H4 Precision of Coordinate Landmark Data Acquired From the Os Coxa

Joan A. Bytheway, PhD, Sam Houston State University, Chemistry & Forensic Science Building, 1003 Bowers Boulevard, Box 2525, Huntsville, TX 77340; and Ann H. Ross, PhD*, North Carolina State University, Sociology and Anthropology, Campus Box 8107, Raleigh, NC 27695-8107*

The goal of this presentation is to show that traditional and novel landmarks located on the human adult os coxa are repeatable and that researchers with at least moderate experience in landmark identification can locate varying types of landmarks on the human adult os coxa with minimal observer error.

This presentation will impact the forensic anthropological community by revealing new landmarks (as well as the use of traditional ones) located on the human adult os coxa that are repeatable and can be located with minimal observer error. These 36 landmarks provide a clear representation of the adult os coxa shape and some landmarks are located in regions that previously have not been metrically considered for sex determination. These landmarks can be used with a high percentage of accuracy in the assessment of sex.

In a recent sexing study using three-dimensional landmark coordinate data collected from 200 human adult os coxae, Bytheway and Ross (in print JOFS July 2010) found that sex and size have a significant effect on shape for both European Americans and African Americans. They achieved a sexing accuracy of 98% for both males and females of European Americans and 98% for African American females and 100% for African American males.

In this study, a total of 36 landmarks were chosen that would best capture the complete shape variation of the os coxa. Thirteen of the 36 landmarks are newly described landmarks identified by the first author. Landmarks were chosen because: (1) they are considered useful and significant in the literature; (2) they are repeatable; (3) they represent the object being studied; (4) they represent regions that are considered reliable for sexing the pelvis; and, (5) they represent regions that have not been metrically considered for sex determination but are addressed in this research. The landmarks fell into the general categories of *Traditional* or *Type 2*, *Constructed*, and *Extremal* or *Type 3* landmarks according to Lele and Richtsmeier (2001) and Bookstein's (1991)

landmark classifications. *Traditional* and *Extremal* landmarks are single points identified by biological description whereas *Constructed* landmarks are points identified once maximum values are established.

The purpose of the present study is to test the *precision* of consistently locating the 36 landmarks on a single form between the repeated measures of the same individual used in the morphometric sexing study. Nineteen individuals were randomly selected and each individual was digitized three times with a wait period of at least 30 minutes between digitizing sessions. The os coxa were "fixed" or not moved between digitizing sessions. A [Microscribe® 3D digitizer] was used to register the x, y, and z coordinates. Each os coxa was clamped into a vertically oriented vise and the 36 landmarks were digitized. Prior to digitizing the *Constructed* landmarks, each was measured with a sliding caliper to obtain maximum measurements. Once maximum value was obtained both points were marked with a pencil. Because the object was not moved between digitizing sessions, it is not necessary to bring each digitized object into the same coordinate system and the estimation of error along each axis can be calculated (Corner et al. 1992). Error was evaluated by calculating the standard deviation of each coordinate for the 36 landmarks across digitizing sessions and individuals. The maximum standard deviation, which is a measure of measurement error, for the X axis is 0.26mm with a mean of 0.180mm, 0.48mm for the Y axis with a mean of 0.240mm and 0.40mm for the Z axis with a mean of 0.260mm. These results show that for the 36 landmarks no one axis or direction is prone to error confirming consistency in locating the landmarks. Both authors were experienced in locating the landmarks, however, a less experienced observer would be expected to have less precision. **Precision, Coordinate Landmarks, Os Coxa**

 ** Presenting Author*