

Camelid Domestication in the Lake Titicaca Basin, Perú

By Nathan Craig, Ph.D.

In an attempt to improve knowledge regarding camelid domestication at Jiskairumoko, Peru, and other sites soon to be excavated in the region, help from the readers of *Cool Camelids* is sought.

Camelids are the only large animal to have been domesticated in the Western Hemisphere. Through the meat, fiber, and perhaps most importantly the transportation capacity of these magnificent animals, camelids formed the economic backbone of the Inca Empire (Figure 1) - the largest and most powerful of the Americas. By the time of European contact, large caravans of sometimes up to thousands of llamas were carrying goods from valley to valley across the vast expanse of the Inca Empire. Yet, despite well over a hundred years of archaeological research in the Andean highlands of South America, precious little is known about when, where, or how llamas and alpacas were domesticated.



Figure 1: Golden llama effigy from the Inca Empire (ca. 1450 AD)

The most direct method of establishing the antiquity of animal penning is to directly radiocarbon date dung soil from ancient animal corrals. However, hunter gatherers making the transition to pastoralism frequently did not make sturdy corrals. They were probably constructed out of little more than brush, which does not preserve well. This makes the identification of early corrals extremely difficult.

Penning animals in corrals produces changes in the age profiles of their populations that archaeologists have used to study early herd management and domestication. When animals are penned in corrals, the rate of juvenile mortality generally increases in comparison to wild herds. This is because the rates of disease and parasite infection are higher among populations that are closely confined and because juvenile animals are among the most susceptible to these diseases. By looking at changes in the mortality profiles of animal remains recovered from excavated and radiocarbon dated archaeological sites, it is possible to infer when ancient hunters made the transition to animal herding.

Archaeologists have generally looked at long bone epiphyses in order to estimate the ages at death of animal bones that are recovered from excavation. The epiphyses are the long bone ends that are initially separated from the main bone by a layer of cartilage while the animal is growing. When the animal stops growing, the epiphysis unites with the main bone through ossification.

By tracking the proportion of animals with unfused epiphyses over time within an archaeological site that spans the beginnings of domestica-

tion, one often encounters a layer of the deposit in which there is a marked increase in the number of juveniles. Few studies of this kind have been undertaken in the Andean region to examine the domestication of camelids, and from what work has been completed the picture raises as many questions as answers.

In the Andean highlands, the shift from hunting and gathering to agropastoralism involving the use of both domesticated plants and camelids along with the formation of early settled villages is commonly described as the transition from the Archaic to the Formative Period. Excavations at the sites of Telarmachay and Pachamachay in the Lake Junin Basin provide some indication of camelid domestication in the Central Andes of Peru. At Telarmachay, radiocarbon dating indicates that a marked increase in camelid juvenile mortality rates occurred from 3140-2100 cal BC [1]. At Pachamachay, this transition does not appear to have occurred until ca. 1850 cal BC [2]. At Qilqatani, located in the Rio Chila drainage just west of the Lake Titicaca Basin in the Peruvian south-central Andes, changes in juvenile mortality profiles were detected at ca. 2000 cal BC. At the site of Asana located in the Rio Osmore drainage, also just west of the lake Titicaca Basin, material recovered from an early corral was radiocarbon dated to ca. 3000 cal BC [3]. Further to the south at the site of Puripica-1 located in the Atacama Basin, camelid corraling appears to have begun sometime shortly after ca. 2500 cal BC [4, 5].

These important studies and other research into the Archaic-Formative transition provide valuable stepping stones to understanding not only the beginnings of camelid domestication

but also the relationship between camelid herding and the emergence of socio-political complexity over 4,000 years before the initial expansion of the Inca Empire in 1350 AD. For example, when viewed over the long term, the amount of non-local obsidian artifacts that arrived in the Lake Titicaca Basin increased dramatically around 3000 cal BC—roughly contemporaneous with camelid domestication. This suggests that early on, ancient residents of the Altiplano were using camelids as pack animals to foster and maintain trade relationships over very long distances.

Recent research at the site of Jiskairumoko in the Rio Ilave of the Lake Titicaca Basin has made several new and important discoveries about the Archaic to Formative transition [6]. This site is composed of a series of small circular pithouses and above ground rectangular structures. Burials present at the site provide a unique window to see how the living memorialized and venerated deceased family members. Interestingly, camelids and trade goods that were likely transported by camelids feature prominently into this picture of commemoration. One individual buried at the site was interred with



Figure 2: Camelid effigy from Archaic Period (ca. 2940 cal BC) burial, Jiskairumoko, Peru.

nine gold beads. Dating to ca. 2050 cal BC, these are the oldest gold artifacts presently known in the Americas. Another individual, buried immediately next to the grave bearing early gold, dated even earlier to 2940 cal BC. This person was an older adult female who was buried with four lapis lazuli beads, an obsidian knife, and a camelid effigy (Figure 2).

Yet another individual, also an older adult female, that dates to ca. 1781 cal BC was buried with an assemblage of camelid bones.

Just outside this structure, next to an arrangement of stones that appears to have served as an altar, an additional gold disk and the earliest pottery in the northern Lake Titicaca Basin were both recovered. Surrounding the altar was a dense scatter of obsidian flakes, another camelid effigy (Figure 3), and an assortment of camelid bones that had been painted red with ochre.



Figure 3: Camelid effigy from outside an Early Formative (ca 1400 cal BC) ritual structure, Jiskairumoko, Peru.

In addition to these spiritually charged symbolic contexts, the butchered remains of camelids were recovered in large quantities from the domestic trash deposits at the site. Camelid bones were also crafted to form weaving tools (Figure 4) that were undoubtedly employed for spinning and processing camelid fleece to make wool clothing. While camelid remains are well represented at Jiskairumoko, the preservation of bone has made the implementation of epiphyses based age estimates very difficult. Sadly, this has complicated

accurate assessments of domestication. Fortunately, teeth provide two other means to estimate age. As teeth are used throughout an individual's life, crown heights wear as a result of the abrasive action of chewing. Furthermore, throughout an individual's life, additional layers of dental cementum are continuously added to the teeth. Both of these processes can be used to provide estimates of age [7], but only when the rates of wear and patterns of cementum development are known (Figure 5).



Figure 4: Camelid bone weaving tool (wichuna), Late Archaic (ca. 2500 cal BC), Jiskairumoko, Peru.



Figure 5: An Aymara individual from the community of Pirco, Rio Ilave, Peru, who assisted with excavations at Archaic archaeological sites in the region. She is shown here with her vicuna companion and her mixed herd of alpacas and llamas.

In an attempt to improve knowledge regarding camelid domestication at Jiskairumoko, Peru, and other sites soon to be excavated in the region, help from the readers of *Cool Camelids* is sought. A comparative collection of camelid teeth from animals for which the age at death, the season of death, and a rough estimate of forage are all known is under development. Analysis of this reference collection will permit the application of crown height wear and cementum annuli age estimation methods to archaeological collections.

Readers of Cool Camelids who have access to specimens meeting these criteria are strongly encouraged to contact Dr. Nathan Craig at the address provided below. The results of this study will be published in a peer reviewed academic journal, and digital copies of the analysis results will be provided for free on the internet. Readers interested in making a charitable investment in this research may also direct their inquiry to Dr. Craig.

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References Cited:

1. Wheeler, J.C., *Patrones Prehistóricos de Utilización de los Camélidos Sudamericanos*, in *Boletín de Arqueología PUCP*, P. Kaulicke, Editor. 1999, Pontificia Universidad Católica del Perú: Lima. p. 297-306.
2. Rick, J., *Prehistoric Hunters of the High Andes*. *Studies in Archaeology*. 1980, New York: Academic Press. 1-360.
3. Aldenderfer, M.S., *Montane Foragers Asana and the South-Central Andean Archaic*. 1998, Iowa City: University of Iowa Press. 327.
4. Núñez, L., *Temprana Emergencia de Sedentarismo en el Desierto Chileno: Proyecto Caserones*. *Chungará*, 1982. 9: p. 80-122.

5. Hesse, B., *Animal Domestication and Oscillating Climates*. *Journal of Ethnobiology*, 1982. 2(1): p. 1-15.
6. Craig, N., *The Formation of Early Settled Villages and the Emergence of Leadership: A Test of Three Theoretical Models in the Rio Ilave, Lake Titicaca Basin, Southern Peru.*, in *Anthropology*. 2005, University of California at Santa Barbara: Santa Barbara. p. 995.
7. Aldenderfer, M., *Dental Microstructure Analysis as Means of Age/Seasonality Estimation in Camelids*. *Zoarqueología de Camélidos*, 1994. 1: p. 9-21.

IMPORTANT NOTICE

LINCOLN - The Nebraska Department of Agriculture (NDA) today issued an import order to help protect the health of Nebraska's livestock as a result of Trichomoniasis infections in surrounding states. The order will take effect on Tuesday, January 1, 2008.

Trichomoniasis is a venereal disease of cattle that is known to cause infertility, open cows, and occasional abortions in cows and heifers.

"The health of the livestock in our state is of utmost concern to the Nebraska Department of Agriculture," said NDA Director Greg Ibach. "Trichomoniasis is a disease of concern

to Nebraska's beef and dairy producers; therefore, it is extremely important to have regulations in place to help safeguard our animals, as well as our livestock production industry."

The import order is in addition to the current Nebraska Animal Importation Act and includes important importation requirements for beef and dairy animals before being imported into Nebraska. Individuals that are planning to import cattle into the state should contact the NDA, Bureau of Animal Industry (BAI) at 800-572-2437 for more information. The complete import order can be found on the NDA website at www.agr.ne.gov, under Animal Health

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