AN INTEGRATIVE APPROACH TO THE STUDY OF BONE TOOL MANUFACTURE AND USE: THE CASE OF THE ST. LAWRENCE IROQUOIANS

Christian Gates St-Pierre¹, Claire St-Germain², Michelle Courtemanche³, Claude Chapdelaine⁴, Matthew Collins⁵

ABSTRACT

The McDonald, Droulers and Mailhot-Curran sites are part of the St. Anicet cluster of St. Lawrence Iroquoian villages, located in southern Quebec. After many years of archaeological excavations, the three sites have yielded large quantities of faunal remains, including numerous bone tools and manufacturing debris. The assemblages are currently being analysed as part of a new research project aiming at a better understanding of the exploitation of the faunal resources by the St. Lawrence Iroquoians. To attain this goal, an integrative approach was developed, combining the insights provided by a series of methods and techniques developed in the field of archaeological sciences (archaeometry), namely zooarchaeological, technological, functional (microwear), and biomolecular analyses. This paper presents the first results of these analyses.

KEYWORDS: Iroquoian, bone tools, zooarchaeology, archaeometry, integrative approach

RESUMEN

Los sitios McDonald, Droulers y Mailhot-Curran pertenecen a un núcleo de asentamientos de los Iroqueses del San Lorenzo ubicado en la parte sur de la provincia de Quebec. Después de muchos años de investigaciones arqueológicas, los tres sitios han producido vestigios de fauna en grandes cantidades, incluyendo herramientas en huesos y desechos de fabricación. Estas colecciones están en el proceso de análisis dentro de un nuevo proyecto orientado a comprender de manera más detallada la explotación de los recursos faunísticos por los Iroqueses del San Lorenzo. Para llegar a ese objetivo, un enfoque integrador fue desarrollado, combinando elementos obtenidos por varios métodos y técnicas elaboradas en el campo de las ciencias arqueológicas (arqueometría) como los análisis zooarqueológicos, tecnológicos, funcionales (de microdesgaste) y biomoleculares. Este trabajo presenta los primeros resultados de estos análisis.

PALABRAS CLAVE: Iroqueses, artefactos óseos, zooarqueología, arqueometría, aproximación integradora

¹ Département d’anthropologie, Université de Montréal. christian.gates-st-pierre@umontreal.ca
² Ostéothèque de Montréal, Département d’anthropologie, Université de Montréal. csgermain@yahoo.com
³ Ostéothèque de Montréal, Département d’anthropologie, Université de Montréal. michellecourtemanche.anro@gmail.com
⁴ Département d’anthropologie, Université de Montréal. claude.chapdelaine@umontreal.ca
⁵ BioArCh, University of York, Biology Department. matthew.collins@york.ac.uk
INTRODUCTION

The St. Lawrence Iroquoians were prolific and talented makers of bone objects of various kinds, including tools of many sorts, utensils, weapons, clothing elements, game pieces, body ornaments, musical instruments, and ceremonial objects. However, these objects have not yet received all the attention they deserve. Most archaeological studies of Iroquoian bone artifacts have consisted of morpho-functional classifications, while technological, biomolecular, and microwear analyses are extremely rare and more recent (Gates St-Pierre 2001, 2007, 2010, 2015; Gates St-Pierre and Boisvert 2015; Jamieson 1990, 1993).

In order to remedy this situation, a new research project adopting an integrative approach was developed, combining zooarchaeological, technological, functional (microwear), and biomolecular analyses. The goal of this project is to attain a holistic vision of the exploitation of the fauna by a late prehistoric community of St. Lawrence Iroquoians, in order to obtain a better understanding of their specific human-animal relationship. For these people, animals were a source of food as much as a source of raw materials, as well as a source of domesticated or tamed companions, and a major source of inspiration in the expression of spiritual beliefs and symbolic thought. These differing relationships are often entangled and each one will be touched upon in this paper.

The specific methodology for each type of analysis will be presented separately in later sections of this paper. However, it must be stressed from the beginning that an integrative approach necessitates the application of a particular methodological procedure requiring the systematic sorting of the faunal assemblage under study into three broad categories: bone tools (fragmented or complete), bone tool manufacturing debris, and untransformed faunal remains. The latter category may include bones with traces resulting from various taphonomic processes (butchering, weathering, carnivore gnawing, etc.), but excludes all bones transformed during the production of bone tools.

For the present study, this procedure resulted in the retrieval of higher numbers of bone tool fragments and bone working debris than if the sorting was being done by a field archaeologist or zooarchaeologist instead of a bone tool specialist (Gates St-Pierre and Boisvert 2015: 261). The sorting will be more successful if the analyst has to consider only one or a very limited number of criteria at a time, and more especially so if he is a specialist familiar with the criteria allowing the identification of bone tool fragments and manufacturing debris, which is not the case of all field or laboratory technicians.

Without this procedure there is a higher risk that many specimens will be missed during sorting, and we may not obtain the large number of bone tool fragments and manufacturing debris essential to the reconstruction of the bone tool manufacturing techniques and chaînes opératoires. However, the zooarchaeologist will also need to consider the bone tools and manufacturing debris during his own data collection, since these objects have the double status of artifacts and ecofacts. This is just one example of the complementarity of the work of the zooarchaeologist and the bone tool specialist, especially when a clearly defined analytical procedure is applied.

ST. LAWRENCE IROQUOIANS AND THE ST. ANICET CLUSTER

The St. Lawrence Iroquoians were one of the numerous peoples of Northeastern North America who spoke languages of the northern branch of the Iroquoian family, which included the Wendat (Huron), the Tionontati (Petun), the Wyandot (Neutral), the Eriechronon (Erie), the Wenrohronon (Wenro), the Haudenosaunee (Iroquois), and the Susquehannock. The St. Lawrence Iroquoians lived on a long stretch of territory in the St. Lawrence River valley, between the eastern end of lake Ontario to the middle estuary of the St. Lawrence River. They were sedentary populations who lived in longhouses aggregated in large and semi-permanent villages. The subsistence of the St. Lawrence Iroquoians was based on
horticulture, complemented by fishing, hunting and gathering, thus combining the products of food production and food predation. The most important domesticated plants were maize, beans and squash, but sunflower and tobacco were also cultivated.

This project is focused on the analysis of faunal remains from the McDonald, Droulers, and Mailhot-Curran sites, which are part of the St. Anicet cluster, located in Southern Quebec (Figure 1). These three villages were probably built successively by a community of St. Lawrence Iroquoians at the end of the Late Woodland period (1350-1550 AD). More precisely, the McDonald site appears to have been occupied during the XIVth century, while the Droulers and Mailhot-Curran sites were inhabited during the XVth and XVIth century respectively. The sites were discovered in the 1990’s and two of them (Droulers and Mailhot-Curran) have been excavated by the students of the Université de Montréal field school since 2010, under the direction of Dr. Claude Chapdelaine. Each site provided large quantities of faunal remains, including bone tools and manufacturing debris (Table 1), the later including not only bone wastes, but also preforms and any other unfinished bone tools.

ZOOARCHAEOLOGICAL ANALYSES

The zooarchaeological analysis is being conducted by Claire St-Germain and Michelle Courtemanche from the Ostéothèque de Montréal, with the assistance of Christian Gates St-Pierre and graduate students. The reference collections of the Ostéothèque de Montréal are being used for the zoological and anatomical identifications. The faunal assemblages of the three sites are at different stages of analysis. The bones from the Mailhot-Curran site have been completely analysed, while those from the Droulers site are still under analysis, and the ones from the McDonald site have only been sorted by animal class. However, the results available already indicate a clear dominance of fish bones in each assemblage, accounting for 69%, 84%, and 96% respectively.

<table>
<thead>
<tr>
<th>Site</th>
<th>Faunal remains</th>
<th>Bone tools</th>
<th>Manufacturing debris</th>
</tr>
</thead>
<tbody>
<tr>
<td>McDonald</td>
<td>24,285</td>
<td>383</td>
<td>642</td>
</tr>
<tr>
<td>Droulers</td>
<td>197,818</td>
<td>370</td>
<td>271</td>
</tr>
<tr>
<td>Mailhot-Curran</td>
<td>27,389</td>
<td>340</td>
<td>433</td>
</tr>
<tr>
<td>Total</td>
<td>249,492</td>
<td>1093</td>
<td>1346</td>
</tr>
</tbody>
</table>

Table 1. Composition of the bone assemblages. Numbers for the Mailhot-Curran site are definitive. Numbers for the McDonald and Droulers sites may change as a result of on going field work and analyses.
of the bones from the Mailhot-Curran, McDonald, and Droulers assemblages respectively (Table 2). A total of 31 fish taxa (with a minimum of 21 different fish species) were identified in the sample analysed from the Droulers site, while the assemblage from the Mailhot-Curran site contained 34 fish taxa (representing a minimum of 24 species), including lake sturgeon (*Acipenser fulvescens*), American eel (*Anguilla rostrata*), channel catfish (*Ictalurus punctatus*), brown bullhead (*Ameiurus nebulosus*), northern pike (*Esox lucius*), suckers, landlock Atlantic salmon (*Salmo salar*), etc. Yellow perch (*Perca flavescens*) is by far the dominant species in both assemblages, especially if the bones identified to the percidae family and the perciformes order are also taken into consideration, since they most probably represent additional bones from yellow perches. If so, yellow perch would count for more than 70% of the total of the fish bone assemblages (Table 3; see also Ostéothèque 2012; St-Germain and Courtemanche 2015). This is indicative of a specialized fishing strategy, and we will see later that it correlates with an apparently limited array of capturing techniques.

The landlocked Atlantic salmon (*Salmo salar, or ouananiche*) has been identified in the faunal assemblages of the Droulers (Courtemanche 2012) and Mailhot-Curran sites (St-Germain and Courtemanche 2015), as well as at the nearby Summerston Station site (Courtemanche 2006). The quantities are small, ranging from 1 to 85 specimens per site, and never exceeds a minimum number of one individual. However, this is an intriguing presence, as this species is not native to the waters of the area. The landlocked variety from lake Ontario, over 200 kilometers to the west, was the closest population of this species (Webster 1982). Its presence among the assemblages of the St. Anicet cluster may result from long distance fishing expeditions, or it may be explained from exchanges with western populations. In either case, this may eventually tell us something about the socio-political relations between the St. Lawrence Iroquoians of St. Anicet and their neighbours. It is also possible that this species lived in the local waters a few centuries ago. If this was to be the case, it could represent an extension of its known historical range; useful information for biologists and wildlife managers, and a concrete example of the way zooarchaeology is relevant to other domains of research and to society in general (see Amorosi et al., 1996; Briggs et al. 2006; Cannon 2001; Frazier 2007, 2010; Lauwerier and Plug 2004; Lyman 1996, 2006; Lyman and Cannon 2004; Maltby 2002).

Mammal bones are fewer in numbers and dominated by just two species (Table 4) : white-tailed deer (*Odocoileus virginianus*) and beaver (*Castor canadensis*), although many other species

<table>
<thead>
<tr>
<th>Site</th>
<th>Yellow perch</th>
<th>Percidae/Perciformes</th>
<th>All other fish taxa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>McDonald</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Droulers</td>
<td>31.45% (N=3442)</td>
<td>38.95% (N=4263)</td>
<td>29.60% (N=3239)</td>
<td>100% (N=10,944)</td>
</tr>
<tr>
<td>Mailhot-Curran</td>
<td>26.35% (N=2118)</td>
<td>45.05% (N=3621)</td>
<td>28.60% (N=2299)</td>
<td>100% (N=8038)</td>
</tr>
</tbody>
</table>

Table 3. Composition of fish bone assemblages. Undetermined fish bones (i.e. fish bones that could not be identified to a more precise taxa) are not included. Numbers for the Droulers site are based on the analysis of a sample of the total assemblage.
are present, including snowshoe hare (Lepus americanus), groundhog (or woodchuck, Marmota monax), muskrat (Ondatra zibethicus), black bear (Ursus americanus), and porcupine (Erethizon dorsatum). In the Mailhot-Curran assemblage, white-tailed deer are mainly represented by metapodial bones and phalanges, which were also the most frequent elements from the skeleton of that species to be transformed into bone tools on the site. This suggests the carcasses were butchered outside the village, and only the distal part of the limbs (along with the hides) were normally brought inside– a pattern also noted elsewhere (see Engelbrecht 2003; Socci 1995, for example). This is a reminder of the necessity to go "beyond protein and calories" (cf. Russell 2012) and to consider animals as a source of raw material as much as a source of food when studying the anatomical representation and the spatial distribution of bones on a site. This idea of considering "bones as food and bones as tools" (Gates St-Pierre et al. 2014), was also addressed by Loponte and Buc (2012), Rabet and Piper (2012), Scheinsohn et al. (1992), and Sidéra (1991, 2000), among others.

Although a few bones of the canis genus were identified in the assemblages of the Droulers and Mailhot-Curran sites, none could be positively identified to the species level. Thus, we have no firm evidence for the ancient presence of dogs in the three villages of St. Anicet. However, carnivore tooth marks were observed on many bone remains, including bone tools and manufacturing debris, and many were found inside the longhouses on each of the three sites. This would suggest that dogs were indeed present in the villages, as wolves, foxes and other dangerous carnivores would not have been allowed inside the longhouses under normal conditions, contrary to domestic dogs. This is in accordance with the ethnographic literature of the Contact period, which frequently reports the presence and use of dogs among the various Iroquoian societies of that time (see Butler and Hadlock 1949; Kerber 1997), including for the Iroquois white dog sacrifice (Blau 1964; Strong 1985; Tooker 1965).

In summary, the subsistence of the St. Anicet Iroquoian community was primarily based on the products of horticulture and fisheries, while the products of hunting appear to have been secondary. If the forthcoming calculation of meat weights and comparative analyses support the present interpretation, this case study would represent a rare archaeological example of a specialized, yet mixed-economy based on the combination of farming and fishing (Gates St-Pierre 2014).

## TECHNOLOGICAL ANALYSES

The objective of the technological analyses is to document ancient Iroquoian bone tool production techniques by studying the manufacturing traces left on the bone artifacts as well as the production wastes. More precisely, the goal is to reconstruct the chaînes opératoires and to identify the techniques and the technological choices made by the craftsmen, in order to better understand the whole production processes. We are also interested in documenting the social aspects of the bone tool technology, such as the social sharing of technological knowledge and know-how.

### Table 4. Composition of mammal bone assemblages.

<table>
<thead>
<tr>
<th>Site</th>
<th>White-tailed deer</th>
<th>Beaver</th>
<th>All other mammal taxa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>McDonald</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Droulers</td>
<td>6.25% (N=2)</td>
<td>21.88% (N=7)</td>
<td>71.88% (N=23)</td>
<td>100,01% (N=32)</td>
</tr>
<tr>
<td>Mailhot-Curran</td>
<td>41.17% (N=599)</td>
<td>20.07% (N=292)</td>
<td>38.76% (N=564)</td>
<td>100% (N=1455)</td>
</tr>
</tbody>
</table>

1: Undetermined mammal bones (i.e. mammal bones that could not be identified to a more precise taxa) are not included. Numbers for the Droulers site are based on the analysis of a sample of the total assemblage. 2: Including bones identified to the artiodactyla order and the cervidae family, which are probably white-tailed deer. 3: Including bones identified as "big rodent", which are probably beaver.
elements in the production of bone tools. Such a selective behavior may seem surprising considering that mammal bones do not dominate the faunal assemblages. Yet they were apparently sufficient to the needs of the craftsmen, allowing them to maintain their usual technological choices and preferences, steadily selecting the same few anatomical elements, although they might have needed to exploit them to their maximum, without leaving any specimen untransformed or unused. This may explain why not a single metapodial bone has ever been found complete in any of the three assemblages analysed (Figure 2). On the other hand, these numerous fragments of metapodial bones have been very useful in the reconstruction of the precise techniques and chaînes opératoires involved in the transformation of bones into tools (Gates St-Pierre and Boisvert 2015), including material evidences for the use of bone flaking techniques which have never been thoroughly documented and studied by specialists of Iroquoian societies (Figure 3). This could lead to promising and stimulating enquiries regarding the interplay between ancient lithic and osseous industries in which similar techniques are found. Modified deer phalanges also provide technological information of great interest, especially those which have been ground (Figure 4). Proximal and medial phalanges ground on both dorsal and ventral surfaces have been variously interpreted to have served as toggles (fasteners), bangles, or gaming pieces, something that may be determined with forthcoming microwear analyses. We found that this type of artifact was first shaped by way
of indirect percussion, with a blow applied on top of the distal articular surface in order to produce two parallel and straight fractures along the longitudinal axis of the phalanx, thus exposing the medullary cavity of the bone (Figure 5). This technique was deduced from the absence of any grooves or sawing marks, and it was confirmed with the finding of a series of highly similar manufacturing debris, some of which could even be refitted (see specimen on the upper-right side of figure 5). It is possible that grinding was used as a finishing technique during the last stage of production, but naming and describing these objects as being "ground" should not disguise the fact that another major technique was also involved in their production.

It must also be stressed that while phalange fragments of this sort were found in each of the three assemblages under study, not a single complete toggle specimen has ever been found in any of them: an unexplained absence. In other words, it is only through these manufacturing debris that we were able to identify the production of bone toggles. Moreover, the debris are small and do not bear any particular manufacturing trace other than a more or less flat surface along the fracture line, which means that the fragments can easily go unnoticed and be classified as untransformed faunal remains by non-specialised analysts, overlooking their technological significance.

Alongside deer metapodials and phalanges, beaver incisors were also frequently transformed, and the constant repetition of some specific technological choices again allow the identification of production patterns. One such pattern is the systematic preference for the mandibular incisor over its maxillary counterpart, probably because the less pronounced curvature of the lower incisor provides
a more handy and efficient tool. Another pattern is the systematic breakage of the beaver lower mandible at the junction between the ramus and the body of the mandible, which coincides with the area where the incisor root takes hold (Figure 6). This may represent a technique that facilitated the extraction of the incisor, after which its naturally bevelled distal end could be ground and polished, very probably in order to use the incisor as a sharp chisel. A less frequent alternative consisted of splitting the tooth along the longitudinal axis, thus obtaining a curved instrument that could be used as a side scraper, or more probably as a crooked knife. These functional interpretations as woodworking tools were tested through microwear analyses (see below).

A related finding is the discovery of beaver bones from four individuals – three adults and one juvenile (perhaps members of a single family captured together) – in a pit located inside a longhouse at the McDonald site. Although most body parts were present, all the mandibles were missing. However, three pairs of adult mandibles and part of a juvenile mandible were found just a few meters away, most probably the ones that were missing from the pit. Moreover, each mandible had its lower incisor extracted following the procedure described above, as indicated by the fracture and cutmark patterns (Figure 7). Moreover, none of the mandibles show any sign of wear polish indicating that they were used as handles, with the incisor still inserted into the mandible, in a fashion analogous to the ethnographically documented crooked knife from which it may be derived (Bradley 1987: 229; Jalbert and Jalbert 2003: 49; Prisch 1982: 5; Robins and Black 1988: 139; Wissler 1923; see also Pilon and Zacharias 1986 for a different opinion). It suggests that the mandibles were defleshed and carried away with the incisors intact, while the rest of the carcasses were stored in a pit but ultimately forgotten. The incisors were then extracted from the mandibles some time later, not far from that storage pit.

The acquisition of osseous raw materials is often considered as a secondary activity, as a byproduct of the carcass processing: first comes the meat, second the bones and hides. But in the present case it might have been different: the incisors were promptly extracted, possibly for an immediate use, while all the meaty parts were kept in a storage pit for a later use which actually never happened. This indicates that in some circumstances, the need to obtain osseous raw materials may have been equally, or perhaps even more urgent than the need

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Figure 4. Modified deer phalanges from the Glenbrook site (Ontario).
to obtain proteins. As one reviewer mentioned, hunters often make complex decisions involving multiple needs that can vary in their order of importance.

This study of Iroquoian bone tool manufacture and use is also informative of the social sharing of technological knowledge among and between households. For example, manufacturing debris is present in each of the six longhouses of the Mailhot-Curran site, and appears to be equally distributed amongst each family spaces; there are no identifiable workshops, and the technological knowledge and materials necessary for the production of bone tools appear to have been shared among each household of the village (Gates St-Pierre and Boisvert 2015). The spatial distribution of the bone tools supports this interpretation, as there are no concentration, no special purpose activity areas involving the utilisation of bone tools, which could have been produced and used by anyone and anywhere inside any longhouse, apparently. Moreover, the same pattern is observable at the McDonald site, which suggest that it was a generalised behavior that was shared between most if not all of the Iroquoian members of the St. Anicet community (Gates St-Pierre et al., n.d.).

MICROWEAR ANALYSES

Microwear analysis is one of the most powerful methods available to determine the function of artifacts and to identify past activities, including activities that may not leave any other material evidence. For example, wooden objects are rarely preserved on Iroquoian archaeological sites, and the recognition of woodworking activities solely deduced from the shaped and presumed function of certain bone tools can be misleading (Gates St-Pierre 2007). Modified beaver incisors are a perfect illustration of such a commonplace interpretation. Their shape seems suitable for a usage as wood chisels or scrapers, a function that is indeed attested in many ethnographic descriptions of North American Native technologies. However, the woodworking function of these modified beaver incisors has never been fully demonstrated: it is always presumed or taken for granted, which does not necessarily mean that it is inaccurate, but it should not remain untested either.

In order to test this frequently encountered assumption, we conducted a microwear analysis involving some experimentation on specimens of various wood species. Although the experiments are not yet complete, some preliminary observations can be presented here. First, it seems...
like wood was indeed the main raw material worked by the modified beaver incisors. However, it appears that some incisors were used on at least one other type of raw material, although we cannot specify which one exactly at this time. This empirical observation of the multiple functions of the modified beaver incisors, which has also been documented elsewhere (see Parmigiani and Alvarez Soncini 2014; Rachez and Pétrequin 1997), needs to be seriously considered in future analyses and interpretations of similar objects. This should serve as yet another reminder of the possible dangers of attributing functions to artifacts without proper analyses and demonstrations.

It was noted earlier that fishes, and especially yellow perch, are dominant in each assemblage that we have analysed, but we do not know how they were captured, since not a single fish hook have been found so far on any of the three sites, nor any clear example of a barb or of a net sinker. Bone harpoon heads are present, but a harpoon is a large instrument inappropriate for the capture of yellow perch, a species measuring on average between 10 and 25 cm in length (Scott and Crossman 1974: 809). Moreover, the function of harpoons in general have been subject to debate between archaeologists. It is still far from certain whether they were used as fishing implements, since they might as well have been used first and foremost as hunting weapons (see Christiani 2009; Cleyet-Merle 1990; Julien 1982, 1995; Leroi-Gourhan 1945; Pétillon 2008; Weniger 1992, 2000). According to Courtemanche (2012), hoop nets, fyke nets, or basket traps were probably the most appropriate implements for the capture of large quantities of yellow perch (see also Mongeau 1976).

In trying to solve this question, we happened to investigate a second and related one. A few bone needles have been found in the bone tool assemblages from the McDonald and Droulers sites (Figure 8), and their precise function appeared...
uncertain. They are somewhat large (often close to one cm in width) but flat and thin (less than two mm in thickness), long (minimally eight cm in length), curved, rather fragile, and have their eye located almost midway along the shaft. They do not appear to have been used for sewing leather clothes or bark containers, as they would have produced over-large sewing holes and would not have been easy to use for such a task because of their size and fragility. An alternative suggestion

Figure 7. Fractured beaver mandibles from the McDonald site. They were found in pairs (except for the juvenile specimen, at the bottom left) near a pit containing the bone carcasses of four beavers.

Figure 8. Fragmented bone needles from the Droulers (six specimens on the left) and McDonald (two specimens on the right) sites.
for this type of artifact is as netting needles (for example, see Pendergast and Trigger 1972: 137; Wintemberg 1936: 57-59). If true, this could indicate that nets might have been used to capture at least some of the fish identified in the faunal assemblages of St. Anicet, although nets were also used for the capture of birds and mammals on some occasions.

Figure 9. Experimental reproduction of a fishing net (top) using a bone needle replica (bottom).

Figure 10. Experimental microwear on the bone needle replica at various stages of development.
Bone needle replicas were made and used for the production of fish nets using fine cordage made of twisted hemp fibres to test this hypothesis (Figure 9). The resulting microwear was observed with a metallographic microscope equipped with 50x, 100x, and 200x objective lenses. It was monitored and systematically recorded through a written and photographic description of its progression during the entire duration of the experimentation (8 hours), as summarised on figure 10. The wear developed gradually on the replica, from a dull polish accompanied by a few striations to a very bright polish with numerous striations. The polish resulted from the progressive abrasion of the highest points of the micro surface, leaving the lowest points intact since the cordage, while a soft material, is not flexible enough to penetrate into the lower, micro-depressions. The striations are variable in size and orientation, although most are long, narrow and shallow, in addition to being.

![Microwear on the tip of four different bone needles from the Droulers site.](image)

Figure 11. Microwear on the tip of four different bone needles from the Droulers site.

![Bevelled and conical bone projectile points from the Droulres site, except Nos 3 and 7 from the McDonald site.](image)

Figure 12. Bevelled and conical bone projectile points from the Droulres site, except Nos 3 and 7 from the McDonald site.
generally oriented more or less perpendicularly to the longitudinal axis of the needle. The wear mostly developed on the distal part of the needle, although it was also visible on the sides and, to a lesser extent, around the eye. However, the pattern was not comparable to use wear visible on the needle artifacts (Figure 11). These "needles" were clearly used to perform some other task(s) such as the production of mats, an hypothesis that will be the subject of our next experiments. While our results do not exclude the possibility that fish nets were being made and used by the St. Lawrence Iroquoians of the St. Anciet area, neither do they support it. Perhaps the fish were caught using basket traps. Our first experimental results may not be as conclusive as we would have liked them to be, but they remain illustrative of the possible complementarity of the zooarchaeological and microwear analyses when implemented within an integrative approach.

Figure 13. Shaman «sucking tube» and pendants respectively made from a bear femur and bear canines, Droulers site.
BIOMOLECULAR ANALYSES

The ZooMS technique, which stands for Zooarchaeology by Mass Spectrometry (see Buckley et al. 2009; Collins et al. 2010; van Doorn 2013; van Door et al. 2011), was applied to obtain more answers to our questions regarding the manufacture and use of the St. Lawrence Iroquoian bone tools. This minimally destructive method is based on the analysis of the peptides contained in the collagen fraction of a bone sample, providing a taxonomic identification to the genus level. Here it is applied to analyse a selection of bone tools that are modified to the point that the original morphology of the bone element cannot be recognised. These analyses are conducted by Matthew Collins and his colleagues at the University of York (UK).

Two conical and bevelled projectile points typical of the St. Lawrence Iroquoians (Gates St-Pierre 2015) from the Droulers site have been processed to this date (Figure 12). Both artifacts have been identified to the ursus genus using this technique, which in this case most probably represents black bear (Ursus americanus), as this is the only bear species present in this region. This is a surprising result, as we were expecting these bone tools to have been made with deer or beaver bones, like most of the other tools and manufacturing debris in the three assemblages analysed. Only four other examples of bear bones transformed into artifacts were found in the collections from St-Anicet, including unique objects such as a decorated «sucking tube» and two probable canine pendants, all from the Droulers site (Figure 13). It would be highly speculative to propose any interpretation based on these preliminary results, but if the other similar projectile points submitted to the ZooMS analysis also happen to have been manufactured from bear bones, then perhaps this would point towards some kind of symbolic meaning for these particular artifacts. As Engelbrecht (2003: 12) pointed out, "Bears are the most humanlike of animals in the northern hemisphere, and shamanistic rituals relating to the bear are found throughout the circumpolar region", as among the Pre-Contact Iroquois (Fenton 1978; Ritchie 1947, 1950; Socci 1995; see also Hallowell 1926; Rockwell 1991).

CONCLUSIONS

This paper offers some glimpses and glances at the ways in which St. Lawrence Iroquoian bone tools were made and used. The results are preliminary and incomplete, but they illustrate how the combination of zooarchaeological, technological, functional (microwear) and biomolecular analyses can lead to a better understanding of the economical, technological, social, and even symbolic dimensions of the exploitation of the faunal resources by this ancient people. The ongoing analyses of the McDonald and Droulers collections will provide more data that will certainly allow us to further investigate the many problems and hypotheses addressed in this paper. Additional methods will also be incorporated in our research project, including DNA analyses and gas chromatography. Undeniably, the rich and unique assemblages of bone artifacts from St. Lawrence Iroquoians sites still have a lot more to tell.

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