MAINE
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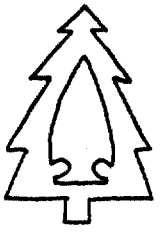

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MID-COAST WASHINGTON COUNTY 2281

by Robert L. Burns

During the summer of 1968, because of contact with several individuals who were actively engaged in collecting Indian artifacts, I had an opportunity to "go digging" with one of them. What started as a curiosity trip has become a hobby, which has provided many hours of field and study activity.

Most of the books in the public library and obtainable from local people dealt with western or mid-western Indians. Some of the information was adaptable to my situation and locality, and with the advice of friends, especially about marking and recording, a one day trip was launched into an enjoyable pastime.

All of my collecting has taken place in Washington County, and most of it in the coastal area of Jonesport and Addison. This is an area of relatively extreme tides, many embayments and islands, and two of the larger rivers in the county.

Shellheaps are quite numerous in this area, as I understand they are to the west along the Maine coast. This, then would tend to indicate a seasonal migratory pattern similar to the Kennebec and Penobscot areas.

The shellheaps in this area are in general, made up of soft shell clams, with a few welk and snail shells intermixed. One shellheap, however, contained a large number of scallop shells.

Shell depth varies from 8-10 inches, and very seldom 12 inches or more. None of the heaps are very large, and generally do not exceed 60-70 feet of frontage on the water. All are within 4-500 feet of a fresh water supply, even those on the islands.

Only one workshop area has been located near a shellheap. This was located on higher ground. Approximately 100 whole and broken artifacts were found that had eroded out of the soil.

Most of the heaps contain a large amount of charcoal blackened dirt, which becomes very gummy when wet and yet seems to penetrate several layers of clothing as dust.

Much of coastal Washington County still displays glacial features, and is made up of deposits left by the last glaciation. Some of the materials, of which the aftifacts found were made, are native to this area. However, the best materials came from glacial deposits or were "traded" into this area.

Quartz, quartzite, chert, jaspers, and quartz like materials were used extensively, as was black felsite. A felsite identified as being from the Mt. Kineo deposit was occassionally used. Since none was left as drift cobbles by the glaciers, it must be classed as a "traded in" item. Pinkish quartz and agate (chipped and whole pebbles) have been found, and swell the traded list some more. Nova Scotia is reported to be the nearest agate source.

Before describing the more common artifacts recovered, it is well to consider that certain types of stone tools were not in common use if the fact of their absence is any indicator. The adze was one of these, with only 3 whole and broken specimens found. Only one abraiding stone has been recovered, and to date, just six step edge scrapers - ranging in size from 5/8 to 7/8 inch in length.

Worked bone items were either not widely used or have not survived. A few notched harpoon or arrow points have been recovered. Most are in poor condition.

Pottery sherds contain both shell and sand tempering. All pieces are thick and crude in appearance. Some decorating is evident.

Animal bones are occassionally found, and the teeth of beaver, woodchuck, moose, seals, and possibly deer have been identified.

A cutting tool form, which I understand is not found to the west of this area is the circular knife. These are found to the east of the area in which I have done most of my work. They are very interesting and drawings of two in my collection are included.

It will be noticed that various base types are present in the points that are shown. Other base forms are depicted for reference. The somewhat extreme length of many of the points is interesting. Workmanship on these long, narrow points is generally very good.

Many of the knife forms, I am told, are common along the Maine coast, and several of these are depicted.

Also, one item, possibly a graver, is included in the drawings. The crooked tip was obviously for cutting or groving softer materials.

Two examples of points found along the Machias River are included to show both their difference and similarity to those of the Addison-Jonesport area.

The area, covered by this report, has never had, as near as I can ascertain, a serious amateur or been studied by a professional archaeologist. There appear to be no reports of work other than Moorehead's in the early 1900's. Thus, I have very little back log of information to draw from in attempting to piece together a picture of prehistorical Indian activity in the central coastal portion of Washington County.

However, the more I learn the more interesting the search becomes. As more information and material is gathered, further reports will follow.

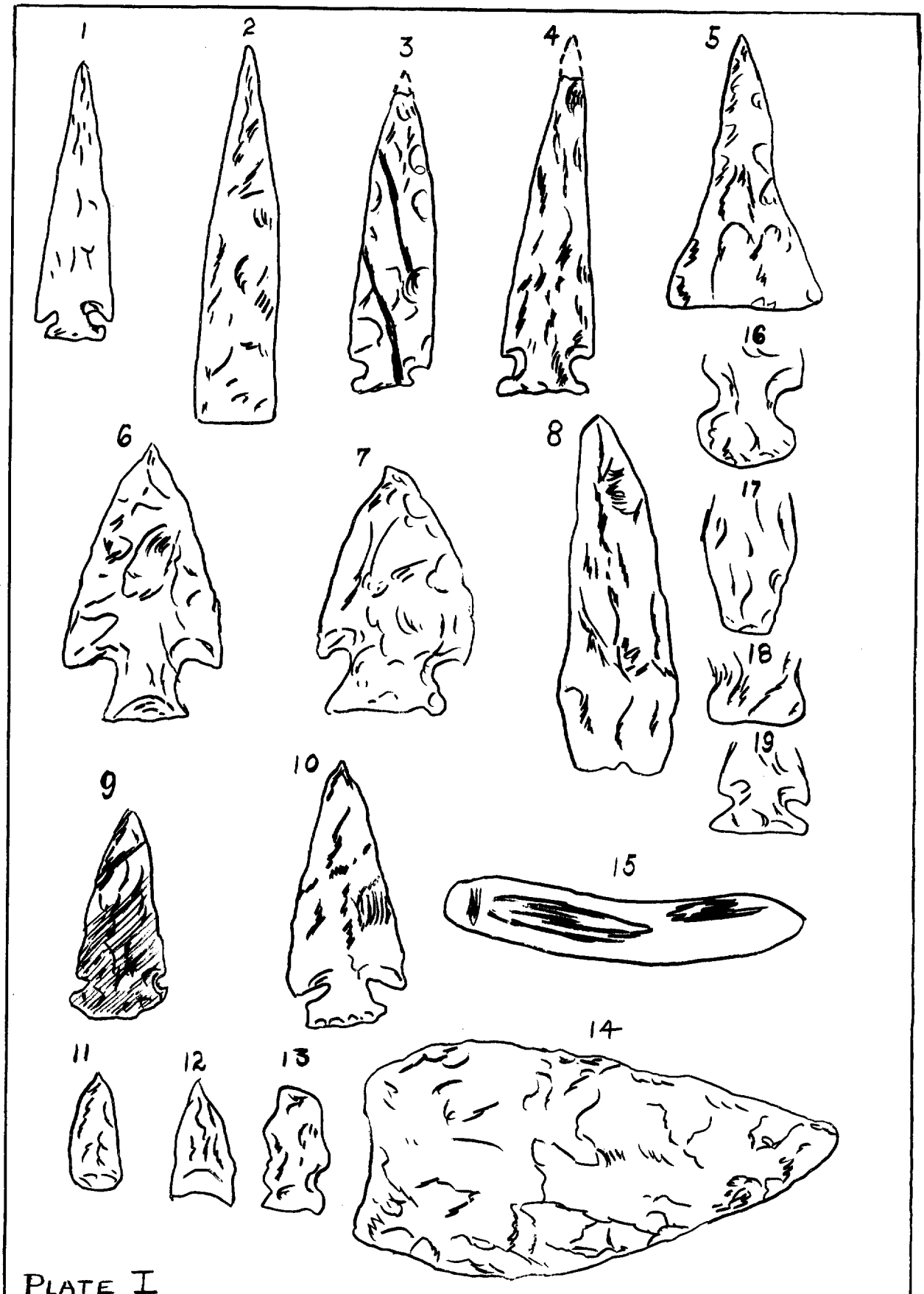

PLATE I

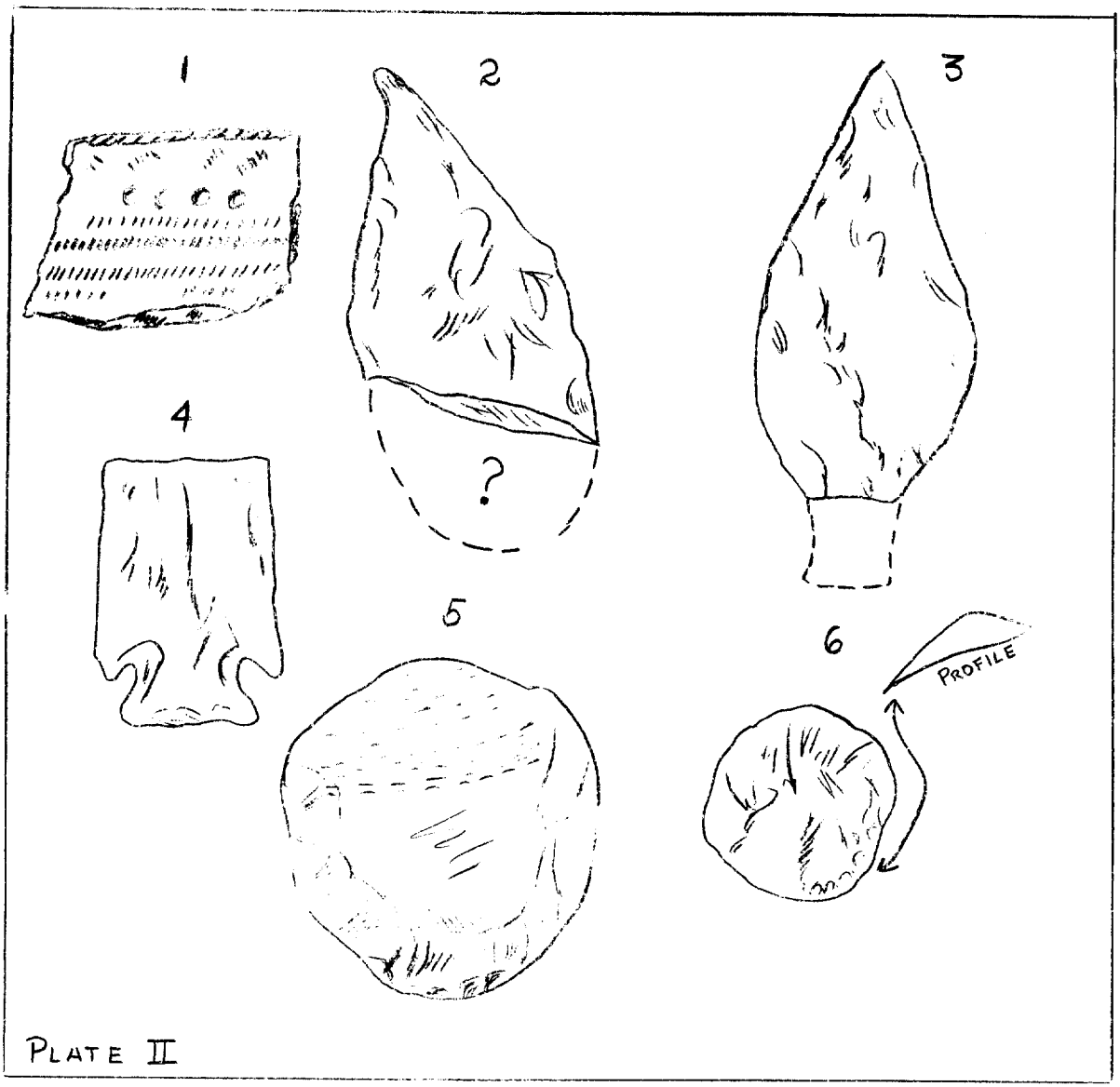

PLATE II

Plate I *No. 1, 7/8" by 3"; No. 2, 13/16" by 3 5/8"; No. 3, 13/16" by 2 5/16"; No. 4, 7/8" by 3 3/8" (remaining); No. 5, 1 1/2" by 3 1/8" from Machias River; No. 6, 1 3/16" by 2 15/16"; No. 7, 1 5/8" by 2 1/4"; No. 8, 1 3/8" by 4" (possibly a knife); No. 9, 1 13/16" long, from Machias River; No. 10, 1" by 2 3/4"; Nos. 11, 12, 13, some of the smallest artifacts found; No. 14, Knife; No. 15, abrader - not to scale; Nos. 16, 17, 18, 19 - other base forms.*

Plate II *No. 1, Pottery Sherd; No. 2, Graver (?); No. 3, Spear Point; No. 4, Base of Spear; Nos. 6, 7, Round Knives - full scale.*

SOME CHARACTERISTICS OF MAINE COASTAL KITCHEN MIDDENS 2282

Robert L. Dow

Volumetrically coastal kitchen middens in Maine consist almost exclusively of the shells of three species: the soft shell clam, Mya arenaria; The hard shell clam or quahog, Mercenaria mercenaria; and the eastern oyster, Crassostrea virginica.

In general, each midden will be dominated by one species. Coastwide the most important species has been the soft clam. A few middens in Casco Bay may be almost wholly quahogs or alternating strata of clam and quahog shells. In the Damariscotta area the dominant species occupying the largest middens has been the eastern oyster.

Only clams, oysters, and quahogs were consistently shucked and appeared in large numbers in Maine kitchen middens. These are the only species which the evidence conclusively shows were utilized by prehistoric people. It is inferred that some other species of marine invertebrates were also eaten (principally whelks, mussels, and the other clam species), but these animals were apparently harvested incidental to other shellfishing efforts.

Shells from the major Maine kitchen middens near Salt Bay of the upper Damariscotta Estuary have a C14 age range from 1600 to 1900 years $\pm$ 250 BP. Accumulation of the middens could very well have spanned an 800-year period commencing shortly after the climatic optimum when sea level in Maine was approximately 20 feet lower than it is today. Pine stumps only moderately older have been found in place both intertidally and subtidally in southwestern Maine.

The oyster shells on the west shore of Salt Bay are all that remain of much larger middens which spanned both sides of the bay. The shells were burned for lime about a century ago. Local records and photographs suggest that before they were destroyed the middens contained the shells of approximately 1.5 billion commercial size oysters, which as living animals would have

a current producer value of about $5 million. Extinction of the population has been attributed to smothering pollutants; sawdust, bark, edgings, and other sawmill and boatyard debris; and to increased salinity associated with coastal submergence.

Frequently remains of 20 to 25 species of marine animals other than mammals and birds will be found in kitchen middens. Possibly because they are less resistant to weathering and to bacterial reduction, the shells of arthropods (lobster, crabs, shrimp, and barnacles) and the tests of echinoderms are rarely found.

Among shell and test fragments occurring in middens are the following:

Oyster	Crassostrea virginica
Clam	Mya arenaria
Quahog	Mercenaria mercenaria
Razor clam	Ensis directus
Hen clam	Spisula solidissima
Truncated boring clam	Barnea truncata
Rough piddock	Zirfaea crispata
False angel wing	Petricola pholadiformis
Arctic rock borer	Saxicava arctica
Green sea urchin	Strongylocentratus droehbachiensis
Blue mussel	Mytilus edulis
Horse mussel	Modiolus modiolus
Ribbed mussel	Modiolus demissus plicatulus
Sea scallop	Placopecten magellanicus
Moon snail	Polinices heros
Mud snail	Nassa obsoleta
Boat shell	Crepidula fornicata
Limpet	Acmaea testudinalis
Waved whelk	Buccinum undatum
Dog whelk	Thais lapillus
Neptune whelk	Neptunea decemcostata
Thin whelk	Buccinum tenui
Whelk	Buccinum donovani
Whelk	Colus stimpsoni
Common barnacle	Balanus balanoides
Acorn barnacle	Balanus balanus
Rock crab	Cancer irroratus
Hermit crab	Eupagurus pollicaris
Macoma	Macoma balthica

Some of these are shown in Figure 1.

In the Basin area of Phippsburg is a stratified midden containing alternating layers of hard and soft shell clams. This alternation of quahogs and clams suggests a climatic cycle comparable to that which occurred between 1939

and 1967 in Maine. During this cycle, soft clam abundance was greatly reduced by predation associated with record high sea temperatures and quahog abundance was greatly increased by optimum spawning and growing temperature conditions. Mean annual sea temperatures and production of the two species are shown in Figure 2.

The lower stratum of quahog shells in the Basin area contains artifacts of apparent similar age to those in the C14 dated middens at Salt Bay.

Since the average clam in the Maine commercial fishery is five years of age, the full effects of temperature variations with their accompanying fluctuations in predation are not evident until five years later. Clam production associated with the temperature period 1939-1948 when mean annual temperature was 46.2°F. averaged 6.6 million pounds of shucked meats. In the high temperature decade when annual means were 49.8° F., associated clam production was 2.1 million pounds. During the declining temperature decade when temperature averaged 46.7° F. clam production averaged 3.3 million pounds. Since fecal bacterial closures of clam growing areas have increased drastically since 1947, actual clam supply today is greater than it was during the 1939-48 period.

During the same cycle, quahog response to temperature fluctuations was direct. When temperature averaged 46.2° F. for the decade 1939-48, quahog production averaged 120 thousand pounds of shucked meats. With the high temperature decade 1949-58 when annual means were nearly 50° F., quahog production averaged nearly 400 thousand pounds. With the 1959-68 temperature decline to an annual mean of 45.7° F., quahog production declined to less than 25 thousand pounds.

1939, the second coldest sea surface year on record, with an annual mean temperature at Boothbay Harbor of 43.5° F., was followed by a continuous warming trend that terminated in the record high of 52° F. in 1953. Thereafter, temperature declined rapidly to 45.1° F. in 1967 (Figure 3).

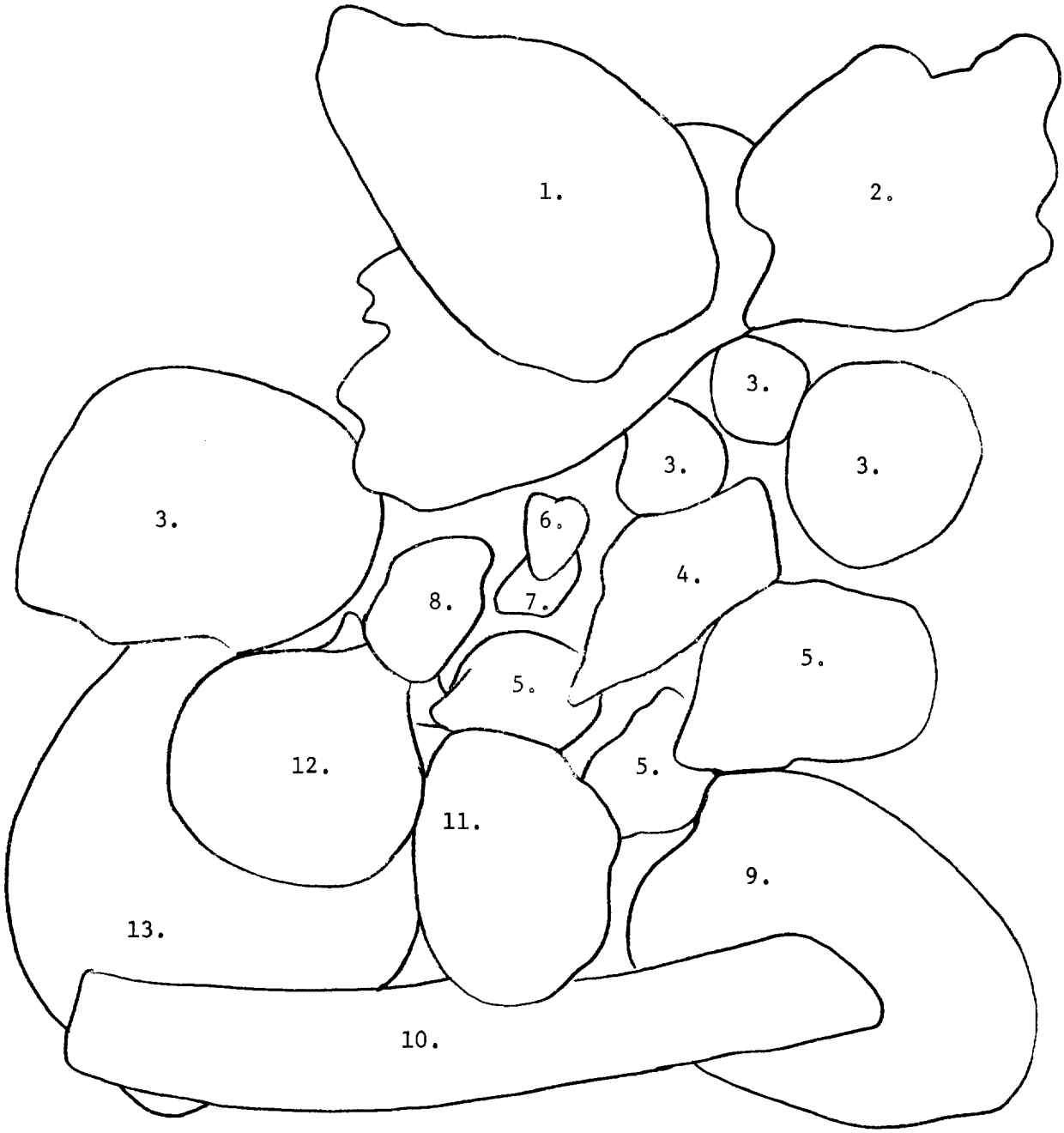
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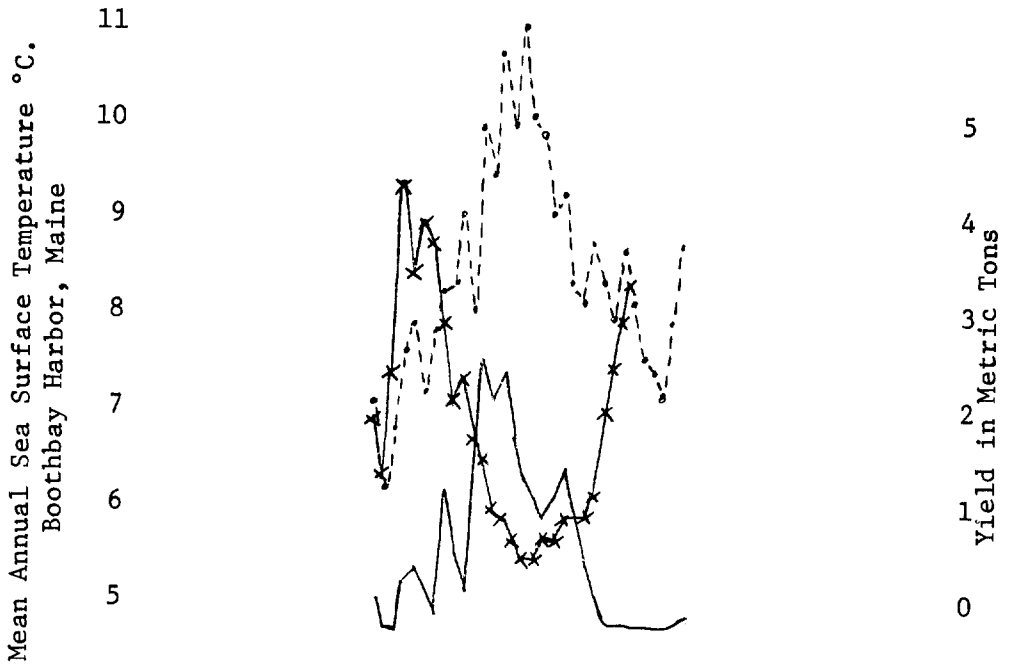
Figure 1

Figure 2

Hard and Soft Clam Abundance
in Relation to See Surface Temperature
1938-1969



Temperature

Hard Clam Yield, Hundreds of Metric Tons, Same Year

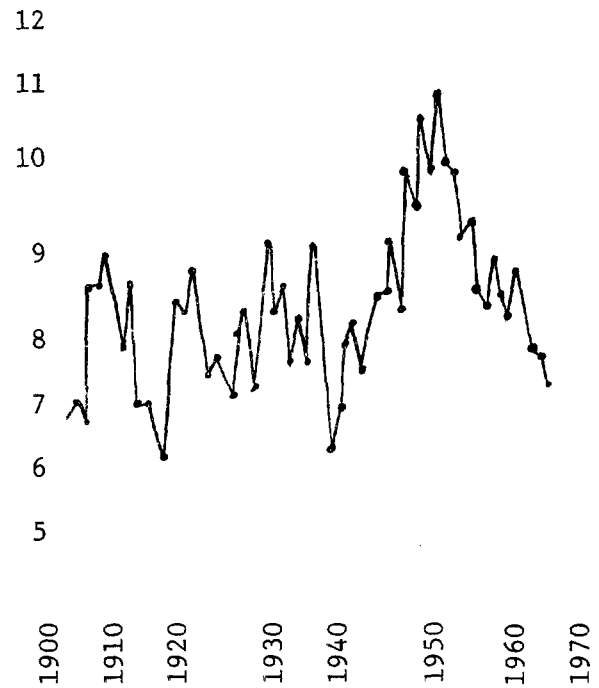
Soft Clam Yield, Thousands of Metric Tons, 5 years Later

In a 1968 personal communication, Dr. Hurd Willett, professor of meteorology at M.I.T., discussed solar activity related climatic cycles and probable future trends:

> "Insofar as the sunspot cycles are able to impose the major pattern of climatic fluctuation, there are two cycles to be considered primarily in middle latitudes. The double sunspot cycle (20-24 years) favors zonal westerlies and cool sea surface temperatures going into the minor sunspot maximum; i.e., in the middle sixties and presumably again at the end of the eighties, and cellular blocking and warm sea surface temperatures off our northeast coast going into the major maximum, early fifties and presumably again in the middle or late seventies. The effects of this cycle are noticed more or less equally all year round.

Figure 3

Sea Surface Temperature - Boothbay Harbor, Maine
Measured by U. S. Fish & Wildlife Service
1905-1967



> "The 80-90 year cycle favors maximum zonal westerlies and minimum water temperatures during the first 20-30 years, presumably 1960-1985, and cellular blocking and maximum water temperatures during the last 20 years, 1937-1957, and probably not again before the next century. The effects of this cycle are much more clearly evident in the summer half than the winter half of the year.
>
> "Assuming then that these two solar cycles continue into the future to affect atmospheric circulation and sea surface temperature pretty much as they have in the recent past, then the next warming of the double cycle, in the middle and late

seventies, should be somewhat suppressed, in summer very strongly so, compared with the levels reached in the early fifties, by the fact that we are coming into the coolest portion of the 80-90 year cycle, whereas in the early fifties we were in the warmest portion of that cycle. The next cool period of the double cycle, at the end of the eighties, may well find all sea surface temperatures somewhat lower than they are at present, and in particular the summer temperatures at the lowest levels of your entire observational record, and probably as low as they are likely to get for most of the next century."

On the basis of Dr. Willett's comments, it would appear that we are well into an inter-oyster and quahog low abundance cold period which will continue until the 21st Century, except for a suppressed warming period between the mid-1970's and 1980's when some population recovery of the two species is likely to occur.

From studies of kitchen middens, post-glacial marine fossil assemblages, and living species, it is inferred that when oyster and quahog shells were being accumulated the sea temperature was several degrees higher than it was in 1953. The alternation in strata of hard and soft clam shells indicates that prehistoric climatic cycles probably corresponded to those since 1905 as recorded at Boothbay Harbor by the National Marine Fisheries Service.

Oysters and hard clams are relatively shallow water species and are frequently fossilized. Since they do not appear in any post-glacial fossil assemblages in Maine, it is likely that they did not occur in Maine waters until well into the climatic optimum some 4000 to 7000 years ago when sea temperature had risen following the post-glacial sea intrusion.

# # # # # # # # # # # # #

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"Lamont Natural Radiocarbon Measurements, III," W. S. Broecker, J. L. Kulp, and C. S. Tucek, Science 124: 158-159, 1956.

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Following the death of Jerry Dunn, Mrs. Dunn gave me some correspondence he had had with numerous individuals in regard to local archaeology and the Maine Archaeological Society, which he founded. Most of the letters were merely replies to some that Jerry had written. However, one individual did everything right, and put his answer on the back of each letter sent to him. Thus, both sides of the conversation were available.

From these letters, which I value because I had the pleasure of knowing both writers, it was possible to locate an extremely productive Indian site - the subject of this report.

# #

A BLUE HILL BAY COASTAL MIDDEN SITE 2283

by LLOYD H. VARNEY

The site, a small midden is situated on the easterly side of an island in Blue Hill Bay. It is well protected from most storms, and is high enough to escape flooding or storm wave action.

The midden is on a very small point, has a beach area to the northwest, and a protected inlet on the opposite side. There is limited shellfishing in the immediate area.

Reddish granite underlays the point, and much of the immediate area, and makes up most of the outcroppings and boulders between the midden and the water.

A small wet run, which must be spring fed, empties into the extreme end of the inlet, and undoubtedly supplied the fresh water for the prehistoric encampment. No investigation has been conducted to locate the site of habitation.

This island has been populated in the not too distant past, although it is not presently inhabited. At one time a public school existed to serve the island children.

The area of the midden, it is reported, was also the site of a boat yard at one time. The small inlet provided a good, deep water, protected launching site. Such activity left little other than a few old nails to show it ever existed above the high water mark.

The soil in the vicinity is a gravely, mineral soil, shallow, with some humus near the surface, and, has liberally mixed into it, red granite ranging

from small grain size to pieces several inches across.

The soil composition at the site is much the same as that of most middens, being composed of native soil mixed with charcoal, shell and other debris. Some layering was evident, but not to the extent observed at other locations.

The total deposit, except in rare pockets, seldom exceeded 12-15 inches in depth, with the most of it in the 6-10 inch range. Overall area, not computed accurately because of the irregular shape of the point, was judged to be about 1/4 acre.

Most of the shells observed were of the soft shell clam. Occassional thin layers of purplish shell fragments indicated some use of blue mussels. A few bones, which had also been found in other middens and identified as fish bones, were observed, as were several plates from sturgeon.

One feature noticed almost immediately was the low ratio of bone to stone artifacts recovered as compared to that of a large, and very deep midden on an adjoining island where the reverse has been observed.

Seven trips have been made to the site, and future trips are anticipated. Fog and rough water conditions have caused cancellation of several attempted visits. One day's activity was climaxed by the necessity of a rescue by the U. S. Coast Guard due to a severe storm.

At the time of the first visit to the island it was evident that someone had been at the site and had coarsley "clam hoed" the edge of the midden next to the inlet. On a trip during the second summer of excavation, two men were found to be tenting at the site. In one and one half days they had hoed up much of the deposit. A later trip showed that they had completed their destruction of the area, leaving only the shallow perimeter and pockets which were deeper than clam hoe tine depth and generally unproductive.

The total amount of chipped, pecked, ground stone, and worked bone artifacts at this site can not even be intelligently estimated. The number of whole and broken items recovered by the writer, his two sons, and another individual who made only one trip, was much greater than from any other site pre-

viously is not known.

In addition to the stone and bone material, pottery was also found. A fairly large number of sherds from one pot were recovered and have been reassembled. It is possible that more of it could have been located, but before the next trip was made, the area had been destroyed. The individuals involved saved none of the pottery they found, so that a second "reworking" might produce enough material to pay for the effort. However, matching would be nearly impossible.

All pottery sherds recovered have grit temper, and some of the base pieces display a definite rounded as opposed to conical base form. Decoration is both on and below the rim on the outside.

A listing of the items recovered would serve no useful purpose. Each has been cataloged or appropriately marked and data relative to it recorded. The types of artifacts, shapes or forms, employed, materials used, and quality of workmanship seems of greater value. This information will uspply a better picture of the tools and artifacts of everyday life at the time this midden was being deposited, and of the ability and need of the people.

The Massachusetts Archaeological Society's identification and classification system is used throughout. Drawings of extremes or variations are depicted full size to provide a better comparison of the range of size, form and workmanship that appears to be representative of the area.

Turtle Backs
(Plate I)

What these stones were intended to be, if they had a future use, poses a problem. Rather they were blanks or cores cannot, with certainty, be answered. That they definitely were meant to serve a purpose must be assumed, since they are present at most coastal and inland sites.

Of varying shape and size, all eight examples recovered, have roughly the same profile - one side flattish to slightly curved, and the other definitely humped.

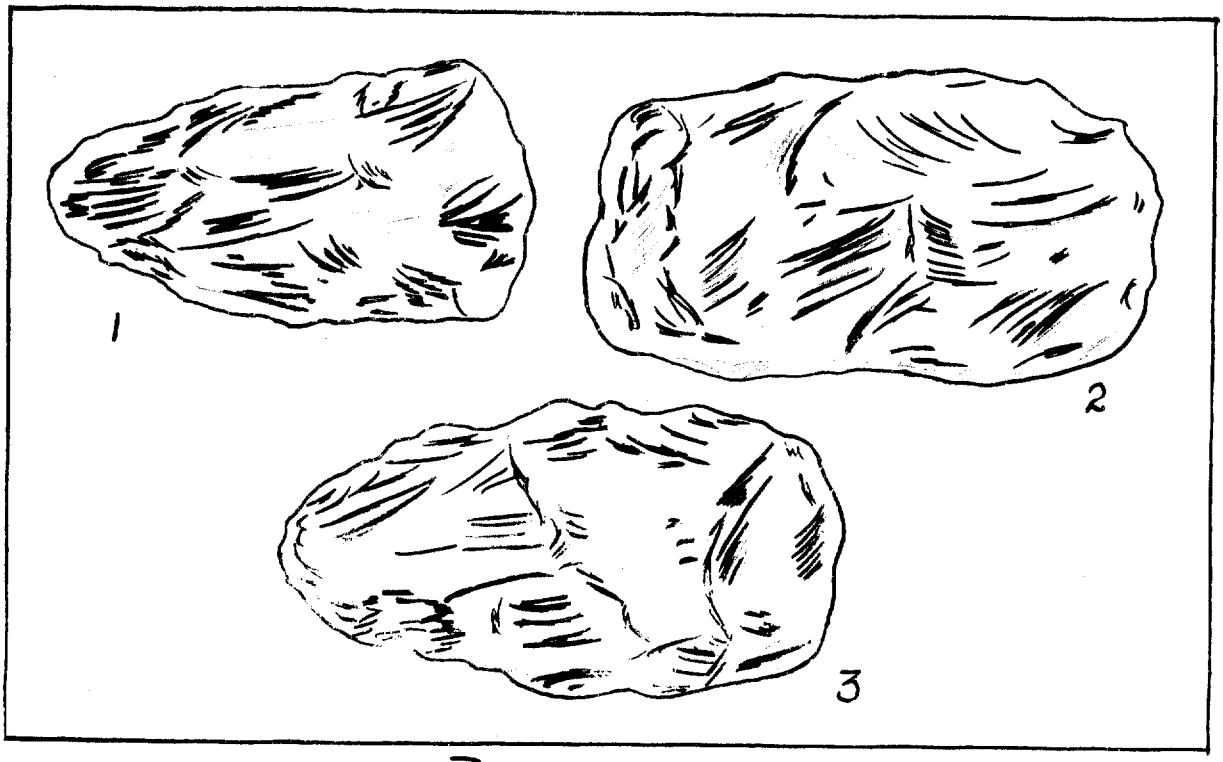

PLATE I

No. 1, material unidentified; No. 2, Quartzite; No. 3, Kineo Felsite.

Below:

Nos. 1 to 6, Arrow points or fish hooks; No. 7 to 10, portions of harpoons; No. 11, reproduction of possible use of Nos. 1-6; No. 12, Bone flaker.

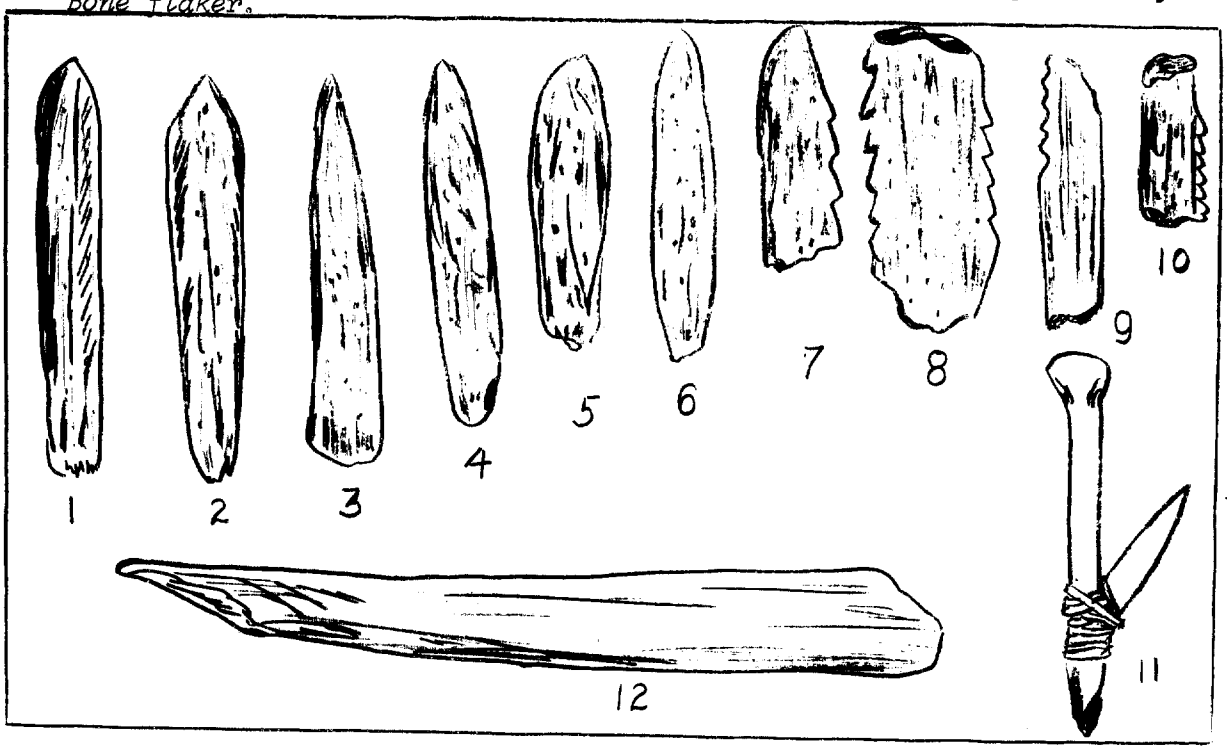

PLATE II

Bone
(Plate II)

Animal, fish, and bird bones were not numerous, but were scattered throughout the deeper areas of the midden. Perhaps more bone material was originally present, but the lack of shell depth and acid soil reduced the survival of such items.

Teeth and pieces of jaw bones were also recovered. These have been identified as being from deer, moose, bear, seal, and beaver. Some of the beaver teeth had been worked by grinding to produce a cutting edge - perhaps as blades for the Indian originated crooked knife.

Worked bone pieces included portions of harpoons, awls, horn and bone flakers, and a number of items variously identified as parts of fish hooks or points.

Projectile Points
(Plate III)

No effort has been made to differentiate between arrow and spear points, since there is most certainly an overlap at the high and low size range of the two.

Materials consist of white quartz, quartzites, banded jasper, Kineo Felsite, black felsite, red and black jaspers, and several unidentified materials.

Workmanship varies with the material to some degree. However, crudely finished specimens were recovered, which had been made of what appeared to be the best of materials.

Forty-one whole pieces were recovered, as well as over 100 bases, tips, and mid sections from broken points. Including the broken items, this group produced the largest number of recovered artifacts.

If the work of classifying is correct, the largest grouping of projectile points are those in the "Side Notched" category.

Nos. 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 18 - Side Notched, most of which display characteristics which indicate manufacture during the Ceramic period.

Nos. 8, 15, 16 - Truncated - another relatively large group of points.

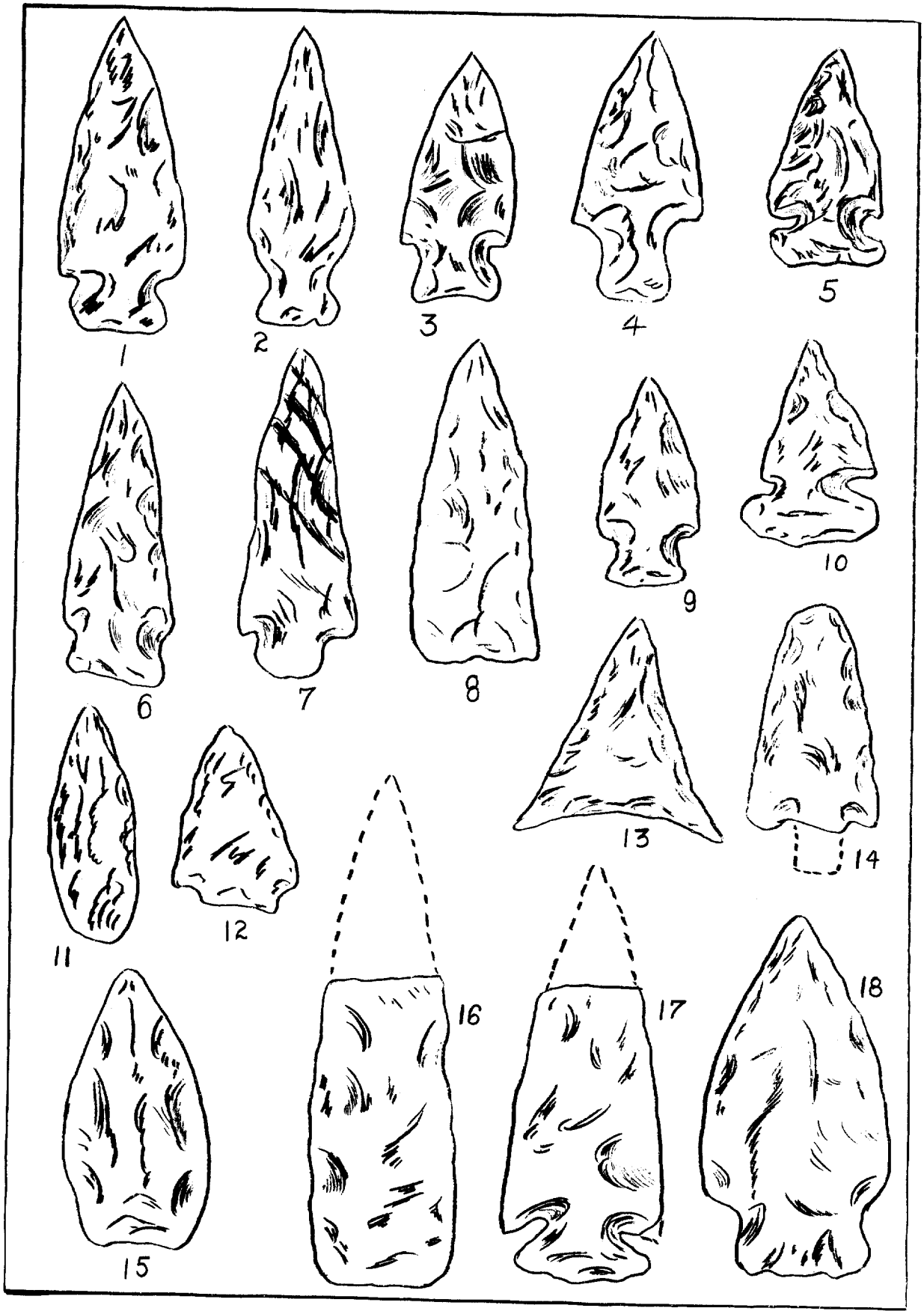

PLATE III

Usually well made.

No. 11, Leaf. Several other examples were found.

No. 13, Triangular. One of two such types recovered.

Nos. 14, 17 - Corner Removed - a not too common base type.

Scrapers (Plate IV)

Nearly 50 examples of this tool were recovered, indicating that wood and/or bone work was practiced by these peoples. The types varied slightly, with less difference in size, material, or workmanship than any other group of chipped stone artifacts.

Individual specimens appear to have been made for right, left, or either handed use. Double ended scrapers were also recovered.

These tools were made, mainly, of the better materials. Red and black jaspers, quartz, fine grained quartzites, and Kineo felsite predominate. Other hard materials were used to some extent.

Nos. 1, 2, 3, 4 - Stepedge - for either hand - Materials, No. 1, Unknown; No. 2, Jasper; No. 3, Unknown; No. 4, Quartzite.

No. 5, 6 - Stem - of Felsite and Kineo felsite respectively.

No. 7, Stepedge with flaking around most of perimeter.

Nos. 8, 9, 10 - Stepedge, Left hand, of Quartzite, Black Jasper, and Red Jasper respectively.

No. 11, Stepedge - double ended - Dark Red Jasper

Nos. 12, 13, 14, 15 - Stepedge - Right hand, of Kineo Felsite, Quartzite, Red Jasper, Black Jasper respectively.

Abrading Stones (Plate V)

The five stones which bear marks from abrading or rubbing are all composed of sandy material. The coarseness ranges from fine to coarse, with gradations as one might find in sandpaper. The specific use made of these is im-

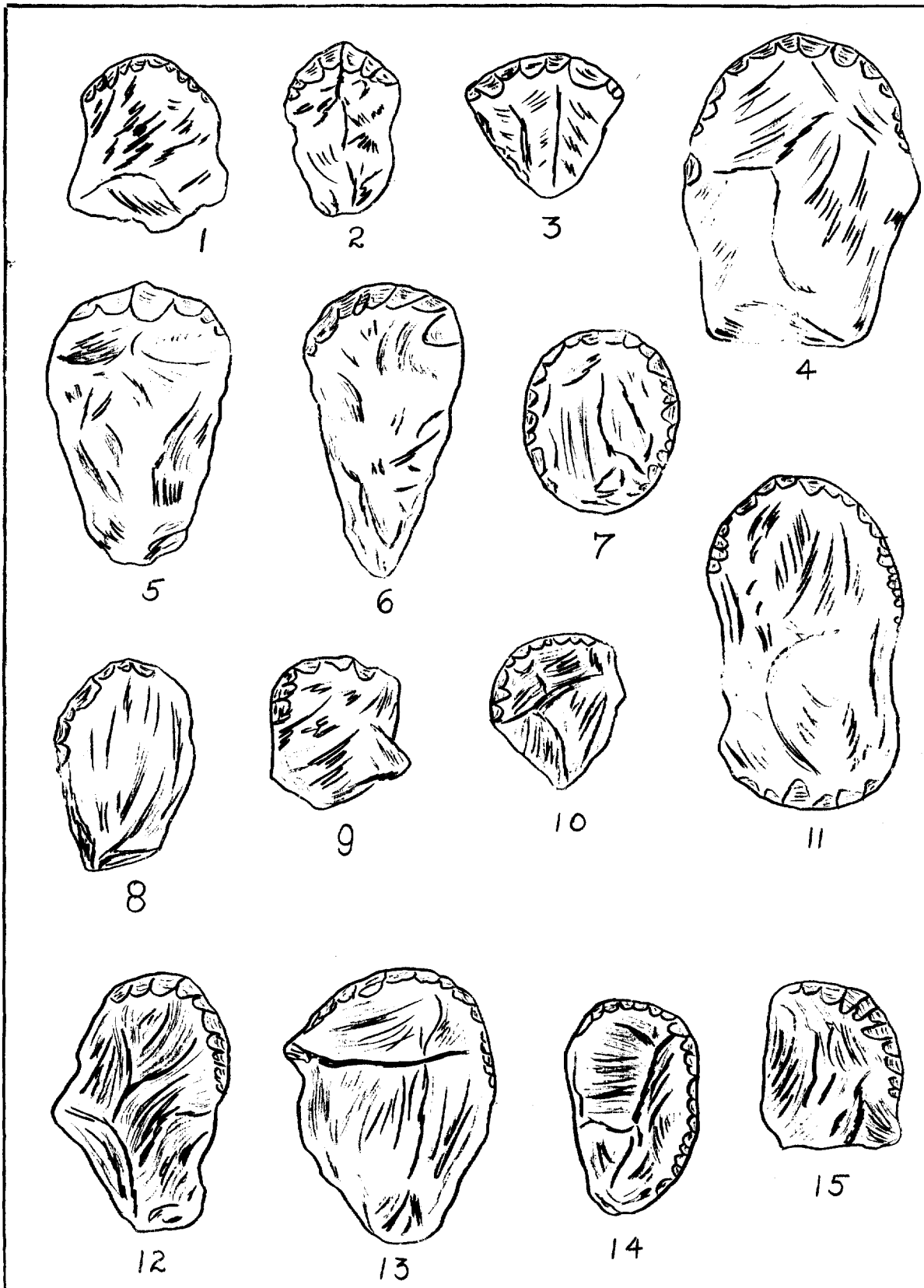

PLATE IV

possible to state, since they do not have groves or notches, which would indicate bone work or shaft abrading.

The small number of worked bone pieces found, and the few abraders or polishers recovered seem to support the theory that this was primarily a work area for stone tools.

No. 1, Fine sandy, shows use along edges and end. Broken.

No. 2, Medium sandy, rubbed places over entire surface.

No. 3, Very coarse, about 1/2 inch thick, shows use in one direction only.

Adze
(Plate VI)

Only one adze was recovered at this site. It had been split lengthwise, and appeared to have been subjected to hard use.

In comparison with the incidence of other tools used in wood working, such as scrapers, it is evident that not much large wood work was done at this site.

This tool is made of a slate like material and was produced through a combination of pecking and abrading or grinding.

Not shown full size, or to scale.

Celt
(Plate VII)

Three celts were recovered, which varied in method of manufacture, size, and material. The smaller were chipped, while the third was made by pecking and abrading. The bit of this latter was well ground for cutting.

No. 1, Chipped, quite thin, bit also chipped.

No. 2, Chipped, no evidence of rubbing.

No. 3, Pecked and abraded to shape and finish. Does not show much use.

Workmanship on No. 1 and 3 was good, while No. 2 was more crudely made. Materials were unidentified.

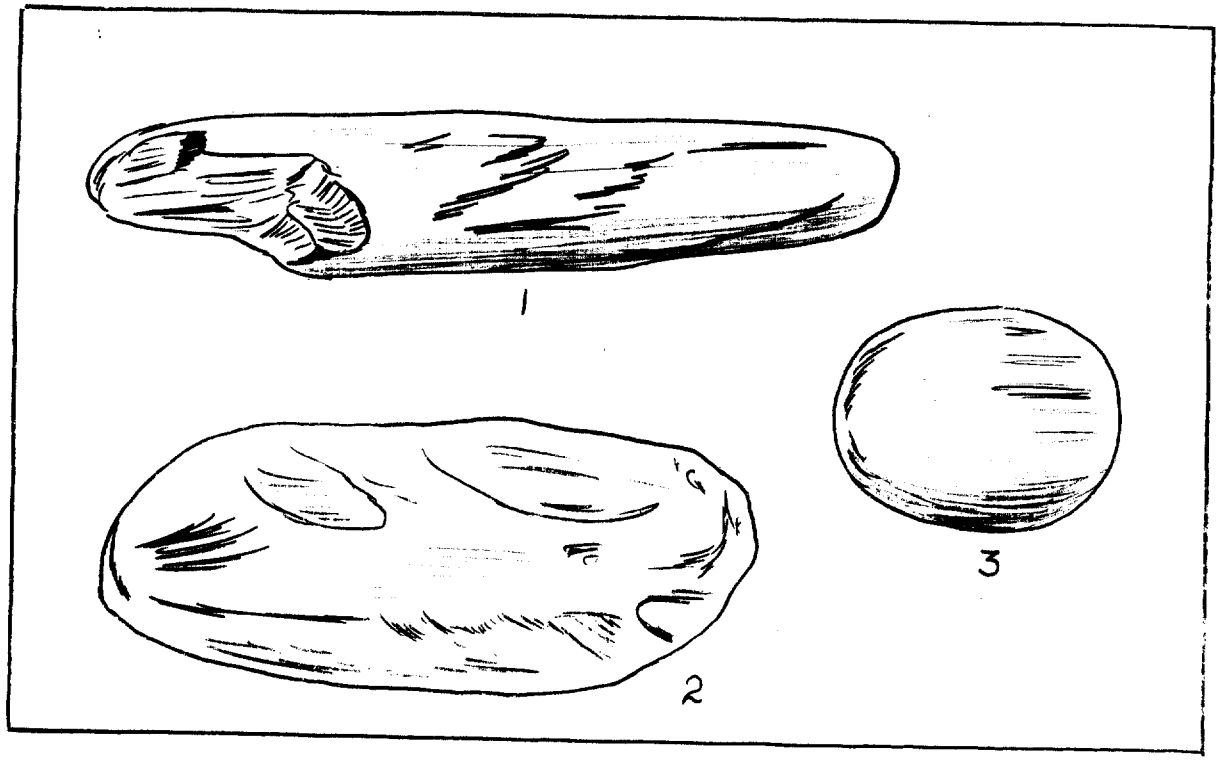

PLATE V

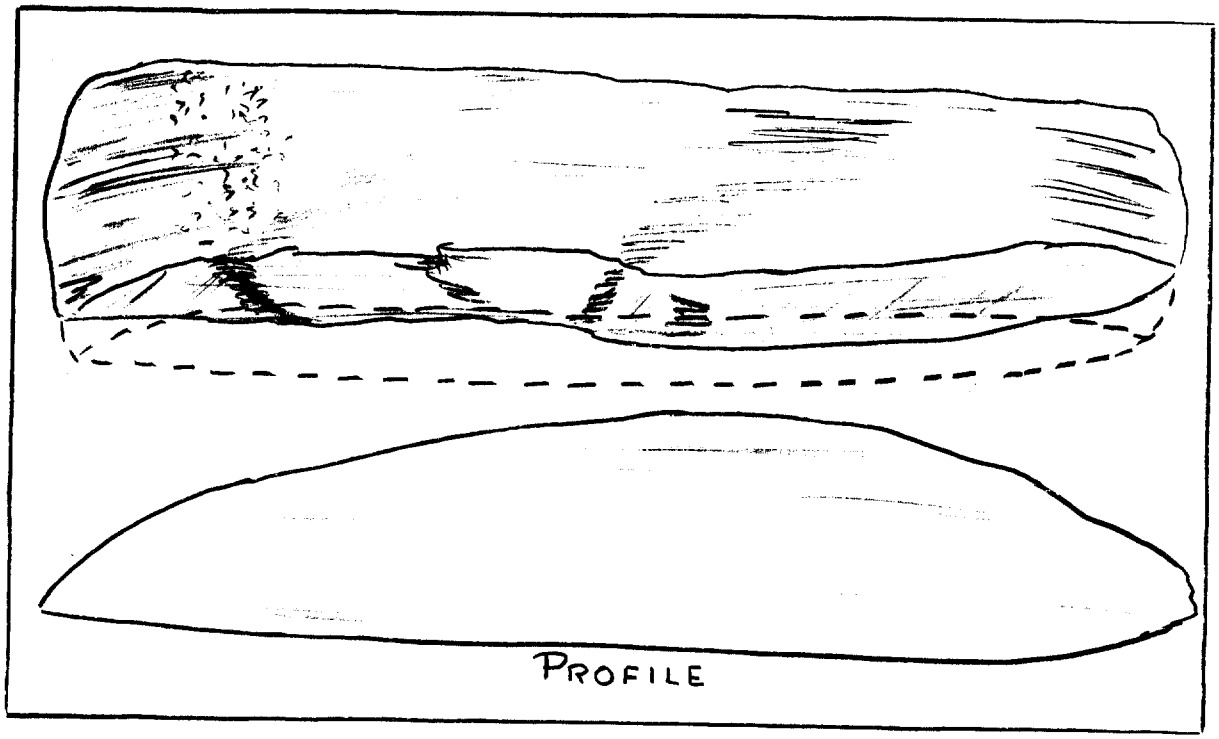

PLATE VI

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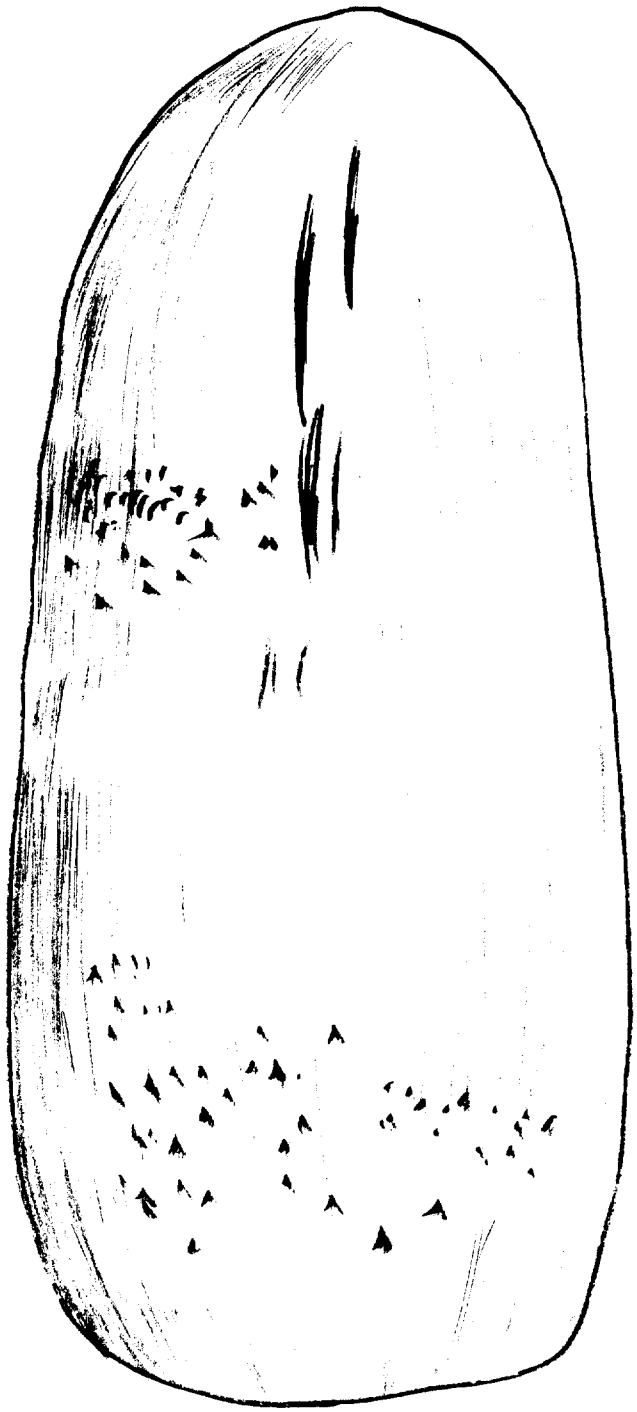

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PLATE VII

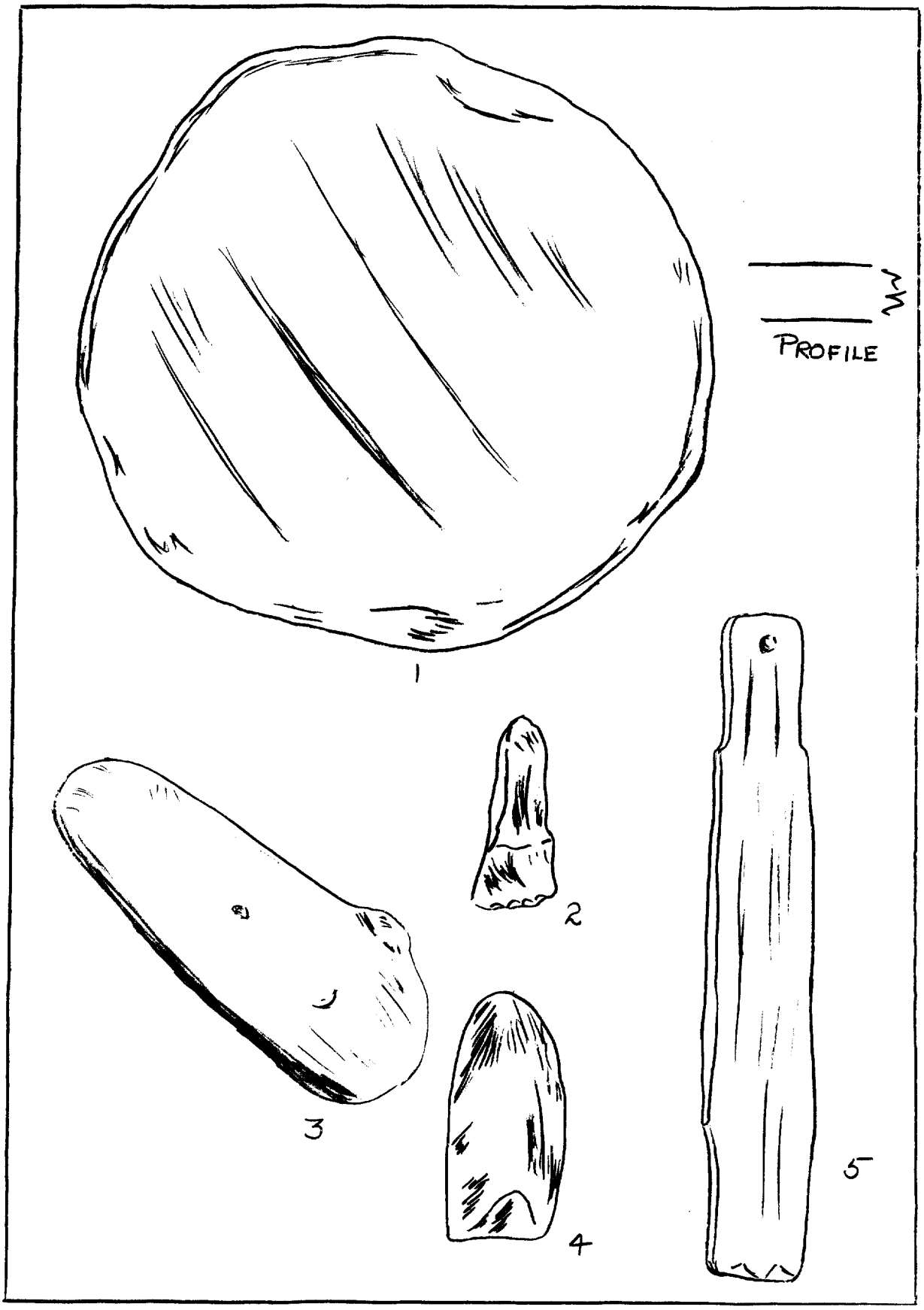


PLATE VIII

(Plate VIII)

Several artifacts were placed in this catagory because of uncertainty as to their proper classification, use, or real purpose. This was not, however, a large group and could perhaps be further reduced with more careful study.

It is an interesting collection of items, and a report - "Shellheap Oddities" has already been written about some of these.

All of these artifacts show evidence of working of some sort. Only five are presented, but they cover a wide range of materials and shapes.

No. 1, Unknown, nearly round, slightly over 1/4 inch thick, has been worked around edge, of shale like material.

No. 2, Unknown, Red Jasper, thin, flaked, definite teeth along bottom edge.

No. 3, Unknown, flattish on one side, rounded up on reverse, very slight evidence of working, possible effigy.

No. 4, Unknown, abraded to shape, thin, definite shape, possibly an abrader, of fine sandy material.

No. 5, Unknown, slaty material, some evidence of working or use, thin, hole started at upper end.

Hammerstones
(Plate IX)

Over twenty examples of hammerstones were found. These varied in size, amount of apparent useage, material and shape. From the different shapes, it is evident that these were stones for specific purposes.

All of them are of hard material, and most would produce concoidal fracture. Several were apparently the remains of larger stones from which flakes had been chipped.

Larger hammerstones must have been used for breaking up other stones, since no real large, pecked artifacts were found. Several flat, oval stones were recovered, which had been used for pecking as evidenced by the perimeter.

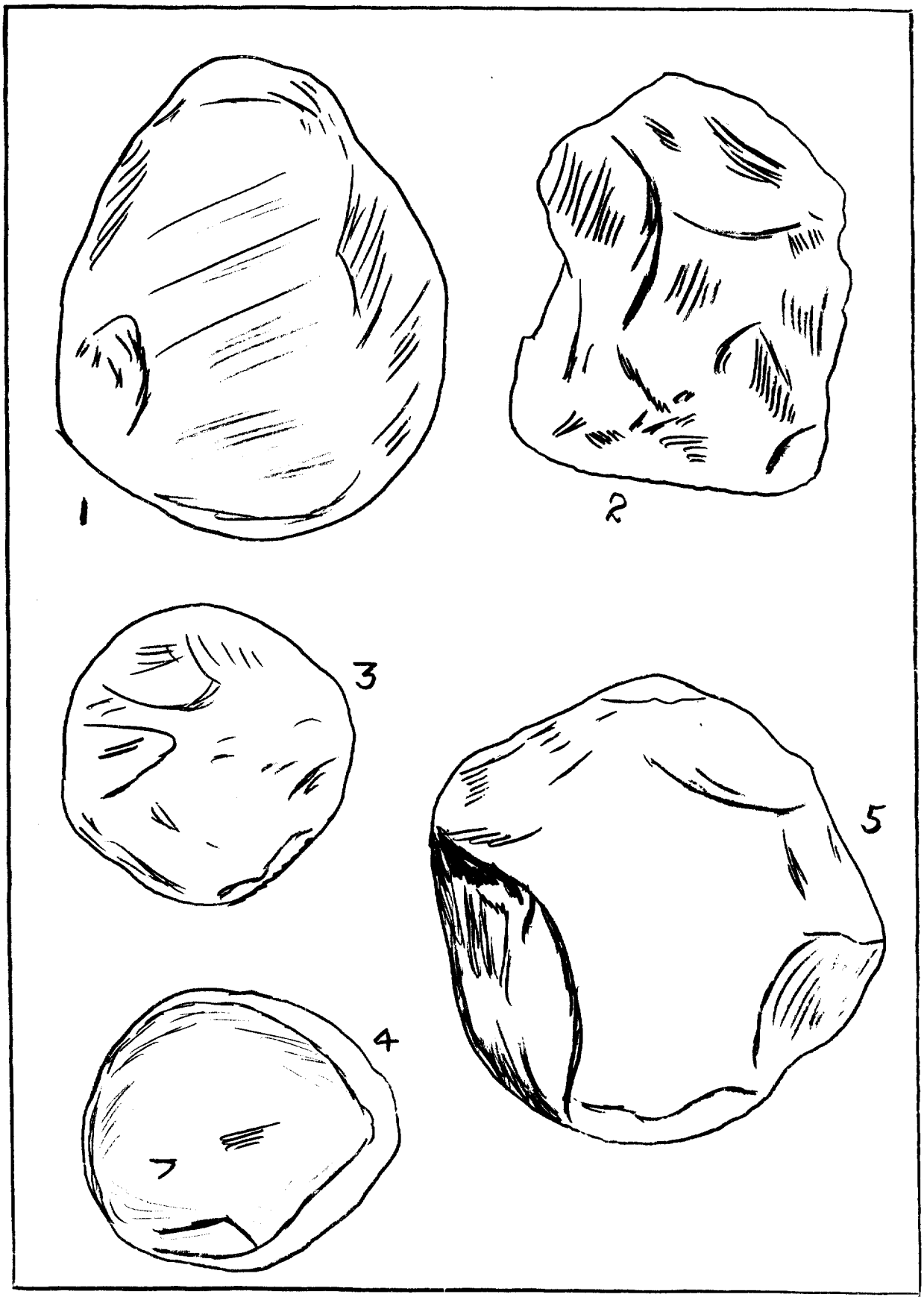


PLATE IX

One anvil stone was also in the group. Round hammerstones were not uncommon.

No description will be given other than that Nos. 2,3,5 are of kineo felsite. Nos. 3 and 5 are oval, Nos. 2 and 5 are remains of flaking, and No. 1, a beach cobble.

Knives
(Plate X)

Of all items recovered from this midden, the knife or cutting tool group alone produced the most complete specimens, and the second highest numbers in total, if breakage is included.

Knives appear to have been extremely important, and most often lfeft behind. Had this been a large, deep deposit, with a greater quantity of discarded bone, it might be supposed that the high incidence was due to actual loss.

Quality of workmanship, or the lack of it, was more evident in this group of artifacts than in any other. Size variation is also extreme. Material varies more and is harder to identify.

Several flake knives were recovered. These are made from chips or flakes, and have uniface chipping along one edge only.

Nos. l, 5, 6, 8, 9, 10, 11, 12 stemless knives showing variance in shape. Nos. 6 and 9 are somewhat standard shellheap knives in relation to shape.

Nos. 2,3,4, stem knives. No. 2, a somewhat rare shape with projection near base on lower side.

No. 7, Leaf knife of quartz. Several other fine specimens were also recovered.

No. 13, Flake knife of red jasper. These knives appear to be made of better materials.

Knives were made of jaspers, quartz, quartzite, felsite, and numerous other unidentified materials.

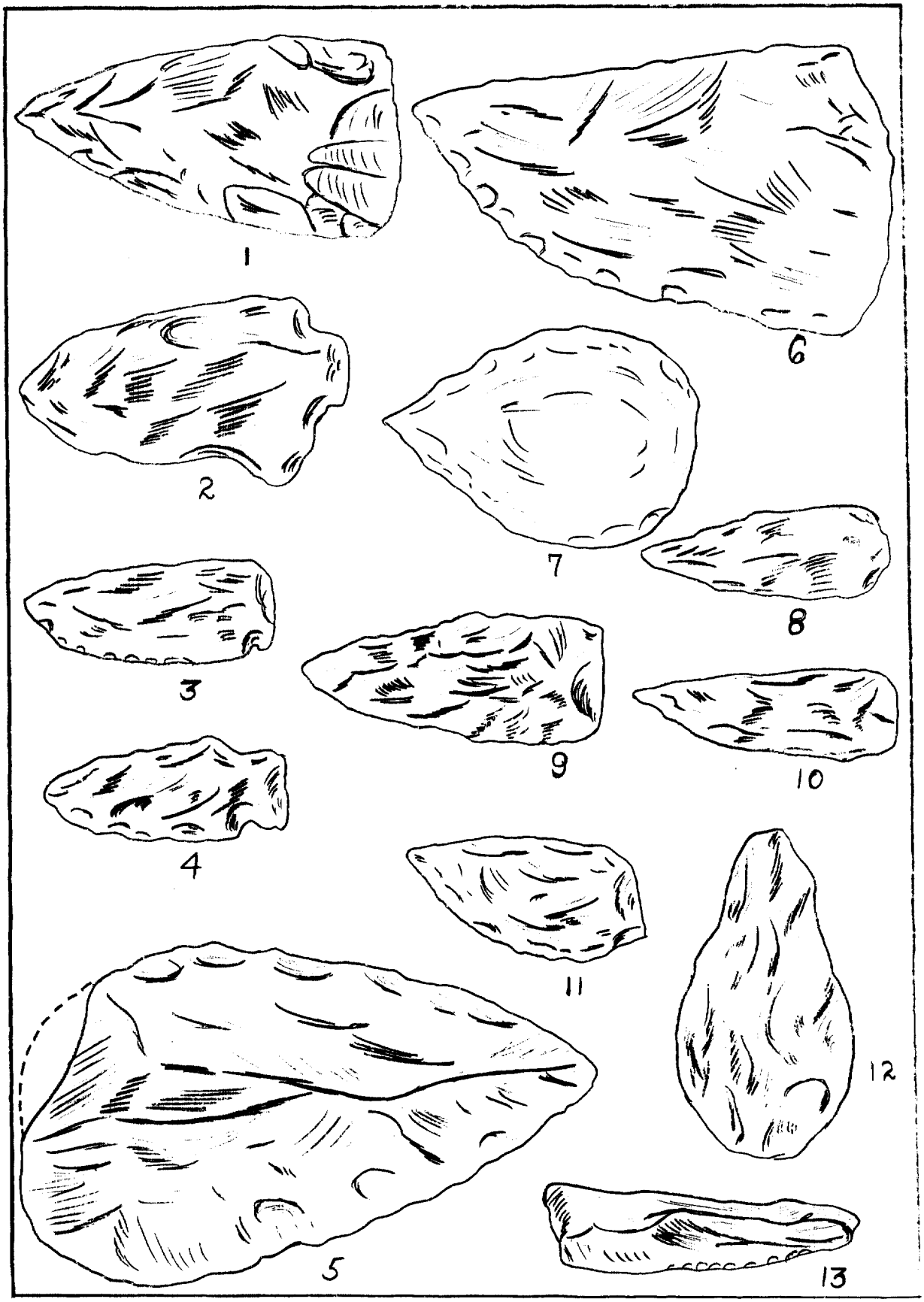


PLATE X

Pottery
(Plate XI)

Pottery sherds were not numerous. Most were unassociated and only parts of one pot have been reassembled to show the shape of the cooking vessel in use.

Portions of concoidal bases were found, which appear to be Stage III. One base, from the reassembled pot, is definitely Stage IV. However, the decorations and neck shape are not Stage IV, therefore classifying it as a late Stage III.

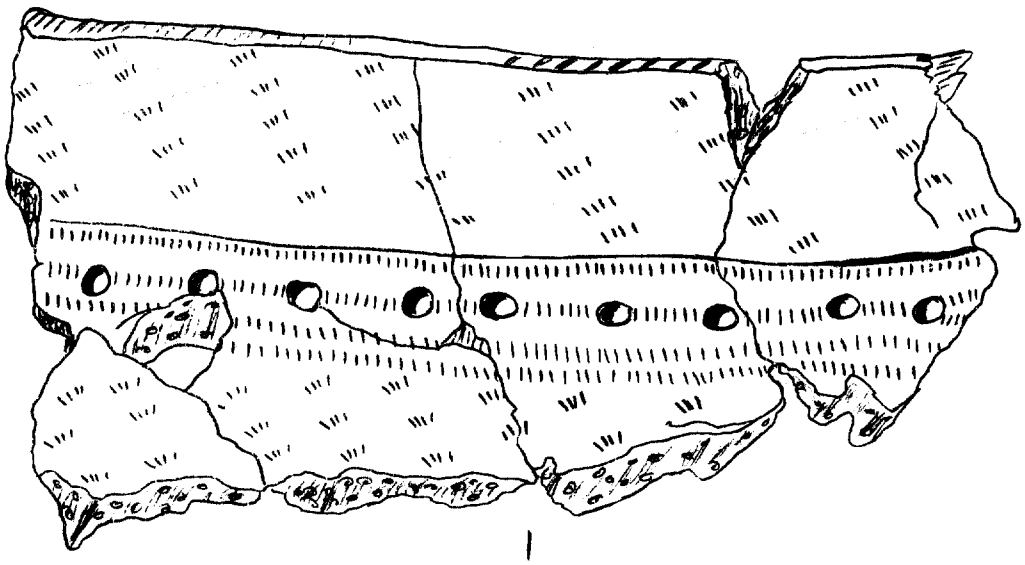
No evidence of coiling is apparent. Decorations consist of cord wrapped stick, incised, dentate, and incised dentate. The top surface of the rims of some rim sherds were decorated with lines, which were pressed into the clay before firing.

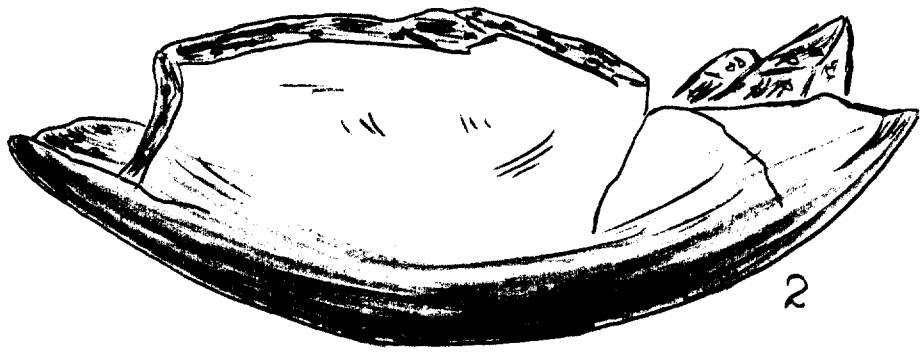
Nos. 1 and 2, Portion of reconstructed rim and base of pot mentioned above.

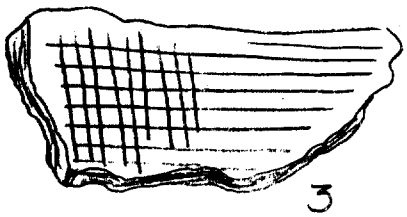
Nos. 3,4,5,6,7 depict various decoration patterns. No two have been found that are the same.

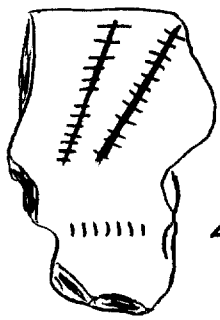
Only grit tempering has been observed.

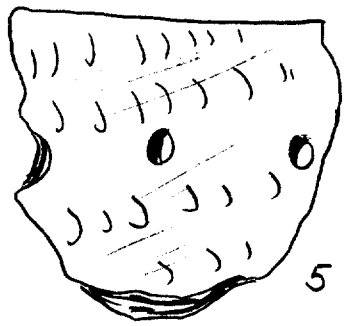
These drawings are not full size or to scale.

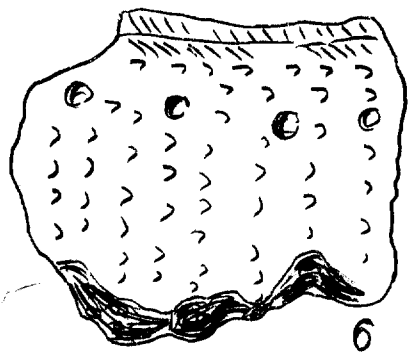












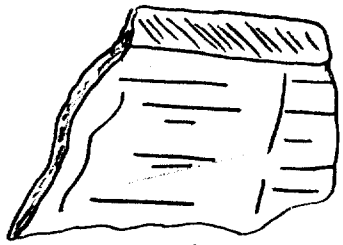


PLATE XI

Conclusion

From all evidence - pottery, tools, and other speculative information, it is possible to draw a conclusion about this midden.

Projectile point shapes, and pottery base form point to a middle to late State III Woodland occupation. It would be safe to state that the midden was deposited some time after 1400 and before 1700 A.D. Carbon dating might more closely fix the date.

A large number of stone artifacts and chips, and a small amount of bone - discarded and worked - indicates that this was a workshop area. Had it been oriented to food gathering, more shell and bone debris should have been present.

With so much of the area being destroyed by others, who left behind what couldn't be traded, the speculative factors have to be considered. There are still more whys than answers.

Only two evicences of contact were found. One was a lead musket ball of about .75 cal, and the other was a piece of brass about 1/8 inch square, 3 inches long, and tapered to both ends from the middle. Both could have worked down through after the shells were deposited, and should be discounted for now.

Since this site has, for all practical purposes, been destroyed, much information has been lost. Thus, the conclusions assumed above must stand.

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POSSIBLE PALEO-INDIAN MIGRATION ROUTES IN NORTHEASTERN NORTH AMERICA - A GEOLOGICAL APPROACH

by Harold W. Borns, Jr. Department of Geological Sciences, University of Maine, Orono, Me.

Introduction

The earliest known inhabitants of New England and the Atlantic Provinces were paleo-Indians of the Llano Tradition. Their presence and life style is documented by artifacts belonging to the Llano Complex first defined by Sellarde (1952). Although paleo-Indian sites, now found across North America, have yielded artifact inventories displaying minor changes in form or presence of artifacts the fluted projectile point remains as characteristic of the Llano Tratition. A fluted projectile point, typified by Clovis and Folsom types, refers to lanceolate points with straight to concave bases, often thinned by the removal of longitudinal flakes from one or both sides.

The two outstanding paleo-indian occupation sites in the region are those at Debert, Nova Scotia, and at Bull Brook in Ipswich, Massachusetts. The Debert site (Byers, Borns, MacDonald, and Stuckenrath, 1966), the better documented of the two and one of the best documented early-man sites in North America, was occupied approximately 10,700 years ago while the date at Bull Brook is not closely bracketed. Besides these sites, each of which yielded several thousand stone artifacts, individual Clovis-type fluted projectile points have been found at Quaco Head, New Brunswick, Ellsworth and Brassua, Maine, Intervale, New Hampshire, and Nantucket, Massachusetts.

As a Quaternary glacial geologist my research has centered on the history of the glacial and associated events in the northeast during the Quaternary Period (the "glacial age"), a time span of approximately two

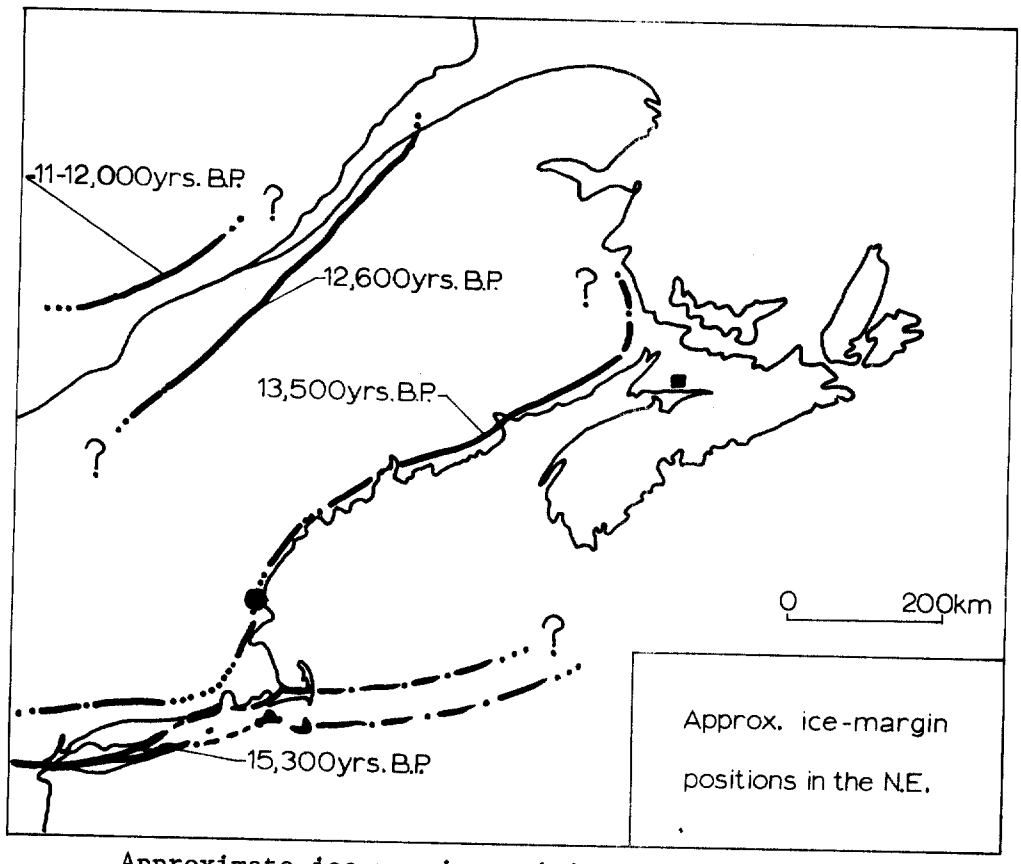
to three million years. From this point of view and stimulated by my association with archaeologists, I have asked the question of when and where paleo-Indians could have migrated into and within the northeast given the limitations of the changing distribution of glacial ice, land, and sea following the last or Late Wisconsin age glaciation. This last major expansion of the Laurentide Ice Sheet from central Canada began about 25,000 years ago, reached a maximum, and had dissipated by about 8,000 years ago. (See Figure 1.)

Given a geographical setting, it is now up to the archaeologists to add factors of paleo-Indian life style such as the migration habits of big game animals that must be considered in determining the details of migration routes.

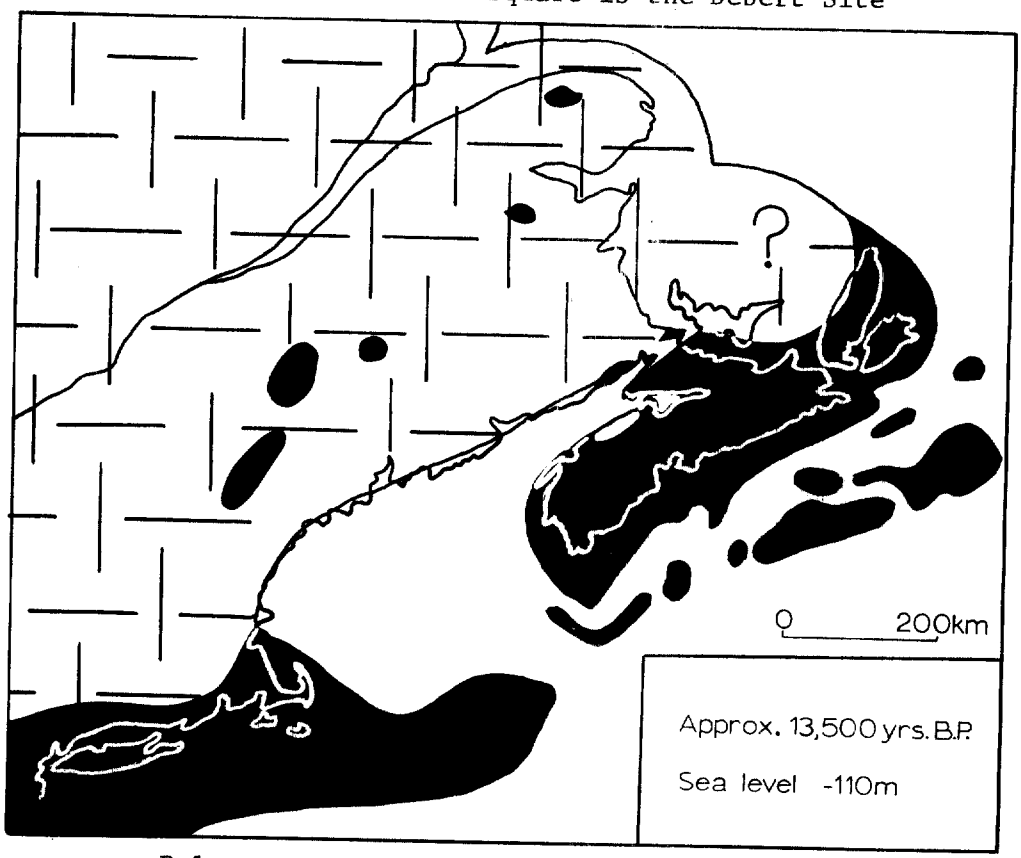
Method

Figures 2, 3, and 4 represent approximate paleogeographic maps of the region for selected times following the maximum Late Wisconsin glaciation. The information protrayed on these maps represents the present state of knowledge and has been gathered from a number of sources, including my own research,[(e.g., Wright and Frey, Borns,)] that provide information on the chronology and distribution of glacier ice and the time and geographic extent of the late-glacial marine transgression. These data, integrated with currently accepted rates and magnitudes of both crustal uplift following deglaciation and with sea-level rise consequent to the melting of the Late Wisconsin ice sheets of the world, have provided the ingredients necessary to construct these maps. The specific times chosen for plotting the paleo-geography were dictated by the data which allowed ice-margin and shoreline positions to be fixed. At intermediate times the available data do not allow this precision.

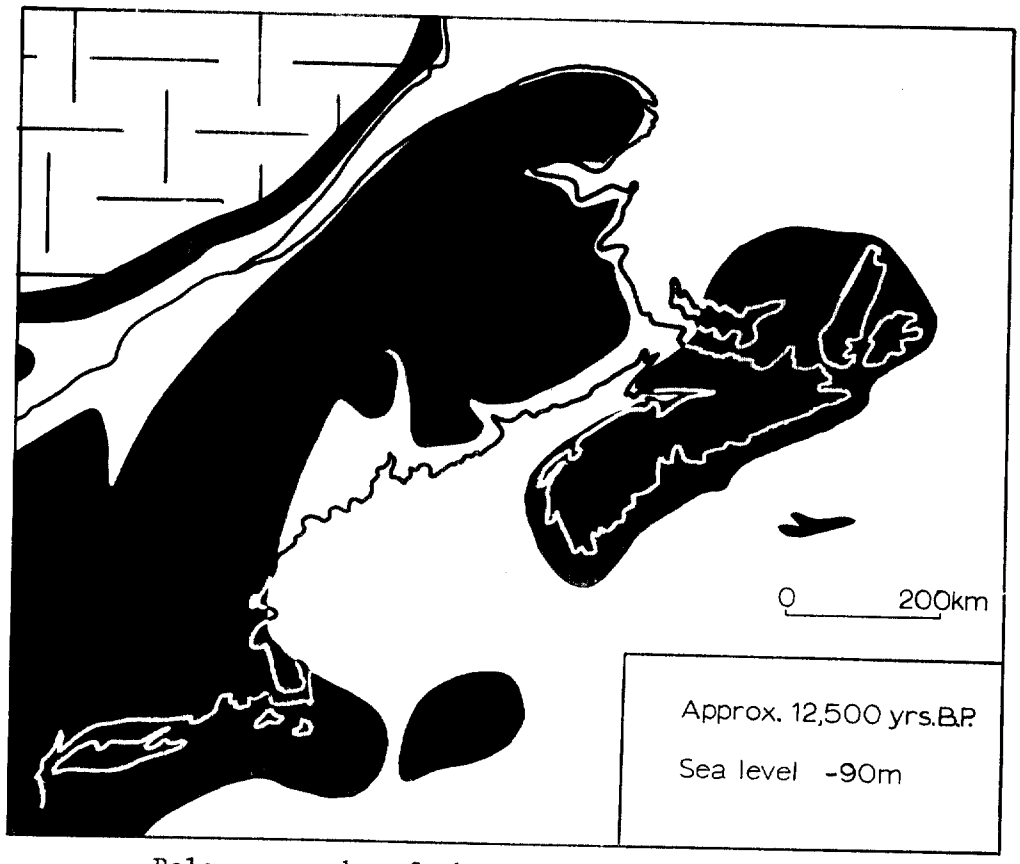
The last ice sheet advancing over the region by 25,000 years ago reached its terminal position of Long Island, New York, southeastern New



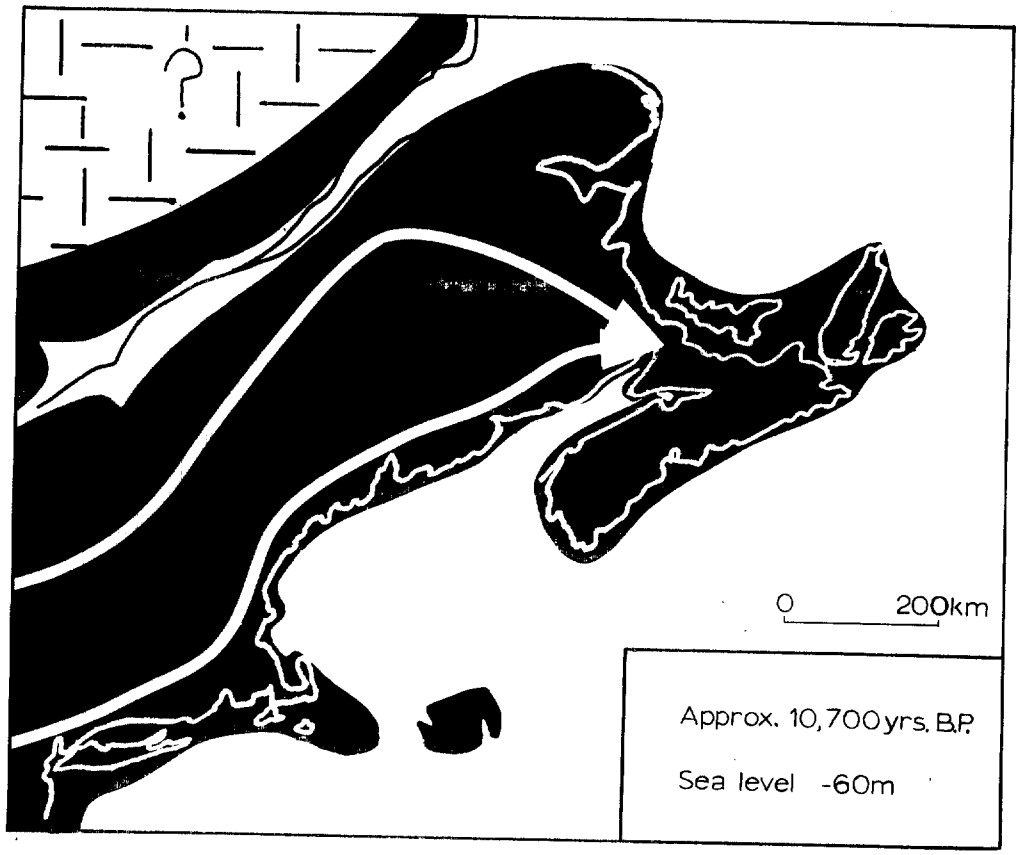
Approximate ice-margin positions of the receding Late Wisconsin Age Laurentide Ice Sheet in the Northeast. The black square is the Debert Site



Paleogeography of the Northeast approximately 13,500 years B.P. (Before Present)
Gridded area - ice sheet
Black area - land
White area - sea



Paleogeography of the Northeast approximately 12,500 years B.P.



Paleogeography of the Northeast approximately 10,700 years B.P., the time of the occupation of the Debert Site. The arrows indicate that all of the Northeast was open to them. Note that the shore line in Maine was lower at that time than at present.

England, and on the continental shelf to the east prior to 17,000 years ago and was still in this position as late as 15,000 years ago (Figure 1). At its maximum the ice sheet completely covered New England and the Atlantic Provinces with the possible exception of Newfoundland. At that time world-wide sea level was 130 meters lower than at present. Subsequently, in this area as the glacier dissipated sea level rose; and the land previously depressed as much as 1000 meters below present sea level by the weight of the glacier started to rebound. The complex relationship of these factors of ice, land, and sea are depicted in Figures 2, 3, and 4.

Interpretation

1. Prior to approximately 15,000 years ago paleo-Indians had no access to the northeast.
2. By approximately 13,500 years ago nearly all of New England was still glacier-covered. However, paleo-Indians were free to migrate on the exposed continental shelf of southern New England as far east as what is now Georges Bank. They may have been able to negotiate the deep Northeast Channel to Nova Scotia if it was frozen over. Northeast Channel is the passage between the Gulf of Maine and the Atlantic which is now submerged on the continental shelf (Figure 2). There is no documentation of the use of boats by paleo-Indians.
3. By approximately 12,500 years ago the ice sheet had retreated from New England, and its margin lay northwest of the St. Lawrence Lowland. At this time sea level was rising more rapidly than the land was rebounding. Consequently, a shallow sea flooded most of central Maine as far inland as East Millinocket in the Penobscot River Valley and Bingham in the Kennebec River Valley. The St. Lawrence Lowland was extensively submerged at this time. Offshore, the land surface had completed its rebound and the rising sea was rapidly covering the

exposed shelf, thereby reducing the probability of paleo-Indians migrating into Nova Scotia via this route. However, clearly they would have had access to most of the northeast at this time via what is presently land with the exception of central and coastal Maine and the connection between Nova Scotia and New Brunswick.

4. By approximately 10,700 years ago, the time of occupation of the Debert paleo-Indian site, the Indians would have had free access to all of the northeast with the exception of parts of the St. Lawrence Lowland which was still partially submerged. At that time the shoreline was about sixty meters lower than at present which would have extended the dry land surface of Maine offshore five to fifteen miles further than the present coastline. Subsequently the sea has risen, reaching its present position approximately 2-3,000 years ago.

Conclusion

The migration routes actually followed at particular times by these early men were determined primarily by the limitations imposed by the changing geography and secondarily by their life habits of hunting and gathering. Speculation has been made on which game animals they followed into and within this region, but unfortunately no animal remains were preserved in association with artifacts at either Bull Brook or Debert. Therefore, all of the evidence associating paleo-Indians with big game animals is indirect. Woodland caribou has been suggested as a strong possibility and recently the partial remains of postglacial mammoth and bison have been discovered in Maine. As yet these remains are undated. However, considering the colder climate and associated but limited vegetation that prevailed in the northeast in early postglacial times it is reasonable to assume that these "big game" animals coexisted with and were probably hunted by early man. This hypothesis is yet to be proven.

Given this knowledge of paleogeography, the fact that these people

were migratory hunters, and the most probable types of big game animals coexisting with them in the area, it should be feasible to "search out" the most probable migration routes and campsites for these first inhabitants of the northeast.

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