Noname manuscript No.
(will be inserted by the editor)

Perdiz arrow points from Caddo burial contexts aid in defining discrete behavioral regions

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Received: date / Accepted: date

Abstract Recent research in the ancestral Caddo area has yielded evidence for distinct *behavioral regions*, across which material culture from Caddo burials—Hickory Engraved and Smithport Plain bottles as well as Gahagan bifaces—have been found to express significant morphological differences. This inquiry assesses whether Perdiz arrow points from Caddo burials, assumed to reflect design intent, may differ across the same geography, and extend the pattern of shape differences to a third category of Caddo material culture. Perdiz arrow points collected from the geographies of the northern and southern Caddo communities of practice defined in a recent social network analysis were employed to test the hypothesis that morphological attributes differ, and are predictable, between the two communities. Results indicate significant between-community differences in maximum length, width, stem length, and stem width, but not thickness. Using the same traditional metrics combined with the tools of machine learning, a predictive model—support vector machine—was designed to assess the degree to which community differences could be predicted, achieving a receiver operator curve score of 97 percent, and an accuracy score of 94 percent. The subsequent geometric morphometric analysis identified significant differences in Perdiz arrow point shape and size, coupled with significant

Components of the analytical workflow were developed and funded by a Preservation Technology and Training grant (P14AP00138) to RZS from the National Center for Preservation Technology and Training, as well as grants to RZS from the Caddo Nation of Oklahoma, National Forests and Grasslands in Texas (15-PA-11081300-033) and the United States Forest Service (20-PA-11081300-074).

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results for modularity and morphological integration. These findings bolster the argument for the establishment of at least two discrete *behavioral regions* in the ancestral Caddo area defined by discernible morphological differences across three categories of Caddo material culture.

Keywords American Southeast · Caddo · Texas · archaeoinformatics · computational archaeology · machine learning · museum studies · digital humanities · STEM ·

1 Introduction

Perdiz arrow points generally follow two distinct manufacturing trajectories; one that enlists flakes, and the other, blade flakes (Dockall, et al. 2020:I-120 - I-121; Johnson 1994:66-80; Ricklis 1994:213-214; Selden Jr, et al. 2021:2). Lithic tool stone in the Caddo area of northeast Texas is relatively sparse, consists primarily of chert, quartzite, and silicified wood characteristic of the local geological formations, which may contribute to local variation in both morphology and size (Banks 1990:Figure 2.1; Selden Jr, et al. 2021: Figure 2). It has been demonstrated elsewhere that Perdiz arrow points from northeast Texas vary significantly by time, raw material, and burial context (Selden Jr, et al. 2021 and supplementary materials). In outline, Perdiz arrow points possess a:

> [t]riangular blade with edges usually quite straight but sometimes slightly convex or concave. Shoulders sometimes at right angles to stem but usually well barbed. Stem contracted, often quite sharp at base, but may be somewhat rounded. Occasionally, specimen may be worked on one face only or mainly on one face ... [w]orkmanship generally good, sometimes exceedingly fine with minutely serrated blade edges (Suhm, et al. 1954:504).

A social network analysis of Historic Caddo (post-CE 1680) sites in northeast Texas demonstrated two spatially distinct communities of practice (Selden Jr. 2021a). The network analysis was limited to Historic Caddo types; however, Formative Early Caddo (CE 800 – 1200) Gahagan bifaces and Caddo bottle types have been found to express significantly different morphologies between the same two areas (Selden Jr. 2018a, 2018b, 2019, 2021b), extending the temporal range of the shape boundary. Gahagan bifaces from the ancestral Caddo area also differ significantly in shape, size, and form from those recovered at central Texas sites (Selden Jr., et al. 2020), suggestive of a second shape boundary between the Caddo region and central Texas.

2 Section title

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2.1 Subsection title

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Paragraph headings Use paragraph headings as needed.

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References