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COASTAL NEW YORK SETTLEMENT PATTERNS: A PERSPECTIVE FROM SHELTER ISLAND

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Archaeologists working in coastal New York are concerned about site investigation bias since much of the past fieldwork has focused on the excavation of large shell middens. This paper attempts to examine the degree to which large shell middens have been overemphasized at the expense of smaller, less visible sites. We begin with an overview of the published literature on New York archaeology in order to document the extent to which shell middens have been studied in the past. The published data base is then compared to the results of an intensive survey of Shelter Island, New York, where a subsurface testing program was employed to detect small, buried sites. The comparison suggests that a considerable number of lithic workshops and food-gathering camps have probably been overlooked using past site-encounter methods. This finding implies that the coastal settlement pattern, at least on Shelter Island, is relatively complex, consisting of a few large shell middens and literally hundreds of small, special-purpose camps.

INTRODUCTION

The archaeology of prehistoric coastal New York has focused primarily on the study of large shell middens. Over the last nine decades, archaeologists have excavated a considerable number of shell middens in the vicinity of New York City and along the coastlines of Long Island. The shell middens, composed of substantial quantities of shellfish detritus, sporadic mammal and fish bones, occasional pit features and assorted artifacts, have long been recognized as an important source of information on the subsistence pursuits of coastal hunter-gatherers. Yet in recent years scholars have become concerned about potential biases in the kinds of sites selected for archaeological investigation. Specifically, Salwen (1970:3-4), Wyatt (1977:408), Saxon (1975:1-3), and others feel that shell middens have been overemphasized at the expense of other kinds of prehistoric sites. They note that very little information exists on other kinds

of sites, such as fishing stations, hunting camps, and nut-gathering loci, which are found commonly in other areas of the eastern woodlands. These scholars suggest that the almost exclusive investigation of shell middens may be perpetuating a rather distorted perspective of the regional settlement pattern (see also Vetter et al. 1978a:28-29; Johannemann and Schroeder 1982:18).

This paper attempts to examine the *degree* to which the archaeology of coastal New York has been characterized by site investigation bias. That is, to what extent have shell middens been overrepresented in relation to other nonmidden sites found in the archaeological record? The paper begins with an overview of the published site reports from the area, the purpose of which is to characterize the published data base and to determine the overall percentage of sites that can be classified as shell middens. The second part of the paper describes the results of an intensive survey project conducted on Shelter Island, New York, which specifically attempted to detect shell middens and other kinds of archaeological remains. The final section compares the range of site types described in the published literature to those found on Shelter Island. Our results suggest that large shell middens may represent only one component of a complex coastal settlement pattern composed of numerous nonmidden sites that are buried and difficult to detect.

THE LITERATURE OVERVIEW: PUBLISHED MATERIAL

The selection of sites for evaluation was limited to published site reports or short site descriptions of prehistoric materials recovered from the Bronx, Manhattan, Staten Island, Fisher's Island, and Long Island. We initially consulted *Readings in Long Island Archaeology and Ethnohistory* (Levine 1977, 1978; Truex 1982), a series published by the Suffolk County Archaeological Society that has reprinted most of the major works on coastal New York archaeology. Other major sources consulted include the Suffolk County Cultural Resources Inventory prepared by Gonzalez and Rutsch (1978), and the bibliography on coastal New York compiled by Kaplin (1982). The site reports reviewed represent the primary published studies readily available to eastern archaeologists, and include the research conducted by Harrington (1909, 1924) and Skinner (1909) during the first two decades of this century; the fieldwork undertaken by Smith (1950), Solecki (1947), and Ritchie (1959) in the 1940s and 1950s; as well as the more recent studies of Salwen (1968), Kaeser (1974), Rothschild and Levine (1977), Wyatt (1977), and others. Recent contract work, which represents an important but as of yet largely unpublished source of archaeological information, will be discussed in a later section.

The results of our overview produced information on a total of 93 sites. Information was obtained on site type, site size, site location, and age for each of the sites.¹ The spatial distribution of these sites is illustrated in Figure 1. Our findings indicate that the published literature is characterized by several interesting patterns, which can be summarized in four points.

1. *Site Type.* Of the 87 site descriptions providing enough information to determine site type, 84% (n = 73) are classified as shell middens (or alternatively as "kitchen middens," "shell heaps," "shell pits," or "shell refuse"). The next most common site type is the mortuary or cemetery site, making up 6% (n = 5) of the sample. This is followed by three lithic scatters (4%), two

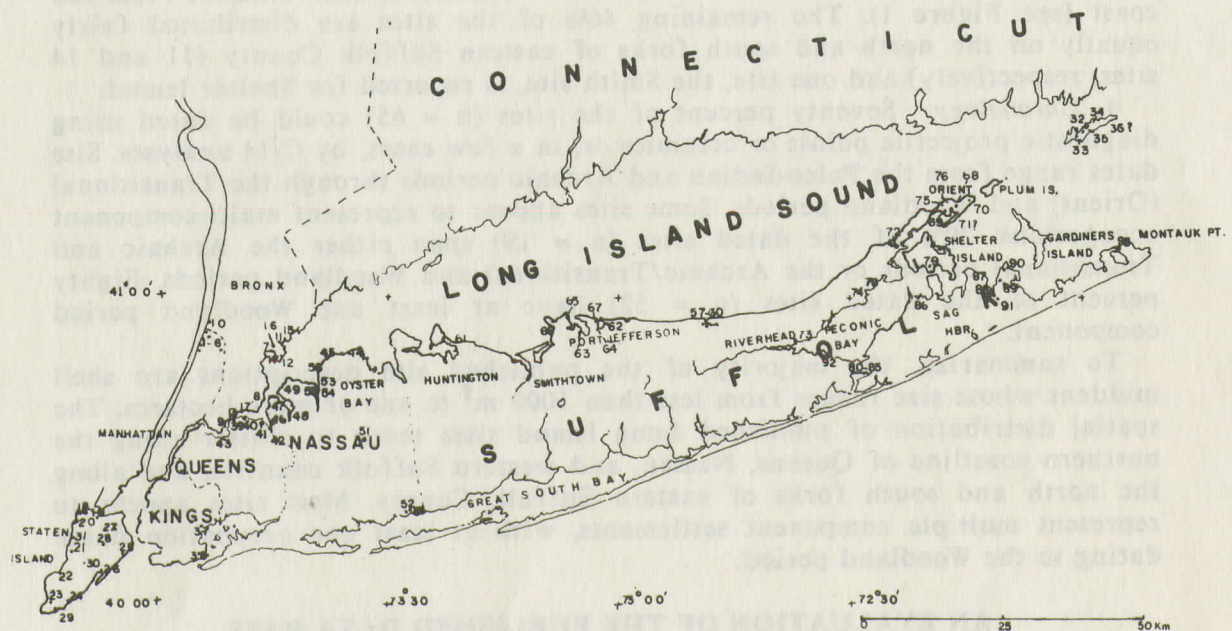


Figure 1. The spatial pattern of coastal New York sites that are reported in the published literature.

lithic workshops (2%), two artifact caches (2%), one lithic and ceramic scatter (1%), and one petroglyph site (1%).

2. *Site Size.* Information on site size is available for only 33% of the sites ($n = 31$), most of which are shell middens. The mean site size is relatively large ($x = 4246 \text{ m}^2$), although there is a considerable range of variation represented ($sd = 8811 \text{ m}^2$). Fifteen sites measure less than 1000 m^2 , and 17 sites have dimensions greater than this, including a few that cover an area larger than $10,000 \text{ m}^2$.

3. *Site Location.* Most of the sites ($n = 57$) are found on Long Island, while the remaining 36 sites are distributed in the Bronx, Manhattan, Staten Island, and Fisher's Island. Of the 57 sites found on Long Island, 46% ($n = 26$) are found along the north shore of Queens, Nassau, and western Suffolk counties. In contrast, only 7% ($n = 4$) of the sites are distributed along the south shore of Kings, Queens, Nassau, and western Suffolk counties, and only one site (the Jericho Petroglyph) is found in the interior woodlands, some distance from the coast (see Figure 1). The remaining 46% of the sites are distributed fairly equally on the north and south forks of eastern Suffolk County (11 and 14 sites, respectively) and one site, the Smith site, is reported for Shelter Island.

4. *Chronology.* Seventy percent of the sites ($n = 65$) could be dated using diagnostic projectile points or ceramics or, in a few cases, by C-14 analyses. Site dates range from the Paleo-Indian and Archaic periods through the Transitional (Orient) and Woodland periods. Some sites appear to represent multi-component occupations: 29% of the dated sites ($n = 19$) span either the Archaic and Transitional periods or the Archaic/Transitional and Woodland periods. Eighty percent of the dated sites ($n = 52$) have at least one Woodland period component.

To summarize, the majority of the published site descriptions are shell middens whose size ranges from less than 1000 m^2 to one or more hectares. The spatial distribution of published Long Island sites tends to cluster along the northern coastline of Queens, Nassau, and western Suffolk counties, and along the north and south forks of eastern Suffolk County. Most sites appear to represent multiple component settlements, with at least one occupation phase dating to the Woodland period.

AN EVALUATION OF THE PUBLISHED DATA BASE

A review of the published literature suggests that site investigation bias is of real concern. One of the most striking features of the published data base is that the majority of sites were discovered by chance or by local collectors, rather than by professional archaeologists working in the field. Fifty-two percent of the sites ($n = 48$) provide enough information to reconstruct how the archaeological remains were found. The most common method of detecting sites involved their chance discovery by construction crews building house foundations, roads, or sewer lines, or by workers digging open-pit gravel mines. Fifty percent of those sites containing information on discovery techniques ($n = 24$) were found in this rather haphazard fashion. In most cases, the sites were brought to the attention of professional archaeologists by local informants or by collectors who believed the finds were substantial enough to warrant further investigation. The next most common way of detecting sites was via the

discovery of artifactual material visible on the ground surface (29%, $n = 14$), or in plowed fields (6%, $n = 3$). Eleven percent of these sites ($n = 5$) were discovered because of previous pothunting activities, and again in most cases these sites were brought to the attention of professional archaeologists by local collectors. Only 4% of the sites ($n = 2$) were detected through archaeological reconnaissance work, although it is unclear whether the reconnaissance involved a simple perusal of the ground surface or whether some form of subsurface testing was involved.

It is clear that few of the sites described in the literature were located as part of an intensive archaeological survey incorporating any kind of a rigorous subsurface testing program. This is an important concern, since coastal New York, like many other areas of the eastern woodlands, is characterized by dense undergrowth that obstructs a clear view of the ground surface. Duff and topsoil accumulation can bury cultural resources rather rapidly. Consequently, there is a good probability that many archaeological resources are not visible on the ground surface, but buried below dense undergrowth and soil--a situation that has been recognized by Long Island archaeologists for many years (see, for example, Harrington 1909:169-170).

The problem with relying on settlement information collected by chance discoveries and casual walk-overs is that the most noticeable and largest sites tend to be reported. As Alexander (1983), McManamon (1984), and others have noted, such a practice can produce significant biases in the kinds of cultural resources studied by archaeologists. Therefore it is important to note, given the results of our literature review, that the most visible sites in coastal New York are shell middens, some of which are characterized by extensive surficial scatters of shell debris that stand out in stark contrast to the surrounding, darker, sand/gravel matrix (for an illuminating description of large south shore shell middens, see Harrington 1924; Tredwell 1912). Although many of the very large middens have now been destroyed, either by housing developments or by farmers mining the middens for shell fertilizer (see Ceci 1982:23), extensive surficial midden deposits can still be observed clearly in some undeveloped areas of the island.

Considering the method in which sites were discovered in the past, we must be concerned about the following two problems.

1. *Spatial Bias.* By concentrating on visible shell middens, archaeological fieldwork has been restricted to one ecological zone--the coastal strip, especially along the north shore and two eastern forks of Long Island. Of the 57 Long Island sites included in the overview, only 3 (Baker Hill, Orient Flaking Station, and the Jericho Petroglyph) are situated in noncoastal settings. The remainder are located on estuaries, tidal flats, or salt marshes.

2. *Functional Bias.* The near exclusive study of shell middens may be perpetuating a skewed perspective of the functional range of sites present during the prehistoric period. The published data base implies that prehistoric coastal hunter-gatherers spent much of their time gathering, consuming, and discarding shellfish. Yet the study of shell middens should be undertaken within a regional perspective that evaluates their relationship to other, less visible, and potentially underrepresented site types. As Salwen (1970:3-4) succinctly states, "To balance this one-sided impression, it will be necessary to search for and to excavate types of sites in the immediate coastal zones other

than the easily discovered shell middens which constitute only a part of the settlement system."

It is clear that a number of very basic questions need to be resolved for coastal New York. To what extent are shell middens actually represented in the archaeological record, and are other kinds of sites a common component of the regional settlement pattern? If other site types commonly exist in coastal New York, then what kinds of activities are represented at these settlements? Finally, how are sites, including shell middens, distributed spatially across the coastal and interior landscape, and how did the regional settlement pattern change over time?

REGIONAL SURVEY WORK ON LONG ISLAND

Over the last decade, archaeologists have begun gathering the kind of settlement information necessary to address the above questions. Specifically, the recent implementation of regionally oriented survey projects is beginning to provide a fresh insight to coastal New York archaeology. Much of this research has been accomplished under cultural resource management guidelines, with survey work being implemented to meet federal, state, and/or local township environmental laws. Numerous clearance surveys have been completed along the right-of-ways of proposed highway modifications, transmission lines, sewer lines, and housing projects that cut across the north shore (Johannemann and Schroeder 1980; Vetter et al. 1977a, 1977b; Ottusch 1982), the south shore (Johannemann and Schroeder 1982; Vetter and Salwen 1974; Gramly 1976, 1977a, 1977b), and interior sections of Long Island (Johannemann and Schroeder 1978, 1982; Vetter and Salwen 1975; Vetter et al. 1978b; Saxon 1975). Although the field methodology varies among the principal investigators, most fieldwork combines both intensive surface reconnaissance with a subsurface testing program--often with shovel test units being spaced systematically across the project's right-of-way on the order of 30 to 60 m apart.

One of the most significant contributions of the cultural resource management work concerns the location and study of artifact scatters that appear to have functioned as lithic knapping, hunting, and/or nut-gathering loci (see Johannemann and Schroeder 1978, 1982:13-18; Ottusch 1984; Vetter et al. 1979:31-35). In addition, Walter Saxon (1975:26-33) has identified a specialized activity station along the Connetquot River which appears to be a place where anadromous fish were harvested and processed. These unpublished reports describe the location of 21 camp sites located in the interior woodlands of Long Island by archaeological survey crews.

However, we still have a long way to go before the regional settlement pattern of Long Island is well understood, and it does not appear that we can rely on contract funding alone to provide this much needed research. Most of the survey work is restricted to the boundaries of contract right-of-ways which usually consist of narrow transects following the paths of transmission lines, sewer lines, and roads. As a consequence, *broad* areal survey coverage of local coastal and interior zones, necessary to define inter-site relationships and community patterns, has not been accomplished. Furthermore, contract funding for implementing large-scale projects on Long Island is relatively limited. Most construction work is being undertaken by private construction companies who

The prehistoric occupation of Shelter Island has also been documented. Although previous archaeological research in the area has been limited, from 1943 to 1953 Roy Latham (1957) directed the excavation of a relatively large shell midden outside the western boundaries of the preserve. The site, designated as the Smith site, contained scallop, soft clam, hard clam, and oyster shell refuse; a diverse artifact assemblage including axes, celts, pestles, mortars, projectile points, and pottery; as well as a variety of mammal (bear, deer, beaver, raccoon, etc.) and fish (sturgeon, bluefish, shark, blackfish, flounder, codfish, etc.) remains. Latham (1957:7) also described hearths and the remains of two possible house structures. The site appears to date to the Late Woodland period, although earlier components may also have been represented.

Booth and Booth (1982) have summarized archaeological information obtained from local amateurs, and have produced a map of the known prehistoric sites of the Mashomack Preserve. Most of the sites are shell middens distributed along the large estuaries of the preserve. Additional discussions with amateur archaeologists indicate that there are a considerable number of other prehistoric sites on the island.

THE SURVEY DESIGN

A survey strategy incorporating a subsurface testing program was implemented that would allow us to detect shell middens and other small, buried sites. In such a manner we attempted to document the extent to which shell middens make up the Native American settlement pattern of the Mashomack Preserve.

The Mashomack Preserve was first divided into a grid system of 10-hectare (25-acre) sample units. We felt that 10-hectare units were large enough to facilitate the study of inter-site relationships and community patterns. At the same time the sample units could be completed by survey crews during a summer's field season. In consultation with the Nature Conservancy's biological scientists, we judgementally selected sample units that were located in areas that characterized the ecological diversity of the preserve. Three units were selected from the coastal strip (C, D, F), which included the survey of salt marshes and estuaries. Three additional sample units (A, B, E) were selected from the interior section of the preserve (see Figure 2).

A study of past land-use patterns indicated that only one sample unit (A) had been seriously affected by crop cultivation. An examination of the 1855 U.S. Coast and Geodetic Survey map shows the field systems of Mashomack at the height of agricultural production. The map indicates that three of our sample units (A, C, D) were once cleared of trees. Survey work in sample unit A showed a relatively deep plow zone (circa 30 cm), while sample units C and D exhibited no evidence of soil modification by agricultural practices. (The other three sample units, B, E, F, also exhibited no evidence of a plow zone.) Daniel (1982:120) has suggested the area of sample units C and D was used primarily as grazing land for sheep. He feels the sheep pastures altered the local conditions sufficiently to allow dense cat briar (*Smilex rotundifolia*) stands to colonize the land after the pastures were abandoned.

The six sample units were surveyed by crews of three to four archaeologists walking contiguous transects back and forth between the unit boundaries. The

Interestingly, no conclusive evidence of a Contact period Manhasset occupation was observed at any of the sites. However, differentiating late prehistoric occupations from Contact period occupations may prove to be a difficult task requiring refined chronometric analyses.

In order to provide a better understanding of the occupation duration and function of survey sites, five of the prehistoric scatters were selected for more detailed study. A grid system was established on each site, and a random sample of 1 x 1 m units was excavated, the number of units varying in relation to site size. The excavation work provided more detailed observations on the natural and cultural stratigraphy, augmented the sample of artifactual and ecofactual material, increased the chances of detecting architectural features, and allowed us, in some instances, to recover datable carbon remains in situ.

Information on the diversity, frequency, spatial distribution, and age of the prehistoric sites is presented below.

SITE DIVERSITY

Analysis of the artifactual material recovered from the survey and excavation work suggests that the majority of sites served as small, special-purpose activity loci. As outlined below, the sites appear to represent a variety of functional types, including shellfish processing camps, quarry sites, and lithic workshops. For more detailed information on the sites, see Table 1.

1. *Shell Middens* (n = 5; C-5N-10, C-5N-12, C-5A-5, D-3-33, D-5-20; D-5-20 was partially excavated).³ The shell middens were small, ranging in size from 4 to 64 m², and contained predominately soft-shell clam with a trace of hard clam and whelk shells. These sites were characterized by very low artifact densities and a low diversity of artifact forms. In addition, the excavation work at D-5-20 yielded no architectural features. An analysis of the sites suggests that they served as special-purpose processing camps, where soft-shell clams were harvested by small task groups over a very short duration (see Lightfoot 1985 for a more detailed discussion). It appears that the clam meat was either consumed at the camp or was transported back to a residential base for consumption or storage (see Salwen 1970; Rothschild and Lavine 1977, for a similar interpretation of some coastal New York middens).

2. *Quarry Sites* (n = 2; C-4-24, C-5A-3). These sites represent discrete places where knappers extracted lithic raw materials. Both sites consisted of large, erratic quartzite boulders that show signs of human modification. Test units placed around the boulders yielded large primary decortication flakes, as well as numerous pieces of smaller debitage.

3. *Lithic Workshops* (n = 4; D-2-2-2, D-3-21, D-3-30, D-7-23; D-2-2 and D-3-21 were partially excavated). Although various stages of tool manufacture were represented on all four sites, two distinct kinds of workshops have been defined. One kind of workshop consisted of large primary quartzite flakes, smaller secondary and tertiary quartzite flakes, a considerable amount of shatter, as well as several battered hammerstones (D-2-2, D-3-21). It appears that some of the primary decortication flakes were quarried from the erratic boulders described above, and transported to these secondary workshop sites.

Table 1. Information on Mashomack Preserve Sites.

Site Number	Site Type	Date (if known)	Site Size (m ²)	Site Radius (m)	Artifacts Recorded by Survey Crews
C-1-18	camp site	Woodland	4	1.12	L, FC (possible hearth)
C-4-24	quarry site	?	16	2.26	L
C-5S-32	lithic scatter	?	20	2.50	L
C-5N-6	lithic scatter	?	13	2.03	L, FC, Ch
C-5N-10	shell midden	Woodland	6	1.40	C, Sh, Ch
C-5N-12	shell midden	Woodland	64	4.50	C, Sh, Ch, L
C-5A-3	quarry site	?	36	3.40	L, Sh
C-5A-5	shell midden	?	4	1.12	L, Sh
D-2-2	lithic workshop	?	8	1.60	L, FC
D-3-21	lithic workshop	?	16	2.26	L
D-3-30	lithic workshop	Woodland	16	2.26	L
D-3-33	shell midden	Woodland	8	1.60	L, Sh
D-5-20	shell midden	Woodland	16	2.26	L, Sh, Ch
D-7-23	lithic workshop	Late Archaic	30	3.00	L
E-3-2	lithic and				
	ceramic scatter	Woodland	200	8.00	L, Sh, C
F-4-4	lithic scatter	?	56	4.20	L, Sh
F-7-4	lithic scatter	?	10	1.80	L
F-7-12	lithic scatter	?	24	2.80	L

Symbols: L = lithics, C = ceramics, Ch = charcoal flakes, Sh = shell refuse, FC = fire-cracked rocks.

The other type of workshop was characterized by very small, tertiary milky quartz flakes (D-3-30, D-7-23). In addition to the minute chips, several broken projectile points (all produced from the same milky quartz) were also recovered in test units. These findings suggest that these two sites functioned as workshops where formal bifacial tools were either manufactured or sharpened by secondary retouch.

4. *Lithic Scatters* ($n = 6$; C-1-18, C-5S-32, C-5N-6, F-4-4, F-7-4, F-7-12; C-1-18 was partially excavated). These sites were all characterized by relatively low density lithic scatters ranging from 10 to 56 m^2 in area. One site, C-5N-6, contained fire-cracked rock and charcoal pieces; another, F-4-4, had several pieces of soft-shell clam; still another, C-1-18, included fire-cracked rock and a possible hearth. This information suggests that the activities performed on these sites probably varied. Yet until further analyses of the lithics are completed, the actual kinds of activities represented on each site are presently difficult to determine.

5. *Ceramic and Lithic Scatter* ($n = 1$; E-3-2; the site was partially excavated). A similar range of materials was recovered from this site as from the above lithic scatters, with the addition of plain ware ceramic sherds and a few pieces of shell refuse.

SITE FREQUENCY

Site frequency, defined as the ratio of sites per unit of area surveyed, is calculated using two different methods. The first method, referred to as the unadjusted frequency, is a parameter estimate based solely on the number of sites recorded during the survey work. It is simply computed by dividing the actual number of sites found by the total area of the sample unit surveyed. The unadjusted site frequencies calculated for the six sample units are in Table 2.

The second measure, the adjusted site frequency, attempts to make estimates that take into account the probability of missing certain size classes of sites. We recognized from the outset that our subsurface testing program would not locate every site in any given sample unit. Our testing program, by placing test units every 10 m across the sample unit, is essentially a systematic aligned sampling strategy with test units arranged along a square grid. While this kind of testing program provides some confidence in our ability to locate relatively large sites, it most certainly misses a proportion of the very small sites. Theoretically, if the radius of a site is greater than the midpoint of the square composed by any four test units, then no matter how the grid is placed in relation to the site at least one of the test probes should pierce the site and lead to its discovery. However, if the radius of a site decreases below this minimal threshold (the midpoint of any four contiguous test units), then the probability of missing sites greatly increases.

Undetected sites are a serious concern, since the generation of regional site frequencies should be based on a sample that is representative of the total universe of cultural resources. There are statistical methods, however, for estimating the number of sites missed in a sample unit, and this information can then be used to adjust frequency measures accordingly. The primary strength of using a probabilistic sampling design is the ability to make such predictions. Recently, Krakker et al. (1983) outlined a method for determining

Table 2. Unadjusted and Adjusted Densities of Prehistoric Sites

Sample Unit	Area Surveyed (hectares)	No. of Sites Recorded	Unadjusted Site Density	Expected No. of Sites	Adjusted Site Density
A	1.4	0	0	0	0
B	6.6	0	0	0	0
C	5.9	8	1.33/h	75	12.59/h
D	5.9	6	1.01/h	45	7.66/h
E	1.3	1	0.74/h	1	0.74/h
F	2.4	3	1.30/h	16	6.79/h
Total	23.5	18	.76/h 76/km ²	137	5.70/h 570/km ²

the probability of encountering small sites when test units are arranged in a hexagonal or square grid. Their probability limits are based on a site characterized by a circular dispersal of artifacts, although other shaped sites may also be considered. Assuming a random distribution of sites across the sample unit, then the probability of detecting small sites (where r = site radius and i = test unit interval) is: $p = \pi r^2/i^2$. Using this formula, we calculated the probability of encountering various sized sites given a 10 m test probe interval. The results are graphically represented in Figure 3. As the graph clearly illustrates, one can be relatively certain of locating sites with a radius of 7 m or more (site size $\geq 154 \text{ m}^2$); however, the probability of finding sites with a radius of less than 7 m declines dramatically following an S-shaped curve. For example, given a site size of 50 m^2 ($r = 4 \text{ m}$), we should locate on the average one out of every two sites that exist in the sample unit. For a site size of 12 m^2 ($r = 2 \text{ m}$), we should locate on the average only one out of every eight sites. That is, for every one site we successfully found, we probably missed seven other comparably sized sites.

The adjusted site frequency takes these factors into account by dividing the *expected* number of sites by the total area of a sample unit surveyed. The expected value is simply the summation of the number of sites actually found by survey crews and the number of small sites estimated to have been missed in that sample unit. The latter figure considers all the sites located in a sample unit with a radius of less than 7 m, and then projects the total number of small sites using the probability values presented in Figure 3. Both the expected number of sites and the adjusted site frequencies for the six sample units are presented in Table 2.

As can be observed in Table 2, the site frequencies (both unadjusted and adjusted) vary tremendously between the sample units. There is a strong tendency for site frequencies to be lowest in the three interior parcels (A, B, E; both unadjusted and adjusted frequencies range from 0 to .7 sites per hectare), and highest among the coastal blocks (C, D, F; unadjusted frequencies range from 1.01 to 1.33 sites per hectare; adjusted frequencies range from 6.79 to 12.59 sites per hectare). These figures indicate that the majority of prehistoric activities leaving recognizable remains occurred along the coastal strip. That is, there appears to be an inverse relationship between the distance to productive estuaries and the number of recognizable sites on the preserve. The overall unadjusted and adjusted site frequency for the sample units combined is .76 sites per hectare ($76/\text{km}^2$) and 5.7 sites per hectare ($570/\text{km}^2$), respectively. We caution, however, that these figures should be viewed as preliminary estimates, since the selection of interior and coastal sample units was done in a rather arbitrary fashion. In subsequent field seasons, the sample design will be modified so as to minimize any bias in the selection of sample units.

THE SPATIAL DISTRIBUTION OF SITES

The interior blocks, where relatively few remains were detected, are characterized by a few isolated projectile points and flakes, and one ceramic/lithic scatter (E-3-2). These finds tentatively suggest that the interior woodlands were sporadically used for hunting, and possibly for gathering wild

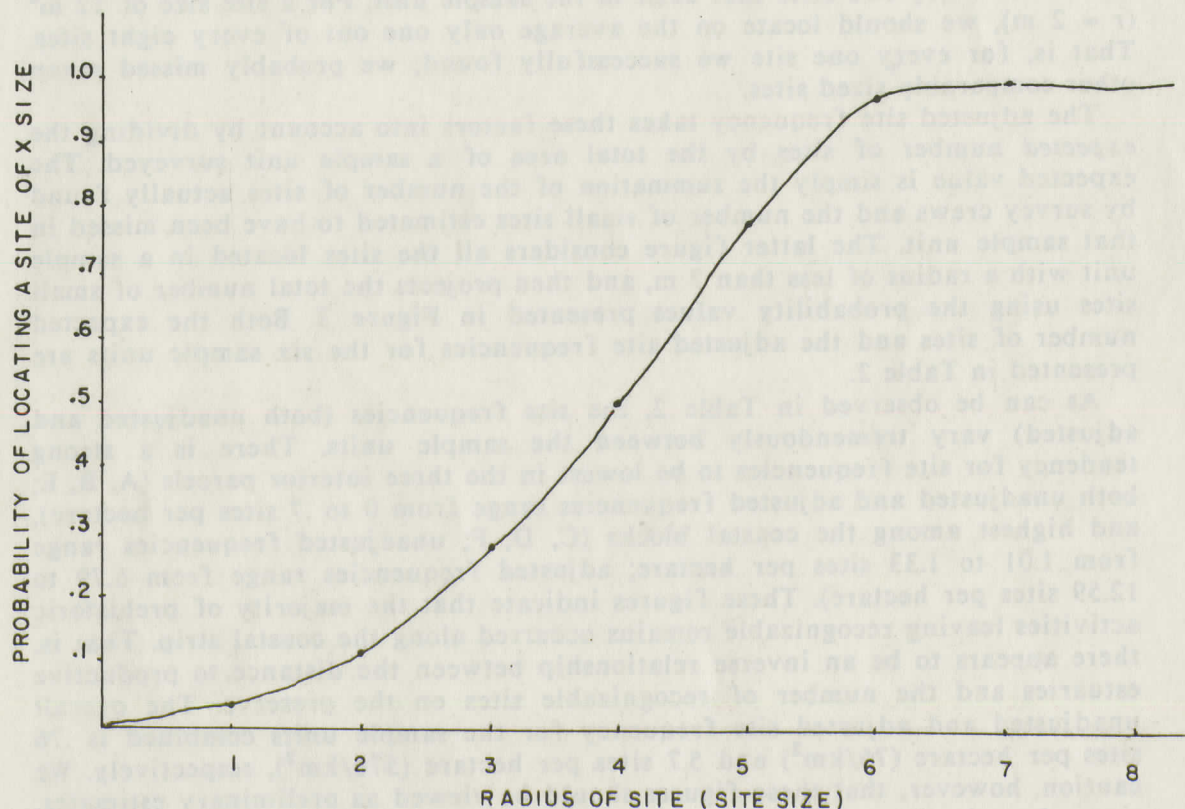


Figure 3. The probability of discovering a specific site size given a grid interval of 10 m.

products, such as mast nuts, although no direct evidence of the latter task has yet been recovered.

On the other hand, the coastal blocks are characterized not only by a high site frequency, but also by a considerable quantity of isolated finds, including projectile points, quartz flakes, and ceramics. When the spatial distribution of these isolated finds is plotted, they appear to be part of extensive low-density scatters or nonsite manifestations (see Thomas 1975; S. Plog et al. 1978:388-389) extending up to 7500 m² in size. Within these nonsite manifestations at least one artifact was discovered for every 18 to 90 shovel probes excavated. That is, at least one artifact was found for every 100 to 500 m² walked by survey crews. These low density scatters (see Figure 4) appear to represent resource zones that were successively utilized by hunter-gatherer bands during the prehistoric period. Taken together, the nonsite manifestations and site distributions produce a rather complex settlement pattern.

The coastal settlement pattern is best illustrated by sample units C and D (see Figure 4). Both blocks contain shell middens, lithic workshops, quarry sites, and lithic scatters located a short distance from one another. The spatial pattern suggests that a number of small, special-purpose camps were established along the estuaries and salt marshes of the Mashomack Preserve. Each site appears to represent the remains of a limited activity (e.g., where one kind of shellfish was collected and processed, where chipped stone material was quarried and manufactured into tools, or where plant resources were harvested). It is possible that small task groups were dispatched from residential bases to set up these small field camps in order to harvest and to process a particular food resource (or raw material). The foodstuffs or raw materials could then be used by the task groups or transported back to the main residences. None of the sites discovered to date on the Mashomack Preserve appear to have been residential bases where family units resided on a seasonal or year-round basis. Residential bases, in contrast to special-purpose camps, should be characterized by much more diverse assemblages of artifacts, representing the material remains of many varied domestic, subsistence and tool-maintenance chores. In addition, they should exhibit a greater range of architectural features and faunal remains (see Lightfoot 1985 for a more detailed discussion).

Since we did not locate the residential bases from which task groups could have been dispatched to exploit the resources of the preserve, one must ask where they are. Some of the residential bases may yet be found in the Mashomack Preserve or elsewhere on Shelter Island (the Smith site, for example). Alternatively, small task groups may have canoed from the mainland of Long Island to gather shellfish, hunt deer, or harvest other resources. Further work will be needed to establish the contemporaneity of the sites (see below), to detect possible residential bases on Shelter Island, and to delineate the community pattern of residential bases and special-purpose camps.

CHRONOLOGY

Although datable carbon samples were obtained during the excavations, C-14 analysis has not yet been completed. Eight sites have been tentatively dated using diagnostic projectile points (i.e., Wading River, Levanna) and ceramics. Seven of the sites appear to represent Woodland occupations, while only one

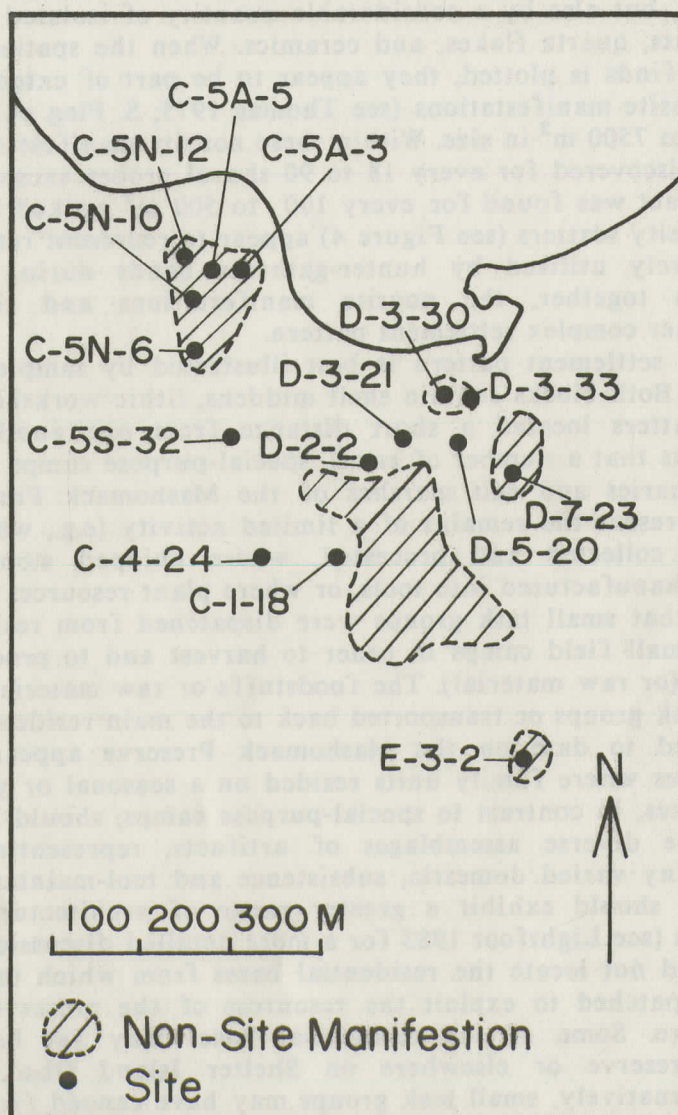


Figure 4. The settlement pattern of sample units C and D.

site, D-7-23, dates to the Late Archaic period (Table 1). The recent age of the sites is not surprising given the dynamic nature of the Shelter Island coastline. Since a broad, shallow shelf surrounds the northeastern, southwestern, and southeastern sections of the island, lower sea levels during the post-Pleistocene would have exposed a much wider area of Shelter Island for human occupation. Therefore, the early coastal sites may now be submerged under water.

How much of the island was exposed during the prehistoric period is debatable. Several different models have been proposed to estimate sea level oscillations during the post-Pleistocene. Most models suggest sea levels began stabilizing about 2000 to 3000 years ago (see Bloom and Stuiver 1963; Stuiver and Daddario 1963; Ruppe 1984:Figure 7), although some suggest considerable fluctuations occurred even during this period (see Fairbridge 1960). Most areas of the world, depending upon local tectonic activities, experienced a significant drop in sea level prior to the Woodland period. For example, Bloom and Stuiver (1963) suggest a drop of .18 m per century between the period of 3000 and 7000 years ago. A drop of 7 m would have greatly altered the configuration of Shelter Island, creating a land mass nearly twice as large as it is today.

Recent geological research on Shelter Island suggests the shoreline might not have stabilized until fairly recently. A core taken from Bass Creek, an estuary of the Mashomack Preserve, indicates that the location was characterized by "upland" soil and vegetation conditions until about 3600 years ago when it became a freshwater bog (Daniel 1982:116). The present tidal marsh began forming about 850 years ago.

Despite the variations in the magnitude of sea level change proposed by scholars, the implications for early human settlements of Shelter Island are clear. There is a very good chance that coastal sites predating the Woodland period are now submerged under a meter or more of water.

IMPLICATIONS OF THE SHELTER ISLAND SURVEY

The results of the Shelter Island survey suggest that site investigation bias is a major problem for coastal New York archaeology. This evaluation is based on the following three observations. First, shell middens do not appear to be the primary site type found on the Mashomack Preserve, since only 5 of the 18 prehistoric sites contained concentrations of shellfish refuse. Although middens are an important component of the coastal settlement pattern, there exists a variety of small, special-purpose camps that represent the remains of diverse resource harvesting and raw material extraction activities. In contrast, only 6 lithic and/or ceramic scatters (6% of the total) have been described in the entire published literature of coastal New York considered in our overview. Second, the Mashomack Preserve sites range in size from only 4 to 200 m² with a mean size of 30 m² (sd = 45.5 m²) (see Table 1). In comparison, most of the published sites are large, the majority measuring well over 1000 m² in area. Finally, only 1 of the sites found in the Mashomack Preserve could have been detected by casual surface reconnaissance work--the remainder were buried at least 10 to 15 cm below ground surface and exhibited no visible surface manifestations. Again, in contrast, most of the published sites were detected because of their high visibility. At least 44% of the published (n = 41) sites

were detected explicitly because of artifactual material and shell refuse found on the ground surface.

These observations suggest that our subsurface testing program was sensitive to the detection of a much greater number of small, nonmiddens sites than is implied by the published literature. Previous site-encounter methods were certainly able to discover the large shell middens, but they appear to have missed the small special-purpose camps that may be found in the hinterland of the large sites. Our results indicate that the settlement pattern of Shelter Island is characterized by a few large shell middens, such as the Smith site, and hundreds of smaller special-purpose camps. Along productive estuaries and salt marshes the frequency of the latter sites may be very high, on the order of 1 to 12 artifact clusters per hectare.

The extent to which we can generalize from the Shelter Island survey to other areas of coastal New York is debatable. However, the survey results suggest that an important component of coastal New York's settlement pattern may have been largely overlooked in the past. For every large shell midden reported along the coastline of Long Island, there may be literally hundreds of smaller sites buried beneath the regional landscape. If such a settlement pattern is found in other areas, then a systematic study of these remains will be necessary to determine the full range of subsistence and raw material extraction activities conducted by coastal hunter-gatherers.

CONCLUSION

The results of the Shelter Island survey, when viewed in conjunction with recent contract work, strongly suggest that the published literature presents a distorted perspective of Long Island's regional settlement pattern. The chance discovery of cultural material by construction projects or by casual walk-over surveys has tended to focus research on the largest and most noticeable sites. Consequently, considerable fieldwork has been devoted to the study of large shell middens, especially those located along the north shore of Long Island. Yet contract work conducted in the interior of the island indicates that prehistoric bands established small camps some distance from the coast. In addition, the survey work conducted on Shelter Island suggests that large shell middens represent only one component of a much more complex coastal settlement pattern. Future work is needed to begin addressing the relationship of the large shell middens to the small special-purpose sites situated in the coastal and interior areas of Long Island. Such research will necessitate the continuation of regional survey work that incorporates a rigorous subsurface testing program.

END NOTES

- ¹. Space limits precluded the publication of the appendix outlining the location, size, age, and type of the 93 sites included in the overview. Copies of the appendix are available by writing the authors.
- ². The Long Island Survey Project has now expanded to include archaeologists from Queens College (CUNY) under the supervision of James Moore, and Suffolk Community College under the direction of Robert Kalin.

3. Note that the first letter of the site designation refers to the survey block, and that the second and third numbers define the transect number and shovel probe number, respectively.

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