4. OBSERVATIONS ON THE EFFICIENCY OF SHOVEL ARCHAEOLOGY

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Recent excavations in a California shell midden furnish material for an appraisal of the efficiency of archaeological work in which shovels are the primary excavating tool. The results of the study are presented here, with an attempt to evaluate shovel archaeology from two points of view. First, efficiency -- how many artifacts are missed in the course of shovel work? And second, accuracy -- is there any particular class of artifacts which escapes detection to the extent that the final report will be weighted in favor of more obvious artifact types which are recovered?

The site excavated was site 4-Mrn-232, a shell midden on the shores of Drake's Bay. This site is a small mound with a maximum depth of 48 inches, situated on a 25 foot bluff overlooking a rock-shelf beach. The site is a black, ashy midden with some clay admixture and a considerable quantity of shell (mostly clam) scattered throughout.

Excavations were carried out in August and September of 1949 by a crew of students from the University of California at Berkeley.[1] The site, formerly known as the Estero mound, had been partially excavated in two previous field seasons (in 1940, under R. F. Heizer, and in 1941, under R. K. Beardsley). The 1940-1941 excavations had yielded some very interesting historical material in the form of fragments of 16th century Ming procelain and of corroded handwrought iron spikes. This material has been attributed to the wreck of a Manila ship in Drake's Bay in 1595.[2]

Because of its interest in the 16th century historic material, the California Historical Society furnished the means for a field crew to continue the investigation of site Mrn-232. It was believed possible that certain small historic objects, such as buttons or coins, might be recovered from the site, and a double-check system was devised to ensure the recovery of all artifacts. Initial excavation was done with shovels, after which the dug deposit was passed through a half inch screen. As a further check, the material which remained in the screen was dumped down a chute onto the beach, where it was washed and again examined. By this method, it is believed that a virtual hundred per cent recovery was attained.

In an effort to locate the finds as exactly as possible, the excavators made every attempt to not the artifacts in situ. The screen was considered a check only, and was not relied upon as the primary agent for recovering artifacts. It was considered a reflection on one's archaeological ability to throw artifacts into the screen, and a conscientious effort was made to discover artifacts in the pits.

All artifacts were tabulated as to whether they were found in the pits or were picked up by the screen. For purposes of analysis, the artifacts are classified into the following general categories:

1. Porcelain fragments
2. Iron spikes
3. Projectible points and fragments
4. Stone core tools

5. Bone tools and fragments (mostly awls)
6. Pestle fragments
7. Mortar fragments
8. Flake scrapers
9. Cut bird bones
10. Sinkers and sinker fragments
11. Bone beads
12. Charmstones and fragments
13. Miscellaneous (artifacts of which only one or two were recovered)

These artifact types were relatively homogeneous in size, ranging, for the most part, from 1 to 6 inches in maximum dimensions. No large artifacts were recovered; complete mortars and pestles, for example, were absent. The small size range of the artifacts should add to the validity of the count which was kept -- many large artifacts, such as whole mortars, would have weighted the count in favor of pit recoveries, as such objects would not, under and circumstances, be missed in shovel work.

A total of 375 artifacts were recovered. This total does not include burial associations, which were naturally recovered with more delicate instruments than shovels. Of this number, 283 artifacts were picked up in the ground, while 90 were caught in the screen. Only two artifacts were recovered from washing the screenings on the beach (a small mortar fragment and a piece of cut abalone shell). In this case, therefore, 75% of the artifacts were recovered in the pits by workers using shovels, and 25% of the artifacts were overlooked, and would have been discarded except for the screen.

The 75% recovery of the shovel workers is actually a rather impressive figure, particularly in view of unfavorable soil factors in this site. As mentioned previously, the Mrn-232 midden contained some clay, the surrounding soil being a red-brown clay. This resulted in two conditions which made it difficult for the excavators to spot the artifacts in the ground:

1. The midden soil tended to break up into hard clods, 3 or 4 inches in diameter, not all of which could be individually examined.

2. A heavy layer of midden adhered to the artifacts, frequently obscuring them completely. Except for porcelain fragments, most of the artifacts had to be washed and scrubbed with a brush before they were definitely identifiable as artifacts.

These drawbacks of midden consistency are not the usual thing in California. The more typical ashy, friable, site deposits should yield a still higher percentage of primary recoveries. In cases where the midden is powdery and breaks cleanly away from solid objects, a careful crew should be able to recover from 85 to 90% of the artifacts during excavation.

A more significant set of figures than mere percentage of recovery can be derived from a breakdown of the percentages into artifact types. If 25% of each class of artifact was overlooked by the excavators, the net result would be merely a smaller sample. If, on the other hand, <u>all</u> of certain artifacts were overlooked, the final analysis, based upon the artifacts recovered, would necessarily be incomplete and possibly even misleading.

TABLE 1 -- ARTIFACT RECOVERY FROM SITE 4-Mrn-232

Artifact type:	Total number recovered	Total in pit	Total in screen	Percentage of pit recovery
Iron spikes	5	2	3	40
Bone beads	10	6	4	60
Porcelain fragments	21	14	7	67
Proj. Points and frags.	69	47	22	68
Charmstones and frags.	13	9	4	69
Bone tools and frags.	35	25	10	71
Miscellaneous	34	25	9*	73
Flake scrapers	48	35	13	75
Sinkers and fragments	9	7	2	78
Pestle frags.	19	15	4	79
Mortar frags.	37	30	7*	81
Cut bird bones	14	12	2	85
Stone core tools	61	56	5	91
Totals:	375	283	92	75% (overall average)

*Includes one artifact recovered from wave-washed screenings on the beach.

In table 1, the percentage recovery of each artifact type is listed. Assuming, for the purposes of discussion, that all of the "screen" artifacts were thrown away, how would the site analysis be affected? It will be seen that the percentages of pit recoveries range from 40 to 91. The bulk of the artifacts, however -- nine of the thirteen categories -- fall between 60% and 80% in pit recoveries. Because of the small sample of each artifact type, the differences between 60% and 80% would probably not affect the final analysis materially. However, if the analysis was made on the basis of pit recoveries alone, there would be a certain weighting of the results in the direction of the core tools, of which 91% were recovered in the excavation units. At the other end of the scale, the archaeologist would be somewhat misled by the small percentage of bone beads recovered. The actual ratio of bone beads to core tools is about 1 to 6; the ratio computed from pit recoveries is 1 to 9.

It is possible that such differences could lead to errors in interpretation. Certainly the relative importance of bone beads, as compared with core tools, is obscured. However, this is the extreme of error, and for other comparisons of more immediate utility (such as the relative importance of scrapers as compared with core tools), the ratios computed from shovel recoveries are very close to those based on total artifact counts. The small numbers of any single type make statistical analysis risky in any event, particularly when one is dealing with a small sample of the site.

In two cases, however, significant artifacts were completely overlooked. Both of the small figurines of baked clay were recovered from the screen. A unique specimen (for purposes of the sample), a small fragment of incised bird bone, also turned up in the screen. It is apparent, therefore, that individual artifacts which may be of the utmost importance (the small rare trade items for which we were searching, for example) can be missed occasionally if shovels are used for excavating a site. In this particular case, these items could easily have been overlooked even by trowellers, although the probability of recovery would naturally be higher if trowels were used.

In the course of excavating site Mrn-232, one serious fault in the excavation technique became apparent; namely, the failure to maintain the exact level being worked. The pits were dug in six-inch levels, and it appeared that the excavators frequently dug into the layer below the one on which they were supposed to be working. In the process of scraping together the last few shovelfuls and levelling the floor, a small portion of the next layer was frequently scraped up in order to keep the floor level and clean. This action resulted in the accumulation of a small heap of midden which had not been carefully examined, and artifacts which had been inadvertently scraped out of the lower level usually appeared in the screen. Thus, some large artifacts, such as a 6 inch pestle fragment, were sometimes tossed into the screen by workers who were otherwise painstaking in their efforts to discover the artifacts in situ. It seemed evident that the percentage of pit recoveries would have been raised materially if the levels had been scrupulously maintained.

The situation could probably have been improved by the use of some sort of constant visual reminder of the level's limits. Such a reminder might be in the form of a narrow board, painted white. If a small ditch was cut at one edge of the level, and the board placed in it at the exact lower limit of the level, it would be immediately apparent if the limits of the level were overstepped. A visual aid of this sort would probably be of great assistance in improving technique.

Despite the sacrifice of a portion of the data, excavation with shovels seems to be justified under certain conditions. It is very seldom that one has the good fortune to work with a hundred per cent sample of a site, and the usual desire is to obtain as big a sample as possible with limited funds and limited labor. In the case of site Mrn-232, it was necessary to excavate 185 cubic yards of midden to recover 375 artifacts. This averages two artifacts per cubic yard (comparative figures on artifact yield are given in table 2). Had the site been excavated with trowels, the sample would have been so small as to have been virtually useless.

Since requirements of practicality force a consideration of shovel archaeology, it seems desirable to devote some effort to improving shovel technique. Statistical counts of the type presented here would be useful in pointing out individual differences between sites. In addition, a careful study of the results of shovel archaeology might show up errors in technique which can be corrected.

In conclusion, it would appear that shovel archaeology has two major disadvantages; the results may be somewhat weighted in the direction of certain classes of artifacts, and some significant artifact types may be overlooked completely. At the same time, the percentage recovery of shovel archaeology seems relatively high, considering that no technique can be

perfect. If a concentrated effort is made to improve present methods, it seems reasonable to expect shovel archaeology to yield a large and representative site sample with a small labor force. Furthermore, the present inaccuracies, which are not extreme, may be reduced to a minimum.

ADDENDUM: Table 2 has been added to the original paper, and the following explanatory remarks are here included:

With the exception of the sites in the southern part of the state, the artifact yield in California is seldom greater than 4.0 to the cubic yard of midden. This does not include burial associations, however, which sometimes make up the bulk of the material recovered. Mr. Franklin Fenenga of the University of California Archaeological Survey has pointed out this difference with the example of site SJo-56. The midden of this site yielded only one artifact for each five cubic yards; this is as low a yield as has been recorded in California. At the same time, this site had one burial for each $2\frac{1}{2}$ cubic yards of midden, and artifacts were abundant with the burials.

The artifact yield may also vary within the individual site. In the case of site SBa-1, the lower levels yielded twice as many artifacts as the upper levels. Such a dichotomy is not unexpected in a stratified site, the different frequency constituting a cultural difference.

A fairly large sample is necessary to compute the artifact yield of a midden site. The midden material is not homogeneous, and a small sample may give misleading results. The artifact yield for seven screened test pits at site Sac-6 (1949 excavations) was computed separately, with the following result:

Pit No.	Cu. Yds.	Yield per cubic yard
T-4	2.8	2.1
T-2	5.5	2.3
T-3	2.8	2.5
T-5	6.5	3.0
T-1	3.7	4.0
T-7	7.4	4.5
T-6	4.6	5.8

The variation in yield from pit to pit was, in this case, as much as 250%. It would appear that a sample of at least 30 to 50 cubic yards is necessary for a reasonably correct estimate of yield.

TABLE 2 -- ARTIFACT YIELD OF CALIFORNIA SITES

Site:	Number of artifacts per cubic yard (not including burial associations):
1. Emeryville Shellmound (Ala-309)[1]	2.0
2. Ellis Landing Shellmound (CCo-295)[1]	0.5
3. Castro Mound (SCl-1)[1]	0.2
4. Gunther Island (Hum-67)[1]	3.0
5. Estero Mound (Mrn-232)	2.0
6. Kings River (Fre-27)[2]	3.8

(Table 2, Continued)

Site:	Number of artifacts per cubic yard (not including burial associations):
7. Kings River (Fre-30)[3]	15.0
8. Thomas Site No. 1 (Mrn-115)	0.6
9. Farallon Islands (SFr-1)[4]	7.3
10. Johnson Mound (Sac-6)	
1947 (omitting baked clay objects)	2.4
1949 (screened test pits, omitting baked clay objects)	3.4
11. Bodega Bay (Son-299)	3.9
12. Richards Mound (Sac-160)	1.4
13. Goddard Mount (Nap-1)	8.5
14. Petersen Site No. 1 (Sol-1)	1.3
15. Wedel's Site 1, Buena Vista Lake (Ker-39)[5]	ca. 1.5
16. Tsurai, Trinidad Bay (Hum-169)[4]	11.0
17. Fig Tree Mound, Carpinteria (SBa-1)	
upper levels	6.0
lower levels	12.0
18. Phelps Mound (SJo-56)	0.2
19. Olson's Mainland Site 6, Rincon Creek[6]	9.0
20. Olson's Mainland Site 10 (Ven-62)[6]	34.0
21. Olson's Mainland Site 1, Goleta Slough[6]	12.0
22. Olson's Santa Cruz Island Site 100[6]	45.0
23. Olson's Santa Cruz Island Site 147[6]	55.0
24. Patrick's Point (Hum-118)	6.5

NOTES TO TABLE

[1]From A. L. Kroeber, Handbook of the California Indians, BAE-B 78, p. 919, 1925.

[2]Includes potsherds, counted as one artifact per sherd.

[3]Includes potsherds, but excludes trade beads, which were present in some numbers. This site was screened.

[4]Includes European and American material, such as crockery fragments.

[5]Estimated from information in W. R. Wedel, Archaeological Investigations at Buena Vista Lake, BAE-B 130, 1941

[6]Figured from information in R. L. Olson, Chumash Prehistory, UCPAAE: 28:1, p. 11, 1930.

NOTES TO TEXT

[1]Financial backing came from the California Historical Society. Mr. Allen L. Chickering was primarily responsible for enlisting the Society's support. The University of California Archaeological Survey supplied transportation, camping equipment, and excavation equipment. The files of the University of

California Archaeological Survey and the University of California Museum of Anthropology have yielded the data contained in table 2.

[2]See R. F. Heizer: "Archaeological Evidence of Sebastian Rodriquez Cermeno's California Visit in 1595" in California Historical Society Quarterly, vol. XX, No. 4 (December, 1941).

5. RECENT DEVELOPMENTS IN THE STUDY OF NORTHWESTERN CALIFORNIA ARCHAEOLOGY

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Recent excavations in shell mounds on the coast of Northwestern California have produced abundant material remains of the distinctive type which we are already familiar with as characterizing the recent cultures of the area. The differences in stratigraphic position and geographical distribution of certain implement forms, together with observed vertical site stratigraphy, promises to yield in Northwestern California a local culture sequence which can be generally correlated with the later prehistoric culture horizon of Central California.

In the summer of 1948, a University of California field party excavated a large shell mound (Hum-118) at Patrick's Point State Park, 30 miles north of Eureka. Another University party in 1949 dug in the historic Yurok village site of Tsurai[1] at Trinidad Bay (site Hum-169). The results of these excavations, taken with those of Loud[2] and Stuart[3] at site Hum-67 on Gunther Island in Humboldt Bay in 1913 and 1928 respectively, exhibited certain features of material culture similarity and other traits which we take to evidence local specializations.

Loud trenches the north portion of the Gunther Island shell mound and recovered 22 burials from this operation. On the basis of this sampling he proposed a sequence of early cremation and later primary inhumation.[4] His cremations, 16 of the 22 remains, consisted of partially-burned skeletal material in each grave accompanied by burned and unburned artifacts. The remainder of the skeletal material had been buried without burning and there were few artifacts present. H. H. Stuart, an amateur archaeologist in Eureka, excavated, in 1928, the area adjacent to Loud's trench and recovered 390 burials. His notes on the first 100 burials show 94 to be "burns" (this is synonymous with Loud's term cremation) and 6 unburned. The average depth for "burns" is 29" and they range in depth from 10" to 58". Loud's cremations average 33" and range from 8" to 68" in depth. The unburned skeletal material from both excavations averaged 23" and 27" in depth and ranged from 12" to 36". Loud's and Stuart's figures do show that the burned skeletal material averaged a slightly lower depth than that of the unburned, but the horizontal distribution of both types of interment and range of depths of each prove that primary inhumation was contemporaneous with the burning pattern. Obviously, the burial complex of Gunther Island was centered about this latter pattern and, for reasons as yet undetermined, a few burials did not receive this treatment. Stuart's and Loud's observations show the burning pattern to consist of charcoal deposits 4' to 5' in diameter, and 5" to 10" in thickness.