

PLAIN LANGUAGE SUMMARY

## A Multi-Method Approach to Re-Associating Fragmented and Commingled Human Remains: Plain Language Thesis Summary<sup>1,2</sup>

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### ABSTRACT

This article is a plain language summary of a Master's thesis, completed in the Department of Archaeology and Anthropology at the University of Saskatchewan in 2020, that aimed to re-associate fragmented and commingled human remains from an Early Neolithic, about 7560–6660 years before present (HPD cal. BP; Weber et al., 2021; Bronk Ramsey et al. 2021), cemetery in Siberia, Russia. This thesis addressed the inability of existing osteological sorting methods to identify the remains of individuals from a collection that was largely broken and completely mixed. By developing a new multi-method approach, this project was able to identify the remains of seven people through the re-association process, and re-associate five of them. This was fairly close to the minimum number of nine individuals that were confirmed in this collection by counting non-repeating bones. This research has implications for the understanding of the culture-history in this area, the applicability of re-association methods to fragmented and commingled human remains, and efforts of reconciliation and repatriation.

*Keywords:* bioarchaeology, re-association, osteology, advancing method, Early Neolithic, Siberia

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It is not uncommon for ancient (and often unmarked) cemeteries to be discovered during the development of land or through land loss

due to climate change. Unfortunately, this usually results in the destruction of such cemeteries and the human remains within them.

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<sup>1</sup> This research was conducted in the Department of Archaeology and Anthropology at the University of Saskatchewan in 2018–2020 under the supervision of Dr. Angela Lieveise (University of Saskatchewan) and Dr. Hugh McKenzie (MacEwan University), with input from committee members Dr. Terence Clark (University of Saskatchewan) and Dr. Ernest Walker (University of Saskatchewan), as well as external examiner Dr. Leslie Herrington (University of Alberta). Further thanks to the Baikal Archaeology Project (directed by Dr. Andrzej Weber) for their support and including me in their project, especially to Vladimir I. Bazaliiskii (lead archaeologist for the MNS site). Their efforts throughout this process were invaluable and greatly appreciated. Ethics approval was obtained by the research ethics boards of both the University of Saskatchewan [BIO–1881], and the University of Alberta [00089535] as a part of the Baikal Archaeology Project. Financial support as provided by the Social Sciences and Humanities Research Council, The Norther Scientific Training Program (Polar Knowledge Canada), and the University of Saskatchewan departments of Archaeology and Anthropology, and History.

<sup>2</sup> The MA thesis summarized here can be found via the University of Saskatchewan Research Archive Harvest (<https://harvest.usask.ca/handle/10388/13041>). Part of this thesis has been previously published as a research article in *Journal of Archaeological Science: Reports* (Bourgeois et al., 2021).

This summary details my thesis that aimed to re-associate a collection of fragmented (broken) and commingled (mixed) human remains back into identifiable individuals (Bourgeois 2020). A multi-method approach was developed using the Early Neolithic Kitoi cemetery site of Moty-Novaia Shamanka (MNS) from the Lake Baikal region of Siberia, Russia, which dates to about 6800 years ago (Bazaliiski et al. 2016). MNS is located between two other large cemeteries of this time period, Lokomotiv and Shamanka II, but it is unique in being the only Early Neolithic Kitoi site to have been found on a tributary river instead of on the coast of Lake Baikal or along the Angara River (the major drainage river from Lake Baikal). Preliminary dates from MNS also placed this cemetery at the end of the Early Neolithic Period, which makes its human remains some of the last uncovered from a visible cemetery before the onset of the Middle Neolithic Period (Bazaliiski et al. 2016). This is important because during the Middle Neolithic Period, it appears as though people stopped burying the dead in formal or visible cemeteries marking a distinct change in burial practices in this region. Over 1000 years later, this practice was started up again (Weber et al. 2021; Weber and Bettinger 2010; Weber et al. 2016).

Unfortunately, in the 1990s MNS, originally located atop a hill, was bulldozed for flood management. This resulted in the commingling and fragmentation of the human remains. Thus far, there has been no analysis on the bones within the MNS collection other than an initial population size estimate of 19 by Dr. Denis Pezhemsky of Lomonosov State University in Moscow, Russia (Bazaliiski et al. 2016). As a part of the Baikal Archaeology Project, this thesis (Bourgeois 2020) addressed this gap in analysis by creating and applying a multi-method approach to re-associate the fragmented and commingled human remains found at MNS. Although many bioarchaeologists have been able to successfully re-associate commingled full human bones back into

individual skeletons, the high level of fragmentation at MNS necessitated a new approach to achieve the same success. Using aspects of other methods (see thesis for details), I created a four-stage approach suited to the MNS collection and the goals of this project. This approach and the following results are detailed in Bourgeois (2020) and Bourgeois and colleagues (2021).

The entire MNS collection included 1,245 human bone fragments whose sizes ranged greatly. For 71% of these fragments, I was able to identify which bone they were from and was able to refit just over 16%, much like puzzle pieces. From this collection, I partially reassociated the remains of five individuals and identified eight other groupings of fragments that were either paired or related bones from the same person. Together, these groupings represented at least seven people. This number, however, represented the amount of people identified by grouping of multiple bones. By counting non-repeating single bones, I found that at least nine people were present in the MNS collection. Within the groupings identified in this thesis there was one juvenile individual, who was approximately fourteen to eighteen years old when they died, while the rest were the remains of adults (over the age of twenty years at time of death). Within the MNS collection there were signs of osteoarthritis, chronic ear infection, and active lifestyle.

This thesis challenged the idea that fragmented and commingled human remains did not warrant the same level of analysis as complete remains and that they can typically only be looked at as separate pieces. The value of this research lies in the information that it was able to gain from the MNS collection, the potential contribution to the goals of the Baikal Archaeology Project, and the development of an approach that can be applied to a wide variety of contexts. To better study life-history, it is important to be able to tell which bones belong to which person. These values,

however, go beyond scientific ability and can contribute to efforts of reconciliation and community-based research.

Re-associating fragmented and commingled human remains into individuals is important in contexts where cemeteries (most frequently unmarked cemeteries) are destroyed during the economic development of land or environmental changes. The ability of this multi-method approach to re-associate the remains of people whose identities have been otherwise lost would, in many cases (such as in forensic and historical contexts), be extremely meaningful to families and descendant communities. This is especially true in countries like Canada where urban sprawl and resource extraction result in rapid land development. Recently, in cases where Indigenous heritage is involved, anthropological practice is often reliant on the relationship between anthropologists and the community under the umbrella of community-based research. In addition to calls of Indigenous communities, widespread stimuli for community-based research are the Truth and Reconciliation Commission of Canada's (TRC) Calls to Action (2015) and the United Nations Declaration of the Rights of Indigenous Peoples (UNDRIP) (United Nations 2007).

The goal of this thesis is relevant to the TRC Calls to Action and UNDRIP by providing a methodological basis that could contribute to matters regarding Indigenous ancestral remains from disturbed contexts. For example, the TRC Call to Action number 74 includes urging the federal government to "... respond to families' wishes for appropriate commemoration ceremonies and markers, and reburial in home communities where requested," in the case of the deceased children from residential schools (2015, 8). This is also stated more generally in Article 12 of UNDRIP as, "Indigenous peoples... have the right to the repatriation of their human remains," (2007, 12). Should a cemetery have eroded or been destroyed, resulting in the disturbance of the

burials, the ability to re-associate the remains of individuals would not only make reburial or repatriation processes easier but would also be extremely meaningful to the families and communities. To address goals that are more personal than scientific, new protocols must be developed for collaboration and study beyond the basic analysis of fragmented remains as separate pieces. This thesis aimed to contribute to advancing how bioarchaeologists consider fragmented and commingled human remains and develop a practical approach that can be applied in a wide variety of circumstances.

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