Differential Recovery Rates of Skeletonized Remains

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Introduction

- Forensic anthropologists have an important role in outdoor crime scene recovery and reconstruction, especially with skeletonized, badly decomposed, and taphonomically-altered remains
- In this study, recovery rates represent element MNI, as defined by Cannon (1991)
- **Goal**: Explore differences in element MNI rates between scenes recovered by Mercyhurst Forensic Scene Recovery Team (M-FSRT) and those performed by other agencies (coroner’s offices, law enforcement, etc.) that are not formally trained in human osteology, forensic archaeology, and forensic taphonomy
- **Hypothesis**: Assuming equal recovery rates, forensic archaeological recoveries are expected to display lower Element MNIs than other recoveries due to longer average PMI

Materials and Methods

- **Sample**: Inventory of cases from the Mercyhurst University Forensic Case Databank (1986 - present) that were completely skeletonized at the time of recovery (Table 1)
  - Cases recovered by the M-FSRT employed forensic archaeological principles and were conducted by individuals with extensive training in human osteology, forensic archaeology, and taphonomy (Fig. 2)
  - Cases recovered by other agencies were delivered to the Mercyhurst Forensic Anthropology Laboratory (M-FAL) for analyses and were not recovered by the M-FSRT (Fig. 3)
  - Cases were re-sampled for element MNI calculations (Table 2)

Analyses

- Individual skeletal elements were coded as present (1) or absent (0) for each case based on the inventories and homunculi in the database (Fig. 1)
- Polygon vector shapefiles were created from each of the homunculi converted to raster data stacked together in ArcGIS® program for analysis
- Recovery rates based on element MNI were compared
  - M-FSRT (n=24) vs. other agencies (n=19)
  - Only included surface scatters where equal skeletal representation could be assumed
  - Element MNI calculated by counting total elements recovered out of all elements available (assuming 100% percent of remains are at the scene)

Results

- **Higher average PMI for M-FSRT recoveries, as predicted in null hypothesis (Table 3)**
  - Higher than expected element MNIs in archaeological recoveries were noted (Table 4)
- Average PMI for M-FSRT recoveries was greater than other agency recoveries
  - M-FSRT avg. PMI = 45.7 months
  - Other agency avg. PMI = 10.3 months
- Using “stacking” method in ArcGIS, M-FSRT recovered a high percentage of skeletal elements, other agencies recovered a low percentage of skeletal elements (Fig. 4)

Discussion and Conclusions

- Importance of incorporating forensic anthropologists into recovery phase of outdoor scenes
  - Despite often widely dispersed scenes (Fig. 5) and higher PMI overall higher element MNI
  - Forensic archaeological methods proved to exceed expectations of having lower element MNI due to greater PMI
  - Need to increase law enforcement and medicolegal awareness and training opportunities for in osteology, forensic archaeology, and taphonomy

Acknowledgements

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- For a list of references or a copy of the poster, please contact: dmperez2@gmail.com or rhian_dunn@Comcast.net

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Table 1. Sample sizes for ArcGIS® analysis.

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<thead>
<tr>
<th>M-FSRT Recoveries</th>
<th>Other Agency Recoveries</th>
<th>Total</th>
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<td>24</td>
<td>19</td>
<td>43</td>
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Table 2. Sample sizes for element MNI calculations.

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Figure 1. Example of a case homunculus indicating inventory, as well as, trauma and taphonomy locations.

Figure 2. Example of a case with a PMI of 15 years recovered using forensic archaeology; overview of scene with approximate location of remains (box (A)), hands and knees denuding (B); scene following denuding (C); geo-referenced plan view map of scene (D); overall view of remains after processing and cleaning in the laboratory (E).

Figure 3. Cases recovered by an agency other than the M-FSRT, FSRT photos of skeletal inventory (A); “box of bones” delivered to M-FAL by an outside agency for skeletal analysis (E). In example A, M-FSRT went back to scene to recover remainder of the lower limbs.

Figure 4. Recovery rates based on ArcGIS® "stacking" of case homunculi which accounts for fragmentary remains. Left: Cases recovered by the M-FSRT are nearly complete. The skeletal elements most valuable for estimation of biological profile parameters have high recovery rates. Right: cases recovered by non-forensic anthropological agencies were frequently incomplete, especially the crania, ribs, pubis, and some bones of the lower limb. Note: sample size is different for each image; therefore, the two cannot be directly compared and are analyzed independently.

Figure 5. ArcGIS® map of M-FSRT case showing the full extent of a surface scatter with widely dispersed elements.