W14   Classifying Unknown Human Mandibles Using the Statistical Procedures and Worldwide Databases Available in (hu)MANid

Gregory E. Berg, PhD*, DPAA Identification Laboratory, Joint Base Pearl Harbor-Hickam, HI 96853-5530; Michael W. Kenyhercz, PhD*, Department of Defense POW/MIA Accounting Agency, Joint Base Pearl Harbor-Hickam, HI 96816

Learning Overview: After attending this presentation, attendees will better understand how to use (hu)MANid, a free, web-based Graphic User Interface (GUI) that allows the user to classify the sex and ancestry of an unknown mandible. Attendees will learn about the three primary statistical classification models available in GUI: linear discriminant analysis, mixture discriminant analysis, and random forest modeling. In-depth discussions detailing how to take appropriate measurements and score the morphology will be presented, culminating in hands-on practice using provided specimens and follow-on classification using the program.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by improving the understanding of how metric and morphological data from the human mandible can be used for determining sex and ancestry for unknown specimens via the free, easy-to-use GUI, (hu)MANid.

This workshop is designed to improve the ability of the forensic anthropologist to conduct sex and ancestry assessments using the human mandible via a relatively newly released GUI, (hu)MANid. As is well known, most of the prominent categories of the biological profile (sex, age, and ancestry) can be addressed from the mandible, yet it has received little attention over the years. Indeed, many computer programs have focused on the cranium for sex and ancestry assessment, but none have effectively addressed the potential of the mandible for making these determinations. Further, few, if any, programs incorporate both metric and morphoscopic data into the same model. (hu)MANid fills this gap in the forensic anthropologist's tool kit.

(hu)MANid is an R-based GUI that allows the user to quickly and easily process mandibular metric and morphoscopic data. The GUI provides the user with the ability to classify a mandible into one of 26 different geographic or temporal reference populations, or into one of several composite global groups. Access to (hu)MANid is easy through the internet and is available freely at www.anthropologyapps.com. It is not necessary to have R installed on the host computer to use this program.

Prior research has demonstrated that the mandible has a high accuracy rate for sex estimation and depending on the group(s) and statistical approach used, very high classification rates for ancestry estimation. Tests using (hu)MANid have shown the mandible to achieve sex and ancestry estimations on par with many currently available methods. Using random forest modeling, newly released in (hu)MANid, mandibles often classify to their respective groups with greater than an 85% accuracy rate (depending on the number of variables available for analysis and groups selected). Finally, the intra- and inter-observer error rates are very low for metric measurements and morphological scores of the mandible, indicating a high reliability between practitioners across cases.

As with any new tool, it has been found that there is a learning curve associated with it—partly from the additional statistical capabilities that this program has over the more standard and familiar forensic applications, as well as from some common misunderstandings of how to measure and score mandibles. With these issues in mind, this workshop will cover the following areas: how to appropriately measure and score a mandible; how to use the (hu)MANid (e.g., everything from how to enter a case to how to print out the results); a discussion on discriminant analysis (both linear and mixture) do's and don'ts, introducing the new capability of random forest modeling within the GUI; and suggestions on case workflow to effective results. The mistakes on measuring and scoring mandibles, result interpretations, statistical considerations, and the use of non-standard data collection possibilities will be highlighted.

The workshop is comprised of lecture and hands-on training that will cover everything from data collection to analysis and reporting of results by the attendees. This will provide the opportunity to (re)learn skill sets that may not be used often, practice those skills on a variety of mandibles, and practice using (hu)MANid for data analysis. Initial data collection and analysis will be conducted at the attendee level, then an interactive discussion with the entire audience will be held to generate additional questions and answers. Experienced practitioners will be available throughout the hands-on portion to answer questions, provide instant feedback, and discuss options.

Mandibles, Classification Programs, (hu)MANid