Resolving Commingled Skeletal Remains

Table of Contents

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1 INTRODUCTION

This document describes procedures for resolving commingled skeletal remains to include sorting and estimating either the minimum or likely number of individuals present.

2 SCOPE

This document applies to Anthropology Examiners in the Trace Evidence Unit (TEU).

3 EQUIPMENT

- General laboratory supplies
- Personal protective equipment (lab coat, gloves, eye protection)

4 PROCEDURE

A. The Forensic Anthropological Examinations Procedure will be followed.
B. Resolving commingled remains may be necessary when more than one individual is represented by the remains/evidence. This may be determined, for example, through investigative information, duplication of skeletal elements, or differences in estimated biological features of skeletal elements.
C. Field recovery records (e.g., written documentation, photographs, maps) will be reviewed if available. Such records may provide evidence of direct association of skeletal elements.
D. As determined by the needs of the examination request, remains will be sorted/segregated, and the minimum or likely number of individuals estimated.
E. Elements that were articulated at the time of recovery will be maintained as a unit throughout the analytical process where practicable.

4.1 Sorting/Segregating Commingled Remains

4.1.1 *Inventory*

Skeletal remains will be inventoried. This inventory may be in narrative/written format or may be recorded on charts or forms.

4.1.2 *Reassembly*

Fragmented bones may be reassembled and affixed where appropriate and to the extent possible.

4.1.3 *Sorting*

Skeletal material will be sorted by element, side, size, estimated biological features, and other criteria where applicable.

4.1.4 *Association*

Skeletal material may be associated where possible using any or all of the following techniques:

- Visual pair-matching – the association of left and right elements based on similarities in morphology and size
- Articulation – the association of congruent elements based on closeness of fit at the joint or juncture with another bone
- Osteometric comparison – the association of elements based on statistical evaluation of size and shape relationships
- Taphonomy – the association of elements based on similarities in preservation (e.g.., color, condition)

4.2 Estimating the Number of Individuals Represented

The number of individuals represented may be a calculation of the Minimum Number of Individuals (MNI), or the Most Likely Number of Individuals (MLNI).

4.2.1 *Minimum Number of Individuals (MNI)*

A. The MNI is calculated by counting the most repeated element (or portion thereof), after sorting by element and side.
B. When calculating MNI from fragmentary remains, every fragment used to calculate the MNI must share a specific landmark.
C. Additional individuals may be added to the MNI estimate based on differences in estimated biological features.

4.2.2 *Most Likely Number of Individuals (MLNI)*

A. The MLNI is used to estimate the actual number of individuals, as opposed to the minimum number.
B. MLNI may be calculated in cases where skeletal preservation is good and elements can be accurately pair-matched.
C. MLNI is calculated based on the number of paired and unpaired bones. The formula for calculation of the MLNI is:

$$MLNI = [(L+1)(R+1)/(P+1)] - 1$$

where R= right, L= left, and P= pairs

5 CALCULATIONS

Calculations carried out as part of commingling analysis will be performed according to appropriate reference data.

6   LIMITATIONS

The conclusions that can be reached from anthropological examinations for resolving commingling are dependent on the condition and completeness of the remains. Results based on fragmentary or poorly preserved material may be inconclusive.

Extremely fragmentary or poorly preserved remains may not be amenable to any meaningful quantification technique.

7   SAFETY

- While working with physical evidence, laboratory personnel will wear at least the minimum appropriate protective attire (e.g., laboratory coat, eye protection, protective gloves).
- Universal precautions will be followed.
- Exposure to biological and radiological hazards may be associated with the examination techniques performed. Safety procedures related to specific instruments or equipment will be followed. Refer to the FBI Laboratory Safety Manual for guidance.

8   REFERENCES

ANTHRO-300: Forensic Anthropological Examinations (current version)

FBI Laboratory Safety Manual (current version)

9 Revision History

Revision	Issued	Changes
02	02/10/2020	Changed 'forensic anthropologist' to 'Anthropology Examiner' in Scope and 'examiner' throughout. Removed 'Sample Selection' from Section 4 title. Updated wording in Section 5.1.2
03	01/28/2022	Formatting and language changes to conform to new template.