AD) of population expansion. They also came through with a continuous demographic increase as the factor behind the Guaraní expansion.

The contribution by Berón puts together all radiocarbon data available for the dry Pampas (Argentina). Despite the limitations of sample size ($n = 64$) for addressing statistically the probability distributions of radiocarbon dates, the author provides a complete framework for comprising some demographic trends during the Holocene. She proposes a late and slow peopling of this continental and semiarid region, and a central and strategic role of water sources in this process (rivers, springs, lakes and holes). Biased research efforts and systemic factors are not underestimated as producing observables effects on the distribution of radiocarbon dates. However, Berón suggests that catastrophic (i.e. a volcanic event) and environmental stress situations could have constrained the human occupations of the area, mainly during early and middle Holocene. It is interesting that these kind of natural events are gaining prominence for explaining the behavior of the archaeological signals at macro-regional scales.

The paper by Martínez et al. offers a deep and comprehensive discussion of the current debate on human occupation of the Pampas (Argentina) on the basis of analyzing probability distributions of the radiocarbon dates available for the area ($n = 441$). The authors illustrate how diverse factors may have affected and shaped the regional structure of the archaeological record by considering: taphonomic and scientific biases, the organization of prehistoric populations, and low/high population density; this last being the highlight of the paper. Based on this background, the paper proposes some hypothesis for explaining the main trends and anomalies emerged from the data analysis. Beyond the complete and "multi-factor" dealing of the issue, the paper underscores that the previously recognized controversial "archaeological silence" for the middle Holocene in the area was not shown by their radiocarbon-series analyses. On the contrary, the authors observe a low but continuous archaeological signal, covering the time period spanning from late Pleistocene to late Holocene.

The paper by Barberena et al. is an interesting example of ecologically-based analysis of chronological data in Northwest Patagonia, Argentina. The authors assess spatial and temporal distributions of archaeological evidence and discuss their implications in terms of both human occupation intensity and sampling biases affecting the archaeological data. They observe that intensity of the archaeological signal differs among the different regions (i.e. forest, grass steppe, and the shrub steppe) through time. The main conclusion of the paper is that differences in temporal distribution of dates are related to carrying capacity of the environment. Humans would have more intensively occupied areas with high populations of guanaco (grass steppe), mainly during arid periods. On the contrary, environments with lower carrying capacity of guanaco (Andean forest and the shrub steppe) would have been less attractive for humans. This model is a useful starting point for evaluating large scale archaeological patterns.

The paper by Zubimendi et al. aims to analyze change and continuity in the chronological signal of past human populations in the southern coast of Santa Cruz province, Argentina, specifically the San Jorge gulf and the south of the Deseado inlet. For the analysis of chronological trends, the authors used 75 radiocarbon dates from 56 sites. They do not intend to estimate paleodemography, but to advance the estimation of general trends in the radiocarbon signal. By doing this, they distinguish three main chronological moments: one dated between 8000 and 5800 cal BP, followed by a hiatus, and an increase in intensity between 3900 cal BP until 300 cal BP. Though the hiatus could be explained by several reasons, it is probably a result of research bias. The Late Holocene has a stronger chronological signal which is attributed to a more diverse and stable human use of the coast, coupled with different types of burial practices, higher occupational redundancy, and the development of extensive exchange networks.

The final paper by García Guraieb et al. addresses the relation between drying trends recorded in Southern Patagonia during the Late Holocene and the effects it produced on residential mobility, settlement choices, and funerary practices in the areas of Lakes

Cardiel and Salitroso. This paper uses multiple lines of evidence besides the regional radiocarbon data. Distributional and compositional studies of the mortuary record, sex and age structure of the skeletal samples, isotopic analyses, and mtDNA are coupled with time series analyses in order to provide a thorough assessment of the paleodemography as a mean to support hypotheses related to changes in mobility and land use strategies. The results point to a biological and cultural population continuity in the region during the Late Holocene with a reduction in residential mobility that would have favored a slight population growth of Lake Salitroso populations during the last millennium.

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