Typology Variance in Southeastern United States Projectile Points

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ABSTRACT

This study uses projectile point/knives (PPK's) of different typologies to construct a database of virtual projectile points, manual measurements, and other details concerning the point to help classify unknown points with similar features. This database will be the first of its kind to feature complete 3D scans of PPK's for users to manipulate. A database with 3D scans of projectile points has a global significance as it gives broad access to virtual renderings where users can make virtual measurements and interact with the projectile points. Current databases of similar types are feature much broader classifications and use 2D images as representations. This study used Flex Scan 3D scanning software and a rotary table to scan the artifacts held at the Florida Bureau of Archaeological Research. All of the PPK's were found and are associated with the Southeastern United States. Several scans were taken of each projectile point from different angles to ensure the entire surface was scanned accurately. Additionally the scans were combined and finalized in a readable format. A unique system was devised for manually measuring PPK's of different typologies (both Clovis and stemmed) and each point was measured accordingly using similar landmarks. These landmarks will be used in a future study of changing morphology among Southeastern PPK typology. Previous studies have used the Flexscan 3D scanning software to aid in archaeological preservation, while others have used the same scanning software to scan macerated bones to recreate animal skeletal structures.

INTRODUCTION

This project was part of a Directed Individual Study (DIS) on gaining proficiency in using the FlexScan3D scanner and software. It focused on a category of archaeological artifacts called projectile point/knives or PPK's as a scannable material for exploring 3D digitization in an archaeological context. Following the initial scanning trials and once an efficient protocol for scanning such objects is established, the researchers will work in conjunction with the Florida Division of Historical Resources to publish a digital reference collection on Southeastern United States PPK's. A reference collection on such points will be useful in classifying and documenting different projectile point typologies in a globally accessible web platform. Current databases and reference collections, though large, make no emphasis on surface morphology and/or detailed typology of points. This reference collection will feature this as well as premier integrated 3D digitized scans for users to manipulate.

BACKGROUND

Only recently have archaeological artifacts been made broadly and freely available to the public through the use of internet databases. More recent still, is the 3D digitization of those artifacts. This is mainly due to monetary and time restrictions, aesthetic preferences, and digital format hurdles on the part of local and state archaeological agencies. However, the benefits of 3D digitization to public education and outreach are innumerable. A database or digital reference collection with integrated 3D models would allow users to manipulate, toggle, print and create a replica artifact, and even experience them through virtual reality instead of merely viewing a stationary 2D image as in current databases. A 3D model would also give users a greater opportunity to understand in depth the differing typologies and classifications so essential to the field of archaeology. Several factors have contributed to the recent push in 3D digitization in archaeology, greatest perhaps being increased globalized research which necessitates easier ways to share information across great distances (Manferdini et al 2008). A researcher no longer has to travel to far away collections, their artifact of study could potentially be only a download away.

MATERIALS

The projectile points/knives (PPK's) included in this study were obtained on loan from the Florida Bureau of Archaeological Research. Each PPK was chosen to represent the projectile point distribution across the Southeastern United States (Table 1). A subsequent study will include a larger population size.

Table 1: Artifact Specifications

PPK Typology	Time Period	Location
Newnan	Middle - Late Archaic, 5,400 - 3,000 BP	N. FL, SE GA, SE AL
Hernando	Early to Middle Woodland, 2,400 - 1,600 BP	FL, S GA, S AL
Bolen Beveled	Early Archaic, 9,500 - 8,500 B.P.	N FL, GA, SE AL, S SC
Bolen Beveled	Early Archaic, 9,500 - 8,500 B.P.	N FL, GA, SE AL, S SC
Bolen Beveled	Early Archaic, 9,500 - 8,500 B.P.	N FL, GA, SE AL, S SC
Unknown #1	N/A	N/A
Unknown #2	N/A	N/A
Santa Fe	Late Archaic to Early Woodland, 3,500 - 2,500	FL, S GA, S AL
Citrus	Early to Middle Woodland 2,400 - 1,600 BP	FL, S GA, S AL
Jackson	Late Woodland to Mississipian 2, 5000- 2,000	N FL, S GA, C FL
Pinellas	Late Mississippi to Historic 700 - 400 BP	N FL, S GA, S AL
Arredondo	Middle - Late Archaic, 7, 000-5,000 BP	SC. FL, S. GA, SE. AL

METHODS

Each artifact was scanned using the following method (Diagram 1). SCAN refers to the 3 different scan methods (Live Scan, Easy Scan, Rotary Table Scan) that were implemented by the HDI 109 Laser Scanner by 3D LMI Technologies and Flexscan3D software (Figure 1). Once the scans are displayed on the computer, TRIM the unnecessary parts and ALIGN the current scan to the rest of the digitized artifact. Repeating this process until most of the projectile point is complete. Then COMBINE the multiple scans into one final scan. Lastly, FINALIZE to fill any holes in the completed scan (Figure 2). Save in your desired format.

SCAN → TRIM → ALIGN → COMBINE → FINALIZE

Diagram 1: Methodology

In addition to digital measurements, manual measurements were made on each PPK. OL refers to Overall Length of the artifact from point tip to the median point of the base. LB refers to the base linear length which is the distance from the base landmark (BL) to base landmark (BL). CND is the distance from each corner created by point notches. NL is the average distance of the left and right notch length from point corner to the base. TB is the average right and left edge distance measurements. MT refers to the maximum thickness taken perpendicular to measurement OL. BB is the base boundary length, which in stemmed points only refers to the concavity. NL and CND are only specific to stemmed points. (Diagram 2 and 3). This measuring technique is the abridged version of Buchanan et al. 2012.
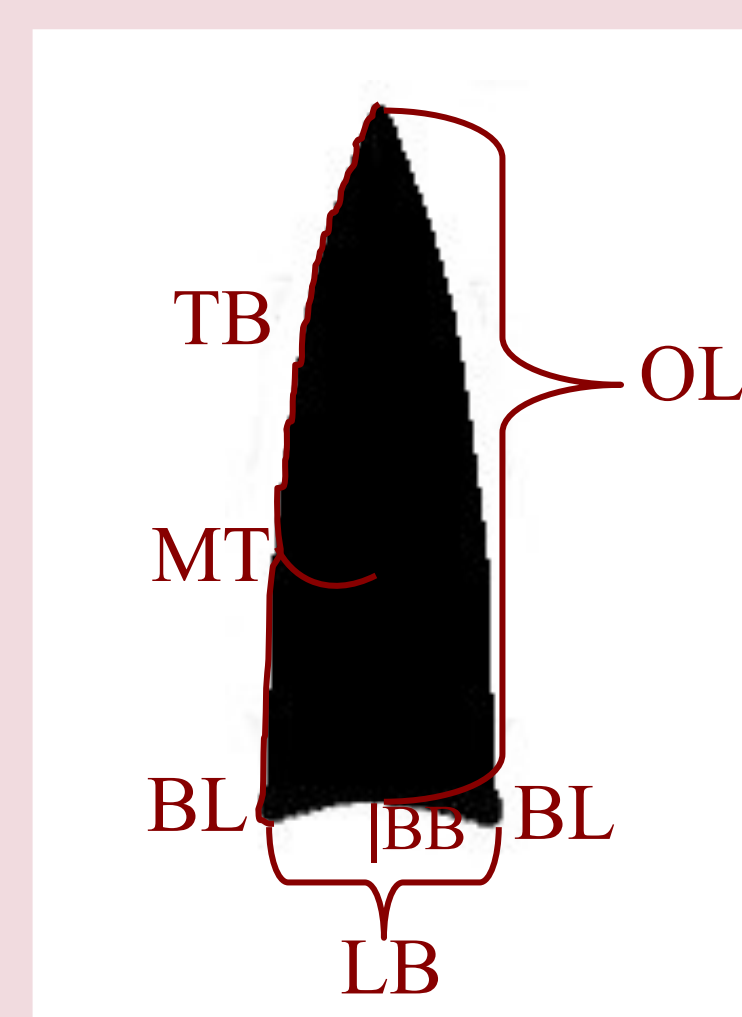

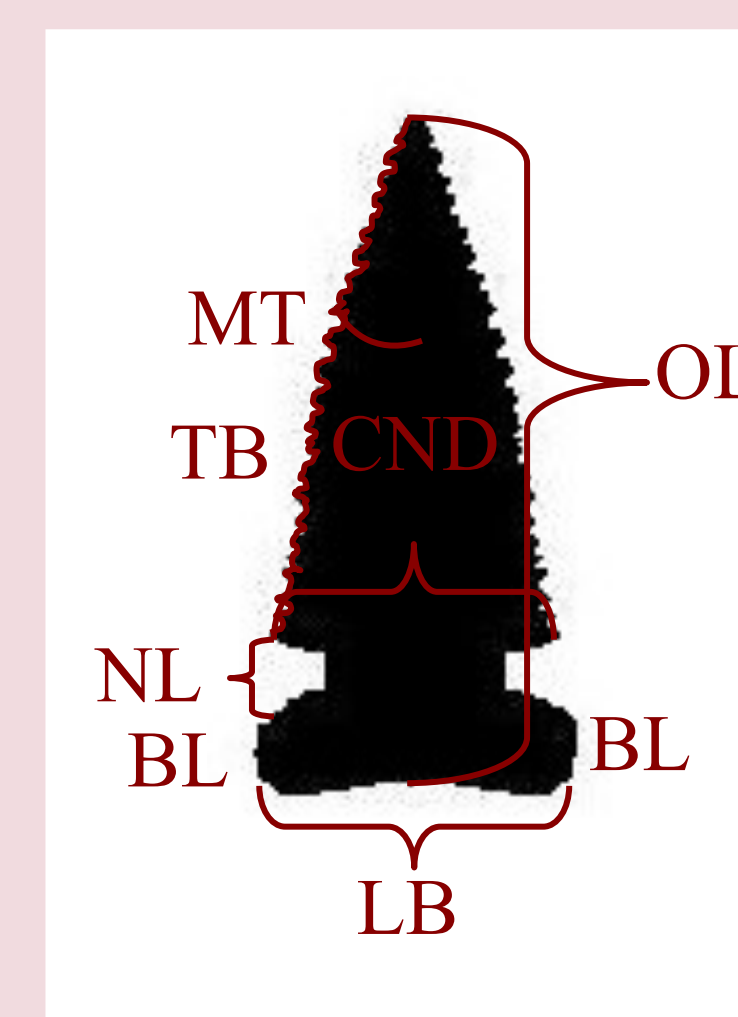**Diagram 2:** Clovis Point typology manual measurements

Diagram 3: Stemmed Point typology manual measurements

Figure 1: A Citrus type projectile point/knife with scale

Figure 2: Finalized projectile point/knife on the Flexscan 3D software

FUTURE STUDIES

This digital reference collection will be expanded to include more variety in typology and location. Since an expanded version of the collection would include more variety, it would increase the accuracy of predictions for determining the typology of unknown projectile points/knives (PPKs). A larger collection, in general, implies more virtual scans to manipulate which gives a better visual to support the manual measurements in comparison to pictures. Another comparison can be made for future studies with molds made from PPKs and 3D printed PPKs made from the virtual scans taken in this collection. Not only would it change the process in which PPKs are obtained on loan from the Florida Bureau of Archaeological Research but it would also influence the ways of accessing artifacts and human remains that may be fragile or too valuable to be transported, pending the study regarding the difference in accuracy of PPK molds and 3D printed PPKs.

Additionally, the landmarks created by the new method of manual measurements will be used in a future study of comparative changing morphology among Southeastern PPK typology.

ACKNOWLEDGEMENTS

REFERENCES

Buchanan, Briggs, Michael J. O'brien, J. David Kilby, Bruce B. Huckell, and Mark Collard. "An assessment of the Impact of Hafting on Paleoindian Point Variability." PLoS ONE 7.5 (2012)

Manferdini, Anna Maria, Fabio Remondino, Simone Baldissini, Marco Gaiani, Benedetto Benedetti "3D modeling and semantic classification of archaeological finds for management and visualization in 3D archaeological databases." Proceedings of 14th International Conference on Virtual Systems and MultiMedia. VSMM (2008)