8-1978

Ethnography for Archaeology: A Functional Interpretation of an Upper Great Lakes Prehistoric Fishing Artifact

Donald E. Weston

ETHNOGRAPHY FOR ARCHAEOLOGY: A FUNCTIONAL INTERPRETATION OF AN UPPER GREAT LAKES PREHISTORIC FISHING ARTIFACT

by

Donald E. Weston

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
August 1978

ACKNOWLEDGEMENTS

I wish to acknowledge the assistance and cooperation of many individuals, without whose help this thesis would not have been possible. The members of my thesis committee, consisting of Dr. Elizabeth Garland (major advisor), Dr. William Cremin, and Dr. William Garland offered many valued comments and criticisms. I am indebted to Dr. James Fitting of the Gilbert-Commonwealth Associates and Dr. Richard Stamps of the Department of Sociology/ Anthropology, Oakland University, for their encouragement and inspiration in the initial formulation of this paper.

I received technical assistance from Terrance Martin of the Anthropology Department, Michigan State University and Elizabeth Cardinal of the Museum, University of Michigan for faunal identifications; Mr. Leonard Blake of the Missouri Botanical Gardens for the identification of the Draper Park floral remains; and Dr. R. C. Koeppen of the U. S. Forest Service and Dr. Volney Jones of the ethnobotany lab, University of Michigan for bast fiber identifications. Dr. Helenan Lewis of the Political Science Department, Western Michigan University, and Dr. Kenneth Hirth of the Department of Anthropology were very helpful with statistical methods. Mr. Brian Mitchel of the Computer Center, Western Michigan

University helped with computer procedures. In addition, I would like to thank Dr. William Lovis of the Anthropology Department of Michigan State University and Dr. Ronald Mason of the Anthropology Department, Lawrence University, for access to their artifact collections and useful advice for analysis. Special thanks is given to Dr. William Ritchie of New York for his helpful comments and Dr. Charles Cleland of the Department of Anthropology, Michigan State University, for allowing me the use of some unpublished data on prehistoric fishing in the Upper Great Lakes. Mrs. Connie Hicks typed the final draft and the excellent artifact photographs were taken by Mr. R. David Hoxie. I would also like to thank my fellow anthropology students at Western Michigan University for their comments and support. Special gratitude is due my wife, Noreen, for her skill in illustrating artifacts, for helping in lab analysis and for proofreading the final draft. Any shortcoming or deficiencies in this study I accept as my sole responsibility.

Donald E. Weston

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of Tables (Continued)

INTRODUCTION AND PROBLEM

One of the basic and challenging tasks in archaeology is the interpretation of artifacts and the reconstruction of prehistoric cultures. Difficulties arise primarily because (1) not all past human behavior is manifest in the archaeological record, and (2) that which remains is only adequately represented. Our success at understanding prehistory is further limited by differential preservation, lack of representative samples, and loss of contextual data. Even with the use of sophisticated recovery techniques, vigorous analysis, and statistical manipulation it is seldom possible to arrive at neat reconstructions. Prehistory is, after all, the indirect study of human behavior and thus, by definition, limited in what it can reveal.

In spite of these drawbacks, one very effective tool used in archaeological interpretation has been ethnographic analogy. From the 1800's until the present time, archaeologists have relied heavily upon the use of analogy (Orme 1973). Those utilizing it include such pioneers as Wilson (1851), Evans (1860), Christy and Lartet (1865), Steward (1942), and Clark (1951). More recently, there has been an increase in the number of researchers employing analogy. Among these, for example, are Binford (1968), Deetz (1968), Flannery and Coe (1968), Furst (1968), Gould (1968, 1971), Hill (1968), and Longacre (1968).

While this approach has a long history of acceptance, it is not without some criticism and must be applied cautiously. Chang (1967:228) has written: "ethnological recourse does not make analogy possible; it only renders its results probable or even scientifically true." Similarly, Childe (1956:49) has noted that "ethnographic parallels in fact afford only clues in what direction to look for an explanation in the archaeological record itself."

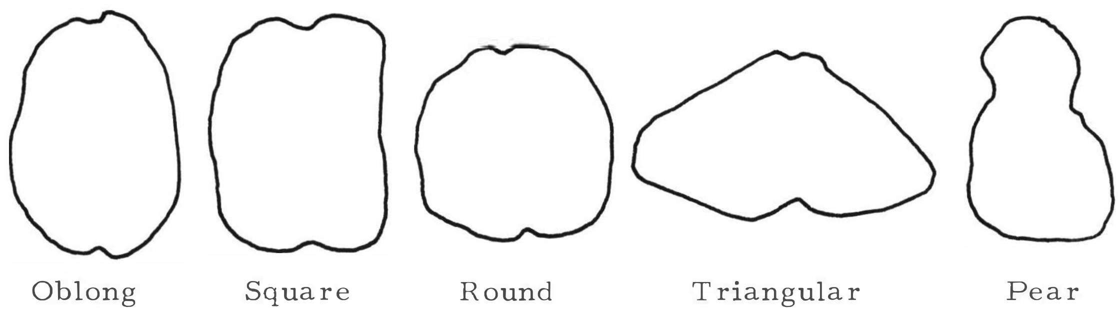
Several recent statements have attempted to clarify the role of ethnographic data within a deductive framework of archaeological reasoning (Ascher 1961; Binford 1967; Freeman 1968; Wobst 1978; Yellen 1977). Binford (1967:1) has demonstrated perhaps most clearly how documented analogies can be used as bases for offering postulates regarding the relationship between archaeological forms and their behavioral contexts in the past and how such postulates can then serve as the foundation for a series of deductively drawn hypotheses which, upon testing, can negate or tend to confirm the postulates offered.

This paper concerns a class of prehistoric artifacts which is commonly found in North America from the Archaic through the historic period. Its specific use, however, is still unknown. The purpose of this paper is to present (by the use of ethnographic analogy) three functional arguments suggesting that it was associated with aboriginal fishing activities in the Upper Great Lakes region (i.e., the Superior, Michigan and Huron Basins). There have been no detailed analyses made on this artifact to date, nor any functional hypotheses tested thoroughly in any specific geographic or cultural area. This study will utilize ethnographic information as recorded by early missionaries and travelers, recent ethnohistorical reports, various archaeological and environmental site data, and statistical analyses and descriptions.

The artifact is the ubiquitous notched stone, commonly referred to as "sinkers" for fish nets or lines in archaeological reports, and often used to infer the subsistence behavior of a group of prehistoric people. Nearly 700 of these artifacts have been found on 16 archaeological sites in the Upper Great Lakes. Typically, these are flat, water-worn beach pebbles of various shapes and sizes (see Figure 1), with a single notch struck off opposing sides or ends. This group of artifacts does not include those with more southern and eastern distributions that are donut-shaped, egg-shaped, or plumb-bob shaped which are ground and polished, not as common in this area, and may have had entirely different functions. Variations occur which have no notches or multiple notches present. They generally range in size from about 5 to 20 centimeters in length and weigh from about 20 to 1100 grams. With no apparent preference for selection by their makers, they are made from various types of igneous, metamorphic, and sedimentary materials. None were made from quarried

FIGURE 1

NOTCHED STONE SHAPES



material. The percentage of different materials utilized varies from one site to another, which may merely reflect the differences in local availability of certain types of materials occurring along beaches or in the glacial drift.

A preliminary analysis of the attributes on notched stone stones from just two sites in the Upper Great Lakes (Draper Park and Sand Point), reveals an unusually high degree of variation in weight, 21,789.12 grams and 2682.38 grams, respectively, with concomitant high standard deviation, 147.61 and 51.79, respectively (See Table 17). These figures indicate from the outset that several populations of artifact forms may be represented in these two samples and suggest that diversity of form may represent variation in function.

There is certainly no overall consensus in the North American literature as to the exact function of notched stones. A cursory search has revealed over 30 separate uses by about 20 separate authors. Obviously a formal definition is much needed. The list of suggested uses includes: bolas weights (Coe 1964:Fig. 70; Hodge 1959:576; deLaguna 1975:171; Watt 1938:54-56), anchors (Abbott 1881:243; Beauchamp 1897:79; Hodge 1959:576; Draft 1975:111-118; Rau 1884:87, 159, 194; Smith 1910:32), canoe smashers (Fowke 1896:97), club heads or slungshots /sic/ (Smith 1910:34; Hodge 1959:576; Fowke 1896:97), digging stick weights (Watt 1938:54, 56), fish line sinkers (Abbott 1881:240; Bird 1945:135; Fowke 1896:97; Jochelson 1925:107; deLaguna 1975:171; Nelson 1899:Plate LXVII; Rau 1884:86, 88, 164, 168), grips on dart or spear throwers (Watt 1938:54, 56), flailing stones (Rau 1884:89), arrowshaft, bone needle, pottery or sinew smoothers or burnishers (Watt 1938:54, 57), harriers used for dragging the bottom of streams to frighten fish into nets or traps (Adair 1968:403; Hodge 1959:576; Jones 1873:338; Kraft 1975:111-118; Rau 1896:97), grips and shuttles in lashing points and feathers to arrow shafts or knives to handles (Watt 1938:54, 56), scale weights (Rau 1884:90), weft weights (Kent & Nelson 1976:152; Rau 1884:168), an intermediary tool in the indirect percussion method of chipping (Haight 1968:75), throwing stones to kill fish (Smith 1910:32), threat or cord twisters or spinning whorls (Watt 1938:54), hammerstones (Fowke 1896:97; Watt 1938:54, 56, 57), dip net sinkers (Nelson 1899:Plate LXX), hoes (Kraft 1975:117; Ritchie 1969:308), hide scrapers or fishscalers (Kraft 1975:117; Wren 1914), potcovers or tools for smoothing out the inside of clay pots (Kraft 1975:117; Wren 1914:84), and, finally, pendants, charm stones, ornaments, or objects of veneration or ceremony (Watt 1938:54, 57).

Rostlund (1952) has written an extensive monograph on prehistoric freshwater fishing in North America, and makes this statement regarding what he terms the "so-called net sinkers":

> Many of them were no doubt used for other purposes . . . nevertheless, stones of this kind were used on fish nets. The archaeologic and historic ethnographic evidence on that point is overwhelming, and that none of these stones were not sinkers is as incredible as the assertion that all of them were. The problem, then, is one of distinguishing the stones actually used as net sinkers from those that were not . . . /emphasis in the original/(1952:87).

> . . .if these /notched/stones are accepted as proof of fish nets, they must imply large seine or gill nets, for sinkers are not required on small hand nets, dip nets, scoop nets, or the like /ibid. 1952:83-84).

Great Lakes literature also expresses some ambivalence with respect to the possible functions of notched stones. Janzen (1968:68), for example, states that

> it has been assumed that the functions of these stones has remained constant through time. Such an assumption obliterates alternative possible uses, and forces the interpretation of fishing activity.

Brose (1970:122-126) has similarly questioned their function at the Summer Island site in Lake Michigan.

This paper endeavors to clarify and document the "archaeologic and historic ethnographic evidence" indicating notched stone use in fishing activities (following Rostlund 1952) specifically within the Upper Great Lakes region. The three functionally different types of notched stones found here are: (1) fish line sinkers, (2) seine and gill net sinkers, and (3) gill net anchors. The sources which will be used to demonstrate this include: First, early accounts of notched stone use as recorded by 17th, 18th and 19th Century Jesuit priests and travelers; second, ethnohistorical reports noting how they have been used by recent Great Lakes region Indian groups; third, various archaeological and environmental data (both published and unpublished) from 16 Upper Great Lakes sites where they have been excavated; and finally, statistical descriptions and significance tests which help substantiate the existence of three separate forms of notched stones.

ETHNOGRAPHIC AND ETHNOHISTORICAL OBSERVATIONS

A considerable amount of literature relating to the Great Lakes was examined in an attempt to locate information relevant to functional interpretations of notched stone artifacts. Among them were: the Anthropological Papers of the American Museum of Natural History, Bureau of American Ethnology Bulletins, National Museum of Canada Anthropological Series, Jesuit Relations, American Anthropological Association Memoirs, Human Relation Area Files (which included 26 Ojibwa references), and a number of early travel accounts.

A careful examination of all the documented material culture from the sources yielded a dozen relevant accounts. Nine of these (which include Huron, Ottawa, Chippewa and Saulteaux) are from the immediate Upper Great Lakes region, while the remaining three (Eastern Cree, Snowdrift Chipewyan, and Mistassini) are from the adjacent northeast, north, and northwestern geographic/cultural areas (see Table 1). Another dozen Great Lakes accounts were located that had only an indirect relevance to the problem of function, since they discuss only early net fishing in general and nothing about notched stones specifically.

The Upper Great Lakes ethnographic sources listed in Tables 1 and 2 and used in the following test are classified into principal

TABLE 1

Primary References to Upper Great Lakes Prehistoric Net Fishing

Source	Reference	Field Dates	Northern Saulteau	Southern Saulteau	S. W. Chippewa	S. E. Chippewa	Huron
Champlain	1929:131, 133 166-168, 589	1615-1618					X
Joutel	1687:503	1687					X
Henry	1809:55	1760-1776					X
Grant	1890:345-346	1791-1804		X			
Densmore	1929:124, 154	1905-1925			X		
Skinner	1912:137	1909	X				
Jenness	1935:16	1929				X	
Hilger	1951:125-126	1932-1940			X		
Hilger	1939:188-189	1938			X		

TABLE 2

Secondary References to Upper Great Lakes Prehistoric Net Fishing

Source	Reference	Field Dates	Northern Saulteau	Southern Saulteau	S. W. Chippewa	S. E. Chippewa	Huron
Sagard	1632:86, 87, 231, 252-260, 316-318, 332	1632-1624					X
Brebeuf	JR10*: 1636:167-169	1636					X
LeJeune	JR8: 1635:39	1635					X
Garnier	JR23: 1643:95	1643					X
Vimont	JR26: 1644:203	1643-1644					X
Perrot	1911: 1662:149-150	1662					X
Dablon	JR54: 1670:149-153	1669-1670		X			

*JR = Jesuit Relations

TABLE 2 (Continued)

Source	Reference	Field Dates	Northern Saulteau	Southern Saulteau	S.W. Chippewa	S.E. Chippewa	Huron
Ragueneau	JR35: 1650:175	1649-1650					X
Schoolcraft	1958:173	1820			X		
Andre and Alloues	JR57: 1673:265-267	1672-1673					X
Andre	JR58: 1673:273	1673					X
LaPotharie	1911:275-276, 283-288, 305	c. 1700		X			
Raudot	1904: Ltrs:41,46, 53	1709-1710					X

cultural-regional divisions which have been suggested by Lagace (1971:2) and other authorities. These divisions are: Huron, Ottawa, and Ojibwa. The Ojibwa are further subdivided into the Southwestern and Southeastern Chippewa as well as the Northern and Southern Saulteaux. The Ojibwa subdivisions are questionable as to the extent to which the distinctions have any real cultural significance, especially between the Northern and Southern Saulteaux. Nevertheless, as Lagace (1971:3) points out, it does constitute a convenient regional division for the classification of sources.

Geographically, the Saulteaux area was roughly bounded by James Bay, Lake Winnipeg and Lake Superior. The Northern bands of the Saulteaux were located more toward Lake Winnipeg, while the Southern bands were located near Lake Superior (cf. maps in Dunning 1959:6; Hickerson 1962:1). The Southwestern Chippewa occupied the area south of Lake Superior running from Upper Michigan through northern Wisconsin, Minnesota, and along the southern border of northern Ontario approximately as far west as Lake of the Woods. The Southeastern Chippewa occupied the area of Lower Michigan, Lake Huron, and a sector of Ontario to the north of Lake Huron. The Huron and Ottawa occupied the general area surrounding Lake Huron and the west end of Lake Superior.

It is immediately apparent that all the accounts pertain to fishing activities, specifically gill and seine net fishing and angling.

No other references were found which suggest alternative uses such as those outlined previously in this paper. The accounts will be quoted directly and at some length, since there is other pertinent contextual information. The first four accounts are from early travelers; the next eight are ethnohistorical recordings by 20th Century ethnographers.

The Great Lakes Region

The Huron in Georgian Bay, 1616-1618.

> The men make the nets to capture fish in summer as well as in winter, when they generally fish, reaching their prey even below the ice, either with the line or the seine.
> They perform this kind of fishing by making several holes in a round through the ice, that by which they have to draw up the seine being some five feet long and three feet wide. At this opening they begin to let down their net, which is attached to a wooden pole from six to seven feet long, and having brought it under the ice, they move this pole with the net from hole to hole, where it is seized by a man or two through the holes; and this they continue until the opening of five or six feet is reached. This done, they let go the net, which sinks to the bottom of the water by means of certain small stones attached to the end [emphasis mine] and afterward they draw it up by its two ends, and thus secure the fish caught in it (Champlain 1615:166-168).

The Huron at Mackinac, 1687.

> Their usual food consists of fish and Indian corn. They are very skillful at fishing, and the fishing is very good in these parts. There are fish of various kinds which they catch with nets made with a very good mesh; and, although they only make them of ordinary sewing thread, they will nevertheless stop fish weighing over ten pounds. They go as far as a league out into the lake to spread their nets, and

to enable them to find them again they leave marks, namely, certain pieces of cedar wood which they call aquantiquants /emphasis in original/ which serve as bouys or anchors. They have nets as long as two hundred fathoms and about two feet deep. At the lower part of these nets they fasten stones, to make them go to the bottom /emphasis mine/; and at the upper part they put pieces of cedar wood which the French people who were there at this place called floats. Such nets are spread in the water, like snares among crops, the fish being caught as they pass, like partridges and quails in snares. The nets are sometimes spread in a depth of more than thirty fathoms, and when bad weather comes, they are in danger of being lost. As these lakes, although they are very large, are frozen over at certain times, they have to make holes in the ice to get the nets in, and they spread them under the ice, which gives them more trouble (Joutel cited in Margry 1879-88/3/:503).

The Ojibwa or Ottawa at Mackinaw, 1760-1776.

The white-fish is taken (at Michilimackinac) in nets which are set under the ice. To do this, several holes are made in the ice at such distance from that behind it as that it may be reached, under the ice, by the end of a pole. A line, of sixty fathoms in length is thus conveyed from hole to hole, till it is extended to the length desired. This done, the pole is taken out, and with it one end of the line, to which the end is then fastened. The line being now drawn back by an assistant, who holds the opposite extremity, the net is brought under, and a large stone is made fast to the sinking-line at each end, and let down to the bottom; and the net is spread in the water, by lighters on its upper edge, sinkers on its lower /emphasis mine/, in the usual manner. The fish, running against the net, entangle their gills in the meshes, and are thus detained till taken up (Henry 1809:55).

The Southern Saulteaux, 1804.

. . . they have a method of taking sturgeon with a kind of drag-net or seine, which, I believe, is peculiar to themselves. The net used for this purpose is about twenty feet long by six feet deep, when shut double. It is dragged between two small canoes, having two men each; while the bowmen paddle gently down the stream the men in the stearns hold the seines by means of long cords, fixed to each end and which can be shortened or lengthened according to the depth of the water and the wish of the seineurs. Two stones are suspended from the lower ends of the seines, by which the nature of the bottom and the surroundings are ascertained, a very necessary precaution to keep the whole clear of foul bottom. The course of the canoes must form an obtuse angle with the middle of the seine.

These nets are mounted like English drag nets, with small knobs of cedar fixed to the upper border instead of cork. When, by the vibrations of the cords, they perceive the fish is taken, they instantly haul up and paddle with all their might to bring the canoes together and, thereby, shut up the fish in the seine. This method of fishing is, of course, practicable only in rivers, narrow channels and small bays, where the bottom is clear (Grant 1804:345-346). [Emphasis on seine, seines, and seineurs is original; the other is mine.]

The Northern Saulteaux, 1909.

Gill nets are employed at present for fishing. The size of the mesh of these nets varies according to the size of the fish. Some old Saulteaux claim that nets are not an aboriginal but European invention. The nets are generally set at the mouths of streams in the shallows along the shores of rivers and lakes. They vary in length, those used in rivers being the shortest, only from twenty-five to fifty feet long; but those used in the lakes and in shallower streams are sometimes a hundred or more feet in length. They are usually made of twine bought from the traders but were probably formerly made of spruce root bark. They are weighted down with unworked pebbles. These are bound to the lower edge of the net by bark cord [emphasis mine]. The nets are kept upright by floats made of wood. These are about one yard long, lanceolate in shape, and four or five inches broad at the broadest part. They are notched at the lower end for tying to the net. In the shallows, the tips stick above the surface and mark the spot where the net was placed . . . (Skinner 1912:137).

The Southwestern Chippewa, 1905-1925.

The use of seines was the general method of obtaining fish, as it secured the largest results in both number and variety of fish . . . if the water were shallow the net was attached to stakes at the corners, but if the water were deep the upper corners were fastened to canoe paddles which floated on the surface of the water, the lower corners weighted with stones, tied with basswood fiber /emphasis mine/. The nets were thoroughly washed after being taken from the water and were sometimes dipped in a decoction of sumac leaves to destroy the odor of fish, it being said that the fish would not approach a net with the slightest odor upon it . . . .

Fishing, except in the coldest winter, was the work of women, who placed the nets in the water at night and took them up in the early morning, spreading and drying them. Every camp had a pole over which the nets were hung for the spreading of the meshes, and a row of tall stakes on which the nets were hung to dry (Densmore 1929:125).

In early times the nets or seines were made of nettle-stalk twine, the stronger twine used for tying the nets to the poles . . . . The width of a net was measured by the number of meshes, and the length by the number of 'arm spreads' . . . . An average size is 19 meshes wide and 60 arm spreads long. Pieces of lightwood about 12 inches long are fastened to the edge of the net as 'floaters,' and opposite each is a stone 'sinker' /emphasis mine/. The distance between these is twice a single 'arm length' (Densmore 1929:154).

The Ojibwa of Parry Island, 1929.

In their fishing the Parry Island Ojibwa used nets, stove weirs, and spears . . . . Nets made of false nettle . . . with floats of cedar or other light wood and sinkers of stone /emphasis mine/ served for both trout and sturgeon (Jenness 1935:16).

The Southwestern Chippewa of Red Lake Reservation, Minnesota, 1930's.

Fishing, formerly, was done largely by means of nets, although fishhooks, spearheads, and traps were also used. Women generally used nets, thus securing the best results in numbers and variety.

A red Lake informant, a professional net maker, in making nets used cord made from the inner bark of the basswood. (Some women used nettles) The bark, torn into fine strands, was boiled for about one-half hour, and while still soft rolled over the bare side of the right leg with the palm of the right hand. If fibers become dry, they are drawn through the mouth to be moistened with saliva. No knots were made in joining strands but the ends of two strands were worked between molars and deftly rolled into each other with fingers. Men who assisted rolled cord above the knee.

One old Red Lake informant's great-grandmother made cords for fish nets by boiling nettles, drying them, separating them into fibers, dampening them by drawing them through the mouth, and then rolling them on her leg. 'This made fine cord for nets. She used to have balls of it ready for use. This was long, long ago.' While rolling basswood fiber women squatted on the ground.

The professional Red Lake net maker, referred to above, made nets as recently as 1930, using quilling twine 'bought at the store.' One of her two shuttles (nābek wē agons) was made of basswood; the other, of a cigar box cover. The former was 7 inches in length and 1 1/4 inches in width; the carrier of the thread was 2 5/8 inches in height, the space for the release of the thread 3 1/2 inches. The mesh of the net as demonstrated was 2 by 2 inches. 'This would catch pike, perch, and suckers,' she remarked. Meshes were measured in the making by pieces of wood (bīmegī mī gon) of various sizes, the size to be used depending upon the kind of fish to be caught in the net. A 2 by 2 5/8-inch measure was used if pike, perch, and suckers were to be caught; if 'two-lippers,' a 3 by 2 1/2-inch; if whitefish, a 2 3/4 by 3 1/8-inch. If the work was well done, our informant noted, the knots of the mesh were immovable. In preparing to set a net as her mother had taught her--the net incidentally had been made by her mother--she held the end of a basswood fiber between her teeth and a stone in her left hand while with her right hand she wound the fiber twice tightly around the stone. She then tied a knot leaving the mouth end long enough so that the stone by means of it could be tied to the edge of the net. Fifteen stones, each about the size of a walnut, were thus prepared and tied to the net, serving as sinkers. On the opposite edge of the net and directly in line with the stones, she attached 15 floaters made of cedar wood. These varried in length from 27 to 29 inches and weighed approximately 2 ounces each. A second set of floaters, also made of cedar wood, were 5 inches long by 2 inches in diameter, the weight of each again being approximately 2 ounces. A nicety of balance had to be estimated between floaters and sinkers. Notchings, an inch from the narrow end of the floater, permitted fastening to net. When the net was set, the floaters stood erect in the water with only the tips showing. The floaters are made and then the size of the stones chosen, 'very large ones would drag the net to the bottom of the lake' /emphasis mine/ (Hilger 1951:125-126).

The Southwestern Chippewa at White Earth Reservation, Minnesota, 1938.

The families of this study did little fishing except for immediate use . . . . A seventy year old woman of one of the families was busy engaged, one of the days we visited her, in fastening the traditional cedar floaters and the stone sinkers to her net /emphasis mine/. The sun was in the last quarter of its day and she must hurry to set her net. 'Nets are set at sunset and are taken in at sunrise,' she remarked. She expected a good catch and hoped to dry some; her rack for drying was already prepared (Hilger 1939:188-189).

The Adjacent Great Lakes Area

The Eastern Cree in the Southern Hudson Bay Area, 1908-1909.

Gill nets were originally made of willow root bark, but now of twine. However, the Indians at present generally prefer to buy their nets ready-made from the Hudson's Bay Company. They are set along the banks of rivers, especially at the mouths of streams . . . . The sinkers are plain unnotched stones, bound by bands of willow bark. For floats, peeled stocks about two inches in circumference and two feet long are used. In winter, the net floats are made like an apple seed in shape as floats of this shape are said not to freeze in the ice . . . . When angling for fish that live near the bottom the line is sunk by a stone sinker. When the bottom is reached the line is hauled up again, the proper distance gauged, the sinker removed, and the line again lowered /emphasis mine/ (Skinner 1911:27-28).

The Snowdrift Chipewyan in the Great Slave Lake and Lake Athabasca Area, 1769-1772.

> The major autumn activity for the people of Snowdrift is fishing. Of prime importance too is the winter's supply of dog food which must be obtained at this time . . .. September . . . is commonly . . . the beginning of autumn fishing. . ..
>
> The good autumn fishing begins when the lake trout and whitefish start to ascend the rivers to spawn. Some men set their nets near the mouth of the Snowdrift river . . ..
>
> . . . It is not uncommon for one man to set as many as five nets at one time and take more than a hundred fish a day. The fish caught at this time of the year are placed on a raised platform until it is cold enough to store them in a tent or warehouse for the winter . . ..
>
> . . . Nets were formerly made of willow bass, which was knotted under water to prevent it from becoming dry. Netting needles were unknown, and the work was done entirely by hand.
>
> . . . Aboriginal nets were made of fine babiche, which rotted easily unless the nets were taken out of the water frequently and dried.
>
> Today the nets for autumn and summer fishing are made of nylon or cotton. They are about thirty to forty feet in length and three to four feet wide, although some fishermen prefer nets of greater width, even as wide as twelve feet. For weight, small stones are placed along the bottom of the net /emphasis mine/ and blocks of wood or commercially made floats run along the top. At one end of the net a piece of wood is fastened. This floats on the surface and indicates where the net is set since the floats are not always on the surface of the water. In bringing in the net, the rock and floating stick /emphasis mine/ are brought into the boat, and the net is then coiled into a large metal tub. In setting it, the same procedure is followed in reverse; the fisherman maneuvres his canoe so that the net plays out smoothly from the tub (VanStone 1965:13-14).

The Mistassini Indians of South-Central Quebec, 1953-1954.

> Net floats were of two types: those for winter use when the nets were set under the ice, and those used

during the summer. Both types were made of dry wood . . . . Small net floats were employed during the winter since they would not become frozen into the ice as easily as the long summer type. . . .

Netsinkers were beach pebbles obtained locally and were approximately the size of a fist. Whenever possible, the pebbles chosen were slightly constricted about the middle. If these could not be obtained, notches were sometimes made in the edges. A string was attached by a slip knot about the middle of the stone, and the other end of the string was tied to the bottom selvage line.

Formerly, narrow strings of willow bark were employed in place of string for attaching the sinkers to the net. Whenever the nets were removed from the water to be dried, the sinkers and bark 'string' were left under water to prevent the latter from drying and breaking.

Net floats and sinkers were tied opposite one another along the net and placed two and one-half or three arm-spans apart /emphasis mine/.

A long pole was employed for setting nets under the ice. It was either a single pole obtained at the time the net was set, or else it consisted of several poles tied end to end. One such pole observed was made with three poles; it had a total length of about 30 feet. The poles were between 2 and 3 inches thick at their bases and 1/2 inch thick at their tips. . . .

/For set line/ a baited hook was tied to one end of a long line, and a stone sinker, if available, or a handful of sand secured in a piece of cloth, was attached to the hook. The hook and sinker were both lowered into the water until they touched the bottom. . . . Next the hook and sinker were removed from the water and the sinker /emphasis mine/ was detached. The hook was then replaced in the water (Rogers 1967:85-89 and Figures 45-51).

A summary list of the ethnographic accounts, indicating the three manners in which stones were (and still are) utilized, is presented in Table 3.

TABLE 3

Ethnographic Accounts of Stones Used as Weights in Fishing Activities

Use	Reference	
Fish Line Sinkers:	Rogers (1967) Skinner (1911)	
Fish Net Sinkers:	Densmore (1929) Jenness (1935) Houtel (1687) Henry (1809)	Hilger (1939; 1951) Rogers (1967) Skinner (1912) VanStone (1965)
Anchors:	Champlain (1615) Densmore (1929) Grant (1804)	Henry (1809) VanStone (1965)

It is evident that only two references (Hilger 1951:125-126; Rogers 1967:85-89) specifically mention that the stones were notched. In fact, there are even two others (Skinner 1911:27-28, 1912:137) which note that the stones were *unnotched.* Thus, it seems contradictory to use the words "notched stones" in this paper. This was an *a priori* designation borrowed from the archaeological literature where, until now, no unnotched specimens had ever been reported. (Unnotched stones have been found archaeologically in recent excavations and will be discussed later in this paper.)

This was, perhaps, an unfortunate term that was given to these artifacts and should be discontinued in light of the ethnographic findings just presented. However, I have with some apprehension, chosen to continue its use for at least three reasons: (1) it is already entrenched in the literature, (2) other functional terms such as "weights" or "sinkers" are: (a) too general and may be confused with other similar artifact classes, and (b) not specific enough to identify the three functional types that were used in this study area, and (3) there is a lack of specific detail concerning net manufacturing or fishing techniques as recorded by ethnographers which may indicate that many of these artifacts were notched. Eight of the ethnographic references just listed simply state that the stones were "attached," "fastened," "suspended," "tied," or "placed" on fish lines or fish nets. None of them outline the exact method of attaching stones to the cordage; this could have been done either by notching the stones first or simply with the cord alone. Rogers (1967:85-89) states that "whenever possible, the pebbles chosen were slightly constricted about the middle. If these could not be obtained, notches were sometimes /emphasis mine/ made in the edges."

Therefore, the use of the words "notched stone(s)" in the remainder of this paper are not to be taken literally, but rather as the name of that class of artifacts (whether notched or not) used in Upper Great Lakes fishing activities.

ARCHAEOLOGICAL AND ENVIRONMENTAL DATA

Turning next to the archaeological and environmental data from the Upper Great Lakes and adjacent areas, at least five items provide additional confirmation that these artifacts are related to fishing activities:

1. Their distribution is primarily in littoral settings on known fishing stations where they are associated with abundant fish remains (see next chapter for documentation).

2. They often appear on these sites in large numbers, suggesting considerable fish netting activity. Examples include the Bristow site, a Middle Point Peninsula to Historic site on Thorah Island in Lake Simcoe, Ontario where over 2,000 notched stones were found (Sweetman 1968); an unnamed Point Peninsula or Owasco site near Lakeview on Lake Erie contained, according to Lee (1952:65), hundreds of net sinkers in all stages of completion which had been removed by collectors and local fishermen for use on modern nets; and in New York State two Archaic sites, Geneva and Lamoka Lake, yielded 700 and over 8,000 respectively (Ritchie 1965:48).

3. Even more convincing evidence is that notched stones were actually found attached to a carbonized fish net in a burial pit at the Early Woodland Morrow site in Ontario County, New York (Ritchie 1965:185).

4. Many notched stones were found clustered in such a way as to suggest the former presence of a net to which they were attached. Examples include 10 tightly packed caches at the Harry's Farm site on the Upper Delaware River, a cluster of 38 at the Draper Park site in south-eastern Michigan (Weston n.d.), 17 and 12 at the Sand Point site in northern Michigan (Moore n.d.), and 37 at Lamoka Lake (see Figures 2 and 3).

5. Several specimens have been found with organic stains running between the notches or with actual cordage still attached. Examples include the carbonized fish net from the Morrow site in New York, two stained artifacts recovered from the bottom of Round Lake, Michigan (Cleland n.d.), seven stained artifacts from Draper Park (Michigan), and two with cordage from Draper Park.

Corded and Stained Notched Stones

The corded specimens (unique to Michigan) and stained artifacts

FIGURE 2

Notched stone cluster A *in situ* from Sand Point

FIGURE 3

Notched stone cluster B <u>in situ</u> from Sand Point

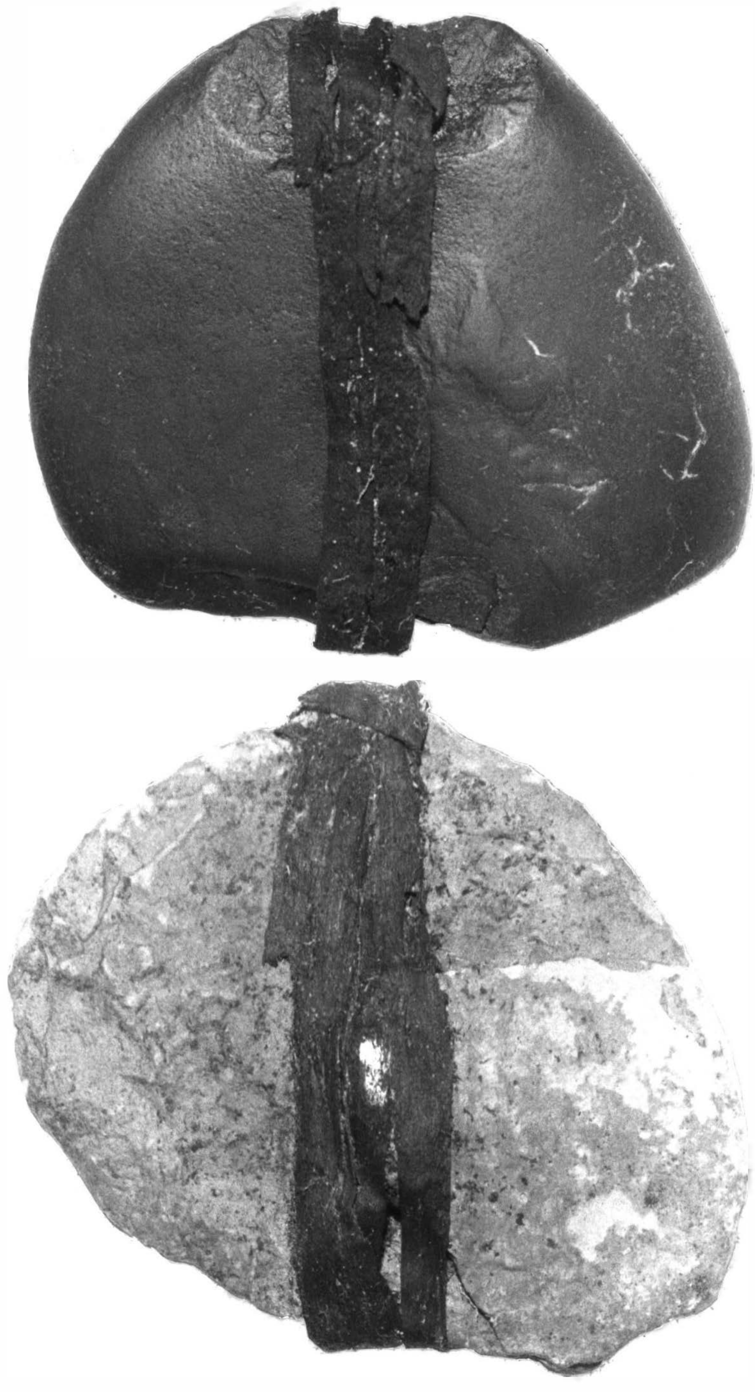


FIGURE 4

Notched stones with cordage from Draper Park. Top (AFB #660) has two notches; bottom (AFB #646) has no notches

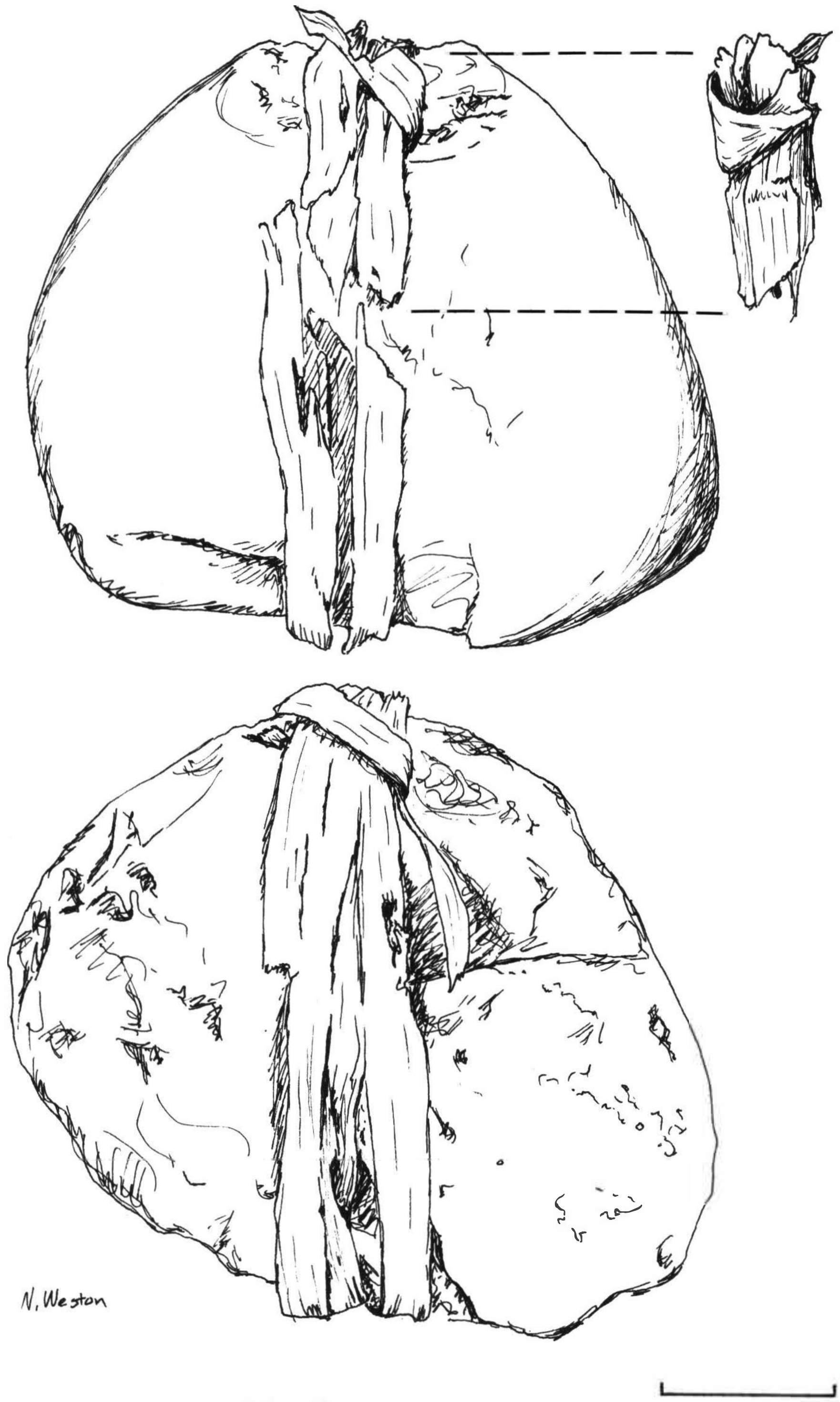


FIGURE 5

Detail of notched stones with cordage. Top is AFB #660; bottom is AFB # 646 warrant further consideration at this point before resuming the main discussion.

Round Lake

The Round Lake stained sinkers (Cleland, personal communication) were recovered from the bottom of the lake near Brow Marina by John Moore in Charlevoix during the summer of 1974. The dimensions of each are summarized in Table 4.

TABLE 4

Round Lake Stained Notched Stones

	Material	L (cm)	W (cm)	Wt (g)
Small	Granite?	9.5	4.7	310.0
Large	Diorite	8.0	6.6	532.5

Both artifacts are now in possession of Mr. Moore. Photographs indicate that each has two notches, one on each side, and that the notches are less than 0.5 cm. deep and ca. 0.5 cm. wide. The cordage stain on each appears ca. 0.75 cm. wide, with the original number of cordage turns not being discernable. There is no visible battering on either artifact.

Draper Park

The corded and stained notched stones from Draper Park were recovered during the 1976 and 1977 excavations at the north edge of the site. Draper Park is a small city park in Port Huron and is located on a (former glacial Lake Algoma) terrace 180.91 meters above sea level and about 4 meters above a wide rapids where Lake Huron outlets into the St. Clair River.

The corded artifacts were all found within an active spring channel on the face of the terrace between 1.8 and 2.7 meters below the present surface. It is interesting to speculate (based on ethnographic information) as to the reason why the notched stones would be found within a spring channel. Rogers (1967:86) notes that "whenever the nets were removed from the water to be dried, the sinkers and bark 'string' were left under water to prevent the latter from drying and breaking."

Preservation within this spring channel was excellent. Associated Late Woodland items included: seeds and nuts (e.g., plum, pin cherry, raspberry, grape, chenopodium, amaranthus, butternut, acorn, and hazelnut) (Blake, personal communication 1978), wooden artifacts (including a paddle ca. 45 cm. long), a bear skull, numerous fish remains (e.g., sturgeon, walleye, drum, white, lake trout, and sucker) (Cardinal, personal communication 1978) and deer. Other items found include: corner and side notched triangular points, drills, scrapers, and Wayne Ware ceramics (Fitting, personal communication 1975). A carbon-14 determination on an associated log yielded a date of A.D. 660± 50 years (DIC-958). Provenience data as well as the associated dated log and Wayne Ware vessel are shown in Figures 6, 7, 8, and 9.

Cordage stain was present on both the soft limestone and hard igneous rocks. Two of the stained sinkers have no notches (see Tables 5 and 6). All the Draper Park and Sand Point notched stones were checked with an ultra violet light at two different wave lengths (ca. 2,000-3,000 angstroms) to determine whether or not staining would be exposed that is not normally visible would be exposed to view. No further staining was noted by this method.

TABLE 5

Draper Park Notched Stones with Cordage or Stains Present

No.	Mat	SH	L	W	T	WT	HW	NW	ND	Prov.
632	I	0	11.41	7.97	3.56	476.4	7.13	2.5	.42	IVB
646	LS	R	8.41	F	1.50	90.6	--	--	--	IVB
601	LS	0	8.93	6.52	1.97	159.4	5.58	--	.47	T III-IV
658	LS	0	11.12	6.22	2.27	228.3	5.65	4.4	.29	IVB
660a	LS	0	8.47	6.31	3.37	140.0	6.0	2.2	.16	IVB
663	I	0	9.33	7.07	4.41	406.2	--	--	--	IVB
104	LS	0	8.37	7.26	1.97	141.4	6.04	2.3	.61	IV
583	LS	0	10.03	7.43	2.62	267.6	6.93	2.1	.25	IV
660b	I	0	7.97	6.77	2.35	167.4	6.22	2.3	.28	IVB

FIGURES 6 & 7

Draper Park notched stone (AFB #646 with cordage) <u>in situ</u>. The associated Carbon 14 wood sample (DIC #958) is the "V" shaped log below and to the left of arrow in Figure

FIGURES 8 & 9

Draper Park notched stone (AFB #660 with cordage) <u>in situ</u> associated with a Wayne Ware vessel

TABLE 6

Draper Park Notched Stones with Cordage or Stains Present

No.	Cordage	Stain	Single Width	Total Width	No. of Turns	Presence		Notches		
						1 side	both	side	end	none
632		x		.87		x		x		
646	x		.49	1.85	4		x			x
601		x		.98		x				x
658		x	.42	1.58	3?	x		x		
660a		x		.91			x	x		
663		x	.43	.98	3?	x				x
104		x		1.24		x		x		
583		x		1.04			x	x		
660b	x		.51	1.47	4		x	x		

Special care was taken in the analysis and curation of these corded and stained artifacts. Before the corded artifacts could dry or become brittle, they were immersed (after a fine brushing) in a 100% ethyl alcohol solution, allowed to dry, then immediately preserved with polyethylene glycol. The stained artifacts were allowed to dry, then carefully brushed clean; preservatives were not necessary. Special care was also taken during excavation of these artifacts for two important reasons: first, it would be easy to overlook unnotched rocks. One corded and two stained artifacts had been found with no notches present. Second, five of the seven stained artifacts have faint staining present on only one side. Fortunately, during the 1976 random sampling of the Draper Park site, two stained artifacts had been recovered from a test pit (10S40E) which came in contact with the spring channel so that in the following year we actually anticipated finding additional specimens.

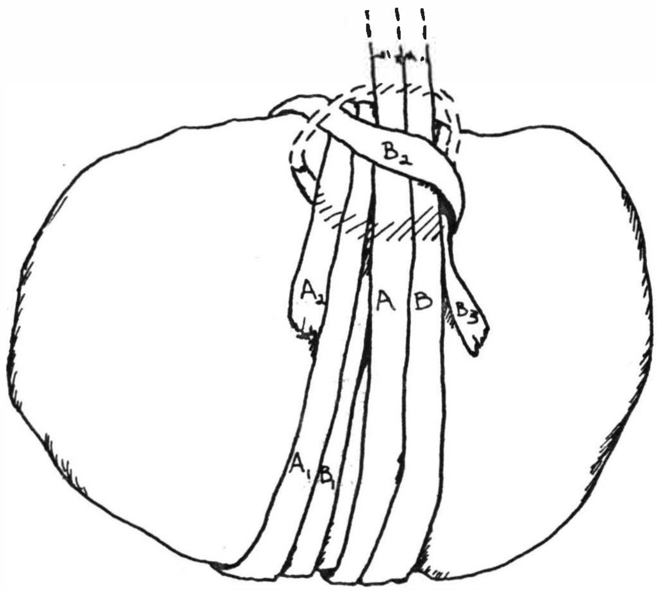
The corded artifacts are bound all the way around with cordage; specimen #646 is intact, however, specimen #660 is in several fragments. A detailed drawing of the binding and knot is shown in Figures 4 and 5 and a drawing which reconstructs the probable attachment is shown in Figure 10. The two cords were first wrapped simultaneously twice around the rock in the same direction. Next, one end was slipped back under and around the wrappings, then tied into a knot (see Figure 10).

Samples of the cords were sent to R. C. Koeppen at the U.S. Forest Products Laboratory, U.S. Department of Agriculture, in Madison, Wisconsin and to Volney H. Jones at the Ethnobotanical Laboratory, Meuseum of Anthropology, University of Michigan. Both analysts identified the material as plant tissue, but were unable to identify the source of the cordage.

Mr. Jones found that in overall appearance it compared well with inner bark, but because it was so badly deteriorated and blackened, apparently by absorption of humic acid, the cellular structure was

FIGURE 10

Reconstruction of Cordage Attachment at Draper Park



almost entirely obliterated. Thus, he could not identify the material to genus or species.

Ethnographically, there are some very suggestive observations on the use of plant material for cordage and netting. There is, for example, considerable comparative data on the gathering, preparation, and use of inner bark. Lalemant (JR 23:55) recorded in 1642 that swamp milkweed (*Asclepias incarnata*) was used as twine for Huron fishnets. Densmore (1929:152-154) notes that cordage used by the Chippewas was made of tough flexible fibers of either basswood (*Tilia americana*) or false nettle (*Boehmeria cylindrica*). Whitford (1941: 11) indicates that black willow (*Salix nigra*) was used by the

Menomini, Ottawa, and Ojibway for making fish nets and cord. This observation is further verified by Skinner (1911:27). Jenness (1935: 113) records that the Ojibwa of Parry Island used false nettle (Urticastrum divaricatum) for twine to make fish nets. Yarnell (1964: 189) also lists nettle (Urtica garcilis), wood nettle (Laportea candensis), and Indian hemp (Apocynum androsaemifolium) as sources of fiber used by Indians in the Upper Great Lakes region. Other references, such as Hilger (1951:125-126), Smith (1923, 1932, 1933), and Jones (1937), to name only a few, list the same fibers. Floats, which were opposite sinkers on the nets, were apparently made exclusively of cedar (Cedrus), (Hilger 1939:188; Joutel 1687:503; Grant 1804:345-346; and Jenness 1935:16).

It is interesting to note that Densmore (1929:153) states that among the Chippewa, "basswood fiber was used in smaller quantities and narrower width for tying the stones on fish nets to serve as sinkers . . . ," and that "the lower corners /of the net/ being weighted with stones, tied with basswood fiber," (1929:125).

Jones (1937) has detailed the process of preparing basswood fibers by Great Lakes Indians. The inner bark or bast was pulled off trees in strips about 10 cm. wide by 3 to 4.5 m. in length. These were then boiled in water containing wood ash or lye for nearly an hour to separate it into layers. The strips were then rinsed, hung to dry, and worked back and forth briskly with the hands to "loosen it into layers of ribbon-like thinness, which were picked apart with the fingers" (1937:4).

SPATIAL DISTRIBUTION AND DISCRETE ATTRIBUTES

Distributions

The archaeological literature of the Upper Great Lakes region was researched in order to locate sites where notched pebbles have been found. The search of Michigan's literature was extensive, that of Wisconsin and Ontario was cursory, and none was made for Minnesota, Illinois, or Indiana since these states have the least amount of land bordering the study area. Not included in this study were sites located in the interior of Wisconsin (with its numerous lakes, rivers, and Mississippi drainage) or the vast interior of Ontario for much the same reason.

The sites in the Lake Superior Basin containing notched stones include: Pays Plat (Wright 1967), Heron Bay (Wright 1967), Naomikong Point (Janzen 1968), and Sand Point (Moore n. d.); the Lake Michigan Basin: Summer Island (Brose 1970), Mero (Mason 1966), Foscoro (Wells 1972), O'Neill (Lovis 1973), Pine River Channel (Holman 1978), and Rock Island (Mason n. d.); the Lake Huron Basin: Donaldson (Wright & Anderson 1963), Draper Park (Weston n. d.), Burley (Jury & Jury 1952), Inverhuron/Lucas (Kenyon 1959; Lee 1960), and Sidney-MacKay (Wintemberg 1964); and one inland lake site: Round Lake (Cleland, personal communication 1978).

TABLE 7

Great Lakes Sites with Notched Stones

Site	Reference	Date	N	Type[a]	Basin
Pays Plat	Wright 1967	Laurel	14	E	Superior
Heron Bay	Wright 1967	A.D. 610±170 (GSC-208)	20	E/S	Superior
Naomikong	Jansen 1968	c. A.D. 400	296	E	Superior
Sand Point	Moore n.d.	A.D. 1050-1250	51	E	Superior
Summer Isle	Brose 1970	A.D. 250±140 (M -1995)	14	E	Michigan
Mero	Mason 1966	Lt. Woodland	23	E/S	Michigan
Foscoro	Wells 1972	Lt. Woodland	6	S	Michigan
Rock Isle	Mason n.d.	Lt. Woodland & Historic	26	E/S	Michigan
Donaldson	Wright & Anderson 1963	530 B.C. ±60 (S-119)	1	E	Huron
Draper Park[b, c]	Weston n.d.	Lt. Woodland	185	S	Huron
Burley	Jury & Jury 1952	667 B.C. ±200 (C-192)	6	E/S	Huron
Inverhuron	Kenyon 1957 Lee 1960	942 B.C. ±75 (S-60)	3	E	Huron
Sidney-McKay	Wintemburg 1946	Historic	13	S	Huron
O'Neill	Lovis 1973	A.D.1000-1700	4	S	Michigan
Pine River Channel	Holman 1978	A.D.800-1000	1	S	Michigan
Round Lake[b]	Cleland 1978	?	2	S	Round Lk.

[a]End/Side Notched [b] Stains present [c] Cordage preserved

In aggregate, 16 sites with notched stones occur in the Upper Great Lakes (see Map 1). The counts of notched stones in each lake basin are 381, 69, 215, and 2 respectively. The total found is 665 specimens for all areas investigated.

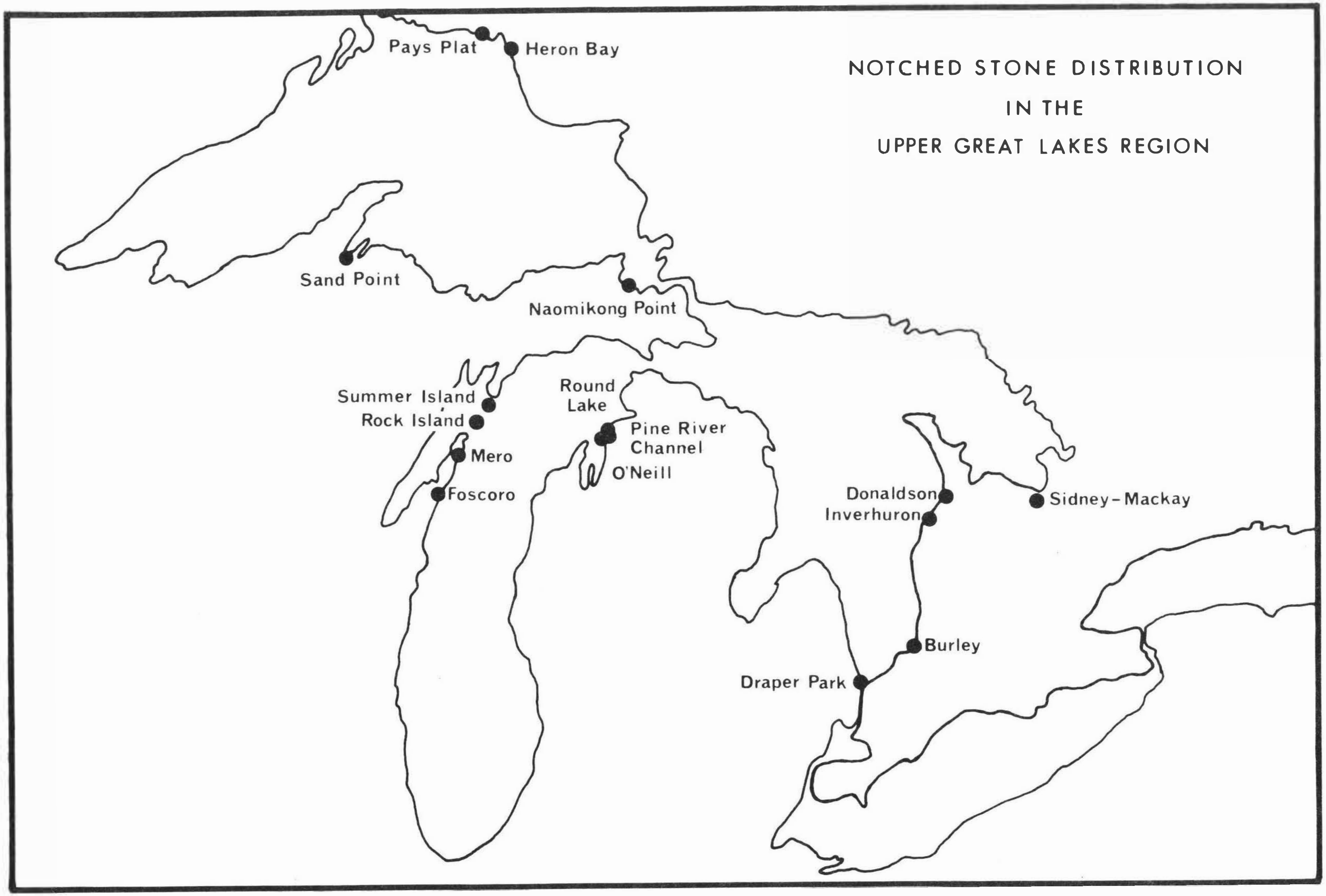
There are two styles of notched stones in the Great Lakes: end and side notched. There are 431 (65%) end notched, while 234 (35%) are side notched. Spatial distributions of these styles indicate that the Lake Superior basin contains primarily end notched stones; Lake Huron primarily side notched; while Lake Michigan has both. This information is summarized in Table 8.

TABLE 8

Spatial Distributions of Notched Stone Styles

	End Notched		Side Notched	
Basin	N	%	N	%
Lake Superior	398	99	3	1
Lake Michigan	45	65	24	35
Lake Huron	8	3	207	97

As shown in Table 9, the end notched style appears first and later develops into side notched. Notching appears in the Early Woodland exclusively on the ends; in the Middle Woodland primarily on the ends; in the Late Woodland primarily on the sides; and in the Historic, exclusively on the sides.


NOTCHED STONE DISTRIBUTION
IN THE
UPPER GREAT LAKES REGION
Pays Plat
Heron Bay
Sand Point
Naomikong Point
Summer Island
Rock Island
Mero
Foscoro
Round Lake
Pine River Channel
O'Neill
Donaldson
Inverhuron
Sidney-Mackay
Burley
Draper Park

MAP 1

TABLE 9

Style Changes of Notched Stones Over Time

	End Notched		Side Notched	
Period	N	%	N	%
Early Woodland	3	100	0	0
Middle Woodland	346	99	5	1
Late Woodland	82	28	216	72
Historic	0	0	13	100

Of the 16 sites listed above, only 10 have measurements reported for the notched stone artifacts (Pine River Channel, Mero, Rock Island, O'Neill, Round Lake, Pays Plat, Heron Bay, Summer Island, Naomikong, Sand Point, and Draper Park). These 10 sites, however, contain 635 or 95% of the total 665 artifacts, and provide ranges and means for most of the attributes such as length (L), width (W), thickness (T), weight (WT), haft width (HW), notch depth (ND), and notch width (NW) (see Tables 10 and 11).

Statistical manipulation is limited by the fact that only 7 sites (n=306 or 46%) have measurements available for each artifact (Mero, Rock Island, O'Neill, Round Lake, Pine River Channel, Summer Island, Sand Point, and Draper Park). Thus, no standard deviations can be obtained on the data from the other sites. At this point, a decision was made to utilize only the Sand Point and Draper Park samples (n=236 or 35%) for further analysis since more detailed information on these artifacts was readily obtainable (e.g., the

TABLE 10

Upper Great Lakes Notched Stone Ranges

Site	L	W	T	WT	HW	NW	ND
Pays Plat	6.3- 12.4	4.7- 11.4	.6- 2.8				
Heron Bay	5.9- 10.6	5.0- 7.9	.7- 3.3				
Summer Isle	6.4- 8.6	4.8- 6.4	1.1- 1.8				
Naomikong Point		4.8- 10.5	.7- 6.5				
Round Lake	8.0- 9.5	4.7- 6.6		310.00- 532.50			
Sand Point	4.6- 10.0	3.2- 8.9	.3- 3.0	19.50- 213.80	2.70- 9.50	0.12- 3.00	0.50- 0.95
Draper Park	4.6- 18.3	3.2- 10.7	.62- 5.9	21.50- 1134.00	2.50- 9.22	0.90- 4.90	0.20- 2.20
O'Neill	10.10- 14.55	5.1- 9.0	1.00- 2.55	53.1- 424.5	4.9- 8.52	.59- 3.24	.24- .82
Mero	4.8- 9.5	4.4- 7.2	1.60- 4.3	107.00- 497.00	4.0- 7.4	.90- 2.90	.20- .55
Rock Isle	6.3- 9.6	4.3- 7.5	.90- 2.50	50.00- 190.00	4.0- 8.8	.50- 3.10	.10- .65

material, shape, number of notches and locations, provenience, firing, battering, notching technique, sharpening, and cordage or stains, etc.) as well as associated site data.

TABLE 11

Upper Great Lakes Notched Stone Means

Site	L	W	T	WT	HW	NW	ND
Pays Plat	9.3	6.7	1.4				
Heron Bay	8.4	6.8	1.8				
Round Lake*	8.8	5.7		842.50			
Summer Isle*	7.4	5.8	1.4	101.5	1.1	.79	6.0
Naomikong Pte.		6.5	2.1	165	1.6	.30	7.9
Sand Point*	7.8	5.9	1.5	92.0	1.2	.27	6.8
Draper Park*	9.1	6.5	2.2	184.9	2.3	.39	5.8
O'Neill*	13.8	7.7	1.91	268.48	7.29	1.84	.48
Pine R. Channel	6.7	5.5	3.0	138.9	1.81	.5	.025
Mero*	6.4	5.8	2.8	195.21	5.43	1.8	.38
Rock Isle*	7.8	5.8	1.8	127.38	3.92	1.73	.24

*Standard Deviations available for this study

Attributes

Before a typology of notched pebbles can be formulated, a description of its discrete attributes should be presented. An attribute is defined here as "the smallest qualitatively distinct unit discriminated for a field of phenomena in a given investigation" (Dunnell 1971:200). The major underlying assumption in establishing any typology is that recurring sets of attributes of human origin equate with shared ideas of the makers and users of the artifacts displaying such attributes. Willey and Phillips (1958:13) have similarly stated

> . . .all types are likely to possess some degree of correspondence to this kind of reality (i.e., behavioral reality) and that increase of such correspondence must be the constant aim of typology.

Because of the importance of such analysis, an attempt was made to measure and objectively describe every attribute on each of the 236 notched pebbles from Draper Park and Sand Point even though some of the attributes observed may not, in the end, prove to be culturally significant. Nineteen attributes were recorded; eight are at the interval and eleven are at the nominal levels of measurement. If accurate measurements were not possible on any artifact due to breakage, those attributes affected were disregarded and recorded as "missing data." The attributes (and a brief definition of each) include:

1. Length - the measurement (in centimeters) of the longitudinal axis of the artifact between the tip and basal edge.

2. Width - The maximum lateral measurement.

3. Thickness - The maximum ventral-dorsal measurement.

4. Weight - The measurement (in grams) on whole artifacts only.

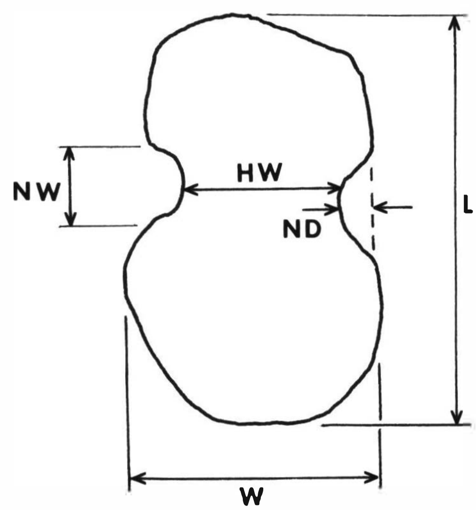
5. Haft Width - The measurement between the two symmetrically opposing medial points of the notches.

6. Notch Width - The measurement between the distal and proximal points of the notch.

7. Notch Depth - The difference between the maximum artifact width and the haft width.

FIGURE 11

Notched Stone Measurements



8. Shape - The formal attributes are recorded as being either round, pear-shaped, oblong, square, triangular, or fragmented (see Figure 1). The number and percent of each of these groups are shown in Table 12.

9. Material - The composition of each artifact is described as sandstone (SS), limestone (LS), slate (SL), or igneous (I) as shown in Table 13.

TABLE 12

Shape of Sand Point and Draper Park Notched Stones

Shape	Sand Point N	Sand Point %	Draper Park N	Draper Park %
Fragmented	9	23.7	31	18.0
Round	11	28.9	25	14.5
Pear	12	31.6	102	59.3
Oblong	6	15.8	6	3.5
Square			7	4.1
Triangular			1	.6

TABLE 13

Material Used in Sand Point and Draper Park Notched Stones

Material	Sand Point N	Sand Point %	Draper Park N	Draper Park %
SS	23	45.1	15	8.1
LS	21	41.2	129	69.7
SL	7	13.7	5	2.7
I			36	19.5

10. Notches - The placement of the notches has been defined on the basis of their occurrence on the sides (lateral), end (tip and base or longitudinal), both ends and side, two ends and one side, two sides and one end, or a single side.

11. Provenience - The Draper Park artifacts were sorted on the basis of vertical distribution as follows: Level II (modern sod and fill), III (historic, nineteenth century), transition III to IV, IV (Late Woodland-general site midden), IVA (Late Woodland-unstratified deposits), IVB (early Late Woodland-c. A.D. 650, stratified deposits), and features. The Sand Point artifacts were sorted by horizon provenience, the excavated areas being referred to as SP1 (mound 1), SP4 (mound 4), and SP15 (habitation area 15).

Only vertical distributions for the Draper Park data are presented here because (1) they are thought to be the most meaningful for interpretative purposes and (2) no other intra-site spatial analyses have yet been attempted which could provide comparative data. There is some problem with the interpretation, at this time, of the Sand Point stratigraphic levels.

TABLE 15

Provenience of Sand Point and Draper Park Notched Stones

Sand Point			Draper Park		
Provenience	N	%	Provenience	N	%
SP1	4	8.0	II	2	1.1
SP4	1	2.0	III	14	8.0
SP15	45	89.0	+III-IV	4	2.3
			IV	43	24.7
			IVA	14	8.0
			IVB	81	46.6
			F	16	9.2

12. Manufacturing Technique - Three techniques were observed for the making of notches: (1) percussion flaking, (2) preparatory percussion flaking, and (3) grinding.

1. The percussion flaking technique was utilized exclusively on the Draper Park notched stones. Beach pebbles were often selected with naturally occurring constrictions. Within these constrictions, flakes were usually struck off both sides (dorsal and ventral); rough spots in the notch were then battered down, apparently with the same tool.

2. The preparatory percussion technique is found only on the Sand Point notched stones. Large flakes were struck off one or both ends (n=18 or 35%) to reduce the thickness of the area subsequently notched by the same technique as the first.

3. Grinding also occurs only on the Sand Point notched stones (n=15 or 29%). Apparently, since a higher proportion of material from Draper Park is soft limestone (70%), flaking alone was sufficient for materials used at the latter site. Grinding occurs both as the only technique used for notching, and also subsequent to the use of the first two techniques. It is doubtful whether this attribute reflects wear instead of grinding because: (1) most of these notches are very small

in width (2 to 4 mm.), whereas the width of the cordage and stain of cordage found at Draper Park are larger (4 to 5 mm.); (2) the cordage that bound these artifacts was probably not that abrasive; and (3) such cordage would have probably been bound too securely to cause abrasion.

13. Secondary Battering - The stones show occasional pitting and battering along their lateral edges.

14. Firing - Some of the notched stones from Sand Point were made from rocks that were either previously used in fires or had been put accidently (?) into a fire after their manufacture.

15. Lateral Flaking - Some of the notched stones were roughly sharpened along their lateral edges by percussion flaking.

TABLE 16

Secondary Battering, Firing, and Sharpening on Sand Point and Draper Park Notched Stones

	Sand Point		Draper Park	
	N	%	N	%
Battering	3	5.9	14	7.6
Firing	5	9.8		
Sharpening	1	1.9	4	2.2

16. Cordage/Stains - The presence of cordage or stains of cordage, their widths, and the number of wraps around the entire stone constitute the final category of observations. These attributes are present only on the Draper Park notched stones and are recorded in Tables 5 and 6.

Table 17 summarizes the total interval-level metric attributes for the Sand Point (N-51) and Draper Park (N-185) notched stones. The Sand Point data is given in the upper half of the table; the Draper Park data in the lower half.

TABLE 17

Metric Attributes of Notched Stones

Sand Point

	No.*	Sum of Observ.	Sum of Obs. Sq.	Min.	Max.	Range	Med.	Mode
L	35	274.70	2234.45	4.60	10.00	5.40	8.20	4.60
W	41	242.10	1485.57	3.20	8.90	5.70	6.10	6.80
T	48	70.00	125.84	0.30	3.00	2.70	1.35	0.90
WT	30	2760.30	331764.30	19.50	213.80	194.30	77.05	19.50
HW	41	279.90	2034.49	2.70	9.50	6.80	7.10	6.50
NW	50	61.99	90.46	0.12	3.00	2.88	1.14	0.95
ND	35	9.42	3.55	0.50	0.95	0.90	0.25	0.15

	No.*	Mean	St. Error of Mean	Std. Dev.	Var.	Coef. of Var.	Kur-tosis	Coef. of Skew.
L	35	7.85	0.26	1.52	2.31	19.35	2.42	-0.52
W	41	5.90	0.18	1.83	1.40	20.04	3.24	-0.19
T	48	1.46	0.10	0.71	0.51	48.75	2.22	0.46
WT	30	92.01	9.46	51.79	2682.38	56.29	2.68	0.74
HW	41	6.82	0.27	1.76	3.09	25.76	2.56	-0.55
NW	50	1.24	0.75	0.53	0.28	42.50	4.75	0.99
ND	35	0.27	0.29	0.17	0.30	64.29	8.36	1.91

Draper Park

	No.*	Sum of Observ.	Sum of Obs. Sq.	Min.	Max.	Range	Med.	Mode
L	173	1570.16	15049.39	4.56	18.30	13.74	8.74	7.60
W	180	1168.28	7895.67	3.20	10.70	7.50	6.41	6.30
T	185	408.99	1012.00	0.62	5.90	5.28	2.10	1.90
WT	173	31994.55	9664787.00	21.50	1134.00	1112.50	141.40	108.60
HW	178	1025.34	6144.56	9.22	6.72	6.72	5.74	4.30
NW	157	367.35	949.85	0.90	4.90	4.00	2.20	1.80
ND	175	67.78	42.56	0.20	2.20	2.18	0.33	0.15

	No.*	Mean	St. Error of Mean	Std. Dev.	Var.	Coef. of Var.	Kur-tosis	Coef. of Skew.
L	173	9.08	0.16	2.15	4.63	23.71	6.41	1.42
W	180	6.49	0.99	1.32	1.75	20.37	3.38	0.42
T	185	2.21	0.56	0.77	0.59	34.63	5.45	1.03
WT	173	184.94	11.22	147.61	21789.12	79.82	15.71	2.98
HW	178	5.76	0.87	1.16	1.35	20.14	3.34	0.33
NW	157	2.34	0.61	0.76	0.58	32.52	3.58	0.78
ND	175	0.39	0.23	0.31	0.94	79.04	15.53	2.93

Sand Point, N = 51   Draper Park, N = 185

*Measurements taken only on whole artifacts

FORMAL DEFINITIONS OF NOTCHED STONE TYPES

In order to formally define the differences between the three types of sinkers from the Draper Park and Sand Point collections, eight interval level and eleven nominal level variables were recorded for each artifact and entered on disk storage in the DECsystem-10 computer housed at Western Michigan University. Various statistical descriptions and tests were then computed utilizing four programs: S.P.S.S. (Statistical Package for the Social Sciences) developed at the University of Pittsburg; S.T.P. (Statpack) developed at Western Michigan University; the Agglomerative Clustering Method written by J. Dubienat Oklahoma State University; and A.D.V.A.O.V. (Advanced Analysis of Variance).

First, an initial a priori, subjective sorting was made of the artifacts by myself. This was based entirely upon my own angling and net fishing experience and extensive readings in the ethnographic literature. The Sand Point collection contained 21 fishline sinkers and 30 net sinkers, while the Draper Park collection has 178 net sinkers and 7 anchors (see photographs). In order to determine whether or not the artifact forms also varied with these (intuitive) functional types, t-tests were computed using seven interval level variables to test the null hypothesis that no difference exists between line and net sinkers ($L_{1-7} = N_{1-7}$) at Sand Point and net sinkers and anchors ($N_{1-7} = A_{1-7}$) at Draper Park. The results are shown in Table 18.

TABLE 18

t-Test on Type 1 (Line Sinkers) versus Type 2 (Net Sinkers)(Sand Point)

Variable	df	t-value	2-Tail Prob.
L (length)	33	-0.99	.329 n.s.
W (width)	39	-3.18	.003**
T (thickness)	46	-8.77	.000***
WT (weight)	28	-3.89	.001***
HW (haft width)	39	-2.48	.017*
ND (notch depth)	33	1.51	.141 n.s.
NW (notch width)	48	-1.84	.072 n.s.

* significant at the .05 level
** significant at the .01 level
*** significant at the .001 level
n.s. not significant

At the .05 level of confidence, the null hypothesis is rejected indicating that there is a significant difference between line and net sinkers at Sand Point. The results also show that at the .05 level of confidence, the null hypothesis is again rejected in favor of the research hypothesis ($N_{1-7} = A_{1-7}$) indicating that there is a significant difference between net sinkers and anchors at Draper Park.

Other nominal attributes were tested in order to discern the differences between the three types of notched stones. During the

TABLE 19

t-Test on Type 2 versus Type 3 (Anchors) (Draper Park)

Variable	df	t-value	2-Tail Prob.
L	171	-7.83	.000***
W	178	-5.61	.000***
T	183	-6.17	.000***
WT	171	-12.04	.000***
HW	176	-5.50	.000***
ND	173	-1.39	.167 n.s.
NW	155	-0.69	.489 n.s.

*** significant at the .001 level
n.s. not significant

initial sorting of these types, it was noted that 99.90% of the line sinkers were made of slate and also, because of their different functions, that more battering from use could be expected on anchors than net sinkers, and more on net sinkers than line sinkers. Chi-square tests were computed on each of these nominal variables with the null hypothesis that no significant difference existed between (1) types and battering ($L_{batt.} = N_{batt.} = A_{batt.}$) and (2) types and slate ($L_{sl} = N_{sl} = A_{sl}$). The results are shown in Table 20.

There is no difference in the amount of battering between any of the three types of sinkers, since at the .05 level of confidence, we failed to reject the null hypothesis. The same results occurred in the test between the amount of slate used in net sinkers and anchors. However, we do reject the null hypothesis in the type 1 (line sinkers)

TABLE 20

Chi-Square Test on Notched Stone Type versus Slate and Battering

Type/ Variance	Corrected Chi-Square	df	Significance
Type 1 vs 2			
battering	.791	1	.374 n.s.
slate	26.2	1	.000***
Type 2 vs 3			
battering	.002	1	.966 n.s.
slate	.545	1	.460 n.s.
Type 1 vs 3*			
battering			.250 n.s.
slate			.000***

* Fisher's Exact Test (n is small; 21 and 7 respectively)
*** significant at the .001 level
n.s. not significant

vs 2 (net sinkers) and 1 (line sinkers) vs 3 (anchors) relating to the use of slate. Indicating that there is a significant difference in the amount of slate used in line sinkers at the Sand Point site. This could indicate: (1) a real difference and thus a reflection of a conscious choice in the selection of slate for use in fishline sinkers, or (2) an apparent difference created because of the abundance of the naturally occurring slate along the Sand Point beach.

Next, to determine if there is a significant difference between the net sinkers at Sand Point and those at Draper Park, t-tests and chi-squares were again computed with the null hypothesis that no differences exist between the net sinkers at the two sites ($N_{sp} = N_{dp}$, $N_{batt.\ sp} = N_{batt.\ dp}$, and $N_{sl.sp} = N_{sl.dp}$). The results are shown in Table 21.

TABLE 21

t-Test and Chi-Square Tests on Type 2 (Sand Point) versus Type 2 (Draper Park)

Variable	df	2-Tail Prob.
L	188	.029*
W	197	.751 n.s.
T	204	.103 n.s.
WT	184	.018*
HW	194	.000***
ND	189	.019*
NW	178	.000***

Variable	Corrected Chi-Square	df	Significance
battering	.020	1	.887 n.s.
slate	1.91	1	.167 n.s.

* significant at the .05 level
*** significant at the .001 level
n.s. not significant

The results indicate that the two samples of net sinkers from Sand Point and Draper Park can both be considered to have been drawn from the same population since we fail to reject the null hypothesis at the .05 level of confidence.

By combining data sets from both sites it was then possible to rerun significance tests on each individual type versus the other two types in order to obtain clearer differentiations between all three types. This was accomplished by the use of t-tests, chi-square calculations, and analysis of variance. The null hypothesis again stated that no significant differences exist between any of the three types of notched stones (Type 1_{sp} = Type $2_{sp\ \&\ dp}$, Type $2_{sp\ \&\ dp}$ = Type 3_{dp}, and Type 1_{sp} = Type 3_{dp}). The results are shown in Table 22.

TABLE 22

t-Test and Chi-Square Tests on Type 1 versus Type 2
(Sand Point and Draper Park)

Variable	df	t	2-Tail Prob.
L	199	-2.36	.019*
W	212	-3.68	.000***
T	224	-8.83	.000***
WT	194	-3.77	.000***
HW	210	0.41	.679 n.s.
ND	201	-0.42	.674 n.s.
NW	199	-6.06	.000***

Variable	Corrected Chi-Square	df	Significance
battering	.006	1	.939 n.s.
slate	.237	1	.627 n.s.

*** significant at the .001 level
n.s. not significant

The null hypothesis is rejected at the .05 level of confidence for all tests. However, there is no difference between (1) any of the types in the presence of battering, or (2) types 2 and 3 in the

TABLE 23

t-Test and Chi-Square Tests on Type 2 versus Type 3
(Sand Point and Draper Park)

Variable	df	t	2-Tail Prob.
L	195	-8.11	.000***
W	204	-5.78	.000***
T	211	-6.45	.000***
WT	191	-12.61	.000***
HW	201	-4.33	.000***
ND	196	-1.60	.110 n.s.
NW	184	-1.13	.261 n.s.

Variable	Corrected Chi-Sq.	df	Significance
battering	.006	1	.939 n.s.
slate	.237	1	.627 n.s.

*** significant at the .001 level
n.s. not significant

TABLE 24

t-Test and Chi-Square Tests on Type 1 versus Type 3
(Sand Point and Draper Park)

Variable	df	t	2-Tail Prob.
L	16	-5.72	.000***
W	20	-6.85	.000***
T	25	-11.13	.000***
WT	15	-6.45	.000***
HW	21	-2.30	.032*
ND	17	-1.07	.299 n.s.
NW	25	-4.77	.000***

Variable	Significance****
battering	.250 n.s.
slate	.000***

****Fisher's Exact Test
* significant at the .05 level
*** significant at the .001 level
n.s. not significant

usage of slate. The tests also indicate that we can reject the null hypothesis with greater confidence in the difference tests between types 2 (net sinkers) and 3 (anchors) and also 1 (line sinkers) and 3 (anchors) than we can in the tests between types 1 (line sinkers) and 2 (net sinkers).

The Analysis of Variance affords a single test by which it should be possible to determine whether or not all three types differ significantly among themselves or, in other words, if they could have been drawn from the same population. The null hypothesis is stated the same as above; the results are shown in Table 25.

TABLE 25

Analysis of Variance Types 1, 2, and 3

Variable	Sum of Squares	Degrees of Freedom k-1/ n-k	Mean Square	F	Significance of F
L	243.9	2	121.9	36.7	.001***
	657.8	198	3.3		
W	54.6	2	27.3	20.7	.001***
	260.8	198	1.3		
T	35.6	2	17.8	38.7	.001***
	91.1	198	.5		
WT	1918841.0	2	959420.5	89.7	.001***
	2118234.2	198	10698.2		
HW	2.0	1	2.0	1.9	.191 n.s.
	10.4	10	1.0		
ND	.0	1	.0		
	.2	10	.0		
NW	1.3	1	1.3	2.15	.171 n.s.
	5.9	10	.6		

*** significant at the .001 level
n.s. not significant

The results of the test show that at the .05 level of confidence, the null hypothesis is again rejected and therefore indicates that differences do exist between the three types of notched stones.

At this point, a final formal description of each of the three types was established and outlined in Tables 26 and 27 for use as a basis by which to compare other Upper Great Lakes sites which contain notched stones in their collections.

TABLE 26

Nominal Attributes of Line Sinkers, Net Sinkers, and Anchors

Variable/Category	Frequency (%) by Type: Line	Net	Anchor
Shape:			
Round	8.3	19.9	14.3
Pear	16.7	16.8	28.6
Oblong	50.0	55.0	42.9
Square	25.0	4.7	0.0
Triangular	0.0	3.6	14.3
Material:			
Sandstone	4.8	17.8	0.0
Limestone	0.0	60.6	42.9
Slate	85.7	3.8	0.0
Igneous	9.5	17.8	57.1
Notches:			
Side	14.3	78.6	85.7
End	33.3	11.7	0.0
Both	9.5	1.0	0.0
2 End, 1 Side	33.3	2.4	0.0
2 Side, 1 End	0.0	1.0	0.0
1 Side	9.5	5.3	14.3
Secondary Battering	0.0	7.7	14.3
Firing	4.8	1.9	0.0
Sharpening	4.8	1.9	0.0
Notch Prep.	0.0	8.7	0.0
Notch Wear	28.6	4.3	0.0

TABLE 27

Metric Attributes of Line Sinkers, Net Sinkers, and Anchors

Type/ Var.	Mean	Mode	Kurtosis	Min.	Max.	Std. Error	Std. Dev.	Skew.	Med.	Var.	Range
Type 1 (Line Sinkers)											
L	7.473	4.600	-0.751	4.600	9.100	.488	1.619	-0.837	7.800	2.620	4.500
W	5.207	6.600	-1.214	3.200	6.700	.301	1.165	-0.310	5.400	1.356	3.500
T	.800	.900	-0.629	0.300	1.200	.053	.236	-0.192	.850	.056	.900
WT	49.360	19.500	-1.377	19.500	80.200	6.691	21.159	0.077	42.550	447.696	60.700
HW	6.025	7.600	-1.483	2.700	8.900	0.508	2.33	-0.254	6.550	4.131	6.200
ND	0.329	0.250	0.901	0.050	0.950	0.073	0.252	1.262	0.275	0.063	0.900
NW	1.082	0.800	4.450	0.120	3.000	0.123	0.562	1.614	1.093	0.315	2.880
Type 2 (Net Sinkers)											
L	8.745	7.600	2.718	4.560	17.350	0.127	1.744	0.829	8.575	3.042	12.790
W	6.377	6.300	0.222	3.200	10.400	0.084	1.191	0.228	6.390	1.418	7.200
T	2.118	2.100	0.096	0.620	4.410	0.046	0.662	0.502	2.052	0.438	3.798
WT	158.965	94.000	0.981	21.500	476.400	6.717	91.605	1.152	134.900	8391.463	454.900
HW	5.884	5.000	0.275	2.500	9.500	0.088	1.239	0.423	5.835	1.534	7.000
ND	0.364	0.150	15.314	0.020	2.200	0.020	0.276	3.089	0.317	0.076	2.180
NW	2.174	1.600	0.535	0.500	4.900	0.060	0.801	0.677	2.101	0.642	4.400
Type 3 (Anchors)											
L	14.446	7.050	0.387	7.050	18.300	1.342	3.551	-1.256	15.250	12.611	11.250
W	9.033	6.580	-0.666	6.580	10.700	0.506	1.339	-0.669	9.290	1.794	4.120
T	3.809	2.270	-0.849	2.270	5.900	0.447	1.184	0.540	3.290	1.401	3.630
WT	670.529	149.800	-0.734	149.800	1134.000	116.319	307.750	-0.233	642.700	94710.347	984.200
HW	7.949	6.150	-1.846	6.150	9.220	0.484	1.280	-0.333	8.700	1.638	3.070
ND	0.544	0.040	0.309	0.040	1.850	0.236	0.624	1.372	0.310	0.390	1.810
NW	2.552	1.500	-1.847	1.500	3.710	0.399	0.978	0.258	1.905	0.956	2.210

Some of the more apparent nominal attribute frequencies which differentiate each of the notched stone types are:

1. Shape - Line sinkers are most often oblong or square, net sinkers are round, pear, or oblong, while anchors are most likely pear or triangular. The square shape of fish line sinkers may have perhaps caused them to "sail" in moving water while angling rather than sink. The triangular shape of anchors may have facilitated their "grounding" and the round, pear, and oblong shape may have been best for holding a net fairly steady in the water.

2. Material - Line sinkers are mostly made of slate but a few are limestone, net sinkers are mostly made of limestone but some are sandstone, igneous, and a few are slate, while anchors are made of either limestone or igneous.

3. Notches - Line sinkers have mostly two end and one side notch or are end notched, net sinkers are largely side notched, and anchors have side notches, exclusively.

4. Anchors show more battering than net sinkers; line sinkers have none. The heavier anchors would be expected to have more battering because of their rugged use at the bottom.

5. Line sinkers have more firing and sharpening than net sinkers.

6. Only net sinkers have notch preparation.

7. Line sinkers have more notch wear than net sinkers; anchors have none. This may be because line sinkers had a more active, individual, and longer use than net sinkers or anchors.

The metric outline shown in Table 27 also indicates distinct differences in the three types of notched stones. The means and ranges (in centimeters) for each of the variables per each of the three types are as follows:

1. Length - The mean length increases from line sinkers (7.5), to net sinkers (8.7), to anchors (14.4), while there is some overlap on the ranges (4.6-9.1, 4.6-17.4, and 7.1-18.3, respectively).

2. Width - The mean width also increases from line sinkers (5.2), to net sinkers (6.4), to anchors (9.0). The ranges are not as clearly differentiated (3.2-6.7, 3.2-10.4, and 6.6-10.7, respectively).

3. Thickness - The mean thickness also increases from line sinkers (0.8), to net sinkers (2.1), to anchors (3.8), while the ranges are overlapped (0.3-1.2, 0.6-4.4, 2.3-5.9, respectively).

4. Weight - The mean weight shows considerable differences from one type to another (49.4, 158.9, and 670.5 for line, net sinkers, and anchors, respectively). There is some overlapping again on the ranges (19.5-80.2, 21.5-476.4, and 149.8-1134.0, respectively).

5. Haft Width - The mean haft width varies from one type to another (6.0, 5.9, and 7.9 for line, net sinkers, and anchors respectively) and is mediated by the width variable. The ranges are also varied (2.7-8.9, 2.5-9.5, and 6.2-9.2, respectively).

6. Notch Depth - The mean notch depth increases slightly on all three types (0.3, 0.4, and 0.5 for line, net sinkers, and anchors, respectively). There is considerable variance, however, in their ranges (0.1-1.0, 0.0-2.2, and 0.0-1.9, respectively).

7. Notch Width - The mean notch width increases from line sinkers (1.1), to net sinkers (2.2), to anchors (2.6) and may reflect larger binding usage. The ranges vary (0.1-3.0, 0.5-4.9, and 1.5-3.7, respectively).

Summary of Statistical Tests and Descriptions

Initial intuitive sortings of 236 notched stones (35% of all that have been found in the Upper Great Lakes) identified 178 net sinkers and 7 anchors from Draper Park plus 21 fishline sinkers and 30 net sinkers from Sand Point. In order to determine whether or not these intuitive functional types covaried with the artifact forms, tests were made that indicated significant differences do, in fact, occur in seven interval variables (length, width, thickness, weight, haft width, notch depth, and notch width) and one nominal variable (slate) between these three types. It was then determined that the

Sand Point and Draper Park sites could have come from the same population; this then allowed the combination of the notched stone data from both sites so that further testing could be made.

This combined data set was retested by the use of the Chi-Square test, t-test, and Fisher's Exact test in order to obtain clearer differentiation between all three types of notched stones--fishline sinkers, net sinkers, and anchors. The Analysis of Variance test verified that these types differ significantly among themselves in form and they had been drawn from the same population.

Finally, a formal metric description of each of the three types was presented in a tabular format in Tables 26 and 27 and then discussed.

The final test attempted was the Advanced Analysis of Variance program to determine whether line sinkers, net sinkers, or anchors could be identified in the collections of notched stones from nine archaeological sites in the Upper Great Lakes. Where standard deviations on metrical data were missing from the published artifact analysis, this test substitutes one from the type (i.e., either line sinkers, net sinkers, or anchors) data (Sand Point and Draper Park combined) with which it was to be compared. This test ran the risk of greatly biasing the samples with substituted standard deviations and therefore was not computed.

It was shown earlier (Table 9) that the end notched style evolved into the side notched style from the Early Woodland through the Middle Woodland and into the Late Woodland. The evolution of notched stone forms over time and the technological shift from angling to net fishing (based on other archaeological data) is certainly real, but whether the two are related remains to be shown. This question may be resolved in the future by the use of a larger sample of sites (with published metric data), another more reliable significance test, and more rigid notched stone type definitions.

POSSIBLE ARCHAEOLOGICAL FISH NET REMAINS

Having established an initial working typology for notched stones, one major question remains involving the Sand Point and Draper Park notched stones before turning to an overview of Upper Great Lakes prehistoric net fishing activities. Is there any evidence indicating that the three clusters of notched stones from archaeological contents on these two sites represent the actual remains of former fish nets to which the sinkers had been attached? And, if so, is further speculation possible regarding the size of each net and their possible fish yield? Unfortunately the sinkers were not found with cordage connecting each together, nor were they found strung out at equal distances as would be expected based on information from ethnographic accounts (e.g., Rogers 1967:86).

One possible method to test this would be to determine whether or not these "clusters" of sinkers are significantly different from all other net sinkers found at that site. The assumption here is that the net sinkers made for one net are, for the most part, uniform in size in order to maintain proper balance in the water. These sinkers as a group would thus be significantly different from those sinkers used on any other net and, therefore, could be statistically differentiated.

One point requires brief clarification before continuing. It is misleading to think of these clusters as caches. They are, in fact, nothing more than groups of stones which at both sites have been found in general habitation middens within areas having a radius of no more than one meter. True archaeological caches of sinkers have been found within pit features, but not in the Upper Great Lakes region proper. One excellent example is the Harry's Farm site on the Upper Delaware River where 10 tightly packed caches were found in small refuse pits. The number in each cache ranged from 5 to 10 tightly packed caches were found in small refuse pits. The number in each cache ranged from 5 to 150, with a mean of 27. A t-test computed on the two largest caches (JF 105 and KF 28a) indicates that a significant difference does occur between these caches at the .05 level of confidence. The results are shown below.

TABLE 28

t-Tests on Caches of Notched Stones from Harry's Farm site

JF 105	n=35		KF 28a	n=9	
Variable	X	S	Variable	X	S
L	6.8	.74	L	8.8	1.08
W	6.1	.78	W	7.5	.56
T	.8	.38	T	1.3	.16
WT	46.0	19.5	WT	122.0	29.40

Variable	df	t
L	42	-4.97
W	42	-5.86
T	42	-5.79
WT	42	-6.96

.05
5 ratio 2.021

There are additional items which provide information initially useful in formulating the assumption which will be tested with the archaeological clusters at Draper Park and Sand Point.

First, at the Harry's Farm site, it was noted that the size of net sinkers comparing each individual cache was remarkably uniform (Kraft 1975). Convinced that these were indeed net sinkers because of cordage stains found on a number of the artifacts and other evidence, it was speculated that these caches represented individually stored nets that had been previously folded across the forearm in such a way as to leave the sinkers clustered and pendant (Kraft 1975:144). The t-test just computed is the first verification of the assumption. Second, Ritchie (personal communication, 1978) has noted that the numerous sinkers excavated from pits in New York (e.g., at the Morrow site) have shown consistent similar sizes within each pit when compared to other pits. Third, ethnographic evidence from the Mistassini indicates that notched stones were carefully choosen because there was an attempt to strike a proper balance between the floats and weights on nets (Rogers 1967:186). It is thus unlikely that a "hodgepodge" of sinkers and floats would be found on the same net and that consistency in manufacture should be expected.

Given this assumption, t-tests were computed for each of the three suspected nets found at the Draper Park and Sand Point sites, with the null hypothesis that no significant difference exists between the "nets" and all other (type 2) net sinkers found at each of the sites ($N_1 = N_{all}$, $N_2 = N_{all}$, $N_3 = N_{all}$). The results are shown in Table 29.

TABLE 29

t-Tests on "Nets" versus all Other Type 2 Notched Stones

"Net"	Variable	x	df	t	2-Tail Prob.
1	L	8.94	164	-0.33	.739 n.s.
(Draper Park)	W	6.47	171	-0.45	.654 n.s.
N=32	T	2.24	176	-0.88	.378 n.s.
Other n =204	WT	179.50	164	-1.05	.297 n.s.
	HW	5.79	169	-0.73	.464 n.s.
	ND	0.35	166	.68	.499 n.s.
	NW	0.77	149	1.06	.291 n.s.
2	L	7.96	18	0.51	.615 n.s.
(Sand Point)	W	6.34	20	0.20	.840 n.s.
N=12	T	1.71	22	1.77	.091 n.s.
Other n = 224	WT	106.77	14	.99	.338 n.s.
	HW	7.44	19	-0.08	.939 n.s.
	ND	0.26	17	-0.63	.536 n.s.
	NW	1.36	21	0.11	.916 n.s.
3	L	7.43	12	1.07	.305 n.s.
(Sand Point)	W	5.85	14	1.79	.096 n.s.
N=17	T	1.90	16	0.60	.559 n.s.
Other n = 219	WT	102.50	8	0.76	.469 n.s.
	HW	6.95	13	0.57	.579 n.s.
	ND	0.21	11	0.33	.748 n.s.
	NW	1.51	17	-0.90	.380 n.s.

n.s. not significant

At the .05 level of confidence, we fail to reject the null hypothesis indicating no difference. Thus, these clusters, it would seem, do not in fact, represent individual nets. My first reaction to these results was to explain these clusters by suggesting that they represent, instead of nets, manufacturing areas or caches of fishing gear. These alternative explanations seemed quite plausible, especially since the two clusters from Sand Point contained, according to the established typology, both line and net sinkers as indicated earlier.

Ritchie, however, has suggested another alternative explanation which, I believe, may account for these test results. He suggests (personal communication, 1978) that there is a difference between the sinkers used on gill nets and the sinkers used on seines. On seines, the sinkers were most likely standardized (such as those found at the Harry's Farm site), because a proper balance had to be maintained while stretching the net across rivers or shallow lake shore areas. Gill nets, possibly like those in question here, were either sunk to the bottom or left somewhat suspended in the water. He believes that whatever combination of sinkers ("hodgepodge" or not) caused the gill net to sink was the one used. Meaning, therefore, that a greater attribute variation should be expected in gill net sinkers than in seine net sinkers. Also, if seines were operated by a family unit and gill nets operated communally, then a greater variation would be expected in the manufacturing and maintenance techniques of gill nets (along with their floats and sinkers) than seine nets. Thus, the clusters at Draper Park and Sand Point may, according to Ritchie's interpretation, be gill net sinkers.

As for the explaining problem of both line and net sinkers within the same clusters as Sand Point, these two types of notched stones have reportedly been used interchangably for several functions. This has been suggested by Munro (1911:165) for Japan, Kroeber (cited in Hallowell 1920:42) in the Sacramento Valley and de Laguna (1975:171) in Alaska, where the Aleut name for the bird bola weight is the same as that given the fishline sinker. Thus the Sand Point clustered "net" sinkers could have been used previously for other functions as well.

Incorporating Ritchie's alternative explanation and assuming that the three clusters of notched stones found at Draper Park and Sand Point represent gill net remains, further speculation can be made on their possible sizes and yields.

Fish net sizes

There are two ethnographic references which note how far apart notched stone sinkers were spaced along the bottoms of aboriginal fish nets. According to Rogers (1967:86), this distance was 2-1/2 or 3 armspans (ca. 1.8 to 2.7 m.) on Mistassini nets, while Densmore (1929:154) recorded it as twice a single arm length (ca. 1.8 m.) on Chippewa nets. By using the more conservative figure of 1.8 m., an estimate of the possible lengths of the three nets can be made. This information is shown in Table 30.

TABLE 30

Draper Park and Sand Point Estimated Net Lengths

Net	Site	N	Length (m.)
1	Draper Park	32*	54.6
2	Sand Point	12	21.6
3	Sand Point	17	30.6
*Two of these are anchors		$\bar{X}$ =	35.6

There are a half dozen ethnographic references to sizes of aboriginal fish nets. These are listed in Table 31.

TABLE 31

Approximate Seine and Gill Net Sizes

Reference	Cultural Group	L (m.)	W (m.)	Mesh (cm.)
VanStone (1965:13)	Chipewyan	3.7		
Rogers (1967:85-89)	Mistassini	30.5	ca. 1	5.1
Skinner (1911:137)	N.Saulteaux	7.6-9.1* 30.5+**		
Hilger (1951:126-129)	S. Objibwa	91.4	.9	4.8
Joutel cited in Margry (1876-86 /3/:503)	Huron	ca.365.8	.6	
Champlain (1616:166-168)	Huron	1.5	.9	

*River nets **Lake and shallow stream nets

These sources indicate that Indians were skillful at manufacturing nets of all sizes--some even longer than 350 meters. The average of all the ethnographically recorded nets, minus the exceptionally long one recorded by Joutel (cited in Margry 1876-86 [3]: 503), is 27.5 meters which is only 8.1 meters shorter than the average Draper Park and Sand Point (possible) nets.

Fish nets yields

There are seven ethnographic references and one modern reference to the harvests of aboriginal net fishing in the Upper Great Lakes region. This information is shown in Table 32.

The minimum number of fish caught per net haul in these accounts is 20; the maximum is 1600 pounds. This clearly indicates how little effort was required in order to gain rather sizable harvests of fish. These harvests were particularly valuable during two seasons of the year--during the spring and fall spawning periods--when the variety of fish species were greatest. Table 33 indicates the variety of fish species netted, the location, type of net used and season of the year the natives fished in the Upper Great Lakes. During the spring, when other animal and plant resources were scarce, fishing significantly raised the number of available food resources. During the fall, fish could be stored over the meager winter months because of the cold weather. This rise in food levels afforded a corresponding

TABLE 32

Recorded Net Yields

Reference	Cultural Group	Yield
VanStone (1965:13)	Chipewyan	one man with 5 nets caught 100 trout and whitefish per day
Dablon (JR 1670:149)	S. Saulteaux	one man with 1 net caught 20 to 40 sturgeon, or 150 whitefish, or 800 herring per night
Kennedy (1951:268-269)	(Modern)	one 90 m. net caught 250# of whitefish and trout or 1600# of the same during the spawning season.
Hilger (1951:126-129)	S. Ojibwa	41 "marketable" pike, pickerel, perch, and whitefish plus a quantity "unmarketable" of croppers, suckers, and rock bass in July.
Dunning (1959:23)	N. Saulteaux	15 gill nets yielded 50 to 200 edible pickerel and white-fish per month during warm weather seasons.
Long (1904:94, Vol. 2)	Ojibwa	18,000 pounds caught in 2 months.
Cameron (1890:298)	S. Saulteaux	200-300 fish that feed on whitefish roe caught per night.
Cadillac (1888:81)	Ottawa	one net yielded 100 white-fish per catch.

TABLE 33

Species of Fish Netted in the Upper Great Lakes Region

Source/Reference	Species	Location	Net	Season
Ragueneau (1650:175)	herring	L. Huron	?	winter
Sagard (1939:231)	trout, sturgeon, assihendos, auhaitsig, (ciscoe)	L. Huron	seine	late fall, late spring
Schoolcraft 1958 (1820:173)	whitefish, herring, trout	L. Superior	gill	?
Andre & Alloues (1673:265)	herring	L. Huron	gill	fall
Dablon (1670:149)	sturgeon, whitefish, carp, herring	L. Superior	?	late fall
Andre (1673:273)	sturgeon	L. Huron	gill	spring
Grant (1804:345-346)	sturgeon	L. Huron	seine	spring, summer, fall
Hilger (1951:129)	pike, pickerel, sucker, perch, whitefish	Red Lake	gill	summer
Dunning (1959:23)	pickerel, whitefish primarily but also sucker, sturgeon, n. pike, tullibee, moriah, lake trout	N. Saulteaux area	gill	continually

Table 33 (continued)

Source/Reference	Species	Location	Net	Season
Henry (1809:55)	whitefish	Mackinaw area	gill	winter
VanStone (1965:13)	trout, whitefish	Great Slave Lake and Lake Athabasca area	?	fall

increase in economic security and population density (Cleland 1966: 177; 1976:19-20; n.d.).

Implications from the Draper Park and Sand Point Faunal Remains

Looking specifically at the Draper Park and Sand Point sites again, the faunal remains indicate that both sites were occupied at times when spawning fish were most susceptible. At Draper Park these included sturgeon, walleye, and drum (spring); and at Sand Point, whitefish and possibly lake trout (fall). Elizabeth Cardinal identified the Draper Park remains and Terrence Martin made the identifications at Sand Point which are shown in Table 34.

Cardinal (personal communication, 1978) reports that sturgeon and drum are both bottom feeders preferring shallow, silty water, while walleyes prefer clear, deep water, but may be caught in shallower water when feeding. Although all three are found in the Great Lakes, they are not found in the same habitats. She believes that "this would indicate that the fishermen at Draper

Park were either fishing in two separate areas or using a method, such as netting, which would cover more than one habitat."

TABLE 34

Fish Remains from the Draper Park and Sand Point Sites

Site	Species	N	Percent of Usable Meat
Draper Park	Sturgeon	36	66.4
	Walleye	85	21.4
	Drum	79	7.5
	Whitefish	6	2.5
	Lake Trout	1	2.0
	Sucker family	1	.2
Sand Point	Whitefish family		50.0
	Brook and/or Lake Trout	8	50.0

Martin was most surprised at the very small number of fish remains from Sand Point--only eight vertebrae. He believes four factors may account for this: (1) acid soil conditions, (2) fish remains may have been scavenged by dogs (see Kohl 1860:327), (3) sampling error, or (4) the fish may have been cleaned elsewhere away from the living area. Hilger helps substantiate this point with a Chippewa example. She notes (1951:129) that "all the nets were brought ashore, women busying themselves sorting fish and removing entrails; men assisted as soon as they had eaten breakfast . . . after the . . . fish had been packed . . . men rowed out into the lake and discarded all offal." Other reasons for this may be that no flotation samples were taken at Sand Point as there were at Draper Park or the fish remains may have been burned in fires.

All the fish found at Sand Point or Draper Park could have been netted. Only one fish, the walleye, is not ethnographically recorded as being netted. There are several indications of netting activity: (1) the associated net sinkers, (2) no other fishing gear was found at Draper Park; at Sand Point, however, copper fish hooks, gorges, and a possible harpoon were found (Hoxie n.d.), (3) two species at Draper Park and one at Sand Point, the sturgeon and whitefish, feed on small organisms and seldom take a hook (Cleland 1966:177), plus the fact that angling is not ordinarily a profitable way to exploit fish resources, (4) the variety of fish from different habitats and of different sizes, ranging from suckers, averaging about two pounds in weight, to sturgeon, averaging 20 pounds and more, and (5) the high number of fish remains recovered. At Draper Park, a total of 4,574 fish bones were excavated during the 1974 and 1975 field seasons from an area amounting to 69.68 cubic meters with a resulting density of almost 66 fish bones per cubic meter of screened and/or floated soil.

Using 3,000 calories per day as a minimum caloric intake for an adult male, Hinsdale (1932:9) calculated that a man would require 6.7 pounds of fish per day. Considering that the fish remains from the excavated portions of the Draper Park site represent 705.6 pounds of usable meat (Cardinal, personal communication 1978), then this amount of food would represent 105.3 subsistence days. As Cleland (1966:134) has pointed out, Hinsdale's estimates, based on 3,000 calories per day, is "extremely conservative" since American Indians could survive on a lower caloric intake, particularly since women and children, who do not require as many calories, would be included.[1] The Draper Park site covers an area of approximately 700 m^2 of which 69.68 m^2 or nearly one tenth was excavated during the 1974-1975 field seasons. Assuming that the denisty of faunal remains across the site is consistent with quantities recovered from 10% of the total site area, it is possible to generate an estimate of 1,053 subsistence days represented by fish remains from the entire habitation area. Assuming the number of individuals at the site was 25, which is an average size for hunter-gatherer groups (Birdsell 1968:235), the Draper Park population could subsist on this amount of fish for 42 days.

---

[1]The United Nations Food and Agricultural Organization (1965) has estimated very high average (modern-world) calorie requirements of 3,200 for male and 2,300 for female working 8 hours per day. The National Academy of Sciences (1968) has estimated lower and somewhat more applicable requirements for hunter-gatherer groups of 2,800 and 2,000 for male and female, respectively.

ETHNOGRAPHIC OBSERVATIONS OF FISHING ACTIVITIES IN THE DRAPER PARK AND SAND POINT AREAS

A second, more detailed search of the ethnographic literature was made in order to locate information documenting (1) the long-time use of these two favored fishing sites by the Indians, and (2) the nature of fishing activities, particularly net fishing, which gives evidence (either directly or indirectly) for net sinker use.

Draper Park

Although many early notables sailed up the rapids at the head of the St. Clair River (very near the site of Draper Park) and into Lake Huron (e.g., La Salle, Fathers Hennepin and Recollects aboard the Griffin; Duluth or Lahontan), none of them specifically mention anything about Indians fishing--just that there were Indians living along the river banks.

Perhaps the earliest account of aboriginal fishing in the area is that given by Charlevoix (cited in Whitaker 1892:165) in his voyage to North America in 1721. In speaking of Lake St. Clair and the St. Clair River, he stated:

> The islands in the river seemed placed on purpose for the pleasure of the prospect, and the river and the lake abound in fish. Were it not for the Hurons at Detroit the other tribes of Indians would starve. This is in

> the flat lands thereabout which would furnish them sufficient subsistence though it were cultivated even so little, but they can subsist upon the fish of the river which are plentiful. We entered Lake Huron where we soon had the pleasure of fishing for sturgeon.

Another early reference (albeit general) is found in an unsigned memorandum to Major General Proctor, Commander of the Right Division at the Headquarters in Montreal, dated October 6, 1813.[1] It states:

> It is known to every person acquainted with the River St. Clair, that near to its sortie from Lac Huron, there is a part of it very narrow, not more than one hundred yards accross; in this spot there is so strong a current that it requires a very stiff breeze to carry up a vessel.--There is a village of Chipiway Indians stationed on the south side /just south of Draper Park/ of this Rapid, attracted to the spot by the great quantities of fish which is there caught.

Another very general reference was recorded seven years later in 1820 by Henry Schoolcraft (cited in Mason 1958:63): "In ascending the river . . . we also passed a number of Indian canoes, in which were generally one family, with their blankets, guns, fishing apparatus, and dogs."

The History of St. Clair County, published in 1883, mentions

---

[1] Michigan Pioneer and Historical Society, Historical Collections, copies of papers on file in the Dominion Archives at Ottawa, Canada, pertaining to the relations of the British Government with the United States during the period of the War of 1812, pp. 400-401.

(p. 258) that "the rapids at all seasons of the year furnished an unlimited supply of all kinds of fish." In a chapter on "Fishing Industries," (p. 377-378) it specifically mentions that:

> The Indians were want to congregate along the St. Clair River and especially near the entrance of the river because of the great abundance of fine fish. . . . the fish, and especially the whitefish, which were very plentiful in the early days, were caught mainly by the seine . . . /emphasis mine/.
>
> The ownership of land property located for the purpose of operating seines for whitefish was considered a matter value, and when the Huron Land Company in 1837, bought... property . . . they acquired all the sections in the township of Fort Gratiot along the lake shore extending from the lighthouse /immediately north of Draper Park/ to the north town line . . . . and divided the space . . . into what they denominated 'fisheries' . . .. the whitefish gradually disappeared . . .. there was also a considerable amount of pickerel and herring caught . . .. In 1836 there were reported 3,100 barrels of these fish caught at Fort Gratiot /300 yards south of Draper Park/, and in the following year 4,000 barrels . . ..

Farrand (1884:496) has also reported that a settler moving to this same area in 1819 "found the place used mostly by the Indians as a . . . fishery," /emphasis mine/. Smith and Snell (1887:227-230) noted that Port Huron (the City where Draper Park is located) was a fish market of considerable importance in 1885 when they conducted a major survey of Great Lakes fisheries for the U. S. Commission of Fish and Fisheries. They found that most fishermen used seines but that a few gill and pound nets were also in use. The yield consisted largely of herring, pike, and pickerel; herring being particularly abundant. The white fish were very scarce by this time. Storrow

(1817:156) states that:

> Within the range of the fort /Gratiot/ there is a fishery, which for years, perhaps ages, has given sustenance to the tribes inhabiting the lower parts of Lake Huron. From this and other causes they have ascribed to it a moral value beyond its due, and rarely pass it without making it, as much from superstition as conscience, a resting place on their way below.

Sand Point

The Sand Point area and Lake Superior literature had numerous reference to aboriginal fishing; first, general ones are presented, then more specific ones follow. Charlevoix (cited in Whitaker 1892: 165-166) in 1721 noted that:

> The Indians from gratitude for the plentiful fish with which this lake /Superior/ supplies them, and from the respect which its vast extent inspires, have made a sort of divinity of it . . . . The Indians live entirely by fishing, and there is perhaps no place in the world where they are in greater plenty. The most common sort of fish in the three lakes which discharge themselves into these straits /Mackinac/ are the herring, the carp, the goldfish, the pike, the sturgeon, the attikumaig or whitefish, and especially trout.

Thompson (cited in Tyrell 1916:297-298) in 1798 also recorded that "deer are so scarce that all they kill does not furnish leather for their wants, and when the mild season comes, they all descend to Lake Superior to live by fishing." Hickerson (1962:81) has even stated:

> I should go so far as to say that without fishing there would have been no human life in the northern Great Lakes region under aboriginal conditions. Fisheries permitted settled populations; the fisheries were the villages.

Somewhat closer to the site proper, Schoolcraft (cited in Mason 1958:173-174) in 1820 recorded that:

> . . .the number of Indians about Huron and Keewaywenon Bays is one hundred and thirty, about half of them males, and about twenty five of these warriors. They subsist in summer principally on fish, which they take in sufficient quantities in the bay by gill nets /emphasis mine/ and the spear. Whitefish, herring, and trout are abundant in these bays.

Referring to the Keweenaw Peninsula area, Smith and Snell (1887:35) note that the fishermen "mostly French Canadians with more or less Indian blood, and full blooded Indian, together with a small number of Swedes and Norwegians," catch a majority of their fish with gill nets. Indians, they say, also used spears and decoys for catching fish in the winter when their supply of other food became exhausted. This seems to agree with the variety of fishing gear found at the Sand Point site. They state that:

> Gill nets have been in use since the first settlement of the region, and are still more extensively employed than any other form of apparatus. Each boat has forty nets . . . averaging 450 feet long and 15 meshes deep, with meshes 4 3/4 to 6 inches. Formerly all were rigged with floats and stones /emphasis mine/, but about 1875, corks and leads were introduced and have now superseded the others. The fishing begins early in May, or as soon as the ice will permit, and continues until the middle or last of November. The largest catches are made between September 25 and November 1, when trout are quite abundant. Whitefish are taken in considerable numbers early in May, and in fair quantities throughout the summer (1887:57-58).

They also discuss in some detail the fishing activities at L'Anse and Baraga which are both in the immediate vicinity of the

Sand Point site. Fisheries of greater or lesser extent had been carried on in L'Anse Bay since the first settlement. At L'Anse, population about 1,000 (mostly half-breeds and Indians), forty fished with hand-lines under the ice, then made their living by spearing trout, and two employed dip-nets in 1885. The proportion of different species caught in total for the summer of 1885 were whitefish 57%, trout 10%, herring 15%, suckers 5%, sturgeon 5%, brook-trout 3%, lawyers 3%, plus pike and pickerel 2% (Smith & Snell 1887:59-62).

Seines, formerly used a great deal in the vicinity, had been completely abandoned by 1885 and gill net fishing had grown in its place. Fishing by this method was reportedly done during three periods of each year: (1) between May 1 and June 15, (2) between July 20 and September 15, and (3) between November 15 and December 15.

Smith and Snell (1887:61) also make these interesting observations about summer gill net fishing:

> The twenty-eight local nets were handled by five men with two mackinaw boats. They were pound-and a half nets, 60 fathoms long and 14 meshes deep, with a 4 1/2 inch mesh. Most of them were rigged in the old-fashioned way, with stone and float /emphasis mine/; but a few had leads and corks. The entire catch for 1884 was only 100 pounds to the net /emphasis mine/; and that for 1885 not much better, being only 150 pounds. In the prosperous days of the business it was not unusual to get as much as that to a net every morning.

Referring to the winter gill-net fishing, they record that four men fishing under the ice from January to April caught only 1500

TABLE 35

Specific References to the Aboriginal Fishing in the Draper Park and Sand Point Areas

Favored Fishing Site	Gill Net Use	Seine Use	Species Caught
	Draper Park		
Storrow (1817:156) Anonymous (1813) History of St. Clair Co. (1883:377-378)	Smith and Snell (1887:227-230)	History of St. Clair Co. (1883:258) Farrand (1884:496) Smith and Snell (1887:227-230)	sturgeon, "all kinds", whitefish, pickerel, herring, pike
	Sand Point		
Schoolcraft (1820) Hilger (1951:125-129) Smith and Snell (1887:59-62)	Schoolcraft (1820) Smith and Snell (1887:61) Hilger (1951:125-129)	Smith and Snell (1887:59-62)	carp, lake and brook trout, whitefish, goldfish, herring, pike, pickerel, lawyers, suckers, large mouth bass, large mouth black bass, ciscoe

pounds with twenty nets. From June 15 to July 15 and again from October 15 to the end of November, the herring fisheries were carried on with "75-fathom nets, 35 meshes deep, having a 2 1/2 inch mesh, rigged with stone and float /emphasis mine/. . . . the catch in 1884, by six men with two mackinaw boats and six nets, was 5 tons; in 1885 with an additional boat, two additional men and four more nets, it was 10 tons . . . ." (Smith & Snell 1887:61-62).

And finally, Hilger (1951:127, Plate 21, No. 2) has a 1935 photograph of Ojibwa commercial fishing nets drying at the L'Anse Indian reservation just across the bay from the Sand Point site. She states (1951:126-127) that families on the L'Anse Reservation in 1935 who were fishing for commercial purposes:

> . . . owned from five to seven nets each. Sinkers consisted of flat or rounded pieces of lead; floaters, of elongated cylindrical pieces of wood attached to the net . . . .
>
> On Keweenaw Bay (L'Anse, 1935) two young men each owned a net 200 feet long and 3 feet wide; each had 40 floaters and as many sinkers /emphasis mine/. 'We set these nets at seven this evening and expect to raise them at four in the morning the day after tomorrow.' They were catching lake trout, large-mouth black bass, and ciscos for commercial purposes . . . some informants had heard old people tell of spearing fish with copper arrows. . . .[1]

---

[1] See the earlier section entitled "Implications from the Draper Park and Sand Point Faunal Remains" for an earlier reference to copper.

UPPER GREAT LAKES PREHISTORIC NET FISHING

The abundant natural supply of fish in the waters of the Upper Great Lakes has played an important role in aboriginal subsistence and settlement practices. There are numerous accounts by missionaries, explorers, and settlers (many of which have already been cited) referring to the bountiful supply of fish in the Great Lakes, to their excellent quality, and to their great importance as a food resource to the natives. Hinsdale (1932:16) thought fish determined the population of the Indians in Michigan. In the northern areas where game was scarce, it was thought that fishing kept the population near the lakes and rivers. Over 230 species of fish, representing 29 families, live in these diverse waters; waters which grade from warm to very cold, from stagnant to great rivers and deep inland seas (Hubbs & Lagler 1947).

In the Upper Great Lakes there are over 77,000 square miles of open water found; making this region unmatched on earth for the proportion of freshwater to land area. In spite of this, it is nevertheless a region where fish are not readily available. Cleland (1976:11-12) gives three reasons to account for this observation. First, the lakes tend to be relatively impoverished because they are so cold and deep. Second, the lakes are so large that the fish remain dispersed throughout most of the year. And third, they are stormy or ice covered three or four months of the year.

Some features of Upper Great Lakes fish resources made fisheries a productive enterprise. Cleland states that while the fish of these lakes may be relatively inaccessible for much of the year, they were available in almost limitless quantities (especially by net fishing) during certain other periods--the spring and fall spawning runs.

The spring spawning run begins soon after ice leaves the open water in mid-April or early May and the fish approach the off-shore shallows or ascend streams and rivers to spawn. The fish of primary economic importance in the prehistoric fishery include the lake sturgeon, Acipenser fulvescens; white sucker, Catostomus commersonni; northern redhorse sucker, Morostoma macrolepidotum; northern channel catfish, Ictalurus punctatus; black bullhead, Ictalurus nebulosus; yellow perch, Perca flavescens; walleye pike, Stizostedion vitrem; northern pike, Esot lucius; and various members of the bass family, Serranidae. Of these, the lake sturgeon and suckers, particularly the white sucker, were the most important of the spring spawners for the natives. Also, some fall-spawning whitefish and trout remained in shallow waters during the spring and early summer. These were taken in nets until they began to retreat into colder, deeper waters in early to middle summer (Cleland 1976:12-15).

The fall fishery begins in late September or October and becomes increasingly productive until the weather and ice cover close the season in mid-December. Most fall spawning fish are found on silt-free, shallow water, gravel shoals. These include the lake trout, Salvelinus namaycush, and several members of the white-fish family--the lake whitefish, Coregonium clupeaformis, the lake herring, Coregonius artedii; and other varieties of shallow water ciscoes, the chubs or deep water ciscoes of various species, and the round whitefish or "menominee," Prosopium cylindraceum. All these species were economically important to the native fisher-men (Cleland 1976:15-16).

The food value of Great Lakes fish is relatively high. They are an excellent source of protein; generally rich in vitamins A and D; and a good source of thiamine (B_1) and riboflavin (B_2). Minerals such as calcium, phosphorus, and potassium constitute from 1 to 2 percent of the edible portion of fish, while fat varies generally between 20 to 25 percent (Borgstrom 1962). Ascorbic acid (C) even occurs in small amounts in fish roe (Driver & Massey 1957:208). Carbo-hydrates, however, are almost totally lacking in fish (Rostlund 1952: 3). The average number of calories per pound, including moisture, for various genera and species of fish range from about 300-1,000 (Atwater 1892:833-835).

The fall-spawning species are nutritionally of higher quality than the spring spawners. Rostlund (1952:4) notes that the majority of spring-spawning fish produce 350-450 calories per pound, while the fall-spawning lake trout and whitefish produce 600 to 800 calories per pound. Cleland (n.d.) believes that fall was a particularly important season to the native fishermen.

With the onset of cold weather (as mentioned earlier), they could now store frozen fish (cf. Densmore 1929:125; VanStone 1965:13) and, thus, high population numbers could be supported.

There are a number of accounts which describe winter fishing activities (Champlain 1929:166-168; Joutel cited in Margry 1876-86 (3):503; JR 35:175; LeJeune 1635:39; Long 1904; Rogers 1967:49, VanStone 1965:19).

Alexander Henry (1809:55) provides a typical example of ice fishing as done by Ojibwa or Ottawa fishermen in 1763 at Michilimackinac (Mackinaw City):

> The white-fish is taken (at Michilimakinac) in nets which are set under the ice. To do this, several holes are made in the ice, each at such distance from that behind it, as that it may be reached, under the ice, by the end of a pole. A line, of sixty fathoms in length, is thus conveyed from hole to hole, till it is extended to the length desired. This done, the pole is taken out, and with it one end of the line, to which the end is then fastened. The line being now drawn back by an assistant, who holds the opposite extremity, the net is brought under, and a large stone is made fast to the sinking-line at each end, and let down to the bottom; and the net is spread in the

> water, by lighters on its upper edge, sinkers on its lower, in the usual manner. The fish, running against the net, entangled their gills in the meshes, and are thus detained till taken up.

Fishing was more productive per acre than hunting or wild plant collecting. It was second only to agriculture in this respect (Cleland 1966:195-196; Driver & Massey 1957:208; Hewes 1948:243). This was especially so in the Upper Great Lakes where (1) important game animals (e.g., moose and caribou to the north and deer and elk to the south) occur in relatively low density and (2) plant resources (e.g., seed and nutbearing species) exploited by prehistoric gatherers are not abundant (Cleland n.d. 11).

Rostlund (1952:65) estimates that the fish yield per surface acre of water for the three Upper Great Lakes varies between one and two pounds which makes their availability low (because of large, deep basins) when contrasted to the fertile Mississippi Valley, yielding 60 pounds of fish per surface area. However, this differential is offset to some extent by the fact that Upper Great Lakes fish are very abundant on a seasonal basis. Also, in terms of human energy expenditure, it was much more efficient to catch many relatively small fish, as with nets, than to kill a few relatively large mammals. Fish are a reliable food resource which could be depended upon day in and day out, whereas mammals were not reliable, and dependance upon them would have resulted in an alternation of periods of scarcity and plenty (Cleland 1966:196). Furthermore, the regularity and abundance of certain migratory fish contributed so much to the security of peoples dependent upon fishing for subsistence that it allowed greater residential stability and population concentrations (Hewes 1948:243).

Lovis and Holman (1976) have presented a stress model for Laurel Middle Woodland to account for its development into a regional Late Woodland in the Mackinac Straits--Sault St. Marie area. In this model, they view the use of net and weir fishing techniques as the triggering mechanism for an increase in carrying capacity and population levels. As a result, there was a trend toward nucleation and seasonal aggregation into large social units in the Late Woodland. Thus the fish net, as an extractive device, had an important impact upon the economy of the Indians when it was introduced into the Upper Great Lakes.

A fish net, by definition, is a trap, snare, or impounding device made for the purpose of catching large quantities of fish. It has the characteristics of being constructed with materials that are so light that maximum dimensions and minimum weight are combined; thus, it is the largest possible fishing implement that can be handled per unit of man power. A fish net has the advantages, (1) capturing fish en masse, (2) capturing any species of fish, and (3) being less restrictive than other forms of fishing such as weirs, dams, spears, etc. (Rostlund 1952:81). Although fish nets are not manufactured and maintained as easily as some other gear, Rostlund (1952:81) believes that "more fish can be taken with them and with less effort than by any other method."

Most authorities agree that small hand nets, dip nets, scoop nets, and the like were used in pre-Columbian North America. The knowledge of seine nets has, however, been questioned by Hallowell (1920). He believed that the seine was introduced by Europeans. Today, archaeological evidence, combined with numerous reports by early observers of aboriginal fishing, clearly shows that many Indians used large seines and gill nets long before the arrival of the Europeans (deLaguna 1934:170; Rostlund 1952:82-84).

Originally it was believed (e.g., Rostlund 1952:98) that fish nets, as an invention, spread southeasterly from Alaska (along the Yukon-Mackenzie-Great Lakes-Atlantic coast axis), however, more recent archaeological evidence provides a quite different picture. The earliest evidence for net fishing in the Great Lakes comes from the south and east, during the Late Archaic, not the northwest (cf. Kraft 1975; Ritchie 1965). Cleland (1976:26) believes netfishing practices entered the Upper Great Lakes region from the east. The earliest evidence for net fishing in the Northeast comes from the Harry's Farm site on the upper Delaware River which dates to the Middle Archaic period, ca. 6,000 B.C. Other early sites in the include the Lamoka Lake site (ca. 2,500 B.C.), the Morrow site (ca. 500-600 B.C.) and the Bent site (ca. 1900 B.C.) all of which are in New York State.

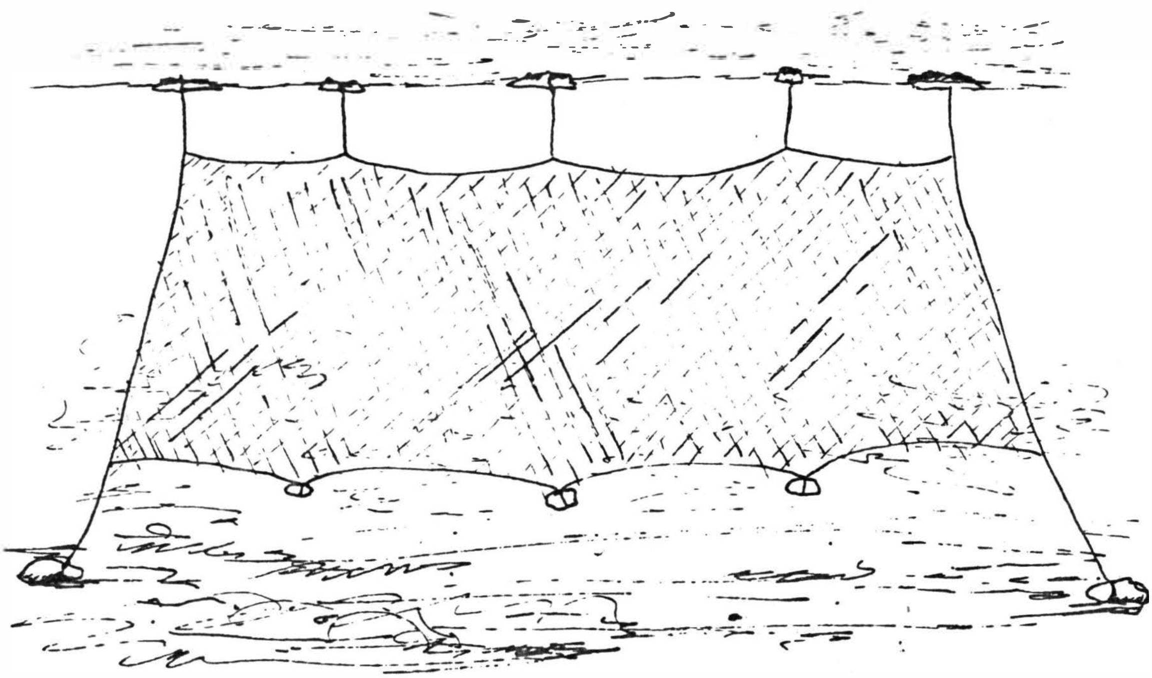
The first appearance of net fishing in the Upper Great Lakes dates to the Early Woodland period. End notched sinkers are found in the Point Peninsula component of the Inverhuron site which Kenyon (1959) dates to ca. 600 B.C. Net sinkers are frequently found on Saugeen Focus Laurel sites of southwestern Ontario (e.g., Donaldson & Burley), and also Laurel sites to the north (e.g., Summer Island in northern Lake Michigan and Pays Plat, Heron Bay, and Naomikong Point in the Lake Superior Basin.

The forms of aboriginal fish nets in North America have not been as well recorded as the functions. We have numerous accounts describing fishing and the use of primitive nets but nowhere in these reports are details offered with respect to the net forms being utilized (Rostlund 1952:83). Nor, is it possible to clearly determine whether seines or gill nets were being used. Furthermore, because fish nets were made of perishable material, very few have ever been found archaeologically; the fragments that are preserved indicate little concerning the original net form or function. Thus, we presently do not know which of the two types of nets discussed in this paper (seine or gill) was used first. One indirect method used to differentiate these forms archaeologically (as suggested earlier) is to identify the notched stone type utilized. So far, this tact has been applied only to the Archaic Harry's Farm site and Late Woodland Draper Park and Sand Point sites where seine and gill nets, respectively, are hypothesized to have been used. Rostlund (1952:93) suggests that the principle of seining appears to be simpler (and earlier) than that of gill netting, a rather complex technique. Therefore, the ordinary dip net or hauled (seine or drag) net may have been independently invented in several regions at early dates, while the specialized gill net developed or diffused more slowly from other areas later in time.

Seine nets were used in rivers and lakes, and especially along beaches in shallow water. They were used in three separate ways: (1) in rivers against the current so that the fish could be encircled and then lifted from the water by the net (Kraft 1975; Sagard 1968:59-60), (2) in large shallow water areas that could be encircled, and then narrowed to secure the entrapped fish, (3) or towed behind a canoe (Rostlund 1952:92). The smaller seine nets had long sticks, used as handles, attached to both ends. This type of seine, called a "double stick net," is today used all over the world (Brandt 1964:109). Seines are typically non-selective in the type and size of fish caught, but do catch fish in quantities.

Gill nets were generally set at the mouths of streams in the shallows along shores of rivers and lakes. They varied in length;

FIGURE 12



Reconstruction of a Gill Net

those used in rivers were only about 7.5 to 15.0 meters long, but those used in the lakes and in shallower streams were sometimes 30 or more meters in length (Skinner 1911:137). Some very large, wide-mesh nets were set in water over 4 kilometers off shore and spread in water having a depth of more than 55 meters (Joutel cited in Margry 1876-86(3):503).

Gill nets are more sophisticated in terms of their method of operation. These nets are set upright in the water by the use of floaters to raise its upper edge, sinkers to weight its lower edge, and two anchors to hold either end secure. The nets are then left, usually overnight. Fish that do not see or detect the cordage until too late, run headlong into the meshes and are caught, as a rule, behind the head or gill covers--hence the term "gill net." The more the larger fish struggle to free themselves, the more and more entangled in the net they become (see Figure 12).

Some people believe that when fishermen noticed very early that some fish became enmeshed in different size seine nets, they began designing gill nets with specific mesh sizes for different species of fish (Brandt 1964:164).

The set gill net also solved the problem of how to catch the night and bottom feeders (e.g., the larger and fatter whitefishes) that were sought by the native fishermen (Rostlund 1952:29). Many skills were needed in order to manufacture and maintain gill nets (Skinner 1912:37). Some of the characteristics required for proper gill nets include: (1) a proper balance between the sinkers and floaters, depending whether or not the net was for use on the bottom or nearer the surface, (2) the right mesh shape, (3) the right mesh size for the fishes to be caught, (4) the proper color so that it contrasted as little as possible with its surrounds and did not look like an impenetrable wall (5) the greatest possible softness, (6) the smallest possible swell, and (7) the least odor.

In regard to the last characteristic, Densmore (1929:125) states that the Chippewa thoroughly washed their nets after being taken from the water. They were sometimes dipped in a "decoction of sumac leaves" to destroy the odor of fish, it being said that "the fish would not approach a net with the slightest odor upon it." According to Rogers (1967:85), Mistassini gill nets were darkened by soaking them for about two days in a dye made from black spruce cones.

Regarding the sizes of mesh required for certain species of fish, there are two references. Hilger (1951:126) reports that the Chippewa used 2" x 2" and also 2" x 2 5/8" mesh sizes for pike, perch, and suckers, 3" x 2 1/2" for "two lippers," and 2 3/4" x 3 1/8" for whitefish. Van Oosten (1938:110-111) reports that 1 1/2" to 2" mesh was used for bait, 2 1/2" to 2 3/4" for herring, chubs, perch, menominees, and other "rough" fish, 4 1/2" to 5" for white-fish, trout, and yellow perch-pike, and 7" to 8" for spawning white-fish and trout.

Both seine and gill net fishing were communal activities because of the temporary nature of the abundance of fish and the need to coordinate the harvest, preparation, and distribution of the catches (Cleland 1966:143). This is illustrated by Sagard (1968:231), for example, who noted that "the catching of small fish is done in cooperation; then the division is made by great bowlfuls, and in this we had our share as fellow-townsmen and /Huron/ residents." Such cooperative subsistence activities required more social and political control than would individualized for family oriented subsistence efforts.

The division of labor in the various activites associated with net fishing varied from one cultural group to another. Net Manufacturing was done primarily by the women (Densmore 1929:152-153; Hilger 1939:188; Landes 1937:95; Sagard cited in Bigger 1929:136, 166-167; Tooker 1964:59), although there is at least one record that men manufactured nets (Champlain cited in Grant 1907:331) and another of men maintaining nets (VanStone 1965:48). Nets were worked by both men and women (men: Hilger 1951:127; Landes 1937:95, 128, 132; Rogers 1959:134; Tooker 1964:63; women: Densmore 1929:125; Landes 1937:94-95, 132; Rogers 1959:134; VanStone 1965:13). The cleaning, cooking and/or drying of fish was done primarily by the women (Hilger 1951:128-129; Rogers 1959:134; Tooker 1965:58), although there are again references to at least some involvement by the men in these activities (Hilger 1951:128-129; Landes 1937:128).

TABLE 36

Division of Labor in Net Fishing Activities

Cultural Group	Net Mfg.		Net Use		Food Prep.	
	M	W	M	W	M	W
S. W. Chippewa		X	X	X	X	X
S. E. Chippewa	X					
N. Chippewa	X		X			X
Mistassini		X	X	X		X
Huron		X	X			X

SUMMARY AND CONCLUSIONS

The combined archaeological and ethnographic information provides ample evidence that notched stones in the Upper Great Lakes region were, and in fact still are, in at least one nearby area, functioning in fishing activities as weights for gill and seine nets and as fishline sinkers. Two sources have documented their use as line sinkers, eight as net sinkers, and five as anchors. Archaeologically, they have been found with cordage stains, with cordage still attached, connected to fish net remains, on well known fishing sites, associated with abundant fish remains, and in caches and clusters within littoral settings. There are two styles of sinkers--end and side notched; the former being earlier in time. The exact function of each is currently unknown, although it has been suggested that the end notched stones were line sinkers and side notched were net sinkers. Notched stones first appeared in the archaeological record of the Upper Great Lakes during the Early Woodland but were probably used even earlier. Net fishing may have spread into the Upper Great Lakes region from the south and east. Statistical analyses of more than a third of the notched stones from the Upper Great Lakes helped verify the existence of three separate artifact forms and typologically define each by correlating a number of nominal and interval attributes. It is suggested that seine net weights were properly balanced (i.e., all the sinkers were of comparable size and shape), whereas gill net weights were not as carefully selected or standardized.

By assuming that the three clusters of sinkers found at the Draper Park and Sand Point sites represent actual gill net remains, estimates of their lengths were inferred based on the ethnographically recorded distance between the sinkers. Their average inferred lengths were found to be comparable to the recorded native lengths.

Net fishing activity is indicated at the Draper Park site (where many net sinkers and anchors have been found) by the associated types, varieties, and quantities of fish remains and references to the site as a well-known Indian "fishery" in the historical literature. The Sand Point site has few fish elements from which inferences can be made, but does have considerable ethnographic evidence relating to native net fishing activity occurring at and very near the site.

In spite of the enormous freshwater area contained within the Upper Great Lakes region, it tends to be relatively impoverished in terms of fish availability. Fish netting, more than any other extractive technique, increased yields, particularly during the spring and fall spawning seasons. With the introduction of gill net fishing came the added exploitation of night and bottom feeders and a more passive means of fishing which allowed more time for other subsistence activities.

Seines are thought by many to have been used earlier than gill nets, with the latter developing out of the use of seines. Seines are typically non-selective and catch fish en masse; whereas gill nets, a somewhat more sophisticated device, are selective (with specific mesh sizes used), and passive (left usually overnight). Native fishermen were skillful at making, maintaining, and using the long, durable nets. These were sometimes set in water over 4 kilometers offshore at depths exceeding 55 meters.

The traditional sexual divisions of labor are reflected in net fish activities. Nets were more often made by the women. It was usual for the men to do most of the angling, spearing, and netting of fish; however during the times of abundant harvest (e.g., spring and fall spawning runs) the women also helped. The fish was prepared and cooked primarily by the women.

Net fishing was a simple, but very effective technology, that could be applied at different levels, depending upon its need (Cleland n.d.). It helped level out and increase the otherwise fluctuating subsistence base, while at the same time promoting economic security and population increase. Fishing was more productive per acre than hunting or wild plant collection in the Upper Great Lakes and its food value was relatively high, especially when supplemented with carbohydrates in the diet. Fishnet preparation and the harvesting and distributing of catches were cooperative activities requiring social and political control; thus, strengthening group relations beyond the family level. The increased regularity and abundance in resource availability from net fishing contributed to the greater residential stability and population concentrations seen in the development of the Late Woodland cultures in this region.

Hopefully in the future, more deeply stratified sites will be found and excavated that have good preservation like that found at Draper Park. Such sites are likely to yield more corded and stained "notched" stones (some may be unnotched). At the time of this writing, two additional sites have been found which contain net sinkers. The first site, found by a Western Michigan University survey crew directed by Mr. Robert Kingsley, was a surface find of a side notched stone on the Kalamazoo River, near its mouth at Saugatuck. The second, called the Elam site, is currently being excavated by a Western Michigan University field school directed by Elizabeth Garland. It has yielded a possible corded specimen from within Mississippian deposits on a floodplain terrace of the Kalamazoo River just below the Allegan Dam in Allegan County.

Deeply stratified sties are rarely found in the Upper Great

Lakes region, and when they are, we are often not fully prepared to excavate and preserve the organic remains utilizing proper techniques. At both the Elam and Draper Park sites, the excavators thought the staining or cordage was, at first, nothing more than roots. One unnotched and stained specimen was even discarded and later found in a backdirt pile.

Many questions will be answered if future excavations uncover a fishnet with notched stones still attached; questions such as: the spacing of the sinkers, number notched and/or unnotched, mesh size, the nature and placement of anchors, net size, and so on. It would be interesting to correlate the fish remains from that site with the net's mesh sizes and also speculate on the possible net yields given the net size and quantity of fish found. Future excavations, particularly at the Sand Point site, should also sample areas more peripheral to the main habitation (or burial) areas to determine whether fish preparation localities (cleaning, smoking, drying, storing, etc.) are present.

When a large number of sites have been found and the sample size of notched stones and associated data has increased, then a series of statistical analyses and descriptions may produce more comprehensive interpretation and stricter morphological and functional definitions. One of the initial objectives of this paper was to correlate a number of separate variables (e.g., site function, size, seasonality, environmental setting, nearby water depth, movement, associated fishing gear and fish remains) with the notched stone styles, types, and possibly even separate attributes. This, however, was not possible because the number of sites with adequate data is too small at present. These correlations could have helped test a number of postulates. For example, Brose (1970:125-126) has suggested that narrow, deep notched stones (with smaller cords) were used in shallow water "where /they/ rested on the bottom and thus received more disturbances requiring . . . more secure fastening," and Lovis and Holman (1976:274) have suggested that with the increased reliance on net and/or weir fishing during the Late Woodland there was a concomitant reduction in the use of fish-hooks, harpoons, and gorges.

It would also be interesting and useful to experimentally manufacture, use, and maintain a net by drawing upon analogies with the archaeologic and ethnographic record, and determine which type of notched stones cause nets to sink, sail, or stabilize in moving water by replicating seine fishing in a stream.

In conclusion, it can now be stated with reasonable certainty that, because of the abundant archaeologic and historic-ethnographic evidence, there is clear indication that notched stones were used in native fishing technology in the Upper Great Lakes region. These artifacts are useful indicators of some of the earliest fishing in the Great Lakes, and possible evidence for a major technological shift which occurred during the Woodland period.

BIBLIOGRAPHY

Anonymous
1883 History of St. Clair County, Michigan. A. T. Andreas, Chicago.

Anonymous
1965 Food and agricultural organization calorie requirements. Report of the Second Committee on Calorie Requirements, FAO Nutritional Studies 15.

Anonymous
1968 Recommended Dietary Allowances. National Academy of Science, National Research Council, Publication 1964. Washington D. C.

Abbott, Charles C.
1881 Primitive Industry: Illustrations of the Handiwork in Stone, Bone and Clay of the Native Races of the Northern Atlantic Seaboard of America. George A. Bates, Salem.

Adair, James
1968 The History of the American Indians. Johnson Reprint Corporation, New York.

Anderson, Keith M.
1969 Ethnographic analogy and archaeological interpretation. Science 163 (3863):133-138.

Andre
See: Thwaites, R. G.

Andre and Alloues
See: Thwaites, R. G.

Ascher, Robert
1961 Analogy in archaeological interpretation. Southwestern Journal of Anthropology 17:317-325.

Atwater, W. O.
1892 The chemical composition and nutritive values of food fishes and aquatic invertebrates. Report of the U.S. Commission of Fisheries for 1888, pp. 679-868.

Beauchamp, William M.
1897 Aboriginal chipped stone implements of New York. Bulletin of the New York State Museum 4 (16):1-84. University of the State of New York. Albany.

Biggar, H. P. Editor
1929 The Works of Samuel de Champlain. The Champlain Society. Toronto.

Binford, Lewis R.
1967 Smudge pits and hide smoking: the use of analogy in archaeological reasoning. American Antiquity 32 (1): 1-12.

Binford, Sally R. and Lewis R. Binford Editors
1968 New Perspectives in Archaeology. Aldine, Chicago.

Bird, J. B.
1945 Archaeology of Hopedale area, Labrador. American Museum of Natural History, Anthropological Papers 39:119-186. New York.

Birdsell, Joseph B.
1968 Some predictions for the Pleistocene based on equlibrium systems among recent hunter-gatherers. In: Man the Hunter, edited by R. B. Lee and I. DeVore, pp. 229-240. Aldine, Chicago.

Borgstrom, Georg Editor
1962 Fish as Food. 3 Vols. Academic Press, New York.

Brandt, Andres von
1964 Fish Catching Methods of the World. Fishing News Ltd., London.

Brefeuf

See: Thwaites, R. G.

Brose, David S.
1970 The archaeology of Summer Island: changing settlement systems in Northern Lake Michigan. Anthropological Papers, Museum of Anthropology, University of Michigan 41. Ann Arbor.

Cadillac, Sieur De Lamothe
See: Margry, P.

Dablon
See: Thwaites, R. G.

Deetz, James
1968 The inference of residence and descent rules from archaeological data. In: New Perspectives in Archaeology, edited by S. R. Binford and L. R. Binford, pp. 41-48. Aldine, Chicago.

Densmore, Frances
1929 Chippewa customs. Bureau of American Ethnology, Bulletin 86, Smithsonian Institution. Government Printing Office, Washington D.C.

Dozier, Edward P.
1970 Making inferences from the present to the past. In Reconstructing Prehistoric Pueblo Societies, edited by Wm. A. Longacre, pp. 202-213. University of New Mexico Press, Alburqueque.

Driver, Harold E. and William C. Massey
1957 Comparative studies of North American Indians. Transactions of the American Philosophical Society n.s. 47 (2). Philadelphia.

Dunnell, Robert C.
1971 Systematics in Prehistory. The Free Press, New York.

Dunning, R. W.
1959 Social and economic change among the Northern Ojibwa. University of Toronto Press, Toronto.

Cameron, Duncan
1890 The Nipigon Country. In: Les Bourgeois de la Compagnie du Nord-Ouest, edited by L. F. R. Masson 2:303-366. De L'Imprimerie Generale A. Cote et cie, Quebec.

Chang, Kwang-Chih
1967 Major aspects of the interrelationship of archaeology and ethnology. Current Anthropology 8 (3):227-243.

Champlain, Samuel De
1929 Voyages and discoveries, made in New France, from the year 1615 to the end of the year 1618 by the Sieur de Champlain ordinary for the King in the Western Ocean, translated and edited by H. H. Langton and W. F. Ganong. The Champlain Society. Toronto.

Childe, V. Gordon
1956 Piecing Together the Past: the interpretation of archaeological data. Fredrick A. Praeger, New York.

Christy, H. and E. Lartet
1865 Reliquae Aquitanica, edited by T. R. Jones. Williams and Norgate, London.

Clark, Grahame
1951 Folk culture and the study of European prehistory. In: Aspects of Archaeology in Great Britain and Beyond: Essays presented to O. G. S. Crawford, edited by W. F. Grimes, pp. 49-65. London.

Cleland, Charles E.
1966 The prehistoric animal ecology and ethnozoology of the Upper Great Lakes region. Anthropological Papers, Museum of Anthropology, University of Michigan 29. Ann Arbor.

1978 The history of prehistoric fishing in the Great Lakes. Unpublished report M26-73 C.A., United States District Court, Western District of Michigan, Northern Division, United States of America v State of Michigan.

n.d. Evaluation of Woodland fishing practices into the historic period. Unpublished paper presented at the 54th annual meeting of the Central States Anthropological Society, 1978.

Coe, Joffre L.
1964 Formative cultures of the Carolina Piedmont. Transactions of the American Philosophical Society n.s. 54 (5). Philadelphia.

Evans, J.
1860 Reigate flints. Proceedings of the Society of Antiquity, January 1860.

Farrand, B. C.
1884 Early history of St. Clair County. Report of the Pioneer Society of the State of Michigan 5:493-499. Lansing.

Flannery, Kent V. and Michael D. Coe
1968 Social and economic systems in formative mesoamerica. In: New Perspectives in Archaeology, edited by S. R. Binford and L. R. Binford, pp. 267-284. Aldine, Chicago.

Fowkes, Gerad
1896 Archaeological work in Hawaii. Bureau of American Ethnology, Bulletin 76. Smithsonian Institution. U.S. Government Printing Office, Washington D. C.

Freeman, L. G.
1968 A theoretical framework for interpreting archaeological materials. In: Man the Hunter, edited by R. B. Lee and T. DeVore, pp. 262-267. Aldine, Chicago.

Furst, Peter
1968 The Olmec were-juguar motif in the light of ethnographic reality. In: Contemporary Archaeology, edited by M. P. Leone. Southern Illinois University Press, Carbondale.

Garnier
See: Thwaites, R. G.

Gould, R. A.
1968 Living archaeology: the Ngatatjara of Western Australia. Southwestern Journal of Anthropology 24:101-122.

1971 The archaeologist as ethnographer: a case from the Western District of Australia. World Archaeology 3:143-177.

Grant, Peter
1890 The Saulteaux Indians about 1804. In: Les Bourgeois de la Compagnie du Nord-Quest, edited by L. F. R. Masson, 2:303-366. DeL'Imprimerie Generale A. Cote et cie, Quebec.

Grant, W. L. Editor
1907 Voyages of Samuel De Champlain 1604-1618. Charles Scribner's Sons, New York.

Haight, Marion R.
1968 The proverbial net weight. Ohio Archaeologist 18:75.

Hallowell, Irving A.
1920 The problem of fish nets in North America. M. A. thesis, Department of Anthropology, University of Pennsylvania.

Heidenreich, Conrad
1971 Huronia: a history and geography of the Huron Indians 1610-1650. Historical Site Branch, Ontario Ministry of Natural Resources. McClelland and Stewart Ltd.

Henry, Alexander
1809 Travels and Adventures in Canada and the Indian Territories between the years 1760 and 1776. New York.

Hewes, Gordon W.
1948 The rubric fishing and fisheries. American Anthropologist 50:238-246.

Hickerson, Harold
1962 The Southwestern Chippewa: an ethnohistorical study. American Anthropological Association, Memoir 92. Menasha.

Hilger, Inez M.
1939 A Social Study of One Hundred Fifty Chippewa Indian Families of the White Earth Reservation of Minnesota. The Catholic University Press, Washington.

1951 Chippewa child life and its cultural background. Bureau of American Ethnology, Bulletin 146, Smithsonian Institution. U. S. Government Printing Office, Washington D. C.

Hill, J. N.
1968 Broken K. Pueblo: patterns of form and function. In: New Perspectives in Archaeology, edited by S. R. Binford and L. R. Binford, pp. 103-142. Aldine, Chicago.

Hinsdale, Wilbur G.
1932 Distribution of the aboriginal population of Michigan. Occasional Contributions from the Museum of Anthropology of the University of Michigan 2. Ann Arbor.

Hodge, F. W.
1959 Handbook of American Indians north of Mexico. Bureau of American Ethnology, Bulletin 30. Pageant Books, Inc., New York.

Holman, Margaret
1978 The Pine River Channel site. Ph.D. dissertation, Department of Anthropology, Michigan State University.

Hoxie, R. David
n.d. A preliminary report on copper artifacts from the Sand Point site in Baraga County, Michigan. Unpublished paper presented at the 54th Annual Meeting of the Central States Anthropological Society, 1978.

Hubbs, C. L. and K. F. Lagler
1947 Fishes of the Great Lakes region. Cranbrook Institute of Science, Bulletin 26. Cranbrook Press, Bloomfield Hills.

Jochelson, W.
1925 Archaeological investigations in the Aleutian Islands: Carnegie Institute, Publication 367. Washington D. C.

Janzen, Donald E.
1968 The Naomikong Point site and the dimensions of Laurel in the Lake Superior region. Anthropological papers, Museum of Anthropology, University of Michigan 36, Ann Arbor.

Jones, Charles C.
1873 Antiquities of the Southern Indians. American Press, New York.

Jones, Volney H.
1937 Notes on the preparation and the uses of basswood fiber by the Indians of the Great Lakes region. Papers of the Michigan Academy of Science, Arts, and Letters 22:1-14.

Joutel Henri
1687 Journal. In: Decouvertes et etablissements des francais dans l'ouest et dans le sud de l'Amerique (1614-1754) by Piere Margry, Vol. 3, 1876-1878. D. Jouaust, Paris.

J. R. (Jesuit Relations)
See: Thwaites, R. G. (editor): The Jesuit Relations and Allied Documents.

Jury, Wilfrid and Elsie Jury
1952 The Burley site. University of Western Ontario, Museum of Archaeology and Pioneer Life, Bulletin 9. London.

Kennedy, W. A.
1951 The relationship of fishing effort by gill-nets to the interval between lifts. Journal of the Fisheries Reserve Board of Canada 8 (4):264-274.

Kent, Kate P. and Sarah M. Nelson
1976 Net sinkers on weft weights. Current Anthropology 17:152.

Kenyon, Walter A.
1959 The Inverhuron site, Bruce County Ontario. Royal Ontario Museum of Art and Archaeology, Occasional 1. The University of Toronto Press, Toronto.

Kinietz, W. Vernon
1965 The Indians of the Western Great Lakes 1615-1760. The University of Michigan Press, Ann Arbor.

Kraft, Herbert
1975 The Archaeology of Tocks Isle. Archaeology Research Center, Seton Hall University Museum. South Orange.

Kumlien, Ludwid
1887 The fisheries in the Great Lakes. In: The Fisheries and Fishing Industries of the United States by G. B. Goode et al. U. S. Commission of Fish and Fisheries 5:757-769.

Lagace, Robert O.
1971 Guide to the Ojibwa file. Human Relations Area File. New Haven. Microfische.

de Luguna, Frederica
1975 The Archaeology of Cook Inlet, Alaska. Alaska Historical Society. Anchorage.

LaPotharie
See: Thwaites, R. G.

Lee, Thomas E.
1952 A preliminary report on an archaeological survey of southwestern Ontario. National Museum of Canada, Bulletin 126. Ottawa.

1960 The Lucas site, Inverhuron, Ontario. National Museum of Canada, Bulletin 167, Contributions to Anthropology, 1958. Ottawa.

LeJeune
See: Thwaites, R. G.

Long, John
1904 Voyages and travels of an Indian interpreter and trader. In: Early Western Travels 1748-1846, edited by R. G. Thwaites, Vol. 2. Arthur H. Clark Co., Cleveland.

Longacre, W. A.
1968 Some aspects of prehistoric society in east-central Arizona. In: New Perspectives in Archaeology, edited by S. R. Binford and L. R. Binford, pp. 89-103. Aldine, Chicago.

Lovis, William Anthony, Jr.
1973 The Late Woodland cultural dynamics in the northern lower peninsula of Michigan. Ph.D. dissertation, Department of Anthropology, Michigan State University.

Margry, Pierre
1879-1888 Decourverts et etablissements des francais dans l'Quest et dans le Sud de l'Amerique septentrionale, 1614-1754. Memoirs et documents inedits, recueillis et publies par Pierre Margry, 6 vols. Paris.

Martin, Terrance J. and Deborah Rhead
n.d. Environment and subsistence at Sand Point. Unpublished paper presented at the 54th Annual Meeting of the Central States Anthropological Society, 1978.

Mason, Philip P. Editor
1958 Schoolcraft's Expedition to Lake Itasca: the Discovery of the Source of the Mississippi. Michigan State University Press, East Lansing.

Mason, Ronald J.
1966 Two stratified sites on the Door Peninsula of Wisconsin. Anthropological Papers, Museum of Anthropology, University of Michigan 26. Ann Arbor.

Moore, Winston D.
1973 In search of Baraga County's ancient past. Baraga County Historical Book 1972-73. Baraga County Historical Society. Baraga.

Munro, Neil Gordon
1911 Prehistoric Japan. Yokohama.

Nelson, E. W.
1899 The Eskimo about Bering Strait. Bureau of American Ethnology, Report 18(1):19-517. Smithsonian Institute. U. S. Government Printing Office, Washington D. C.

Orme, Bryon
1973 Archaeology and ethnography. In: The Explanation of Culture Change, edited by C. Renfrew, pp. 481-492. University of Pittsburg Press, Pittsburg.

Penot, Nicholas
1662 Memoir on the manners, customs, and religion of the savages of North America. In: The Indian Tribes of the Upper Mississippi Valley and Region of the Great Lakes by Emma H. Blair 1:31-272, 1911. Arthur H. Clark Co., Cleveland.

Radcliffe, William
Fishing from the Earliest Times. Ares Publishing Inc., Chicago.

Ragueneau
See Thwaites, R. G.

Rau, Charles
1873 Indian netsinkers and hammerstones. American Naturalist 7:139-146. Peabody Academy of Science. Salem.

1884 Prehistoric fishing in Europe and North America. Smithsonian Contributions to Knowledge 25(1):10342. Washington D. C.

Raudot, Antoine Denis
1904 Relation par letters de l'Amerique Septentrionale. In: The Indians of the Western Great Lakes 1615-1760 by W. Vernon Kinietz, pp. 339-410. University of Michigan Press, Ann Arbor.

Ritchie, William A.
1965 The Archaeology of New York State. The Natural History Press, Garden City.

Rogers, Edward S.
1963 The hunting group--hunting territory complex among the Mistassini. National Museum of Canada, Bulletin 195. Ottawa.

1967 The material culture of the Mistassini. National Museum of Canada, Bulletin 218, Anthropological Series 80. Ottawa.

Rogers, Edward S. and Jean H. Rogers
1959 The yearly cycle of the Mistassini Indians. Arctic 12 (3):130-138.

Rostlund, Erhard
1952 Freshwater fish and fishing in native North America. Publications in Geography 9. University of California Press, Berkeley.

Sagard Theodat, Gabriel
1632 Le Grand voyage du pays des Hurons, situe en l'Amerique vers la mer douce, es derniers confines de la Nouvelle France, dite Canada. Denys Moreau, Paris.

1636 Historie du Canada et voyages que les freres mineurs recollects ye ont faicts pour la conversion des infidelles. Claude Sonniers, Paris.

1939 The Long Journey to the Country of the Hurons, edited by G. M. Wrong. The Champlain Society. Toronto.

1968 Sagard's Long Journey to the Country of the Hurons. Champlain Society, Publication 25. Greenwood Press, New York.

Scott, W. B. and E. J. Crossman
1973 Freshwater fishes of Canada. Fisheries Research Board of Canada, Bulletin 183. Ottawa.

Skinner, Alanson
1912 Notes on the eastern Cree and northern Saulteaux. Anthropological Papers American Museum of Natural History 9 (1):1-177. New York

1921 Material culture of the Menomini. Indian Notes and Monographs, edited by F. W. Hodge. Heye Foundation. New York.

Smith, H. H.
1923 Ethnobotany of the Menomini Indians. Bulletin of the Public Museum of the City of Milwaukee 4:1-174. Milwaukee.

1932 Ethnobotany of the Ojibwa Indians. Bulletin of the Public Museum of the City of Milwaukee 4:327-525. Milwaukee.

1933 Ethnobotany of the Forest Potawatomi Indians. Bulletin of the Public Museum of the City of Milwaukee 7:1-230. Milwaukee.

Smith, Harlan I.
1910 The Yakima Valley. American Museum of Natural History, Anthropological Papers 6. New York.

Steward, Julian H.
1942 The direct historical approach in archaeology. American Antiquity 7:337-343.

Storrow, Samuel A.
1817 The Northwest in 1817: a contemporary letter. In: Wisconsin Historical Collections 6:156, 1872.

Sweetman, Paul W.
1968 The Bristow site Thorah Island, County of Ontario, Providence of Ontario, Canada. Pennsylvania Archaeologist 37 (1-2):5-21. Gettysberg.

Thwaites, Ruben Gold Editor

1904 Early Western Travels 1748-1846. Arthur H. Clark Co., Cleveland.

1959 The Jesuit Relations and Allied Documents 1610-1791, 73 volumes. Burroughs Bros., New York.

Tooker, Elisabeth

1964 An ethnography of the Huron Indians, 1615-1649. Bureau of American Ethnology, Bulletin 190, Smithsonian Institution. U. S. Government Printing Office, Washington D. C.

Tyrell, J. B. Editor

1916 David Thompson's Narrative of His Explorations in Western America, 1784-1812. The Champlain Society. Toronto.

Van Oosten, John

1938 Michigan's commercial fisheries of the Great Lakes. Michigan History Magazine 22 (1):107-145.

VanStone, James W.

1965 The changing culture of the Snowdrift Chipewayan. National Museum of Canada, Bulletin 209, Anthropological Series 74. Ottawa.

Vimont

See: Thwaites, R. G.

Watt, F. H.

1938 The Waco sinker. Central Texas Archaeologist 4:21-70.

Wells, Edward W.

1972 An artifactual report on the Foscoro site. Wisconsin Archaeologist 53 (3):96-107.

West, George A.

1907 Pebble net-weights. Wisconsin Archaeologist 7(3): 131-133.

Whitaker, Herschel

1892 Early history of the fishers of the Great Lakes. Transactions of the American Fisheries Society, 21st Annual Meeting, May 25th. New York.

Whiteford, A. C.
1941 Textile fibers used in eastern aboriginal North America. Anthropological Papers of the American Museum of Natural History 38(1):1-22. New York.

Willey, Gordon R. and Philip Phillips
1958 Method and Theory in American Archaeology. Chicago.

Williams, Mentor L. Editor
1953 Narrative Journal of Travels of Henry R. Schoolcraft. Michigan State College Press, East Lansing.

Wilson, D.
1851 Archaeology and the Prehistoric Annals of Scotland. Edinburgh.

Wintemberg, W. J.
1946 The Sidney-Mackay village site. American Antiquity 11(3):154-182.

Wobst, H. Martin
1978 The archaeo-ethnology of hunter-gatherers on the tyranny of the ethnographic record in archaeology. American Antiquity 43(2):303-309.

Wren, Christopher
1914 A study of Appalachian Indian pottery. Proceedings of the Wyoming Historical and Geological Society 13.

Wright, James V.
1967 The Laurel tradition and the Middle Woodland period. National Museum of Canada, Bulletin 217. Ottawa.

Wright James V. and J. E. Anderson
1963 The Donaldson site. National Museum of Canada, Bulletin 184. Ottawa.

Yarnell, Richard Asa
1964 Aboriginal relationships between cultures and plant life in the Upper Great Lakes region. Anthropological Papers, Museum of Anthropology, University of Michigan 23. Ann Arbor.

Yellen, John E.
1977 Archaeological Approaches to the Present: models for reconstructing the past. Academic Press, New York.

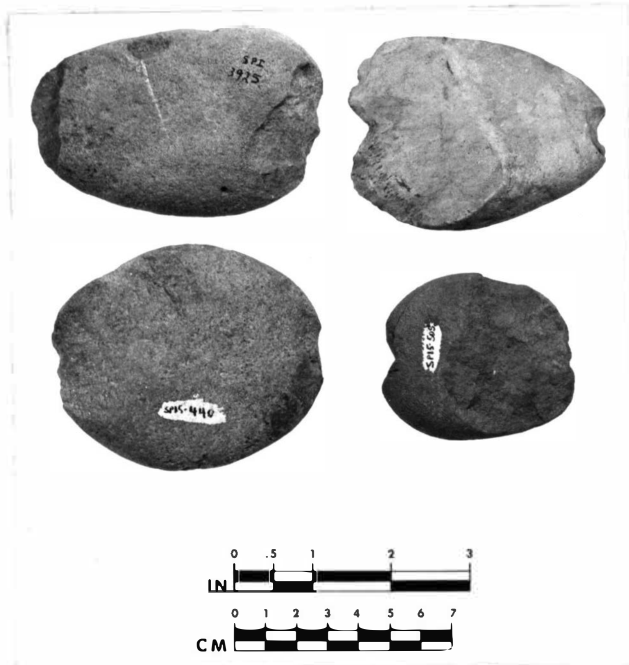


FIGURE 13 End notched stones from Sand Point showing preparatory percussion flaking prior to notching

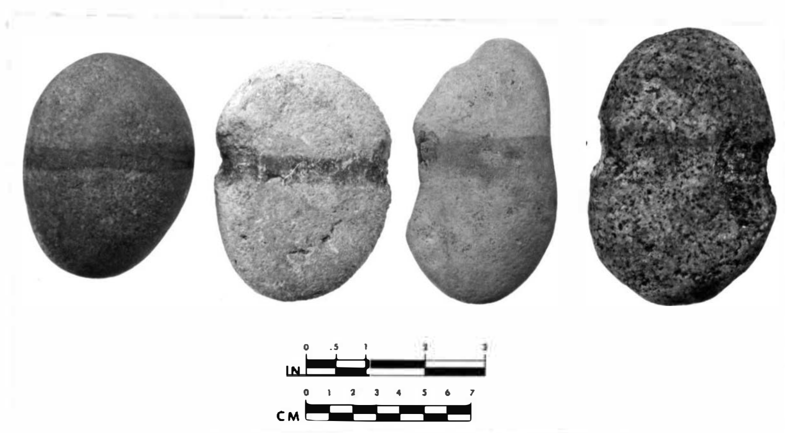


FIGURE 14 Cordage stained stones from Draper Park. Note the one on the left has no notches and the third from the left has only one. They are (from left) AFB Nos. 663, 583, 658, and 632

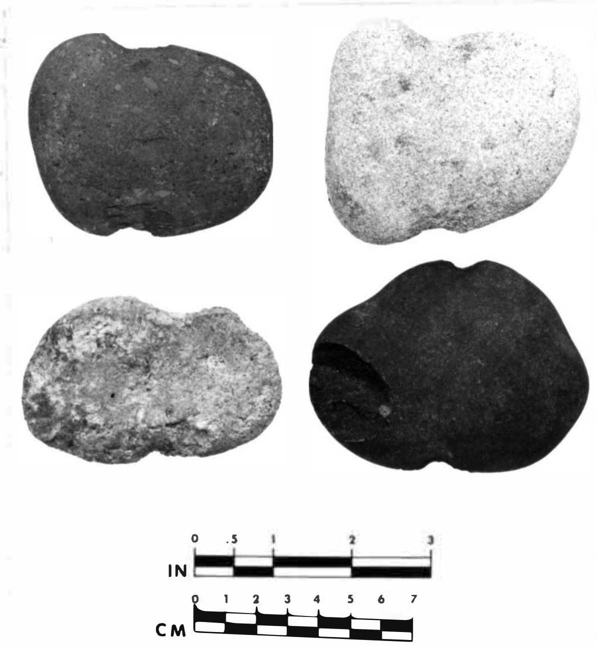


FIGURE 15 Typical side notched stones from Draper Park

FIGURE 16 Typical end notched stones from Sand Point

FIGURE 17 Typical anchors from Draper Park

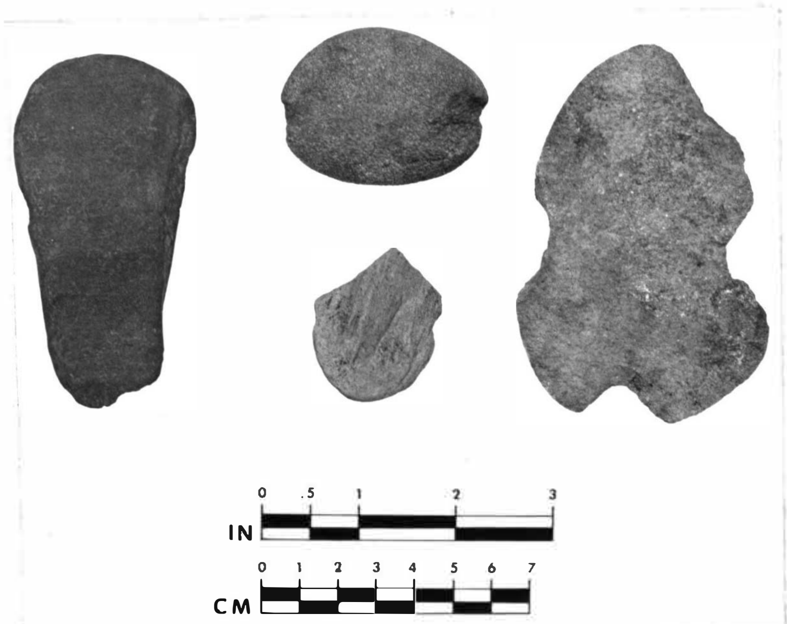
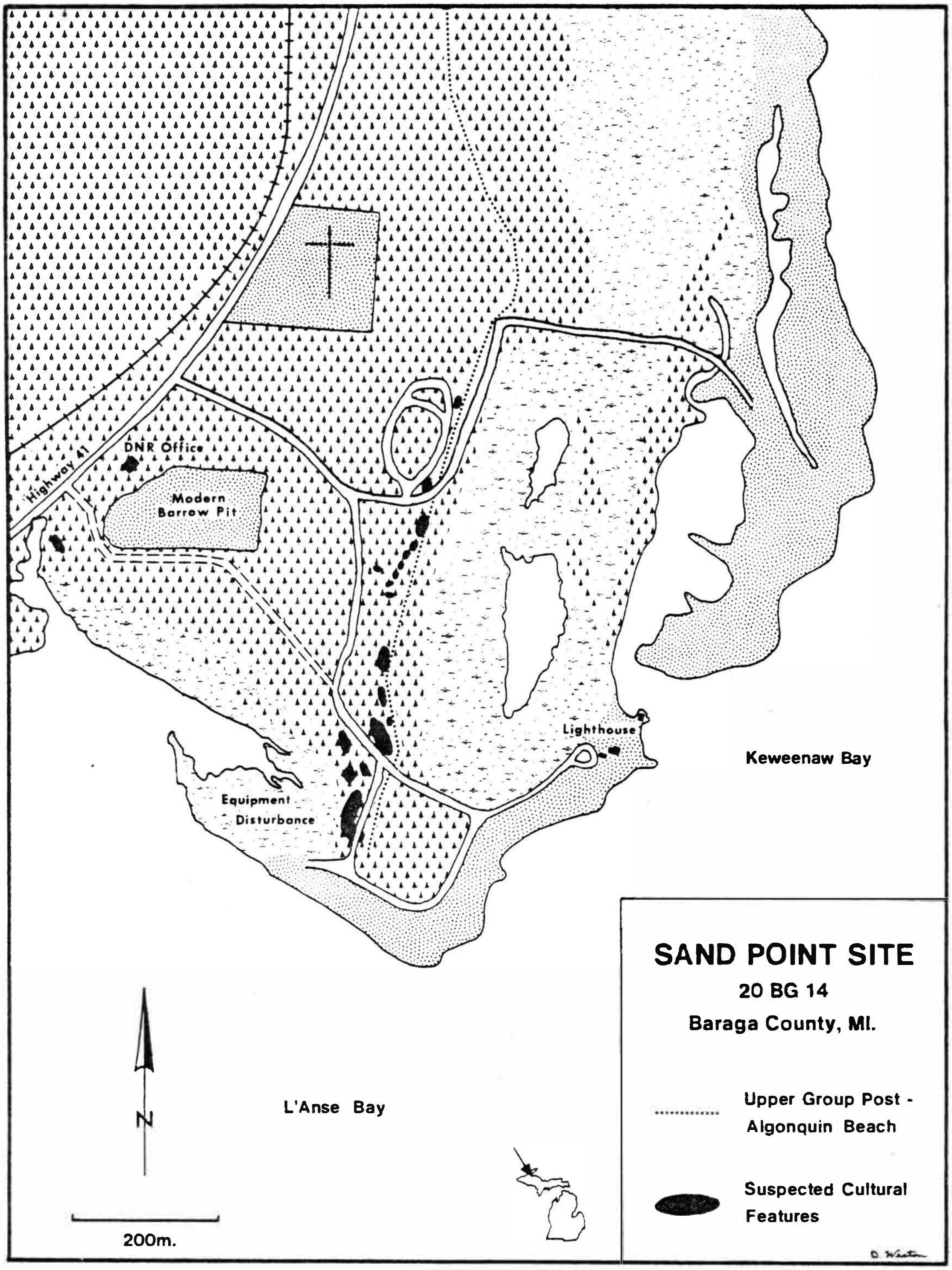
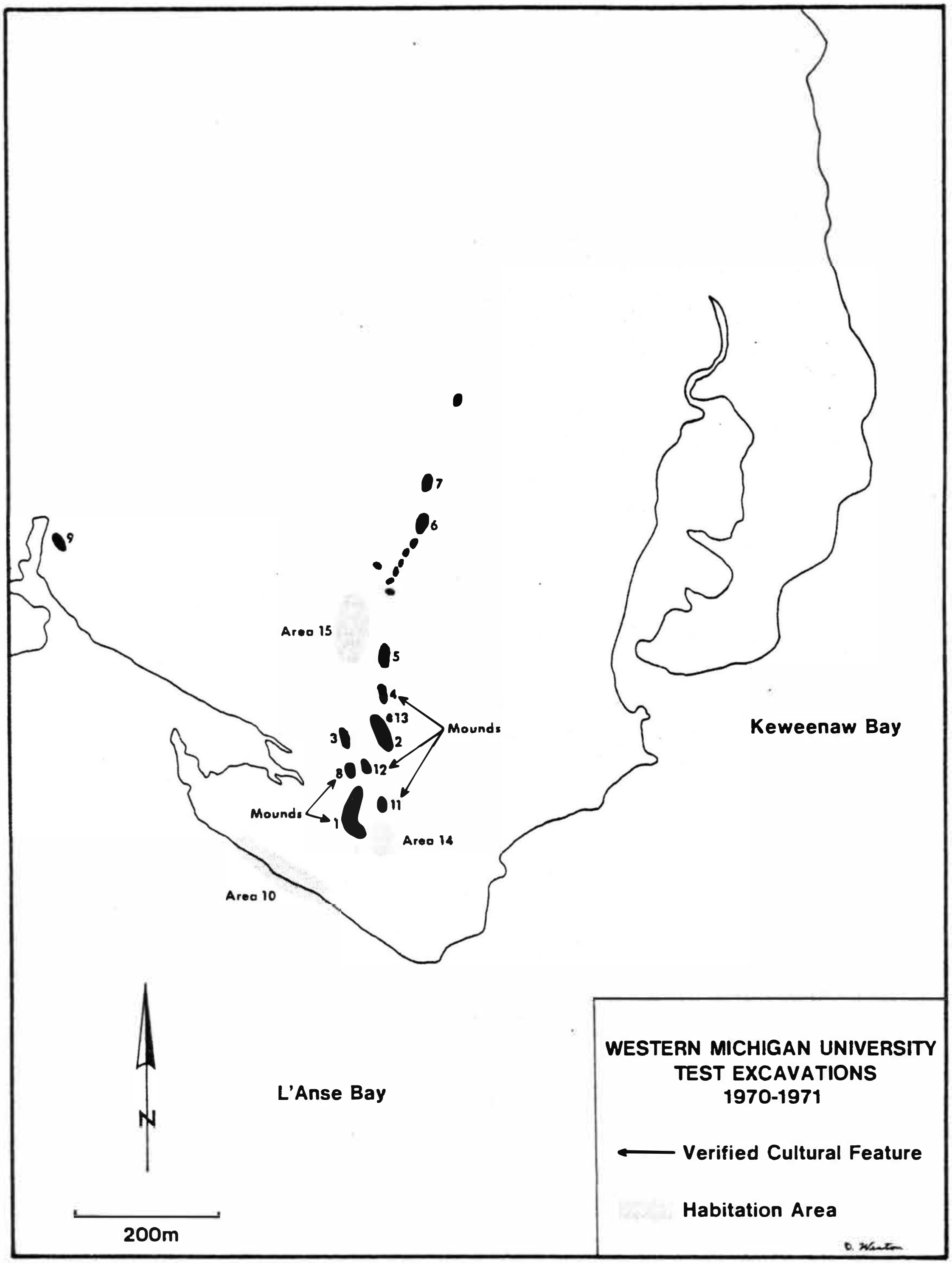


FIGURE 18 Typical fishline sinkers from Sand Point


Highway 41
DNR Office
Modern Barrow Pit
Lighthouse
Keweenaw Bay
Equipment Disturbance
L'Anse Bay
N
200m.
SAND POINT SITE
20 BG 14
Baraga County, MI.
Upper Group Post - Algonquin Beach
Suspected Cultural Features

Map 2


7
6
9
Area 15
5
4
13
Mounds
3
2
8
12
11
Mounds
1
Area 14
Area 10
Keweenaw Bay
L'Anse Bay
N
200m
WESTERN MICHIGAN UNIVERSITY
TEST EXCAVATIONS
1970-1971
Verified Cultural Feature
Habitation Area

Map 3

APPENDIX I*

Draper Park Notched Pebbles

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
128	I	T	11.40	7.60	--	6.70	2.79	.45	396.90	III
115	I	R	8.30	7.00	--	6.70	3.14	.10	283.50	III
127	LS	P	7.60	6.00	1.90	5.00	2.62	.50	112.00	IV
162	SS	O	7.80	7.10	1.20	6.40	1.46	.35	82.00	IV
187	LS	R	6.00	5.70	2.20	5.50	1.40	.10	100.00	IV
28	LS	O	10.80	8.50	3.50	7.30	3.30	.60	437.00	IV
225	LS	R	9.90	8.10	2.40	6.90	3.38	.60	234.50	IV
162	LS	F	F	F	1.40	F	2.36	--	36.00	IV
135	LS	P	9.30	7.90	2.00	6.00	3.17	.95	205.5	IV
139	SS	R	5.60	4.50	1.90	4.20	1.46	.15	56.00	IV
212	LS	O	8.20	5.80	1.50	5.00	3.82	.40	92.50	feat.
77	LS	R	7.60	7.10	2.90	6.80	1.61	.15	221.00	feat.
77	SS	R	7.90	6.40	2.80	6.20	1.73	.15	227.50	feat.
96	SS	O	13.50	8.00	2.40	6.90	3.41	.55	229.00	feat.
--	SS	O	8.20	5.90	2.60	5.70	1.78	.10	197.00	feat.
73	LS	-	7.60	6.00	3.10	5.50	2.70	.35	188.00	feat.
159	SS	O	6.20	4.50	2.10	4.30	1.15	.10	86.50	feat.
104A	LS	P	15.30	10.70	5.90	7.00	3.70	1.85	1134.00	Gen. Site
233	LS	O	10.30	7.19	1.40	6.10	1.43	.55	126.00	III
239	LS	O	6.84	4.60	1.70	4.56	2.31	.02	69.00	III
258	I	-	7.34	5187	2.60	5.54	2.18	.17	181.00	III
242	LS	O	7.40	5.10	1.50	5.00	2.46	.05	88.50	III
249	LS	O	7.62	4.94	1.00	4.30	1.96	.32	29.50	T3-4
262	LS	P	7.18	5.83	1.40	4.70	2.18	.57	86.40	T3-4
244	SS	S	7.27	5.60	1.40	4.82	2.68	.39	74.30	IV
296	LS	O	10.65	7.58	2.40	6.75	2.45	.42	212.00	feat.
339	LS	-	8.50	5.65	1.50	4.60	2.26	.53	100.20	feat.
304	SS	D	17.35	9.20	1.90	8.30	3.46	.45	378.70	feat.
386	LS	P	F	F	1.20	F	3.19	--	69.50	feat.
400	LS	-	8.96	6.75	1.50	5.63	2.43	.56	121.00	feat.
405	LS	P	15.25	8.78	4.50	8.70	3.71	.04	838.00	feat.
388	LS	O	10.37	4.10	1.70	2.50	3.09	.80	72.80	feat.
104B	LS	P	8.15	5.47	2.70	4.94	2.04	.27	153.50	Gen. Site
AFT	LS	-	8.80	4.74	1.70	4.00	2.67	.37	108.60	---
119	LS	O	5.64	3.66	1.60	3.59	1.91	.04	43.00	III
484	LS	O	6.84	3.67	1.50	3.49	1.95	.09	54.40	F54
476	SS	O	11.82	7.57	1.70	6.82	4.30	.38	211.5	5(4)
504	LS	S	6.13	6.02	1.10	4.32	2.65	.85	46.3	X

APPENDIX I Continued

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
504	LS	O	8.99	5.69	1.80	5.45	3.00	.24	87.3	X
504	LS	R	6.58	5.45	1.88	4.83	1.55	.31	92.0	X
504	I	O	6.12	4.59	2.79	4.30	2.10	.15	94.0	X
544	SS	R	5.04	4.92	.62	4.08	3.63	.42	21.5	XVII
544	LS	O	8.73	6.84	3.49	6.57	2.90	.14	211.6	XVIIIA
545	LS	O	10.73	8.69	3.28	7.79	2.05	.45	402.1	XVIIIA
545	LS	P	9.10	5.94	2.38	4.84	3.30	.55	176.6	XVIIIA
545	LS	F	6.65	4.70	2.54	4.37	--	.17	F	XVIIIA
545	LS	P	6.97	5.23	2.05	4.49	--	.37	80.0	XVIIIA
545	LS	T	9.00	6.48	1.95	5.91	1.65	.29	92.6	XVIIIA
545	LS	R	8.43	6.80	2.11	6.50	2.10	.15	151.5	XVIIIA
545	LS	O	8.76	6.80	2.27	6.04	1.40	.38	165.4	XVIIIA
545	LS	O	9.33	6.30	1.45	5.55	1.95	.38	89.1	XVIIIA
545	LS	R	7.13	6.41	2.01	5.72	--	.35	98.0	XVIIIA
545	LS	O	9.89	5.38	2.07	5.10	2.10	.14	136.5	XVIIIA
545	LS	O	13.44	8.38	2.20	7.92	2.80	.23	355.3	XVIIIA
545	LS	O	9.24	6.70	3.52	6.36	1.90	.17	267.4	XVIIIA
545	I	O	9.88	7.06	3.35	6.77	1.20	.15	304.0	XVIIIA
545	I	O	7.27	5.93	3.34	5.73	2.20	.10	196.9	XVIIIA
545	I	O	8.21	6.89	2.10	6.24	1.70	.33	183.5	XVIIIA
545	F	S	6.22	6.06	2.50	6.18	2.00	--	F	XVIIIA
549	LS	P	9.82	8.20	3.30	7.38	s.30	.41	355.5	XIX
549	LS	O	7.60	5.97	2.36	5.30	1.90	.34	134.9	XIX
550	LS	O	7.57	5.63	1.32	4.75	2.10	.44	49.1	XIX
550	LS	O	7.45	4.47	1.89	3.97	--	.25	76.7	XIX
550	LS	T	14.86	9.79	3.22	8.87	2.60	.46	642.7	XIX
555	LS	O	7.77	5.88	1.29	5.44	1.80	.22	82.1	XIX
518	I	R	4.56	3.87	2.10	4.48	--	--	58.1	XI
572	LS	R	7.81	7.00	2.88	6.80	2.00	.10	253.2	--
583	I	O	8.54	6.65	3.02	6.49	1.70	.08	219.1	--
583	SS	O	7.18	5.45	.62	4.80	1.50	.33	36.2	--
549	LS	O	10.42	8.14	2.92	7.17	1.80	.49	268.1	--
104	LS	F	5.09	4.38	2.46	4.04	--	.17	60.1	--
104	LS	O	7.83	4.93	2.25	4.62	--	.16	93.9	--
104	LS	O	7.94	6.16	2.08	5.40	--	.38	107.6	--
593	I	O	8.11	6.49	1.49	5.69	1.85	.40	114.1	III
593	LS	O	10.29	6.02	1.82	5.21	--	.41	169.3	III
661	I	O 8.38		5.76	1.96	5.44	1.05	.16	157.6	IV
601	LS	O	7.41	5.03	1.96	3.79	2.15	.62	85.9	III
601	LS	O	8.93	6.52	1.97	5.58	--	.47	159.4	IV
593	LS	O	11.16	6.42	2.84	5.95	2.65	.24	244.2	III
597	I	P	7.56	5.61	2.10	5.01	2.40	.30	118.7	F

APPENDIX I Continued

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
594	LS	O	11.20	7.97	2.26	5.83	3.95	1.07	245.0	IVA
594	LS	O	8.71	5.83	2.28	5.06	2.95	.39	134.9	IVA
653	LS	O	8.33	5.32	1.94	4.43	2.20	.45	108.7	IVB
653	LS	O	8.95	6.45	2.79	6.29	1.80	.08	56.3	IVB
652	I	T	7.70	5.24	2.31	4.85	2.20	.20	122.6	IVB
649	LS	O	10.33	8.63	2.90	8.04	--	.30	80.6	IVB
650	LS	R	5.38	4.51	1.75	3.95	1.80	.28	43.7	IVB
610	LS	T	12.34	7.64	2.22	7.29	1.85	.18	170.5	IVDA
632	I	O	11.41	7.97	3.56	7.13	2.55	.42	476.4	IVB
611	I	O	9.00	6.70	2.13	6.13	1.60	.29	172.2	IVEA
611	I	R	7.05	6.58	2.27	6.15	1.50	.22	149.8	IVG
104	I	-	9.60	6.03	1.35	5.32	--	.36	107.2	---
658	LS	O	11.12	6.22	2.27	5.65	4.40	.29	228.3	IVB
660	LS	O	8.47	6.31	3.37	6.00	2.20	.16	140.0	IVB
663	I	O	9.33	7.07	4.41	--	--	--	406.2	IVB
104	LS	O	8.37	7.26	1.97	6.04	2.30	.61	141.4	---
583	LS	O	10.03	7.43	2.62	6.93	2.10	.25	267.6	---
660	LS	R	6.70	6.12	.91	5.64	2.00	.24	64.9	IVB
660	I	R	7.97	6.77	2.35	6.22	2.30	.28	167.4	IVB
646	LS	R	8.41	6.63	1.50	6.65	--	--	90.6	IVB
625	I	O	7.48	6.49	1.94	5.75	1.90	.37	133.2	IVB
507	I	O	13.86	9.29	3.29	9.00	2.70	.15	485.9	XV
631	I	O	8.71	6.65	2.99	6.17	2.30	.24	246.0	IVA
664	S	O	10.55	5.14	1.17	4.85	2.00	.15	89.9	XVI
633	SS	P	8.19	7.26	1.42	6.05	2.60	.61	127.5	IV
664	I	T	8.88	6.95	1.92	6.65	1.70	.18	180.3	XVI
505	I	O	16.50	8.25	4.27	6.70	1.90	.78	637.5	X
664	I	O	18.30	9.84	3.21	9.22	--	.31	805.8	XVI
664	I	O	9.73	6.07	2.90	5.99	--	.04	259.8	XVI
630	I	O	9.71	6.98	3.42	6.66	2.40	.16	350.2	IV
631	I	X	9.11	8.08	1.25	6.76	--	.66	152.6	IV
633	I	O	9.30	6.56	2.82	5.76	2.45	.40	275.4	IV
633	I	O	F	8.75	2.36	7.77	--	.49	215.8	IV
633	I	O	11.13	8.45	2.16	7.75	2.60	.35	262.2	IV
632	I	O	12.56	6.39	3.40	5.89	2.70	.25	425.8	IV
632	C	R	8.50	6.65	2.77	6.21	1.10	.22	89.5	IV
611	SS	R	7.60	7.62	1.70	6.51	--	.56	92.4	IVA
611	S	R	8.67	7.80	.98	6.71	2.70	.55	73.7	IV
632	S	R	7.58	6.30	1.55	5.88	.90	.21	87.1	IV
632	S	O	10.44	6.67	1.11	5.33	1.80	--	97.6	IV
632	LS	P	8.59	7.02	1.90	5.89	2.30	.57	155.3	IV
632	LS		10.13	9.09	1.70	7.98	1.20	.56	272.9	IV

APPENDIX I Continued

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
632	LS	O	5.09	5.44	1.86	5.21	1.20	--	71.3	IV
634	LS	P	8.79	7.81	3.13	7.45	2.50	.36	300.1	IV
634	LS	O	8.18	6.25	2.19	5.80	2.25	.23	170.9	IV
634	LS	-	8.89	6.50	2.22	F	1.80	--	218.0	IV
609	LS	O	12.78	8.73	2.65	6.85	4.90	.94	361.7	IV
609	LS	O	6.72	4.48	1.38	4.18	--	.15	43.9	IV
625	LS	R	8.38	7.09	1.93	6.34	2.80	.38	129.7	IV
633	LS	P	10.82	7.86	1.69	5.88	3.85	.99	185.5	IV
640	LS	O	8.93	5.97	2.27	5.42	2.20	.28	141.1	IV
640	LS	O	10.50	5.48	1.96	4.54	3.80	.47	117.2	IV
625	LS	R	7.65	6.40	2.18	5.51	1.60	.45	146.2	IV
640	LS	R	8.84	7.59	3.35	6.97	2.05	.31	281.0	IV
640	LS	O	9.23	6.48	1.95	5.61	2.15	.44	145.3	IV
631	LS	O	9.13	5.93	1.62	4.65	3.25	.64	77.7	IV
631	LS	O	9.69	6.12	2.07	5.13	4.50	.50	195.2	IV
624	LS	S	8.98	7.29	1.99	6.65	1.60	.32	196.4	IV
631	LS	O	9.00	5.26	2.33	4.45	2.55	.41	116.6	IV
664	LS	P	12.82	8.41	2.50	4.46	3.60	1.98	372.4	XVI
631	LS	O	8.57	5.97	1.26	5.36	1.80	.31	98.7	IV
664	LS	P	10.42	8.04	1.65	6.47	2.85	.79	155.3	XVI
631	LS	O	8.49	7.05	1.95	5.90	2.00	.58	135.5	IV
633	LS	R	F	6.30	1.18	5.58	1.60	.36	F	IV
664	LS	O	9.64	6.95	2.43	6.29	2.35	.33	186.2	XVI
664	LS	O	10.18	6.81	2.56	6.27	2.35	.27	338.2	XVI
664	LS	R	7.65	6.27	1.62	5.84	1.75	.22	120.5	XVI
505	LS	R	7.99	5.89	1.28	5.60	2.55	.15	65.4	X
507	LS	-	9.40	6.55	1.44	6.36	--	.10	91.5	XV
507	LS	R	8.37	6.83	1.73	5.97	2.70	.43	100.3	XV
507	LS	O	9.02	4.93	2.03	4.43	3.20	.25	92.2	XV
507	LS	O	10.45	6.45	2.05	5.46	4.00	.50	188.7	XV
507	LS	O	9.12	6.30	3.44	5.99	--	.16	270.5	XV
104	LS	O	7.76	5.19	1.77	4.83	2.60	.18	93.5	--
104	LS	P	9.02	8.26	2.0	5.96	--	1.15	119.9	--
611	SS	P	10.41	7.30	1.90	6.13	1.20	.59	212.9	IV
650	LS	R	7.24	6.43	2.10	4.96	1.55	.74	128.9	IV
650	LS	O	3.19	6.47	2.72	6.00	--	.24	184.8	IV
660	LS	P	9.49	5.16	2.13	4.91	2.10	.13	129.8	IV
660	SS	S	10.54	6.17	1.48	5.52	2.20	.33	106.2	IV
660	LS	P	8.43	5.67	1.78	4.50	--	.59	108.6	IV
660	I	O	7.67	4.85	2.26	4.60	1.05	.13	114.2	IV
660	LS	R	7.48	6.03	2.67	5.48	1.75	.28	151.9	IV
660	LS	-	8.91	3.86	2.05	2.84	2.50	--	47.9	IV

APPENDIX I Continued

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
589	SS	O	8.47	5.24	1.72	4.64	2.65	.30	106.4	III
589	LS	P	9.74	7.16	3.44	6.66	2.50	.25	318.9	III
596	LS	O	6.36	3.20	1.17	3.10	--	.05	31.4	IVC
596	LS	T	11.85	6.96	1.21	6.39	1.00	.29	141.0	IVC
601	LS	O	7.84	5.66	2.00	4.91	1.85	.38	102.0	III-IV
651	LS	O	8.90	4.72	2.21	4.00	2.60	.36	107.7	III
608	I	O	9.67	5.98	2.24	5.32	1.50	.33	187.9	IVE
589	LS	O	8.54	6.32	2.18	5.44	2.75	.44	161.7	III
646	LS	R	8.74	6.77	1.99	6.68	1.60	.05	134.5	IV
658	LS	O	8.48	5.59	2.48	5.01	1.75	.29	238.0	IV
658	LS	O	7.89	5.74	2.28	5.14	2.00	.30	142.9	IV
658	LS	O	7.32	5.34	2.58	5.28	--	.03	125.5	IV
636	LS	O	12.64	9.01	3.25	7.60	3.10	.71	302.0	IV
626	LS	O	10.89	7.49	1.46	6.60	3.05	.45	142.5	IV
630	LS	P	9.14	7.30	2.20	4.88	2.75	1.21	122.9	IV
660	LS	O	9.28	6.41	2.45	5.74	1.60	.34	169.0	IV
633	LS	-	5.68	4.97	1.91	4.38	--	.30	66.1	IV
620	LS	O	10.08	7.07	3.17	6.44	2.30	.32	301.1	IV

*Key:

No. = Artifact Number, MAT = Material (SL=slate, Sa or SS =Sandstone, C=clay, I=igneous, LS=limestone), SHAPE = Shape (T=triangular, P=pear, F=fragment, S=square, O=oblong, R=round), L = Length, W = Width, T = Thickness, WT = Weight, HW = Haft Width (between the notches), NW = Average Notch Width, ND = Average Notch Depth, Prov. = Provenience.

APPENDIX II

Sand Point Notched Pebbles

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
868	SA	O	9.00	6.40	2.1	8.4	1.10	--	123.7	SP15
795	SA	R	7.60	6.50	1.6	7.0	.50	.30	107.9	SP15
382	SA	P	7.90	5.50	1.1	7.6	1.05	.15	63.0	SP15
490	SA	P	10.00	6.20	1.5	9.5	.75	.25	114.2	SP15
3925	SA	P	10.00	6.10	2.1	9.1	1.10	--	152.8	SP1
799	SA	P	8.70	5.10	2.7	8.4	.85	.15	137.4	SP15
802	SA	O	5.30	4.10	1.5	5.0	1.15	.15	40.1	SP15
576	SA	P	9.60	6.80	1.9	9.1	1.15	.25	133.0	SP15
800	SA	R	6.80	6.80	2.0	6.2	1.05	.30	122.9	SP15
505	SA	R	6.20	5.30	2.1	5.5	1.50	.35	75.7	SP15
791	SA	R	5.60	5.20	1.7	5.3	1.85	.15	66.0	SP15
359	SA	R	6.10	5.50	1.4	5.7	1.17	.20	52.9	SP15
440	I	R	8.50	7.00	2.4	8.3	1.75	.10	192.9	SP15
4118	I	O	8.30	6.30	2.5	8.1	1.00	.10	165.6	SP1
3209	I	O	8.40	6.10	2.7	7.4	1.90	--	187.2	SP1
1083	SA	O	9.70	6.70	.7	8.9	3.00	.95	52.3	SP8
443	SL	O	8.70	5.70	.6	8.0	1.00	.35	41.9	SP15
386	SL	S	7.70	6.00	1.0	7.6	1.40	.25	69.2	SP15
444	SL	P	6.90	5.40	.9	6.8	.95	.05	59.3	SP15
506	SL	R	4.60	4.70	.9	4.5	.50	.05	19.5	SP15
445	SL	F	3.00	3.20	.6	2.7	1.10	--	5.8	SP15
388	SL	F	2.80	5.60	1.3	1.8	1.40	--	18.3	SP15
446	SL	F	5.00	4.10	1.2	4.7	1.20	--	30.6	SP15
67	SL	F	4.10	3.30	.5	3.0	1.10	--	7.4	SP15
507	SL	F	7.80	5.50	.6	4.6	.70	--	27.8	SP15
389	SL	F	4.60	4.30	.9	3.9	1.55	.35	21.9	SP15
805	SL	F	4.60	3.00	.3	3.9	1.20	--	6.0	SP15
792	SL	S	7.80	6.60	1.2	7.3	1.23	.25	80.2	SP15
801	SL	P	10.00	7.90	1.2	9.4	1.00	.30	129.1	SP15
796	SL	S	8.90	6.60	.9	8.3	1.25	.30	75.6	SP15
442	SL	O	6.80	5.90	.8	6.5	1.13	.15	38.8	SP15
385	SL	O	8.20	6.10	.8	7.7	.80	.25	46.6	SP15
66	SA	S	7.50	6.00	1.4	7.1	1.30	.20	79.5	SP15
798	SA	O	8.30	5.10	1.3	8.0	.95	.15	72.3	SP15
93	SL	F	F	F	1.0	F	.90	--	21.3	SP15
804	SL	O	8.90	4.00	.5	7.6	.95	.65	19.5	SP18
924	SL	P	9.10	4.80	.7	4.1	1.20	.35	40.6	SP1
794	SL	R	9.70	8.90	1.9	9.1	2.50	.30	186.8	SP15

APPENDIX II Continued

Artifact No.	MAT	SHAPE	L	W	T	HW	NW	ND	WT	PROV
801	SA	R	9.20	7.50	1.3	8.5	1.35	.35	94.0	SP13
441	SA	S	7.10	5.60	2.0	6.4	1.17	.23	78.4	SP15
448	SA	F	F	F	F	F	1.30	--	32.8	SP15
447	SA	F	F	F	F	F	2.30	--	21.6	SP15
397	SA	O	8.50	6.80	3.0	6.5	2.10	--	214.0	SP15
797	SL	P	8.40	6.3-	1.9	7.5	1.80	.45	111.2	SP15
813	I	P	7.80	6.80	2.9	7.5	1.60	--	148.3	SP15
475	SA	F	5.30	7.20	1.7	6.4	1.90	.40	69.9	SP15
806	SA	S	6.00	5.00	2.1	5.9	.95	.05	77.5	SP15
373	SA	F	7.30	6.30	1.4	6.5	1.05	.40	78.3	SP15
819	I	P	9.40	7.00	2.6	9.0	.87	.20	213.8	SP15
957	I	O	4.80	4.60	.9	4.3	.40	--	28.4	SP15
2409	I	F	5.60	5.70	1.0	5.2	.80	--	37.9	SP4

APPENDIX III

Catalog Numbers of Notched Stone Clusters Found at Sand Point and Draper Park

Cluster A (Sand Point)	Cluster B (Sand Point)
SP15-443	SP15-795
SP15-386	SP15-799
SP15-444	SP15-802
SP15-506	SP15-800
SP15-445	SP15-791
SP15-388	SP15-792
SP15-446	SP15-801
SP15-507	SP15-796
SP15-389	SP15-798
SP15-385	SP15-794
SP15-441	SP15-801
SP15-448	SP15-797
SP15-447	
SP15-382	
SP15-505	
SP15-440	
SP15-442	
17 Total Number	12 Total Number

Cluster C (Draper Park)

Catalog No.	No. of Artifacts
AFB-544	2
AFB-545	16
AFB-549	2
AFB-550	3
AFB-631	7
AFB-632	8
	32 Total Number