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Studies of Physical Parameters of Indigenous Artifacts: Collecting and Preserving the Relating Oral Stories

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Article abstract

This project, supported by the Department of Canadian Heritage, was conducted by scholars from the First Nations University of Canada, Royal Saskatchewan Museum, University of Regina, and University of Saskatchewan in collaboration with Sturgeon Lake and Pelican Narrows First Nations communities in Canada. The objectives of the project were (i) to develop a research ethics protocol for collecting, studying, and preserving Indigenous artifacts; (ii) to determine physical parameters of artifacts from communities and Royal Saskatchewan Museum collections; and (iii) to collect oral stories in communities. Within the project, we also managed consultations with Elders and Indigenous Knowledge Keepers, organized two workshops in the communities, and trained Indigenous students for working in the communities. The laboratory measurements were carried out at the Scanning Electron Microscope Laboratory of the University of Alberta, Saskatchewan Isotope Laboratory of the University of Saskatchewan, and André E. Lalonde Accelerator Mass Spectrometry Laboratory of the University of Ottawa. We analyzed the data obtained from the measurements of physical parameters of artifacts collected in these communities and selected from the Royal Saskatchewan Museum collections. The purpose of the statistical analysis was to determine the similarities of artifacts with respect to their chemical compositions.

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Abstract This project, supported by the Department of Canadian Heritage, was conducted by scholars from the First Nations University of Canada, Royal Saskatchewan Museum, University of Regina, and University of Saskatchewan in collaboration with Sturgeon Lake and Pelican Narrows First Nations communities in Canada. The objectives of the project were (i) to develop a research ethics protocol for collecting, studying, and preserving Indigenous artifacts; (ii) to determine physical parameters of artifacts from communities and Royal Saskatchewan Museum collections; and (iii) to collect oral stories in communities. Within the project, we also managed consultations with Elders and Indigenous Knowledge Keepers, organized two workshops in the communities, and trained Indigenous students for working in the communities. The laboratory measurements were carried out at the Scanning Electron Microscope Laboratory of the University of Alberta, Saskatchewan Isotope Laboratory of the University of Saskatchewan, and André E. Lalonde Accelerator Mass Spectrometry Laboratory of the University of Ottawa. We analyzed the data obtained from the measurements of physical parameters of artifacts collected in these communities and selected from the Royal Saskatchewan Museum collections. The purpose of the statistical analysis was to determine the similarities of artifacts with respect to their chemical compositions.

KeyWords Indigenous artifacts, archaeology, oral stories, statistical analysis, carbon dating

This paper provides brief information about a community-based project relating to Indigenous artifacts. Indigenous artifacts have been objects of interest to museums and private collectors (Henry, 2013). In recent decades, researchers determined that the aging of artifacts can help reconstruct Indigenous trade routes and exchange networks from hundreds of years ago (Gage, 2016; Livine, 2007). Schaepe et al. (2017) argue that community-based archaeology—meaning community-directed studies of ancestral places practiced by invitation—can improve individual and communal health and well-being. Archaeologists suggest that there is significant untapped potential for elucidating and verifying connections among people, places, objects, knowledge, ancestries, ecosystems, and worldviews. Such interconnections endow individuals and communities with identities, relationships, and orientations that are foundational for health and well-being. In particular, archaeology practiced as place-focused research can counteract cultural stress, a pernicious effect of colonialism that is pervasive among Indigenous peoples worldwide.

Modern laboratory technologies allow for precise, non-destructive physical and chemical analyses of artifacts (Ambrose, 1990; Katzenberg & Harrison, 1997; Nehlich, 2015). While this may be recognized within the non-Indigenous research community, some Indigenous Elders and Knowledge Keepers express ethical concerns. The purpose of this project was to study the Indigenous research ethics protocols recommended by First Nations community members for working with Indigenous artifacts to enhance processes for the engaged anthropological scholarship. Another goal of the project was to record and preserve samples of oral stories of collaborating First Nations relating to the artifacts.

From the beginning, we intended to co-create this knowledge with Indigenous communities. We initiated conversations with the communities of Pelican Narrows and Sturgeon Lake First Nations through primary contacts Elder Willie Ermine and Ida Swan. As a result of our initial engagement, Chief Greg Ermine (Sturgeon Lake) and Chief Peter A. Beatty (Pelican Narrows) expressed their support for our project. Subsequently, we developed the research proposal, which was accepted by the Department of Canadian Heritage.

Figure 1. Workshop in Pelican Narrows, Opawikoscikan School Library, October 13, 2018. (Photo by Arzu Sardarli)

Figure 2. Workshop in Sturgeon Lake, Sturgeon Lake First Nation Healing Lodge, October 22, 2018. (Photo: Arzu Sardarli)

Ethics Review and Research Protocol

According to the agreement between the First Nations University of Canada (FNUniv) and the University of Regina (U of R), our proposal was reviewed by the U of R Research Ethics Board and granted certification on July 17, 2018 (ethics REB#:2017-199).

After engaging with community members, community consultants, and a community research coordinator, we scheduled community workshops on October 13, 2018 (Pelican Narrows) and October 22, 2018 (Sturgeon Lake). Consultations were carried out within one-on-one and group meetings. The meetings were initiated by the principal investigator. Workshops were facilitated and organized by the community coordinator and community consultants. Elders, community members, community consultants, the principal investigator, the community coordinator, and the consultant for archaeology and anthropology participated in both workshops (Figures 1 and 2). Some research team members joined the workshops by teleconferencing. The principal

investigator informed Elders about the project, asked for their permission and guidance, and invited them to participate. Research team members provided more specific information about the goals of the project and answered the questions of community members. Elders spoke of their own views and some concerns regarding the community-based research in their communities, the process of Indigenous artifact collection, and artifact exhibition at museums. They emphasized the importance of building trust between the community and the research team. After the discussions, Pelican Narrows Elders confirmed their willingness to participate in the project.

Elders and Knowledge Keepers of Sturgeon Lake First Nation requested another meeting to make a final decision regarding their participation in the project. They invited research team members to participate in a Sweat Lodge ceremony at Sturgeon Lake on December 6, 2018. Participation of research team members in the Sweat Lodge ceremony would be considered the beginning of the trust-building process and part of the ethics protocol for working in the Sturgeon Lake community.

The principal investigator and consultant for archaeology and anthropology participated in the Sweat Lodge ceremony. The principal investigator was asked to address their team's request about conducting the project to community members. After the ceremony, Elders expressed the community's willingness to support the project.

Training

Seven students (four Indigenous, three non-Indigenous) participated in the project as research assistants. Depending on their research field, students were previously trained in statistical analysis (Drs. Sardarli and Volodin), interview and transcribing techniques (Dr. Sardarli), working with artifacts and museum catalogues (Dr. Siegfried), Indigenous Research Protocol (Dr. Kingfisher), and basics of archaeology (Dr. Panas). The training of students working in the field included processes for archaeological research in Northern Saskatchewan in three separate stages. The first of these stages was a half-day lecture on archaeology at FNUniv (Northern Campus, Prince Albert, Saskatchewan). Major topics discussed in this lecture included:

Figure 3. Training session in Humboldt, SK, at the site of the Humboldt Telegraph Station. Dr. Panas working with research assistants. (Photo: Arzu Sardarli)

- Basic background in archaeology
- Methods used in obtaining calendar (or absolute) dates for artifacts
- General types of artifacts found in Saskatchewan (SK) (such as lithic, bone, and ceramic)
- History of the landscape of Saskatchewan, from the last Ice Age to today
- Currently understood archaeological history of the province
- Indigenous archaeological objects and site types found in Saskatchewan, including artifacts, tipi rings, medicine wheels,

Figure 4. Oral Story interview with Elder Gilbert Linklater, Opawikoscikan School Library. (Photo: Arzu Sardarli)

effigies, rock art, and cellar depressions
- Field survey methodologies, note-taking in the field, and the operation of handheld global positioning systems (GPS)

In conjunction with the public archaeological excavations organized by the Saskatchewan Archaeological Society, the second stage of the training took place in Humboldt, SK, at the site of the Humboldt Telegraph Station. During this stage, students acquired actual experience identifying artifacts, conducting field surveys of large areas of land, and recording archaeological information in the field. During the half-day exercise, students were responsible for surveying a portion of the telegraph site to locate and record any artifacts or features (such as foundation remains or evidence of campfires). Once located and identified, students took detailed field notes on their finds and recorded the location of each artifact using a GPS (Figure 3).

Within the third stage of training, the students visited the communities under the supervision of the principal investigator and archaeological advisor. Areas mentioned by Elders during the interviews were examined. Examination of the lands was conducted considering Elders' recommendations and included methodologies to survey and record any data collected at these locations. Following this trip, students conducted their own surveys of these areas.

Indigenous Protocol training was done at FNUniv (Northern Campus, Prince Albert, SK). During the week, the Indigenous Studies faculty member of FNUniv, Dr. Kingfisher, taught the community research assistants about the basics of the Indigenous Research Protocols.

Oral Stories

The names of five interviewees (Elders and Knowledge Keepers) from both Pelican Narrows and Sturgeon Lake First Nations were suggested by community consultants. The interviews were scheduled and organized by community consultants and the community coordinator, and they were held at the Opawikoscikan School Library of Pelican Narrows (Figure 4) and the Adult Education Centre of Sturgeon Lake (Figure 5).

Figure 5. Oral Story interview with Elders Rose and Mike Daniels, Adult Education Centre of Sturgeon Lake. (Photo: Arzu Sardarli)

One Pelican Narrows Elder was interviewed in her own home. Dr. Sardarli and research assistants interviewed Elders and Knowledge Keepers, and community consultants occasionally participated in interviews.

All interviews were recorded with the permission of interviewees by two voice recorders simultaneously. Some interviews were conducted in Cree, while others in English. The oral stories were transcribed by research assistants.

Figure 6. Indigenous artifacts borrowed from communities. (Photos: Arzu Sardali)

Archaeological Survey and Laboratory Measurements

The areas chosen for the archaeological survey (Pelican Narrows and Sturgeon Lake) were determined by community consultants. In the first days of surveying, the community research assistants were supervised by Dr. Panas, after which surveys continued with the community research assistants and Dr. Sardarli. On occasion, the community consultants participated in the surveys.

We obtained twelve bone and nineteen lithic artifacts from the Royal Saskatchewan Museum (selected by Dr. Evelyn Siegfried), nine artifacts from Pelican Narrows, and two artifacts from Sturgeon Lake (Figure 6).

Previously, we had developed a statistical method for analyzing the chemical compositions of surfaces of Indigenous artifacts (Sardarli et al., 2018). Within this project, the chemical composition measurements were carried out on a scanning electron microscope with the energy dispersive X-ray spectroscopy module at the Scanning Electron Microscope Laboratory of the University of Alberta. The radiocarbon dating of the bone samples was conducted at the André E. Lalonde AMS Laboratory at the University of Ottawa. The ages of seven samples were determined using methods that are accepted in the field and were explained to community members (Table 1). We sought to discover the composition of different radioactive compounds, such as the fractions of carbon-14 compared with carbon-12, to help achieve a timeline that would show community members which artifacts belonged together in the record. Calibration

Table 1. Radiocarbon results

Lab ID	Submitter ID	Material	Mat. Code	^{14}C yr BP	±	F^{14}C	±	Cal BC
UOC-11422	SAMPLE 01	Bone fragment	BU	3655	30	0.6345	0.0023	2133 – 1943 (95.4%)
UOC-11423	SAMPLE 02	Bone fragment	BU	3711	25	0.6300	0.0019	2198 – 2167 (11.7%) 2149 – 2031 (83.7%)
UOC-11424	SAMPLE 03	Bone fragment	BU	3559	41	0.6421	0.0033	2023 – 1771 (95.4%)
UOC-11425	SAMPLE 04	Bone fragment	BU	---	---	---	---	
UOC-11426	SAMPLE 05	Bone fragment	BU	3315	33	0.6619	0.0027	1682 – 1674 (1.5%) 1666 – 1509 (93.9%)
UOC-11427	SAMPLE 06	Bone fragment	BU	3590	28	0.6396	0.0022	2024 – 1886 (95.4%)
UOC-11428	SAMPLE 07	Bone fragment	BU	---	---	---	---	
UOC-11429	SAMPLE 08	Bone fragment	BU	3604	32	0.6385	0.0025	2036 — 1885 (95.4%)
UOC-11430	SAMPLE 09	Bone fragment	BU	4496	25	0.5714	0.0018	3342 – 3097 (95.4%)
UOC-11431	SAMPLE 10	Bone fragment	BU	---	---	---	---	
UOC-11432	SAMPLE 11	Bone fragment	BU	---	---	---	---	
UOC-11433	SAMPLE 12	Bone fragment	BU	---	---	---	---	

of the machines involved was performed using OxCal v4.3 (Ramsey, 2009) and the IntCal13 calibration curve (Reimer et al., 2013). Those interested in more details on the process and material codes may explore Crann et al. (2017).

Figure 7. Preparation of bone collagen for isotope analysis. Collagen samples (top) are weighted into 6×4 mm tin capsules (≈0.5 mg per sample). (Photo: Sandra Timsic)

Carbon and nitrogen stable isotope analyses of bone collagen were conducted in the Saskatchewan Isotope Laboratory at the University of Saskatchewan by Dr. Sandra Timsic (Figure 7).

Statistical Analyses

Details of the statistical analyses of physical parameters of Indigenous artifacts have been reported (Sardarli et al., 2022) for the purpose of determining the level of similarities of artifacts with regard to their chemical compositions. We analyzed the amount of fifteen different chemical components: carbon, oxygen, fluorine, sodium, magnesium, aluminum, silicon, phosphorus, sulphur, chlorine, potassium, calcium, titanium, manganese, and iron. Based on the analyses,

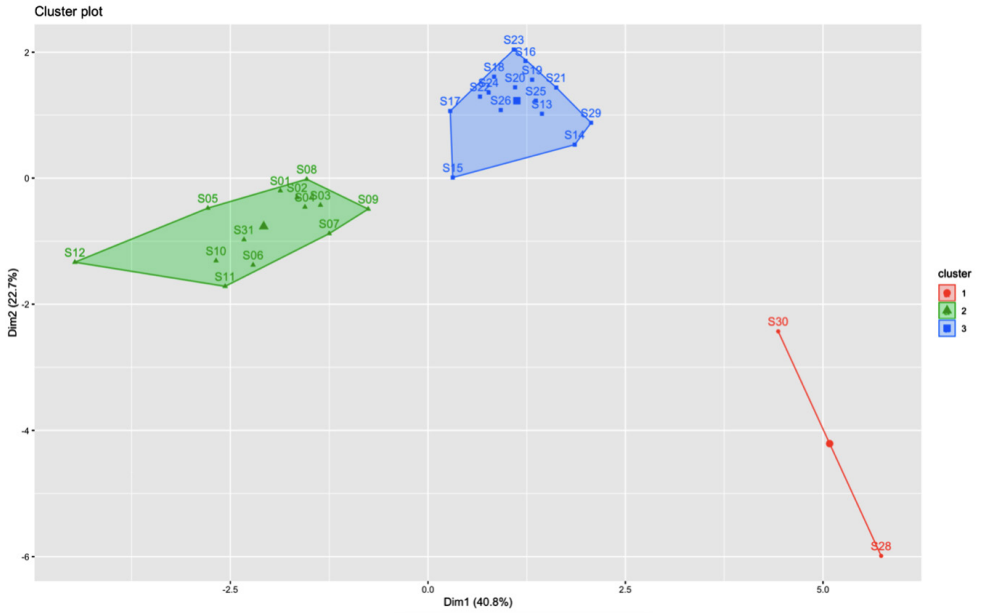

Figure 8. **Cluster Plot (Sardarli et al., 2022)** Green (triangle symbol) cluster: artifacts S01, S02, S03, S04, S05, S06, S07, S08, S09, S10, S11, S12, and S31; Blue (square symbol) cluster: artifacts S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, and S29; Red (circle symbol) cluster: S28 and S3

we found that there were three clusters containing the most similar artifacts (Figure 8).

The artifacts in a shared cluster have similar chemical compositions within the accuracy of measurements. The similarity of chemical compositions of artifacts belonging to the same cluster could be caused by the provenance of these artifacts from the same communities.

Preliminary Results About Our Processes

As a team, we reflected on some of the learnings in our research process. We found that with archaeological projects in Indigenous communities, formal and detailed discussions with Elders, local administrations, and informal leaders enhanced our relationships and ability to conduct sensitive research. It was also important to discover, and then follow, communities' individualized research protocols. We left space at each meeting for community experts to help address community concerns about proposed projects, our progress, and, ultimately, how the research would benefit communities.

We also found that Elders had differing opinions on the roles of museums in preserving artifacts. We learned that most Elders found laboratory analyses of artifacts acceptable if the items do not have any spiritual significance (such as animal bones and tools), whereas some were against any laboratory measurements on Indigenous artifacts. However, all Elders were against any measurement that could potentially damage the artifacts.

All Elders and Knowledge Keepers were pleased to share oral stories relating to their families and communities. We did not, however, observe statistically significant evidence of the correlation between oral stories and artifacts.

We determined the ages of seven artifacts by radiocarbon dating. The results correlated well with the Broken Axle site stratigraphy (oldest dates from the lowest layers, youngest dates at the top). The radiocarbon dating analysis also confirmed the results of earlier dating that had been completed on a number of bone artifacts that originated from the same archaeological site (the Broken Axle site) following excavation and site analysis in the 1980s. This earlier work was completed as part of the required analysis and summary reporting of the regulatory process.

The bison femur found in Sturgeon Lake was analyzed at the Saskatchewan Isotope Laboratory. Isotopic biogeochemistry of collagen found in the sample can now be used in the construction of paleoecology and paleoenvironments, including climatic variables such as temperature and precipitation.

Within the project, we used classical statistical analysis methods for determining the similarities of artifacts with respect to their chemical compositions. Our analysis shows that we need to increase the number of samples to develop a more complete record of paleoenvironments to better blend oral storytelling findings with laboratory analyses.

Conclusion

The final report on the project (Sardarli, 2020), including the project outline, oral stories, and preliminary results, and the catalogue (Sardarli et al., 2021) have been published in English and French. At the recommendations of Elders, the final report has been translated to Cree. Detailed information about the project has been made available via Indigenous Artifacts (http://indigenous-artifacts.ca), the project website. The project's preliminary results have been reported to community members. Elders, Knowledge Keepers, and team members participated in online discussions on these preliminary results.

This project can be considered a first step in developing a protocol for future engaged scholarship on Indigenous artifacts using contemporary technologies in collaboration with the two communities partnered here. The findings and conclusions have been co-developed based strictly on our knowledge created within this project and may not be suitable for all communities. It would be reasonable to consider developing a research proposal for a longer-term archaeological project within the extended geography surrounding the two communities that agreed to be part of this research project. Perhaps other Indigenous communities and museums may wish to become part of a larger project that explores the realms of oral history and connection to the materials found in archaeological contexts.

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