

Dental Enamel Hypoplasia at Black Cat Cave, Site 40RD299

This project was funded by a Spring 2020 URECA Assistant Grant to the author.

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Abstract

This project originally aimed to identify instances of dental enamel hypoplasia in the human remains excavated at Black Cat Cave (site 40RD299) in order to assess the overall health of the population(s) that used this site for human burial during the Middle to Late Archaic periods.¹ This site would not have been occupied on a permanent or semi-permanent basis, but was “a specialized component of a larger settlement system”.¹ Upon study at the macroscopic level, I identified a lack of enamel hypoplasia and sought to expand the project to include pathologies of the cranial vault (porotic hyperostosis, cribra orbitalia). However, at this point the project was disrupted due to COVID-19.

Introduction

Dental enamel hypoplasia can serve as a non-specific indicator of systemic stresses like nutritional deficiency, disease, childhood fevers, and physical trauma on the body during the formation and growth of teeth.^{2,3,4,5} These stresses can disrupt “the cells forming enamel matrix in growing teeth, which in turn cause groups of these cells to cease secreting matrix earlier than normal.”⁴ It is shown by the presence of “horizontal grooves or pits on the labial surface of both...deciduous and permanent anterior teeth”.⁵ By determining the frequency of dental enamel hypoplasia observed in individuals from this site, we can compare the overall health of the population buried with that of other Middle/Late Archaic sites in the Southeast, and thus place it within a larger cultural narrative.

Bioarchaeological studies of Southeastern Archaic populations are limited as high rates of mobility and a lack of permanent structures both discourage the use of dedicated cemeteries and make existing cemeteries difficult to find.⁶ However, existing studies of contemporary populations like that of Indian Knoll suggest good health based on low frequencies of enamel hypoplasia, among several other factors, compared to that of their “horticultural descendants”.⁶ With this in mind, I expected to find low frequencies of linear enamel hypoplasia in the samples from Black Cat Cave.

Methods

Because linear enamel hypoplasia is a non-specific indicator, it is most often used to assess the general wellness of an archaeological population.²⁻⁷ This project sought to take an initial step in evaluating the pathology of the population interred at Black Cat Cave to make such an assessment. Because anterior teeth tend to have a higher prevalence of linear enamel hypoplasia, I limited my study to only anterior teeth (incisors and canines) that had 50% or more of the crown intact.^{7,5}

After initial analysis, I determined that only eight teeth were suitable for evaluation, and none of those eight exhibited linear enamel hypoplasia. Upon this realization, I consulted with Dr. Shannon Hodge, who recommended that I expand the project to include analysis of the bones of the cranial vault for the presence of porotic hyperostosis and cribra orbitalia. Unfortunately, at this point I was unable to continue the project, as the osteology lab was shut down due to COVID-19. The one individual I was able to evaluate for porotic hyperostosis and cribra orbitalia did not exhibit any signs of the two pathologies.

Results

- No enamel hypoplasia was identified at the macroscopic scale.
- This suggests that those interred at Black Cat Cave experienced few to no systemic stresses in early childhood, which is consistent with the results of previous studies on Archaic populations.^{6,7}
- Despite this, we must remain aware that these individuals do not fully represent the health of a larger population because of reasons outlined in Wood et al (1992); selective mortality (the individuals present can only represent those that survived to that specific age-at-death), and hidden heterogeneity in risks (the individuals’ unknown variability in their susceptibility to morbidity and mortality).⁹

Discussion

This project seeks to understand health in an Early Archaic population as found at Black Cat Cave. However, the topic of health in the field of bioarchaeology is complex. Though the lack of dental markers of stress might generally indicate that the individuals interred at Black Cat Cave experienced little to no stress in terms of nutritional deficiency and morbidity in early childhood, the presence or absence of linear enamel hypoplasia does not automatically yield a black-and-white conclusion of “healthy” or “unhealthy”.⁹

The fact that Black Cat Cave was only used seasonally highlights that the population was not stationary, and that statistics derived from osteological studies will not be direct estimates of disease prevalence.^{1,9}

Conclusions

This research, though limited in both time and resources, is a valuable addition to the existing body of knowledge concerning prehistoric health in the Archaic period, a time for which there is comparatively little bioarchaeological data. Though the sample size is small, this data is consistent with that of previous studies of Archaic populations in the American Southeast, and further study of skeletal stress markers in this population will contribute greatly to our body of knowledge concerning the Archaic southeast.

Future Directions

In part due to the project’s disruption, the future directions for this research are clear—it is necessary to continue evaluating the remains from Black Cat Cave for porotic hyperostosis and cribra orbitalia in order to achieve the project’s goal of assessing the overall health/wellness of the population. Additionally, expanding the methodology for the evaluation of linear enamel hypoplasia to include microscopic magnification at the 4x and 100x levels, and possibly further, could shed more light on the subtler manifestations of metabolic insult.

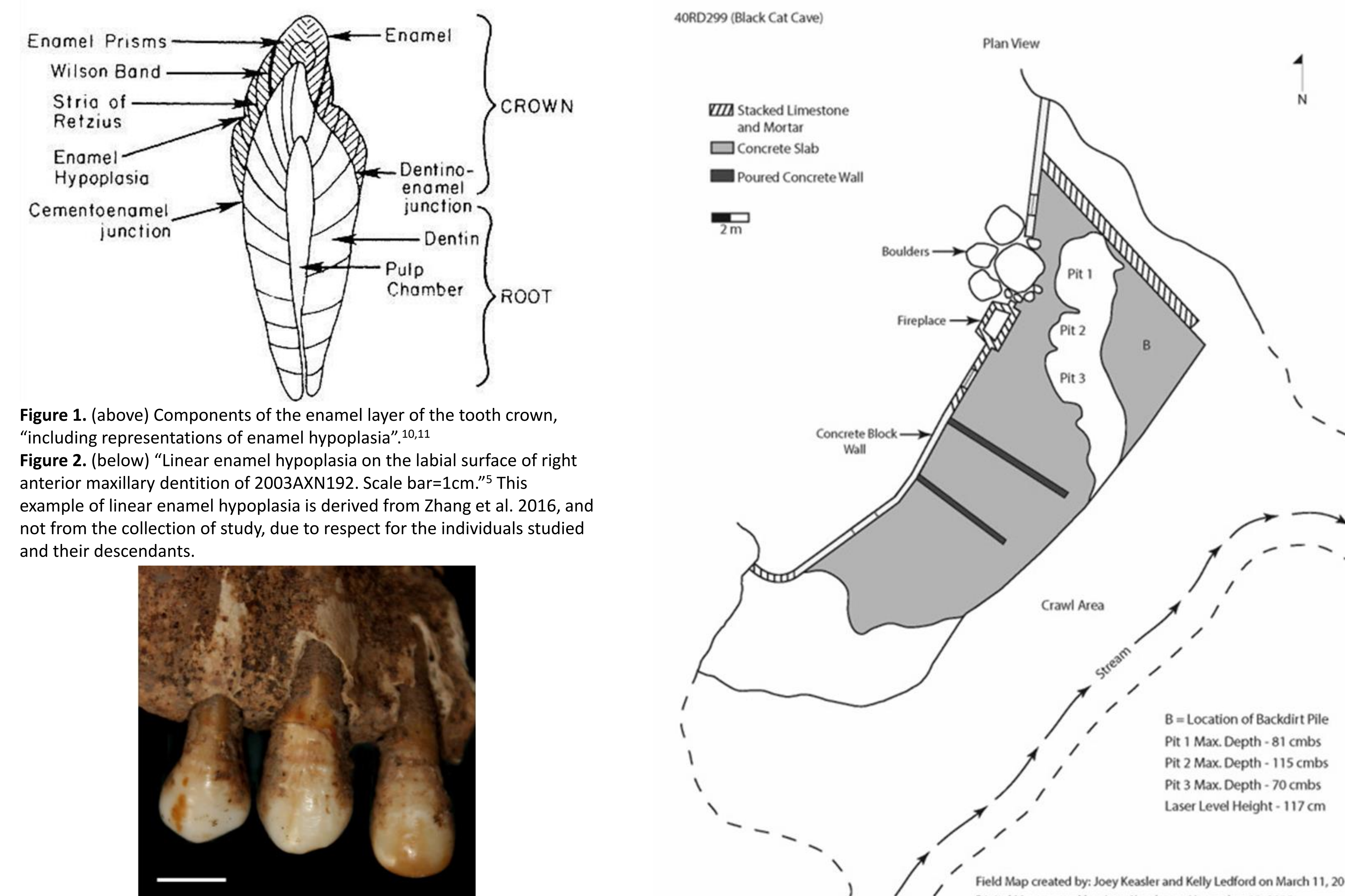


Figure 3. (right) A site map of 40RD299, citation on image.¹

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Acknowledgements

Special thanks to Dr. Shannon Chappell Hodge for her guidance and for access to the Black Cat Cave population.