

Lake sturgeon fishing at Prehistoric Iroquoian sites near Lake Simcoe, Ontario

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ABSTRACT: This paper is part of continuing research into fish subsistence strategies at several prehistoric Iroquoian sites near Kempenfelt Bay on Lake Simcoe. Lake sturgeon bones were found at each of these sites, although they are only present in significant numbers at the earliest one. A desire to establish how sturgeon fishing fit into the subsistence schedule of the site inhabitants prompted a survey of the relevant ethnohistoric and fisheries sources, as well as discussions with fisheries biologists. This paper discusses the range of fishing techniques and variety of locations that may have been used to catch sturgeon. It also suggests ways of determining time of capture. Analysis in progress of incremental growth in pectoral spines may to some extent narrow the range of possibilities. Lake sturgeon were most easily and reliably obtained during the spring spawn run at the headwaters of the Nottawasaga river. There are, however, several other possible scenarios; this paper details the various factors that complicate interpretation.

KEYWORDS: LAKE STURGEON (*Acipenser fulvescens*), IROQUOIAN, SEASONALITY, FISHING TECHNIQUES

RESUMEN: Esta ponencia forma parte de un análisis todavía en marcha sobre el uso en la dieta de los peces por parte de los Iroqueses en varios sitios prehistóricos situados cerca de la Bahía Kempenfelt del Lago Simcoe. Huesos de esturión (*Acipenser fulvescens*) aparecen en todos los depósitos aunque sólo se recuperan en número significativo en el yacimiento más temprano. El interés en establecer el papel de la pesca del esturión en el patrón dietético de los Iroqueses impulsó un estudio de las pertinentes fuentes etnohistóricas y de pesquerías, así como discusiones con biólogos marinos. Esta ponencia discute las diversas técnicas y lugares de captura. Concluye que es necesaria más investigación de tipo esqueletocronológico para reducir el espectro de posibilidades. Al parecer los esturiones se pescaban de forma más sencilla y eficiente durante la migración gamética primaveral a la cabecera del río Nottawasaga. Existen, no obstante otras alternativas que nuestro estudio se encarga de valorar.

PALABRAS CLAVE: ESTURIÓN, IROQUES, ESTACIONALIDAD, PATRONES DIETÉTICOS, TÉCNICAS DE PESCA

INTRODUCTION

Lake sturgeon (*Acipenser fulvescens* Rafinesque) bones were identified at three late prehistoric Iroquoian sites in south-central Ontario, near Lake Simcoe. This paper, based on research in progress, explores ways of determining method, location and timing of capture in order to establish where and when the lake sturgeons at these sites were obtained.

The three sites were occupied between about A.D. 1290 and A.D. 1525 (Table 1) and are close to the headwaters of the Nottawasaga River and Kempenfelt Bay on Lake Simcoe (Figure 1). Settlement patterns and faunal assemblage composition indicate that these sites were permanently occupied, year-round villages rather than fishing camps (Archaeological Research Associates Ltd., 1989; Needs-Howarth & Sutton, 1993; Needs-Howarth, 1994, 1995; Needs-Howarth & Thomas, 1994, in press; Sutton, 1994; Thomas, 1995). The

people living in these villages were related to the Huron, who were living in the area when European missionaries settled there in the 17th century.

Prehistoric Ontario Iroquoian subsistence in general is based on corn horticulture, hunting, fishing and gathering (see Williamson, 1990; Dodd *et al.*, 1990 for overviews). Animal procurement at these three sites appears to be characterised to a large extent by opportunistic, small-unit exploitation, probably involving passive technology like snares, traps and nets (Needs-Howarth & Sutton, 1993; Needs-Howarth, 1994, 1995; Needs-Howarth & Thomas, 1994, in press).

Bone preservation at the sites was generally very good and diagnostic features were preserved on many of the fish bones. Lake sturgeon elements are easily identified because of their distinctive surface structure and robusticity, but many of the cranial bones are poorly ossified.

RESEARCH AIMS

A preliminary study of fish subsistence strategies at two of the three sites discussed here, Barrie and Dunsmore (Needs-Howarth & Thomas, in press), combined information on spawning behaviour and co-occurrences of fish species within archaeological features to establish location and timing of catch. The results suggest that there was considerable variability in timing, location and method of fishing, not only between taxa, but also within taxa disposed of in different features, and

therefore presumably representing different catch events. Although several taxa were probably infrequently or rarely caught during their spawning run, it was argued that the co-occurrence of many lake sturgeon and sucker (particularly longnose sucker, *Catostomus catostomus*) or larger yellow perch (*Perca flavescens*) bones in a single feature might indicate these taxa were caught together during a period of overlap in their spawning runs.

This paper examines in more detail various (mostly non-archaeological) sources of evidence pertaining to where and when the lake sturgeon represented at these sites were caught. Do the bones come from spawn run sturgeon going from a lake up one of the local rivers in spring, do they come from a year-round, resident population from the river, or do they come from resident populations in Lake Simcoe or Georgian Bay? A river-resident population is not completely stationary; although it lives in the same body of water year-round, it may have a range of up to 160 km (Bill Beamish, pers. comm.).

To find out where and when the sturgeon were caught, three further issues have to be addressed: the first is «how did the occupants of the sites catch sturgeon?» This may indicate likely fishing locations and season of capture. The second is «what was the condition of the local water sources at the time, and did they support sturgeon populations?» This may indicate where sturgeon could have been caught. The third involves determining population structure: «were the sturgeon from these sites of spawning age, and more specifically, were they caught around spawning time?» This

SITE	approx. TIME OF OCCUPATION	LAKE STURGEON*	STURGEON/FISH	FISH**	FISH/ALL TAXA	ALL TAXA
Barrie (BcGw-18)	AD 1290-1350	67 ¹	20%	344	50%	694
Dunsmore (BcGw-10)	AD 1350	4 ²	< 1%	634	70%	903
Carson (BcGw-9)	AD 1450-1525	3 ³	< 1%	423	65%	650

TABLE 1

Summary of lake sturgeon identifications, expressed as Number of Identified Specimens. (1) 5 ossified first pectoral fin ray sections (MNI=2); 2 incomplete pterygoids; 56 probable cranial fragments; 3 miscellaneous post-cranial fragments; 1 dermal scute fragment (ridge is angular, possibly indicating a younger individual than pectoral spines, which are relatively large) - recovered from 3 of 3 middens and 8 features in 2 of 2 houses, none from the 4 external non-midden contexts (all contexts from excavated portion of site were analysed). (2) 1 mid-line cranial fragment, 3 unidentified fragments - recovered from 1 of 3 completely analysed middens and 1 of 10 partly analysed houses (site partly excavated). (3) 3 probable cranial fragments - recovered from 2 features in 1 house of 2 completely and 2 incompletely analysed houses (site completely excavated). (*) elements in University of Toronto and Royal Ontario Museum Vertebrate Palaeontology reference collections only partly labeled. (**) fish identifications below family level; NISP does not include spines, rays, scales or vertebrae (except for sturgeon pectoral spines and ictalurid pectoral and dorsal spines).

could imply spring-time exploitation and would narrow the range of catch locations.

There is a lot of published information on the commercial lake sturgeon fisheries during the nineteenth and early twentieth centuries, but not much specific information is available on local non-commercial fishing or on this taxon's natural habits and spawning locations. The following discussion, therefore, relies on ethnohistoric and fisheries sources and on information gathered from several fisheries biologists during interviews.

CATCHING LAKE STURGEON WITH TRADITIONAL METHODS

Lake sturgeon are freshwater bottom-feeders that usually live in highly productive shallower areas of large lakes and large rivers (Harkness & Dymond, 1961: 17). They spawn in rivers at depths of about 0.5 m to 5 m in areas of swift water or rapids, or at the foot of low falls that prevent further migration (Harkness & Dymond, 1961: 38). In the lower Great Lakes there were also po-

pulations of lake spawning sturgeon (Bill Bea-mish, pers. comm) that spawned in shallow water over rocky ledges close to shore or around rocky islands (Harkness & Dymond, 1961: 40). The spawning date is precisely determined by water temperature, which has to be between 13.9 and 15.5° C (Harkness & Dymond, 1961: 36, 38). For the lower great lakes, this means sometime in May. Spawning temperatures will be reached earlier in rivers than in lakes (Harkness & Dymond, 1961: 40). Reports on other seasonal movements are conflicting (Harkness & Dymond, 1961: 19).

Several ethnohistoric sources provide useful information on techniques of capture. Early visitors to North America described uniform and widespread methods of taking sturgeon. On the east coast they were commonly netted or speared (Roslund, 1952: 11). During the spawning season, sturgeon are more noticeable and more preoccupied. The fisheries biologists consulted for this paper suggested they can be caught individually with a spear from the shore, especially if they are in shallow water. In deeper water they can be speared from a canoe.

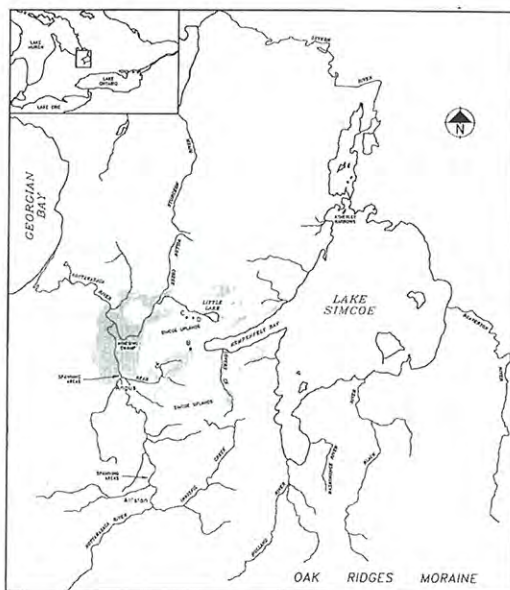


FIGURE 1

Location of sites and water sources. B = Barrie (BLGW-18); D = Dunsmore (BLGW-10); C = Carson (BLGW-9).

Map by Andrew Allan.

Spearing may also have been practiced on the lake. The French explorer Charlevoix (1923 [1761]: 236) described the following technique, relating to one of the Great Lakes (name not specified), during his visit to New France in 1720:

«Two men place themselves in the two extremities of a canoe; the [one] next [to] the stern steers, the other standing up holding a dart to which is tied a long cord, the other extremity whereof is fastened to one of the cross timbers of the canoe. The moment he sees the sturgeon within reach of him, he lances his dart at him and endeavours, as much as possible, to hit in the place that is without scales. If the fish happens to be wounded, he flies and draws the canoe after him with extreme velocity; but after he has swam the distance of an hundred and fifty paces or thereabouts, he dies, and then, they draw up the line and take him.»

Although sturgeon are not called biting fishes, they can be captured by means of set lines (Roslund, 1952: 11; Harkness & Dymond, 1961: 61). Iroquoian fishing nets were commonly made from Indian hemp (*Apocynum cannabinum*) (Sagard, 1939: 240) or nettle (*Urtica holosericea*) (Hennepin, 1903 [1698]: 522). Fishing line made from these fibres has about the same tensile strength as modern 12- to 20-pound (5.5-9 kg) utility test line (Salls, 1989: 186). The description of sturgeon fishing by Recollect Brother Gabriel Sagard, who lived among the Huron in 1623-24, may imply that sturgeon were caught with a hook and line. He states that hooks, made of wood with a bone bar tied with hemp cord, were often found in the stomachs of fish (Sagard, 1939: 189). In the same section he mentions that in Georgian Bay there were fish *«of such monstrous size that nowhere are they to be found bigger»* (Sagard, 1939: 189). This appears to indicate that the Huron used hemp fishing line to catch sturgeon, and that it was not always strong enough to hold the larger individuals.

Sturgeon are apparently easily entangled in gill nets because their pectoral spines get stuck, even in wide-meshed nets (von Brandt, 1964: 170). Father Louis Hennepin (1903 [1698]: 522) mentions that the Iroquois fished for whitefish and lake sturgeon with large gill nets that required two men at either end to draw them into shore. Sagard (1939: 185-186) recounts joining in a fishing expedition with the Huron. They went by canoe to an island in the «Fresh-Water Sea» [Georgian Bay of Lake Huron] and *«every evening they carried the nets*

about half a league or a league out into the lake, and ... at daybreak they went to draw them in, and always brought back many fine big fish such as Asihendo [whitefish], trout, lake sturgeon, and others». Taking into consideration Sagard's comments about fish breaking the fishing line, it is likely that larger lake sturgeon would sometimes break these nets made from hemp or nettle. Nevertheless, netting probably was a highly effective manner of catching lake populations of sturgeon.

Other methods for catching sturgeon involve the use of impounding gear or a weir. There are native fish weirs on Lake Simcoe, which were described by explorer and missionary Samuel de Champlain in 1615 (Biggar, 1922-1936(3): 56-57).

«There is another lake immediately adjoining [Lake Simcoe], ... draining into the small one [Lake Couchiching] by a strait [Atherley Narrows], where the great catch of fish takes place by means of a number of weirs which almost close the strait, leaving only small openings where they set their nets in which the fish are caught; and these two lakes empty into the Freshwater Sea [Georgian Bay, by way of the Severn River].»

The weir was investigated by archaeologists in the mid-1970s (Johnston & Cassavoy, 1978) and again in the early 1990s (Cassavoy, 1994). The orientation of the stake pattern indicates that the weir was, indeed, used to obstruct fish swimming with the current from Lake Simcoe toward warmer and shallower Lake Couchiching. However, another section of stakes was positioned to obstruct fish swimming upstream, towards Lake Simcoe. This part of the weir would entrap fish coming from Georgian Bay. Calibrated radiocarbon dates indicate that parts of the weir date back to around 2500 BC (Johnston & Cassavoy, 1978).

Although it would be interesting to link sturgeon fishing at the archaeological sites to a known prehistoric catch location, the weir was probably not designed to catch sturgeon. Excavator Kenneth Cassavoy (pers. comm.) suggests that the construction indicates that users of the weir were fishing for large quantities of smaller fish. The location itself was suggested as a possible catch location by several fisheries biologists (Bill Beamish, Lloyd Mohr, Tom Willans pers. comm.). It is likely that the resident Lake Simcoe and Lake Couchiching populations moved between their respective lakes, especially if they were part of the same genetic population (Bill Beamish, pers. comm.). It is not

known, however, whether they would have passed through the narrows to spawn. There may have been two Georgian Bay groups, one using the Nottawasaga river, the other the Severn river, to spawn. It appears likely, therefore, that sturgeon would get caught in the weir, but not necessarily in great numbers at a predictable time of year.

The modern Lake Simcoe population uses rivers on the eastern shore (Robin Craig, pers. comm.). The status of the Holland river, at the south end of Cook's Bay, is unclear. It appears too diffuse and calm for spawning (Bill Beamish, pers. comm.), but it is also unlikely that any of the tributaries of Lake Simcoe supported resident populations (David Noakes, pers. comm.). One article (Harkness & Dymond, 1961: 99) suggests the Holland river supported a commercial lake sturgeon fishery in the past, but does not specify whether this involved spawning fish, and does not cite a source.

Lake sturgeon can sometimes be caught from lake shoals; one biologist (Tom Willans, pers. comm.) reported seeing sturgeon off the shore of Lake Erie in areas so shallow that their backs were out of the water. Hennepin (1903 [1698]: 314) describes seeing sturgeon spawn on the shore of Lake Erie. However, there are several reasons why sturgeon would have been more accessible in a river than in a lake. They are fast water spawners, and even at other times of the year they prefer areas with a current. A river provides more opportunities for netting and somehow confining the fish. The inhabitants of these Iroquoian villages lacked the modern fishing gear and vessels required to safely access the local deep water Lake Simcoe population, and even the middle of Kempenfelt Bay may have been too deep to fish the resident sturgeon population with traditional methods (Robin Craig, Lloyd Mohr, pers. comm.), unless the sturgeon came close to shore.

STURGEON AVAILABILITY IN LOCAL WATERS

The annual commercial returns of lake sturgeon for Lake Simcoe peaked in the 1890s, but because of overfishing there was no significant population left by the beginning of this century (McCrimmon & Skobe, 1970: 30). It is likely that lake sturgeon were abundant in Lake Simcoe in prehistory. Nearby Lake Couchiching and the Holland and Se-

vern rivers also had a commercial lake sturgeon fishery (Harkness & Dymond, 1961: 99). Fisheries biologists (David Lostus, Bill Beamish, pers. comm.) confirm there was probably a year-round resident population in the Nottawasaga river in the past. There certainly is now, and was in the past, a resident population in Georgian Bay of Lake Huron, which spawned in the Nottawasaga river.

There are no significant barriers that form obvious spawning locations on the main part of the Nottawasaga river today (Dave Buritt, pers. comm.). There are ripples at Alliston (Fred Dobbs, Robin Craig, pers. comm.), but there were probably good spawning areas as well all around Angus (Fred Dobbs, pers. comm.), both up river (southward) from the sites.

Although lake sturgeon can travel great distances (Lloyd Mohr, Bill Beamish, pers. comm.; Harkness & Dymond, 1961: 19; Scott & Crossman, 1973: 87), they have a strong homing instinct (Harkness & Dymond, 1961: 19). Year classes of males spawn every 2 or 3 years, females every 4 to 6 years (Roussow, 1957; Magnin, 1962). A group of spawning sturgeon may, therefore, be composed of individuals of different states of maturity, and different ages and sizes (Roussow, 1957). It is likely, however, that members of the same population spawned in more or less the same locations, minimizing the year to year variation in which spawning sites were actually being used (Bill Beamish, pers. comm.).

There are ripples at the mouth of the river that may have provided a suitable spawning ground, especially at lower water levels (Robin Craig, pers. comm.). The mouth of the Nottawasaga would have been the most convenient and predictable place to obtain spawn run sturgeon. Travel to this location by water would have involved a canoe trip through the Minnising swamp (perhaps involving some portage) and down the Nottawasaga north-westward.

DO THE BONES ORIGINATE FROM SPAWNING FISH?

It may be possible to resolve which body of water the sturgeon came from and when they were caught by establishing whether the sturgeon from these sites were spawners. It has been argued (Neds-Howarth & Thomas, in press) that the co-occurrence of sturgeon and longnose sucker in the

same feature may mean they were caught during their spawning run. The literature confirms that «*some late spawning suckers may have overlapped early spawning lake sturgeon*» (Harkness & Dymond, 1961: 39). Suckers eat the roe of spawning walleye (*Stizostedion vitreum*) and it was suggested (Lloyd Mohr, pers. comm.) that they may do the same with lake sturgeon roe.

There may be more direct methods to address when the sturgeon were caught. The first step is to ascertain whether the sturgeon at these sites were sexually mature. Age at sexual maturity varies between bodies of water and by latitude (cf., Roussow, 1957; Harkness & Dymond, 1961). The first spawning takes place some years after maturity is reached (Roussow, 1957: 560). Nevertheless, it is probably safe to assume that if the sturgeon represented at the sites were older than 25 years, they were of spawning age (see Harkness & Dymond, 1961: 32, table II). This does not imply the fish were actually on their spawn run when caught, but it would allow for that possibility. There are some first (ossified) fin rays from the pectoral spine in the Barrie sample. Unfortunately their articular end is not complete enough to extrapolate fish size (cf., Desse-Berset, 1994), and thus obtain an indirect age estimate.

Age and growth interpretations on thin-sections of the spines are incomplete at the time of going to press. The following is a brief outline of the working hypotheses, based on preliminary research (Needs-Howarth & Casselman, 1996). Thin sections of sturgeon spines can be used to establish age and approximate time of capture (cf. Cuerrier, 1951; Cuerrier & Roussow, 1951; Roussow, 1957). It is likely that the archaeological spines from the Barrie site cannot be interpreted with as much confidence as the modern reference material. Because of their friable and partly mineralised condition, however, it might be possible to obtain a minimum age.

In theory, it is possible to establish season of death with even greater accuracy. Like many fish, sexually mature lake sturgeon form so-called spawning marks on certain bones, in this case on the pectoral spine (Roussow, 1957). If these marks were located on the two pectoral spines preserved from the Barrie site, it would indicate not only that the archaeological bone came from a sexually mature individual, but also when, in relative and to some extent absolute terms, it had most recently spawned.

However, even if the thin sections provide all the information that could possibly be hoped for, certain aspects of lake sturgeon physiology and behaviour will make it difficult to confirm or rule out spawn run exploitation. In older fish, the *annuli* are closer together, making age and season of death assessments more error-prone. An additional problem is that immature sturgeon (Harkness & Dymond, 1961: 17) and non-spawning mature sturgeon (David Noakes, pers. comm.) go up rivers in spring at the time mature fish of certain age classes are on their spawning migration. Finding fish without any spawning marks, therefore, does not preclude their having been caught from the river in spring. Conversely, finding mature fish together with spawn run fish also does not preclude their having been caught together from the river in spring. However, finding fish with a recently formed spawning mark would provide a good indication of timing of catch.

CONCLUSIONS

The aim of this paper is to investigate where and when the lake sturgeon at these three sites were caught. Do the bones represent spawning sturgeon caught from the Nottawasaga or Holland river, or a year-round, resident population from these rivers, or resident populations from Lake Simcoe or Georgian Bay? The paper addresses three further questions in an attempt to confirm or eliminate these three options.

The location and season of capture is investigated by establishing how the occupants of the sites caught sturgeon using available methods and implements. The fish from the river were most likely speared, those from the lake (gill) netted.

The location of catch is further elucidated by a survey of the condition of the local water sources at the time. There were almost certainly resident sturgeon populations in the Nottawasaga river, Georgian Bay and Lake Simcoe. There were also migratory populations that travelled from Georgian Bay up the Nottawasaga river and the Severn river to spawn. The mouth of the Nottawasaga is considerably closer, and there are several potential spawning locations close to the mouth.

The season and location of catch might be further narrowed down by establishing whether the sturgeon from these sites were of spawning age

and, more specifically, whether they were caught around spawning time. Based on preliminary research on age and growth, the paper concludes, however, that the quantity and condition of the archaeological material, together with certain aspects of sturgeon physiology and behaviour, would render population structure a somewhat inconclusive source of information on time of capture.

The fact that local sturgeon spawn in May does not mean they were exclusively caught during that time. Their movements vary within years and between years. The most predictable populations, the resident ones in Lake Simcoe or Georgian Bay, probably spent most of the year in less accessible, deep water. Even outside the spawning season in May, sturgeon would certainly be much more accessible in a river than in a lake. The zooarchaeological, archaeological, zoological and ethnohistoric data presented here, together with previous research on intrasite bone distributions (Needs-Howarth & Thomas, in press) indicate that it is likely that the site occupants were mostly exploiting semi-migratory spawning populations. If the pectoral spines prove to be from sexually mature individuals, age and growth analysis of pectoral fin rays may further support this argument.

The most productive and predictable place for a sturgeon fishing camp would probably be at, or close to, the mouth of the Nottawasaga during the spring spawn run. Nevertheless, it is evident that lake sturgeon were probably not an easily obtained resource. An obvious issue that is beyond the scope of the present paper is why there are so many lake sturgeon bones at one of these sites, when locating and catching sturgeon may have been a fairly labour- and time-intensive activity. Was lake sturgeon a special, perhaps mythically or religiously significant, fish for Iroquoian people? Was it considered more special by the occupants of the Barrie site, which has many sturgeon bones widely distributed across the site, than those of the Dunsmore and Carson sites, which produced only a few sturgeon bones? This clearly requires further investigation.

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