BULLETIN OF THE
ARCHAEOLOGICAL SOCIETY OF CONNECTICUT
NUMBER 53 1990

Edited by LUCIANNE LAVIN

CONTENTS

Cover Illustration: Susquehanna tradition blades from a cache at site SI-2-1 on Shelter Island, New York.

THE ARCHAEOLOGICAL SOCIETY OF CONNECTICUT, P.O. BOX 386, BETHLEHEM, CT 06751

EDITOR'S CORNER

The main theme of *Bulletin* 53 is the elucidation of archaeological techniques that may help us to achieve our goal of understanding the past. The article by Abraham discusses various techniques of analyzing shellfish remains from archaeological sites for information on site seasonality and the paleo-environment. Kerber's paper concerns techniques of site salvage and public education. It is a fine example of the results of co-operation among private developers, government agencies, and archaeologists. Rivers' article is an organized approach to educating the public about local archaeology using a combination of various educational, historical, and archaeological techniques and tools.

Witek's review of the archaeology on Shelter Island continues the theme generated in *Bulletin* 51 -- the importance of an interregional approach to archaeological reconstruction and the value of amateur and professional interactions to a better understanding of the past. Pagoulatos' article deals with the use of statistical techniques to analyze and interpret artifact distributions Terminal Archaic habitation sites. It complements the articles by Thompson, Pfeiffer, *et al.* on Terminal Archaic burial sites in out last *Bulletin.* Banks' paper concerns prehistoric fishing techniques in southern New England. It is another good example of the usefulness of an inter-regional approach in archaeological interpretation. Tottenham's discussion of projectile point function demonstrates the importance of replicative techniques in archaeology for a better understanding of past human behavior.

Archaeologists are constantly fine-tuning old techniques and creating new techniques of excavation and analysis. It is essential that amateurs and professionals alike keep abreast of the new developments in methodology so we might obtain the maximum amount of cultural information possible from our sites.

DATA FROM SHELLS: THEORY IN SEARCH OF A METHOD

JUDITH FARBER ABRAHAM
YALE UNIVERSITY

ABSTRACT

An important part of many archaeological investigations is determining the "time of year" an event took place. And archaeologists not only want to know when, but also the physical environment in which it took place. Floral and faunal remains have been a staple in these studies. This article discusses the use of shellfish as indicators. It gives an overview of molluscan growth, discusses some of the methods in use and some of the problems inherent in using the growth cycles of shellfish.

INTRODUCTION

A major part of many archaeological investigations is determining the "time of year" for a site activity. Estimates of when a site was occupied or when a specific event took place is needed when trying to reconstruct subsistence strategies, settlement patterns, and population, for example. And archaeologists not only want to know when an event took place, but also the physical environment in which it took place. Floral and faunal remains have long been a staple in these studies. One type of fauna, though, has not quite found a secure niche in seasonality and paleoenvironmental studies--shellfish.

Molluscs have been shown to be very responsive to their environment. This results in a long-term record of conditions under which they lived in both the external and internal structure of their shells (e.g., Jones 1983). Besides season of harvest, this long-term record offers other possible uses for excavated shells--paleoenvironmental reconstruction and local relative dating sequences similar to the floating chronologies that are derived from tree rings. In the past ten years, research to retrieve data from shells has increased. Much of this research has been done for the hard and soft clam, *Mercenaria mercenaria* and *Mya arenaria*, and the East Coast oyster, Crassostrea *virginica*. Studies are ongoing to devise the most reliable methods to obtain information.

Research has shown that it is not necessarily "intuitively obvious" how to decipher the data in the shells. The very important point in any work using shells is that not all members of the same species community respond to a change in the environment in precisely the same way. And, as Shakespeare wrote "...there's the rub."

MOLLUSC BIOLOGY

There are two mollusc classes that make up the main shells found at archaeological sites. These are the gastropods, such as conchs, periwinkles and snails, and the bivalves, such as mussels, oysters and clams (Waselkov 1987). (Table 1 shows the relationship of some of the well-known members of the *Mollusca* phylum.) All of these species live in habitats close to shore, often in the intertidal and shallow subtidal zones. Within those zones, some live on the rocky substrates (for example, mussels and oysters) and others, such as the clam, in sand or mud. Many can move about by adjusting their depth in the sand (clam) or move to another substrate (snail), but oysters and mussels are attached permanently to their substrate (Abbott 1968; Barnes 1980).

TABLE 1: *TAXONOMY OF THE OYSTER AND SOME RELATED SPECIES* (compiled from Barnes 1980; Yonge 1966)

PHYLUM -- Mollusca

CLASS -- Gastropoda -- "oyster drill, land snail, whelk, etc."
Monoplacophora
Polyplacophora
Aplacophora
Bivalvia -- "clam, oyster, mussel, shipworm, etc."
ORDER -- Mytiloida
FAMILY -- Ostreidae (the "edible" oyster)
*GENUS -- Crassostrea
*SPECIES -- virginica (American East Coast oyster)
SPECIES -- gigas (Japanese)
:
*GENUS -- Ostrea
SPECIES -- edulis (European)
SPECIES -- lurida (American West Coast oyster)
:
GENUS -- Lopho
:
FAMILY -- Pteriidae
*GENUS -- Pinctada (the "pearl" oyster)
:
FAMILY -- Mytilidae (mussels)
:
FAMILY -- Pectinidae (scallops)
:
ORDER -- Veneroida
FAMILY -- Veneridae
GENUS -- Mercenaria (hard clam)
:
ORDER -- Myoida
FAMILY -- Myacidae
GENUS -- Mya (soft shell clam)
:
:
:
Scaphopoda
Cephalopoda -- "octopus, squid, nautilus, etc."

Techniques to analyze growth patterns are based on examination of internal growth lines in shells. In order to understand the techniques and problems, a knowledge of molluscan shell growth is necessary. I shall briefly discuss shell growth with some specifics for Long Island Sound. An excellent in-depth discussion of this complex subject can be found in Rhoads and Lutz (1980). Figures 1 and 2 illustrate clam and oyster terminology.

The shell is made up of incremental growth structures or microgrowth increments (Figure 3). This type of structure also is found, for example, in bones, teeth, elephant tusks, and trees. Molluscan shell grows by the deposition of

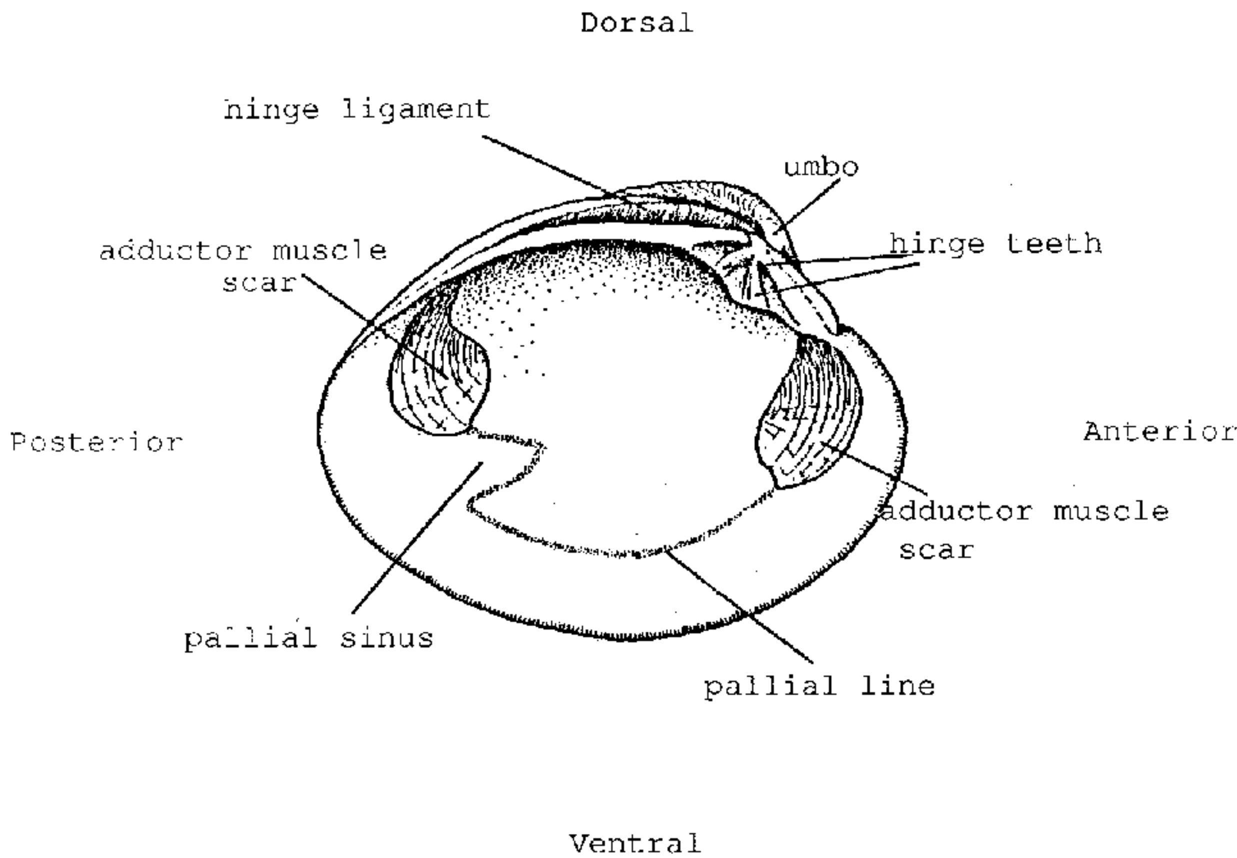

Figure 1. *Hard clam shell interior and its terminology.*

calcium carbonate crystals within an organic matrix on the growing surfaces of the shell--the inside of the shell and along its margin. These incremental structures are distinctive self-contained units, each one immediately after the previous, and are the result of varying rates of growth. The size, microstructure and chemical composition of these increments are influenced by the organism's biology and by its environment: time of year it starts and stops growing, when it spawns, available food, water temperature, storms, tides, and any combination of these and other factors. Thus each increment has "physiological, environmental, and/or chronological significance" (Aten 1981:181). The shell has the potential to grow in size for its entire life. Thus it carries a permanent record of the age, rate of growth, and the season of death of the organism.

The overall aspect of the increments is a banded appearance (Figure 4). Periods of rapid growth are visible as wide, white, opaque bands of microgrowth increments. This growth is dependent upon favorable environmental conditions, such as adequate food supply and optimal temperature. Periods of slow or reduced growth are visible as narrow, dark, translucent bands of closely spaced microgrowth increments representing periods of stress. Stress is the result of extreme heat or cold, extremes of salinity, low food availability, spawning, tides, and storms, for example. Short periods of rapid growth may be found within periods of slow growth, and visa versa (Figure 5).

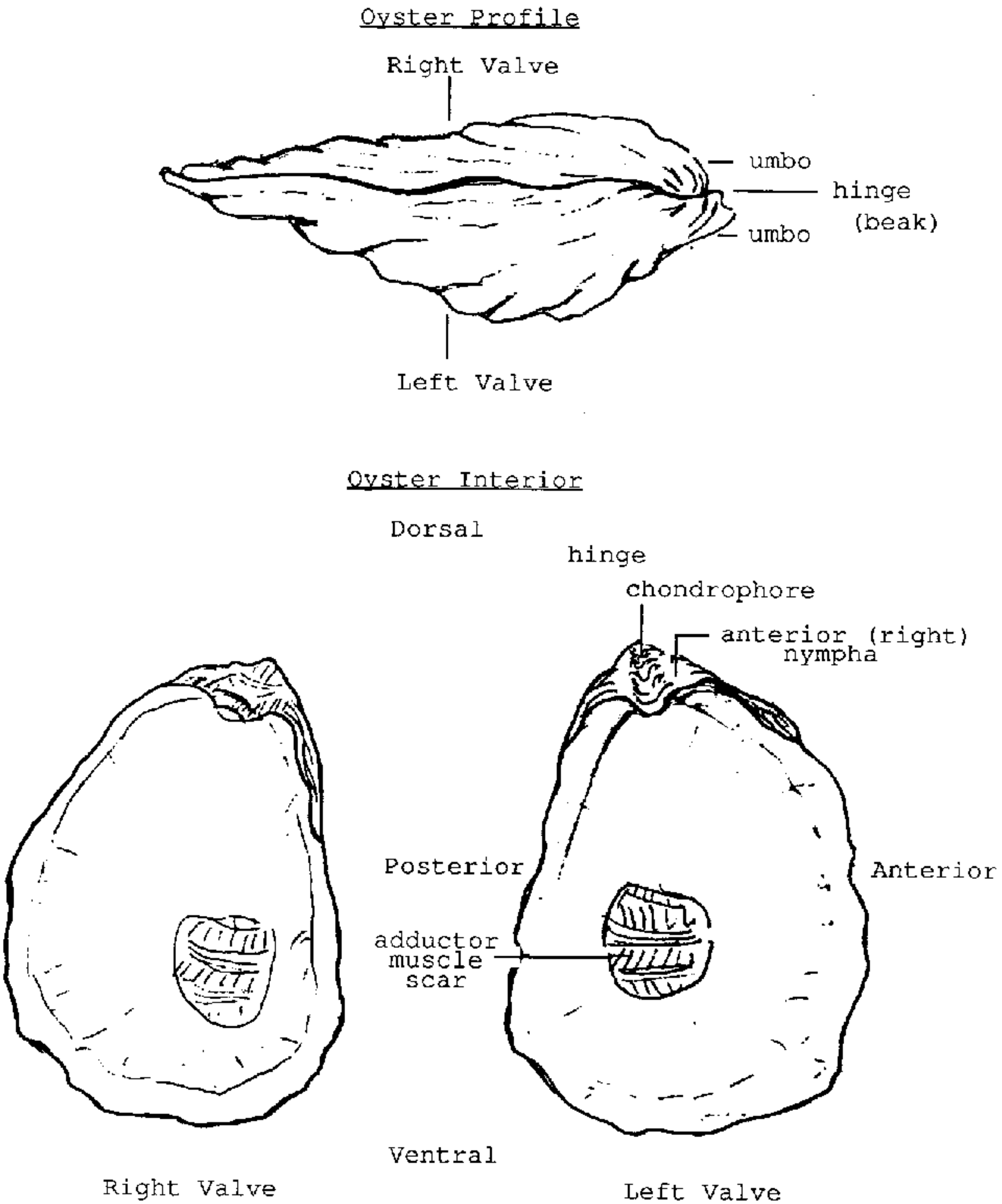

Figure 2. *The oyster shell and its terminology.*

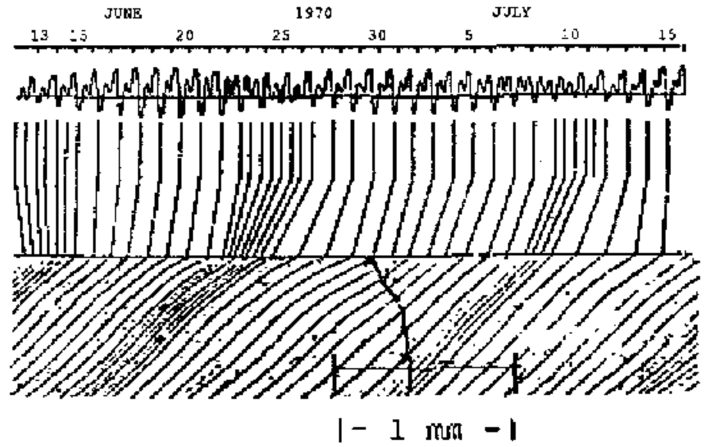

Figure 3. *The reflection of tides on growth lines. An acetate peel of a radially sectioned shell valve. Diurnal, semidiurnal and fortnightly patterns are apparent. After Lutz and Rhoads (1980).*

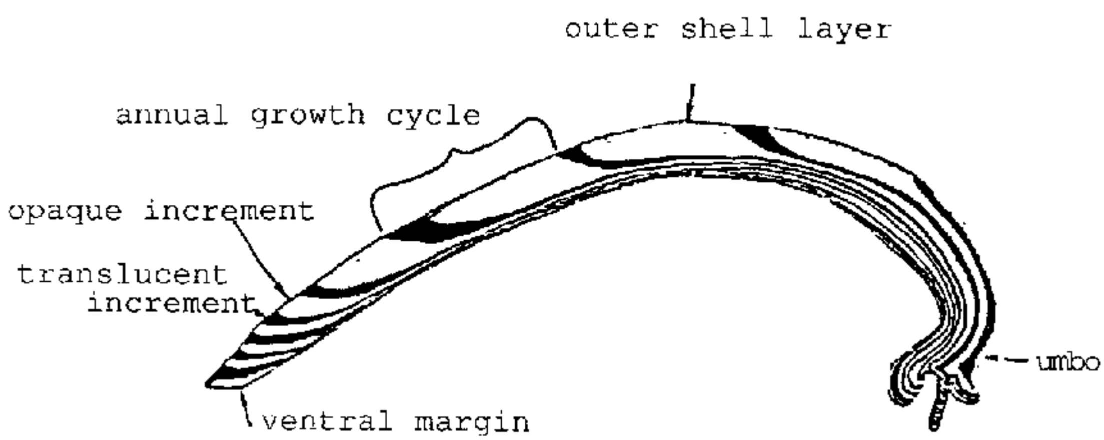

Figure 4. *Hard clam cross section illustrating annual growth banded appearance.*

The growing season in Long Island Sound is from about late April to mid-November. During winter, growth stops and the animal hibernates. This occurs when water temperature is near freezing, usually between late December and early January. This is known as the annual growth break, or "winter break". Growth cessation is often marked by a growth break groove in the shell surface. Many events can stress an organism and result in a growth break. Kent (1988) has identified spawning, storm and heat-shock, as well as winter breaks in oysters (Figure 5), and Kennish (1980) has observed more in the hard clam. Knowledge of all the factors which influence the growth cycle, combined with observations of the point in the cycle at which growth ceases for the year, can provide seasonal inferences. The annual growth breaks can be counted to give age.

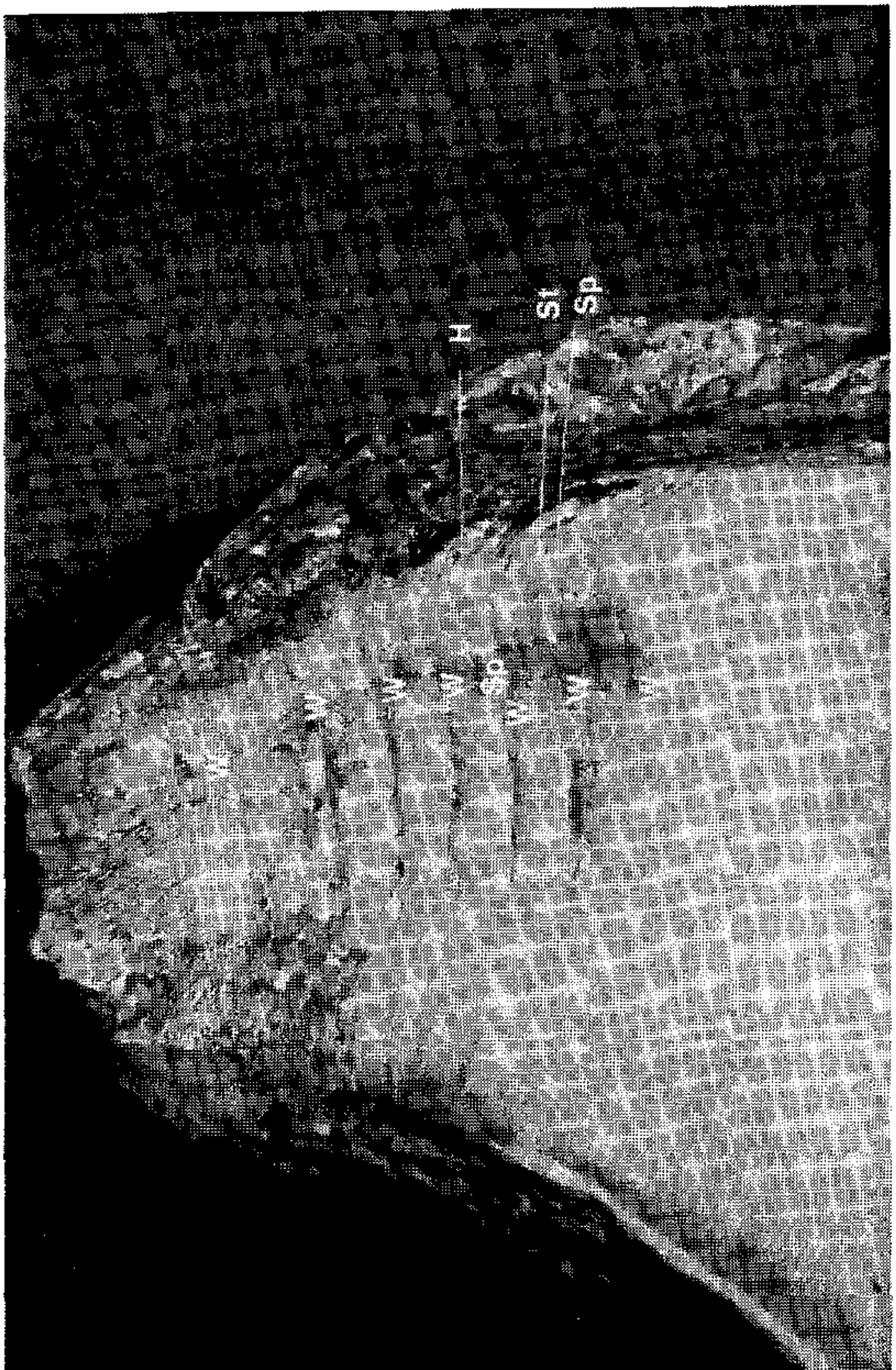

Figure 5. *Oyster hinge with evidence of growth breaks (W - Winter; Sp - spawning; St - storm; H - heat-shock). After Kent (1988).*

For valid seasonality, the annual growth break must be accurately identified. Many times there is a problem differentiating annual growth breaks from "disturbance lines" (for example, growth breaks due to storms), particularly for prehistoric shells where decomposition blurs patterns. There is a greater problem separating these in external growth lines, but the annual growth breaks are often more distinctive in internal lines. Techniques that use internal lines: cross sections, thin sections, acetate peels, staining, and even direct microscopic observation, give the most reliable results (Kent 1988).

Not all shells grow consistently and growth increments may accumulate more on some parts of the shell than others. It must be established for each species which part of the shell is most appropriate for analysis. For instance, the clam can be radially cross sectioned and its microgrowth increments seen (Figures 6 7). This method has not proved useful for the oyster, but the surface of the left valve hinge does show microgrowth increments and can be used (Kent 1988; Figures 5 and 6).

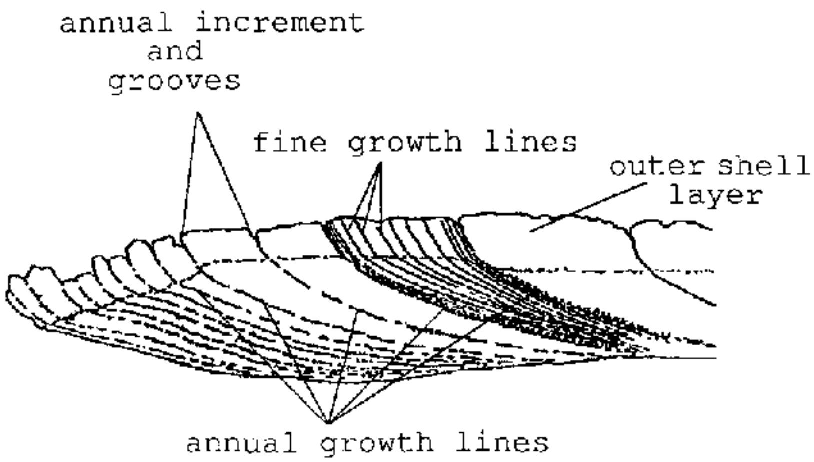

Figure 6. *Hard clam cross section illustrating various growth lines and features.*

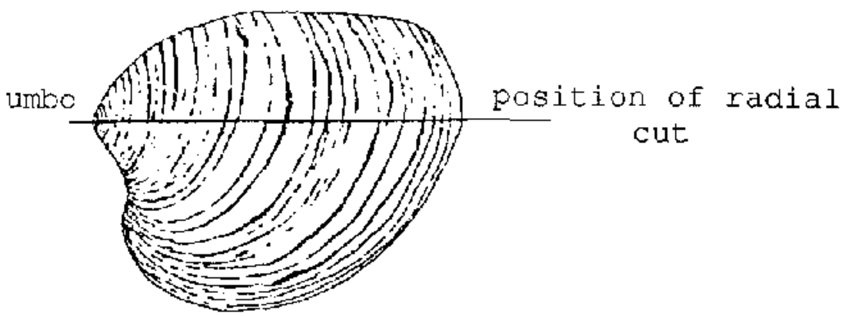

Figure 7. *Left valve of the hard clam showing the position of the radial cut.*

The time when growth increments form varies annually, with latitude, and between microhabitats (Quitmyer *et al.* 1985). All of a single species living in a given environment do not start or stop growing at the same time, nor do they all grow at the same rate. Environmental factors are modified by the biological clock and by the natural variability between members of the same species. *A study of the growth cycles of the species being investigated must be done from local modern specimens before evaluating archaeological remains at a site in the area.* Some patterns still will not be decipherable.

METHODOLOGY FOR SEASON OF HARVEST

The use of excavated shells to determine seasonality was first applied to an archaeological site in 1969 (Claassen 1984). Archaeologists using shells include Aten (1981), Bailey *et al.* (1983), Claassen (1984), Custer (1987), Deith (1986), Hancock (1981), Kent (1988), Killingley (1981), Lightfoot and Cerrato (1988), Quitmyer *et al.* (1985), Sanger (1982), and myself (Abraham 1989). Interestingly, there seem to be almost as many variations for retrieving "season" as there are archaeologists. Each is using a method he/she feels is the most accurate and precise. The seasonality analyses discussed here are chemical, structural or morphological approaches (*sensu* Aten 1981). Chemical techniques measure stable isotope ratios to determine water temperature at the time the shell was formed. Structural techniques involve counting the daily growth increments since the last annual growth break. Morphological techniques compare the most recent growth to (mean) growth for the last "x" year(s).

For the latter two methods, archaeologists use cross-sectioned clams by looking directly at the section, at acetate peels of the section, or at thin sections. (A shell is cross-sectioned by sawing along the axis of maximum growth--a line from the umbo to the ventral margin of the valve (Figure 7). Obtaining a cross section that passes exactly through this axis is fairly difficult (Lightfoot and Cerrato 1988). Archaeologists studying oysters examine the surface of the left valve hinge area by microscopic observation either of the hinge itself, or by first staining it and viewing a photographic slide, or by acetate peels (Figure 3).

Whatever the approach, some feel that time of death can be ascertained to month, some to within two months and some to season. Some calculate mean growth using all the years, some the last one, two or three years. Some count daily increments; others simply calculate if the mollusc was in fast or slow growth when it died. The particulars for some archaeologists follow:

Custer (1987) studied oysters from a Maryland site. He divided time of harvest into fall, late fall-early winter, winter, late winter-early spring, spring, and summer. Keith Doms (Center for Archaeological Research, University of Delaware, personal communication 1988 and 1989) states that they basically use Kent's technique. They make acetate peels of the hinge area which they view through a slide projector for examination and measurement. They use oysters six years or older, and use the last three years growth for mean growth calculation. They feel that the first three years of the oyster's life are juvenile, fast growth, which would distort mean growth calculations.

Deith (1986) analyzed stable isotopes ($^{18}O/^{16}/0$ and $^{13}C/^{12}C$) in the growth rings to determine shellfish gathering strategies. Her work used a variety of shellfish found in Mesolithic middens in Scotland. The main animal was the cockle, *Cerastoderma edule*.

Hancock (1981:4) examined hard clam thin sections to determine "general" season of death at a Cape Cod site. For this study, the position of the ventral margin with respect to the last fall through winter slow growth was noted. When possible, the season was refined by noting the spacing pattern of the "fine growth lines at the margin".

Kent (1988) used the hinge area of the oyster for season of harvest determinations for Maryland middens. He used acetate peels, or stained and then photographed the hinge. In either case, they were then viewed under a microscope and measurements taken. He used oysters two years or older, and used the last two years for mean growth calculations.

Killingley (1981) determined time of harvest by using stable oxygen isotope analysis for shells from a Baja California midden. He felt this method had an accuracy of ± a month.

Lightfoot and Cerrato (1988) examined microgrowth lines in thin-sectioned hard clams. Estimates of season of harvest were obtained by counting the number of daily lines from the last winter break. When the daily lines grouped into fortnightly or lunar month patterns, those were counted instead. The winter break was approximated at about January 1. Their site was on Shelter Island in Long Island Sound.

Quitmyer *et al.* (1985) examined cross-sectioned hard clams. Clams less than eight years old were examined with thin sections; those older with acetate peels. They noted the location of the opaque and translucent bands that represented one annual growth cycle. Season of harvest was determined by comparing the amount of the last year's growth to the previous year's growth. The sites were in Georgia.

Sanger (1982) examined soft shell clams from Maine sites. He simply noted whether they were harvested in their fast or slow growth phase.

I (Abraham 1989) examined oysters for season of harvest using a modification of Kent's technique. The hinge was viewed directly under a binocular microscope and measurements made with an ocular micrometer. Oysters erode at their dorsal end as they get older. Therefore, oysters three or more years old were used for seasonality, with only the last two years used for mean growth calculations to minimize the dorsal erosion factor. The sites were on the Connecticut coast.

RELATIVE DATING

Radiometric techniques are able to provide dates from shell samples, but their associated standard deviations are too broad for chronologically ordering occupations separated by as little as 100 or 200 years. Various bivalves, the ocean quahog, *Arctica islandica*, for example, and other sea fauna meet two important criteria for chronological and environmental studies--restricted habitat and a suitable long life (e.g., Jones 1983, Turekian 1978). Unfortunately, for the shells found at the archaeological sites noted in this paper, the majority of clams seem to have lived less than 10 years with only a small amount living as long as 20; and oysters less than 10. In general, the hard clam seems to have a maximum life of about 20 years (Lightfoot and Cerrato 1988), and the East Coast oyster, 10 to 12 years (Barnes 1980). At least these bivalves do have a restricted habitat, especially the oyster since it is cemented to it.

If one is willing to work in small time scales, Kent feels that oysters can be used for relative dating (and the system also should be workable with other bivalves). Certain years will be recognizable on a number of valves from a specific component at a site, either due to an abnormally high or low amount of growth, or to a distinctive pattern of storm breaks. By comparing the position of "marker" years on the hinges of oysters from different places at the site, it may be possible to determine those oysters collected in the same year, thereby stratifying the site. Furthermore, the marker years could be used to construct a local relative chronology for a group of adjacent sites.

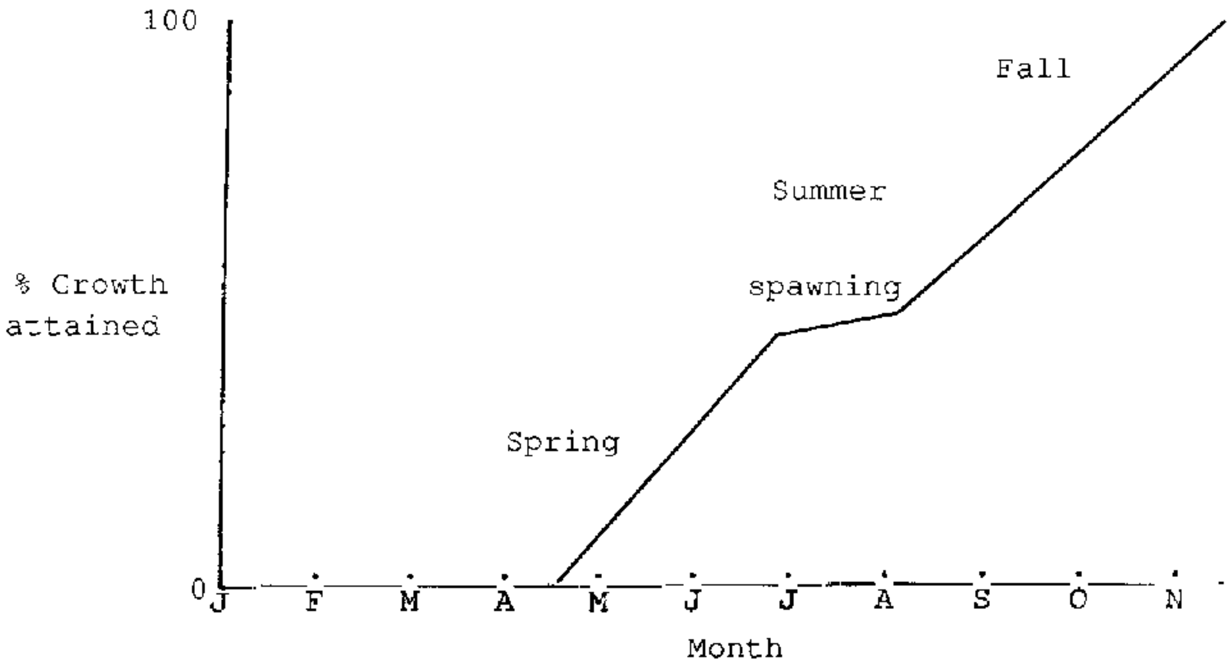

Figure 8. *Growth and growing season. Robert Cerrato (personal communication 1989).*

DISCUSSION

Personally, I am not convinced that we can accurately and precisely read seashells. (Accurate means the right season; precise means duplicatable results). The fact that there are variations on any given method implies that we are still groping. It may be that, depending on the geographical location (e.g., latitude) of a site, different methods may be needed or that one may be as good as another. But this still does not dispel my uneasiness.

Mollusc shell growth is a very complex process. Increments are laid down as often as semi-diurnally/with every tide. They also form patterns fortnightly, lunar monthly and annually (Figure 3). Other growth breaks may be intermingled: heat and freeze shock, spawning, storms, and neap tides (Kennish 1980). Environmental forces, the biological rhythm for a species and natural variability within a species make patterns difficult to interpret. Environmental and biological factors must be separated. The patterns that give hope to seasonality and paleoenvironmental studies also are the bane of applying the technique. Even with a study collection of local modern oysters, too many patterns on my prehistoric oysters were not definable either because decomposition had blurred the features, and/or because those prehistoric patterns had no modern analogs. Also, some of the patterns on the modern oysters were not understandable.

Monks (1981:202-211) has written a good synthesis and evaluation of methods being used. I would like to add some comments on aspects of the three approaches.

1. Oxygen isotope analysis seems to work well on fauna in stable marine environments, but is not useful for the oyster or other shellfish of the estuaries with their widely fluctuating temperatures and salinities

(Shackleton 1973).

2. Counting increments is a laborious task. Increments may be as little as a few microns in width. One has to decide which are the daily increments as opposed to tidal, and also decide on the "time" of the winter break. The environment can upset incremental deposition.
3. There is difficulty in making "exact" radial cross sections.
4. Annual breaks are not always obvious. Many times interpretations are subjective. It is possible to make inaccurate measurements even when working as carefully as possible.
5. With regard to microgrowth increments and the resulting bands: Bivalves deposit the widest growth bands during their first four years, and "old" bivalves can have bands so close together that they are impossible to interpret (Robert Cerrato, Marine Sciences Research Center, SUNY Stony Brook, personal communication 1989).
6. With regard to mean growth calculation or comparisons simply to the previous year: Since the bivalve decreases its annual growth band width as it grows older, mean growth becomes biased toward an earlier season. A Walford Plot inversion is one method to predict the growth for the year of death (Cerrato personal communication 1989). This allows the last partial year's growth to be compared to what it would have grown as opposed to comparisons with the previous year's growth. (This does assume that the environment was stable and only age was affecting growth).
7. No method should be used which assumes that growth is linear throughout the growing season. During spawning, the bivalve is stressed, growth slows and may even cease (Figure 8). Also, after one-half the growing season, less than half the yearly growth has been made.

CONCLUSION

From my research on the natural history of bivalves, I believe that present techniques are capable only of giving a general seasonality for a large sample. With regard to oysters, the techniques are not refined enough to give a precise seasonality, seasonality for a small sample or for a sample of young oysters, or for local paleoenvironmental information at this time.

Work must continue on the identification of growth breaks and the resulting microgrowth patterns. This is needed for paleoenvironmental studies also. Chemical techniques may add data. Perhaps resolutions will come from these two techniques used in conjunction. I do think there is a wealth of information in shells, and I do think that accurate and precise methods can be found.

ACKNOWLEDGMENTS

This paper is based on research done for my M.A. thesis. I spoke with many experts in my quest to understand the oyster, and bivalves in general. I am grateful for their help. Primary among them are Keith Doms of the University of Delaware Center for Archaeological Research; Richard Lutz of the New Jersey Agricultural Station at Rutgers; Edwin Rhoads of the National Marine Fisheries Service in Milford; and John Volk of the Connecticut Aquaculture Division in Milford. Special mention must be given to Robert Cerrato of the SUNY Marine Research Center in Stony Brook for the hours he spent with me explaining oysters and other shellfish, and for the work he did cutting up oysters in all directions possible and trying to interpret them for growth information.

REFERENCES CITED

Abbott, R.T.
1968 *A Guide to Field Identification. Seashells of North America.* Golden Press, New York.

Abraham, J.F.
1989 Seasonality and Other Determinations Based on the American Oyster, *Crassostrea virginica*: A Review of Available Methodology and Its Application to Archaeological Sites on the Southern Connecticut Coast. Unpublished M.A. thesis, Yale University, Department of Anthropology, New Haven.

Aten, L.E.
1981 Determining Seasonality of *Rangia cueata* from Gulf Coast Shell Middens. *Bulletin of the Texas Archeological Society* 52:179-200.

Bailey, G.N., Deith, M.R., and N.J. Shackleton
1983 Oxygen Isotope Analysis and Seasonality Determinations: Limits and Potential of a New Technique. *American Antiquity* 48(2):390-398.

Barnes, R.D.
1980 Invertebrate Zoology. Saunders College/Holt, Reinhard and Winston. Saunders College, Philadelphia.

Claassen, C.
1984 Shellfishing Seasons in the Prehistoric Southeastern United States. *American Antiquity* 51(1):21-37.

Custer, J.F.
1987 Survey and Test Excavations at the Fairlee Neck Shell Midden (18KE17), Kent City, Maryland. *Bulletin of the Archaeological Society of Delaware* 23:9-23.

Deith, M.R.
1986 Subsistence Strategies at a Mesolithic Camp Site: Evidence from Stable Isotope Analyses of Shells. *Journal of Anthropological Science* 13:61-78.

Hancock, M.E.
1981 *Preliminary Analysis of Shellfish Remains Caco Survey: 1981.* North Atlantic Regional Office, National Park Service.

Jones, D.S.
1983 Sclerochronology: Reading the Record of the Molluscan Shell. *American Scientist* 71:384-391.

Kennish, M.J.
1980 Shell Microgrowth Analysis: *Mercenaria mercenaria* as a Type Example for Research in Population Dynamics. In *Skeletal Growth of Aquatic Organisms,* edited by D.C. Rhoads and R.A. Lutz, pp. 255-294. Plenum Press, New York.

Kent, B.W.
1988 *Making Dead Oysters Talk.* Maryland Historical Trust, Historic St. Mary's City.

Killingley, J.S.
1981 Seasonality of Mollusk Collecting Determined from O-18 profiles of Midden Shells. *American Antiquity* 46(1):152-158.

Lightfoot, K.G. and R.M. Cerrato
1988 Prehistoric Shellfish Exploitation in Coastal New York. *Journal of Field Archaeology* 15(2):141-149.

Lutz, R.A. and D.C. Rhoads
1980 Growth Patterns Within the Molluscan Shell: An Overview. In *Skeletal Growth of Aquatic Organisms*, edited by D.C. Rhoads and R.A. Lutz, pp. 203–254. Plenum Press, New York.

Monks, G.G.
1981 Seasonality Studies. In Advances in Archaeological Method and Theory, edited by M.B. Schiffer, pp. 177–240. Academic Press, New York.

Quitmyer, I.R., H.S. Hale, and D.S. Jones
1985 Paleoseasonality Determination Based on Incremental Shell Growth in the Hard Clam, *Mercenaria mercenaria* and its Implications for the Analysis of Three Southeast Georgia Coastal Shell Middens. *Southeastern Archaeology* 4(1):27–40.

Rhoads, D.C. and R.A. Lutz, editors
1980 *Skeletal Growth of Aquatic Organisms*. Plenum Press, New York.

Sanger, D.
1982 Changing Views on Aboriginal Seasonality and Settlement in the Gulf of Maine. *Canadian Journal of Anthropology* 2:195–203.

Shackleton, N.J.
1973 Oxygen Isotope Analysis as a Means of Determining Season of Occupation of Prehistoric Midden Sites. *Archaeometry* 15(1):133–141.

Turekian, K.K.
1978 On Reading Seashells. *Discovery* 13:2–11.

Yonge, C.M.
1966 Oysters. Collins, London.

Waselkov, G.A.
1987 Shellfish Gathering and Shell Midden Archaeology. In *Advances in Archaeological Method and Theory*, Vol. 10, edited by M. Schiffer, pp. 93–210. Academic Press, New York.

SAVING ENDANGERED SITES IN SOUTHERN NEW ENGLAND: PUBLIC ARCHAEOLOGY AT LAMBERT FARM, WARWICK, RHODE ISLAND

JORDAN E. KERBER
THE PUBLIC ARCHAEOLOGY LABORATORY, INC.
and
COLGATE UNIVERSITY

ABSTRACT

This article discusses threats to archaeological sites resulting from private development in southern New England and ways in which some threats may be minimized and even eliminated. An overview of a public field school in archaeology at the Lambert Farm site in Rhode Island is presented as a successful model for cultural resource management of an important yet endangered prehistoric site. Through this multi-year educational program, significant information is being collected while at the same time public awareness of archaeology and the crisis of site destruction are heightened in a manner that can contribute towards the protection of similarly threatened sites.

INTRODUCTION

Many important archaeological sites in southern New England are destroyed each year by private development. This article discusses the threats to archaeological sites resulting from private development and the ways in which these threats can be minimized and even eliminated. In particular, one possible solution, that of a public field school in archaeology, is highlighted in addition to some of the interesting results of this program in research and development.

Private development is defined here as any construction or construction-related impact on private property that does not require state or federal funding or permitting. In southern New England private development, with few exceptions, does not trigger review under current state or federal historic preservation laws and regulations. For example, the National Historic Preservation Act of 1966, a landmark piece of legislation designed to protect significant historic and archaeological resources in the United States, only pertains to public development; i.e., development requiring federal funding or permitting. The vast majority of development in the region, however, is private. Even property listed on the National Register of Historic Places is not protected from private development solely because of its National Register status.

There are limited legal measures to protect important cultural resources from private development. Some cities and towns have enacted local ordinances that require review of all private development plans, even house painting, in areas designated as historic districts. Such ordinances, however, largely apply to historic buildings and rarely to archaeological sites. Under this review structure, it is difficult to protect below ground, invisible sites when they have not yet been identified, and such local ordinances typically do not have the power to require archaeological investigations to locate sites prior to private development. In certain circumstances preservation restrictions can be applied towards archaeological sites. A preservation restriction sets out certain conditions limiting or prohibiting development on an archaeological site and is recorded on the deed so that future owners of the site would be required to abide by the conditions. Preservation restrictions are an effective strategy to protect sites from private development if the sites are closely monitored. But preservation restrictions require consent of the property owner and often consultation, if not approval, from the state historic preservation office and the state archaeologist. As such, they are only used in a limited set of circumstances when private development is known well in advance, and there is ample time to draw up the restriction.

For the vast remainder of archaeological sites located in areas where private development is imminent, if not ongoing, there is even less opportunity for protection. Salvage archaeology of known sites or even undiscovered sites is always a possibility, at least in theory. In reality, however, private developers are rarely required to pay for this kind of archaeological investigation. Furthermore, when grants and funds to support this archaeological work are not immediately forthcoming, the result is usually the destruction of the resource. Such a scenario occurs time and time again in southern New England, thus creating a vicious circle of site destruction by private development.

ONE SOLUTION

The remainder of this article discusses one creative solution to break this vicious circle. Preliminary analysis and even more preliminary interpretations of information retrieved from one threatened site are also presented; at this early stage in the research the interpretations are more like impressions.

The Public Archaeology Laboratory, Inc. in Rhode Island has recently initiated a public educational program in archaeology consisting of a series of field schools and workshops in archaeology at the Lambert Farm site (RI-269), an endangered Woodland period site in Warwick, Rhode Island (Fig. 1). Through direct participation of the public in excavation, laboratory work and partial funding, and with supervision of professional archaeologists, significant information was retrieved from a site listed on the National Register of Historic Places which otherwise would have been destroyed by private development. The public field school program at the Lambert Farm site represented the sole practical way to save the site in light of the constraints created by private development.

Lambert Farm was first surveyed in 1980 by Morenon (n.d.), who also prepared the nomination for the site to the National Register of Historic Places (Morenon 1981). It was not until January, 1988 that the Rhode Island Historical Preservation Commission became aware of a proposed private residential project approximately 10 acres in area, which would result in the destruction of the Lambert Farm site. Since the site was not protected by any federal, state or city legislation, despite its National Register status, a series of negotiations was established among the developer (Commercial Realty, Inc.), the Rhode Island and Warwick preservation commissions and the Public Archaeology Laboratory, Inc. By May, 1988 the developer agreed to delay construction until October, 1990 within the area containing the site, specifically six proposed houselots. Construction of a portion of a proposed roadway and drainage easement, both of which are located within the site, also would be delayed for at least two months. The remainder of the area within the proposed project would be developed around the known boundaries of the Lambert Farm site during the operation of the field school. The October, 1990 date represented a maximum 2 1/2-year deadline for the entire site to be cleared for development.

Since June, 1988 nearly 150 people of various ages and backgrounds have excavated at Lambert Farm in both a full- and part-time capacity. Over 450 50x50 cm (20x20 inch) shovel test pits placed within a 2.5m (8.2 ft) interval staggered grid and 80 excavation units, mostly 1x1m (3.3x3.3 ft) have been completed so far within an area of less than two acres. In addition to public

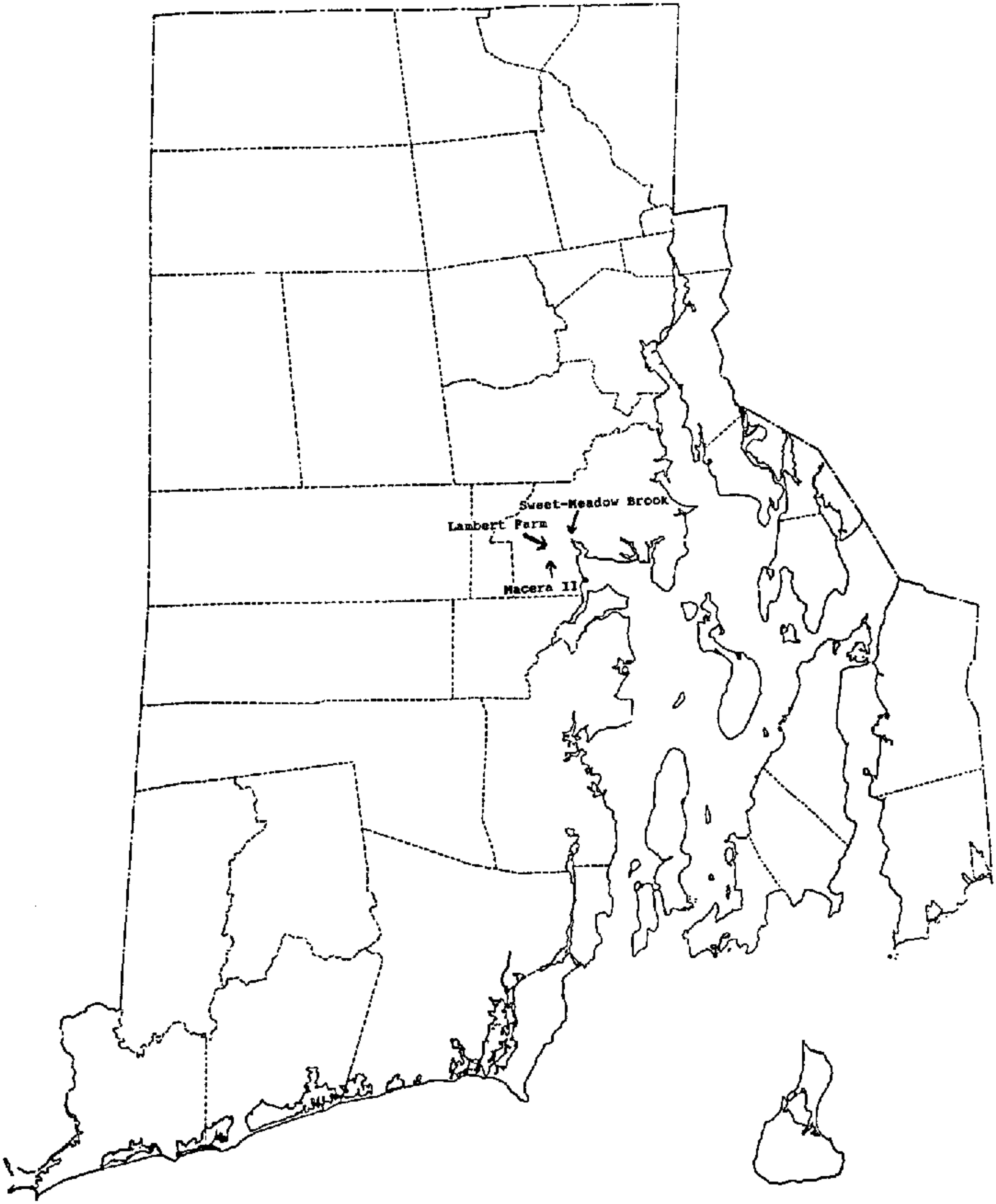

Fig. 1. *Rhode Island state map showing location of the Lambert Farm site, Macera II site, and Sweet-Meadow Brook sites.*

field school sessions, weekend workshops have been held at the site in which junior and senior high school students, among other people, have participated. The site also has served as the focus for a field methods course in archaeology that the author taught at Brown University (Kerber and Larson 1988). Both college credit and in-service credit for Rhode Island teachers have been available by participating in the field school. Additional field school and workshop sessions are planned until October, 1990.

In sum, the goals of the ongoing field school are two-fold:

1. To conduct archaeological research at an important prehistoric site in order to recover information prior to its destruction; and
2. To increase public awareness of archaeology and prehistory by providing an opportunity for the public to participate in a continuing archaeological study.

Underlying the field school program is the conviction that good, responsible archaeology can be done by the public with proper professional supervision and commitment.

PRELIMINARY ANALYSIS AND INTERPRETATIONS

Analysis of the recovered information from Lambert Farm is incomplete since much of the material has not yet been processed in the laboratory due to time and funding constraints. Admittedly, the analysis and interpretations that follow are preliminary, if not in some cases speculative, given the current stage of research.

Based on diagnostic styles of projectile points and ceramics, it appears that the Lambert Farm site was occupied intermittently during the Transitional Archaic and Woodland periods (Kerber *et al.* 1989). The six uncorrected radiocarbon dates from the site support, in part, this interpretation: 1060 $\pm$60 B.P. or A.D. 890, (Beta 27939); 900 $\pm$70 B.P. or A.D. 1050 (Beta 27938): 870 $\pm$80 B.P. or A.D. 1080 (Beta 27937); 860 $\pm$90 B.P. or A.D. 1090 (Beta 28339); 720 $\pm$60 B.P. or A.D. 1230 (Beta 27936); and 610 $\pm$70 B.P. or A.D. 1340 (Beta 28499). All currently radiocarbon-dated samples consisted of quahog (*M. mercenaria*) shell in features.

It is striking that dense shellfish remains in excess of 2000 pounds (907kg) abound at the site, given its location about one mile (.62km) west of the current shoreline of Narragansett Bay. The distance to the coast was even greater, though not significantly, at the time the site was occupied due to previously lower sea levels. At first glance it may seem unusual that large quantities of shell were transported to the site. Presumably, it would have been easier to have camped along the shore and consumed the shellfish there as long as access to the shore was available. Several shell middens have been identified along Narragansett Bay in the vicinity of Lambert Farm (Bernstein 1987; Kerber 1984; Morenon n.d.; Versaggi 1981).

Why transport more than 2000 pounds (907kg) of shell over a mile (.62km) to this one location? In order to address this question it would be important to know whether Lambert Farm was unique in this regard or whether other sites also containing large amounts of shell exist near Lambert Farm. Unfortunately, the area around Lambert Farm has been heavily impacted by development, both private and public, and thus few sites are known to have survived. There is one site close by, however, that is similar with respect to the recovery of dense shellfish remains. The Macera II site (RI-194), situated just over 1/2 mile (.31km) south of Lambert Farm but about the same distance west of the coast, dates to the Late Archaic and Woodland periods (Morenon n.d.; Versaggi 1981) (Fig. 1).

Limited investigation and analysis at both sites precludes further comparison.

It also would be important to know whether or not the densities of shellfish remains at Lambert Farm varied over time. Based on the limited sample of radiocarbon-dated shellfish remains previously delineated, it appears that shellfish were intensively gathered and transported to Lambert Farm beginning about 1000 B.P. until at least 600 B.P. (A.D. 950 - A.D. 1300). Between 3000 and 1000 B.P. (1050 B.C. and A.D. 950), shellfish may have played a lesser role in the diet of the inhabitants at the site for reasons currently unknown but perhaps related to the effect of horticulture on mobility. For instance, one hypothesis that needs to be further developed and tested is that after 1000 B.P. (A.D. 950) horticulture was being practiced at Lambert Farm, and mobility shifted from large-scale movement to restricted forays. Since horticulture requires a considerable investment of time from spring through fall to cultivate, plant and harvest, movement of an entire camp or base camp may have been difficult, if not precluded. Limited movement of small task groups to adjacent resource areas, such as the coast for gathering shellfish and interior wooded locations for hunting deer, and then back to the site still would have enabled a successful harvest.

Put simply, prior to 1000 B.P. before horticulture is assumed to have been introduced in southern New England, camps moved to where resources were available. After 1000 B.P. when horticulture was practiced, resources were brought back to camp. Seasonality studies and additional radiocarbon dating of shellfish from Lambert Farm are being planned and will help test this hypothesis and develop a model of subsistence and settlement. No evidence of horticulture (e.g., vegetal remains or tools) has yet been recovered *in situ* or identified from the site, although none of the flotation samples has been analyzed yet.

One other striking occurrence at Lambert Farm consists of a dense circular feature, approximately 65cm (25.6 inches) thick and 1m (3.3 ft) in diameter, which contained several species of shellfish, such as quahog, softshell clam (*M. arenaria*), oyster (*C. virginica*), scallop (*A. irradians*), knobbed whelk (*B. canaliculatum*), razor clam (*E. directus*) and mussel (*G. demissus*). Some of these species were whole and stratified within the feature, especially the scallop shells, which were situated toward the bottom of the feature (Kerber *et al.* 1989). The feature was constructed as a mound and also contained numerous burned rocks, ceramics, local and exotic lithics, such as Pennsylvania jasper and New York chert, deer and bird bone, and a steatite platform pipe. Situated both below a portion of (within Excavation Unit 3) and within a different part of the feature (within Excavation Unit 8) were the articulated, yet fragmentary, skeletal remains of two canids, tentatively identified as domesticated dog (*C. familiaris*). Because of the fragmentary condition of the skeletal remains, only the general orientation is depicted for the two dogs in Fig. 2.

Preliminary analysis indicates that both dogs were immature, approximately five to six months old, based upon the sequence of tooth eruption (Miller *et al.* 1964: 652-653; Kerber *et al* 1989). Both cause of death and sex were not able to be determined for either dog. Associated with the skeletal remains buried beneath a portion of the shell mound within EU 3 were two shells, a complete knobbed whelk and a single valve of a softshell clam (Fig. 2). None of the skeletal elements has been subjected to radiocarbon dating due to the destructive effect of this dating technique, but a sample of quahog shell from the lowest level of the shell mound, directly above the skeletal remains within EU 3, received an uncorrected radiocarbon date of 870 $\pm$80 B.P. (A.D. 1080) (Beta 27937).

One possible interpretation is that the two dogs, most likely puppies, were sacrificed and deliberately buried below and within a dense mound of shell and other cultural debris. It appears that a portion of the mound was constructed following the burial of one dog (within EU 3), while another portion was

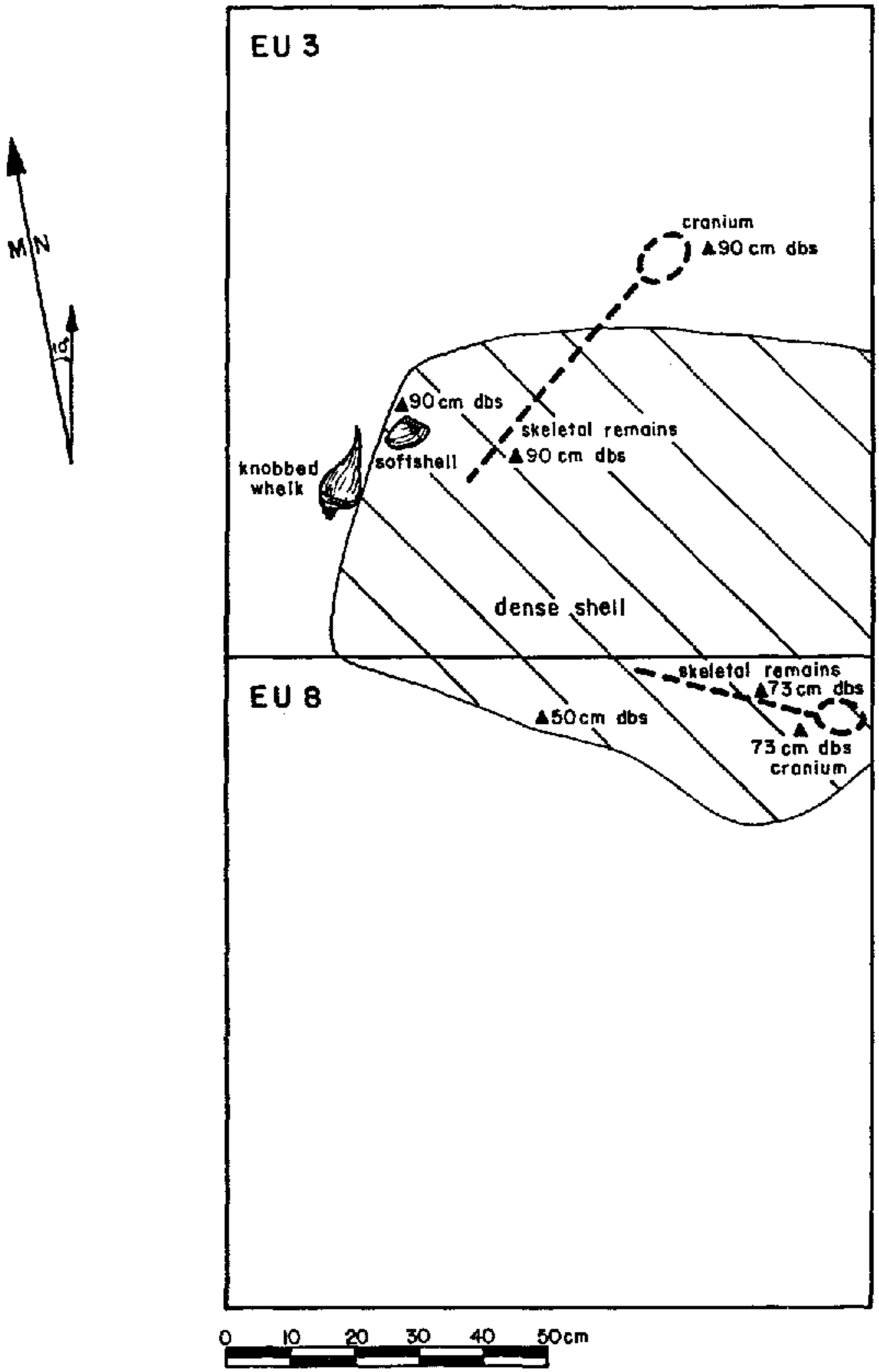

Fig. 2. *Orientation of the two dog burials and other cultural remains within Excavation Units 3 and 8 (from Kerber et al. 1989).*

constructed before the interment of the second dog (within EU 8). The association of the dense shell mound, platform pipe, and dog burials may represent rare evidence of ceremonial and/or religious activity from the area. Additional analysis and interpretation of the shell mound and dog burials at Lambert Farm, which are beyond the scope of this article, are presented by Kerber *et al.* (1989).

One coastal site, located approximately two miles (1.24km) northeast of Lambert Farm, provides insight into the two dog burials. The Sweet-Meadow Brook site (RI-191), excavated in part by the Narragansett Archaeological Society between 1954 and 1955, yielded seven burial features in which the remains of eight people and two dogs were retrieved both within and below dense shellfish remains (Fowler 1956) (Fig. 1). The remains of one dog were discovered as a single interment within a burial feature, while the remains of the other dog were found within a separate burial feature that also contained two human adults and an infant. Associated with the remains of one individual in the multiple interment feature was a fragment of a pipe bowl made of steatite. Two other platform pipes, one of steatite and the other of chlorite, also were found at Sweet-Meadow Brook, but detailed information on the provenience of these two artifacts is lacking. The only radiocarbon date reported from the site yielded a date of 800 $\pm$80 (A.D. 1150) (Lamont 270) (Fowler 1956:8). The radiocarbon sample upon which this date was based consisted of oyster associated with one of the human burials. This date may be contemporaneous with that of the lower level of the shell mound (within EU 3) at Lambert Farm. Unlike Sweet-Meadow Brook, however, no human burials have been identified at Lambert Farm.

Shortly after this article was prepared, a third dog burial was discovered at Lambert Farm in a similar context as the other two burials. This burial also was encountered within a dense mound of shell, approximately 65cm (25.6 inches) thick, containing a variety of shellfish species. Although detailed information is not yet available, it is known that the dog is a male adult and its lower back appears to have been broken and its body folded, perhaps to facilitate its placement in a small pit. The discovery of three dog burials at Lambert Farm and five or six dog burials from Grannis Island in New Haven, Connecticut on the east shore of the Quinnipiac River (David Thompson, Greater New Haven Archaeological Society, personal communication 1989) represent the only two prehistoric sites in southern New England known to the author that contain three or more dog burials.

CONCLUSIONS

The public field school in archaeology at the Lambert Farm site provides a successful model for the recovery and preservation of information from a Woodland period site threatened by private development but not protected by historic preservation legislation. Such a model may apply to other, but certainly not all, sites in southern New England endangered by private development. The solution hinges on both the cooperation among state and city officials, developers, archaeologists, and granting agencies and the direct involvement of the public in funding and performing archaeological research. In this case a significant resource is being studied and protected, while at the same time public awareness of archaeology and the problems of site destruction are heightened in a manner that can contribute towards the protection of other threatened sites. Public archaeology at Lambert Farm has recently begun and promises to be an exciting program in both research and education.

ACKNOWLEDGMENTS

This article is based on a version of a paper delivered by the author at the 29th Annual Meeting of the Northeastern Anthropological Association in Montreal on March 16, 1989. Funding for the archaeological research at Lambert Farm has been provided in part from: American Association for State and Local History; Rhode Island Heritage Commission; National Endowment for the Humanities; IBM; the June Rockwell Levy Foundation; The Public Archaeology Laboratory, Inc.; Rhode Island Historical Preservation Commission; Salomon Fund; Brown University; and the field school participants. Preliminary faunal analysis of the remains of the two immature dogs was performed by Dr. Ruth Greenspan, of The Public Archaeology Laboratory, Inc. Imogene Lim prepared Figure 2. The author also is grateful for the public support from more than 100 people, too numerous to mention individually here, who have participated in the field school and workshop program at Lambert Farm and without whom this research would not have been possible. Any errors or shortcomings of this article are the sole responsibility of the author.

REFERENCES CITED

Bernstein, David J.
1987 Prehistoric Subsistence at Greenwich Cove, Rhode Island. Unpublished Ph.D. Dissertation, Department of Anthropology, State University of New York at Binghamton.

Fowler, William S.
1956 Sweet-Meadow Brook: A Pottery Site in Rhode Island. *Bulletin of the Massachusetts Archaeological Society* 18(1):1-23.

Kerber, Jordan E.
1984 Prehistoric Human Occupation and Changing Environment of Potowomut Neck, Warwick, Rhode Island: An Interdisciplinary Approach. Unpublished Ph.D. dissertation, Department of Anthropology, Brown University.

Kerber, Jordan E. and Mary Ann Larson (editors)
1988 Archaeological Testing at the Lambert Farm Site, Warwick, R. I.: Brown University Field Methods Project. Department of Anthropology, Brown University.

Kerber, Jordan E., Alan D. Leveillee, and Ruth L. Greenspan
1989 An Unusual Dog Burial Feature at the Lambert Farm Site, Warwick, Rhode Island: Preliminary Observations. *Archaeology of Eastern North America* 17:165-174.

Miller, M.E., G.C. Christensen, and H.E. Evans
1964 *Anatomy of the Dog*. W.B. Saunders Company, Philadelphia.

Morenon, E. Pierre
n.d. Archaeological Resources in an Urban Setting: The Warwick, Rhode Island Case Study, Volume 2: Technical Data. Papers in Archaeology, Public Archaeology Program, Rhode Island College, Number 5. Prepared for the Rhode Island Historical Preservation Commission.
1981 RI 269: Lambert Farm Site. National Register of Historic Places Inventory Nomination Form. On file at the Rhode Island Historical Preservation Commission.

Versaggi, Nina M.
1981 An Investigation of Prehistoric Site Structure and Organization in the East Greenwich Quadrangle, Rhode Island. Department of Anthropology, State University of New York at Binghamton. Prepared for the Rhode Island Historical Preservation Commission.

ARCHAEOLOGY: A TOOL FOR THE RECOVERY OF DATA FOR LOCAL HISTORY

LORETTA J. RIVERS
UNIVERSITY OF CONNECTICUT

ABSTRACT

Versions of this paper were presented at the Annual Meetings of the Council for Northeast Historic Archaeology, held in October 1988 in Quebec City, Quebec, Canada, and at the session "Archaeology and the Public I: Education and Perception" at the First Joint Archaeological Congress, held January 1989 in Baltimore, Maryland. Cassette tapes of the Congress sessions on archaeological education are available for purchase. For further information about the Congress sessions and future sessions on archaeological education, contact: Martha Williams, Education Chairman, Society for Historical Archaeology, 7129 Oakland Avenue, Falls Church, VA 22042.

INTRODUCTION

Over the past five years, archaeology is a topic that has received increasing attention in museum exhibits and programs, and in pre-college classrooms. Some states such as Texas are in the process of developing curricula on archaeology for use with elementary and high school students. Others, including Arizona and Louisiana, already have such literature available, as well as participatory workshops for both young and adult audiences.

This article is intended as a means of sharing ideas and experiences on teaching archaeology at two different kinds of small museums. It is also an attempt to encourage other museums and historical agencies to devote time and financial resources to promoting archaeological education. Non-site-specific museum exhibits, loan materials, and programs for grade four through adult audiences are discussed. They were developed and implemented while I was curator of education at Jefferson County Historical Society in Watertown, New York, and at the Lutz Children's Museum in Manchester, Connecticut. All were based on outreach sessions and teaching aids I created and used from 1976 to 1979 as a docent at the Lutz Children's Museum. They address major issues of archaeology and preservation in Eastern North America, teach archaeological research and interpretive skills, yet do not require the excavation of a site. The educational programs and materials are presented as they were used at each institution, so it is clear how and why they came about, and the ways that they were suited to the needs of both museums. They were made possible by funding from the New York State Council for the Arts and from the Connecticut Humanities Council, state-based fiscal agents of the National Endowment for the Humanities.

In the late 1970s when programs and materials were first organized and used, and when they were revised and expanded in the mid-1980s, many resource allocators were not supportive of workshops which prepared classroom instructors to teach archaeology. Also at that time, there was a shift to funding programs which educated the general public, rather than those which were directed at school groups and educators. In addition, the few archaeology education programs which did exist focused on the excavation of intact archaeological sites, and the field work was often directed by individuals who lacked proper training. Thus, the funding agents' concerns were founded on real problems. They wanted to prevent the destruction of archaeological sites and to minimized adverse reaction from professional archaeologists. To satisfy grant reviewers, the archaeological community, teachers, and institutional goals, programs were created which initially were conducted by museum staff that had an academic background in archaeology. However, the staff-led sessions also prepared teachers to include the subject in their curriculum by using museum loan materials which did not require staff assistance or the excavation of a site. Today many archaeologists and preservation agencies play an active role in training instructors to teach archaeology and in educating the public.

There are several reasons to educate the public and teachers about archaeology. The most important of these are to change existing misconceptions, to make the public aware of the importance of preserving archaeological resources, and to increase financial and social support for archaeological research and site preservation.

Until recently, many professional archaeologists were reluctant to educate the public out of fear it might increase site destruction, but avoiding the issue has proven equally damaging. For example, teachers and museum staff lacking archaeological training and without professional supervision have "dug up" sites as a hands-on experience to supplement a local history unit. After having destroyed most of a site, they have requested the assistance of professional archaeologists to help them identify the recovered artifacts. Others have taken classes surface collecting across plowed fields in search of prehistoric and historic remains. Also, in recent years archaeology has become a more common word among the public. Increased construction activities requiring cultural impact reports and site surveys to locate and record sites are making archaeology more visible in many communities. Effective management of archaeological resources above and below the ground relies on public support.

The public must be taught that archaeological sites are a non-renewable resource that is part of their cultural heritage, that excavation is a destructive research technique, and that even the most careful excavation at least partially destroys a site. Preservation and a hands-off approach should be emphasized for those who lack training or professional guidance. This can be achieved, in part, by teaching audiences to do archaeological research above the ground which will not damage sites. In addition, literature should be provided on the individuals to contact regarding sites that are threatened by vandalism, construction, or other activities, and about archaeological projects and related information. However, for any educational effort to be successful there must be cooperation in the community or region between archaeologists, local museums and historical agencies, libraries, and school administrators and teachers. Cooperation promotes the sharing of financial resources, staff, collections, and ideas, as well as facilitating the standardization of the issues and facts to be publicized. The message travels quickly when people are learning something interesting and having fun. Therefore, it is important for the public to know that archaeologists and educators are working together and have established guidelines and procedures for doing and teaching archaeology. If such cooperation and policies do not exist, or are not made known, educating the public could result in further site destruction.

How do you develop educational resources? What issues should be covered? How do you convince audiences that what you have to say about archaeology is *significant to them*? First, check the resources available at museums or related agencies. Review the public and private school curricula in the community and/or state, and take local issues such as a construction project into consideration. Then, do a survey of the literature and teaching aids that exist to determine what has been done and the different ways to approach the topic. Materials produced by other individuals and organizations can supplement your programs just by making them available to audiences and educators. Within the last few years, several museums, preservation agencies, and archaeologists have produced a variety of resources. They include in-house exhibits, traveling exhibits, materials for classroom use, audiovisuals, and books for children.

Traditionally, archaeology has been taught by involving students in the excavation of either an intact site or simulated site. Another common technique, called shoebox archaeology, is a simulated site in a small box. All three tend to promote the belief that archaeology primarily involves the recovery, recording, and cataloging of artifacts and their related data found in the soil. It also requires the explanation of stratigraphy and chronology which can be difficult concepts to teach and hard for many audiences, particularly young ones, to understand. There are other important factors to consider. First, not all audiences want to experience field work. For many it is sufficient to learn how and why archaeologists do research without participating in or watching an excavation. Learning about the subject through other media provides them with basic information and satisfies their curiosity. Second, in many areas of the country due to climate conditions, it is not possible during the school year to visit an excavation done by professional archaeologists. In many instances, unless there are staff or volunteers to talk to the public, frequent visitation interrupts and slows down fieldwork. Further, the excavation of a site, be it *in situ* or simulated, is not necessarily the most effective way to teach the subject. Some facilities, such as Old Salem, Inc. in North Carolina, Colonial Williamsburg, and the Baltimore Center for Urban Archaeology in Maryland, have found it successful to educate the public and teachers by involving them in an excavation. Those institutions have at least one full-time archaeologist, researcher, and educator (Anderson, Comer, and Stevens 1988; Hammond 1989; Samford 1989). Others, including the staff at the Historic St. Augustine Preservation Board in Florida, found that using a simulated site to teach archaeology to children has problems. At their site, many elementary and junior high students became bored and lacked the patience and persistence necessary to carry out the extensive note-taking, mapping, cataloging, and other time-consuming, repetitious tasks required by the excavation of a site (Chance 1989).

Instead, the excavation of a site or field trip to an excavation should be follow-up activities to other materials which stress that field work is a small part of archaeological research. The emphasis should be on teaching the archaeological skill of research, observation, description, analysis, and explanation through the use of artifacts, documents, and other materials which do not require field work or a small simulated site. Unlike excavation, this method gives participants knowledge and skills which they can do on their own. As examples of this alternative approach, I am presenting exhibits, educational loan materials, and programs I developed and implemented while curator of education at both the Jefferson County Historical Society and at the Lutz Children's Museum.

JEFFERSON COUNTY HISTORICAL SOCIETY

The Jefferson County Historical Society is located in Watertown, New York. Jefferson County is primarily a rural area situated in the northern part of the state along the St. Lawrence River. The Historical Society was organized in 1886 and in 1972 received accreditation from the American Association of Museums. In the early 1970s, museum outreach programs were initiated and delivered to school children on a regular basis. In 1978, the content of its educational services began shifting to local history, and by 1979 the transition was complete. That is important, because in 1980 the New York State social studies curriculum was rewritten making it mandatory to teach local history at the fourth grade level. The change in the curriculum increased the demand for programs presented by museum staff. During that year, the Historical Society staff worked with personnel at the Board of Cooperative Education Services, teachers, and librarians, to assist them in locating and using primary sources and artifacts to create local history units.

When I arrived in 1983, there was a well-established cooperative network among the public school system, libraries, and the Historical Society, and other historical agencies in the region. The Society's active outreach programs, loan materials, exhibits, tours, workshops, and other programs had fostered a long-standing rapport with communities throughout the county. Assistance from the media, primarily newspapers, produced much coverage about the museum and its educational services. Thus, the institution had a following audience that was ready and waiting for new information.

Archaeology programs at the Historical Society came about for a number of reasons. Its popular outreach program for elementary students, "Native Americans in Jefferson County", and a loan case and in-house exhibit on that subject, had attracted many visitors. They motivated audiences to pose questions about the origin of the artifacts, what archaeology is, how artifacts are recovered, and what they reveal about the past. The issue that rushed the development of educational programs and resources on archaeology was the expansion of Fort Drum, a military base in the county. Its growth would increase the population and require the building of housing facilities, commercial structures, and improved transportation systems throughout the county. Proposed construction using private, state, and federal funds would require cultural impact statements to determine the nature and extent of potential archaeological sites. Archaeology was a topic that received little notice in 1983, but by 1984 it would gain increasing coverage. Before it became a high profile subject, it was the responsibility of the Historical Society to educate the public (Rivers 1985).

Through the winter and spring of 1984, pilot sessions were offered at the museum for grades four through eight. These trial programs and others allowed staff to try different teaching strategies and information. The goal was to combine education materials on archaeology which I had created and used while a docent, with what was called "above-ground archaeology" by John Cotter and Thomas Schlereth. Above-ground archaeology includes some of the research and work done by archaeologists before, during, and after excavation. It involves the study of maps, photographs, illustrations, mail order catalogs, and other documents. The examination and interpretation of artifacts, architecture, and the cultural landscape are other aspects. Schlereth suggested using such sources to teach the archaeological skills of observation, description, and explanation (Schlereth 1981; Cotter 1976).

Knowledge gained from these pilot sessions, and from lessons given in the classroom during the fall of 1983, provided the museum staff with information on how to design archaeology programs and resources for a wide audience. In 1984, the Historical Society submitted a grant proposal to the New York State Council for the Arts requesting funds for the development of museum in-house and outreach programs entitled "Archaeology: A Tool for Recovery of Data for Local History." They would focus on the recovery and interpretation of prehistoric, historic, and industrial data from the county. These materials were to provide grade four through adult audiences with a better understanding of the interrelationship of cultural, technological, and environmental changes and how those changes are reflected in material culture. It would be done through interpretive programs, exhibits, slide lectures, walking tours, and loan materials for the classroom and community groups. Such educational resources would broaden the use of the museum's collections and make use of the mid- to late-nineteenth century mill structures and related transportation facilities visible in the landscape. All programs and materials would emphasize data recovery techniques, interpretation, preservation and conservation, and would explain why a site must never be excavated except under the supervision of a professional archaeologist. Above-ground archaeology, primarily researching and interpreting material culture, and studying and explaining the cultural landscape, would be a major part of the exhibits and programs (Jefferson County Historical Society 1984).

Funding was awarded and three consultants were hired: Earl Sidler, Michael Gimigliano, and Thomas Schlereth. Earl Sidler had done extensive archaeological research on prehistoric sites in Jefferson County. The industrial archaeologist and cultural geographer, Michael Gimigliano, had worked on local historic sites. The third consultant, Thomas Schlereth, is a material cultural historian who advocates the use of living history museums and reading the cultural landscape to understand current and past relationships between people and objects. The consultants reviewed the preliminary plans for the program and resources, provided suggestions, and each presented a lecture at the museum for members and the adult public. The archaeologists supplied information on industrial development and on Native American material culture and settlement patterns in the county. They also furnished reference materials to aid in cultural resource management and to assist professional archaeologists. The material cultural geographer gave different approaches to examining and interpreting the cultural landscape.

After the consultations, an interpretive session was designed and tested with several fourth grade classes. It integrated teacher materials, student activities, and artifacts for the proposed loan case, walking tour, and exhibits. Slides, graphics, artifacts, and information were presented a variety of ways to determine what sequence and teaching methods were most effective. At the end of the session, teachers and students offered comments and all classes were asked to complete an evaluation form. Several educational programs and materials resulted.

A one-hour interpretive session and accompanying exhibit case were designed for grades four through eight. They focused on archaeological research, excavation, and above-ground techniques. These concepts were presented through slides, graphics, small excavation tools, and recording equipment. Prehistoric and historic artifacts, both fragmentary and intact, were also used. Audiences were taught that archaeology enhances our knowledge and understanding of local history. Different kinds of archaeology done in the county were discussed, as was the impact that the expansion of Fort Drum would have on archaeological remains. The first part of the session covered the purpose of archaeological research, its scientific nature and methods, and preservation. To prevent future damage to sites by enthusiastic audiences, it was emphasized before, during, and after the presentation, that a site must never be disturbed or excavated without the direction of a professional archaeologist. Further, specific site locations were not given. What followed was an explanation of why certain materials do not survive in the soil, how archaeologists identify objects, and what artifacts tell about the people that made and used them. The remainder of the program taught participants how they could become above-ground archaeologists. Audiences were instructed and encouraged to discover information at museums and libraries, and to view the cultural landscape in their community as an above-ground site that contains many artifacts which reflect on-going and past activities. Thus, in a sense, their surroundings become a living history museum.

Pre- and post-visit teacher materials accompanied the interpretive program. They included a brief introduction to archaeology which prepared instructors and students for the session. This allowed them to play an active role during the staff-led program, because participants had some prior knowledge of the subject, had time to think about it, and to formulate questions. The literature covered the different kinds of archaeological sites in the county, and the four main phases of archaeology: discovery, recovery, conservation, and analysis. It stressed that sites are protected by state and national laws which do not permit museum staff to provide site locations. Audiences were instructed to contact either the Historical Society of State Division of Anthropological Services if they have information on county sites threatened by construction or other activities. Follow-up teaching strategies and a list of books and museum resources were provided for doing above-ground archaeology.

A related loan case, "Meaning in Artifacts," was designed for grade four through adult audiences. It was intended to supplement the interpretive session and to be used with the loan materials, "Architecture in Jefferson County". These resources were intended to help borrowers develop a unit on above-ground archaeology in their community. It included some visual aids and teacher materials identical to those in the interpretive program and focused on the same issues. Archival materials from the museum's collection were reproduced as slides to show some of the different kinds of sources that archaeologists and historians use to learn about the past. Included are excerpts from mail order catalogs, magazines and directories, photographs, postcards, maps, letters, and other documents.

The two following activities were included in the loan case and as follow-up lessons for the interpretive session; versions of them appear at the end of this article (Appendix 1). They can be adapted for use with grade four through adult audiences by changing the teaching approach and level of detail. Both teach research, observation, description, analytical, and interpretive skills. They instruct audiences to approach data with questions, to think about it, and to try to explain the information. The activity. "Artifact Identification and Intepretation", was adapted from E. McClung Fleming and Fred Schroder (Fleming 1974; Schroder 1976). Nineteenth- and twentieth-century intact objects, such as sad iron, fluting iron, and electric iron, are used. Participants must identify an artifact, place it in its cultural context and study how its appearance and function change over time. This requires the close examination of an individual artifact, of assemblages of related artifacts, and the consideration of social dynamics, such as use, associated with an object. Research techniques are taught through the use of printed and photographic sources. The other activity, "Reading the Cultural Landscape in Your Community", was adapted from one described by Thomas Schlereth (Schlereth 1981). Modern and historical photographs and maps are utilized to teach map reading skills and to explain how and why a community changes over time. A few aspects studied are the location of natural and cultural features, the placement and structure of a community in relation to topography, and the relationship of transportation routes, different kinds of buildings, parks, and other features to one another. It enabled the public to create an indoor program and/or walking tour of the cultural landscape in their town.

The issues, information, and types of artifacts presented in the interpretive session and loan case were to be repeated in two in-house exhibits. They would explain how archaeological data broadens our understanding of local history. One exhibit would stress preservation and explain the goals and scientific methods of archaeological research and excavation. The other would present above-ground archaeological techniques and sources.

After the programs and resources were introduced, the interpretive session continued to be presented over the next three years to many elementary students, primarily those in grade four, and to some community groups. To complement that program, a unit on classical archaeology, mainly in Greece and Italy, was created by the next curator of education. I supplemented the sixth grade curriculum. In 1987, to assist the Historical Society in educating the public, Louis Berger and Associates placed an exhibit in the museum. It focused on their archaeological research at Fort Drum and adjacent towns. Through 1989 and 1990, the interpretive session will be transformed into a loan case so that borrowers can teach archaeology without museum staff. The idea of studying the cultural landscape eventually became accepted and applied in many towns. The museum has received funds to reproduce graphics that demonstrate physical changes in the cultural landscape of several county communities. Those materials will be used in the exhibit, "The Built Environment", and will be available as loan materials to school and community groups.

LUTZ CHILDREN'S MUSEUM

The Lutz Children's Museum is located in Manchester, Connecticut, a few miles east of the state capital. It originated in 1953 and over the past 30 years has grown in size and in the variety of educational services it offers. The museum has mainly participatory exhibits, a live animal exhibit area, and a nature center. In addition, it provides schools, libraries, and community organizations with educational loan materials and resource lessons led by museum staff and volunteers. For children in preschool through junior high, it offers in-house tours, and after-school, weekend, and summer classes at the museum, as well as parent-child programs and field trips.

Programs and resources on archaeology at the Lutz originated in 1976 in response to requests from elementary school teachers of gifted students. To meet this need, I worked with some Manchester teachers and librarians to develop a resource lesson and loan kit that focused on Native Americans in the Manchester area, and on archaeology. In 1978, with assistance from Dr. Douglas Jordan, the former Connecticut State Archaeologist, a loan kit entitled "Connecticut Indians" was developed for grades three through eight. Due to its popularity, a duplicate kit was produced last year. They include slides, a script, and literature about archaeology, brief information on Connecticut Native Americans, suggestions for further reading, and prehistoric artifacts mounted with explanatory labels and graphics.

Over a decade later, the loan kits continue to be used regularly and teachers requested more resources on archaeology. In 1987, most presentations and materials on archaeology were done in conjunction with the traveling exhibit, "What is Archaeology?." It focuses on classical archaeology and was prepared by the New Haven Society of the Archaeological Institute of America, with support from the Connecticut Humanities Council. The Council provides circulating exhibits at no fee and mini-grants of up to five hundred dollars to borrowers. The financial assistance is available to help recipients with exhibit-related events and resources. At the Lutz, the funds were used to hire outside scholars to do three slide-lecture presentations. A lecture on Connecticut archaeology, mainly prehistory, was presented at the museum for high school students and adults. Staff from the American Indian Archaeological Institute in Washington, Connecticut, gave two parent-child workshops on the same topic for children in grades three through eight. The monetary award also made possible the loan kit, "Archaeology: Exploring the Past." It is for grades four through eight, but can be adapted for use with older children and adults. As at the Jefferson County Historical Society, slides, graphics, literature, and small excavation equipment and artifacts, both fragmentary and intact, were included in the outreach materials. However, at this museum, several other programs and loan materials focused on science and natural history. As a result, many audiences thought that archaeologists studied dinosaurs and fossils of ancient plants and animals. Thus, it was necessary to explain the difference between archaeology and paleontology, in addition to covering the different kinds of archaeological sites in the state, the scientific methods of archaeological research, excavation, and above-ground techniques.

A small in-house exhibit on local archaeology and above-ground research was placed near the traveling exhibit, along with a brief handout. The literature emphasized preservation, the different types of archaeological resources in Connecticut, and gave suggestions for further reading. The address of the Connecticut State Archaeologist, and that of the staff archaeologist at the Connecticut Historical Commission were also provided.

In addition to the exhibits and lectures, programs were offered at the museum for children in grades four through eight. They included sessions of one to two hours in length, which met once a week for four to six weeks, both after school and during the summer. The classes were designed so that each week participants could build on the skills they had learned in the previous class. Excavation methods, artifact study and interpretation, the examination of maps and archival materials, a walking tour of the main street, and a visit to nearby cemeteries were included in the programs.

At the schools, the resource lesson, "Archaeology as Community History", was presented to many fourth, fifth, and sixth grade classes. The one-hour to one-and-one-half hour outreach session was requested often and accepted quickly for two reasons: local history and "The Artifact Box". Since the late 1970s an increasing number of schools in Manchester and other towns have included local history in the curriculum. Many had used the loan kits on Native Americans and wanted materials that focused on historical archaeology. In conjunction with local history units some teachers were doing a project with their classes called "The Artifact Box." That project is done nationwide by students in programs for the gifted; however, several teachers had adapted the unit for use with other pupils. Classes create a box which contains artifacts, photographs, and printed sources that provide clues about their town and state. Boxes are then sent to a committee for random distribution to schools throughout the country. The recipients use the clues to determine where the box originated and to interpret life in that community. A few topics covered by the clues are: the natural and cultural features of a community, local industry, population, historic landmarks, typical home, flora and fauna, and a food or product characteristics of a region. Some teachers doing this unit asked for museum staff-led sessions and loan materials that would teach students how archaeologists construct and explain the past. They felt that such resources would help classes to create an artifact box and to interpret the one they would receive. Thus, "The Artifact Box" project provided a good way to introduce young audiences to some archaeological concepts, as well as to the analytical and explanatory techniques used by archaeologists. In addition, it allowed an opportunity to determine what teachers and students would find useful to have available as loan materials.

CONCLUSIONS

In summary, there is a need to educate the public and instructors about archaeology and many audiences are eager to learn about the subject. The educational programs, exhibits, and outreach materials on archaeology that were developed and implemented at the Lutz Children's Museum and at the Jefferson County Historical Society are examples of effective ways to reach and instruct a diverse audience. At both museums, the teaching methods and media were successful for several reasons. Their existing staff-led sessions and loan materials used artifacts, as well as written and pictorial documents, to acquaint audiences with examining and explaining objects and the past. Studying the cultural landscape was readily accepted at the Jefferson County Historical Society because of already popular loan materials and walking tours on local architecture. The resources on architecture, and the emphasis on artifact reading and interpreting in other educational programs and materials, provided a basis from which the public could be taught to view the built environment as artifacts and culture that had not yet become part of the archaeological record below the ground. In addition, at the two institutions, archaeology was presented in a manner that made it significant to audiences. For teachers and students, the materials supplemented the local history curriculum. For those individuals, and the general public, the resources were also relevant to current events. They explained why county and state residents might read about or see archaeology being done in their area prior to construction. Also, for most audiences it was a topic that had a mysterious quality; thus, the programs and related materials piqued their curiosity.

All those factors considered, it was the cooperation and sharing of resources and ideas among museums, historical agencies, archaeologists, libraries, and schools that made the educational efforts work. That cooperation made it possible to standardize the information and the policies and procedures for doing and teaching archaeology, and to make them known. Data recovery through excavation was explained, but preservation and a hands-off approach for those who lack training or professional guidance was emphasized. Above-ground archaeology, including research, analysis, interpretation, and the study of the cultural landscape, were given equal attention.

Thus, a few simple points were conveyed to all audiences. First, the public was told what archaeology is, how and why it was done, and why a site must never be excavated without the direction of a trained archaeologist. Second, audiences were told that the reason archaeologists study artifacts is to learn about people, by trying to understand changing relationships between people and things. Last, they were taught that it is difficult to construct the past even when there are many contemporaneous documents and intact objects available. Through these programs and resources, the public was made aware of and encouraged to preserve archaeological remains above and below the ground.

Some of the educational programs, loan materials, and exhibits at the Jefferson County Historical Society and those at the Lutz Children's Museum provided the basis for the initial planning of the traveling exhibit, "Preserving Connecticut's Archaeological Heritage," and its accompanying brochure.

ACKNOWLEDGMENTS

Special thanks to Margaret Shaeffer Dowd, former director of the Jefferson County Historical Society and to Steven Ling, director of the Lutz Children's Museum, for their editorial review and comments. Thanks also to Margaret Shaeffer Dowd, Douglas F. Jordan, and Thomas J. Schlereth for believing that archaeological education was worth their time and effort.

REFERENCES CITED

Anderson, Louise E., Elizabeth Anderson Comer, and Kristen Stevens Peters
1988 Educating the Public and B.C.U.A. Way. Paper presented at the 1988 Annual Meeting of the Society for Historical Archaeology, held at Reno, Nevada.

Chance, Marsha A.
1989 Using an Accurate Simulated Site to Teach Cultural and Preservation Concepts to Children. Paper presented at the First Joint Archaeological Congress, held at Baltimore, Maryland.

Cotter, John L.
1976 *Above-Ground Archaeology*. U.S. Government Printing Office. Washington, D.C.

Fleming, E. McClung
1974 Artifact Study: A Proposed Model. *Winterthur Portfolio* 9:153-161.
1982 Artifact Study: A Proposed Model. In *Material Culture Studies in America*, edited by Thomas J. Schlereth. American Association of State and Local History, Nashville.

Hammond, Michael
1989 Teaching Teachers about Archaeology and Material Culture. Paper presented at the First Joint Archaeological Congress, held at Baltimore, Maryland.

Jefferson County Historical Society
1984 Archaeology: A Tool for the Recovery of Data for Local History. Grant proposal submitted to the New York State Council for the Arts.

Rivers, Loretta J.
1985 The Jefferson County Historical Society: A Museum to School Exhibit Case Program. *Regional Conference of Historical Agencies Bulletin* 15:11.

Samford, Patricia
1989 Hey, What Are You Guys Doing? Paper presented at the First Joint Archaeological Congress, held at Baltimore, Maryland.

Schlereth, Thomas J.
1980 *Artifacts and the American Past.* American Association of State and Local History, Nashville.

Schroder, Fred
1976 Designing Your Exhibits: Seven Ways to Look at an Artifact. Technical Leaflet No. 91, *History News* 31(11).

APPENDIX 1

ACTIVITIES

These activities provide a starting point for instructing audiences to do archaeological research above the ground. They teach students to approach artifacts and data with questions, and to think about and explain the information. Both can be used with students in grade four and older audiences by changing the level of detail.

ARTIFACT IDENTIFICATION AND INTERPRETATION

This activity introduces audiences to the methods used by archaeologists and historians to analyze and extract information from artifacts, and from contemporaneous written and graphic sources. Participants must identify an artifact, place it its cultural context, and consider how its appearance and function change over time. This requires close examination of individual artifacts, assemblages of related artifacts, and the consideration of social dynamics, such as use, connected with an object. It was adapted from Fleming (1974) and Schroder (1976).

Materials:

a) Modern object familiar to students. Examples: electric iron and apple peeler.
b) Old object not familiar to students. Examples: san iron, fluting iron, apple peeler, and cherry stoner. Select an artifact that can be found in mail order catalogs and other sources, such as magazines.

Many museums and historical societies have loan materials for the classroom, which include originals or reproductions of artifacts similar to those given as examples.

Begin with a modern object and go through the following steps with students. Then have them identify an unfamiliar object using the same questions. After participants have examined a complete artifact have them study an artifact fragment. This will help them to understand how difficult it is for an archaeologist to learn about people from fragmentary evidence recovered through excavation.

Identify:

a) Material--stone, bone, wood, plastic, metal (tin, copper, cast iron, etc)
b) Shape and dimensions
c) Color
d) Surface treatment
e) Function--How is the object used? What is it used for?
f) Manufacture--How was it made? Any visible marks from manufacture?

Place the artifact in its historical and cultural context. This is the relationship of the artifact to its own time and culture.

a) Material--What materials were available?
b) Shape and dimensions--Are they similar to a modern object?

c) Color is the color common today and for this type of artifact? How do you feel about the color? How do you think people in the past felt about it?
d) Surface treatment--Is this type of marking used today? Why? Is it popular?
e) Function--Is the object used the same way today as it was fifty or one hundred years ago? Has its use changed over time? How? How do you feel about the way the artifact is used? How do you think people in the past felt about using the object?
f) Manufacture--How would the object be made today? Where? How do you feel about the way it was produced? How do you think people in the past felt about the way it was made?

Where can further information be found to place the artifact in its cultural and historical context?

a) Mail order catalogs. They are wonderful sources for the different models and prices of an artifact, and for artifact assemblages. An artifact assemblage is a group of artifacts that are used together (or found together at an archaeological site). For example, to do laundry in the nineteenth century you needed: A wash tub, scrub, board, clothes pins, clothes line, and iron.
b) City and county directories. These include information on the places different artifacts were manufactured and sold, different styles of an object, and sometime include prices.
c) Newspapers. Often they provide the same information as directories.
d) Photographs, postcards, magazines, advertising art, and trade or business cards. These provide information on how an object looked, was used, and marketed.
e) Maps may contain information on where an artifact was manufactured or sold.
f) Letters, diaries, journals, and similar sources often reveal how people felt about an artifact and their surroundings.

READING THE CULTURAL LANDSCAPE IN YOUR COMMUNITY

This activity was adapted from one described in *Artifacts and the American Past* by Thomas J. Schlereth. Modern and historic photographs and maps are used to teach map reading, research, and analytical skills, and to explain how and why a community changes over time. It is most successful when used in conjunction with a unit on local history or architecture. Teachers and students can design a classroom unit, and/or walking tour, on the changing cultural landscape in their town. Maps, photographs, and illustrations should be used to develop a slide presentation and bulletin board exhibit, which show how the different sections of a town or city changed over time. It will also provide the background for a walking tour.

Directories and land records can be used to provide additional research experience and information. Generally, historical societies, museums, libraries, and archives will allow maps and other documents to be reproduced in the form of slides and photographs for classroom use. Depending on the condition of the artifact, some may be duplicated on a copy machine.

Materials:

a) Current town and county map
b) Current U.S.G.S. topographic map of your community
c) Eighteenth-, nineteenth-, and twentieth-century town and county maps
d) Sanborn (fire insurance) maps
e) Past or current photographs, illustrations, postcards, or paintings of your town.

Identify:

a) Natural features--vegetation, waterways, terrain. These must always be considered because the origin and development of most towns was dependent upon and influenced by natural features. For example, eighteenth- and nineteenth-century mills and factories are located along rivers and streams.
b) Cultural features--houses, schools, churches, public buildings, mills, businesses, streets, parks, statues, and monuments, ethnic communities, farms.

Ask the following question:
a) Relation of a community to the natural terrain and vegetation. Example: Why is a town located along a river? Is it related to early transportation and trading? Is it related to manufacture (mills--waterpower)?
b) Street--What and where are the major routes? Have these changed over time? What about transportation changes over time? How have they affected the growth and shape of the town? What are the origin of street names (businesses, citizens, ethnic groups)?
c) Buildings--Where are the residences, businesses, public buildings? Why? Where are they in relation to each other? How has their location changed over time? Why?
d) Parks and recreational areas--Where are they and why? Who in the community would use a park? Who would have a public garden? Where would a community get money for a public park? Consider the different socio-economic levels of community residents and where they live.
e) Statues and markers--Where are they? What person or event does the artifact commemorate? Are they restricted to a certain time period or aspect of a community's history? Why?
f) Consider the changes in the economy (agriculture, small mills, factories, etc.) and their relationship to the above.

AN OUTLINE OF THE ABORIGINAL ARCHAEOLOGY OF SHELTER ISLAND, NEW YORK

JOHN CHARLES WITEK
NEW YORK STATE ARCHAEOLOGICAL ASSOCIATION

ABSTRACT

Although Shelter Island, New York, is the locus for hundreds of prehistoric sites, and is one of the last relatively undisturbed parts of Long Island offering splendid opportunities for studying coastal New York subsistence/settlement patterns, field work and published literature concerning the island have been limited. This overview attempts to expand the record by synthesizing prior commentary, by proposing a preliminary cultural sequence and chronology, and by providing data for future research which, we urge, should emphasize site reports and testable hypotheses concerning the archaeology of nearby coastal Connecticut with which Shelter Island is associated, geographically and culturally.

GEOGRAPHY AND NATURAL HISTORY

Located 19 kilometers (12 miles) south of the mouth of the Connecticut River, Shelter Island, New York (Figure 1) lies midway along a glacial archipelago of "Indian islands" stretching along the northern edge of the North Atlantic coastal plain province from Staten Island to Cape Cod. It is approximately 3200 hectares (7907 acres) in area, and is separated from Long Island Sound to the north and from the Atlantic Ocean to the south, by the north and south "forks" of Long Island. *Manhansack-aqua-quash-awamock*, "island sheltered by islands", was the Algonkian name for it used by resident Manhanset Indians in the seventeenth century (Duvall 1952:9).

A broad, shallow shelf surrounds most of Shelter Island, except in the northwest, where sandy bluffs rise 40 meters above sea level. Topography is morainal with kames, kettleholes, and erratic boulders that are the result of one or more advances of the late Wisconsonian glacier (Englebright 1982). The present shoreline of broad, irregular coves, shallow tidal marshes, and sandy beaches, was formed by post-glacial rises in sea level, and by the comparatively recent action of wind and waves. Much of the terrain available for human occupation during the post-Pleistocene is submerged (Lightfoot *et al* 1985:77).

Farming has been carried out on Shelter Island since the 1600s', although some portions of the island were never cultivated. Fortunately for archaeologists seeking to account for human activities since European contact that might have disturbed prehistoric sites, past land use patterns are well documented. Island soil is generally acetic to extremely acetic, and has a simple, well-developed profile. A thin upper stratum of decaying organic material and humus is underlain by glacial outwash sand and till continuing for a considerable depth (Broughton *et al* 1966:35).

Heavily forested once, the island still supports large stands of hickories and mast-producing oaks. The white oak (*Quercus alba*) grew profusely on Shelter Island in the 1650s, and was coveted both by Indians as a food source, and the European merchants seeking timber (Duvall 1952:10). The diametrically opposed

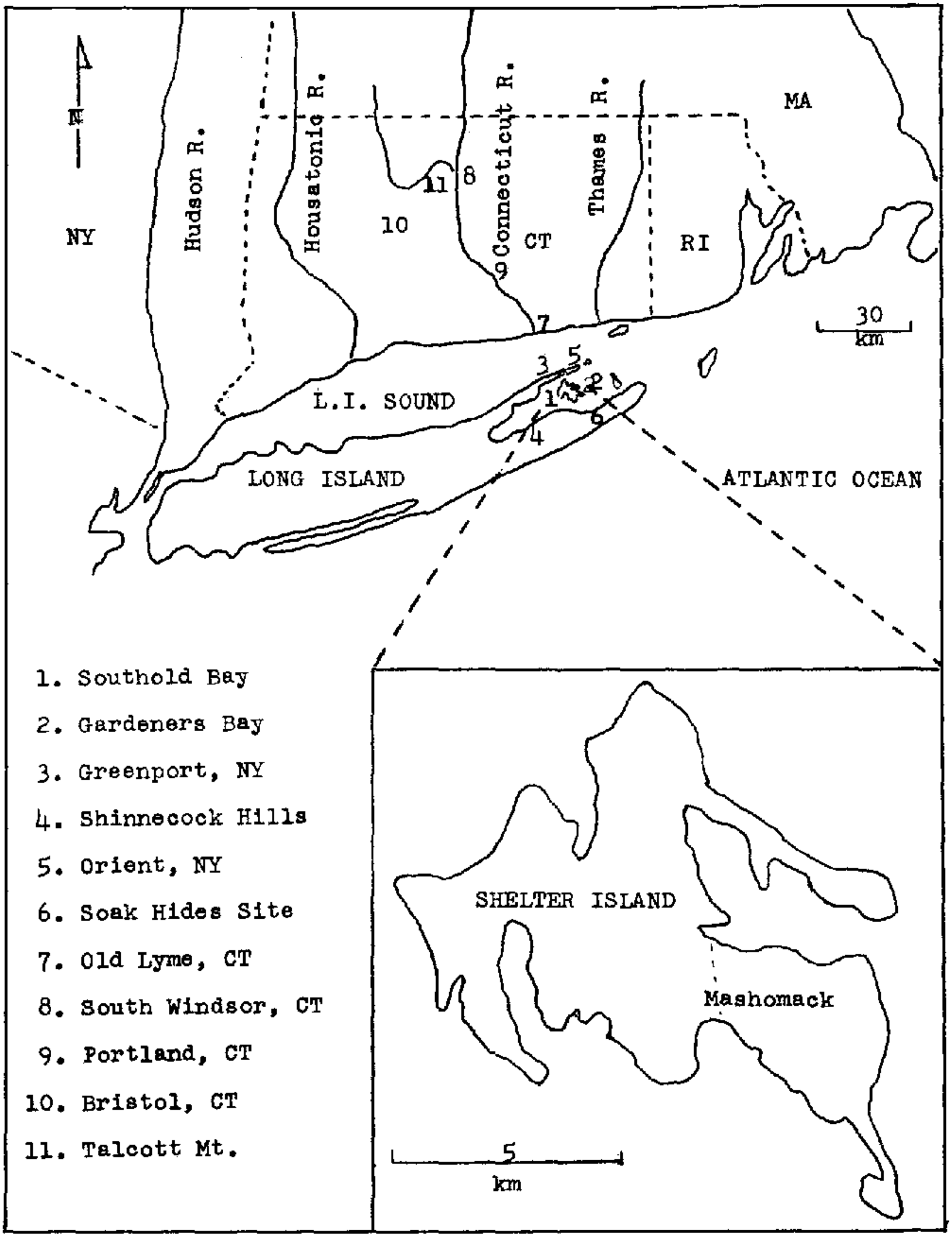

Figure 1. *Shelter Island, NY, and locations mentioned in the text.*

uses of this resource by whites and Indians presages the rapid dissolution and destruction of the latter's societies on Shelter Island and elsewhere throughout the northeast.

Until the onset, in 1985, of an algal bloom that decimated island shellfish populations, local waters yielded commercial quantities of bay scallop (*Aequipecten irradians*), oyster (*Crassostrea virginica*), hard clam (*Venus mercenaria*), soft clam (*Mya arenaria*), knobbed whelk (*Busycon carica*), and channeled whelk (*B. canaliculatum*), all of which have been recovered locally from Late Woodland period middens.

Edible wild plants and game are abundant. Of the 32 species of mammals, birds, reptile, crustaceans, and fish recovered by Roy Latham (1957) from a Late Woodland stratum at Shelter Island's Smith site, 25 are still resident or visit the island. White tailed deer (*Odocoileus virginianus borealis*) is extremely populous. These and other local mammals are plagued by the deer tick (*Ixodes dammini*), which transmits Lyme Disease that is endemic on Shelter Island. Archaeologists working here are warned to protect themselves from bites during the long tick season, which lasts from May through November.

ISLAND ARCHAEOLOGY

Despite the opportunities it affords for the study of a wide range of prehistoric sites in relatively undisturbed settings, Shelter Island received scant attention from professional archaeologists until 1983. At this time, work commenced here under the direction of Dr. Kent Lightfoot, SUNY at Stony Brook, as part of the university's regional survey program designed to supplement ongoing cultural resource management projects on Long Island. An intensive subsurface testing program was conducted to detect buried sites within Shelter Island's Mashomack Preserve -- an 825 hectare (2039 acre) tract administered by The Nature Conservancy, a non-profit environmental organization. Lightfoot discovered 18 prehistoric sites and concluded that the coastal settlement pattern for Shelter Island "is relatively complex, consisting of a few large shell middens and literally hundreds of small, special purpose camps" (Lightfoot 1985:59). Mashomack is also the subject of a preliminary archaeological survey commissioned by The Nature Conservancy, which notes site locations inside and outside of the preserve (Brush and Brush 1982).

Previously, the only significant research on Shelter Island was the excavation of the Smith site by the avocational archaeologist, Roy Latham, together with Charles F. Goddard and other members of the Incorporated Long Island Chapter, New York State Archaeological Association. As early as 1911, Indian burials had been encountered at the southeastern Shelter Island site which was to preoccupy Latham between 1938 and 1945 [not 1943 - 1953, as he perplexingly states in his 1957 site report (Latham 1957)]. Long trenches dug by the excavators through a large shell midden revealed the only stratified site yet reported for Shelter Island. It included Late Woodland, possibly earlier Woodland, and Terminal Archaic components, and yielded five burials, floral and faunal remains, as well as architectural features including hearths and house structures. Unfortunately, most of the site has been obliterated by road grading and house construction, and Latham's (n.d.) field notes are cursory and incomplete.

A report by the writer concerning a cache of Susquehanna tradition blades (Witek 1989) comprises the rest of the published literature devoted to Shelter Island prehistory. A slender collection of documents -- town records, deeds, memoirs, court records, prose fiction, and local histories -- provides some ethnohistoric data about Indian life on the island from the seventeenth through the nineteenth centuries.

Hundreds of artifacts from the Smith site, together with his manuscripts and field notes were donated by Roy Latham to the Southold Indian Museum maintained by the Incorporated Long Island Chapter, New York State Archaeological Association. Other Shelter Island artifacts may be found at the Museum of the American Indian, Heye Foundation. Others, including those excavated by Lightfoot at Mashomack, are stored at Queens College.

Artifacts collected locally by island residents and exhibited at the Manhanset Museum, administered by the Shelter Island Historical Society, were particularly useful in preparing this overview. These include diagnostic and non-diagnostic artifacts of chipped, ground, and polished stone -- projectile points, celts, mortars, pestles, axes, adzes, bifacially chipped blades, knives, balls, scrapers, drills, problematic objects, Sebonac and Niantic pottery. A small sampling of 403 projectile points with a Shelter Island provenience was examined by the writer and classified by type according to Ritchie (1971). Findings are summarized in Table 1.

Table 1. Projectile Point Distribution By Type

Type	Number	Percent
Vosburg	3	.7
Brewerton Side-Notched	5	1.2
Brewerton Corner-Notched	1	.2
Brewerton Eared-Triangle	3	1.7
Normanskill	4	.9
Wading River	135	33.4
Bare Island	7	1.7
Orient Fishtail	8	1.9
Snook Kill	5	1.2
Adena	2	.4
Otter Creek	1	.2
Steubenville Stemmed	2	.4
Jack's Reef Pentagonal	3	.7
Jack's Reef Corner-Notched	1	.2
Rossville	8	1.9
Levanna	162	40.1
Madison	8	1.9
Untyped	45	11.0
TOTAL	403	

ASSOCIATIONS WITH SOUTHERN CONNECTICUT

Speaking at a Metropolitan Chapter meeting of the New York State Archaeological Association (May 14, 1987), Carlyle Smith drew an analogy between the Mediterranean Sea and Long Island Sound as conduits for ancient peoples and cultures, observing that the movements of prehistoric groups to and from Long Island occurred longitudinally across the sound, more often than overland from west to east. It would seem to follow, therefore, that to clarify Shelter Island's complex prehistory it must be examined within a perspective provided by adjacent southern Connecticut.

As late as 15,000 BP, Long Island and Connecticut were contiguous; separation due to glacial melting and rising sea levels occurred by 9000 BP (Lavin 1984:9). During this period, human occupation of the Lower Connecticut River Valley appears to have been intensive (McBride 1984a:56).

The Connecticut River meets Long Island Sound 19 kilometers (12 miles) due north of Shelter Island. Allowing for swift currents in the Sound that run east and west, voyages from Connecticut to Shelter Island wouldn't have been extraordinary for Archaic and Transitional period riverine and maritime-oriented hunter gatherers and later inhabitants. Such travel would assist in explaining parallels that exist between Shelter Island and southern Connecticut's prehistory regarding subsistence/settlement patterns, resource exploitation, and systems involving trade or tribute.

Wading River (narrow or small stemmed) points, much associated with the Late Archaic period, but shown to extend temporally into the Contact period (Lavin 1984:31), are abundant at sites along the Connecticut coast adjacent to Shelter Island (Bourne 1972:37; Pagoulatos 1983:56), and are a common point type occurring here. However, until parallel radiocarbon dates are obtained from Late Archaic sites in Connecticut and on Shelter Island, we can only presume that such points are coeval.

There is firmer evidence for visits to Shelter Island by Connecticut residents during the Terminal Archaic (Transitional) period. Twenty basalt Susquehanna tradition preforms excavated by the writer (Witek 1989) resemble closely preforms discovered in South Windsor, Connecticut (Vibert 1970) and elsewhere in New England (Hadlock 1948). John Pfeiffer, who excavated a major Susquehanna cremation burial site in Old Lyme, Connecticut (Pfeiffer 1980) has stated that the Shelter Island blades resemble specimens found by him there (personal communication 1987). Basalt occurs on Shelter Island only as glacial pebbles and cobbles, and not as frost-broken sheets from outcroppings, from which it would appear the 20 preforms were manufactured. Such outcroppings may be found at Connecticut's Talcott Mountain escarpment (Feder 1984b:53). Basalt also occurs along the Connecticut River at Rocky Hill and in the New Haven area (Lavin, personal communication 1987). Thin section studies could help to determine whether or not the Shelter Island specimens were quarried there. Other exogenic minerals -- graphite and amphibole talc -- indicate links between Shelter Island and New England.

Describing a cache of graphite found at East Quogue on the south fork of Long Island, Latham (1956) writes: "Judging by the material common in New England recorded in the Long Island sites, canoe traffic had been carried on for hundreds of years before the arrival of the settlers...The course by canoe would have been from Connecticut across Long Island Sound to Orient Point, west through Gardeners Bay, passing either north or south of Shelter Island.

If canoes skirted Shelter Island, they doubtlessly stopped there as well. Latham (1957) recovered 27 pieces of rubbed graphite from the Smith Site. We recovered a single, small, striated specimen from a possible Early Woodland site mentioned later.

Amphibole talc (steatite) is another non-local mineral Latham excavated at the Smith site, where he recovered seven sherds representing "two small vessels with notched rims" (Latham 1957:7). As to this material's source, Ritchie's comments about similar stone vessels near Orient, New York (1959:64) probably apply here as well:"...I am inclined to look northward across Long Island Sound to one or more of the numerous known aboriginal quarries of Rhode Island, Connecticut, or western Massachusetts."

Ritchie (1965:173) identified Providence, Rhode Island and Portland and Bristol, Connecticut as quarry and workshop sites of the steatite industry closest to Long Island, and concluded it was probable that in Orient times, "contact and trade relations existed across Long Island Sound. Parties of workmen from Long Island may have visited the New England quarries for soapstone vessels, or such vessels in the finished state may have been imported into New York from the New England Indians."

Precisely how trade figures into the aboriginal life of Shelter Island is conjectural. Sufficient data hasn't accumulated that would show whether or not the island's archaeology reflects the "vigorous trading network operant in southern New England before European exploration of the area (Feder 1984a:58). Shelter Island projectile points and other chipped stone tools are crafted primarily from locally available white quartz. We have only one made of the chert used by Indians along the Connecticut coast, whose sites yield many artifacts and much debitage of this material (Feder 1984b:51-65).

For most of human prehistory, there may have been no resident Shelter Island population with whom one could trade; the place may have been *terra nullius*, a land belonging to no one. Visits by Indians from Connecticut were made probably only for limited special purposes. Local quartz pebbles would have been preferred for tool making because they did not have to be transported -- a conclusion which makes finding basalt preforms here even more enigmatic.

Without a burgeoning, sedentary population to deplete natural resources, Shelter Island might have been considered an inviting place to obtain food when conditions on the mainland made this expedient. Although it has been argued that Late Archaic subsistence/settlement patterns "based on the seasonal availability of a wide range of hunted and gathered resources prevents overexploitation of a single resource (Salwen 1975:55; Lavin 1984:28), it is reasonable to assume that central based wanderers from the Connecticut River Valley experienced occasional resource depletions due to ecological events, which might have resulted in brief foraging expeditions to Shelter Island.

By the Late Woodland period, a resident aboriginal population with a few large seasonal camps or semi-permanent villages seems to have established itself locally. During this time, relations between Shelter Island's Indians and those from Connecticut's mainland would have been influenced by political and kinship alliances, and by the territorialism of cultures whose world views were shaped, in part, by the dynamics of a sedentism not operant in pre-agricultural times. Most Shelter Island Late Woodland pottery thus far identified corresponds to the Sebonac phase of the Windsor tradition (Latham 1957:7), which is found elsewhere on Long Island and coastal Connecticut (Ritchie 1965:265; Wiegand 1987:34). More recent Niantic sherds, also found throughout the lower Connecticut River Valley (Lavin 1984:25), occur here as well.

During the opening decades of the Contact period, Shelter Island's Manhansets had to deal with aggression by Pequot and Narraganset Indians from southern New England -- a reason, among others, for which they participated in defensive alliances with neighboring tribes, in particular the Montauks, Shinnecocks, and Corchaugs.

PRELIMINARY CULTURAL SEQUENCE AND CHRONOLOGY

The sequence that follows is based on information obtained through our excavations and surficial inspections, a review of the literature, and examination of artifacts with a known Shelter Island provenience. Dates correspond to those presented by Lavin (1984:5-40) in her synthesis of recent studies of Connecticut prehistory. (For published radio-carbon dates see Lightfoot *et al* 1987).

PALEO-INDIAN PERIOD (10,000 - 7000 BC)

No evidence for this period has been found, although the loci for three fluted points have been reported not far distant: approximately two kilometers (1.2 miles) north, at Greenport; 13.5 kilometers (8.4 miles) southwest within Southampton township (Ritchie 1957:86); and roughly the same distance southeast at the Soaks Hides site (Saxon 1973:4).

EARLY AND MIDDLE ARCHAIC PERIODS (7000 - 4000 BC)

Bifurcated projectile points and Neville and Stark points diagnostic for Connecticut's Neville horizon are negative traits for Shelter Island thus far. If there were Early and Middle Archaic sites here, it is likely that most would have been inundated by rising sea levels.

According to Bloom (1967:8) "the Connecticut coast has submerged about 9.7 feet (3 m) in the last 3600 calendar years, about 27.5 feet (8.4 m) in the past 8000 years." A drop in sea level of just 7 m "would have greatly altered the configuration of Shelter Island, creating a land mass nearly twice as large as it is today...There is a very good chance that coastal sites predating the Woodland period are now submerged under a meter or more of water (Lightfoot 1985:77). Cores of "muck" recovered several hundred feet east of Cedar Beach Point on the Great Hog Neck peninsula, show that much of the submerged area west of Shelter Island was once marshland (Walter Smith, personal communication 1987).

LATE ARCHAIC PERIOD (4000 - 2000 BC)

Less than a dozen local points pertaining to the Laurentian tradition have been seen by the writer. Evidence for the Sylvan Lake and Squibnocket complexes are presently lacking. Lamokoid points are common locally. Lightfoot's (1985: 75-77) survey at Mashomack revealed one Late Archaic lithic workshop, and a small lithic workshop we are currently excavating may prove to be Late Archaic.

TERMINAL ARCHAIC (TRANSITIONAL) PERIOD (2000 - 1000 BC)

During the Terminal Archaic period, Shelter Island experienced what may be described as ripples generated by the "explosion" of activity on the mainland by peoples using broad blades and fishtail points. Although Terminal Archaic period projectile points are uncommon locally, steatite vessels excavated by Latham, and Susquehanna tradition preforms discovered by us suggest that Indians from this period visited Shelter Island briefly.

Our finding Wading River and Orient Fishtail points with Susquehanna tradition broad blades at the same Shelter Island sites (Witek 1989), may reflect the contemporaneity of various Terminal Archaic complexes that McBride posits for southern Connecticut (1984b). Mortuary contexts, so important during this period and represented dramatically nearby at Orient, New York and Old Lyme, Connecticut, have not been discovered here.

EARLY AND MIDDLE WOODLAND PERIODS (1000 BC - AD 1000)

As recent research for Connecticut suggests (Lavin 1984:17), much continuity exists between the Early Woodland way of life and aboriginal life during the preceding Late Archaic period. Evidence for discrete Early and Middle Woodland complexes is very sparse for Shelter Island, which parallels the situation in southern Connecticut, where much more activity is noted for prior and subsequent periods. Rossville projectile points we have excavated might have originated in Early Woodland times, but the continuity of this type from the Late Archaic to the Middle Woodland period would make such a conclusion tentative.

LATE WOODLAND PERIOD (AD 1000 – 1500)

Diagnostic traits from Late Woodland occupations are abundant on Shelter Island. Triangular quartz Levanna points are commonly found at what appear to be fairly large seasonal camps. Madison points occur, but less frequently. A degree of sedentism not apparent in earlier occupations is evidenced by the presence of many domestic artifacts including mortars, pestles, milling stones, and manos.

Much pottery has been reported by informants, as well as the location of a prehistoric clay quarry, now obliterated. We recovered Sebonac body sherds at a large Late Woodland site; included was one large grit-tempered specimen made of compact, well-consolidated paste one cm thick, with scallop shell channeled interior, and a slightly cord-marked smoothed over exterior with parallel horizontal incised decoration. Sebonac pottery is also reported for the Smith site (Latham 1957:7). Other sherds from the Smith site with incised curvilinear decorations are probably Mantinecock Point incised ware of the Windsor aspect (Lopez 1958:235).

Shelter Island's Late Woodland occupations seem to mirror the florescence of aboriginal activity during this period reported for Connecticut (Feder 1984a: 104). However, we have not encountered much evidence, such as the presence of exotic cherts that would reflect the burgeoning of trade networks occurring on the mainland.

FINAL WOODLAND PERIOD (AD 1500 – 1638)

To date, ceramic analysis has been the entire basis for establishing the presence of Final Woodland components on Shelter Island. Latham (1957:7) reports that Niantic "styles" of pottery were associated with Sebonac ware at the Smith site. The case is similar for Connecticut, where Niantic occupations have been reported from Windsor to the mouth of the Connecticut River (Lavin 1984:24).

HISTORIC PERIOD (AD 1638 – 1835)

The first half of the seventeenth century witnessed the collapse of traditional Woodland communities throughout the northeast. Information concerning the size of historic Indian populations at this time is limited. Dunhill (1982:9) believes that "a few to 100 families" lived on Shelter Island "in semi-permanent villages that were moved in relation to seasonally available resources (Lightfoot *et al* 1985:65).

In 1638, James Farrett, the first European to arrive on Shelter Island. found it occupied by Algonkian-speaking Manhanset Indians, who were then allied with the other 12 Long Island tribes in the Montauk Confederacy. Previously, the Manhansets and their neighbors had been subjugated by the Pequots and forced to pay them tribute.

"The destruction of the Pequots in 1637 threw fear into all the tribes of the Sound. With the return of peace, English colonization of their land began in earnest, and the whites found most Indians anxious to sell them parts of their countries to have friendly Englishmen living close to them, providing them with manufactured trade goods, and sheltering them with their power against their enemies (Josephy 1972:73).

In 1652, an agreement made by Farret with the Manhansets, in which he claimed to have purchased their rights to Shelter Island, was contested successfully by the Indians before the Commissioners of the United Colonies of New England at Hartford, Connecticut. At this time Shelter Island's first white settler, the Barbados sugar merchant Nathaniel Sylvester, was obliged to purchase the island again from the Manhansets.

Although the deed for this purchase notes that the sachem, Yokee, "with all his indians that were formerly to said island of Ahaquatawamock did freely and willingly depart the aforesaid island" (Duvall 1952:13), it is certain that a number of Indians remained, and were joined later by others.

The journal of Quaker John Taylor, records that when he visited Shelter Island in 1659 "a great many Indians lived on it..." (Wortis 1978:16). Elsewhere it is mentioned that in 1675, Sylvester permitted Ambusco, a sachem from Southold, Long Island, and his family, "to dwell on what is now named for him Sachem's Neck" (Loper n.d.:2).

Early colonial documents shed little light on the anthropology of Shelter Island's aborigines. The few notes concerning Indians are sketches mainly of the suspicions and dissatisfactions of their new neighbors. These include a decree of 1672 granting Nathaniel Sylvester constabulary power over the island's Indians, of which some, on prior occasions, had become drunk and disorderly; a court decision of 1675 holding that guns confiscated from the Indians not be returned, because they had formerly "paid Contribution to those of Narragansett"; and a complaint lodged that same year against four Shelter Island Indians who had agreed to go whaling for whites, and failed to keep their bargain (n.a.:1883).

The Indians ultimate dissolution is manifest in the unpublished journal of Lodowick Havens (1774 - 1858), who recorded that half of the Indian "huts" on Shelter Island were destroyed by fire in 1790. Of the Indians, Havens recalled that

> ...most all I can remember then lived on Sachem's Neck in wigwams. One old Indian by the name of Stephen, lived beside Henry Haven's swamp. There is one large burying ground on Sachem's neck in what is called the Thicket. Some of their names I recall very well. Peter, an Indian, with both feet frozen off; Mol Daniel, who drowned her child in the mill pond; Sam Gonnav, Geoffrey, Keziah, his wife and two children, old Tack and his wife, Sabina with six children, Joe Portagee, Old Sip, Sarah and Betty toby, Old Bet Stephen, Governor Will and his wife Cuffie Cuff and Sarah his wife, two children and old Stephen.

Havens also notes that he saw: "...in a grove of shrub oaks...the last Indian burying ground. I saw twenty braves buried there and at the time there were only about 30 remaining" (Havens n.d.). The last of the "Manhansets" living on Sachem's neck, Betty Tobs Caesar, died a Christian about 1835 (Loper n.d.:3).

SITES AND SURFACE FINDS

While preparing this report we encountered 47 sites and surficial hot spots through published literature, discussions with local informants, and direct observation. These range in size from an individual activity area about two meters (six feet) in circumference, to a large seasonal camp or residential base. The preponderance of sites are coastal and estuarine, and appear to be Late Woodland. Only four of the sites we visited included large shell middens.

Site characteristics are summarized in Table 2. The precise locations of sites in this paper not previously noted in the literature are on file with the Suffolk County Archaeological Association. Three sites discovered by the writer were studied with some intensity in the field between 1986 and 1988. Brief mention is made of them below.

Table 2. Shelter Island Site Information (see Lightfoot 1985 for sites 1-18).

NO.	SITE CODE	TYPE	PERIOD	LOCATION	REMARKS
1	C-1-18	camp	Woodland	estuary	L, FC
2	C-4-24	quarry	?	estuary	L
3	C-5S-32	lithic scatter	?	estuary	L
4	C-5N-6	lithic scatter	?	estuary	L, FC, Ch
5	C-5N-10	shell midden	Woodland	estuary	C, Sh, Ch
6	C-5N-12	shell midden	Woodland	estuary	L, C, Sh, Ch
7	C-5A-3	quarry	?	estuary	L, Sh
8	C-5A-5	shell midden	?	estuary	L, Sh
9	D-2-2	lithic workshop	?	estuary	L, FC
10	D-3-21	lithic workshop	?	estuary	L
11	D-3-30	lithic workshop	Woodland	estuary	L
12	D-3-33	shell midden	Woodland	estuary	L, Sh
13	D-5-20	shell midden	Woodland	estuary	L, Sh, Ch
14	D-7-23	lithic workshop	L. Archaic	estuary	L
15	E-3-2	lithic/ceramic scatter	?	estuary	L, Sh
16	F-4-4	lithic scatter	?	coastal swamp	L, Sh
17	F-7-4	lithic scatter	?	coastal swamp	L
18	F-7-12	lithic scatter	?	coastal swamp	L
19	SI-1-1	seasonal camp or village	Woodland/ Terminal Archaic	coastal	L, C, Ch, Sh, FC, CL, RL, PL AB, P, B, H
20	SI-2-1	food processing station	Terminal Archaic	estuary	L, Ch, FC, CL, RL, PL, H
21	SI-3-1	lithic workshop	Early Woodland?	estuary	Sh, Ch, L, CL, H, RL
22	SI-4-1	seasonal camp or village	Late Woodland	interior	L, C, Ch, Sh, FC, CL, PL, P, B, H
23	SI-A-0	?	?	estuary	CL
24	SI-B-0	?	?	interior	CL
25	SI-C-0	?	?	coastal	P, FC
26	SI-D-0	?	?	coastal	P, FC
27	SI-E-0	camp?	Woodland?	interior	C, Sh, CL, L
28	SI-F-0	camp?	Woodland?	interior	C, Sh, CL, L
29	SI-G-0	?	?	estuary	B
30	SI-H-0	?	?	coastal	P
31	SI-I-0	?	Woodland?	coastal	Sh, C, CL, P
32	SI-J-0	?	?	coastal	P
33	SI-K-0	?	?	interior	Ch, L
34	SI-L-0	surface finds	?	estuary	CL
35	SI-M-0	surface finds	?	estuary	P, Sh, CL
36	SI-N-0	surface finds	?	interior	CL, PL
37	SI-O-0	surface finds	?	coastal	CL
38	SI-P-0	surface finds	Woodland?	coastal	CL, L
39	SI-Q-0	?	?	estuary	FC
40	SI-R-0	?	?	estuary	Sh, P, B
41	SI-S-0	small camp	?	interior	H, L
42	SI-T-0	?	?	estuary	Sh
43	SI-U-0	?	?	estuary	Sh
44	SI-V-0	?	Woodland?	coastal	Sh, C, B
45	SI-W-0	?	?	coastal	Sh
46	SI-X-0	?	Woodland?	coastal	Sh, C
47	SI-Y-0	?	Woodland?	coastal	Sh, C

Symbols: L = lithics, C = ceramics, Ch = Charcoal, Sh = Shell, FC = fire-cracked rock, CL = chipped stone, RL = rough stone artifacts, PL = pecked, ground & polished stone, AB = antler/bone, P = pit, B = burial, H = hearth

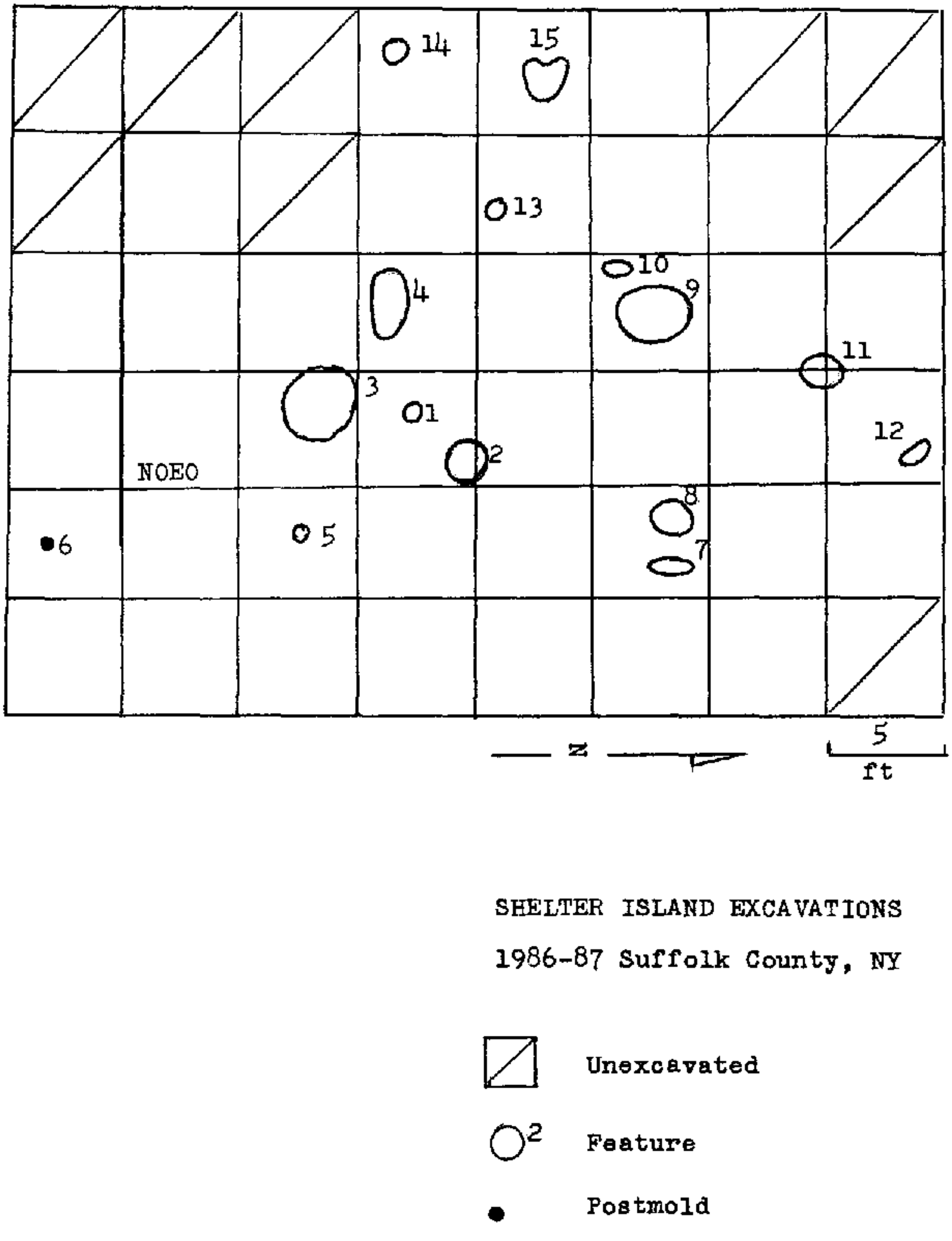

Figure 2. *Site SI-2-1.*

SI-2-1: TERMINAL ARCHAIC FOOD PROCESSING STATION

This buried non-stratified site on a low-lying tongue of land bordering a tidal lagoon is predominantly a lithic scatter with portions submerged in adjacent wetlands. Three hundred and five square meters (975 square feet) of extremely acetic humus and sandy clay (about 20% of the site) were excavated, revealing the 15 features shown in Figure 2.

Features include platform hearths, collections of boiling stones, stockpiles of worked and unworked pebbles, rock clusters, 20 Susquehanna tradition preforms cached together (Figure 3), and a post mold.

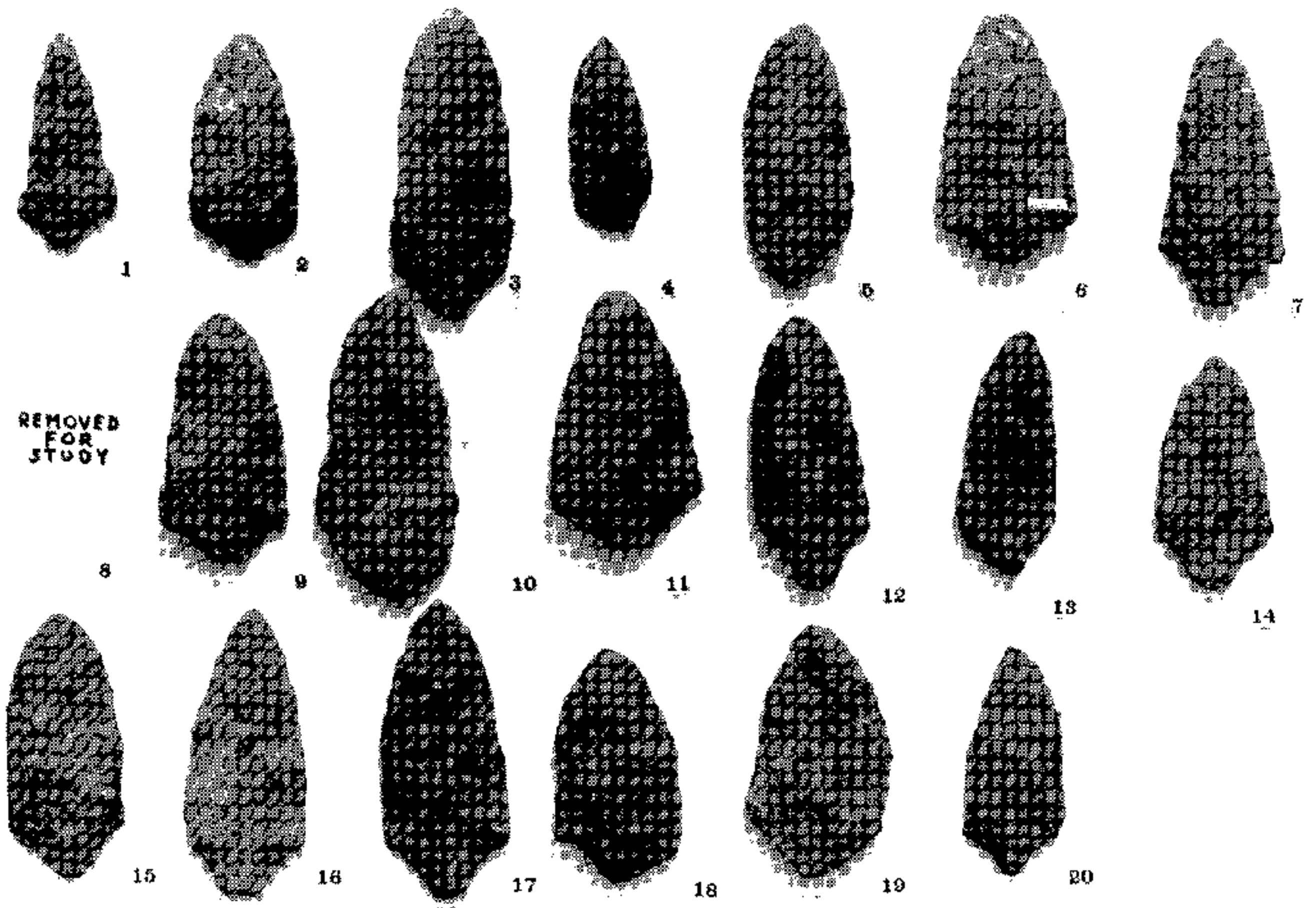

Figure 3. *Susquehanna Tradition Cache Blades from Shelter Island.*
Material: 1-20, basalt.

The rather equidistant location of the blade cache (Fea. 1) between a mass of boiling stones (Fea. 2), a stone platform (Fea. 3), and a rock cluster (Fea. 4), indicates that the location was oriented intentionally to these features. That all the features were made by a small group of people over a short period of time is suggested by their relatively even horizontal distribution, with no feature impinging upon another, and by their consistent vertical arrangement.

Recovered traits reflect hunting and butchering during the Terminal Archaic period. The projectile point inventory includes 14 Wading River points, 3 Orient

Fishtail points (2 of these are shortened variants) one each of Bare Island and Rossville varieties, and four problematic points (Figure 4). Crude, percussion flaked ovate quartz knives and quartz bifaces are common. The absence of domestic artifacts suggests further that the site was a field camp used for hunting and food processing.

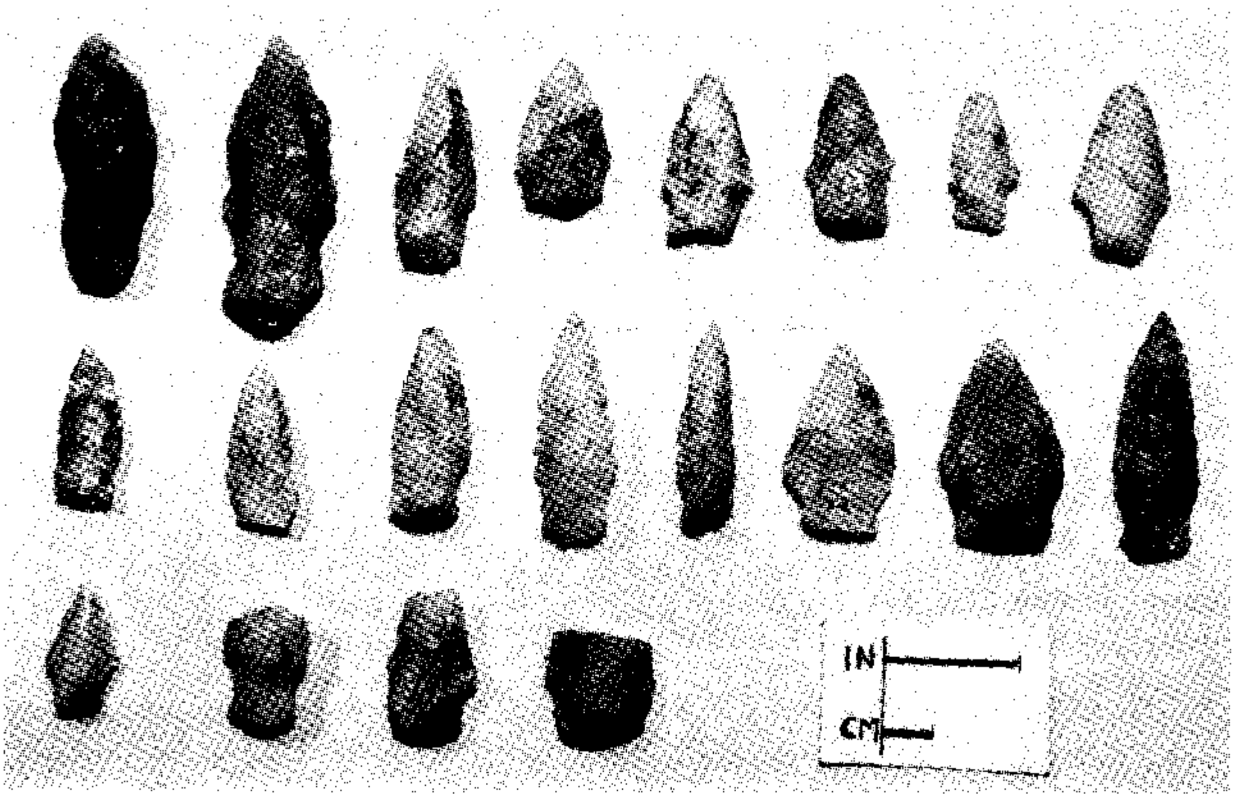

Figure 4. *Projectile Points, Site SI-2-1.*
Top row: 1,2 point blanks; 3-8 narrow stemmed points. Middle row: 1-4 narrow-stemmed points; 5 Bare Island point; 6-7 Orient Fishtail variants; 8 Orient Fishtail point. Bottom row: 1 narrow-stemmed "bird point"; 2-4 narrow-stemmed point bases.
Material: all, quartz except; middle row, 6, quartzite.

SITE SI-3-1 EARLY WOODLAND(?) FLAKING STATION

A second discrete site was located 122 m (400 feet) west of SI-2-1, which proved to be a small, buried, non-stratified quartz pebble flaking station no greater than 23 m sq (248 ft sq) in area. Six 1.5 m squares were excavated by stratigraphic levels (Figure 5). Virtually all artifacts from the site came from a "C" Zone stratum of ashy gray sand, 18 to 23 cm (7 - 9 inches) thick. This productive stratum yielded thousands of white quartz decortication flakes, practically all of which were secondary products of pressure flaking.

A battered quartz cobble anvil was recovered together with associated arcuate quartz blades and blade fragments (Figure 6). A single, rhomboidal quartz projectile point (Figure 6:1) is limited evidence suggesting that the site is Early Woodland, although we recognize that this point type appears initially during the Late Archaic, and persists into the North Beach and Clearview ceramic foci (Ritchie 1971:46).

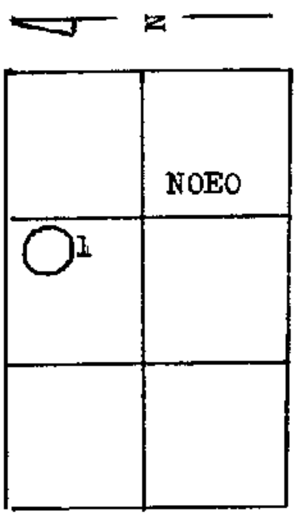

Figure 5. *Site SI-3-1.*

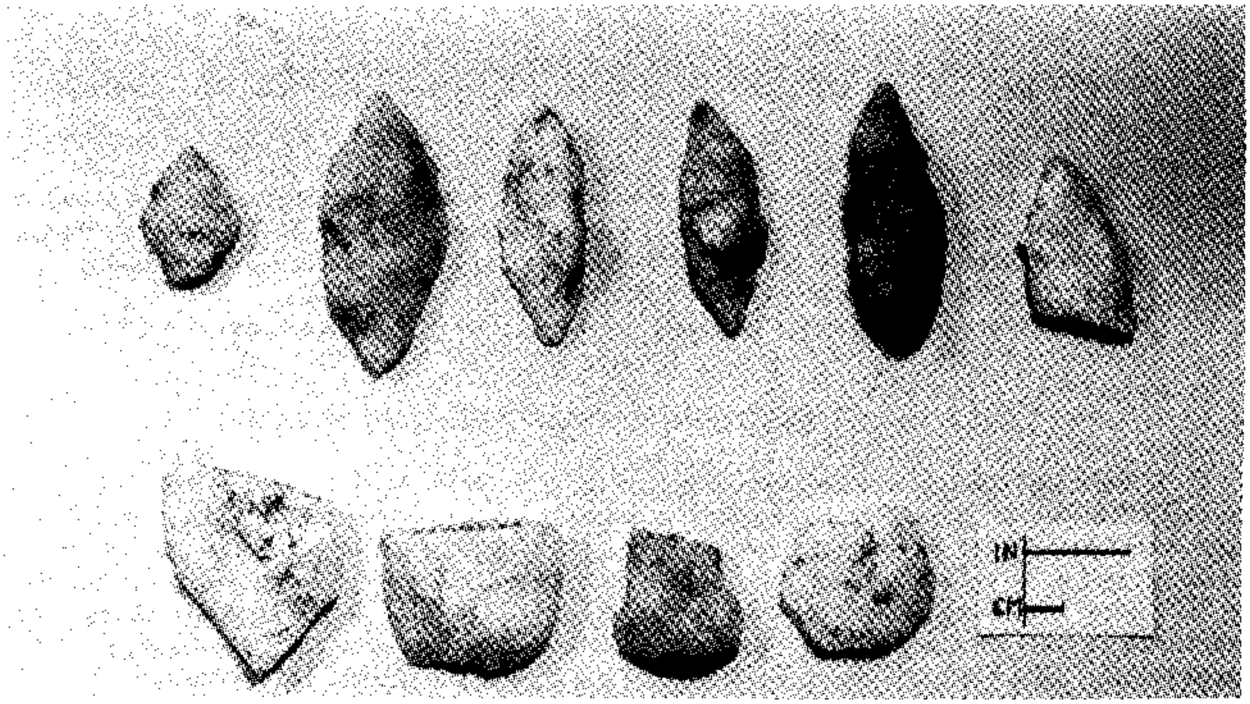

Figure 6. *Artifacts, Site SI-3-1.*
Top row: 1 rhomboidal (Rossville) projectile point; 2-6 arcuate blades. Bottom row: 1-2 biface blade fragments; 3 knife or drill base; 4 discoidal scraper.
MATERIAL: all, quartz.

SITE SI-4-1: LATE WOODLAND CAMP OR VILLAGE

This large site is situated on the southern and western shores of a deep, spring fed kettlehole lake. It crosses the property lines of nine residents, some of whom have described interesting buried and surficial finds here including pottery, stone artifacts, shell middens, pits, and human burials.

SI-4-1 measures more than 245 m north-south by 91 m east-west (804 ft by 300 ft), and it includes vestiges of a channel that once connected the lake to semi-saline mud flats 200 m (656 ft) to the south.

A portion of the site is submerged beneath the lake to a depth of .6 m (2 ft). We studied 37 sq m (398 sq ft) of this portion encountering, first, a mantle of light colored sand up to 15 cm (6 inches) thick. Modern industrial artifacts occur in the stratum with decortication flakes, projectile points, and other chipped and ground stone artifacts (See Figure 7 and Table 4).

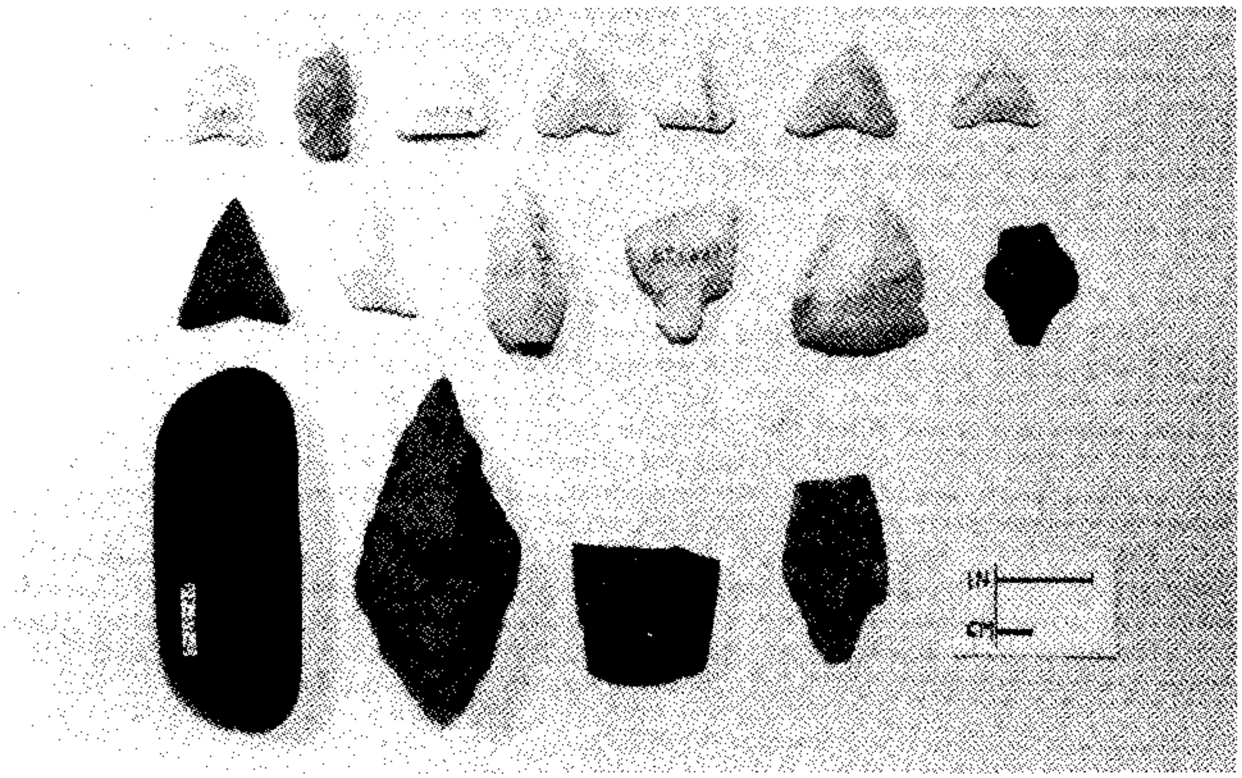

Figure 7. *Artifacts, Site SI-4-1.*
Top row: 1 lanceolate point; 2 narrow-stemmed point; 3-7 Levanna points. Middle row: 1 Levanna point; 2 Madison point; 3 biface blade knife or point; tool of unknown use (possibly rechipped Fulton Turkey Tail point); 5 denticulate end scraper; 6 drill base. Bottom row: 1 whetstone; 2 perforator; 3 gorget fragment; 4 knife or spear point. Material: Top row: all, quartz. Middle row: 1 chert; 2-5 quartz; 6 slate. Bottom row: 1 basalt; 2 traprock; 3 unknown; 4 smoky quartz.

Beneath the sand is a layer of dark, compact sandy loam (pH 8.0), of which the uppermost 5 cm (2 inches) is impregnated with fire-cracked rock, patches of amorphous charcoal, and concentrations of burned, broken hard clam and oyster.

Fifteen shovel probes were made in this stratum, and the soil thus obtained was dried and sifted. The process yielded eight thin-walled, shell-tempered pottery fragments .8 cm (5/16 inches) or smaller in diameter, four small, shattered mammalian bone fragments, and what might be a human molar.

The presence of many pits reported for this site suggests that occupation was at least semi-permanent. This assumption is supported by much evidence that the occupiers exploited a wide variety of shellfish, the availability of which would have been subject to seasonal and ecological variables (Braun 1974). Practically all the submerged shell we encountered is hard clam and oyster, On land, 18 m (59 ft) north, a small individual activity area revealed a scatter of broken valves almost entirely from soft clam and bay scallop. Sixty meters (197 ft) south of the submerged portion of the site, a shell midden exposed during house construction produced many unbroken scallop valves and some knobbed whelk.

The site's large size, choice location, proximity to marine shellfish resources, and the kind of domestic artifacts it is yielding, suggests that we have here another manifestation of the stable, Sebonac focus Windsor aspect community described by Ritchie (1965:265-267) and by Smith (1950:133-34). Evidence of much Sebonac activity locally includes sites at Old Lyme and South Woodstock, Connecticut (Praus 1942, 1945) and nearby on Long Island's south fork at Soaks Hides and Squa Cove (Ritchie 1965:265). There are also parallels between SI-4-1 and a site approximately 17 kms (10.6 miles) southwest at Shinnecock Hills, excavated in 1902 under the auspices of the American Museum of Natural History (Harrington 1924).

CONCLUSION

Questions seeking answers confront future research into Shelter Island's prehistory. Did local Late Woodland peoples practice agriculture, manufacture wampum, or exploit deep water marine resources? How diverse are residential bases; what are their sizes and seasons of use? Are Manhanset "forts" and early Contact period sites to be found on Shelter Island as ethnohistoric evidence indicates? What varieties of interaction occurred between local aborigines and those from the Connecticut and Thames river valleys?

Groundwork has been laid for finding answers. In the field, a wealth of information is waiting for archaeologists who can beat developer's bulldozers to sites yet unrevealed. Hopefully, work to come will be linked to related studies for southern New England so that regional findings for Shelter Island will be made more meaningful by their inclusion within a broader context.

ACKNOWLEDGEMENTS

Artifacts discovered by the writer together with field notes and records will be donated to the Shelter Island Historical Society as an expression of thanks to local residents who shared their time and knowledge with us generously, and upon whom local prehistory bears directly.

In particular, for their gracious assistance we would like to thank Lt. Colonel and Mrs. Howard Brandenstein, the Anthony Cicale family, Clifford Clark, Gerald Fregoe, Michael Laspia, and Norman Sandwald.

Special thanks are extended to Louise Green, Director of the Manhanset Chapel Museum, and to Ellen Barcel, doctoral candidate for archaeology, SUNY, Stony Brook, who made accessible Roy Latham's field notes and Smith site artifacts.

REFERENCES CITED

Bloom, A. L.
1967 Coast Geomorphology in Connecticut. *Final Report, Geography Branch, Office of Naval Research Task Number NR 388-603*:8.

Bourne, Richard Q., Jr.
1972 New Submerged Sites of Coastal Connecticut. *Archaeological Society of Connecticut Bulletin* 37:5-16.

Braun, David P.
1974 Explanatory Models for the Evolution of Coastal Adaptation in Prehistoric New England. *American Antiquity* 39(4):582-596.

Broughton, J.G., D.W. Fisher, Y.W. Isachsen, L.V. Rikard
1966 Geology of New York. *New York State Museum and Science Service Educational Leaflet* 20:35.

Brush, C.F. and E.S. Brush
1982 A Preliminary Archaeological Survey of Mashomack. In *The Mashomack Preserve Study*, vol 1., edited by S. Englebright, pp. 101-107. The Nature Conservancy.

Dunhill, P.
1982 The People of Sachem's Neck. In *The Mashomack Preserve Study*, vol 1., edited by S. Englebright, pp. 4-99. The Nature Conservancy.

Duvall, Ralph G.
1952 *History of Shelter Island 1652 - 1952.* Second Ed. Shelter Island Heights, New York.

Englebright, Steven.
1982 Geology of the Mashomack Preserve. In *The Mashomack Preserve Study*, vol 1., edited by S. Englebright. The Nature Conservancy.

Feder, Kenneth L.
1984a Pots, Plants, and People: The Late Woodland Period in Connecticut. *Archaeological Society of Connecticut Bulletin* 47:99-111.
1984b Metal Tools for Stone-Age New Englanders. Trade and Warfare in Southern New England. *Man in the Northeast* 27:51-65.

Hadlock, Wendell S.
1948 A Cache from Ipswich. *Massachusetts Archaeological Society Bulletin* 37:5-16.

Harrington, Mark R.
1924 An Ancient Village Site of the Shinnecock. *American Museum of Natural History, Anthropological Papers* Vol 22, Pt. 5.

Havens, Lodowick
n.d. *Memories.* unpublished MS, Shelter Island Historical Society, New York.

Josephy, Alvin M.
1972 Indians of the Sound. *On the Sound* Vol. 2, No. 2:73.

Latham, Roy
1956 A Cache of Graphite Found on Long Island, NY. *New York State Archaeological Association Bulletin* No. 6.
1957 A Preliminary Report of the Smith Site, Shelter Island. *New York State Archaeological Association Bulletin* No. 11.
n.d. Notes. Ms on file with Southold Indian Museum, Incorporated Long Island Chapter, NYSAA.

Lavin, Lucianne
1984 Connecticut Prehistory: A Synthesis of Current Archaeological Investigations. *Archaeological Society of Connecticut Bulletin* 47:5-40.

Lightfoot, Kent G, Robert Kalin, Owen Lindauer, and Linda Wicks
1985 Coastal New York Settlement Patterns: A Perspective from Shelter Island. *Man in the Northeast* 30:59–82.

Lightfoot, Kent G., Robert Kalin, James Moore
1987 *Prehistoric Hunter–Gatherers of Shelter Island, New York: An Archaeological Study of the Mashomack Preserve*. Archaeological Research Facility, University of California at Berkeley.

Loper, Lillian
n.d. The First Owners of Shelter Island. unpublished MS on file with the Shelter Island Historical Society.

Lopez, Julius
1958 Curvilinear Design Elements in the New York Coastal Area. *Archaeological Society of Connecticut Bulletin* 28:3–11.

McBride, Kevin A.
1984a Archaic Subsistence in the Lower Connecticut Valley. unpublished Ph.D. dissertation, Department of Anthropology, University of Connecticut, Storrs.
1984b Middle and Late Archaic Periods in the Connecticut River Valley: A Re–examination. *Archaeological Society of Connecticut Bulletin* 47:55–72.

Pagoulatos, Peter
1983 Terminal Archaic Settlement–Subsistence Patterns in the Lower Connecticut River Valley: A Set of Testable Hypotheses. *Archaeological Society of Connecticut Bulletin* 46:55–62.

Pfeiffer, John
1980 The Griffin Site: A Susquehanna Cremation Burial in Southern Connecticut. *Man in the Northeast* 19:129–133.

Praus, Alex A.
1942 Excavations at the Old Lyme Shellheap. *Archaeological Society of Connecticut Bulletin* 13:3–66.
1945 The South Woodstock Site. *Archaeological Society of Connecticut Bulletin* 17:1–52.

Ritchie, William A.
1957 Traces of Early Man in the Northeast. *New York State Museum and Science Service Bulletin* No. 358.
1959 The Stony Brook Site and its Relation to Archaic and Transitional Cultures on Long Island. *New York State Museum and Science Service Bulletin* No. 372.
1965 *The Archaeology of New York State*. Natural History Press, Garden City, New York.
1971 A Typology and Nomenclature for New York Projectile Points. *New York State Museum and Science Service Bulletin* No. 384.

Salwen, Bert
1975 Post–Glacial Environments and Cultural Change in the Northeast River Basin. *Man in the Northeast* 10:43–70.

Saxon, Walter
1973 The Paleo Indian on Long Island. *New York State Archaeological Association Bulletin* No. 57:1–11.

Smith, Carlyle S.
1950 The Archaeology of Coastal New York. *Anthropological Papers of the American Museum of Natural History*. Vol. 43, Pt 2.
1987 Paper presented to Metropolitan Chapter, New York State Archaeological Association. Unpublished MS on file with author.

Vibert, Edith M.
1971 The Waldron Cache, South Windsor, Connecticut: Provocative Points and Pipe from Podunk. *Archaeological Society of Connecticut Bulletin* 36:17-21.

Wiegand II, Ernest A.
1987 The Prehistoric Ceramics of Southwestern Connecticut: An Overview and Reevaluation. *Archaeological Society of Connecticut Bulletin* 50:23-42.

Witek, John C.
1989 A Preliminary Report Concerning a Unique Tangency of Susquehanna Tradition and Wading River Traits at a Buried Multi-Component Site on Shelter Island, New York. *New York State Archaeological Association Bulletin*, in press.

Wortis, Helen Z.
1978 A Woman Named Matilda and Other True Accounts of Old Shelter Island. *Shelter Island Historical Society*. New York.

N.A.
1883 *Documents Relating to the Colonial History of the State of New York*. Vol. XIV. Albany, New York.

TERMINAL ARCHAIC 'LIVING AREAS' IN THE CONNECTICUT RIVER VALLEY

PETER PAGOULATOS
R.A.M.

ABSTRACT

The organizational structure of Terminal Archaic occupations assigned to the Susquehanna tradition is poorly understood in the Northeast. The primary purpose of this paper is to present current data on Susquehanna tradition settlement structure and activity variability in the Connecticut River Valley. Data on the chronological setting and settlement patterns of the Susquehanna tradition are presented. One occupation assigned to the Susquehanna tradition is analyzed using descriptive statistical procedures such as nearest neighbor analysis and the index of aggregation to discern the spatial clustering of tools, debitage, ceramics, stone bowl fragments, and food remains. Subsequently, intersite comparisons are made in the Connecticut Valley.

INTRODUCTION

The internal spatial organization of Terminal Archaic period occupations assigned to the Susquehanna tradition (i.e., activity areas, features) is poorly understood in the Northeast. This paper briefly summarizes some current research on the Susquehanna tradition in the Connecticut River Valley. Data on the chronological setting and settlement patterns of sites assigned to the Susquehanna tradition are presented. One Susquehanna tradition occupation is then analyzed using descriptive statistical procedures and artifact distributions to discern the spatial clustering of tools from features. Then intersite comparisons with other designated Susquehanna tradition sites are made for the Connecticut Valley.

The Terminal Archaic period is a temporal designation for sets of artifacts assigned to the Narrow-stemmed and Susquehanna traditions. For the purposes of this study, only Susquehanna tradition sites are evaluated. Narrow-stemmed tradition occupations have been assessed elsewhere (McBride 1984; Pagoulatos 1986). The Susquehanna tradition is characterized by carved steatite bowls, ceramics, groundstone tools and a variety of broadspear points found in sites which date from 3600 to 2700 B.P. (1650 - 720 B.C.) in New England (Witthoft 1953; Dincauze 1968, 1975; Ritchie 1969; Snow 1980; Lavin 1984; McBride 1984; Pagoulatos 1986). Broadspear points in Connecticut primarily consist of Snook Kill, Susquehanna Broad, Mansion Inn, and Orient Fishtail varieties (Figure 1).

Susquehanna tradition settlement patterns are clearly oriented toward the river and terrace edges in the Connecticut River Valley (McBride and DeWar 1981). Terminal Archaic occupation is predominantly on the river edge terraces, overlooking the Connecticut River floodplain. Large, multiactivity occupations tend to be found on the terrace edges; smaller, limited activity sites in the upland locales (Table 1).

Table 1. Terminal Archaic Occupation Data

site	site size (sqm)	site location	Radiocarbon Dates
54-25	1500	terrace	2740 ±60 (Pagoulatos 1986) 2460 ±60 (Pagoulatos 1986)
105-43	1500	riverine	2200 ±100 (Pfeiffer 1984)
6MD40	1500	terrace	
54-24	1000	terrace	
41-18	1000	terrace	1910 ±100 (Pagoulatos 1986)
32-50	500	upland	3380 ±130 (Pagoulatos 1986)
32-47	300	upland	3620 ±80 (Beta 15584)
1-1	300	upland	
169-4	300	upland	
105-34	250	upland	3610 ±70 (McBride 1984)
61-58	300	upland	
19-6	300	upland	3130 ±90 (McBride 1984)
12-17	250	upland	3740 ±80 (Pagoulatos 1986)
75-7	250	riverine	2740 ±70 (McBride 1984)
54-53	200	riverine	
105-33	50	upland	2700 ±60 (McBride 1984)
105-06	50	upland	
105-01	50	upland	2940 ±230 (Pfeiffer 1984)
105-29	50	upland	
105-41	50	upland	3535 ±140 (Pfeiffer 1984)
105-41	50	upland	3495 ±150 (Pfeiffer 1984)
105-41	50	upland	3140 ±60 (Pfeiffer 1984)
105-41	50	upland	3105 ±60 (Pfeiffer 1984)
105-41	50	upland	3005 ±70 (Pfeiffer 1984)
105-41	50	upland	2985 ±70 (Pfeiffer 1984)
54-23	25	terrace	3550 ±90 (Pagoulatos 1986)
41-39	10	upland	

TIMOTHY STEVEN'S SITE

The Timothy Steven's site (#54-25) is located in Glastonbury, Connecticut (Figure 2). In 1978 and 1981, the Public Archaeology Survey Team tested here, revealing extensive prehistoric occupation, including Orient Fishtail points, chipping debris and retouched tools (McBride 1984). In 1984 and 1985, testing was resumed under my direction. To determine site limits, test squares were placed at systematic intervals in the four cardinal directions (Figure 3). Test squares were terminated when two consecutive sterile units were excavated. This sampling procedure yielded an estimated occupation size of 1500 square meters. Secondly, squares were placed where prehistoric features had been identified, including hearths, storage facilities, postmolds, trash pits, and activity areas.

ARTIFACTS

The Timothy Steven's assemblage yields a diversity of raw materials, such as flint, rhyolite, siltstone and quartz (Table 2). Recovered cultural materials include chipping debris, cobbles, cores, resharpening flakes, Snook Kill, Susquehanna Broad and Orient Fishtail points, Mansion Inn blades, retouched tools, ceramics and steatite bowl fragments, indicative of stone tool manufacturing, maintenance and domestic activities (Tables 3,4).

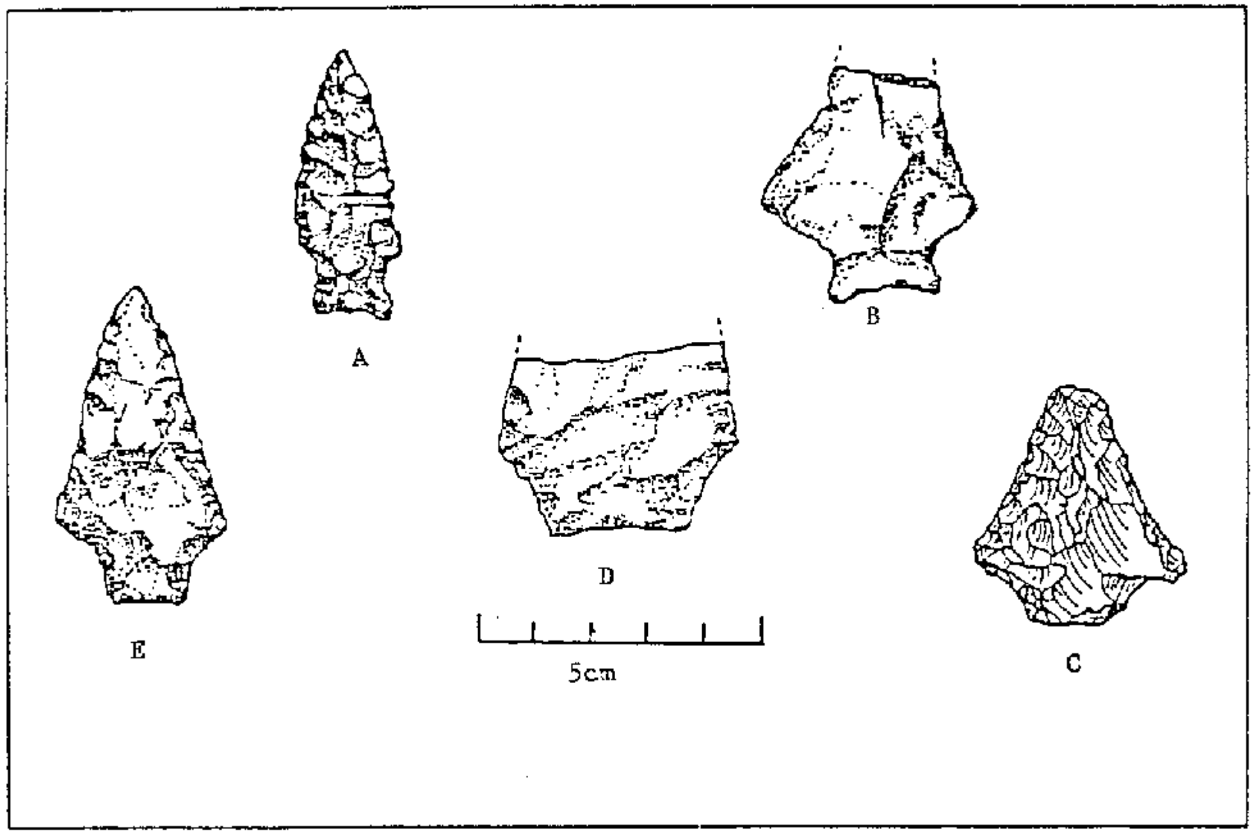

Figure 1. *Susquehanna Tradition Points, Timothy Steven's (54-25). (A) Orient Fishtail (B) Susquehanna Broad (C) Snook Kill (D) Mansion Inn Blade (E) Untyped Point.*

Table 2. Raw Material Frequency (Timothy Steven's Site #54-25)

Local	#	%	Nonlocal	#	%
siltstone	2033	34.9	flint	1475	25.2
quartz	738	12.7	rhyolite	712	12.2
quartzite	434	7.5	felsite	145	2.5
basalt	146	2.5	argillite	10	0.1
slate	67	1.2	other	13	0.1
sandstone	48	0.9			
steatite	10	0.1			
ceramic	6	0.1			
Total	3492	59.9	Total	2345	40.1

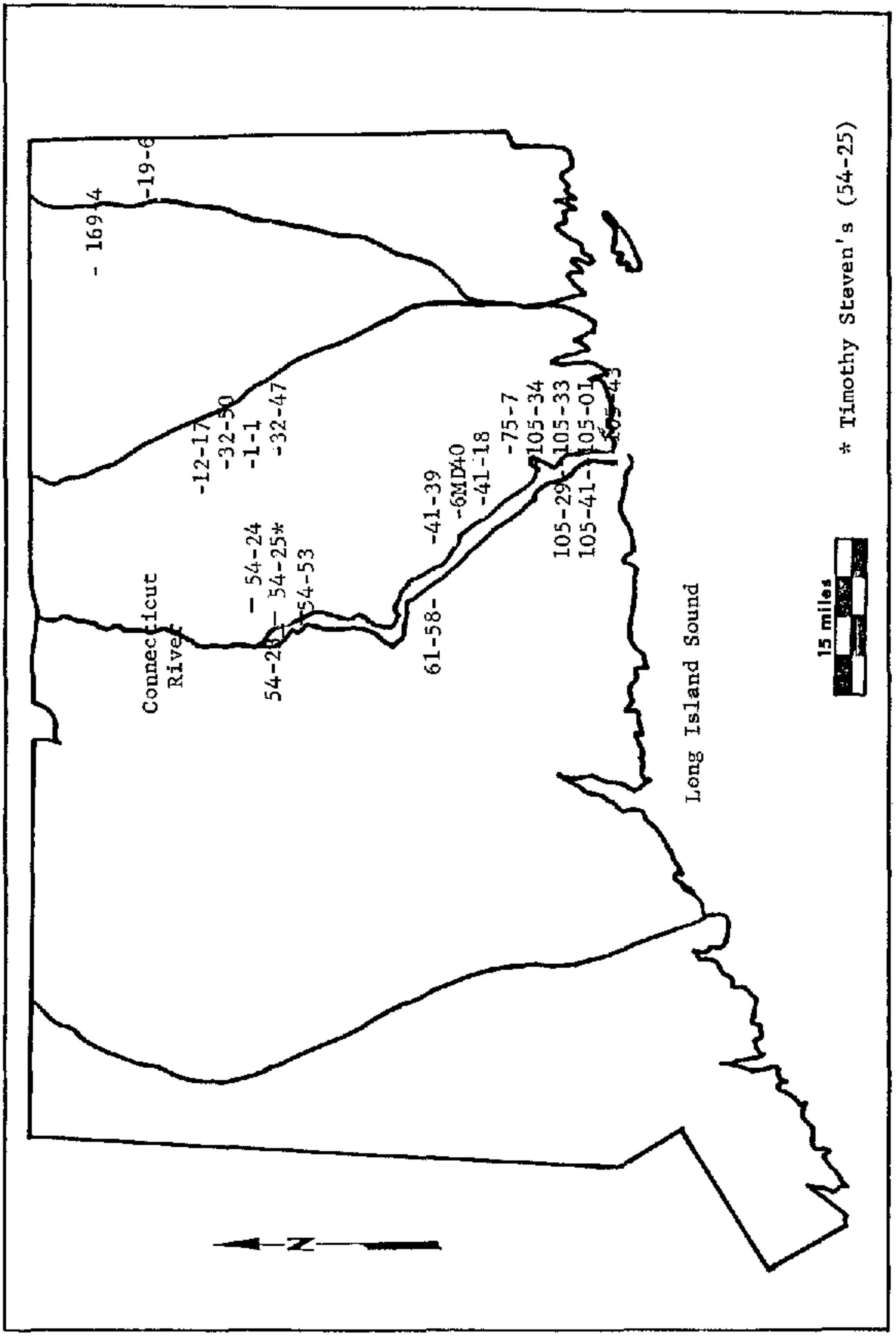

Figure 2. *Susquehanna Tradition site locations in the state of Connecticut.*

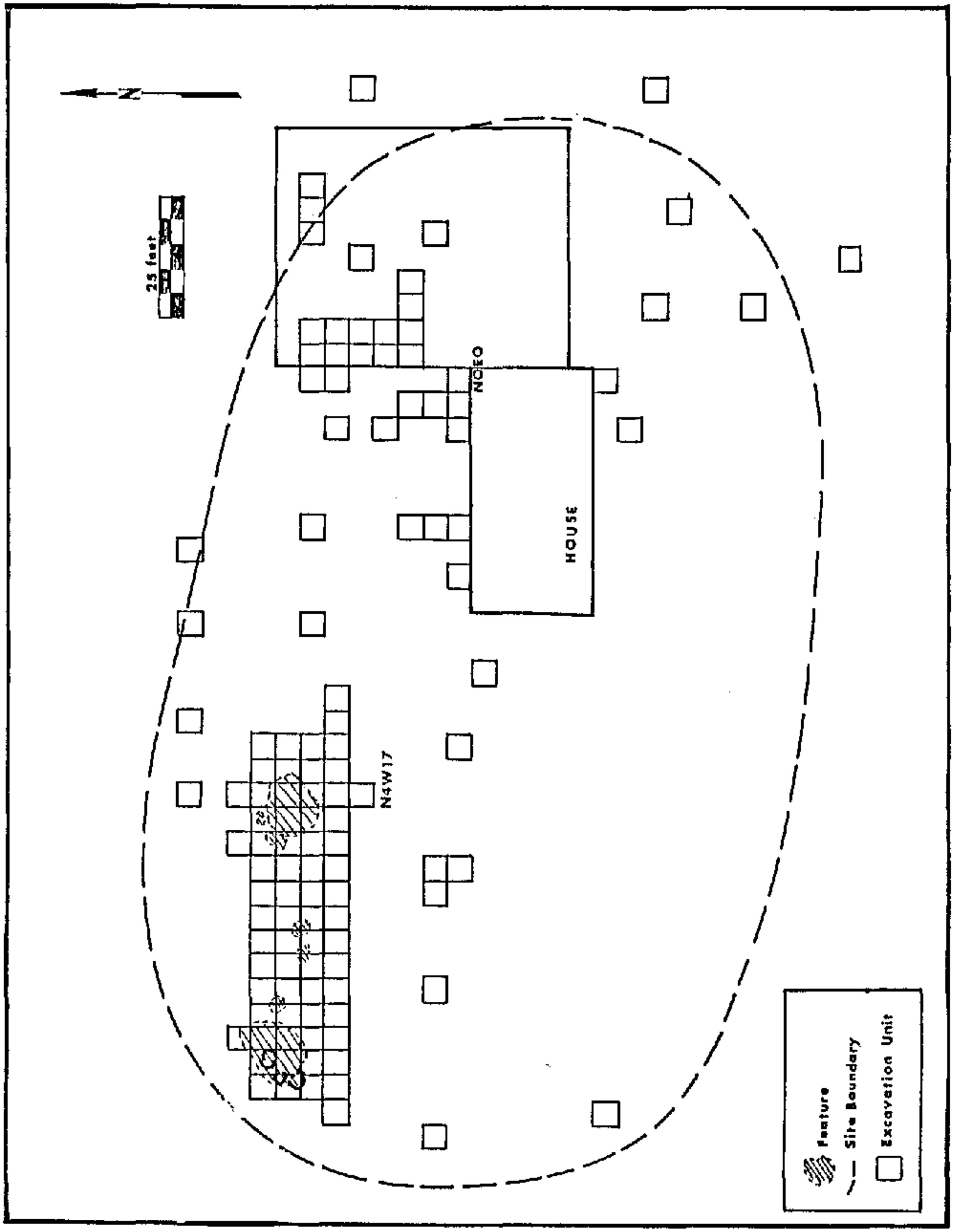

Figure 3. *Timothy Steven's (54-25), Glastonbury, Connecticut.*

Table 3. Frequency Artifact Classes, Timothy Stevens (#54-25)

Artifact Classes	#	%
amorphous flakes	3688	65.0
biface reduction flakes	1392	25.2
resharpening flakes	248	4.3
microliths	104	1.8
utilized flakes	76	1.3
bifaces	75	1.3
projectile points	45	0.7
chunks	36	0.5
unifaces	25	0.4
modified cobbles	12	0.1
steatite sherds	10	0.1
ceramics	6	0.1
cores	5	0.1
drills	3	0.1
hammerstones	3	0.1
Mansion Inn Blade	1	0.1
axes	1	0.1
Total	5837	100.0

Table 4. Projectile Point Types and Provenience

Soil Horizon		Orient	Snook Kill	Susquehanna	Mansion Inn
Plowzone	0-12"	7	4	0	1
B	12-18"	12	5	3	1
C	18-21"	0	0	0	0

Soil Horizon		Point Tips	Brewerton	Otter Creek	Narrow-stemmed
Plowzone	0-12"	4	0	0	0
B	12-18"	3	2	1	1
C	18-21"	0	1	0	0

SUBSISTENCE REMAINS

Charred nut remains consist of hickory, butternut and walnut (Table 5). The recovery of various nut varieties may suggest the use of at least two microenvironments: the floodplains and uplands. Hickory is usually present in dry upland zones with well-drained soils; walnut and butternut can be found in bottomlands and floodplains, especially in rich low mixed deciduous forests. All three species are available by September and October. Charred seed remains include ragweed (*Ambrosia* sp.) which is found in wetland locales and is available between August and October. These data imply that Timothy Steven's was at least occupied in the late summer and fall.

Recovered calcined bone includes white-tailed deer, beaver, and mammals of various sizes. Aquatic resources include freshwater clam and unidentifiable fish bone. While a variety of mammals may have been exploited by the inhabitants of this site, white-tailed deer appears to have been the primary prey (Table 6).

Table 5. Botanical Remains (Site #54-25)

Botanical Assemblage
15 walnut fragments (Juglans sp.)
2 hickory fragments (Carya sp.)
1 butternut fragment (Juglans sp)
1 ragweed seed (Ambrosia sp.)

Table 6. Faunal Remains (Site #54-25)

Faunal Assemblage
White-tailed deer (O. virginianus)
3 molars, 1 cloven bone, 3 rib fragments, 5 long bones, 1 phalange fragment, 1 humerus fragment, 1 scapula fragment
Beaver (Castor canadensis)
1 long bone
Bird
1 vertebrae fragment
Fish
1 cranial fragment
Medium-sized mammal
1 radius fragment, 1 ulna fragment, 2 long bones
Small mammal
1 flat bone
Freshwater clamshell
9 clamshell fragments
Mammal
43 long bones, 34 bone fragments

FEATURES

Features Three, Four and Seven represent hearths. They are roundish in form, shallow, basin-shaped in profile, and associated with fire-cracked rock, chipping debris, complete retouched tools, charred nutshell and mammal bone (Figure 4). Features Five, Eight, Nine and Ten are trash dumps. They are deep, round, and bell-shaped in form, yielding flakes, broken tools and discarded food remains. Feature 2 is circular and basin-shaped in profile. Because it contained five complete Orient Fishtail points, the feature may have served as a 'cache' to store hunting equipment.

Features One and Eleven represent activity areas. There are oval/round in shape, each measuring about 5 meters in diameter. Recovered materials included clustered scatters of artifacts, such as chips, bifaces, points, drills, preserved food remains, ceramics, stone bowl fragments and fire-cracked rock. Postmolds exhibiting an oval pattern were recovered from these activity areas, ranging from 5 to 10cm in diameter and exhibit slightly rounded bottoms. Charcoal collected from Features One and Eleven yielded radiocarbon dates of 2740 ±60 B.P. or 790 B.C. (Beta 13404), and 2460 ±60 B.P. or 510 B.C. (Beta 16117), respectively (Pagoulatos 1986).

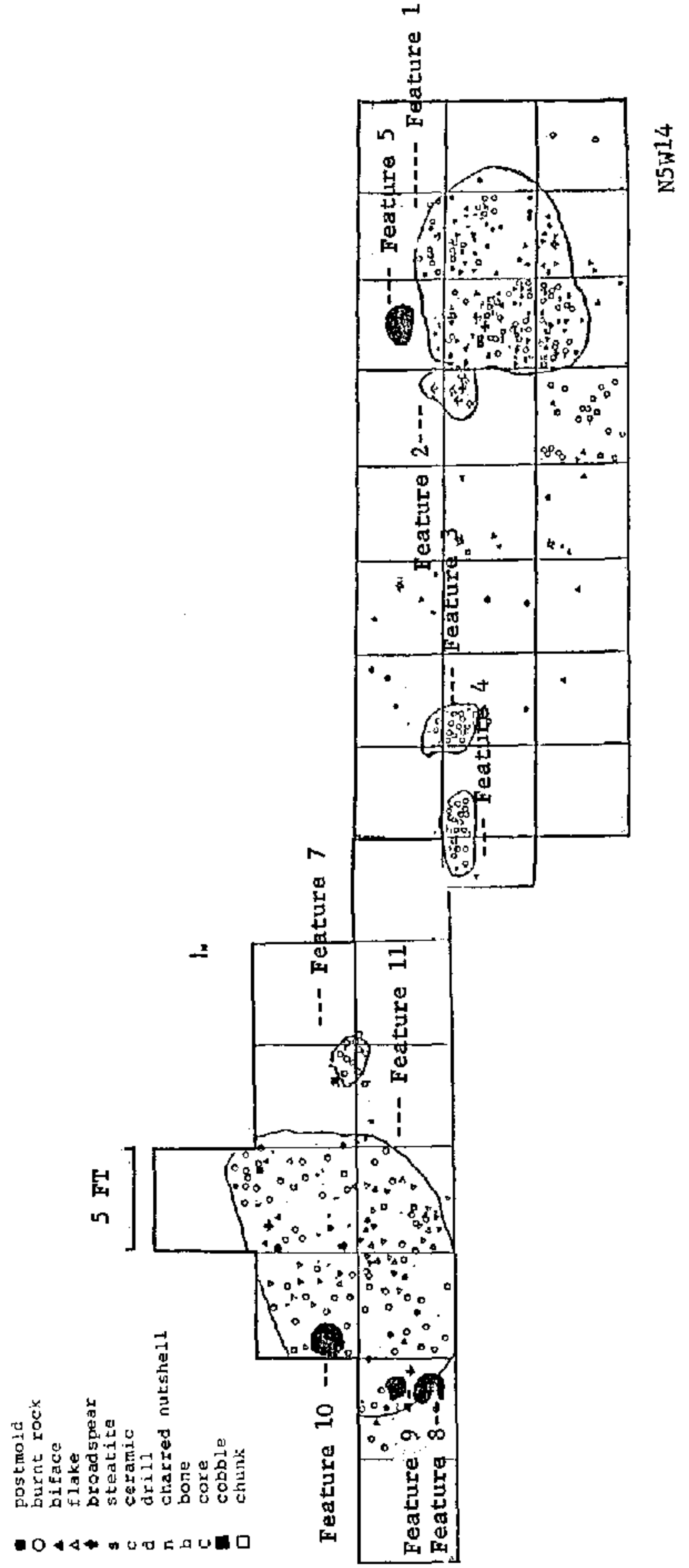

Figure 4. *Timothy Steven's site (54-25).*

SPATIAL ANALYSIS

Nearest neighbor analysis and the Index of Aggregation statistics provide information on intrasite activities. Nearest Neighbor analysis (R) was initially introduced to study the distribution and degree of clustering of plant and animal populations by ecologists (Clark & Evans 1954). More recently, it has been applied to discern clusterings of artifacts on prehistoric occupation floors (Whallon 1974).

The Index of Aggregation (Ag) provides a measure of association between two or more artifact classes, measuring the tendency for artifact classes to be aggregated in space. The Index of Aggregation is complementary to the Nearest Neighbor statistic. While (R) measures the distribution of an individual artifact class, the Index of Aggregation measures two or more artifact classes (Price 1978).

These statistical procedures were used to assess spatial patterns from Features One and Eleven, the two activity areas at the site. Seven categories were selected for both statistical analyses: (1) amorphous flakes; (2) biface reduction flakes; (3) modified cobbles, cores, and chunks; (4) retouched bifacial and unifacial tools; (5) projectile points; (6) ceramics and steatite, and; (7) preserved food remains (Tables 7,8).

Table 7. Feature One Cultural Materials (Site #54-25)

Artifacts:	200 amorphous flakes, 81 biface reduction flakes, 15 resharpening flakes, 10 microliths, 9 Orient Fishtail points, 9 bifaces, 3 chunks, 6 steatite sherds, 2 utilized flakes, 1 core, 1 Susquehanna Broad point, 1 drill, 1 modified cobble, 1 uniface, 1 Snook Kill point, 1 Mansion Inn blade.
Botanical:	3 hickory nuts, 1 butternut, 1 walnut.
Faunal:	Deer - 1 phalange, 2 molars, 1 scapula fragment, 1 cloven bone. Beaver - 1 long bone. Medium-sized mammal - 1 long bone. Small mammal - 1 flat bone. Mammal - 3 long bones, 5 bone fragments.

Table 8. Feature Eleven Cultural Materials (Site #54-25)

Artifacts:	341 amorphous flakes, 144 biface reduction flakes, 20 resharpening flakes, 6 utilized flakes, 8 bifaces, 5 microliths, 3 Snook Kill points, 6 ceramic sherds, 3 steatite sherds, 1 Susquehanna Broad point, 1 point tip, 1 drill, 1 chunk, 2 unifaces.
Botanical:	6 walnuts.
Faunal:	Medium-sized mammal - 1 long bone. Mammal - 5 bone fragments.

Calculation of the Nearest Neighbor statistic across both activity areas indicates that there is a high degree of clustering of projectile points and modified cobbles, possibly indicative of hunting and primary stone tool manufacturing activities. Steatite bowl debris and ceramics also represent another clustering which may imply a distribution of certain domestic tasks. Weaker distributional clusterings are found for flake debris, retouched tools and food remains (Tables 9,10).

Table 9. Nearest Neighbor Analysis (Feature 1, Site #54-25)

Artifact Class	N	p	p	R(e)	R(o)	R
steatite	6	.0003	.018	27.8	6.7	0.24
cobbles	4	.0002	.014	35.7	15.0	0.42
bifaces/unifaces	8	.0004	.021	23.8	17.0	0.71
amorphous flakes	21	.0012	.034	12.2	10.8	0.74
resharpening flakes	11	.0006	.025	20.4	14.9	0.74
bone	11	.0006	.025	20.0	15.9	0.80
points	10	.0006	.025	40.0	21.0	0.53

Area=18000sq"

Table 10. Nearest Neighbor Analysis (Feature 11, Site #54-25)

Artifact Class	N	p	p	R(e)	R(o)	R
ceramic/steatite	3	.0002	.014	38.5	21.3	0.55
bifaces/unifaces	3	.0002	.014	38.5	29.0	0.75
flakes	32	.0018	.042	11.8	9.1	0.77
points	5	.0003	.017	29.4	26.4	0.90

Area=18000sq"

The Index of Aggregation statistic suggests a clustering of artifacts across both activity areas. Projectile points, flake debris, primary core reduction and retouched tools tend to display a tendency toward aggregation. In contrast, steatite bowl debris, ceramics, drills and food remains were clustered. The presence of flakes and cores suggest stone tool manufacturing and primary lithic reduction; projectile points indicate hunting related activities. By contrast, the recovery of ceramics and steatite is indicative of domestic storage; the presence of organic remains and drills reflect food processing and hideworking tasks, respectively (Tables 11,12).

Table 11. Index of Aggregation (Feature 1, Site #54-25)

Artifact Category	pts	bif	refl	cob	amfl	bone	steat
pts	2.00	1.11	0.70	0.68	0.63	0.38	0.37
bif	1.11	2.00	1.25	1.14	1.12	0.69	0.21
refl	0.70	1.25	2.00	0.68	0.60	0.10	0.20
cob	0.68	1.14	0.68	2.00	0.60	0.00	0.00
amfl	0.63	1.12	1.06	0.60	2.00	0.80	0.38
bone	0.38	0.69	0.10	0.00	0.80	2.00	1.05
steat	0.37	0.21	0.20	0.00	0.38	1.05	2.00

Table 12. Index of Aggregation (Feature 11, Site #54-25)

Artifact Category	pts	bif	flakes	ceram
pts	2.00	1.06	0.76	0.54
bif	1.06	2.00	0.48	0.36
flakes	0.76	0.48	2.00	0.52
ceram	0.54	0.36	0.52	2.00

DISCUSSION

Hearths, trash pits, activity areas and a possible storage cache have been identified at Timothy Steven's. Statistical analyses of activity areas suggests the spatial clustering of particular artifacts. Two different artifact groupings have been identified. One cluster consists of stone tool manufacturing and hunting equipment. The other cluster yields domestic debris such as steatite vessel fragments, ceramics, drills and food remains. These tool clusterings may be indicative of different work areas (Pagoulatos 1986).

Similar spatial patterns have been recognized from different Susquehanna occupations in the Connecticut Valley (Table 1 & Figure 2). For example, large multi-activity occupations such as Blaschick (6MD40), Parkos (41-18) and the Horse Barn (54-24) near the Connecticut River yielded numerous hearths, post-molds, trash pits and activity areas (Table 13). These activity areas yielded spatial clustering of artifacts which suggest woodworking, hideworking and plant processing work areas (Pagoulatos 1986).

Table 13. Terminal Archaic Occupations/Features

site	hearths	act/area	refuse	postmolds	storage	burials
54-25	x	x	x	x	x	
6MD40	x	x	x	x		
105-43	x	?				
41-18	x		x			
54-24	x	x	x		?	
32-50	x					
1-1	x		x	x		
32-47	x		x	x		
19-6	x					
12-17	x					
75-7	x					
105-34	x					
105-33	x					
105-06	x					
105-01	x					
105-41						x
54-23						x

In contrast, Bear Swamp Knoll (1-1) and Rufus Brook (32-47) are smaller, limited activity hunting and nut collecting stations situated away from the Connecticut River, in the uplands (Table 1 & Figure 2). Perhaps these limited

Table 12. Index of Aggregation (Feature 11, Site #54-25)

Artifact Category	pts	bif	flakes	ceram
pts	2.00	1.06	0.76	0.54
bif	1.06	2.00	0.48	0.36
flakes	0.76	0.48	2.00	0.52
ceram	0.54	0.36	0.52	2.00

DISCUSSION

Hearths, trash pits, activity areas and a possible storage cache have been identified at Timothy Steven's. Statistical analyses of activity areas suggests the spatial clustering of particular artifacts. Two different artifact groupings have been identified. One cluster consists of stone tool manufacturing and hunting equipment. The other cluster yields domestic debris such as steatite vessel fragments, ceramics, drills and food remains. These tool clusterings may be indicative of different work areas (Pagoulatos 1986).

Similar spatial patterns have been recognized from different Susquehanna occupations in the Connecticut Valley (Table 1 & Figure 2). For example, large multi-activity occupations such as Blaschick (6MD40), Parkos (41-18) and the Horse Barn (54-24) near the Connecticut River yielded numerous hearths, postmolds, trash pits and activity areas (Table 13). These activity areas yielded spatial clustering of artifacts which suggest woodworking, hideworking and plant processing work areas (Pagoulatos 1986).

Table 13. Terminal Archaic Occupations/Features

site	hearths	act/area	refuse	postmolds	storage	burials
54-25	x	x	x	x	x	
6MD40	x	x	x	x		
105-43	x	?				
41-18	x		x			
54-24	x	x	x		?	
32-50	x					
1-1	x		x	x		
32-47	x		x	x		
19-6	x					
12-17	x					
75-7	x					
105-34	x					
105-33	x					
105-06	x					
105-01	x					
105-41						x
54-23						x

In contrast, Bear Swamp Knoll (1-1) and Rufus Brook (32-47) are smaller, limited activity hunting and nut collecting stations situated away from the Connecticut River, in the uplands (Table 1 & Figure 2). Perhaps these limited activity sites represent short-term occupations which were used by organized task groups or domestic units, on a seasonal basis, away from larger riverside occupations such as Timothy Steven's (Pagoulatos 1986).

CONCLUSION

Current data pertaining to the internal spatial organization of Susquehanna tradition occupations has been presented in light of recent research undertaken at Timothy Steven's and other sites in the Connecticut River Valley. Susquehanna tradition living areas have been discerned.

Future archaeological research by the author in the Connecticut River Valley will address questions concerning the internal spatial structure of smaller, limited activity loci in the uplands, in relation to larger multi-activity occupations near the Connecticut River. Data will be used to assess differential feature distribution, cultural activities and season of occupation. These data should allow us to develop testable hypotheses regarding mobility patterns and activities of hunter-gatherer populations during the Terminal Archaic period in the Northeast.

ACKNOWLEDGEMENTS

I wish to thank Robert Dewar, Kevin McBride and Lucianne Lavin for their helpful comments to improve the organization, structure and content of this paper.

REFERENCES CITED

Clark, P.J. and F.C. Evans
1954 Distance to Nearest Neighbor as a Measure of Spatial Relationships in Populations. *Ecology* 35:445-453.

Dincauze, D.
1968 *Cremation Cemeteries in Eastern Massachusetts.* Peabody Museum, Cambridge, Massachusetts.
1975 *The Late Archaic Period in Southern New England.* Arctic Anthropology 12(2).

Lavin, L.
1984 Connecticut Prehistory: A Synthesis of Current Archaeological Investigations. *Bulletin of the Archaeological Society of Connecticut* 47:5-40.

McBride, K.A.
1984 *The Prehistory of the Lower Connecticut River Valley.* Ph.D. dissertation, University of Connecticut, University Microfilms, Ann Arbor.

McBride, K.A. and R. Dewar
1981 Prehistoric Settlement in the Lower Connecticut River Valley. *Man in the Northeast* 22.

Pagoulatos, P.
1986 *Terminal Archaic Settlement and Subsistence in the Connecticut River Valley.* Ph.D. dissertation, University of Connecticut, University Microfilms, Ann Arbor.

Pfeiffer, J.
1984 The Late and Terminal Archaic Periods of Connecticut Prehistory. *Bulletin of the Archaeological Society of Connecticut* 47:73-98.

Price, D.T.
1978 The Spatial Analysis of Lithic Artifact Distribution and Association of Prehistoric Occupation Floors. In *Lithics and Subsistence*, edited by D.D. Davis. Vanderbilt University Publications in Anthropology, no. 20, Nashville, Tennessee.

Ritchie, W.A.
1969 *The Archaeology of New York State*. Natural History Press, New York.

Snow, D.
1980 *The Archaeology of New England*. Academic Press, New York.

Whallon, R.
1974 Spatial Analysis of Occupation Floors II: The Application of Nearest Neighbor Analysis. *American Antiquity* 39:18-34.

Witthoft, J.
1953 Broad Spearpoints and the Transitional Period. *Pennsylvania Archaeologist* 23:4-31.

ABORIGINAL WEIRS IN SOUTHERN NEW ENGLAND

MARC BANKS
UNIVERSITY OF CONNECTICUT

ABSTRACT

Weirs present a rather unique opportunity for archaeologists. The likelihood of these features being preserved is greater than for other forms of fishing. Unlike the portable artifacts which are evidence of certain other fishing methods, the weirs represent the major component of a method that had the capacity to yield substantial quantities of fish. In addition to answering questions about subsistence, the weirs provide insight into the ancient settlement patterns and social organization.

INTRODUCTION

The importance of fish to the early aboriginal inhabitants of southern New England is obscured by the emphasis generally placed on their use of terrestrial resources and shellfish. Nonetheless, a multitude of references pertaining to the abundance of fish species in this area and to the Indians' exploitation of them are found in the early descriptions and histories of New England. In addition, there are many artifacts that provide direct evidence of various Amerindian fishing technologies.

The degree to which modern-day hunter-gatherers rely on fish for food appears to be a function of latitude (Lee 1968). This is in part a result of the relative scarcity or abundance of resources at different latitudes. A second factor is the reliability of the resource. Hunter-gatherers depend to a greater extent upon hunting at high latitudes, on fishing at middle latitudes, and on gathering at low latitudes. If this world-wide pattern also held true for Amerindians, the potential for large-scale fishing was certainly present in southern New England, where the presence of fish cannot be questioned.

Early accounts of large quantities of shad, salmon, alewives, herring, and eels are numerous (e.g., Eaton, 1831; Josselyn 1833; Potter 1856; Wood 1967). The accounts also frequently mention sturgeon, bass, trout, perch, mackerel, pickerel, sucker, and bullhead. While Carlson (1988) suggests that salmon played a very minor role in aboriginal subsistence, shad, sturgeon (both anadromous), and eel (catadromous) could have represented a sizable food resource. Except for salmon and sturgeon, these fish species are still present today.

As far as the fishing technology available to the Indians is concerned, Wood (1967), Josselyn (1833), DeForest (1851), and others describe the use of torchlight with spears and clubs, nets, hooks, bow and arrow, traps, and weirs for our area. Of these methods, weirs while requiring much labor to construct, would have been the most productive in terms of the quantity of fish they would yield. Weirs would have been most effective when employed to catch anadromous fish.

While it is impossible to determine the Indians' preferences among their food resources, the many references to the Indians' use of some fish for food and others for fertilizer indicate that fish were an important resource. This importance is further emphasized by the names of the months in the aboriginal calendar. Their months were named to correspond to the various seasonal activities (Thomas 1976:5-6). The month which corresponds to parts of March and

April is named for the catching of fish. Fish would have been available in large quantities in the spring, when other foods would have been limited. In his *History of the Indians of Connecticut*, DeForest (1851:3) states that "every spring, great numbers of shad and lamprey eels ascended the rivers, furnishing a seasonable supply to the natives when their provisions were exhausted by the long and severe winter." The American Eel, the most nutritious of the food fish, would have been particularly abundant in the spring, although eels would have been available to some degree all year round (Rostlund 1952:35).

Aboriginal weirs were fence-like structures composed of wooden stakes driven into the river bottom at strategic locations such as at fall-lines and in areas where a river's water level fluctuated with the tides. Often, these pointed stakes were driven through the silt deposits into the underlying clay. In areas where the river's current was too swift, rocks were used to help support the stakes. The stakes were interwoven with branches of various sizes, thus creating a barrier that prevented the fish from returning downstream once they had gotten beyond the weir. The fish, thus confined, could be taken easily with dipnets or spears. This method would have been especially effective during spawning runs, when enormous quantities of fish would be entering the rivers. Often, various types of pen-like traps were incorporated into the weir's design in order to further confine the fish. Fig. 1 is an example from Maine.

Fig. 1. *Modern day weir in Maine. Photograph courtesy of the Robert S. Peabody Foundation for Archaeology, Andover, Massachusetts.*

In southern New England, weirs have been recorded in New Hampshire along the Merrimack River near the outlet of Lake Winnepesaukee (Potter 1856:32-33), in Massachusetts near the Charles River (Willoughby 1927), and in Connecticut along the Housatonic River (Coffin 1947), and in Lake Bashan (Pfeiffer 1983) (Fig. 2). The use of weirs was not confined to southern New England but has been

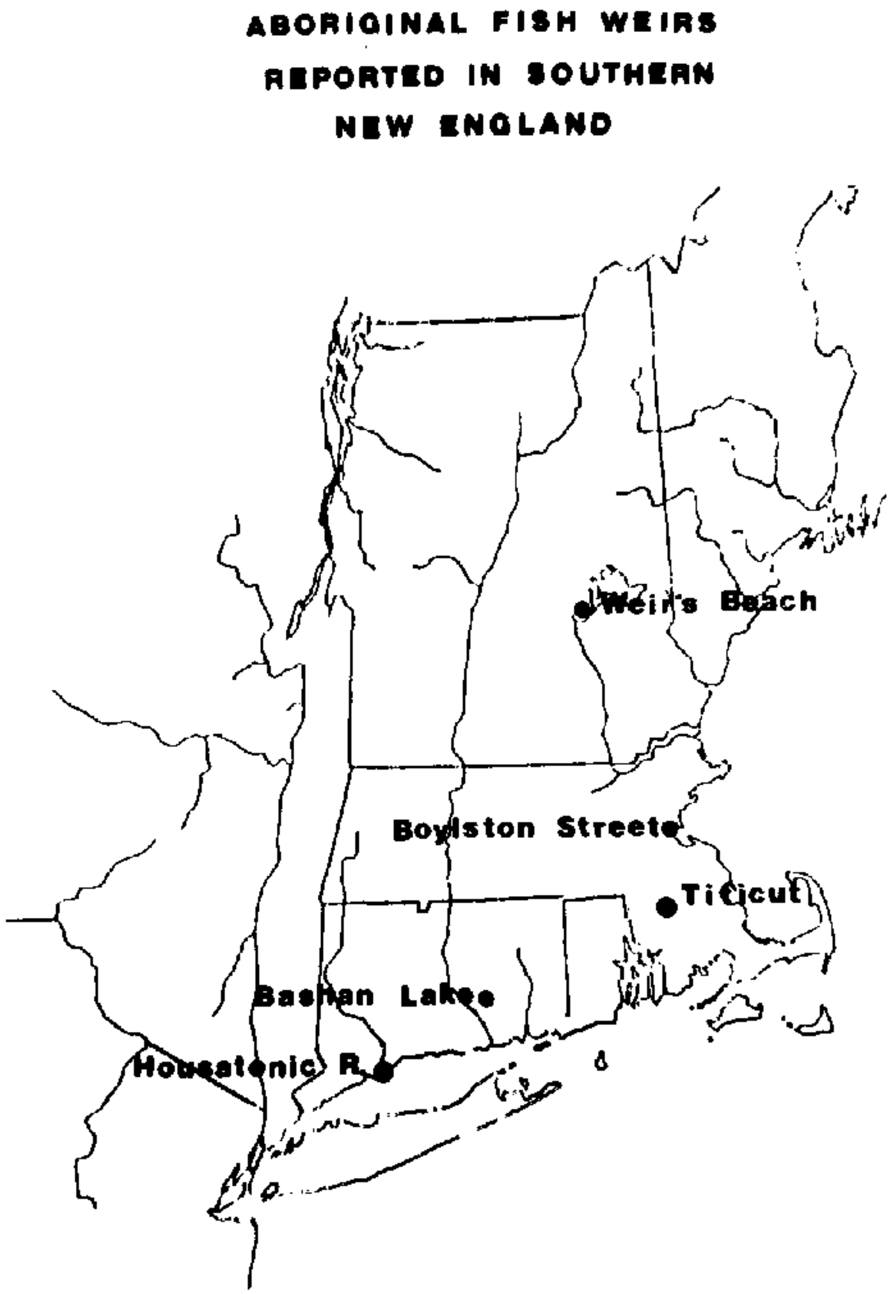

Fig. 2. *Aboriginal fish weirs reported in Southern New England.*

employed throughout the world. A map (Fig. 3) taken from Rostland's (1952) *Freshwater Fish and Fishing in Native North America* indicates how common weir technology was in North America. This widespread use of weirs can best be explained by the fact that the concept involved in this fishing method is quite simple. Although considerable labor is involved, the equipment necessary to construct and use the weir is very basic.

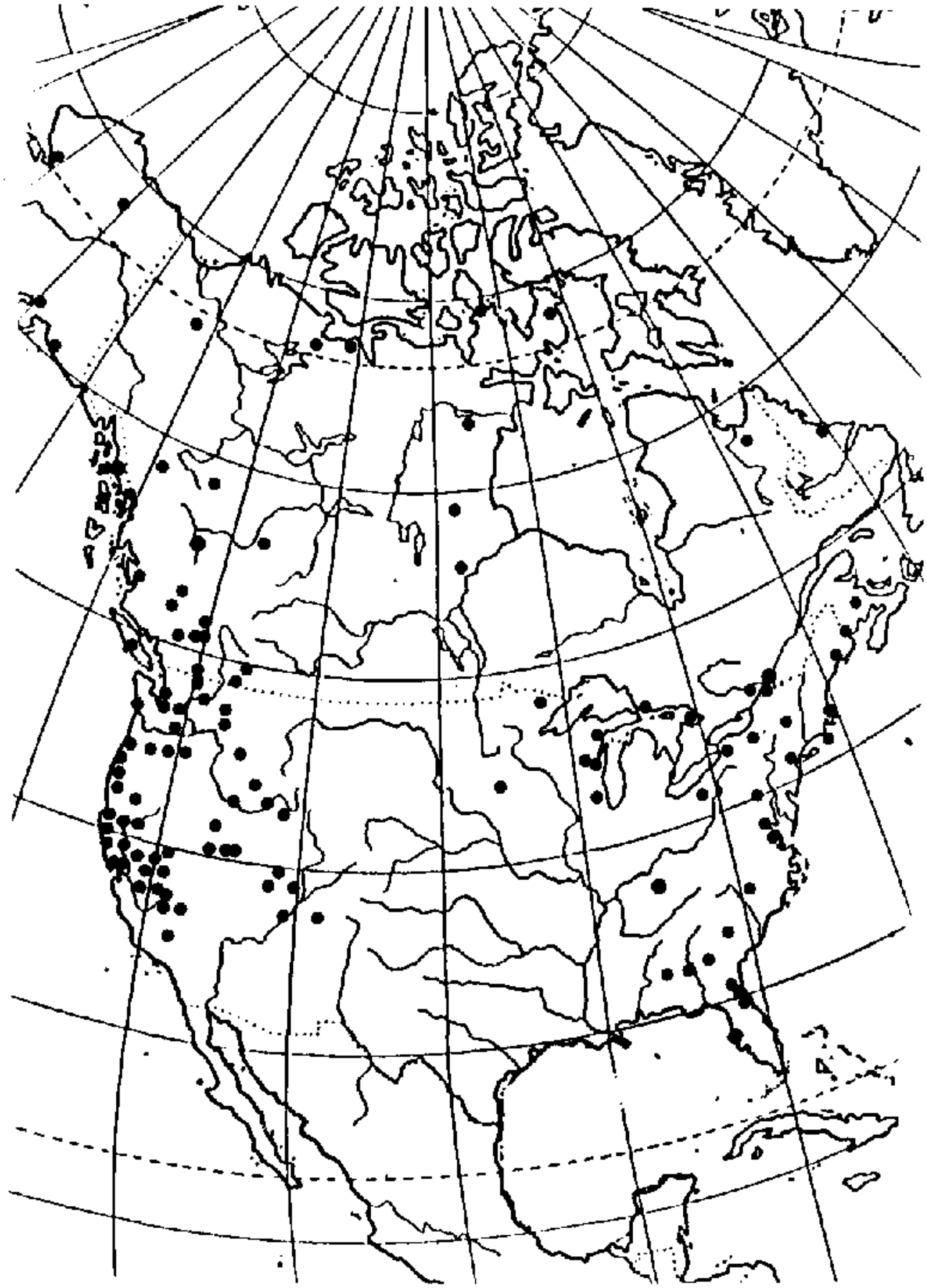

Fig. 3. *Locations of aboriginal fish weirs reported by Rostland (1952).*

The aboriginal weirs are of archaeological interest for a number of reasons. A primary reason is the potential for their preservation. Aside from stone netsinkers and occasional bone fish hooks and probable gorges, few traces remain of other fishing methods that were used by the Indians. While silt deposits may have obscured the presence of weirs, there have been instances in which the silt has aided in preserving portions of these early structures. In faster-moving water where silt did not build up, the stone walls used to support the weirs may be in evidence. Some of these stone walls may have been used as weirs without wooden stakes (Warner 1972).

The presence of the fish weirs may also provide some insight into the social organization of these early people. The size of some of the known weirs precludes their having been the work of a few individuals (Johnson 1942; Coffin 1947). A considerable amount of cooperation would have been necessary to build and maintain these weirs. The groups involved would have had to schedule their seasonal movements to take advantage of the fish resources, since the latter would have been available for a limited time. Also, the quantities of fish that the weirs could provide would have helped to support larger populations. Larger populations would have necessitated greater social organization.

SOME WEIRS RECORDED IN SOUTHERN NEW ENGLAND

In his *History of Manchester* (New Hampshire), Potter (1856:32-33) describes the Indian's use of large rocks and interwoven brushwood for weirs at the outlet of Winnepesaukee. Here they caught shad which had made their way up the Merrimack River, seeking the warm waters of the lake. These weirs were used in both the spring and the fall. Weirs Beach gets it name from Indian weirs that were known to have been used in the area. Eels, shad, and salmon are reported to have been taken with the use of a weir at Namoskeag Falls, which is also on the Merrimack River (Meader 1869).

The Boyleston Street Fishweir in the Back Bay District of Boston afforded archaeologists a rare opportunity to see just how such weirs were constructed. The weir also raised a number of questions about the environment at the time of its use. In addition, it provided some clues as to just how far into the past such devices were used.

Evidence of the weir first appeared in 1913 during construction of the Boylston Street Subway (Johnson 1942). A number of partially decayed upright stakes with horizontal "wattling" were found buried under a substantial deposit of silt. Approximately 65,000 stakes covered a two-acre area. This represented only a portion of the area that the weir may have encompassed. What attracted the attention of archaeologists was the fact that the stakes were located some thirty feet below the street surface (Willoughby 1927). Although radiocarbon dating was not yet available, there was good reason to suspect that the weir had been constructed thousands of years earlier. The upper 18 feet (5.5m) above the weir was fill that had been dumped there during the nineteenth century. Below the fill was about 15 feet (4.6m) of silt, which had built up over the centuries since the time of the weir's construction. Clearly, the landscape had changed dramatically (Fig. 4).

The weir became visible once again during excavation for the New England Mutual Life Insurance Company. It was during this time that further observations of the weir were made by Johnson (1942). This excavation revealed six walls formed by the wooden stakes as well as six other areas with less defined concentrations of stakes. The stakes, which were from four to seven feet (1.2 - 2.1m) in length, were sharpened at the bottom and ranged from one to four inches (2.5 - 10cm) in diameter. There were groups of four to eight stakes within a square foot area as well as individual stakes. In some places, the stakes were

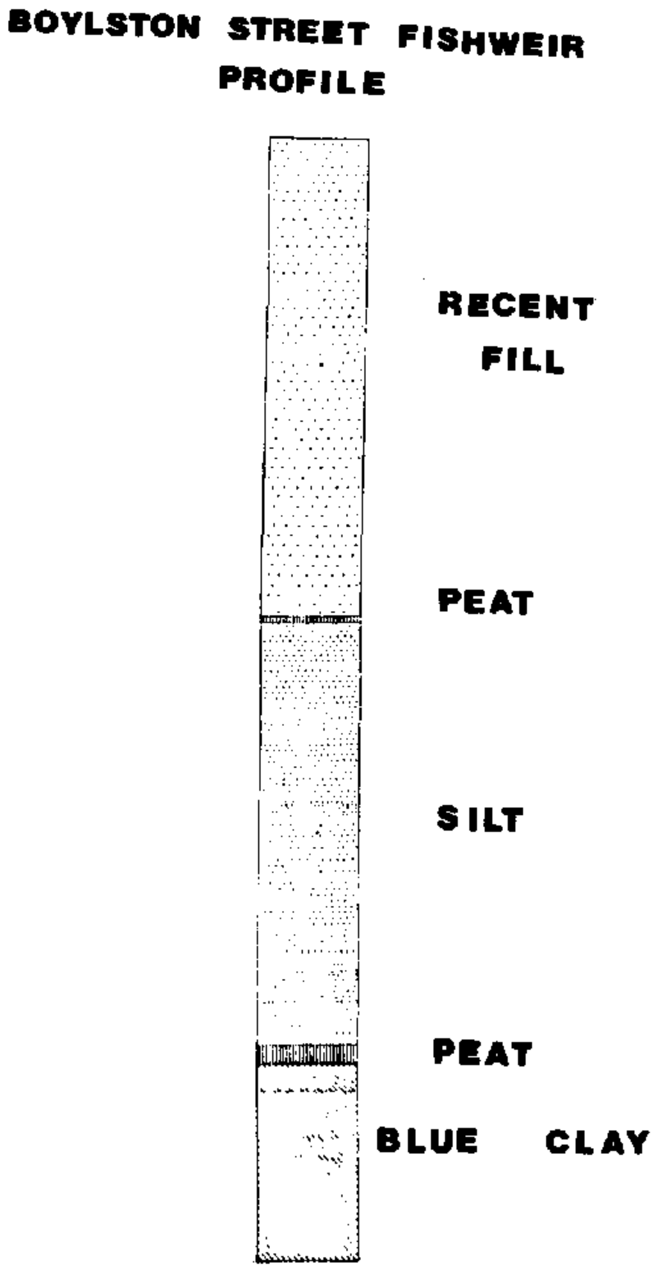

Fig. 4. *Profile from excavation at the Boylston Street Fishweir. Adapted from Johnson (1952). Courtesy of the Robert S. Peabody Foundation for Archaeology, Andover, Massachusetts.*

driven into the blue clay that formed the lowest level. Some of the stakes were driven into a thin layer of peat above the clay, and other stakes were driven into the silt that had built up above the peat. The stakes had been driven about eighteen inches (46cm) deep. The variation in the length of the stakes may have been an indication of work being done on the weir at different times. It also indicates that the area had already begun filling in with silt at the time of the weir's construction. Some of the stakes are shown in Fig. 5.

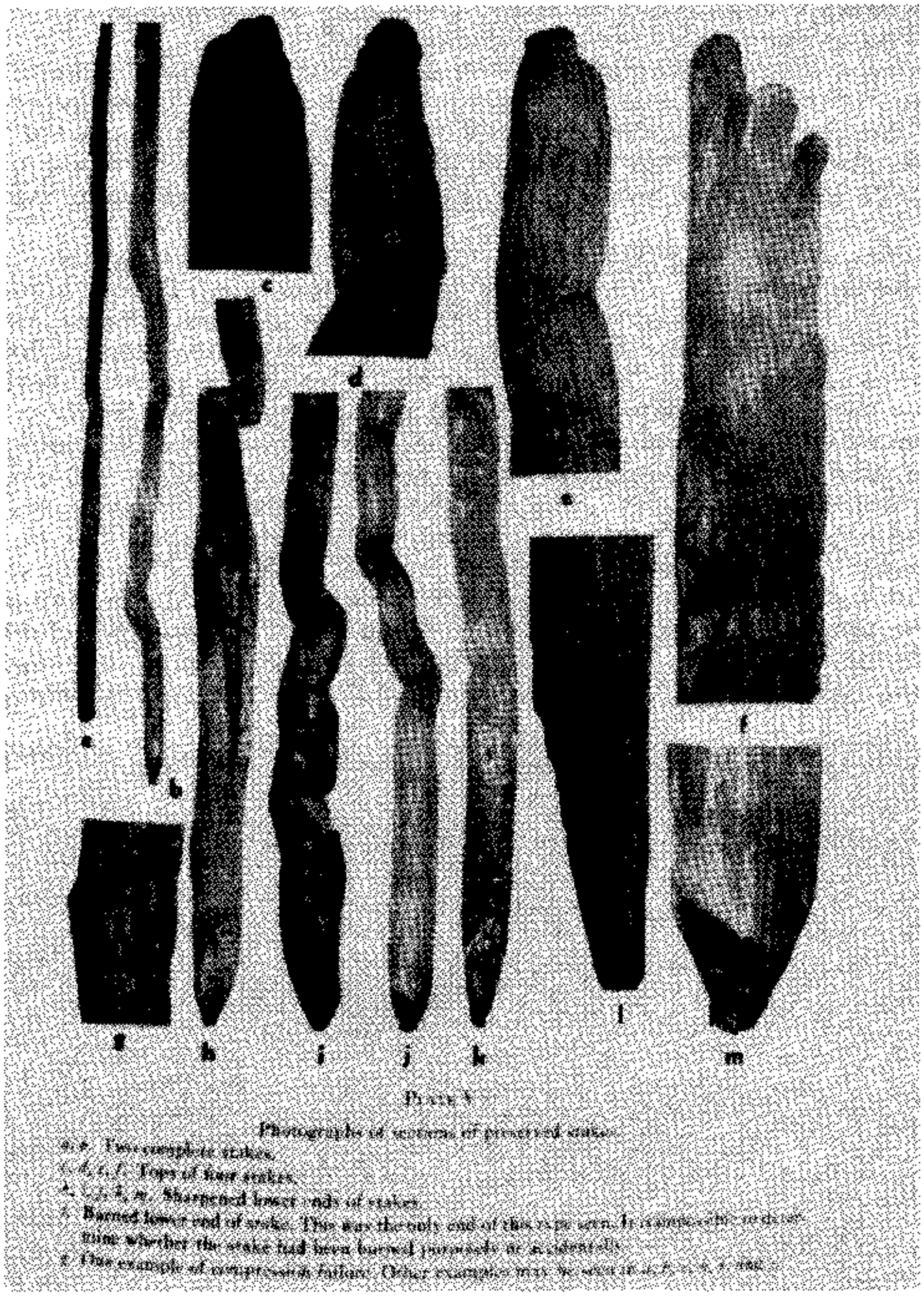

Fig. 5. *Wooden stakes recovered from the Boylston Street Fishweir. Photograph courtesy of the Robert S. Peabody Foundation for Archaeology, Andover, Massachusetts.*

During this excavation, the tops of the wooden stakes were found to be covered by approximately twelve-and-one-half-feet (3.8m) of silt. Rising sea level was having a profound effect on this area. Because the horizontal wattling, which was composed of brush, was not present everywhere and because a sequence to the wattling's addition to the weir could not be detected, it was not possible to determine which portions of the weir had been constructed first. It appeared as though some portions of the weir had been used at different times and as though some portions had been abandoned.

A microscopic examination of some of the stakes from the weir revealed that sassafras, alder, beech, and oak were the woods most often selected (Johnson 1942). This examination also disclosed the fact that all the work done on the weir took place in the spring. This being the case, it strengthens the notion that a large labor force would have been needed to carry out the work on the weir.

Several layers of shell found within the silt deposits also provide clues to the environment at the time of their build-up. These shell layers had occurred after construction of the weir. Some of the species that comprised these layers seem to indicate that the water temperature was warmer and not as brackish as at present. Using these shell layers to mark previous low-tide levels, we can see the developing trend of increasing sea level.

Because this excavation pre-dated the use of radiocarbon dating, the age of the weir had to be determined from geological evidence. Placing a date on construction of the weir was difficult at best, considering the many uncertainties about the time and rate of submergence that was occurring along the Atlantic coast. Based on this limited information, Johnson (1942:194) suggested a date of about five thousand years ago for the building of the weir. Since the time of Johnson's study, a number of radiocarbon dates have been acquired for the weir that generally accord well with his estimate. When calibrated, these dates fall within the middle to late 3rd-millennium B.C. (See Fig. 6).

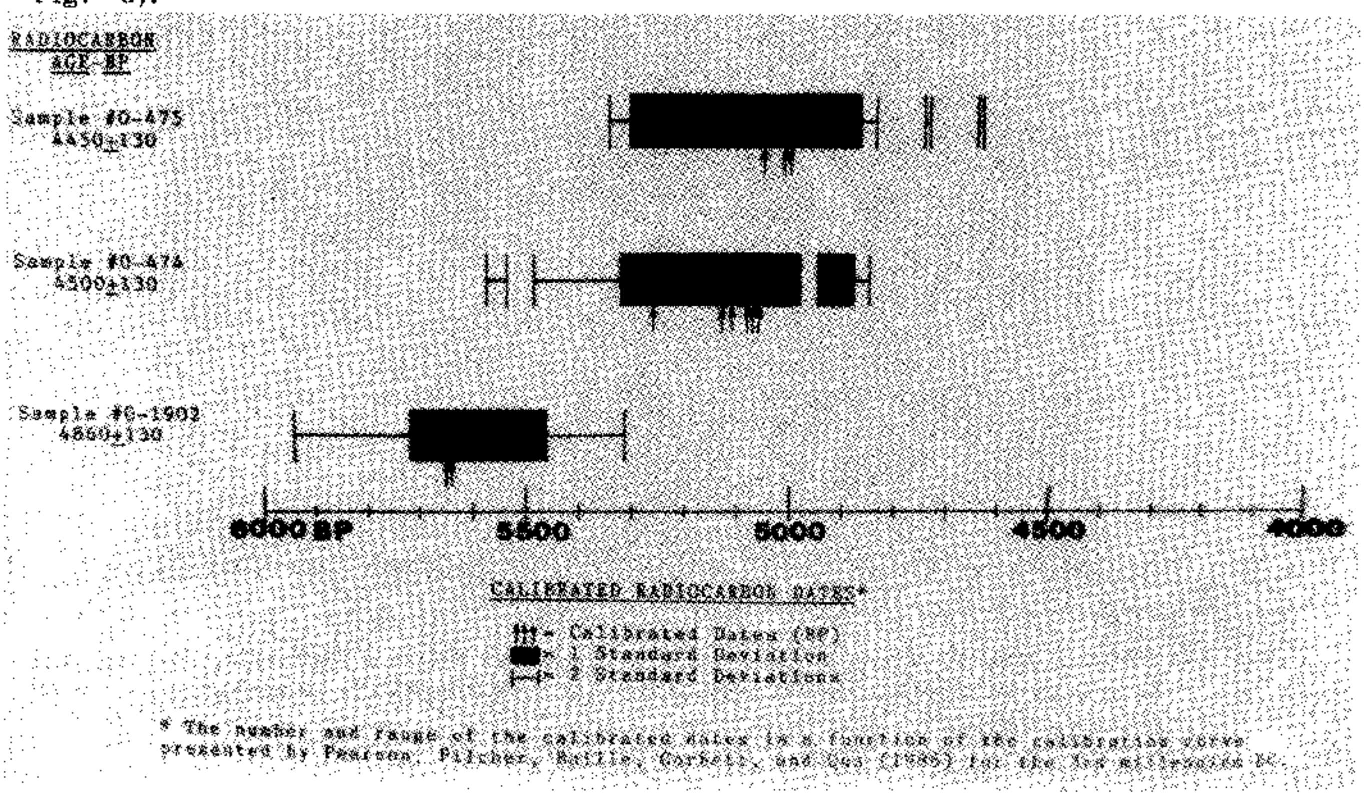

Figure 6. *Calibrated Radiocarbon Dates for the Boylston Street Fishweir.*

Last year, contract work was carried out on an area approximately the size of a city block (Dena Dincauze, personal communication, 1988). Although the data are still being analyzed, radiocarbon dates that were obtained all fall within the range of previous dates. However, it appears that some of the wooden stakes are still older and younger than those which have been dated.

Coffin (1947) reported on weirs that had been constructed both at the mouth of the Housatonic River and at a number of locations upstream along the river. At the mouth of the river, wooden stakes were encountered by oyster men digging down to old shell layers to get shell for their oyster grounds. These stakes were below about four feet (1.22m) of mud and covered by another three feet (.91m) of shell. Like the stakes from the Boyleston Street Fishweir, these stakes were two and three inches (5 - 8cm) in diameter and ranged from three to six feet (.91 - 1.83m) in length. As had been the case at the Boyleston Street Fishweir, the tops of most of the stakes had been twisted off, apparently by some natural process. The stakes, which were spaced about two inches (5cm) apart, were in five rows that extended four to five hundred feet (120 - 150m) from Smith's Point to Nell's Island. To the east were two somewhat shorter rows in a zigzag pattern.

Here again, it is obvious that a substantial effort was necessary to build and maintain these weirs and that the efforts of a number of people would have been required, even if only portions of the weir were being used at any one time. Some level of leadership would have been required to make decisions about the construction of the weir and to maintain the cooperation of the people involved. If these episodes of work on the weir represent a time when smaller social units were aggregating to obtain large quantities of fish, other social activities could also have been taking place. These activities might have included rituals, the obtaining of marriage partners, the exchange of information, and trade.

The weirs along the Housatonic River were of a different type of construction than those discussed previously. Coffin states that rocks, some quite large, were made into walls that extended thirty to fifty feet (9.1 - 15.2m) out into the river. He speculates that the stakes were driven between these rocks to support them against the current. These stakes were identified as red oak. As stated earlier, it may be that these rocks were themselves the weir. However, some of these rock walls may be the remains of weirs used by colonists in historic times (D.F. Jordan, University of Connecticut, Department of Anthropology, personal communication, 1988). Two similar rock walls were located at inlets to Lake Bashan following the lowering of the lake's water level in the fall of 1982 (Pfeiffer 1983). Stone net sinkers found in association with one of these weirs suggest an aboriginal origin for this weir.

DISCUSSION

Weirs present a rather unique opportunity for archaeologists. The likelihood of these features being preserved is greater than for other forms of fishing. Unlike the portable artifacts which are evidence of certain other fishing methods, the weirs represent the major component of a method that had the capacity to yield substantial quantities of fish. In addition to answering questions about subsistence, the weirs provide insight into the ancient settlement patterns and social organization.

The radiocarbon dates for the Boyleston Street Fishweir demonstrate that fish had become an important part of the Indians' subsistence as early as Late Archaic times. The opportunity to exploit the large numbers of anadromous fish that entered southern New England's rivers came at a time of the year when other plant and animal foods would have been available in limited quantities. Many early accounts refer to the Indians' seasonal exploitation of resources. Josselyn (1675:305), for example, states, "Their fishing followes in the spring, summer and fall of the leaf." Fishing thus filled the voids between the time of hunting and the times of planting and harvesting the crops. Weirs would have enabled Indians to obtain more fish than any other form of fishing (Rostlund 1952).

The fact that weirs of the magnitude of the Boylston Street Fishweir were constructed demonstrates that fish were available in quantities large enough to warrant such labor efforts. The presence of these weirs also provides evidence that these people were aware of the habits of the fish in southern New England's waters. More than anything else, it was possibly the fish resources that drew Indian groups to riverine settings.

CONCLUSION

The back seat fishing has taken in many archaeological discussions of Indian subsistence reflects the difficulty of locating sites where there is evidence of this activity. Poor preservation of fish remains and site destruction due to natural causes and construction are only part of the problem. It may be necessary to rethink how fishing sites were selected in the past. Not all locations along a river would have been equally suitable. An understanding of anadromous fish and the techniques employed to exploit them may provide insight into locating these sites and further our knowledge about the Indian's use of this food resource.

ACKNOWLEDGMENTS

I would like to thank Dr. Robert E. Dewar, Dr. Walter R. Whitworth, Dr. Kenneth L. Feder, and Tammy Banks-Spooner for their assistance in the preparation of this paper.

REFERENCES CITED

Carlson, Catherine C.
1988 Where's the Salmon? – A Reevaluation of the Role of Anadromous Fisheries in Aboriginal New England. In *Holocene Human Ecology in Northeastern North America*, edited by George P. Nicholas, pp. 47–80. Plenum Press.

Coffin, Claude C.
1947 Ancient Fish Weirs Along the Housatonic River. *Bulletin of the Archaeological Society of Connecticut* 21:35-38.

DeForest, John W.
1851 *History of the Indians of Connecticut from the Earliest Known Period to 1850.* Wm. Jas. Hamersley, Hartford.

Eaton, Amos
1831 Fish of the Hudson River. *American Journal of Science and Arts* 20: 150–152.

Johnson, Frederick
1942 The Boyleston Street Fishweir. *Papers of the Robert S. Peabody Foundation for Archaeology Vol. 2.* Phillips Academy, Andover, Massachusetts.

Josselyn, John
1833 An Account of Two Voyages to New England, 1638-1663...London, 1675. *Massachusetts Historical Society Collections Ser.* 3, 3:211-354.

Lee, Richard
1968 What Hunters Do For a Living, or, How to Make Out on Scarce Resources. In *Man the Hunter,* edited by R.B. Lee and I. DeVore, pp. 30-48. Aldine, Chicago.

Meader, J.W.
1869 *The Merrimack River: Its Source and its Tributaries.* B.B. Russell, 55 Cornhill, Boston.

Pfeiffer, John
1983 Bashan Lake: 4500 Years of Prehistory. *Bulletin of the Archaeological Society of Connecticut* 46:45-53.

Pearson, G.W., J.R. Pilcher, M.G.L. Baillie, D.M. Corbett, and F. Qua
1986 High-Precision 14-C Measurement of Irish Oaks to Show the Natural 14-c Variations from AD 1840 to 5210 BC. *Radiocarbon* 28(No. 2b): 911-934.

Potter, C.E.
1856 *History of Manchester.* C.E. Potter Publisher, New Hampshire.

Rostlund, E.
1952 Freshwater Fish and Fishing in Native North America. *University of California Publications in Geography 9.*

Thomas, Peter A.
1976 Contrastive Subsistence Strategies and Land Use As Factors For Understanding Indian-White Relations in New England. *Ethnohistory* 23:1.

Warner, Frederic W.
1972 The Foods of the Connecticut Indians. *Bulletin of the Archaeological Society of Connecticut* 37:27-47.

Willoughby, Charles Clark
1927 An Ancient Indian Fish-weir. *American Anthropologist* 29:105-108.

Wood, William
1967 *New England's Prospect.* First published in 1634. Reprinted by Burt Franklin, New York.

THE POINT OF THE MATTER

JEFFREY TOTTENHAM

ABSTRACT

From a shelter I excavated in Oxford, Connecticut, some questions came to mind over a few of the various types of projectile points. They are not questions about distinctive cultural styles or their relationship to other cultures or phases, but questions about the utilitarianism and effect of the points... specifically the different penetration of a point type as opposed to a similar point.

Some of the points from this hunting shelter were the distinguishable Orient Fishtail type; others were notched, and some stemmed with a sprinkling of trianguloids (Figures 1 – 3). I call the shelter a hunting shelter because all that was found were whole or broken projectile points and one wing of a bannerstone. There was complete lack of any domestic goods. Thus, in my limited experience, I called it a hunting shelter.

From my experiences bow hunting, I have come to learn that penetration and the resulting hemorrhaging are the ingredients necessary to kill a deer. Eight of the 60 projectile points I found in the shelter had what looked to me to be unfinished bases (Fig. 1:3,5,7,9,12,14; Fig. 2:38, 40). The other points from the shelter were flaked in the usual manner -- their bases were flaked and finished as sharp as their blades. When a base as sharp as the blade of a point is fastened in the notch of the arrow shaft, the chance of spitting the shaft upon impact is likely.

At first thought, it seemed that the flat base points were that way to save the maker some time in manufacture. Now keeping in mind the penetration needed to cause hemorrhaging, and the sharp wedge shape of a finished base point, it would seem upon impact that the point might be driven up the shaft, splitting it to an extent and thereby reducing the degree of penetration. In fact, I experienced such a mishap with one of my own arrows I had tipped with a finished base point. On the other hand, a point with a flat unfinished base would not be driven to split the shaft upon impact because of its flat surfaces. Indeed, the unfinished base point would have a hammering effect, driving the head and shaft the full extent of their velocity, losing no penetration by the negative shaft-splitting action (Figure 4).

Over the past 10 years I have had much practice in manufacturing arrows. I can knap a stone arrow point in about 10 minutes. Working, straightening, and notching the wooden arrow shaft, however, takes about three days. If the use of flat base points increases the use-life of an arrow shaft, the savings in energy expenditure would be considerable.

Here we have two points similar in shape and size except for the basal finish. What I am questioning is: Is the flat base of some points by design to increase penetration, or is it the inability of the stone worker to shape or thin out this particular piece of material?

If the flat base were by design, learned through the split shaft experience, then perhaps it could be classified as a distinct functional point within an already classified type -- one with a flat base with more penetrating ability for larger animals, but still the same size as the one with finished base with less ability to penetrate the smaller game. Because the two points

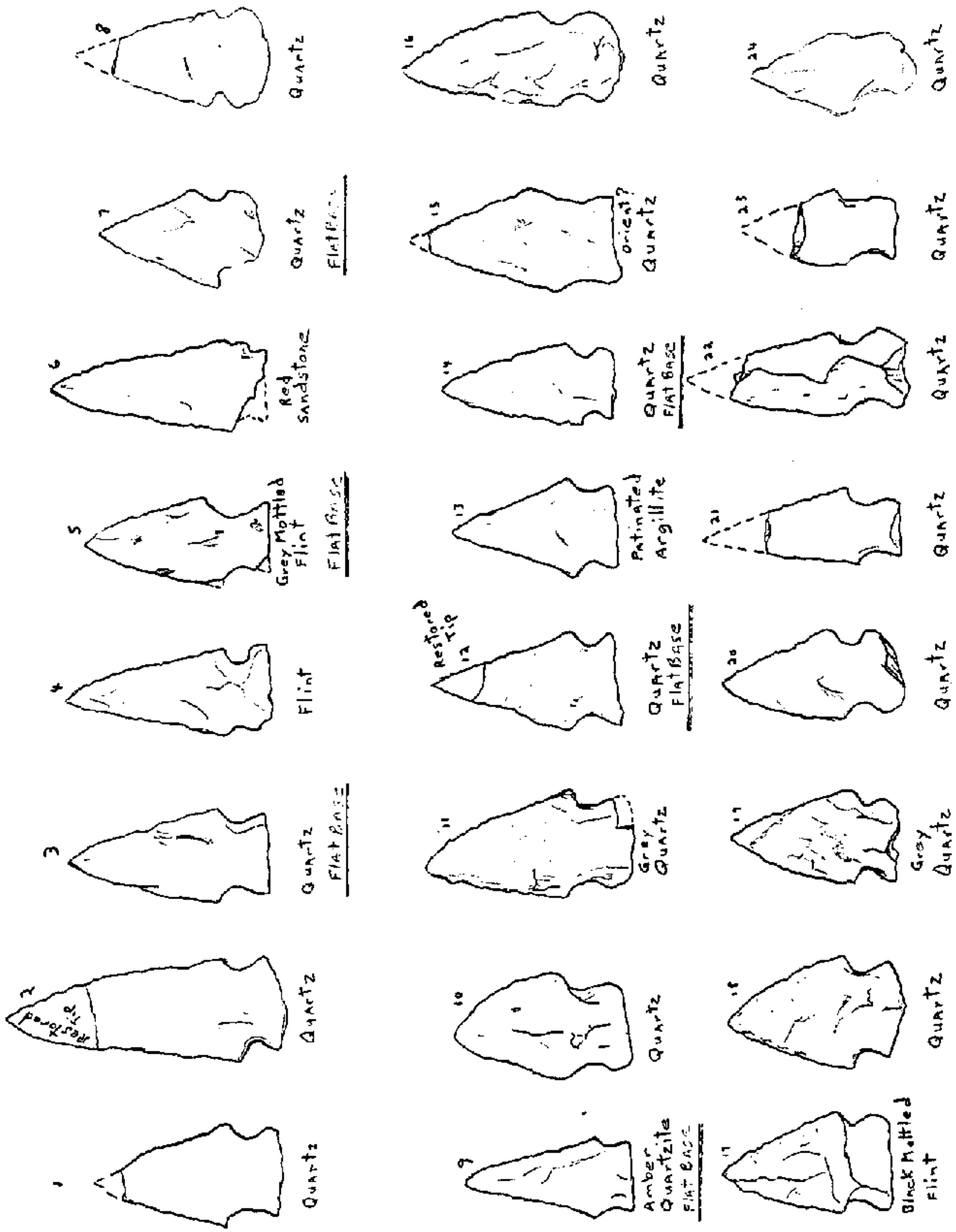

Figure 1. *Projectile points excavated from a rockshelter overlooking the Housatonic River in Oxford, CT.*

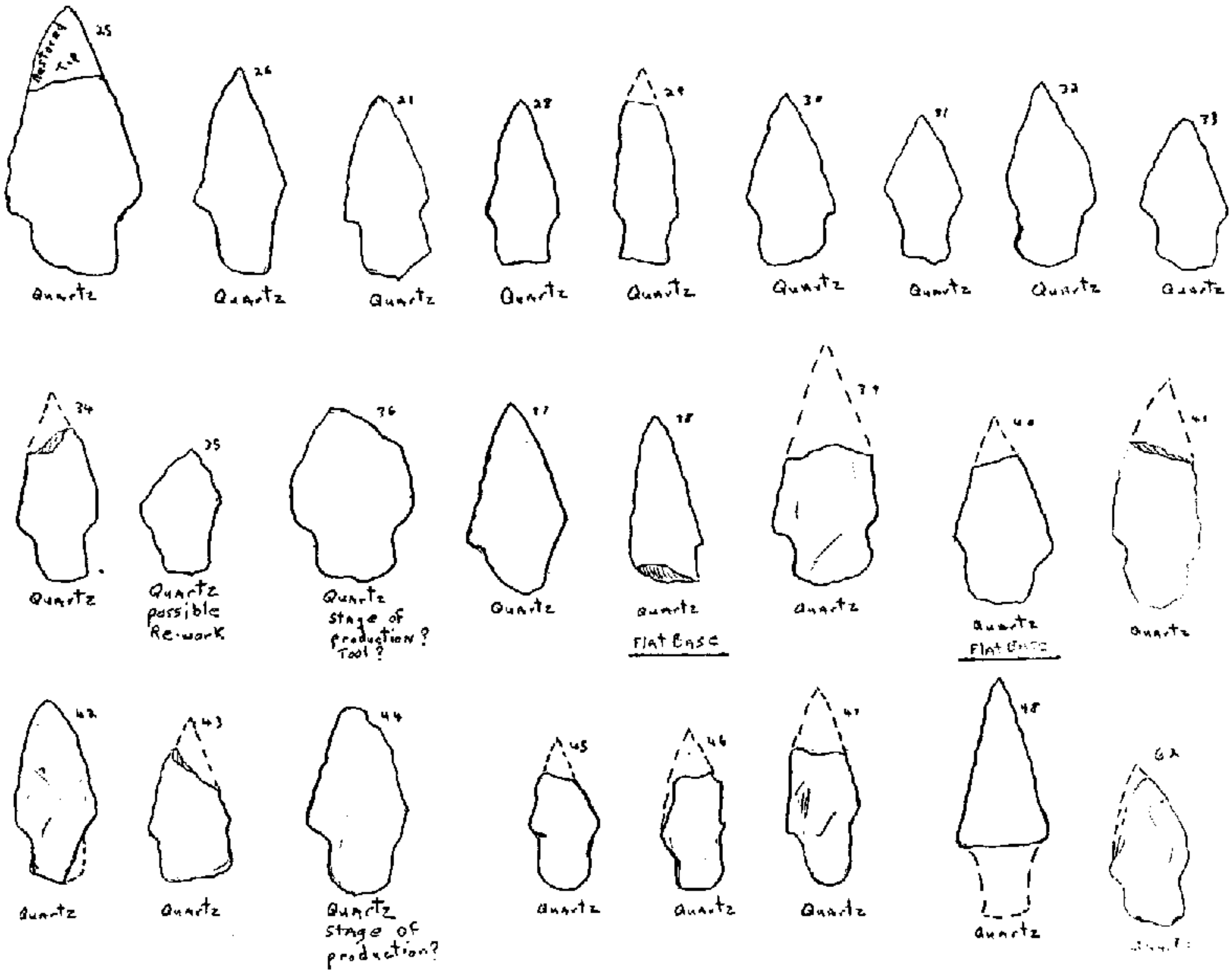

Figure 2. *Projectile points excavated from a rockshelter overlooking the Housatonic River in Oxford, CT.*

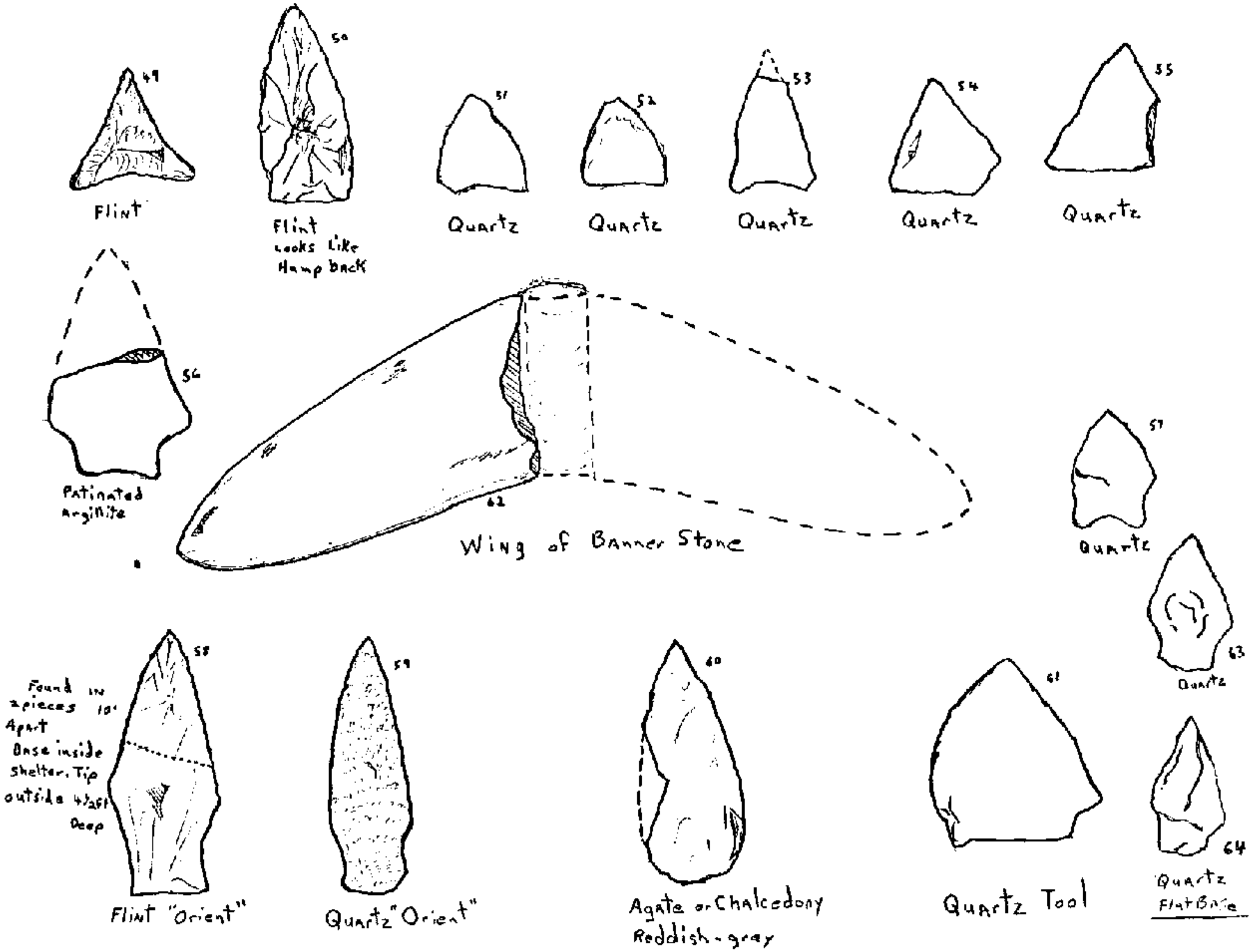

Figure 3. *Artifacts excavated from a rockshelter overlooking the Housatonic River in Oxford, CT.*

were so close in size and shape, it would be unnecessary to create a new style or type for the two functions.

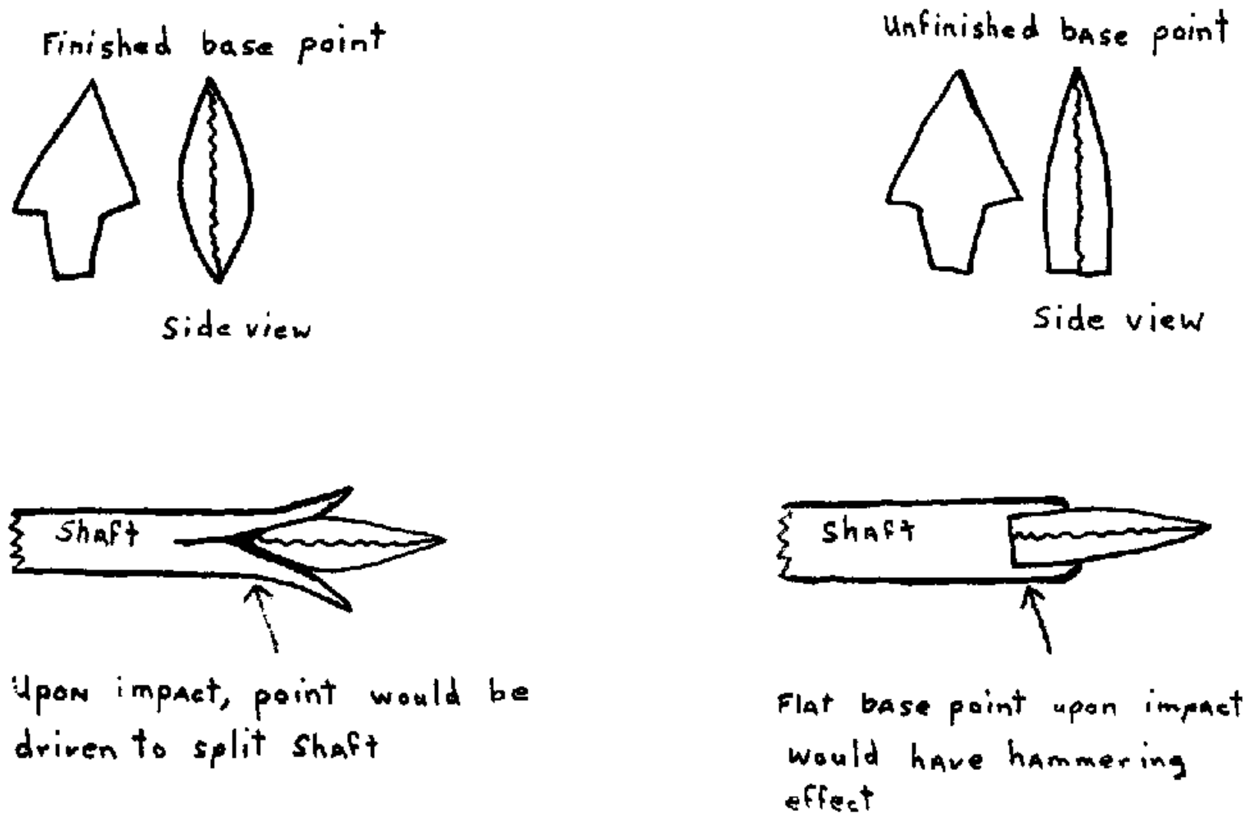

Figure 4. *Comparison of penetrational abilities of finished and unfinished base points.*

In the hafting process, a finished base point could possibly have been used as its own shaft notcher; this would seem an advantage because each point is different and requires a secure customized seat for fastening. Whether from experimentation or haste, the flat-based point in my estimation would have been more lethal.

In my years of collecting, the overwhelming majority of points have the finished base, and I must admit they are more appealing to the eye. From time to time, I have made surface finds of projectile points with unfinished bases, the flat base being the cortex of the cobble from which it was struck.

I would seriously like to believe the flat base points were made with intent, which would give more credence to the adage "simpler is better". The possibility is real.

THE CONTRIBUTORS

JUDITH FARBER ABRAHAM received her M.A. in archaeology from Yale University. She is presently editor of *Archaeotext*, the newsletter for the Archaeology Club of Norwalk Community College, and a field director for the Weigand archaeological contracting firm. Her major interest is shellfish analysis.

MARC BANKS is currently enrolled in the doctoral program for Archaeology in the Department of Anthropology at the University of Connecticut. His primary interests are prehistoric settlement and subsistence in southern New England. He is presently involved in archaeological research in the Farmington Valley.

JORDAN KERBER received his Ph.D. degree in anthropology from Brown University. Currently, he holds a position at The Public Archaeology Laboratory, Inc. in Pawtucket, Rhode Island as co-Director of the Lambert Farm Field School. He is also a member of the faculty at Colgate University.

PETER PAGOULATOS received his Ph.D. in anthropology from the University of Connecticut. He is a member of the archaeological consulting firm, RAM.

LORETTA J. RIVERS is a M.A. candidate in American History and Archival Management at The University of Connecticut, Storrs where she received a B.A. in Anthropology/Archaeology. Currently she is employed as an archival consultant at the CIGNA Corporation, Bloomfield. She has worked on prehistoric and historic archaeological excavations in New England and the Midwest, and as a research, lab, and field assistant for a contract archaeology firm. In addition to being curator of education at the Jefferson County Historical Society and at the Lutz Children's Museum, she was a museum teacher and interpreter at Old Sturbridge Village. Recently Loretta served as archaeological consultant for the initial planning of the traveling exhibit "Preserving Connecticut's Archaeological Heritage."

JEFFREY TOTTENHAM is an amateur archaeologist and primitive technologist.

JOHN CHARLES WITEK is a professional writer, who has pursued regional Long Island archaeology as an avocation for twenty years. He is a member of the New York State Archaeological Association, Metropolitan Chapter, and the Suffolk County Archaeological Association.