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## Past Andean Pastoralism: A Reconsidered Diversity. Introduction to the Special Issue

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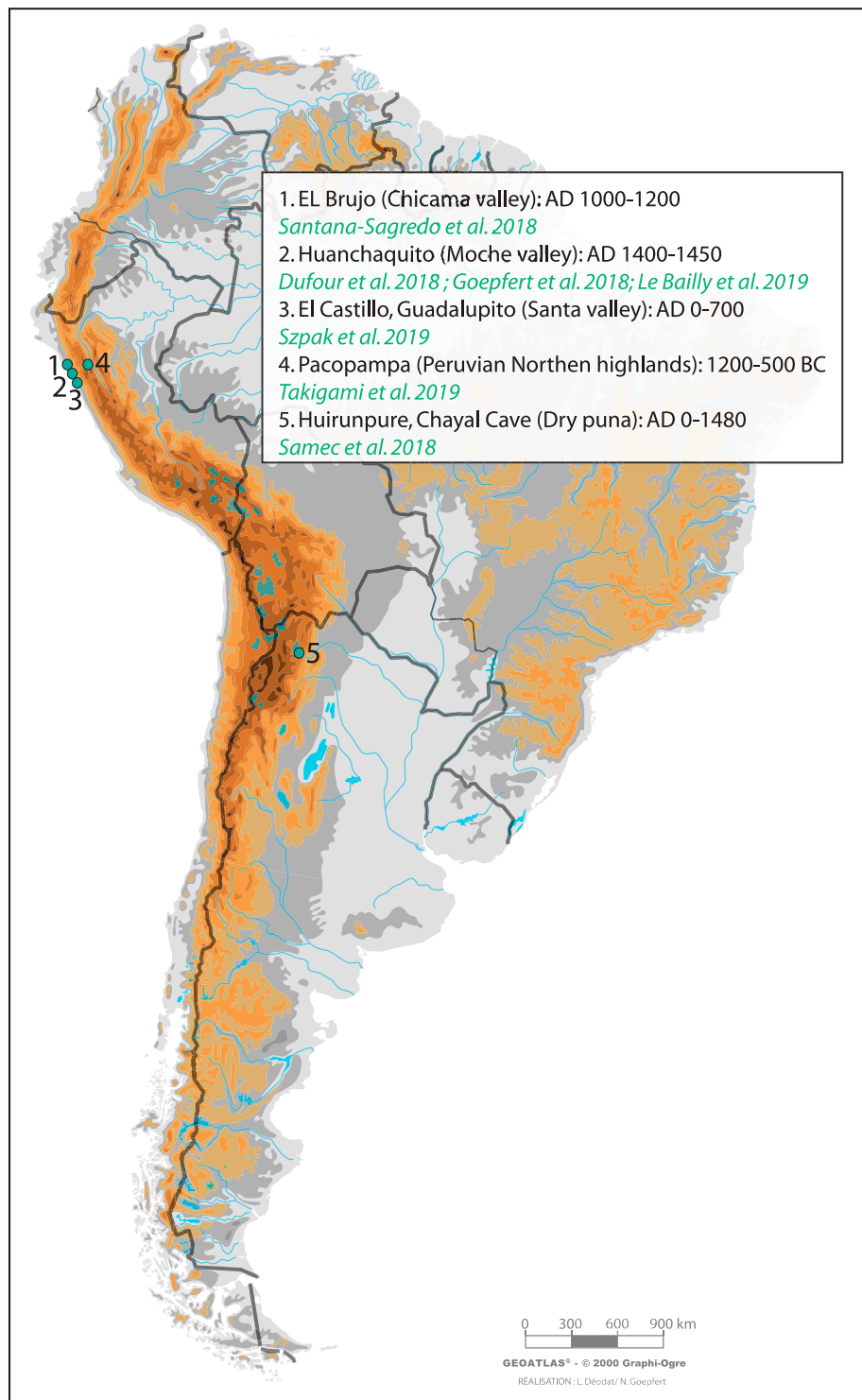
### Introduction

Pastoralism, understood here as an economy based on the breeding and herding of domestic ungulate livestock, is an essential component of human–animal relations in the Andean zone. Nowadays, Andean pastoralism mainly involves the extensive breeding of domestic South American camelids and sheep. It is confined to limited altitudinal ecological zones, namely, the *puna* and the *altiplano*, and is mostly aimed at the production of wool and meat. Domesticated 5000 years ago in the central and south-central Andes (Mengoni-Goñalons and Yacobaccio 2006; Wheeler, Chikhi, and Bruford 2006), llamas (*Lama glama*) and alpacas (*Vicugna pacos*) were the only domesticated ungulates present in the Andean zone before the Conquest. Archaeology documents a dramatically greater significance of these two species in the social, cultural and economic life of pre-Hispanic societies (Bonavia 1996). As providers of raw material, they contributed not only meat and wool, but also bone for making tools and dung for fertilisation the agricultural fields. As providers of services, they could have accompanied the deceased and sacrificed in rituals, and they contributed labour as beasts of burden for the short- or long-distance exchange of goods. The establishment of trade between different ecological levels in the Andes, described using the concept of the ‘Andean verticality and archipelago’ for the Inca period (Murra 1975), is considered to be the basis for the emergence of complex societies in the central and south-central Andes. It is thus necessary to document pre-Hispanic camelid husbandry – notably, its elevation, its ecological extent, and its onset outside the environment where domestication and traditional herding originally took place – to understand the functioning of these societies, as well as their relationship to their environment. However, classical approaches fail to document the diversity of pastoralism practices and uses over the diversity of Andean landscapes. Some aspects of these practices and uses can only be established

directly, from the study of archaeozoological remains and manufactured objects produced through the exploitation of animal raw materials.

This special issue was designed to document the complexity and diversity of Andean pastoralism over a large environmental and temporal framework, and it focuses exclusively on domestic camelids. It grew from a dedicated session at the 82rd Annual Meeting of the Society for American Archaeology, held in Vancouver in 2017, entitled ‘Ecological adaptations and new forms of pastoralism? New insights into herding practices in the Andes during the pre-Hispanic times’. The seven papers published in this special issue investigate remains dating from a millennium before the Common Era to late pre-Contact times (Figure 1) and originating from a variety of archaeological contexts (domestic, funerary, sacrificial). The papers’ geographical coverage extends from the lowlands of the Pacific to the highlands of the Andean Cordillera and from northern Peru to northern Argentina (Figure 1), encompassing a large part of the modern geographic distribution of domestic camelids and a variety of environments, ranging from dry desert coast to productive valleys and highland pasturelands. Specific aspects of camelid herding are investigated: the camelid diet, the geographic location of camelid herding, the existence of specialized herds, the origin and exchange of wool, and animal health, using various methodological approaches and techniques (archaeozoology, stable isotope analysis, palaeoparasitology) for the analysis of different preserved tissues and anatomical parts.

This special issue illustrates the interpretative possibilities for insights into pre-Hispanic pastoralism that are offered by the diversity of methodologies and the integration of multi-analytical approaches. It includes the first study of intestinal parasites in camelids from a site in the northern part of the central Andes, which attempts to provide a picture of the health status of the camelid herds. The majority of the papers (five out of seven) rely on stable isotope analysis, reflecting the



**Figure 1.** Map showing the localisation of archaeological sites considered in 'Past Andean pastoralism: A reconsidered diversity' special issue.

dynamism of this area of investigation in a South American context. Like elsewhere in the world, stable isotope research on animal remains is no longer restricted to providing a comparator for values obtained on human remains for the purpose of reconstructing the diet of ancient human populations (Birch 2013). There is no doubt that stable isotope analysis of archaeozoological remains will continue to be applied with the aim of understanding past subsistence strategies and economic exchange networks in the Andean area.

### Overview of the Articles

One of the salient features of this special issue is that it highlights the tremendous progress that has been made in the northern part of the central Andes over the past few years. Five papers (Dufour et al. 2018; Goepfert et al. 2018; Le Bailly et al. 2019; Santana-Sagredo et al. 2018; Szpak et al. 2019) are devoted to the uses and practices of the lowlands of the northern coast of Peru, an area overly characterized by a hyperarid

climate and desert environment. Pioneering work carried out in the 1980s and 1990s suggested that camelid livestock breeding would have been possible locally (Bonavia 1996; Shimada and Shimada 1985), even though the climatic and environmental conditions were drastically different from those of the original place of domestication and husbandry. Local breeding was firmly demonstrated by the first stable isotope analyses performed in this geographical area (Dufour et al. 2014; Szpak et al. 2014). Work by Dufour et al. (2018), Santana-Sagredo et al. (2018) and Szpak et al. (2019) on sites dating to the Early Intermediate Period (200 BC–AD 600), the Middle Horizon (AD 600–1000) and the Late Intermediate Period (AD 1000–1470) located in the lower parts of the Chicama, Moche and Santa Valleys (Figure 1) confirms these first observations and enhances our picture of the nature of camelid husbandry and adaptation to local conditions during the millennium preceding the Spanish Conquest. All the studied groups of camelids show considerable intra-group isotopic variability. Camelids fed on a diverse range of both wild plants and cultigens. The contribution of  $C_4$  resources was large, and maize foddering is suggested. It is noteworthy that all datasets are composed of several dozen individuals, ensuring that the reconstructions based on them are representative of past pastoral practices.

In addition, the good preservation of the remains on coastal sites has made it possible to analyse both bone and fleece, which record the animal's overall life history and its late life history, respectively, and to thus investigate intra-life mobility. Santana-Sagredo et al. (2018) show that at El Brujo, the animals, belonging to different age classes and originating from different herds, had been grouped together only recently before being killed and deposited next to the *fardos* (funerary bundles) of the Lambayeque/Sicán period.

Szpak et al. (2019) investigated the origin of wool recovered at two sites in the Santa Valley by comparing the isotopic composition of the yarns used to manufacture textiles with that of camelid bone collagen. The wool derived from locally raised camelids, which does not fit the expected pattern of wool traded from a long distance away, especially from the highlands. According to the authors, the animals were kept spatially segregated and were managed in small herds kept close to the houses. Interestingly, different herds may have been used for domestic purposes and for wool production, suggesting the possible existence of specialized herds in the lowlands and/or middle lands.

Dufour et al. (2018) and Goepfert et al. (2018) cross-referenced stable isotope data and age at death estimates of animals found at the mass sacrifice site of Huanchaquito-Las Llamas (Prieto et al. 2019). The data show that camelids were young (80% were less than a year old) and bred in the low- and/or

medium-altitude valleys of the northern coast, probably near Chan Chan, the capital of the Chimú Empire. They would have come from various herds that were differently managed and whose size is difficult to establish. The authors argue that the large number of young animals that are removed from the population is an indirect testimony for the existence of a large livestock population. The importance of camelids in the Chimú economy and rituals in general provides further evidence of this large livestock population at low elevation. The animals sacrificed at Huanchaquito-Las Llamas were also selected according to their coat colour. Only brown, beige and mixed animals (exhibiting both colours) have been recovered, while white, grey or black animals – which are currently common – are lacking. There may have been herds composed specifically of animals of a particular colour dedicated to sacrificial rituals, as described later for the Incas.

The exploratory work of Le Bailly et al. (2019) investigated the gastro-intestinal parasite diversity in camelids sacrificed at Huanchaquito-Las Llamas in order to provide access to their health status at the time of sacrifice. Analysis performed on preserved intestinal remains and faeces revealed that 8 individuals out of a total of 13 were infested by one or more of five taxa of helminths and protozoans. Some of them, such as *Eimeria macusaniensis*, are potentially lethal. However, the presence of these parasites does not necessarily lead to visible symptoms. It is thus not possible to infer yet whether some of the camelid sacrifices were opportunistic and served to eliminate sick animals from the herds. Altogether, the restricted reconstructed geographic origin of the sacrificed animals (lowlands and/or middle lands), the deliberate choice for young animals with a limited range of coat colours, and the presence of infested and potentially sick animals provide new insights into livestock management and the nature of animal sacrifice during the Chimú period.

For its part, the work of Takigami et al. (2019) fills an important gap in the current knowledge about domestication diffusion. The presence of local domestic camelid herds had hitherto been documented along the northern coast of Peru for the Early Intermediate Period and maybe as early as the Early Horizon (800–200 BC) (Szpak et al. 2016). Takigami et al. (2019) shed light on the arrival and geographic origin of domestic livestock at the site of Pacaopampa, located in the highlands (the *quechua* and *yunga* ecozones) of Cajamarca, in the northern part of Peru (Figure 1). Herding practices during the Middle Formative Period (1200–800 BC) and Late Formative Period (800–500 BC) occupations of the site were investigated through a multi-isotope analysis on both bone and teeth, the latter of which record the first years of life. Local husbandry is attested from the Late Formative Period, and different economic uses of camelids over time are suggested (Samec et al. 2018a).

Aimed to reconstruct herding and management strategies employed by pastoralist groups that occupied two caves in the Dry Puna of Argentina during the late Holocene (AD 0–1500) (Figure 1). This work is based on the stable isotope analysis of llama remains and represents a case study for the reliable interpretation of archaeological data based on a modern reference. Stable isotope analysis has proved to be a valuable approach for studying the use of camelids in this region (Grant, Mondini, and Panarello 2018), and the establishment of a correlation between modern camelid isotope values and altitude can be used to reconstruct the origin of animals found on archaeological sites (Samec et al. 2018b). There was, however, a discrepancy between the expectations based on this correlation and the isotope values actually measured for the Chayal Cave site. According to Samec et al. (2018a), this unexpected pattern is not necessarily the result of different herd management practices or climatic variations over time; rather, it may be the result of the particular setting of the site, which led to different moisture conditions and floristic composition from that expected at this elevation.

In sum, the diversity in the studied periods, geographical and cultural areas, and archaeological remains presented in this special issue renews the traditional view of pastoralism and its variation. It provides new evidence of pastoral practices both in the highlands and at low and middle altitudes, attesting to husbandry in non-traditional environments. These advances are only made possible by the application of diverse methodological approaches, adapted to the local characteristics of the studied environments.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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