NANTUCKET ARCHAEOLOGICAL STUDIES #5

PREHISTORIC SHELLFISH HARVESTING AT NANTUCKET ISLAND.

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4/25/85

Paper given at 1985 Northeastern Anthropology Association Meeting, Lake Placid, New York.

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ABSTRACT.

We establish the geographic distribution of modern shellfish habitat, and describe current low-tech methods and seasons of harvesting shellfish. Contemporary evidence for shellfish harvesting opportunities after storms and for unstable, episodic shellfish habitat has interesting implications for models of settlement patterns and lifestyles of prehistoric Nantucketers. Data on sea level rise and on the effects of storms on the island shorelines allows a preliminary analysis of the distribution and age of prehistoric shell middens.

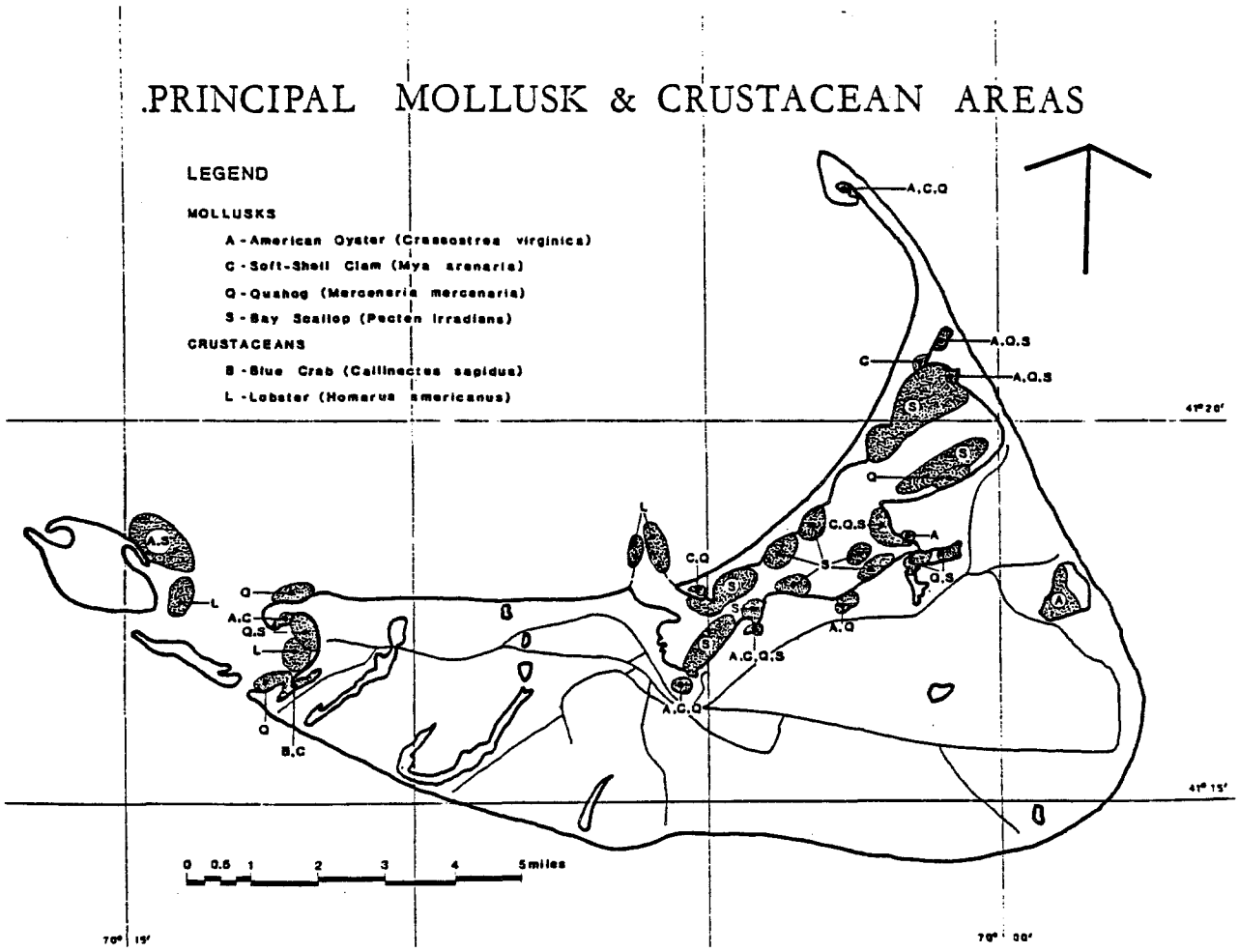

Figure 1. Principal inshore shellfish habitat at Nantucket in 1967 (Zube and Carlozzi 1967:45).

INTRODUCTION.

Shell middens provide archaeologists with high density prehistoric floral and faunal remains. Because of the high visibility of shell, shell middens tend to dominate coastal studies, and there is always a question of what their contents mean about prehistoric lifeways. To approach this question from a new direction, we have used personal experience with commercial (Andrews) and family (Andrews, Little) shellfish gathering at Nantucket and historic sources to assemble data (Little 1985b) and provide a framework to study the harvesting of shellfish found in prehistoric middens at Nantucket. We correct some of the shellfishing assumptions in the archaeological literature, and identify a number of phenomena with potential significance for understanding and analyzing prehistoric shell middens and their geography.

HABITAT AND HARVESTING OF SHELLFISH AT NANTUCKET TODAY.

Habitat and Modern Shellfish Distribution at Nantucket.

Figure 1 shows the modern distribution in sheltered inshore waters and marshes of quahogs, oysters, soft shell clams, and scallops, which are the twentieth century's commercially important local shellfish (Ingersoll 1881; Belding 1909; Rehder 1981; Gibbons 1964; for common and Latin names, see Table 1). Waters protected from winds and waves also provide habitat for carnivorous shellfish: channelled and knobbed whelk, oyster drills, and moon shell snails; and for the hitchhikers: the boat shell and the common jingle shell, which often attach themselves to oysters and scallops. The ribbed mussel and mud basket snail live in the salt marsh peat and mud at the edge of the harbors. A limited number of blue mussels live attached to rare

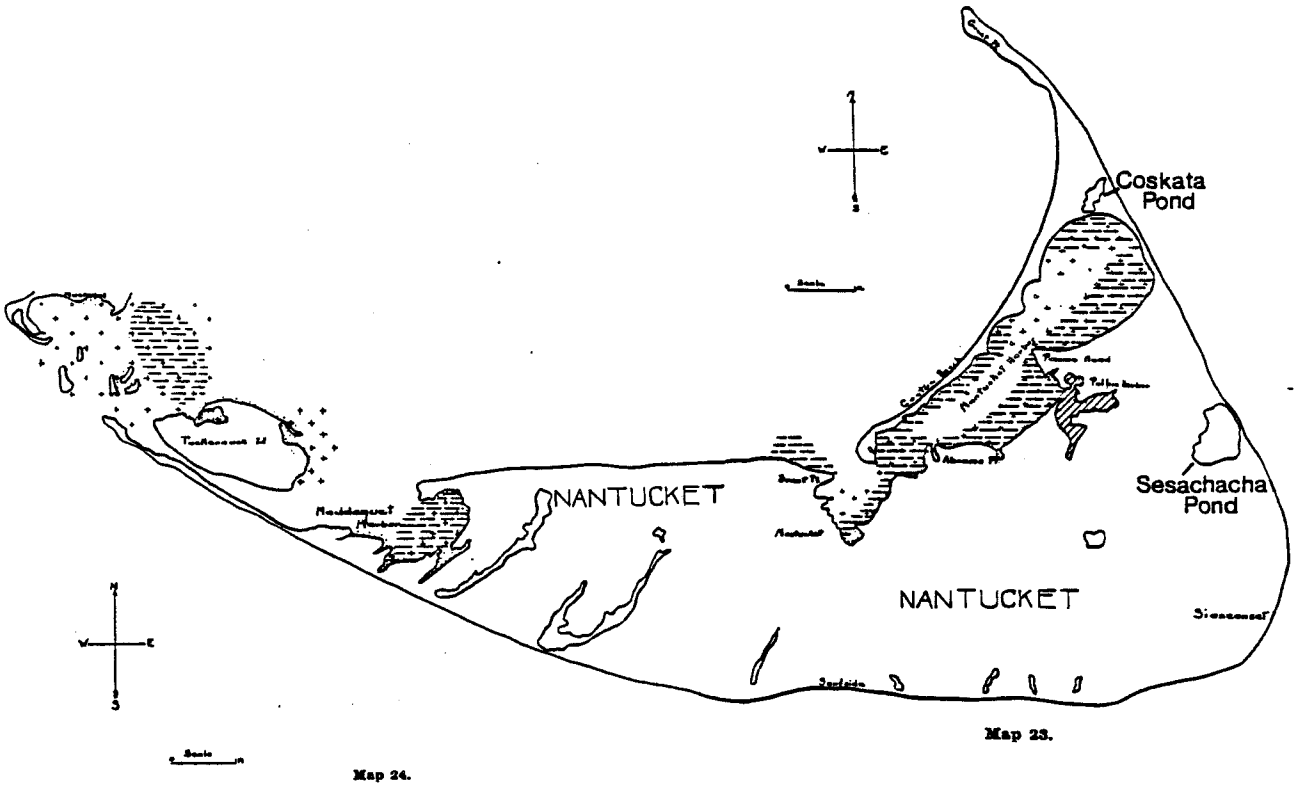

Figure 2. Inshore shellfish habitat at Nantucket in 1909 (Belding 1909). Crosses indicate quahog beds; dots, softshell clams; diagonal lines, oysters; and horizontal dashes, scallops. Note the absence of oysters in Sesachacha and Coskata Ponds.

boulders in the shallows on the north shore and harbors of the island. Some small shellfish of Table 1 are of minor or unknown significance.

In addition to using some inshore habitat, blue mussels also form large mats in water up to 12 meters deep among the offshore shoals south of the island. The surf clam also lives in the shoals off the south shore. This delicacy is the clam served in a national chain of restaurants as fried clams. Quahog, whelk, and scallops also inhabit deep water beds north of the island.

These data, not fully documented in published shellfish habitat maps, indicate that several important species differ in their geographical distribution.

Variations in Shellfish Distribution with Time at Nantucket.

According to Belding (1909), in the nineteenth century pollution and overfishing accounted for substantial reductions in shellfish production in Massachusetts. At Nantucket, in addition to these stresses, shellfish are subject to predators and the shellfish beds, with their unstable sandy substrate, are subject to storm damage, both erosional and depositional, changes in water temperature and salinity due to changes in shorelines and currents, and ice damage in shallow water (Massachusetts Census 1915:639).

Oysters provide a good example of the variations in shellfish abundance observed at Nantucket (Tables 1, 2; Figs. 1, 2). There is a great amount of oyster shell in middens, some dating to 1680 $\pm$ 80 years B.P. (I-9734) (Little 1984), on the borders of Sesachacha Pond, which is at present closed to the sea by a barrier beach. In 1909 Belding showed oysters, transplanted from New Haven, only in cultivated beds in Polpis Harbor, while Sesachacha was a fresh water pond (Belding 1909:158; Fig. 2). And finally, in 1967 (Fig. 1) oysters were growing in small numbers in Sesachacha Pond.

TABLE 1. SHELLFISH SPECIES USED (+) AT NANTUCKET (NAMES AFTER ABBOTT (1974)).
A) RANKED BY RELATIVE PREHISTORIC USE AT NANTUCKET (Little 1979,1984)
B) 17th CENTURY MASSACHUSETTS (Brereton 1602; Williams 1963; Wood 1865)
C) 1782 NANTUCKET (Crèvecoeur 1971)
D) 1875 " (Massachusetts Census 1875)
E) 1885 " (Massachusetts Census 1885)
F) 1909 " (Belding 1909)
G) 1915 " (Massachusetts Census 1915)
H) 1967 " (Zube and Carlozzi 1967; Little 1985b).

Species:	A	B 17C.	C 1782	D 1875	E 1885	F 1909	G 1915	H 1967
Mercenaria mercenaria (quahog)	+	+	+	+	+	+	+	+
Crassostrea virginica (oyster)	+	+	+	+		+		+
Mya arenaria (softshell clam)	+	+	+	+	+	+	+	+
Busycon carica & *B. canaliculatum* (knobbed and channeled whelk)	+	+						+
Argopecten irradians (scallop)	+	+			+	+	+	+
Crepidula fornicata (boat)	+							
Spisula solidissima (surf clam)	+	+	+					+
Polinices duplicatus, *Lunatia triseriata*, *Lunatia heros* (moon)	+							
Mytilus edulis (blue mussel)	+	+						+
Geukensia demissa (ribbed mussel)	+							
Urosalpinx cinerea (oyster drill)	+							
Buccinum undatum (waved whelk)	+							
Anomia simplex (common jingle)	+							
Ilynassa obsoleta (mud basket shell)	+							

TABLE 2. SOME HISTORIC COMMERCIAL SHELLFISH HARVESTS (IN BUSHELS) AT NANTUCKET (MASSACHUSETTS CENSUSES OF 1875,1885,1895,1905,1915),(* "planted").

SPECIES	1875	1885	1895	1905	1915
Clams	30,000	775	718	208	225
Quahogs	2,500	600	1,465	4,346	115,216
Scallops	----	590	17,240	200	32,875
Oysters	500	---	---	560*	---

In the nineteenth century there was some commercial soft shell clamming for local consumption (Table 2), but today there is only a town regulated winter family season, and quahogs and scallops are Nantucket's major commercial shellfish. As possible examples of changing cultural preference, bay scallops and blue mussels have only been commercial food products in New England since 1881 (Belding 1909; Table 2), and about 1964 (Gibbons 1964; Table 1), respectively. Some of these variations are worth pursuing further.

Episodic Shellfish Development.

Episodes of shellfish development occur after storm waves, carrying shellfish larval forms, overwash or breach barrier beaches into freshwater ponds, and have been recorded for the past 37 years in at least six ponds (Andrews' Records 1947-). Andrews' Records, which were obtained by monitoring and recording shellfishing visits to ponds, provide valuable chronological data. At Coskata Pond, a fresh water pond flowing into the upper harbor at Nantucket, a storm of 1944 enlarged the outlet, which by 1946 had stabilized to allow a regular influx of salt water. After 1947, the pond was dominated sequentially by a florescence of quahogs (1947-51), oysters (1950-51, 1954-57), and, with the establishment of eel grass, scallops (1951-57). Some soft shell clam seed was observed, but not many mature clams. Since 1975, thick eelgrass and a developing shoal at the entry have inhibited salt water circulation and essentially terminated the 30 years of shellfish habitat. Ancient salt and fresh marsh peat in this pond testify to previous salt water incursions.

Methods of Harvesting Shellfish at Nantucket.

Hand collecting, feeling with one's hands and feet, diving, using collecting nets, digging, or raking (Ritchie 1969; Braun 1974; Rainey 1956) are all possible methods of gathering shellfish in the relatively shallow

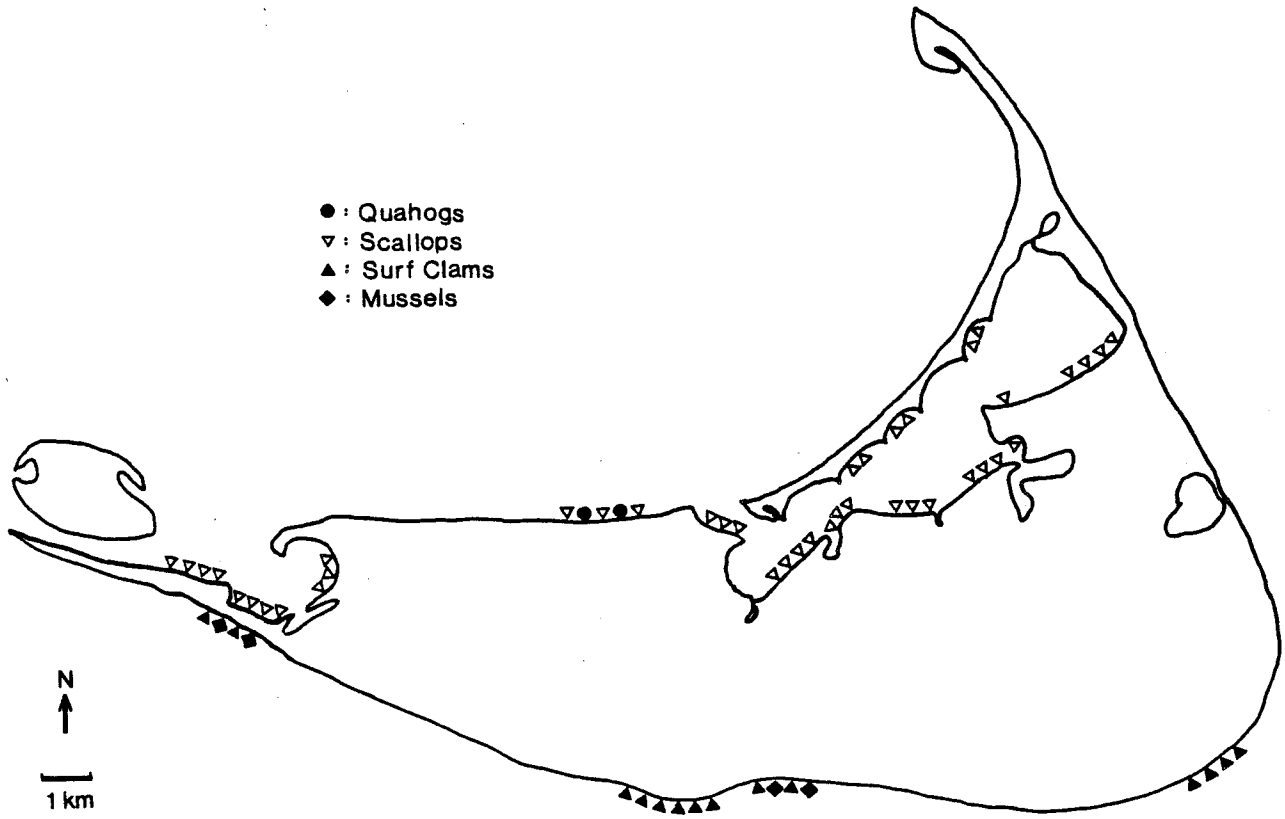

Figure 3. Areas along the shores of Nantucket Island where Quahogs, Bay Scallops, Surf Clams, and Blue Mussels are most often cast ashore by storms (after map and records of J. Clinton Andrews (Little 1985b)).

waters of Nantucket Sound and harbors (Fig. 1).

In addition, shellfish in deep water habitat, such as scallops, surf clams, and mussels primarily, but also whelk and quahog, can be gathered in sometimes considerable numbers live from beaches where they have been cast up by storms (Fig. 3). In the fall the eel grass leaves die, and the first large fall or winter storms drive great quantities (wagon loads (Belding 1909:85) or tons (D.C. Edwards 1984, personal communication)) of scallops onto downwind harbor shores in windrows. Similarly, high onshore winds and waves cast up surf clams and mussels on the south shore. With the exception of scallops, most shellfish close their shells when disturbed and can survive out of water for many hours.

Harvesting the seafood cast up by the sea has not always been considered seriously in the archaeological literature (Osborn 1977), nor is it well documented. However, William Wood at Lynn in 1634 mentioned surf clams, "as big as a pennie white loafe, which are great dainties amongst the natives", and reported that the sea, at Nahant, "after stormes, casts up great store of great Clammes, which the Indians taking out of their shels, carry home in baskets" (Wood 1865:38, 44). Here is ethnohistoric evidence of a method of shellfish harvesting still practiced at Nantucket Island.

Whales (Little and Andrews 1982), fish, and lobsters are also cast up on Nantucket beaches, dazed but not necessarily dead. A seafood harvester who knows which wind and sea direction is apt to cast up resources on which beaches, will schedule an immediate search after a storm at certain beaches to collect any gifts of the sea promptly, before birds or insects get to them. Fresh and unusual varieties of seafood harvested from the beaches add to the already high quality of life on the island.

Seasons of Harvesting Shellfish at Nantucket.

Some shellfish species may be and have been harvested any time of the year (Little 1985b; Wood 1865:35; Williams 1963:139), and some have, without the use of high technology, a limited season of greatest availability. Oysters, soft shell clams, and quahogs are available all year round. Whelk come inshore at Nantucket in early summer to spawn, and are easily available in numbers only at that time. As Roger Williams reported in 1643, the Indians of Narragansett Bay used to "...store up [whelk] shells in Summer against Winter whereof to make their money" (Williams 1963:180). Scallops spend the warm months in deep water protected in eel grass, and, together with surf clams and mussels, are most easily gathered near shore after the first big storm after a period of calm. Although storm dates are unpredictable, large storms usually arrive during the fall and winter. These findings differ from the summer shellfishing hypotheses of the literature (Snow 1980:230; Perlman 1973). Note that, since it is possible to obtain a shell or two of any of these species at any time of year, their presence in a shell midden is not evidence for the season of collection.

Implications of Unstable Shellfish Habitat for Settlement Patterns.

In unstable habitat, the response of shellfish to storms has important implications for prehistoric lifestyles at Nantucket. Not only are shellfish harvesting opportunities created by storms, but episodes of enhanced shellfish production are created in fresh water ponds by shellfish seed washed over barrier beaches during storms. Modern Nantucketers have sometimes dug temporary channels through barrier beaches to allow fish and shellfish larval forms to enter the ponds, a practice which might have ancient roots. Man's use of unstable shellfish habitat requires post-storm, seasonal, and annual monitoring of changes in habitat. The episodic availability of

shellfish can provide an explanatory mechanism for Ritchie's model of episodic prehistoric use of certain shell middens at Martha's Vineyard (Ritchie 1969:234).

PREHISTORIC SHELL MIDDENS AT NANTUCKET.

The most abundant shellfish species found at most prehistoric Nantucket middens (Table 1) are generally the same as today's commercial species,- quahogs, oysters, soft shell clams, whelk and scallops. Although all the shellfish of Table 1 are edible, that they are in shell middens does not prove that they were eaten. The presence of predator shellfish and hitchikers may be adventitious, and surf clams, scallops, whelk, and quahog shells had uses in addition to their role as food byproducts (Little 1985b).

The Distribution and Age of Prehistoric Shell Middens at Nantucket.

Nantucket's prehistoric shell middens, of which 56 have been inventoried, are almost all found less than one kilometer (Figure 4) from protected bodies of salt or brackish water, such as Nantucket Sound, the harbors and a few ponds (Little 1979, 1983; Figure 5; Ingersoll 1881:14). The oldest projectile point styles as yet documented as associated with shell at Nantucket are Woodland Period styles as old as 2700 years (Little 1979, 1984; Luedtke 1980b; Ritchie 1969). Therefore, although our data are limited, we form the hypothesis that shorefront up to one kilometer from sheltered shellfish habitat (Fig. 5) will probably contain shell midden, and the midden will date only to the Woodland Period. Naturally, we shall try to challenge and falsify these initial findings.

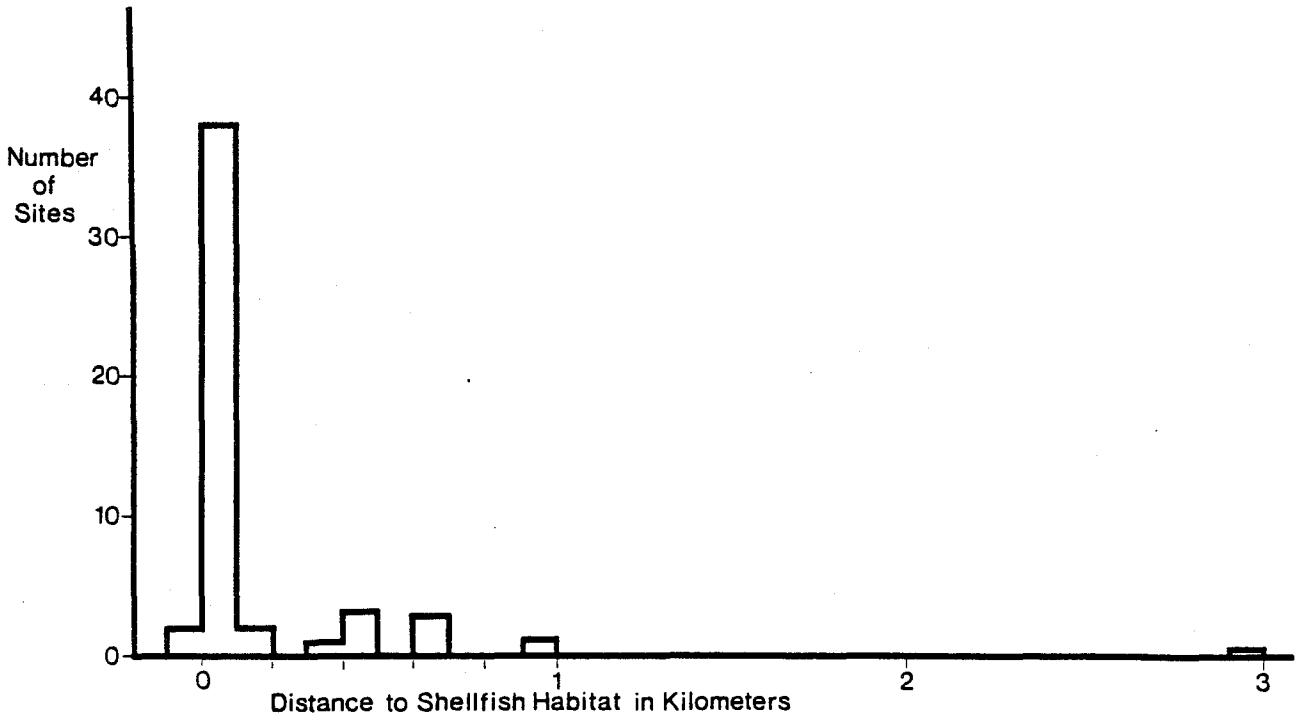

Figure 4. Number of inventoried prehistoric shell midden sites per 100 m (Little 1979) as a function of their distance to salt water, showing the increase in number as one approaches salt water. The ease of site discovery at an eroding shore bluff contributes to the shape of this graph. Seven historic shell middens have been omitted.

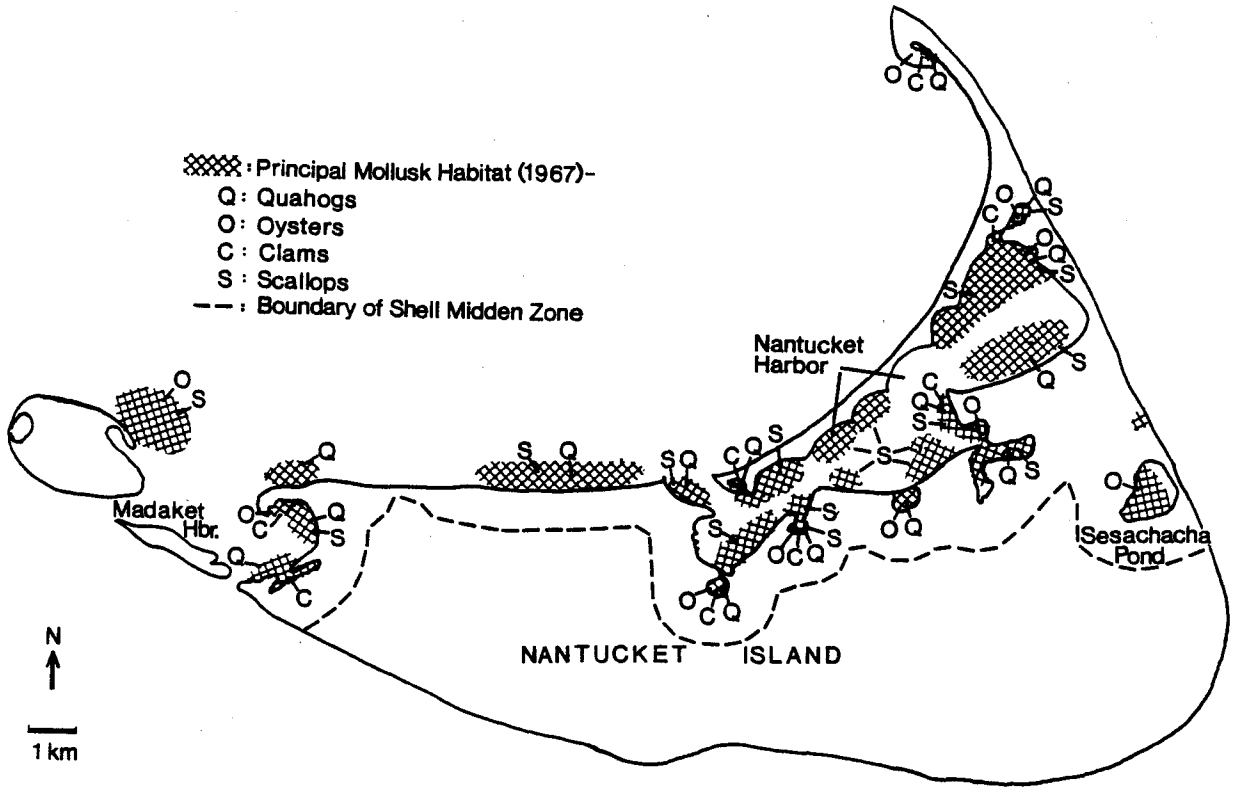

Figure 5. High density zone of prehistoric shell middens up to one kilometer (dashed line) from shellfish habitat in protected waters at Nantucket (after Zube and Carlozzi (1967) with additions by J. C. Andrews; Little 1983).

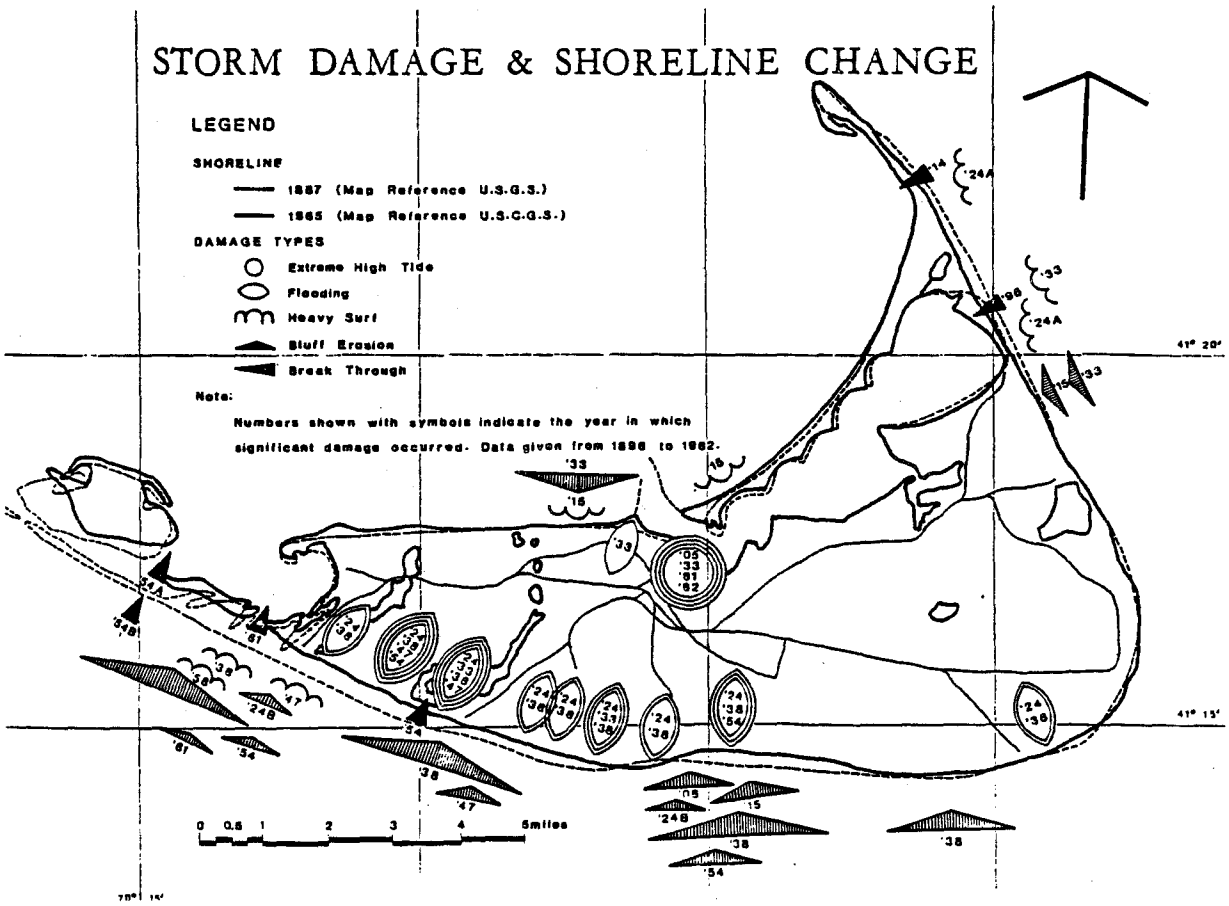

Figure 6. Storm damage and shoreline changes (extreme high tides, flooding, heavy surf, bluff erosion, break through) at Nantucket since 1896 (Zube and Carlozzi 1967), showing the chief shores impacted by the sea. Details of shoreline changes since 1846 are given by Gutman et al. (1979).

The correlation of shell midden with sheltered waters makes sense on several dimensions. Shell is heavy to carry far from the water. The north shores of the island, with the hills of the glacial moraine for winter wind protection, boulders and lacustrine clay deposited by the Late Wisconsinan ice, surface fresh water springs and ponds, marine resources, boat launching sites, and woods, are generally richer in resources than the dry, flat outwash plains of the south half of the island (Little 1985a; Oldale 1981; Langlois 1977; Walker 1980). We shall assume, however, that the south shore with its freshwater ponds was used for fishing, shellfishing, and hunting, as it is today. Where then are the shell middens of the south shore?

Several natural phenomena can explain the shell midden distribution at Nantucket. The rapid erosion of unsheltered shores of the island by storm seas (Figure 6) eliminates any accumulation of shell middens on those shores. The eight meter rise of local relative sea level during the past 4000 years (Figure 7) also contributes to the shore erosion. By its horizontal advance (transgression) on the land the rising sea can account, too, for a lack of Archaic shell midden along the shores of the harbors. Not only would the rising sea have drowned Archaic sites, but if the transgressing sea did not reach the harbor during the Archaic Period, Archaic shell middens may never have existed here (Snow 1980:180).

Because tidal scouring and sand deposition have changed the underwater topography, we cannot establish the dates of the sea's transgression into Nantucket Harbor from our present depth data. The oldest C-14 date published for the Harbor at the base of Folger Creek salt marsh is about 1700 years B.P. (Fig. 7). However, if shell middens have always accumulated less than one kilometer from salt water, an interesting means (Dincauze 1973) of establishing the date of arrival of salt water at various shores around the harbor would be to obtain dates for the oldest shell at archaeological sites.

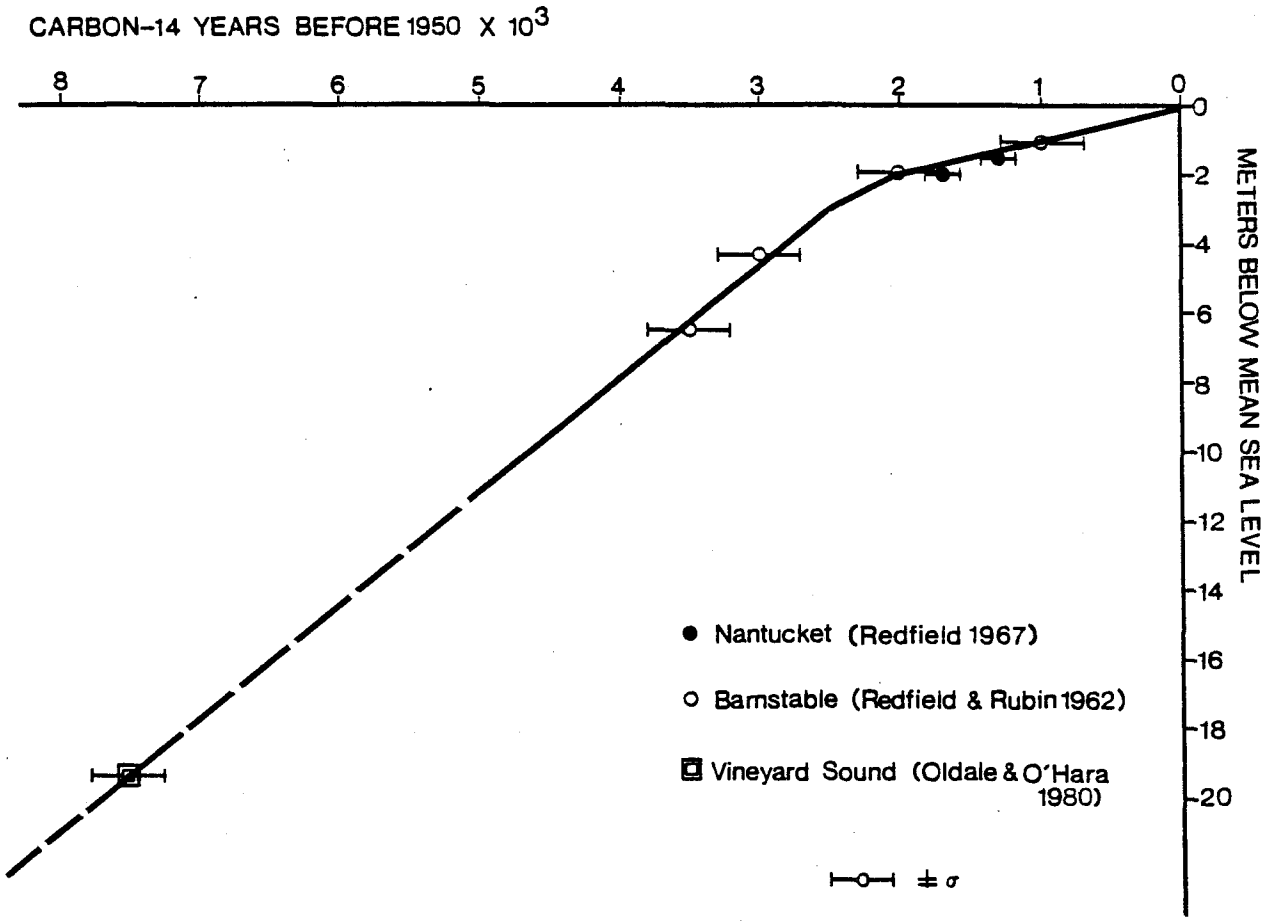

Figure 7. Relative sea level as a function of time for the past 7000 years on the coast of Southeastern Massachusetts. The tidal range at Nantucket is 0.7m or less.

Implications of Rapid Shellfish Adaptations.

Evidence for rapid shellfish adaptation to new habitat raises the question of whether shellfish habitat has always accompanied the rising sea in southern New England. If we base our calculations on the present shallow floor of Nantucket Sound (NOAA 1975; Luedtke 1979; Fig. 7), the average rate of transgression of the sea in Nantucket Sound between 5000 and 3000 years ago may have been as high as 4m/year. In other words, whereas Braun (1974) has proposed coastal stabilization for Vineyard Sound at the end of the Late Archaic as the rate of sea level rise decreased, we may be seeing shoreline destabilization in Nantucket Sound at that time.

Under the conditions asssociated with rapid transgression of the sea, Braun (1974) and Oldale (1985) suggest there might have been no shellfish habitat, and Dincauze (1981) has predicted rapidly changing shellfish habitat development. The first hypothesis would seem to require a sterile sea, since Andrews' Records (1947-1985) provide evidence for rapid shellfish growth, less than 3 to 13 years for spawn to reach maturity, in new and unstable habitats such as those which may have always accompanied the Holocene rise in sea level in Nantucket Sound.

SUMMARY.

We have shown that shellfish are harvested at locations, seasons, and with methods which vary with the species. The unstable sandy substrate, acted on by storm winds and waves, provides both cast up shellfish on beaches after storms, and transient, episodic shellfish habitat in shore ponds.

Prehistoric shell middens appear to be limited to a zone less than one kilometer from the borders of today's sheltered waters, and appear to be no

older than 2700 years. We suggest that beach erosion patterns and a rising sea level can account for the observed midden distribution and age. The model thus established requires testing. Unstable shellfish habitat probably has characterized the leading edge of the transgressing sea near Nantucket Island for the past 4000 years.

Geographical, chronological and cultural data obtainable at Nantucket today on rapid changes in shellfish distributions can contribute to an understanding of prehistoric geography and settlement patterns, similar to but with interesting variations from those being reported for other New England coastal sites (Ceci 1977,1982; McManamon 1984; Luedtke 1980a; Barber 1982; Yesner 1980; Sanger 1982; Spiess, Bourque, and Cox 1983).

ACKNOWLEDGEMENTS.

We thank Ken Kelley, Shellfish and Marine Department, Town of Nantucket, for current data on shellfish, D. Craig Edwards, Zoology Department, University of Massachusetts, Amherst, for guidance to the Latin names for shellfish, and Barbara Luedtke, University of Massachusetts, Boston, for helpful editorial advice. Joseph H. Hartshorn, Dena F. Dincauze, and Robert N. Oldale, have been generous with their advice and support.

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