

Hunter-Gatherer Territoriality in the Late Archaic Texas Coastal Plain using Strontium Stable Isotope Ratios—A Pilot Study

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Introduction

Territoriality is fundamental to understanding human societies as it related to the emergence of property rights, land tenure, warfare, and socioeconomic inequalities. However, human societies have not always been territorial and many questions remain as to the timing and conditions under which territoriality emerges. Anthropologists have theorized that territoriality emerges as a trade-off between benefits and risks of defending land using the Economic Defensibility Model (EDM). While this model has been effective in understanding ethnographic examples of different types of territoriality, it has yet to be systematically evaluated in archaeological contexts. My proposed dissertation project will evaluate the EDM through the study of archaeological materials from the Texas Coastal Plain (TCP) using strontium stable isotope ratio ($^{87}\text{Sr}/^{86}\text{Sr}$) analysis. Between Fall 2014 and Summer 2015, I conducted a pilot study analyzing six human enamel samples from the site of TCP site of Loma Sandia (41LK28). Twenty faunal samples from two geologic zones were also analyzed to find the bioavailable $^{87}\text{Sr}/^{86}\text{Sr}$ range for each of these zones to serve as a point of comparison for human enamel samples.

Background

During the Late Archaic (ca 4000-1200 BP) the TCP experienced a period of climatic amelioration that may have led to the associated peak population density. Hunter-gatherers in the TCP made use of freshwater resources, white-tail deer, pecans, and tubers. Researchers argue that as hunter-gatherer populations increased, there was a decline in mobility that may have led to increasing territoriality. Evidence of territoriality is also argued due to the increase presence of mortuary sites during the Late Archaic (Hall 1995, Hard & Katzenberg 2011, Story 1985, Taylor & Highley 1995). Hunter-gatherer mortuary sites are not uncommon and tend to be associated with freshwater resources and high population densities (Binford 2001, Kelly 2013).

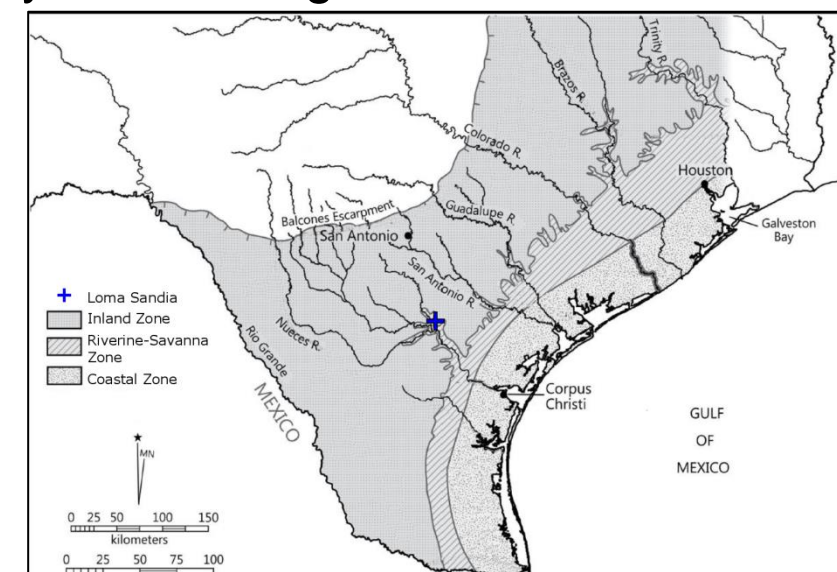


Figure 1: The Texas Coastal Plain's (TCP) ecological zones and the study site of Loma Sandia

This project considers Cashdan's (1983) two described forms of territory defense: perimeter defense and social boundary defense. Social boundary defense occurs competition is high but resources are sparse. This form of territoriality allows for access to a social group and access to resources with the assumption of reciprocity to lower resource risk. Perimeter defense is expected when competition for resources is present but resources are abundant enough to maintain a group in a small defensible territory. With this form of defense, access to resources between social groups is uncommon if present at all.

Stronium background: Strontium(Sr) is chemically similar enough to calcium that it absorbs into the bones and teeth of humans and animals through the food chain (Kenoyer, et al. 2013; Slater, et al. 2014.). As Sr goes through the ecosystem and food chain it does not fractionate by any significant amount (Price, et al. 2002). $^{87}\text{Sr}/^{86}\text{Sr}$ is an ecological tracer and can be used to tie individuals to particular locations which allows for inferences regarding territoriality. The Sr found in animals skeletal tissues is referred to as bioavailable strontium (Price, et al. 2002). Bioavailable Sr is ideal for finding the $^{87}\text{Sr}/^{86}\text{Sr}$ range of a geologic region because it provides an average Sr signature range of an area rather than the great heterogeneity that results from the use of plants, substrate, or minerals. This project will look at the bioavailable Sr from seven geological zones.

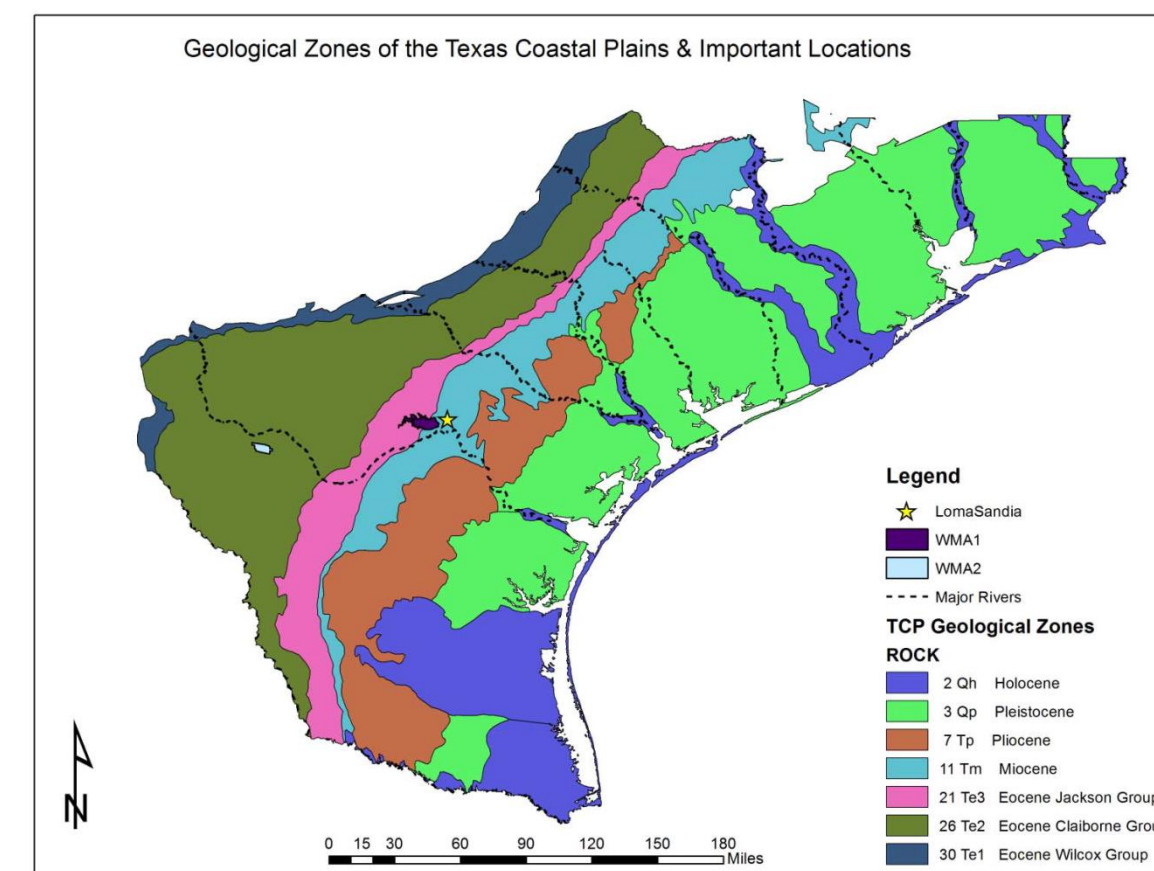


Figure 2: Map of the TCP geological zones that will be used in this project. The location of Loma Sandia and two wildlife management areas from which bioavailable Sr were obtained in the pilot study are also displayed.

Study Area

The Texas Coastal Plain is divided into three zones: 1) the Coastal Zone, 2) the Riverine-Savanna Zone, and the 3) the Inland Zone (Figure 1). These zones coincide with the "cultural-ecological" boundaries present through the Middle and Late Archaic (Taylor 1998). These zones do not correspond with the geological zones from which bioavailable Sr will be obtained, but they are important for understanding mobility and territoriality. Each ecological zone has a set of similar resources and resource fluctuations that differs from the other zones. Because of this, mobility between zones, to access different resources, is more probable than mobility within zones. Stable isotope data suggests that by 2500 BP, most other riverine sites in the TCP showed little to no use of marine resources despite the coast being only 75-100 km away. Coastal residences also do not appear to have been exploiting freshwater resources only 25 km away (Hard and Kateznburg 2011). This dietary evidence is also suggestive of possible territoriality in the TCP during the Late Archaic.

This project focuses on Loma Sandia, large mortuary site in the Riverine-Savanna Zone of the TCP. The site was excavated between 1977 and 1978. Loma Sandia dates to 2800 BP to 2600 BP. Burials and cremations of over 205 individuals and a large number of local and non-local mortuary goods were recovered. Males and females of all age groups were buried at the site (Taylor and Highley 1995).

Hypotheses & Predictions

The proposed dissertation project will test three hypotheses based on the EDM and Cashden's models of territoriality.

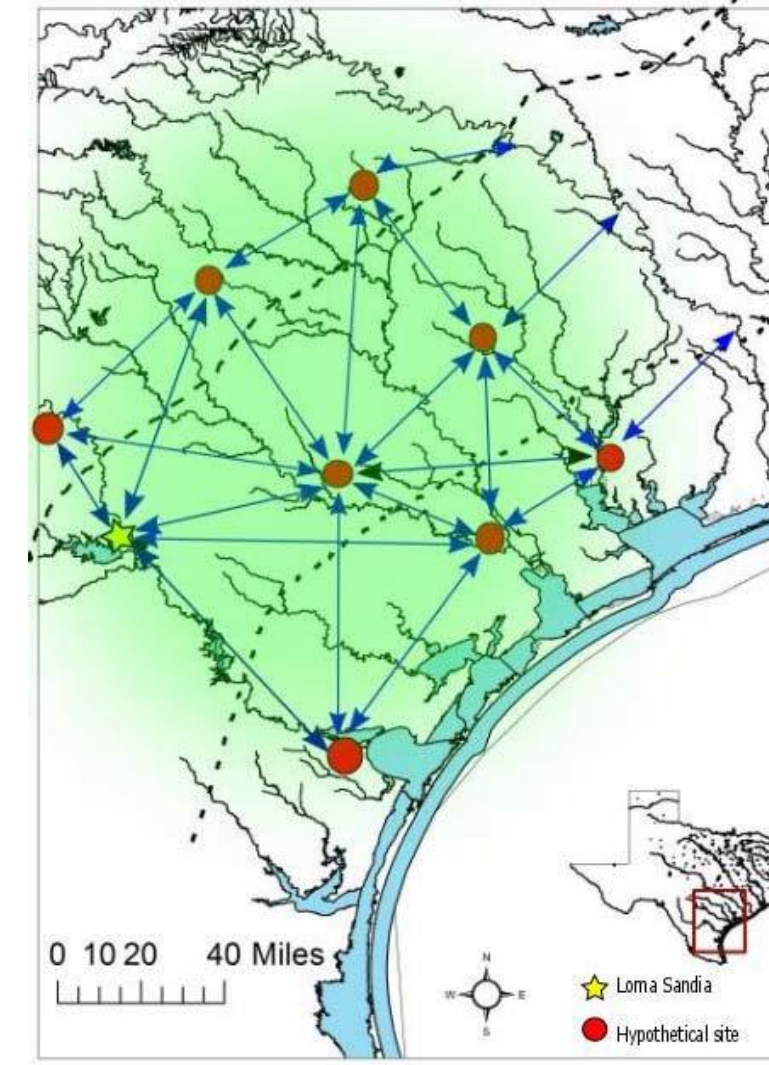


Figure 3A

Hypotheses 1: If territoriality is not present, then free movement of populations among the geological and ecological zones would have occurred. See Figure 3A (left)

Predictions: Sr signatures of individuals from Loma Sandia will be variable, showing a large spread. Sr signatures of most individuals will not match the bioavailable Sr of the local geology.

Hypotheses 2: If territories were maintained through social boundary defense, then territoriality would have allowed for risk-reducing social alliances between cultural-ecological zones. See Figure 3B (right)

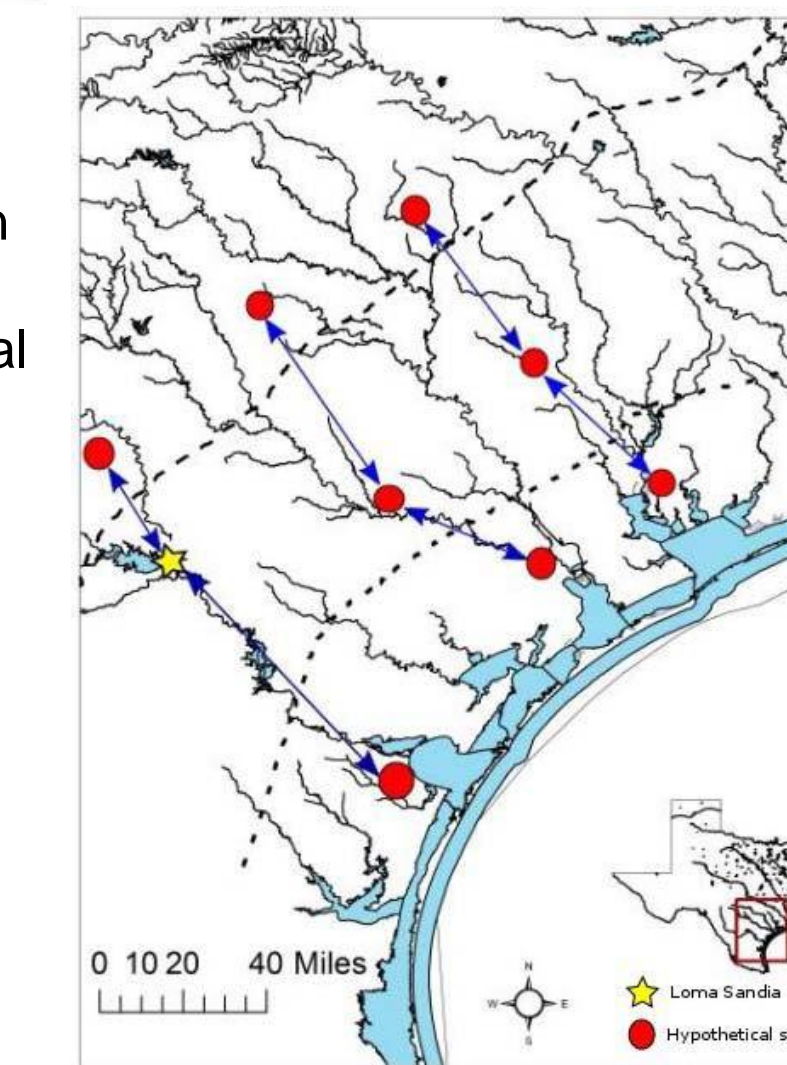


Figure 3B

Predictions: Most individuals ($\geq 50\%$) at Loma Sandia will have similar Sr signatures to each other, falling within the range of local geology. Sr signatures are expected to be bimodal or multimodal.

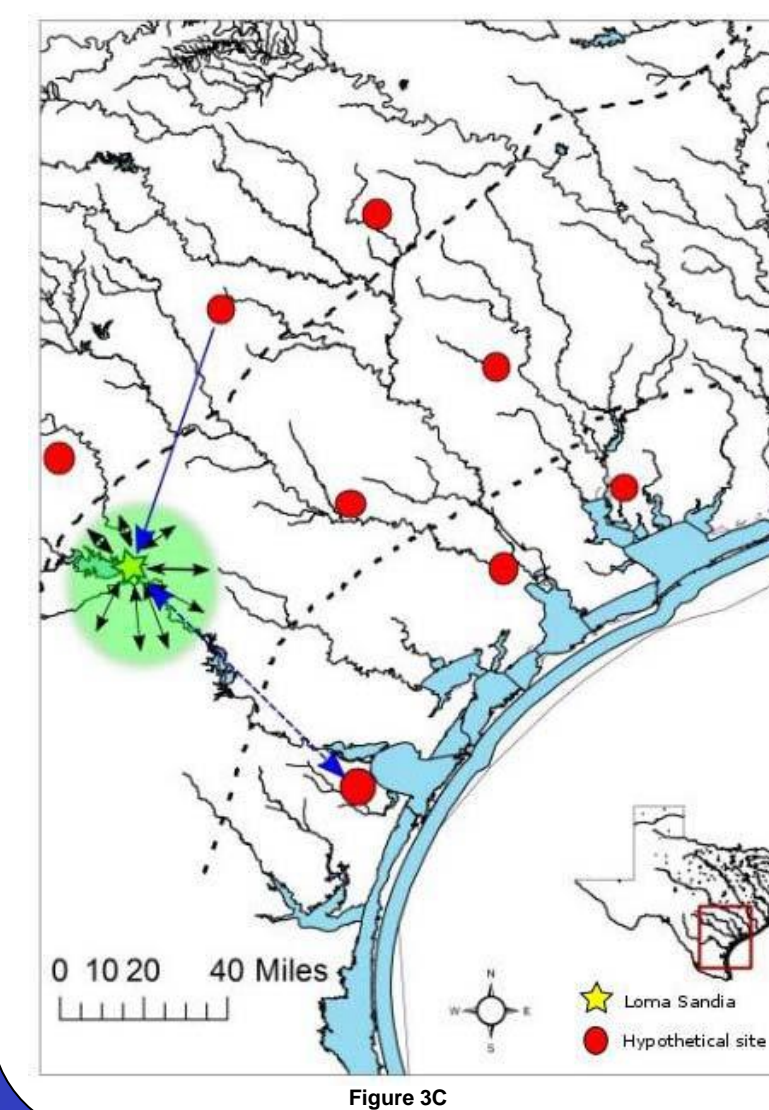


Figure 3C

Hypotheses 3: If territories were maintained through perimeter defense, then territoriality would have been strictly defined and stable. See Figure 3C (left)

Predictions: Most individuals ($\geq 75\%$) at Loma Sandia will have similar Sr signatures to each other. Sr signatures of most individuals at Loma Sandia will fall within the range of the local geology with few outliers.

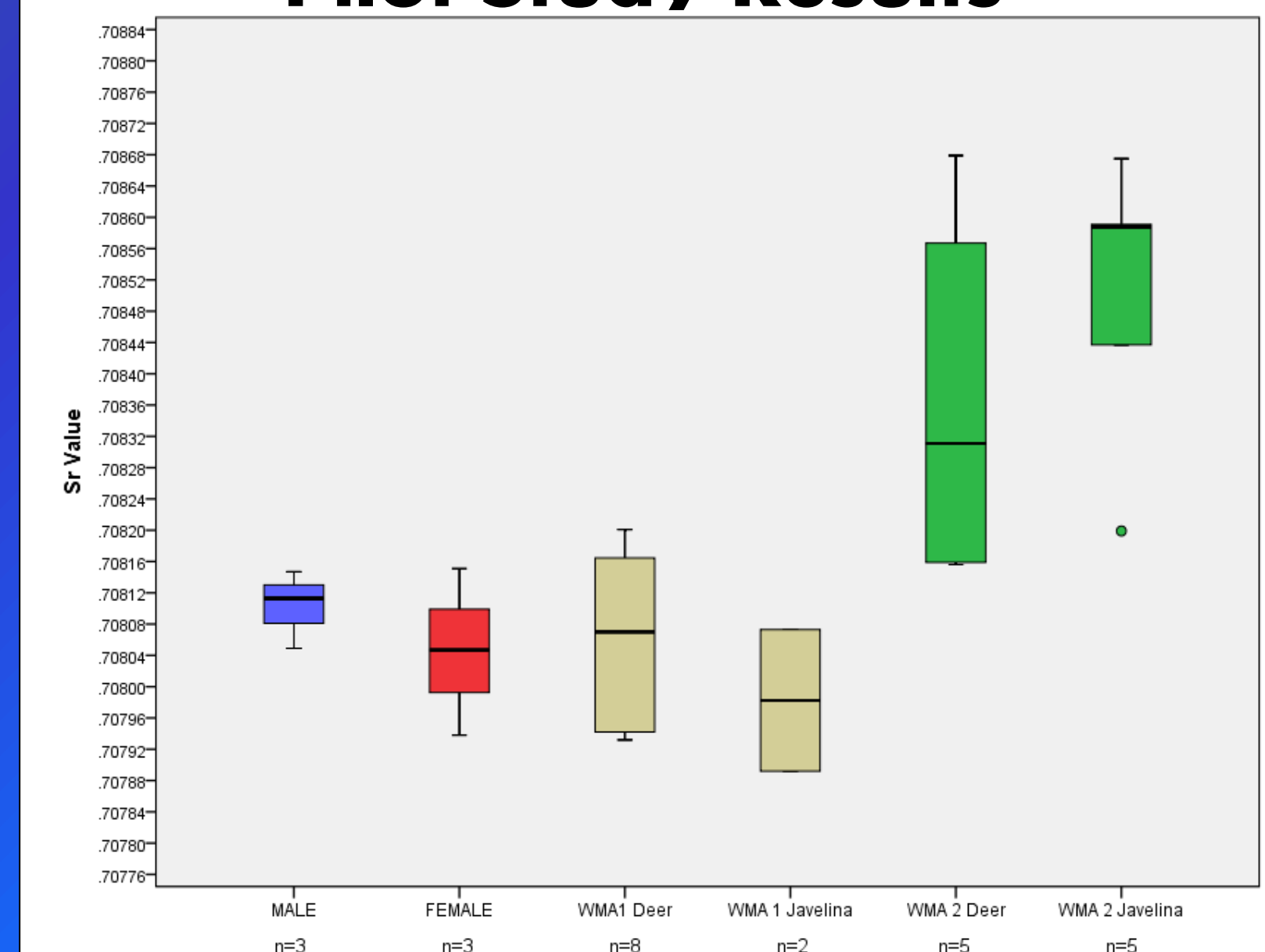
Methods & Pilot Study

Because enamel is an acellular tissue that does not regenerate as a person goes through life, it contains an archive of an individual's childhood diet and geographic natal origin (Price et al. 2002). Enamel is also resistant to chemical change over geological and archaeological times scales (Hoppe, et al. 2003, Montgomery 2010, Nafplioti 2011). For these reasons, the teeth of individuals buried at Loma Sandia play an important role in this project as they will give uncontaminated information about the individual's natal origin. The dissertation project will analyze 54 individuals from Loma Sandia. Permission has been granted by the Texas Historical Commission to analyze one tooth per individual.

In order to obtain bioavailable Sr ratios from each geological area, wild animals with localized diets are required. Archaeological bone is susceptible to diagenesis. Faunal bone and tooth specimens will come from deer and javelina, two commonly hunted species in the TCP with very small home ranges. The samples will be collected from wildlife management areas (WMAs) by Texas Parks and Wildlife Department biologists.

For the pilot study, the enamel of six individuals, 3 males and 3 females, from Loma Sandia were analyzed. Preliminary bioavailable Sr ratios were obtained from two WMAs using 10 faunal samples for each WMA. One WMA was located in the same geologic region as Loma Sandia, the other was located in a different geologic region. All samples were analyzed at the University of North Carolina-Chapel Hill Isotope Geochemistry Laboratory in the Department of Geosciences.

Pilot Study Results



The human samples used in the pilot study fell within the normal range of bioavailable Sr values for WMA1, located in the same geological region as Loma Sandia. This may indicate very low mobility and high territoriality, however the human sample size (n=6) is currently too small, and a larger sample size may yield different results.