

## *Phaseolus vulgaris* Seeds from the Late Sixteenth–Early Seventeenth Century AD Ancestral Oneida Diable Site, New York

John P. Hart<sup>1\*</sup>

<sup>1</sup>New York State Museum, Albany, NY

\*john.hart@nysed.gov

**Abstract** The ethnohistorical, ethnographic, and contemporary literatures all suggest that common bean (*Phaseolus vulgaris*) was an important component of Northern Iroquoian agronomic systems and diets. Seemingly at odds with this is the sparse occurrence of whole and partial common bean seeds on fourteenth through seventeenth century AD village sites. The recovery of a large quantity of whole and partial bean seeds from the ancestral Oneida Diable site, dated here to between AD 1583 and 1626 with a Bayesian model using seven new AMS radiocarbon dates, provides clues as to when large quantities of rehydrated/cooked common bean seeds may occur in the archaeological record.

Received July 7, 2022

Accepted September 24, 2022

Published October 24, 2022

OPEN ACCESS

DOI 10.14237/ebl.13.1.2022.1834

**Keywords** Paleoethnobotany, Taphonomy, *Phaseolus vulgaris*

**Copyright** © 2021 by the author(s); licensee Society of Ethnobiology. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International Public License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Introduction

How well does the macrobotanical record reflect the plant-based components of past diets? Does the proportion of a taxon in an assemblage reflect its dietary importance? How did harvesting, storage, cooking, consumption practices, and post-depositional taphonomy bias the macrobotanical record of that taxon? The importance of these questions is particularly evident for resources whose dietary importance in a region is known or suspected from alternate sources of evidence but are missing from or are scarce in the macrobotanical record. One such resource is the common bean (*Phaseolus vulgaris*) seed in fourteenth through mid-seventeenth century AD northern Iroquoia, comprising portions of present-day New York, USA and southern Ontario and southern Québec, Canada. This is a region inhabited by Iroquoian-language family speakers prior to and after European incursions in the sixteenth- and seventeenth-centuries AD and where descendant communities live today (Birch 2015). Common bean was part of maize (*Zea mays* ssp. *mays*), bean, and squash (*Cucurbita pepo*) polyculture agronomic systems

often referred to as the “Three Sisters” (e.g., Mt. Pleasant 2016; Waugh 1916).

Maize was the primary source of calories in northern Iroquoian diets in the fourteenth through mid-seventeenth centuries AD (Feranec and Hart 2019; Pfeiffer et al. 2016). The subsistence portion of the macrobotanical record from village sites in this time span is often dominated by the charred remains of maize, including kernels and cob fragments. This is consistent with the ethnohistorical (e.g., Biggar 1929:125; Thwaites 1896–1901: 15:153, 21:195; Wrong 1939:106), ethnographic (e.g., Parker 1910; Waugh 1916), and contemporary (e.g., de Souza et al. 2021; Ngapo et al. 2021) literatures, which attest to the crop’s central place in Northern Iroquoian subsistence. However, these same literatures identify common bean as an important component of Northern Iroquoian diets. One estimate based on the early seventeenth-century AD ethnohistorical record suggests common bean averaged 13% of daily Huron-Wendat caloric intake in southern Ontario; maize, on the other hand, was estimated to account for 65% (Heidenreich 1971:163). The consumption of



common bean seeds added important nutrients to the maize-based diets of Northern Iroquoian people (Mt. Pleasant 2016).

Despite the evident importance of common bean in Northern Iroquoian diets, macrobotanical remains are generally sparse in the archaeological record. While maize macrobotanical remains are ubiquitous in village sites, whole and partial common bean seeds generally occur in small quantities from a few features, if at all. For example, at the large, completely excavated early seventeenth-century AD Jean-Baptiste Lainé (Mantle) site in southern Ontario, 23 common bean cotyledons were recovered through the flotation of 710.6 liters of feature fill as compared to 5,759 maize kernels; maize kernels and/or cob fragments were recovered from 176 features, while bean cotyledons were recovered from only four (Archaeological Services Inc 2012:834840). Regional paleoethnobotanical studies of multiple Northern Iroquoian village site collections indicate that common bean whole and partial seeds at any given site seldom account for more than a few dozen specimens at most, with >100 specimens being rare occurrences (Fecteau 1985; Monckton 1992; Ounjian 1998).

This trend is true of the broader temperate eastern North America (e.g., Smith 1992:293; Wagner 1987), leading some to suggest that common bean seeds do not preserve well in the archaeological record. This is thought to be primarily because of the manners in which it was prepared for consumption, including pounding, boiling without prior parching, and mashing (e.g., Fritz 1990:398, 2011:508; Smith 1992:293). Here I report on the recovery of several thousand common bean cotyledons and fragments and several hundred whole seeds from a pit feature at the late sixteenth to early seventeenth-century AD ancestral Oneida Diable site, which was the subject of limited avocational excavations in the 1980s (Bennett et al. 2007; Gibson 1991; Weiskotten 2007). A comparison of cotyledons from this site with the morphology of cotyledons from the recent charring experiments (Hart 2021; Whyte 2019) allow an interpretation of taphonomy for the Diable site beans. These results provide additional clues for common bean seed preservation in the archaeological record.

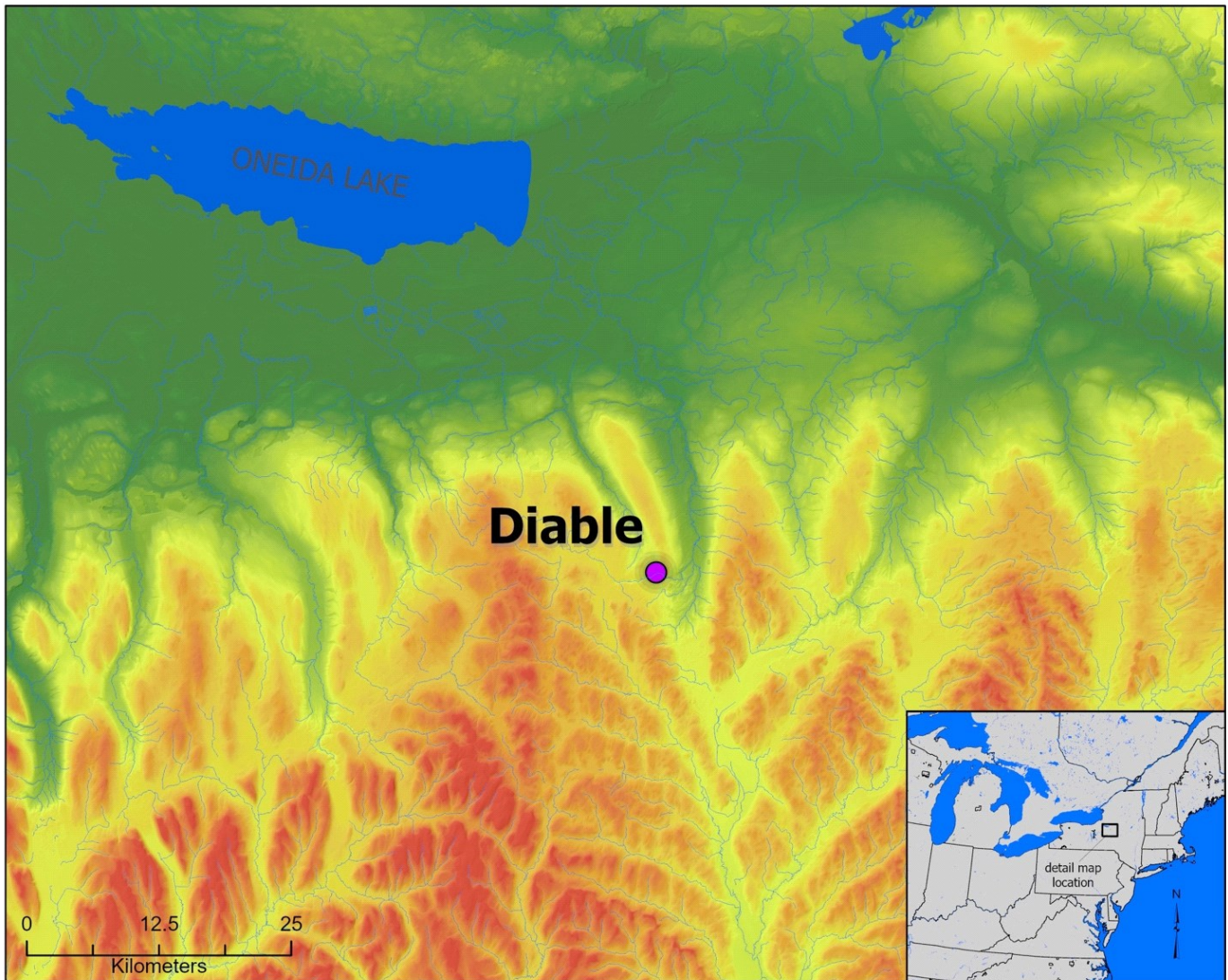
### **The Diable Site Bean Contexts**

The Diable site is an ancestral Oneida Iroquoian palisaded village located along Oneida Creek in Madison County, New York (Figure 1). The site is

situated on a peninsula-like ridge with sharp drop-offs to Oneida Creek on three sides (Pratt 1976:118). The palisade enclosed approximately 1.45 ha, of which 1.1 ha has a gradient low enough for habitation; excavations in the 1980s exposed 1,909.33 square meters, within and immediately outside of the stockade (Weiskotten 1989). These excavations exposed lines of post molds representing portions of longhouses, one complete longhouse, and portions of the palisade. Also exposed and excavated were hearths and deep pits (Bennett et al. 2007; Gibson 1991; Weiskotten 2007).

In addition to small numbers of common bean seeds and cotyledons recovered from various features, large numbers, consisting of charred whole seeds and complete and partial cotyledons, were recovered from two pit features. The first of these was irregularly shaped, measuring 131 cm long, ~80 cm wide, and 69 cm deep, and was apparently bark lined (Gibson 1991). Referring to it as “the bean pit”, Gibson (1991:1) reported that it contained several bushels of bean seeds, as well as a few maize cobs and kernels and squash seeds. There is no indication what method was used to recover the pit’s macrobotanical contents or how much of the deposit was recovered. A small sample of 22 whole common bean seeds and 150 cotyledons presumably from this pit is in the New York State Museum’s (NYSM) collections (catalog number A-A2009.35G.99.77). There are no records tying the sample to the pit, but this is the only feature Gibson (1991) mentions with a substantial amount of common bean seeds.

A second, previously unreported, pit feature yielded a substantial number of charred whole bean seeds and cotyledons and cotyledon fragments. This feature was located immediately adjacent to a longhouse exterior wall. It measured 180 cm by 120 cm in plan and 100 cm deep below the base of the plow zone. No documentation is available on the pit’s excavation other than plan map and profile drawings, one of which indicates a stratum with “corn.” This is presumably where the assemblage originated given that it was contained in a bag labeled “carbonized corn.” Here too, there is no indication as to the recovery method. The collection from this pit (NYSM catalog number A-A2008.02A.11.22) includes 362 whole bean seeds, 4,283 complete cotyledons, and 3,975 cotyledon fragments, as well as 1,014 maize kernels and 148 kernel fragments, 21 pieces of maize cob consisting of single or multiple cupules, and a



**Figure 1** Location of the Diable site.

large amount of wood charcoal. Based on the amount of material and its wide range in size, it is apparently representative of the stratum's macrobotanical assemblage, if not the entire assemblage. As a result, my focus in the present analysis was on this assemblage. For simplicity's sake, this feature is referred to as Pit 2.

### Methods and Materials

#### *Radiocarbon Dates and IRMS Measurements*

Four maize kernels and three bean cotyledons were sampled for accelerator mass spectrometry (AMS) radiocarbon dating. Samples were submitted for AMS dating and isotope ratio mass spectrometry (IRMS) measurement to the Keck-Carbon Cycle AMS facility at the University of California-Irvine (UCIAMS).

Protocols for AMS sample preparation and dating are available on the website (Keck-Carbon Cycle AMS 2022).  $^{13}\text{C}$  and  $^{15}\text{N}$  measurements were made to a precision of  $<0.1\text{‰}$  and  $<0.2\text{‰}$ , respectively using a Fisons NA1500NC elemental analyzer/Finnigan Delta Plus IRMS. Remaining portions of the sampled specimens were returned to the NYSM's collections. Bayesian modeling of the AMS dates was done in OxCal v 4.4.4 (Bronk Ramsey 2009) using the IntCal20 Northern Hemisphere terrestrial calibration curve (Reimer et al. 2020).

#### *Macrobotanical Assemblage*

The common bean seeds from Pit 2 were contained in a large plastic bag intermixed with the rest of the macrobotanical assemblage. Because of the large



number of whole bean seeds, cotyledons, and fragments and maize kernels, it was possible to sort most of them out simply by placing a small amount of the assemblage in a tray and picking bean and maize remains out with forceps. After initial sorting the remaining assemblage was passed through 4-mm and 2-mm nested screens. The sorting process was repeated for those portions remaining in each of these screens. The material falling through the 2-mm screen was not examined.

Length and width measurements were made of whole bean seeds and complete cotyledons with an electronic digital caliper. Length was measured at the longest extent between the anterior and posterior ends. Width was measured perpendicular to length at the hilum location. The length:width ratio was then calculated for each specimen. Photographs were taken of select specimens of bean seeds and cotyledons and maize kernels for illustrative purposes with a Nikon D3300 camera equipped with a 40mm Nikon lens.

## Results

### *Site Chronology*

The Diable site is generally considered to date to the late sixteenth century AD because of the recovery of a large amount of European metal trade goods and a few glass beads (Engelbrecht 2003; Pratt 1976). To refine the age estimate of the Diable site, accelerator mass spectrometry (AMS) dates were obtained on four maize kernels and three common bean seed cotyledons from six features (Table 1).

The dates fall on a large reversal in the IntCal20 calibration curve resulting in multimodal probability distributions falling in the fifteenth and late sixteenth to early seventeenth centuries AD. This is a frequently encountered problem when radiocarbon dating Iroquoian sites (Manning and Birch 2022; Manning et al. 2020). Birch and colleagues' (2021:23) Bayesian modeling of radiocarbon dates from Northern Iroquoian sites indicates that sites with large amounts of European metal artifacts date toward the end of the sixteenth century AD and thereafter (Birch et al. 2021:23). Between AD 1550 and 1575 European metals increasingly occur on village sites throughout the region (Sanft 2022). It is clear based on the large number of European metal objects found on the site, including iron axe heads (Bennett et al. 2007; Gibson 1991) that Diable must date after the mid portion of the sixteenth century AD. Therefore, to resolve the age of the site, AD 1550 was used as a *terminus post quem* (TPQ) in an OxCal Bayesian uniform Phase

model given what is known about European metal circulation and use by Iroquoian peoples. This resulted in a Start Boundary of AD 1574–1616 (95.4% highest posterior density [hpd]), a Date estimate of AD 1583–1626 (95.4% hpd), and an End Boundary of AD 1595–1634 (95.4% hpd). These results suggest that the site's occupation straddled the end of the sixteenth and beginning of the seventeenth centuries AD, coincident with ethnohistorical accounts of Northern Iroquoian Three Sisters agriculture suggesting the dietary importance of common bean seeds.

### *Bean Seed Morphology*

Bean seeds from Pit 2 are renal shaped with narrow anterior and wide posterior halves and generally round ends. Initial inspection of the specimens suggested the possibility of two distinct forms—one with a relatively wide and one with a relatively narrow anterior half (Figure 2a, c). However, closer examination of the cotyledons indicated that the latter represents warping with most of the cotyledon interior burned away and the lateral edges curled upward and sometimes inward (Figure 2b, d). Cotyledons with this shell-like morphology represent 73.7% of the complete cotyledons from Pit 2. Based on a series of bean seed charring experiments, this morphology indicates rehydrated/cooked seeds exposed to temperatures  $\geq 260^{\circ}\text{C}$  (Hart 2021). Consistent with this is the lack of fissures on the dorsal side of the cotyledons and sometimes rippled interior surfaces. That not all the complete cotyledons exhibit this shell-like form indicates that the seeds were subjected to varied temperatures. Blistering on some cotyledons (Figure 2 e, f) suggests direct contact with flames (Whyte 2019).

The possibility that bean seeds were exposed to varied temperatures is supported by an examination of maize kernels. Charring experiments indicate that at temperatures above 250–260 °C maize kernels extrude their endosperms and burn into amorphous masses (Hart and Feranec 2021; King 1987). Maize kernels from Pit 2 include whole kernels with intact pericarps; whole, swollen kernels with intact pericarps; whole and partial kernels with the pericarp and partially extruded endosperm; and crescent-shaped kernels with portions of the pericarp extant and missing points of attachment and embryos (Figure 2). The presence of pericarps indicates that the kernels had not been processed into hominy, which King (1987) suggested was the most likely form of maize

**Table 1** AMS dates on maize kernels and common bean seeds. All dated macrobotanical remains are from feature contexts.

UCIAMS No.	NYSM Catalog No.	Material Dated	<sup>13</sup> C (‰)	<sup>15</sup> N (‰)	<sup>14</sup> C Age (BP)	68.3% Cal Range (AD)	94.5% Cal Range (AD)
236881	A-2008.20.11.22	Maize kernel	-8.3	4.2	38015	1458–1495 (57.7) 1602–1611(10.5)	1453-1514 (71.9) 1590-1620 (23.5)
236882	A-2007.20B.99.3	Maize kernel	-8.9	4.5	38020	1458–1495 (57.7) 1602–1611(10.5)	1453-1514 (71.9) 1590-1620 (23.5)
236883	A-2007.20B.8.1	Maize kernel	-8.7	5.8	37020	1467–1508 (43.4) 1594–1618 (24.9) 1499–1524 (24.5)	1455–1524 (57.9) 1572–1630 (37.6)
236884	A-2008.02A.99.06	Maize kernel	-9.8	2.2	34015	1571–1600 (28.6) 1614–1631 (15.1) 1499–1524 (24.5)	1481–1529 (32.5) 1544–1635 (62.9)
257109	A-2009.35G.99.77	Bean cotyledon	*	0.9	34015	1571–1600 (28.6) 1614–1631 (15.1)	1481–1529 (32.5) 1544–1635 (62.9)
257110	A-2009.35G.99.62	Bean cotyledon	-25.8	2.2	35515	1483–1516 (35.2) 1590–1620 (33.0) 1499–1524 (24.5)	1472–1525 (44.7) 1558–1632 (50.8)
257111	A2007.20B.99.3	Bean cotyledon	*	1.7	34015	1571–1600 (28.6) 1614–1631 (15.1)	1481–1529 (32.5) 1544–1635 (62.9)

\*Sample too small for IRMS <sup>13</sup>C measurement.

kernel to survive charring. A small number of whole kernels with intact pericarps exhibited brown streaks indicating desiccation. In charring experiments this occurred in kernels heated at 180°C, further suggesting the Pit 2 kernels were subjected to varied temperatures (Hart and Feranec 2020; Feranec and Hart 2019).

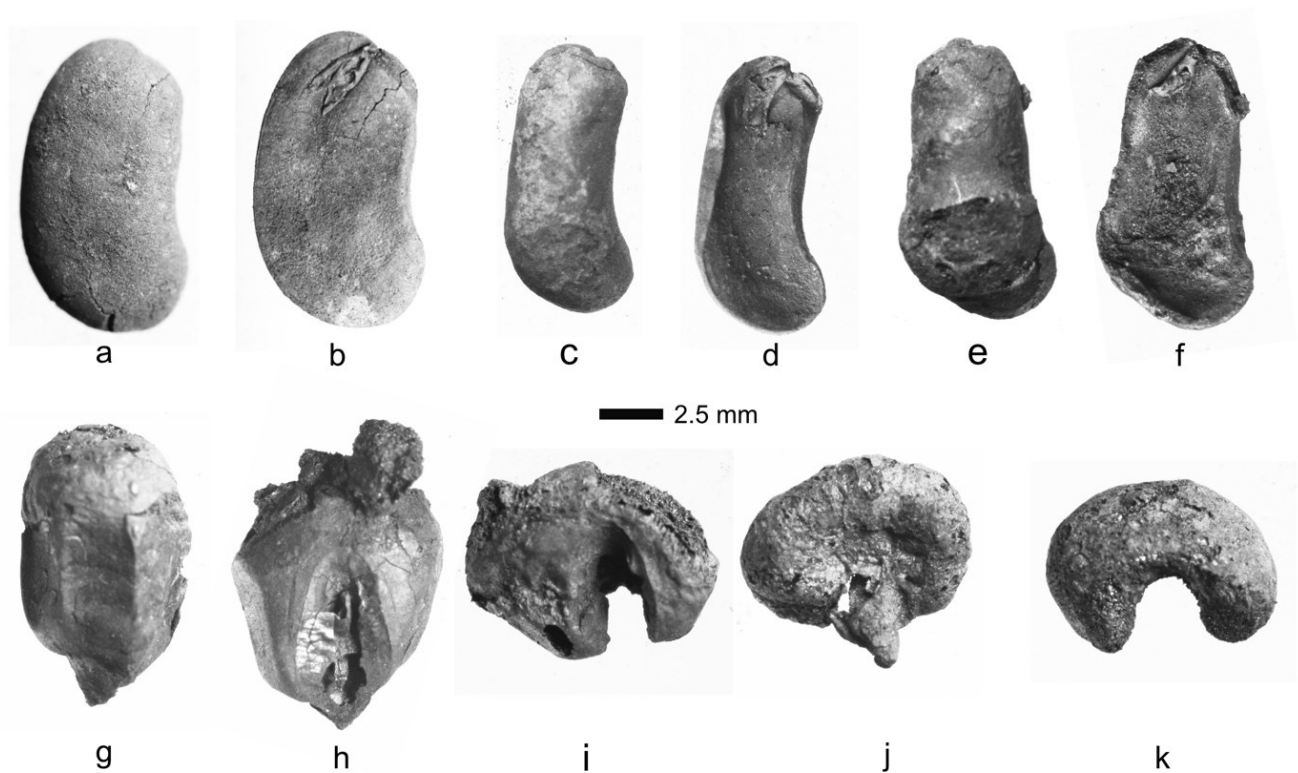
Length and width measurements were made on all whole bean seeds, all cotyledons not exhibiting the warping of the shell-like cotyledons, and 10% (n=316) of the warped cotyledons. All measurements are available in Hart (2022). As is evident in Table 2, the warped cotyledons tend to be narrower than the other cotyledons as reflected in the length:width ratios. The whole seeds and unwarped cotyledons have similar measurements.

### Discussion and Conclusions

That common bean seeds were important components of Northern Iroquoian agronomic systems is attested by the ethnohistorical record. However, common bean seeds are generally sparse in fourteenth–seventeenth century AD macrobotanical

assemblages. Maize kernels and cob fragments, on the other hand, are generally ubiquitous occurring in high percentages of pit feature, hearth, and midden samples. Maize can also occur in massive deposits, while common bean is typically not found in such deposits. This disparity has been attributed to the manners in which the two crops were prepared, with maize having more opportunities to enter and preserve in the archaeological record.

The Diable site is unusual in having at least two pit features with large amounts of charred bean seeds and fragments. An examination of the macrobotanical remains from one of these features provides clues as to how the assemblage formed. The morphology of 73.7% of the complete cotyledons is consistent with rehydrated beans experimentally charred at temperatures ≥ 260°C, with some directly exposed to flames. That not all the cotyledons have these morphologies suggests that the bean seeds were exposed to different temperatures. This is also the case for maize kernels, some of which indicate exposures ≤ 180°C while others indicate exposures



**Figure 2** Examples of common bean cotyledons and maize kernels from Pit 2: (a, b) exterior and interior of an unwarped common bean cotyledon, (c, d) exterior and interior surfaces of a warped common bean cotyledon, (e, f) exterior and interior of common bean cotyledon exhibiting blistering, (g) complete maize kernel, (h) complete maize kernel with partially extruded endosperm, (i) swollen maize kernel with partially extruded endosperm and missing point of attachment and embryo, (j) crescent-shaped maize kernel with partially detached embryo, (k) crescent-shaped maize kernels missing point of attachment and embryo. Note the presence of a complete or partial pericarp on each kernel.

$\geq 250\text{--}260\text{ }^{\circ}\text{C}$ . These results suggest that the assemblage formed as the result of a catastrophic cooking event, such as a pot breaking with the contents spilling into a hearth. That the fire must have been quickly extinguished is suggested not only by the varied morphologies of the bean seeds and maize kernels, but also by the fact that endosperms of some kernels were only partially extruded indicating that the extrusion process was halted before the kernels burned into amorphous masses. This is consistent with Whyte's (2019:236) experimental results, which resulted in large percentages of bean seeds surviving direct exposure to flames if the flames were quickly extinguished through dousing or smothering.

This result indicates that rehydrated/cooked common bean seeds can preserve in large quantities in unusual circumstances. Given that common bean seeds and fragments generally occur in small numbers on Northern Iroquoian sites, the occurrence at the Diable site represents a rare condition in which a large mass of rehydrated bean seeds survived exposure to fire and was subsequently removed and disposed of in a context favorable for preservation. That this chain of events happened, and the result was uncovered during an archaeological excavation, is obviously a rare occurrence. However, the result of this chain of events suggests that common bean was a significant resource for at least one meal at this site and is consistent with the contemporaneous ethnohistorical

**Table 2** Pit 2 bean seed metrics.

Portion	n	Range (mm)			Mean±1σ (mm)		
		Length	Width	L/W	Length	Width	L/W
Whole	362	7.19–14.31	4.01–7.93	1.40–2.49	11.18±1.18	6.10±0.72	1.84±0.15
Unwarped cotyledon	1126	7.91–15.17	4.10–8.48	1.51–2.43	11.47±0.96	6.12±0.62	1.88±0.14
Whole seeds and unwarped cotyledons	1488	7.19–15.17	4.01–8.48	1.40–2.49	11.40±1.02	6.12±0.65	1.86±0.14
Warped cotyledons	316 <sup>1</sup>	8.80–13.55	3.69–6.88	1.56–2.71	10.82±0.81	5.18±0.55	2.10±0.20

<sup>1</sup>A total 3,157 whole, warped cotyledons are in the assemblage.

record indicating common bean was an important constituent of Northern Iroquoian diets.

### Acknowledgments

I thank Susan Winchell-Sweeney for drafting Figure 1.

### Declarations

*Permissions:* Permission was received from the New York State Museum for radiocarbon date destructive analysis.

*Sources of funding:* The New York State Museum funded the radiocarbon dates.

*Conflicts of Interest:* None declared.

### References Cited

Archaeological Services Inc. 2012. The Archaeology of the Mantle Site (AlGt-334): A Report on the Stage 3-4 Salvage Excavation of the Mantle site (AlGt-34) Part of Lot 33, Concession 9, Town of Whitchurch-Stouffville, Regional Municipality of York, Ontario. Ontario Ministry of Culture, Tourism and Sport, Toronto. Available at: <https://asiheritage.ca/wp-content/uploads/2020/06/Mantle-Final-Report.pdf>. Accessed on September 24, 2022.

Bennett, M., G. L. Hayes, and S. A. Young. 2007. The Diable Site (MSV-2-2): A Protohistoric Oneida Iroquois Village. *The Bulletin of the Chenango Chapter of the New York State Archaeological Association* 30(1):41–73.

Biggar, H. P., ed. 1929. *The Works of Samuel de Champlain in Six Volumes. Vol. 3, 1615–1618*. The Champlain Society, Toronto.

Birch, J. 2015. Current Research on the Historical Development of Northern Iroquoian Societies. *Journal of Archaeological Research* 23:263–323. DOI:10.1007/s10814-015-9082-3.

Birch, J., Manning, S. W., Sanft, S., and Conger, M. A. 2021. Refined Radiocarbon Chronologies for Northern Iroquoian Site Sequences: Implications for Coalescence, Conflict, and the Reception of European Goods. *American Antiquity* 86:61–89. DOI:10.1017/aaq.2020.73.

Bronk Ramsey, C. 2009. Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51:337–360. DOI:10.1017/S0033822200038212.

de Souza, R. J., N. M. Bilodeau, K. Gordon, A. D. Davis, J. C. Stearns, M. Cranmer-Byng, K. Gasparelli, L. D. Hill, and S. S. Anand. 2021. Entsisewata'karí: teke (You Will be Healthy Again): Clinical Outcomes of Returning to a Traditional Haudenosaunee Diet. *International Journal of Indigenous Health* 16:82–119. DOI:10.32799/ijih.v16i2.33098.

Engelbrecht, W. 2003. *Iroquoia: The Development of a Native World*. Syracuse University Press, Syracuse, NY.

Fecteau, R. D. 1985. The Introduction and Diffusion of Cultivated Plants in Southern Ontario. Unpublished Master's Thesis, Department of Geography, York University, Toronto, ON, Canada.

Feranec, R. S., and J. P. Hart. 2019. Fish and Maize: Bayesian Mixing Models of Fourteenth-Through Seventeenth-Century AD Ancestral Wendat Diets, Ontario, Canada. *Scientific Reports* 9:1–9. DOI:10.1038/s41598-019-53076-7.

Fritz, G. J. 1990. Multiple Pathways to Farming in Precontact Eastern North America. *Journal of World Prehistory* 4:387–435. DOI:10.1007/BF00974813.

Fritz, G. J. 2011. The Role Of “Tropical” Crops in Early North America. In *The Subsistence Economies of Indigenous North American Societies*, edited by B. D.



- Smith, pp. 503–516. Smithsonian Institution Scholarly Press, Washington, DC.
- Gibson, S. 1991. The Bean Pit, Msv2, Diable Site. *The Bulletin of the Chenango Chapter of the New York State Archaeological Association* 24(1):1–14.
- Hart, J. P. 2021. The Effects of Charring on Common Bean (*Phaseolus vulgaris* L) Seed Morphology and Strength. *Journal of Archaeological Science: Reports* 37:102996. DOI:10.1016/j.jasrep.2021.102996.
- Hart, J. P. 2022. Diable Pit 2 Bean Measurements [website]. Available at: <https://doi.org/10.5281/zenodo.7093392>. Accessed September 24, 2022.
- Hart, J. P., and R. S. Feranec. 2020. Using Maize  $\delta^{15}\text{N}$  Values to Assess Soil Fertility in Fifteenth- and Sixteenth-Century AD Iroquoian Agricultural Fields. *PLOS ONE* 15:e0230952. DOI:10.1371/journal.pone.0230952.
- Heidenreich, C. E. 1971. *Huronian: A History and Geography of the Huron Indians, 1600–1650*. McClelland & Stewart, Toronto.
- Keck-Carbon Cycle AMS. 2022. Protocols [webpage]. Available at: <https://sites.uci.edu/keckams/protocols/>. Accessed September 24, 2022.
- King, F. B. 1987. Prehistoric Maize in Eastern North America: An Evolutionary Evaluation. Doctoral Dissertation, Department of Crop Sciences, University of Illinois at Urbana-Champaign, Urbana, IL. Available from ProQuest Dissertations and Theses database (UMI No. 8803089).
- Manning, S. W., and J. Birch. 2022. A Centennial Ambiguity: The Challenge of Resolving the Date of the Jean-Baptiste Lainé (Mantle), Ontario, Site—Around AD 1500 or AD 1600?—and the Case for Wood-Charcoal as a *Terminus Post Quem*. *Radiocarbon* 64:279–308. DOI:10.1017/RDC.2022.23.
- Manning, S. W., J. Birch, M. A. Conger, and S. Sanft. 2020. Resolving Time Among Non-Stratified Short-Duration Contexts on a Radiocarbon Plateau: Possibilities and Challenges from the AD 1480–1630 Example and Northeastern North America. *Radiocarbon* 62:1785–1807. DOI:10.1017/RDC.2020.51.
- Monckton, S. G. 1992. *Huron Paleoethnobotany*. Ontario Archaeological Reports 1. Ontario Heritage Foundation, Toronto.
- Mt. Pleasant, J. 2016. Food Yields and Nutrient Analyses of the Three Sisters: A Haudenosaunee Cropping System. *Ethnobiology Letters* 7:87–98. DOI:10.14237/ebl.7.1.2016.721.
- Ngapo, T. M., P. Bilodeau, Y. Arcand, M. T. Charles, A. Diederichsen, I. Germain, O. Liu, S. MacKinnon, A. J. Messiga, M. Mondor, S. Villeneuve, N. Ziadi, and S. Gariépy. 2021. Historical Indigenous Food Preparation Using Produce of the Three Sisters Intercropping System. *Foods* 10: 524. DOI:10.3390/foods10030524.
- Ounjian, G. L. 1998. Glen Meyer and Prehistoric Neutral Paleoethnobotany. Doctoral Dissertation, Department of Anthropology, University of Toronto, Toronto, ON, Canada. Available from ProQuest Dissertations and Theses database (UMI No. NQ35273).
- Parker, A. C. 1910. *Iroquois Uses of Maize and Other Food Plants*. New York State Museum Bulletin 144. University of the State of New York, Albany.
- Pfeiffer, S., J. C. Sealy, R. F. Williamson, S. Needs-Howarth, and L. Lesage. 2016. Maize, Fish, and Deer: Investigating Dietary Staples Among Ancestral Huron-Wendat Villages, as Documented from Tooth Samples. *American Antiquity* 81:515–532. DOI:10.1017/S0002731600003978.
- Pratt, P. P. 1976. *Archaeology of the Oneida Iroquois (No. 1)*. Man in the Northeast, George's Mills, NH.
- Reimer, P. J., W. E. N. Austin, E. Bard, A. Bayliss, P. G. Blackwell, C. Bronk Ramsey, M. Butzin, H. Cheng, R.L. Edwards, M. Friedrich, P. M. Grootes, T. P. Guilderson, I. Hajdas, T. J. Heaton, A. G. Hogg, K. A. Hughen, B. Kromer, S. W. Manning, R. Muscheler, J. G. Palmer, C. Pearson, J. van der Plicht, R. W. Reimer, D. A. Richards, E. M. Scott, J. R. Southon, C. S. M. Turney, L. Wacker, F. Adolphi, U. Büntgen, M. Capano, S. M. Fahrni, A. Fogtmann-Schulz, R. Friedrich, P. Köhler, S. Kudsk, F. Miyake, J. Olsen, F. Reinig, M. Sakamoto, A. Sookdeo, and S. Talamo. 2020. The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). *Radiocarbon* 62:725–757. DOI:10.1017/RDC.2020.41.
- Sanft, S. M. 2022. The Circulation of Shell and Copper Objects in the Circa 1450–1600 Haudenosaunee Homeland. Unpublished Doctoral Dissertation, Department of Anthropology, Cornell University, Ithaca, NY.
- Smith, B. D. 1992. *Rivers of Change: Essays on Early Agriculture in Eastern North America*. Smithsonian Institution Press, Washington, DC.





- Thwaites, R. G. (editor). 1898. *The Jesuit Relations and Allied Documents; Travels and Explorations of the Jesuit Missionaries in New France, 1610-1791, 71 volumes; the original French, Latin, and Italian Texts, with English Translations and Notes*. Burrows Bros. Co., Cleveland, OH.
- Wagner, G. 1987. Uses of Plants by Fort Ancient Indians. Doctoral Dissertation, Department of Anthropology, Washington University, St. Louis, MO. Available from ProQuest Dissertations and Theses database (UMI No. 8809599).
- Waugh, F. W. 1916. *Iroquis [sic] Foods and Food Preparation*. Gov't. Printing Bureau, Ottawa.
- Weiskotten, D. H. 1989. Areas of Recorded Excavations as of 5/10/1989, Diable Site, MSV-2-2. Unpublished manuscript on file at the New York State Museum, Albany, accession number A2008.02A.
- Weiskotten, D. H. 2007. Summary of Excavations Done on the Diable Site, MSV-2-2 (NYSM #665), Stockbridge, New York: Principally Those on the Southwest Point, September-November 1985. *The Bulletin of the Chenango Chapter of the New York State Archaeological Association* 30(1):75–103.
- Whyte, T. R. 2019. An Experimental Study of Bean and Maize Burning to Interpret Evidence from Stillhouse Hollow Cave in Western North Carolina. *Southeastern Archaeology* 38:230–239. DOI:10.1080/0734578X.2019.1616275
- Wrong, G. M., ed. 1939. *Sagard's Long Journey to the Country of the Hurons*. The Champlain Society, Toronto, ON, Canada.