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Guest Editorial

Multidisciplinary studies on the human–environment interaction during the initial peopling of the Americas



Climatic and environmental impact on humans and their role in animal and vegetation communities during the Pleistocene/Holocene transition (ca. 13,000–8000 ^{14}C BP) is a major topic for the archaeology of the initial human peopling of the Americas. This time period is crucial to understand the range of adaptive strategies displayed by early hunter-gatherers to changing ecosystems and climatic conditions during their expansion throughout the continent. The detailed chronoclimatic framework reveals high climatic fluctuation (in temperature, humidity, dryness), whereas the archaeological record suggests significant cultural diversity, exemplified by the appearance of various techno-complexes dispersed through space and time, diversification of subsistence resources with special emphasis on plants, and broad spectrum economies. Thus, the complex human–environment interaction has been a recurrent issue in the research agenda. However, given the fragmentary archaeological and paleoecological record, such interactions are difficult to address at a continental scale.

Notwithstanding that climatic–human–environment interaction is by definition dynamic, past interpretations have both characterized early hunter–gatherers as mere “resource consumers” and overemphasized, from a deterministic perspective, the role of climatic and environmental events over human societies. Nevertheless, new ideas and the supporting evidence suggest that human activities and environmental change should be viewed together as a coevolutionary and adaptive process. This change in understanding of this interaction was possible because of the contribution of distinct disciplines (archaeology, paleoecology, taphonomy, paleontology, bioarchaeology, etc) and evidence (lithic technology, paleoclimatic and paleoenvironmental proxies, radiometric databases, faunal and human skeletal remains, among others) investigated from different spatial scales (from micro to macro scales).

Here, we present an invited volume in *Quaternary International* integrated by a series of papers that deal with the human–environment interaction during the initial peopling phase from a continental perspective from Mexico to Patagonia, including the Pacific coast of South America, the Andean highlands, the tropical lowlands, and the wide grasslands of the south of the continent. The evidence studied and the methodological and theoretical approaches were diverse. This volume is the result of the session chaired by Miguel Delgado and Francisco Aceituno entitled, “Multidisciplinary studies on the human–environment interaction during the initial phase of the American peopling” held during the “VI International Symposium Early Man in America: Models and Contributions from Tropical Territories” presented in Pereira, Colombia, 19–24 November, 2012. The main aims of the session were to offer a place to present recent results favoring multidisciplinary approaches on the

interaction between humans, the environment (climate and landscape) and other animal and vegetation species during the Pleistocene/Holocene transition and to discuss new theoretical and methodological strategies to address interaction from the archaeological record in relation with other evidence.

The ten papers included in this volume are representative of the current diversity of research topics and methodological/theoretical perspectives on the archaeological study of the human–environment interaction during the Pleistocene/Holocene transition in the Americas. Together, the papers demonstrate at different levels and spatiotemporal scales the complex dynamics between humans and the environment, integrated by several biotic and abiotic agents that potentially promoted their biocultural evolution. The case studies cover a wide spectrum of contexts, evidence, and approaches focused on hunter–gatherers, spanning from the late Pleistocene to the early/middle Holocene. Interestingly, two papers included addressed aspects of total relevance such as plant domestication using experimental approaches on and the development of theoretical perspectives to study early American hunter-gatherers.

The work of S. Gonzalez, D. Huddart, I. Israde-Alcántara, G. Domínguez-Vásquez, J. Bischoff and N. Felstead presents new data regarding stratigraphy, dating, and tephrochronology of some important late Pleistocene/early Holocene sites in the Mexico Basin. Their results indicate the likely influence of volcanic processes and a meteorite airburst event on human, animal and vegetation communities during the Pleistocene/Holocene transition. This paper enhanced the chronological resolution of the studied sites, an important step to discuss the initial human peopling of the Mexico basin, and provides detailed evidence on the multiple events that likely influenced the early hunter-gatherer way of life and dispersals throughout the region. Importantly, this work stressed the relevance of human skeletal remains recovered, which have some of the earliest radiocarbon dates obtained in the Americas.

The four following papers concern the environmentally and culturally diverse northwestern South American region, including much of the current Colombian territory. They all emphasize adaptive strategies mostly based on plant resources, the lithic technology, and the chronology of the early archaeological record. Moreover, two of these papers present both new radiometric measurements of some archaeological contexts and critical evaluations of the regional chronological database within an archaeological and paleoenvironmental framework.

The article of F. Aceituno and N. Loaiza focuses on the adaptive strategies of human groups that settled Northwest South America (Colombia) during the Pleistocene/Holocene transition. The authors present a synthesis that suggests the key role of plant resources in the human settling of neotropical forests. The evidence analyzed,

basically lithic technology and the archaeobotanical record, support previous ideas on the impact of early hunter-gatherer societies on the environment through forest clearing, burning, and cultural selection of key vegetation resources. In addition, this paper contributes to the discussion of early plant domestication and cultivation in tropical America.

G. Santos, C. Monsalve, and L. Correa present data from the Medellín-River Basin in the Cordillera Central (Colombia) which suggest that the human disturbance of the tropical forest increased the carrying capacity. Furthermore, there is evidence that reveals the importance of the small-scale cultivation of plants since the end of the early Holocene. This work highlights the importance of anthropogenic landscapes used by hunter-gatherers during the peopling of Northwest South America.

R. Dickau, F. Aceituno, N. Loaiza, C. López, M. Cano, L. Herrera, C. Restrepo, and A. Ranere reported new late Pleistocene/middle Holocene sites (between 10,600 and 3600 ^{14}C BP) lying in the Middle Cauca, in the Cordillera Central (Colombia). In this article, the authors described new sites and presented a solid radiocarbon chronology of 26 sites in order to obtain a better chronological resolution on the peopling of Northwestern South America. This work also includes the description of lithic technology and the archaeobotanical evidence for the early plant use in this neotropical region and contributes to the clarification of cultural periodization on the basis of archaeological materials.

M. Delgado, F. Aceituno, and G. Barrientos presented the most updated regional analysis of the radiometric database corresponding to the Pleistocene/Holocene transition (ca. 13,000–8000 ^{14}C BP) in order to establish a reliable chronological framework, critical to inferences on the timing, pattern, process and tempo of early exploration and colonization of the study area. The authors using uncalibrated and calibrated dates explored some spatial and temporal trends illustrating the regions with the earliest and latest occupations within the chronological range considered and the fluctuation of the archaeological signal before and after 11,000 ^{14}C BP. Using paleoclimatic proxies and published paleoenvironmental reconstructions considering pre-11,000 ^{14}C ages, the authors suggested that the exploration phase occurred during a relatively warm and humid period, but it was during the El Abra Stadial, contemporary with the Younger Dryas Chronozone (12,900–11,600 cal BP) when the colonizing population first reached an indisputably clear archaeological visibility represented by a diversity of contexts deposited at different environmental settings. These four articles represent a major contribution for the study of the early human occupations in the northwestern South American region that must be inserted in broad discussions at a continental level.

The paper of D. Piperno, I. Holst, K. Winter, and O. McMillan presents the results of an excellent experiment on the domestication of teosinte (*Zea mays* ssp. *parviglumis*), specifically on phenotypic diversity and productivity (biomass, seed yield). The experimental data suggest that the environmental conditions of the terminal Pleistocene and early Holocene were a crucial factor to explain plant cultivation origins, such as teosinte. For instance, the lower level of Pleistocene CO_2 , temperature and precipitation fluctuations were significant limiting factors on plant growth compared with the following Holocene epoch. In contrast, the increase of Holocene CO_2 favored teosinte productivity and the appearance of new phenotypic traits, fact that was taken advantage of by the human populations. Probably from this moment, the foragers would focus their attention on more productive plants that later were cultivated. This work highlights the potential of new methodological tools derived from actualistic approaches to address important issues such as New World agriculture emergence following the end of the Pleistocene.

The following three papers are framed on southern South American environmental scenarios from the dry Puna to Pampa and Patagonia grasslands in Argentina. They focus on the initial human colonization, paleoenvironmental scenarios, and lithic technology. Some of these papers addressed interesting issues such as megafaunal extinction, water availability in arid and semiarid environments, chemical analysis of consumed resources, and lithic taphonomy.

The work of R. Huguin and B. Oxman describes the relation between climatic/environmental fluctuations, resource availability, and the lithic technological strategies followed by early hunter-gatherers during the initial peopling of the dry Puna in northwestern Argentina. In this case-study, the authors use pollen analysis to suggest that the occurrence of humid conditions, although not synchronously, during the early Holocene favored the extension of wetlands and the expansion of Andean grasslands, allowing the increase of regional carrying capacity. The hunter-gatherer response was to increase mobility to deal with the reduction of distance between productive patches and the long distance location of raw material sources, which in turn favored flexible operational chains and low technical investment. This study, along with other recent investigations, stressed that the early Holocene in the region was a very diverse period with distinct technological and environmental changes.

On a similar topic, but based on the chemical analysis of organic remains found on lithic artifacts, N. Mazza and N. Flegenheimer identified a variety of resources which were relevant to discuss paleomobility, paleoenvironmental scenarios and the diversity of resources consumed in the Pampean region (Argentina) during the late Pleistocene and the early Holocene. The lithic repertoire analyzed provides clues on marine resources consumed, suggesting high mobility that includes different terrestrial and coastal scenarios. Their results stressed the important role of vegetation resources among early hunter-gatherers which contrasts with previous interpretations performed by local archaeologist on high dependence of animal resources, basically megafauna. This paper, despite the requirements of good preservation, supports the idea that the analytic technique of chemical analysis of organic matter (in this case fatty acids) recovered from lithic artifacts provides an independent and reliable line of evidence concerning consumed resources and dietary mobility.

In Patagonia, Argentina, A. Brook, N. Franco, P. Ambrústolo, M. Mancini, L. Wang, and P. Fernandez presented evidence for early occupations in the southern Deseado Massif during the Pleistocene/Holocene transition. On the basis of sediment and pollen analysis, the authors suggested that the major human occupations coincided with wetter conditions. ^{14}C dates confirm that megafauna, more specifically the giant ground sloth, were present after the first human arrival and became extinct soon afterwards. The lack of evidence of human activities during several early and middle Holocene periods is explained, at least partially, through the increase of aridity and reduction of water sources during the same intervals inferred from the pollen records. This paper presents new and interesting evidence on the initial peopling of Patagonia.

Finally, L.A. Borrero presents a very interesting paper on crucial aspects of the initial peopling process of South America including the knowledge of the environment by the first settlers, differential preservation of archaeological materials and visibility (regional taphonomy), biogeographic features, and ecological peopling models, all framed in the theoretical perspective of “cultural geography”. The author discussed in a detailed form the mechanisms implied in exploration, colonization, and effective occupation phases. When this wide range of indicators and perspectives are applied to the early South American archaeological record, an interesting pattern emerged which indicates that the first settlers

probably were generalist hunter–gatherers with high flexibility to exploit different niches, likely following less-resistant routes and employing a variety of lithic technologies mostly focused on a wide spectrum of resources, including plants. Finally, Borrero stressed the importance of evidence emerging from forested landscapes mainly tropical forests from Colombia and Brazil, the key role of non-utilitarian items and exchange to identify exploration and/or effective colonization stages, and the importance of empty lands which reflects both low demography during the initial peopling and a relative knowledge of the local geography, especially during the colonization and effective occupation phases.

The papers included in this volume, covering a wide chronology and geography, as well as different study materials, approaches and perspectives, show distinct approximations – from case studies to broad interpretations – to understand human–environment interactions in America during the Pleistocene/Holocene transition using archaeological indicators along with a variety of evidence. This reflects an emerging pattern regarding the use of multidisciplinary and interdisciplinary approaches to address holistically the initial peopling of the American continent. This also exemplifies the use of promising evidence and perspectives to enhance our interpretations on the early human history in the Americas, which the archaeological community will surely find interesting.

In conclusion, this volume indicates high population dynamism during the Pleistocene/Holocene transition in America, a crucial period to understand both the early hunter–gatherer dispersal throughout the continent and their complex interaction with their surrounding environment. During this time, important adaptations emerged, including plant cultivation.

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