

Commentary on: Identification of Missing Norwegian World War II Soldiers, in Karelia Russia. *J Forensic Sci* 2015;60(4):1104–10.

Sir,

In their paper, Morild et al. describe a complex endeavor attempting to identify the remains of multiple WWII Norwegian soldiers associated with the Battle of Karelia (1). Primarily relying on DNA, the authors were able to identify 14 individuals, which had been recovered from multiple disturbed contexts throughout an undefined, but very large, forested area.

Based on their work, Morild et al. conclude that their “examinations could be used as a model for further DNA identification of human remains exhumed from WWII mass graves” (1:6). While we agree that the DNA methods used here were well done, we argue that while Morild et al. were able to identify 14 individuals, their processes for locating, recovering, and analyzing these remains should not be considered best practice or used as a model for attempting to resolve such complex cases. That is not to say that the efforts of Morild et al. are unacceptable; however, based on the context described in their article, we would like to offer insight into how similar complex cases could be better investigated and resolved.

Our experience comes from working at the Defense POW/MIA Accounting Agency (DPAA), a United States organization tasked with accounting for U.S. servicemembers missing from past military conflicts (primarily WWII, the Korean War, and the Vietnam War). While the DPAA is a new Department of Defense (DoD) agency (established January 2015), it was formed by the merging of several preexisting DoD organizations, including the Joint POW/MIA Accounting Command (JPAC). The DPAA encompasses systematic investigation and analysis practices for resolving military unknowns utilized since the 1990s as part of the Joint Task Force—Full Accounting (JTFFA) and Central Identification Lab—Hawaii (CILHI) (2). Staff of the DPAA includes forensic anthropologists, archaeologists (terrestrial and underwater), forensic odontologists, historians, geographers (GIS specialists), life support investigators, DNA technicians, and evidence coordinators. The scientific staff (primarily forensic anthropologists, archaeologists, and historians) of the DPAA routinely deploy to austere locations throughout East Asia, Oceania, and Europe, with the Agency sending approximately 50 teams overseas per year, investigating and recovering missing U.S. servicemembers. Excavations are overseen by a Recovery Leader (Forensic Anthropologist or Archaeologist) and supported by both U.S. military and local personnel. These recovery missions are preceded by investigations, which locate recovery sites with the use of historical records, witness/informant interviews, and site surveys, to determine site viability. Recovery missions then systematically excavate the viable sites found to contain potential evidentiary materials, including remains and personal effects.

A Systematic Approach to the Identification of Missing from Historic Contexts

In their endeavor to identify Norwegian remains associated with the Battle of Karelia, Morild et al. faced a very complicated case. Their description of the challenges involved with their work sheds light on a number of important issues, some of which may have been overlooked or misinterpreted by the original authors.

Geographically Large Project Area

The portion of the Battle of Karelia with which this article was concerned, took place on and between the two hills of Kaprolat and Hasselman (1). As the authors indicate, this may suggest a relatively constrained space; however, these hills account for several square miles of terrain.

Disturbance of Depositional Context

Per the authors, extensive postdeposition disturbance occurred between deposition and recovery. Artifact hunters removed personal effects, such as rings, dog tags, and helmets, and disturbed remains to the extent that some skeletal elements were moved to Northwest Russia (1:1). Moreover, evidence of animal scavenging on the remains likely led to complete loss of some skeletal elements, extensive scatter of remains, and commingling between individuals (3,4).

Open Loss Population

While Morild et al. seem to assume they are only looking for the remains of 100 Norwegian individuals (and that any remains found in their project area must belong to one of these 100 individuals), the Battle of Karelia involved forces from both Norway and the Soviet Union, with massive losses on both sides occurring between 25 and 26 July 1944. Trigg (5) argues that during the fighting, just one of the Soviet Union’s battalions suffered losses reducing it from 400 to 36 men during the fighting on Kaprolat Hill alone. Further, the time depth of the landscape since the incident to recovery, approximately 70 years, has increased the potential, not only for incident-related individuals to be removed (1:1), but also for nonincident-related individuals to be added. The lack of incident-related materials associated with many of the recovered individuals (e.g., military issued equipment, identification media, and clothing) either due to looting or diagenesis only further complicates this issue.

Commingled Individuals

Dealing with the sorting and identification of commingled individuals is a very complex endeavor. While the authors state “several cases basically consisted of one skeleton with only one or two duplicate elements (1:2)” from our experience, it is not uncommon to have extensive commingling even when only a single skeletal element appears to be duplicated. In such cases, the use of taphonomy as an indicator of association between skeletal elements is not always helpful, as all the remains are recovered together from a similar depositional context. Additionally, military populations such as this are often composed of individuals with very similar biological profiles, males of similar age with minor variations in stature, thereby making the sorting commingled individuals based on biological parameters difficult (6).

Socio-Political Issues

As the authors state, the Norwegian soldiers fighting in this battle were considered traitors to Norway, as they “had voluntarily joined the German forces, in the Norwegian Ski Battalion (1:1).” Because of this, identifying their remains was a difficult subject to approach with many Norwegian families, and this

complicated the important step of collecting family reference samples for DNA comparison; without adequate samples for comparison, identification of some individuals will just not be possible.

A Systematic Approach to the Identification of Missing from Historic Contexts?

While we commend the efforts of the authors, based on the explanations of their work, it does not appear that they appropriately addressed the above issues. We must, therefore, argue that much of the investigation and examination protocol from this project should not “be used as a model for further DNA identification of human remains exhumed from WWII (1:6).” Rather, a much more rigorous approach must be taken considering the disciplines of history, forensic anthropology, archaeology, and molecular biology (DNA experts, primarily to resolve comingling and perform identifications). From the thousands of cases investigated by the DPAA (and previous iterations thereof), such an incident requires a systematic, multidisciplinary approach with the expertise of historians, forensic anthropologists, and archaeologists, in addition to other experts such as geographers and DNA analysts. Although we recognize that the resources available to the DPAA are not available everywhere, we cannot stress enough the importance of a trained historian conducting thorough historical research prior to search/recovery, the importance of an experienced forensic anthropologist and/or archaeologist as part of the on-site recovery team, and an experienced forensic anthropologist conducting laboratory analyses. In the case study provided by Morlid et al., these subject-matter experts would have contributed a more thorough historical context, systematic search and recovery, and detailed biological information, all of which are important for identification of unknown skeletonized individuals in such a complex case.

The Added Value of Subject-Matter Expertise

Historians

Historians are trained not only to read and interpret documents, but also to evaluate their context and authenticity. By employing professionally trained historians, significant methodological improvements can be made, such as detecting areas most likely to produce evidence based on historic accounts of a battle, making informed associations between recorded loss incidents and recorded casualties, and identifying variability in postbattle burial/mortuary procedures.

At the DPAA, historians help establish an important base of information, from which other subject-matter experts can work, by evaluating historic documents as well as providing interpretations of historical field and laboratory findings. One of their most important contributions is providing a fuller understanding of original depositional contexts, which can give information about the battlefield and overall loss incident, postbattle burial/mortuary practices (i.e., the degree to which to expect comingling), material evidence, including clothing and artifacts, types of weapons used and the potential for associated skeletal trauma, and casualties historically associated with the loss incident, all of which can provide guidelines for collecting family DNA reference samples. Many of the analytical methods of Morlid et al. (1) did not rely on historical contributions of this nature and were based on their own interpretation of the historical context,

which lacked expert knowledge of the battle and was largely based on inferences from the historical narrative. Without the use of a professional historian, unsubstantiated narratives can lead to inaccurate interpretations, low numbers of identifications, and any number of errors or omissions throughout the recovery and identification process. The accuracy of historical inferences is imperative to the success of such efforts, and the low rate of identification seen in this case study may be the best indicator of the need for improved methods and increased use of subject-matter experts, such as historians.

Archaeologists

Archaeologists are trained to systematically evaluate, document, and investigate landscapes and subsurface matrix; forensic archaeologists are specifically trained to do so in the context of search and recovery for human remains and maintaining documentation related to chain of custody and evidence curation. At the DPAA, most sites excavated are larger than 400 square meters and it is not uncommon for an investigation team to spend 1–2 weeks surveying large areas (sometimes as large as the area described by the authors) attempting to define site boundaries and concentrations of aircraft wreckage or other evidentiary materials using pedestrian surveys, metal detector surveys, and test pits. In cases with multiple ground losses, such surveying is even more important as it can directly indicate areas of interest (e.g., depressed surface features, and graves containing metal artifacts). When conducting such surveys, the use of a properly trained archaeologist is beneficial as it allows for systematic pedestrian/metal detector surveys as well as survey mapping (commonly using GPS). Such methodology, if employed correctly in the Karelia region, would have been useful for defining the extent of the incident area, tracking areas previously searched, documenting location of materials recovered (*in situ* and out of context from looting), and identifying patterns of material scatter and density. Detailed survey maps (created by archaeologists or geographers) can also be used to generate predictive models of where additional remains may be more or less likely to be found. This information, combined with the historical context and an understanding of taphonomic processes, namely animal scavenging and grave looting, would have led to a more thorough understanding of the depositional and postdepositional processes that affected the site and the individuals recovered, including assisting with the determination of the minimum number of individuals (MNI).

Forensic Anthropologists

Forensic anthropologists are trained experts in human skeletal morphology and biology, and the factors that result in their modification or destruction (trauma and taphonomy). Additionally in the U.S.A., forensic anthropologists are typically cross-trained in archaeology, filling both field investigation and recovery, and laboratory analysis roles. The utilization of forensic anthropologists allows for the systematic sorting of comingled individuals, thorough examination of taphonomic processes affecting bone preservation, detailed reconstruction of the biological parameters of unknown individuals, the analysis of skeletal trauma, and nomination of remains for DNA (both for sorting of comingled remains, as well as identification purposes).

In the context of the Karelia remains, trained forensic anthropologists would have been thorough and conservative in

dealing with the commingling and taphonomic modification of the remains. For example, many of the element associations, including pair-matching, would be challenging if not impossible, as the color of remains (1:2) is not a reliable indicator of a match, especially when remains share a similar depositional context and taphonomic history. Additionally, forensic anthropologists would have provided a thorough biological profile from which available antemortem information could be compared to postmortem parameters. A trained forensic anthropologist would have recognized that the Karelia remains are from an open population and would have provided an MNI based on the materials recovered, rather than assuming that a historically reported number of potential dead from Norway alone is the guiding number of available individuals to be recovered. Furthermore, sex and age would have been estimated without the biased assumption that all remains were those of young adult/late adolescent Norwegian males unless evidence indicated otherwise. This would have identified the presence of females or other outlying individuals rather than force fitting the remains into preconceived parameters (see Nakhaeizadeh et al. [7] for a larger discussion on bias in forensic sciences). Stature estimates would have been conservative, recognizing that preservation and taphonomic modification to elements affect measurements and that the use of more than one element in stature estimation is suspect with the level of commingling in this assemblage.

Finally, a trained forensic anthropologist would have also provided a more detailed assessment of the trauma present on the remains. While patterns of trauma are unlikely to aid in the identification of unknown individuals, in those rare circumstances where descriptions of ante- or perimortem skeletal trauma may be available, such trauma patterns can be used to assist with the identification of unknown remains (8).

Forensic Odontologists

Forensic odontologists are dentists that primarily compare known antemortem dental records with recovered human remains to aid in the identification of the individual. Their role in contexts such as those found in the Karelia missing is to chart the dentition of the unknown remains and to conduct dental comparisons when possible (either to historic dental charts or radiographs). While Morild et al. note that no antemortem dental records were available for the Norwegian soldiers from Karelia (1:4), forensic odontologists play a key role in identification efforts when such records are available and could still play a role here if dental work completed prior to military service was encountered or provided by families.

Conclusions

Morild et al. have provided a methodology regarding the DNA identification of missing war dead and recommend it as a model for future projects of similar complexity. We, however, suggest that a multidisciplinary team of subject-matter experts would have improved the scientific integrity and the final results of the project significantly, from the historical background, to the field and laboratory analyses. The proper recovery, analysis, and identification of human remains are a socially and scientifically complex mission and should, whenever feasible, be staffed with properly trained professional to achieve the most scientifically rigorous outcome possible.

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