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STILL MORE ON THE ANTIQUITY OF MAPLE SUGAR AND SYRUP IN ABORIGINAL EASTERN NORTH AMERICA

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ABSTRACT.—For almost three centuries historians and ethnologists have debated the question of whether the production of maple sugar was an indigenous (pre-contact) or European-inspired development in North America. This question has recently become important to archaeologists as they attempt to define the nature of prehistoric settlement-subsistence systems in the Northeastern-Great Lakes area of North America. On the basis of experimentation with aboriginal technology and a re-evaluation of linguistic data, oral traditions, and early historic documents it is concluded that the controversy is largely semantic in nature; making the distinction between maple syrup and maple sugar, the available information suggests that maple syrup was produced prehistorically but that maple sugar production does not predate ca. 1675.

RESUMEN.—La antigüedad de la producción del azúcar de arce en la América del Norte ha sido debatida por historiadores y etnólogos durante casi tres siglos. ¿Fue el azúcar de arce un producto indígena (precolombino), o fue introducido por colonizadores europeos? Recientemente esta pregunta ha adquirido importancia conforme los arqueólogos tratan de definir la naturaleza de los patrones prehistóricos de subsistencia y asentamiento en la región Nordeste-Grandes Lagos de Norteamérica. Basándose en experimentos con la tecnología aborigen y en reinterpretaciones de datos lingüísticos, tradiciones orales y documentos históricos tempranos, este informe concluye que la controversia es en gran parte semántica. El jarabe de arce y el azúcar de arce deben diferenciarse. La información disponible sugiere, que el jarabe de arce se producía en tiempos prehistóricos, pero que la producción de azúcar no se inició antes de 1675 d.C., aproximadamente.

RÉSUMÉ.—Les historiens et les ethnologues ont débattu depuis presque trois siècles de l'origine de la production du sucre d'érable: a-t-elle été le résultat d'un développement indigène (pré-contact) ou de l'importation d'une pratique européenne en Amérique du Nord? Cette question a récemment pris de l'importance auprès des archéologues, dans leur tentative de définir la nature de systèmes préhistoriques de subsistence-établissement dans les régions du nord-est et des Grand Lacs américains. S'appuyant sur l'expérimentation de la technologie aborigène et sur la réévaluation des données linguistiques, des traditions orales et des documents historiques anciens, la recherche est arrivée à la conclusion que la controverse est largement sémantique par nature. Parce qu'elle fait la distinction entre le sirop d'érable et le sucre d'érable, l'information disponible suggère que le sirop d'érable est une production préhistorique, mais que la production du sucre n'est pas apparue avant les environs de 1675.

INTRODUCTION

The origin and antiquity of the production of maple sap into syrup and sugar, although hardly ranking among the most important questions concerning the subsistence economies of the indigenous populations of eastern North America,

is nevertheless a subject that has generated considerable interest and controversy for 300 years. Two recent publications (Pendergast 1982; Mason 1986) have summarized the history of this debate in some detail. The subject was originally a concern primarily of ethnohistorians and ethnologists, who drew upon the same corpus of early historic documents, oral traditions, and ethnographic data to arrive at opposed conclusions; either the processing of maple sap was an indigenous American Indian practice that, prior to the introduction of European utensils, was accomplished with aboriginal technology, or it was a development that occurred after European contact and was dependent on the introduction of European technology.

As the interests of Americanist ethnohistorians and ethnologists shifted to other concerns, the topic faded, at least as a controversy, by about 1950. In the last 15 years, however, the subject (and controversy) has re-emerged as an archaeological issue. If "sugaring" was a subsistence activity of the prehistoric populations of the sub-boreal and temperate zones of eastern and central North America, its antiquity and dietary importance must be demonstrated before the settlement and subsistence systems for this area can be reconstructed and understood. Reflecting this concern, there have recently appeared a number of articles that either describe what are assumed to be archaeological "sugar camps" (Pendergast 1974; Kingsley and Garland 1980; Holman 1984), argue forcefully that maple sugar was produced and was important prehistorically (Pendergast 1982; Holman and Egan 1985; Holman 1986), or argue equally as forcefully that it was not part of the prehistoric subsistence systems (Mason 1985; 1986; 1987).

The well-designed experiments of Holman and Egan (1985), whereby it was demonstrated that maple sap could feasibly be processed with aboriginal technology, have considerable bearing on this problem. I have carried part of these experiments a step farther, and the insights so gained are the basis for re-evaluating, from a perspective different from that of most previous investigators, the linguistic data, oral traditions, and early historic documents that pertain to the origin and antiquity of maple products.

BIOLOGICAL AND TECHNICAL ASPECTS OF MAPLE PRODUCTS

Sap that rises in maple trees in the late winter-early spring has a high sugar content, and by the collection and evaporation of the sap maple syrup and sugar are produced. Of the American maples, *Acer saccharum* (sugar maple, érable à sucre) and *A. nigrum* (black maple, érable noir) have been and are most used for the production of syrup and sugar. One or both are common forest constituents from New England and the Maritime Provinces to the Great Lakes, and their sap has the highest sugar content (average 2.5%, or 1:40) of the maple species. Although having a somewhat lower sugar content (average 2.0%, or 1:50), the sap of *A. rubrum* (red maple, érable rouge), *A. saccharinium* (silver maple, érable argenté), and *A. negundo* (box elder, Manitoba maple, érable négundo) will also yield acceptable syrup and sugar, and in some areas one or more of these species have been and are used for this purpose.

Historically, the manufacture of maple products has been widely practiced from New England and the Maritime Provinces westward through New York,

southern Quebec, southern Ontario, Michigan, Wisconsin, and eastern Minnesota. The preferred (and in most areas exclusive) species utilized in this zone are sugar maple and black maple, and the "sugar season" begins between mid February to early March and extends into April. To the south of this area, through Missouri, Illinois, Indiana, Ohio and southward into the Appalachian highlands, "sugaring" was and is also practiced, but to a more limited extent. Sugar maple is the preferred species in this area, although some considerable use is also made of red and (to a lesser extent) silver maple. Near the southern margin of this zone the season often commences in mid January and usually ends by early to mid March. In the northern Plains (North Dakota and southern Manitoba and Saskatchewan), where box elder is the most common or only maple, the sap does not begin rising until April, and the syrup-sugar season extends until early June.

At the time of early European contact, the techniques for collecting the sap were either to slash the bark in a V-shaped pattern and to prop or hang a container at the bottom of the V, or to cut or drill a hole through the bark and then drive a wooden spile into the hole, from which a container was hung. Prior to this century, when evaporator pans have increasingly been employed, the method of processing the sap was to place it in a large metal kettle suspended over a fire and boil it to reduce the water content.

Maple syrup, which will result from simple evaporation, is sap in which the water content has been reduced to 50% to 33% of the fluid (modern commercial-grade maple syrup is at least 65% sugar). The syrup stage can be determined with a hydrometer, a thermometer (boiling temperature of 65% syrup is 104°C/219°F at sea level), or, with experience, taste, the appearance of the bubbles while boiling, or the way it "aprons" when dripping from a spoon. Maple sugar is produced by continued boiling of the syrup until the sugar concentration reaches 98% to 99% (at which point the boiling temperature is *ca.* 121°C/250°F), and then removing the container from the source of heat and vigorously stirring or beating the contents as they cool in order to granulate the sugar. Failure to stir will result in the sugar cooling into a hard, crystalline mass which, except as maple "rock candy," is difficult to utilize.

The advantages of sugar over syrup, in addition to the reduction in weight through the elimination of the water, are that as a solid it is easier to store and transport, and if sugar is kept dry it can be preserved for long periods. Syrup, being a fluid, is more difficult to store and transport. Furthermore, unless kept constantly cool, canned, or treated with preservatives (potassium sorbate and sodium citrate are widely used for this purpose today) it will quickly mold and, at concentrations less than 65% sugar, will ferment. Cold preservation would not have extended much beyond the season of manufacture, and the other preservation techniques were not available until very recently.

THE ANTIQUITY OF USE OF MAPLE PRODUCTS

Given the nature of collecting maple sap and processing it into syrup or sugar, there is nothing that survives in the archaeological record that is an unequivocal indicator of this activity. The question of its presence in the prehistoric past, therefore, can only be approached through indirect evidence, all of which is also

equivocal. In the absence of hard data, the academic community has divided into diametrically opposed camps, which hold, simply put, that the use of maple products (a) was an American Indian practice that began sometime in the prehistoric period with aboriginal technology, or (b) began after the arrival of Europeans and was dependent on European technology.

(a) *The case for antiquity*—The proponents of the position that maple use was an early, indigenous development in North America have drawn upon four considerations, singly or in combination, to form the basis for their argument. First is a group of observations that emphasize the importance of maple products in the subsistence systems of the historic American Indians, the degree to which maple sugar was integrated into the economic, social, and mythological fabric, and the wide geographical distribution of maple use, combined with the absence of a maple-using tradition in Europe (cf. Henshaw 1890; Chamberlain 1891; Pendergast 1982).

Oral traditions are also frequently cited in support of a pre-European antiquity for the practice. Of these traditions, one stands out as particularly interesting, because it refers to sugar-making without European utensils. In the early 19th century, a Kickapoo chief stated that before metal kettles were available the Indians had:

> . . . the art of excavating the trees in order to make troughs of them, of placing the sap in these, of heating the stones and throwing them into the sap so as to cause it to boil, and by this means reducing it into sugar (Keating 1825:114-115).

Although this tradition was recorded many generations after European contact (and some 150 years after the introduction of metal kettles), the fact that the tradition exists at all, with its explicit reference to pre-European maple sap processing using aboriginal technology, has been considered noteworthy (Henshaw 1890; Nearing and Nearing 1950; Holman and Egan 1985).

Linguistic data also suggest antiquity. Henshaw (1890) and Gilmore (1919), on the basis of examination of native terminology for maple sugar in a selected number of languages, concluded that the absence of European borrowings for this substance, coupled with the etymologies referring to its manufacture from sap, indicated that maple usage was pre-European. This position is strengthened by the consideration of sugar terminology in an expanded suite of native languages (Table 1); apparent intrafamily cognates are common, and the etymologies are similar across language families from the Atlantic coast to the northern Plains.

Finally, in a series of well-designed replication experiments, Holman and Egan (1985) have demonstrated that by using only stone-boiling, direct heating in birch bark containers, or direct heating in ceramic vessels it is feasible to manufacture maple syrup.

(b) *The case against antiquity*—Of the arguments that have been offered against the antiquity of maple use in North America, the earliest stress the importance of the physical technology of the Europeans, specifically the large kettles of brass, copper, or iron in which the sap was evaporated into syrup and sugar in the

TABLE 1.—American Indian terminology for maple sugar.

SIOUAN		
Omaha	žo^{n}ni	"wood water" (Gilmore 1919:100)
Kansa	žo^{n}ni	"wood water" (Henshaw 1890:351)
Osage	žo^{n}i	"wood water" (La Flesche 1932:226)
Winnebago	-danijura	"wood water" + -jura (Marino 1968: 328)
Ioway	na^{n}ni	"wood water" (Henshaw 1890:351)
Dakota	ča^{n}ha^{n}pi	"wood sap" (Gilmore 1919:100)
IROQUOIAN		
Tuscarora	urẽ$^{?}$ná:kri$^{?}$	"tree sap" (Henshaw 1890:351)
Oneida	onũtákli$^{?}$	Modified? Contains verb root -kli$^{?}$, meaning "be the juice of" (M. Mithun, pers. comm. 5/14/86)
Seneca	$^{?}$owæ:nɔ$^{?}$	Compare $^{?}$oæenɔ$^{?}$, "sap" (Chafe 1967: 47)
ALGONQUIAN		
Ojibwa	sensepa'kwot	"from wood" (Henshaw 1890:349)
Cree	sisipaskwat	(Lacombe 1874:597)
Sauk	-si'sebak^{w}	(Skinner 1925:139)
Micmac	sesmogen	(Rand 1888:258). Cognate with Ojibwa, Cree and Sauk?
Potawatomi	šopomo	(Smith 1933:93). Compare with Ojibwa ousebun and Delaware wsúpi, "sap"
Menomini	šo'pomo	(Hoffman 1896:326)
CADDOAN		
Pawnee	nakits	Contraction of nakis "tree" and kitsu "water" (Gilmore 1919:100)

historic era. Many have argued that before these utensils were available it would have been impractical if not impossible to process maple sap (e.g. Ganong 1910:123 footnote; Waugh 1916:141; Yarnell 1964:78). This position has recently been weakened by the experiments of Holman and Egan (1985), as discussed above, who demonstrated the feasibility of producing maple *syrup* with aboriginal technology. However, as will be discussed subsequently, the technology argument may still have considerable merit in regard to the manufacture of maple *sugar*.

The most compelling argument for a post-contact origin of maple sugar manufacture was first presented by Ganong (1910:123 footnote), again by Flannery (1939:22) and Keesing (1939:21), and more recently and more extensively by Mason (1985; 1986; 1987). After an exhaustive search of the early ethnohistorical documents for North America, it has been pointed out that whereas the literature some 150 years after first contact is replete with references to maple sugar and its manufacture, importance, and value, the accounts of Indian life prior to *ca.* 1675 are completely silent on the subject of maple sugar. Why, it is asked, would an article as "tasty" and with such obvious commercial potential as maple sugar be overlooked or ignored by generations of the earliest European observers if indeed it had been present in the Indian economic systems prior to *ca.* 1675?

SUGAR VERSUS SYRUP

The resolution of the prehistoric (Indian) versus historic (European) origin controversy might be that both positions are partly correct—and partly wrong. The key is the distinction between syrup (and syrup making) and sugar (and sugar making). With the notable exceptions of Charlevoix (1761:192) and Waugh (1916:140), persons considering the aboriginal manufacture and use of maple products usually have not made this distinction, either using the term sugar exclusively or using sugar and syrup interchangeably. Holman and Egan, for example, after demonstrating experimentally that syrup (up to 61.5% sugar solution) could be produced using aboriginal technology, concluded that "the introduction of metal kettles was not a necessary condition for the . . . production of maple syrup *or sugar*" (1985:70, emphasis added).

While true that in a chemical sense the difference between maple syrup and maple sugar is only the proportion of water, and also true that both are produced by reducing the water content of maple sap by evaporation, there are three practical differences between the two, which, I submit, have a considerable bearing on their production. Syrup will result from simple evaporation at relatively low temperatures (sap boils at 100°C at 2.0-2.5% sugar solution, increasing to 104°C at the 65% or syrup stage). To keep the syrup at a rolling boil as it approaches the sugar stage, which is necessary if the syrup-to-sugar conversion is to be accomplished within a reasonable length of time, heat must be significantly increased, for the boiling temperature of "pure" sugar (98-99%) is *ca.* 121°C. Secondly, to prevent the concentrated mass from scorching, the bottom of the container must be constantly scraped. Thirdly, if granular sugar, rather than a hard-to-use crystalline mass of "maple rock candy," is the desired product, it is necessary to vigorously stir the liquefied sugar as it cools in order to break the crystallizing mass into granular pieces and to introduce air between the granules (Nearing and Nearing 1950:188). All three factors are relevant in regard to the use of aboriginal boiling utensils and techniques (stone-boiling, bark containers, ceramic vessels) versus European utensils (metal kettles).

To first consider stone-boiling of maple sap in wooden troughs or bark containers, Holman and Egan (1985) have demonstrated that syrup with a sugar content of up to 59% can be produced by this technique and that the required

time to achieve this concentration is only 14% greater than using a metal kettle placed over a fire (one should note, however, that kettle boiling is a relatively passive activity, requiring only the occasional addition of sap to the kettle and fuel to the fire, whereas stone-boiling is much more active, requiring not only the addition of sap and fuel but also the nearly constant insertion and removal of stones from both the fire and boiling container). In a limited exercise, I have carried Holman and Egan's experiment a step farther. Stones were heated in an open, unbellowed wood fire and then inserted into 65% syrup, bringing the mixture to a boil. With boiling the sugar concentration continued to increase. However, when the concentration reached 75%, the insertion of stones sufficiently hot to maintain boiling caused the mixture to begin caramelizing on the rocks. At 83% the caramelized masses began charring, imparting a dark color and slightly burned taste to the syrup. By 91%, where the experiment was terminated, a strong odor of burning accompanied the insertion of the hot stones. When cooled, the semi-fluid product was very dark, had a bitter, burned, not very sweet taste, and was probably at least partly indigestible. The results of this experiment indicate that while it is feasible to produce maple syrup by stone-boiling, it would be at best very difficult (I think impossible) to make sugar by this technique.

Holman and Egan have also demonstrated the feasibility of producing 61.5% syrup by putting sap in shallow birch bark trays that were placed directly above glowing charcoal. I have not experimented with this technique, but one of the unintended results of Holman and Egan's experiments (1985:66) was that in the process of achieving a syrup-stage concentration one of their four bark containers ignited, with the resultant loss of the container and its contents. This is illuminating, for to increase boiling temperatures from the syrup stage (104°C) to the sugar stage (121°C) would require even greater amounts of heat and the consequent increased danger of ignition of the container; constant and very close attention would be required to prevent this catastrophe. Furthermore, even assuming that the sugar-stage could be accomplished in direct heated bark containers, there is another consideration. Birch bark is a relatively "flimsy" material, and the consequence is that without reinforcement with ribbing (as in a canoe, which would be impractical in a boiling utensil) only small containers could be used (Holman and Egan's were less than two liters capacity); sugar could be produced only in very small batches. And finally, I would think that the shape of the bark trays and their flexibility would make it very difficult, if not impossible, to stir or beat the liquid sugar in the manner required to make granular sugar.

Ceramic vessels were used aboriginally in eastern North America to boil water in the cooking of stew, soup, porridge, and mush, and Holman and Egan have demonstrated that maple syrup of at least low sugar content can also be produced by direct heating in ceramic vessels more or less analogous to those used in the prehistoric and early historic periods. Although again I have not experimented with producing sugar using such utensils, I suspect that it would be both difficult and risky, with a very high cost to benefit ratio. The required increase in heat that is necessary to keep the water-sugar solution boiling as the sugar content increases from 65% to 98% would greatly increase the risk of thermal shock to the vessel, and the chances of this occurring would be significantly increased at the final stage when not only would the vessel and its contents are at their

hottest but also when it is necessary to constantly scrape the interior walls of the vessel with a wooden paddle (to prevent scorching), in the process unavoidably striking against the walls. Furthermore, even if granular sugar could be produced without catastrophic failure in ceramic vessels, it is my impression that the prehistoric-early historic vessels of northeastern North America were poorly designed for sugar-making; they are relatively tall compared to their width, bottoms are rounded or pointed, and orifices are usually restricted, all characteristics that are not well adapted for efficient evaporation or for vigorous scraping and stirring.

The difficulty (and with some techniques probable impossibility) of producing sugar with aboriginal techniques and utensils is to be contrasted with the relative ease by which sugar can be produced with metal kettles. A large, open-orifice kettle is suspended (by its metal bail) over a fire, sap is added, fuel is replenished at intervals and as needed to keep the fluid boiling rapidly, and the sap to syrup to liquid sugar proceeds without fear of ignition or breakage of the container. When the sugar stage is reached, the kettle can easily be removed from the fire (utilizing the metal bail) and the contents stirred without danger of either tipping or breaking the kettle. The most reasonable conclusion, given the validity of the above observations, is that maple *sugar*-making was indeed an historic development, that sugar was not made before metal kettles became widely available to the native American populations.

But the technological arguments for the non-antiquity of sugar-making do not apply to syrup. The experiments of Holman and Egan (1985) have shown that syrup production is feasible with the technology available to pre-contact Indians. Furthermore, the oral traditions and folklore of the native Americans, which suggest an antiquity for "sugar," can be read equally as well for syrup. And the linguistic data, which I find the most compelling of the indirect indicators of a pre-European origin, very strongly suggest that the original product was syrup; note in Table 1 that the native terminology for the solid (i.e. sugar) refers without exception to a liquid (e.g. "wood, water," "tree juice," "sap"), or syrup.

THE SILENCE OF THE EARLY HISTORIC DOCUMENTS ON SYRUP

Although experimentation has demonstrated that it is feasible to produce maple syrup with pre-European technology, and oral traditions, folkloristic motifs, and linguistics suggest that syrup production was of some antiquity in North America, we are still confronted with what could be a rephrasing of the earlier question in regard to sugar: Why, if maple syrup was being produced at the time of initial European contact, did it escape the notice of the earliest European observers? As Keesing (1939:22), Mason (1986:307; 1987:102), and others have noted, the only references to the use of maple products before *ca.* 1675 was the "drinking of the sap." The answer to this question might lie in the nature of the prehistoric-early historic use of maple products, and here several considerations are of importance.

First, the earliest references to maple sugar coincide with its production in commercial quantities. In a minor way its production and position in the Indian economy at that time might be compared to the role of furs and hides. Moreover,

because sugar is relatively easily to store and transport, it would have an obvious commercial value. Syrup, on the other hand, will spoil rapidly and is relatively difficult to transport; therefore its value is for immediate, or nearly immediate, consumption close to its area of production.

Second, maple sap is available in late winter-early spring, the "hungry months" of the northern latitudes. At the beginning of this season many mammals are in hibernation and those that aren't are at the lowest ebb of their annual population densities and fat cycles; fishing is difficult because of the thickness of the ice; edible tubers cannot be found or dug because of the snow cover and frozen ground; and the arrival of the spring migration of waterfowl or the beginning of the anadromous fish runs are still six weeks or more in the future. Unless human populations in this environment had stored foodstuffs upon which to rely, their choices for sustenance during this season would be lean, low-density terrestrial animals, the edible cambium of slippery elm *(Ulmus rubra)* and green ash *(Fraxinus pennsylvanica)*, and processed maple sap.

For populations who normally had sufficient quantities of stored foods to carry them through the early spring (and before there were the means and the commercial reasons to produce sugar), syrup production might have been a sporadic activity, carried out only in those occasional years when stored foods were inadequate. Alternatively, production may have been an adjunct activity carried out as a dietrary supplement by only certain members of the social group, with the product (syrup) being consumed at the place of manufacture and within a few days or weeks of its production. The opportunities for the earliest Europeans, who at that time could often be considered only casual observers, to notice such practices would have been limited.

Third, making the distinction between syrup and sugar, it is worthwhile to re-examine the earliest historical documents in regard to the use of maple products. Ganong (1910), Flannery (1939), Keesing (1939), and Mason (1985; 1986; 1987) are on solid ground when they argue that the absence of references to sugar prior to *ca.* 1675 constitutes strong evidence against sugar production prior to that date. However, when they argue that all references to the use of maple products before 1675 are only to "the drinking of maple sap," their basis is not as firm.

The earliest comment on maple products is by Thevet in 1557 (quoted in Pendergast 1982:9-14, 33) who, apparently in reference to the Cartier or Roberval expeditions to Canada between 1535 and 1543, stated that "someone" cut down a tree (presumably a maple) and found that of the sap that poured forth possessed a taste "resembling that of the good wines of Orleans or Beaune," and that "the Canadians [Indians], much liking the drink . . . , now care for these trees in order to make it . . ." Pendergast (1982) has argued that this document is strong support for the existence of maple *sugar* at the time of initial European contact. In a recent article, Mason (1987) has thoroughly criticized Pendergast's argument, pointing out that there is no assurance that the "someone" who discovered the taste of the sap refers to an Indian (although in context it seems to me that it does) and, more cogently, that the use of the sap was only as a beverage, not as sugar. She is puzzled however by the comparison of the taste to that of "good wines," and can only offer that "either their memories of French wine were fading or they were being consciously ironic . . ." (Mason 1987:101).

The comparison to sweet wine would not be puzzling if one assumed that the Canadian Indians were presenting the French with sap that had been boiled to at least a semblance of syrup.

The next reference to the use of sap is a single sentence by Lescarbot, pertaining to his observations in 1607 among either the Micmacs or Abnakis, who "have the skill of sucking *[de sucer:* sucking, draining, drawing from] certain trees . . . a sweet and very pleasant liquor . . ." (Grant 1914:194). As with the Thevet statement above, this seems to be an overly generous assessment of the sweetness of unprocessed maple sap. Even more suggestive that at least thin syrup, rather than simply sap, was being drunk is the statement by Le Jeune in 1634 in regard to the Montagnais, namely that there is "a certain tree, . . . which they split *[fendent:* split, cleave, slit] in the Spring to get from it a juice, *sweet as honey* or as sugar" (Thwaites 1959:273, emphasis added). Somewhat later (but still "pre-sugar"), Denys in 1672, referring to his experiences with the Micmacs in the period 1632-68, stated that "The Maple . . . has sap different from all the others. There is made from it a beverage . . . of the colour of Spanish wine . . . It has a sweetness which renders it of very good taste" (in Schuette and Schuette 1935:210); here the sweetness, but even more so the color and the verb "made from," can leave no doubt that Denys was referring to maple syrup.

The earliest reference to what is undoubtedly maple sugar is by Le Clercq, who was among the Micmacs from 1675 to 1687: ". . . maple water . . . by virtue of boiling . . . hardens to something like sugar . . . It is formed into little loaves . . ." (Ganong 1910:122-123). A roughly contemporary observation was made by Hennepin in 1680; referring to practices in the Great Lakes area, he noted that: "After a long boiling . . ." maple sap yields ". . . a kind of reddish Sugar" (in Schuette and Ihde 1946:97).

In view of the early French records of possible (1535-43, 1607), probable (1634), and definite (1632-68) uses of maple syrup by the Indians, and in the absence of observations of sugar production prior to 1675-1680, the relevance of the first English reference to the Indian manufacture of maple products can be re-evaluated. In 1684, less than a decade after the first definite reference to the production of maple sugar, a Dr. Robinson opined that "The Indians have practiced it time out of mind; the French begin now to refine it . . ." (in Schuette and Schuette 1935:211; Pendergast 1982:36). Noting again that, almost without exception, persons commenting on the origins of maple products have not made a clear distinction between syrup and sugar, it would seem at least plausible that what had been practiced for "time out of mind" was syrup production, and what only recently (in 1684) had begun to be refined was true sugar.

As a final comment in regard to the early historic references to the drinking of maple "sap," it should be noted that the sugar content of raw sap is so low (*ca.* 2.5%) that this would not be a feasible source of sustenance. To supply 2000 calories would require the consumption within a 24 hour period of a formidable 14 liters of sap. Evaporation of only 75% of the water reduces the volume to a manageable 3.5 liters, and at this concentration (10% sugar) the solution is noticeably sweet and slightly reddish-brown in color. Such a substance could plausibly be referred to as a "sweet and very pleasant liquor," comparable in taste and color to wine. Furthermore, if this semblance of syrup was offered to

an early European observer and the question was asked "What are we drinking?" a literal translation of the answer, from the languages of any of the Indian groups of the sub-boreal and temperate zones of eastern North America, would have been "sap" (see Table 1).

CONCLUSIONS

For almost 300 years there has been controversy over the question of whether the manufacture of maple products in eastern North America had an aboriginal/prehistoric or a European (inspired)/historic origin. Both positions can be reconciled when one realizes that maple syrup and maple sugar are not synonyms. Methods of manufacture and the ways in which the two products are and can be used are very different. Although indirect, there is nevertheless persuasive evidence for the pre-contact production and use of maple syrup (at least as a "famine food" or dietary supplement). There are equally persuasive data, however, to support the position that maple sugar was not produced until the late 17th century, its manufacture coinciding with or shortly following the introduction of metal kettles. These two data-sets are not incompatible or contradictory. Rather, they document a logical sequence of events. Maple syrup (or perhaps better "concentrated maple sap"), which is easy to produce with the technology of the American Indians, had its origins in prehistory, but because it is difficult to transport and store it played only a limited or sporadic role in the subsistence economies. With the introduction of a technological item that made possible (or at least greatly facilitated) the conversion of syrup to the transportable and storable sugar, combined with the economic impetus to do so, sugar manufacture quickly followed.

This conclusion, although supported by more detail, mirrors that of one of the first persons to address the question of the origins of maple syrup and sugar; Charlevoix, after observing the processing of maple sap in the spring of 1721, argued that:

> It is very probable that the Indians . . . have at all times, as well as today, made considerable use of this liquor. But it is certain, they were ignorant of the art of making a sugar from it . . . They were satisfied with giving it two or three boilings, in order to thicken it a little, and to make a kind of syrup from it, which is pleasant enough (1761:192).

Lastly, if the prehistoric archaeological sites that have been identified as "sugar camps" (e.g. Pendergast 1974; Kingsley and Garland 1980; Holman 1984) are indeed loci of maple sap processing, they (as well as any similar sites found in the future) should be referred to as "syrup camps."

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