THE STEGE MOUNDS AT RICHMOND, CALIFORNIA

BY

LLEWELLYN L. LOUD

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LOCATION AND SIZE OF THE MOUNDS

The Oakland–Richmond beaches.—Directly opposite the outlet of San Francisco bay, from Point Richmond on the north to Goat island on the south, lies an area 6 miles long and 3.5 miles wide, where the depth of water does not exceed 12 feet at low tide.[1] This area was excellent for fishing in primitive times, as is proved by the number of net sinkers found in mounds on the shore. Some of the largest shell-mounds of the bay region occupied this stretch of shore, not altogether because the fishing there was good and the extensive tide flats suitable for obtaining mollusks, but rather because these advantages were not, as in many other tracts, counterbalanced by the disadvantage of wide areas of marsh lands.

[1] Univ. Calif. Publ. Zool., XIV, 20, 1914, gives the area of San Francisco bay as 400 square miles exclusive of Suisun bay, Carquinez straits, and several large salt-water estuaries.

The largest mound, that at Ellis Landing, at the foot of Eleventh street, Richmond, had a diameter of about 475 feet, and was probably, in former times, at least 30 feet deep. Excavations have been made and the results published by Nelson.[2] One mile to the east, at Stege, within the city limits of Richmond, lie several moderate-sized mounds, which are dealt with in the present paper. Near the center of the Oakland–Richmond beach, at West Berkeley, about 4½ miles from Ellis Landing, is a large mound, 20 feet in depth. This mound has been excavated, but the results are as yet unpublished. About 2 miles farther south is the Emeryville mound, 310 feet in diameter and 32 feet in depth, described by Uhle.[3] Other mounds in the vicinity[4] are not mentioned in this paper.

The Harborgate tract.—In the autumn of 1915, a real estate company laid out the streets and did the grading on the Harborgate tract in the city of Richmond and the writer, aided by Mr. Leonard Outhwaite, spent sixteen days watching the operations of plow and scraper as they leveled one of the Stege mounds at the foot of Twenty-fifth street and part of a larger mound at the foot of Twenty-seventh street. Only two men, with a single team of horses, were engaged in removing the mounds; consequently their work extended over a number of months. Operations had proceeded several weeks before the writer arrived, and were continued until both mounds were entirely leveled. About 550 artifacts—only a part—were secured, including perhaps 150 beach specimens washed out of the larger mound at high tides. Between 1910 and 1914, the writer had collected about 50 objects on the beach, and in 1922, 300 additional specimens were obtained.[5]

Mound no. 300.—According to the system of numbering the shellmounds of San Francisco bay initiated by Nelson and adopted by the Department of Anthropology,[6] the larger mound of the Stege or Harborgate tract is number 300. It indicates the block bounded by Twenty-seventh street, Montgomery street, Twenty-eighth street, and the present water front (fig. 1). The mound was elliptical in outline

[2] N. C. Nelson, The Ellis Landing Shellmound, this series, VII, 357–426, 1910.

[3] Max Uhle, The Emeryville Shellmound, this series, VII, 1–106, 1907.

[4] See figure 1, also the map in N. C. Nelson, Shellmounds of the San Francisco Bay Region, this series, VII, 301–356, 1909.

[5] N. C. Nelson, The Ellis Landing Shellmound, *op. cit.*, 365, states that, in the course of twenty years, the shore at the Ellis Landing mound has been eroded to a width of about 200 feet by wave action. This is perhaps due to gradual subsidence.

[6] Part of the numbers are shown on the map in N. C. Nelson, Shellmounds of the San Francisco Bay Region, *op. cit.*

with the long axis of 475 feet parallel to the shore. The minor diameter before erosion of one side by high tides was probably not greatly in excess of 350 feet. Because of the transporting effect of the waves, there was a small shell bar near the eastern end of the mound.

Near the center of the mound, and at about its highest point, the writer and Mr. Outhwaite excavated a shaft some 5 feet in diameter

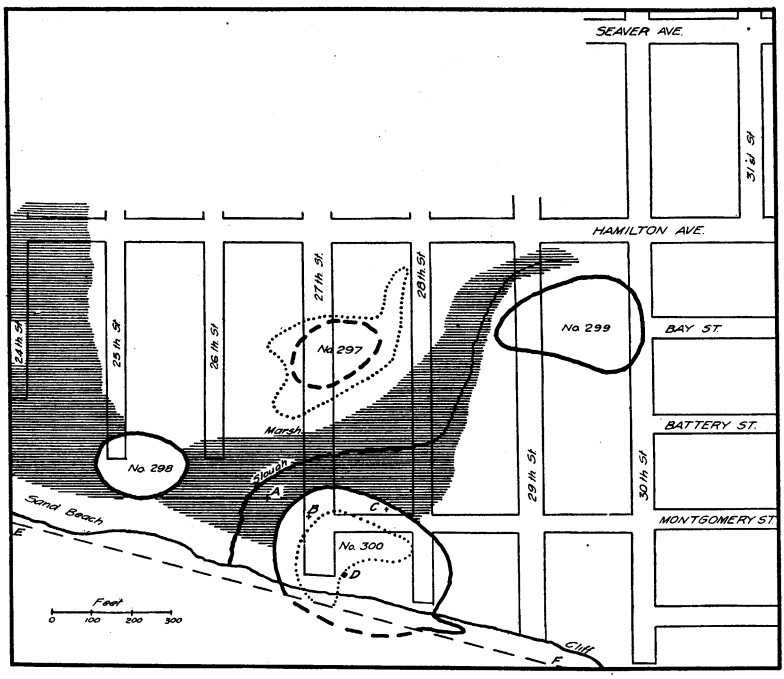

FIG. 1. MAP OF STEGE MOUNDS

Dotted line of mound no. 297 on the Owens tract indicates area of shell after leveling by real estate operations; broken line shows approximate original area of the mound. Dotted line of mound no. 300 incloses area which was partially removed previous to archaeological work. A, Test hole, 20 in. depth of black marsh muck to level of salt water. B, 3 ft. of shell to salt water. C, 20 in. of shell to clay. D, Shaft, 9 ft. of shell to clay and 11.5 ft. to water level. Solid line E–F, bounds of high tides, 1922. Broken line E–F, approximate bounds of high tides, 1915. Mound no. 298, the smaller Stege mound, leveled 1915.

in order to determine the depth of the shell deposit. This was found to be 9 feet. The definitely marked bottom was clay. Water was encountered after digging through 2½ feet of the clay. The water was at approximately sea level, as the fluctuation with the tide was not great.

Mound no. 298.—The smaller mound, at the foot of Twenty-fifth street, measured about 240 by 160 feet. A shaft was dug near the

center, but the bottom of the shell deposit was somewhat indistinct. A sample taken at a depth of 6 feet is a black muck containing a slight amount of shell. Whether the black material is an Indian deposit or not, it is safe to say that the entire depth of the mound did not exceed 7 feet. A sample of pure clay was obtained at a depth of 8 feet.

Mound no. 297.—Another shellmound, leveled before 1915, was situated in the Owens addition, across a small salt-water slough, two or three hundred feet north of mound no. 300. To judge from the scattered shell, it possibly covered nearly as much area as no. 298, though probably it was not so deep.

Mound no. 299.—To the south of Hamilton avenue, between Twenty-ninth and Thirtieth streets, about 500 feet to the northeast of mound no. 300, is a fourth site. It covers an area of about 350 by 250 feet, paralleling the head of a small slough between mounds nos. 300 and 298. The deposit, which is largely black dirt with a limited amount of shell, is probably more than 3 feet deep, as an uprooted tree near the northeast perimeter reveals a deposit 2 feet in depth.

No further report is made here on mounds nos. 297 and 299.

COMPOSITION OF THE MOUNDS

Shell.—Although the proportion of each molluscan species would appear to be about the same for the two Stege mounds, there are some differences. The principal constituent of both mounds was mussel shell (*Mytilus edulis*) with smaller quantities of bent-nosed clam (*Macoma nasuta*), oyster (*Ostrea lurida*), heart-shell (*Cardium corbis*), and a few rarer species.[7] It was found in digging the shaft in the larger mound that there was much less clam and more oyster shell at a depth of 3 to 5 feet than in the upper 3 feet. In fact, oyster shell was rare in the upper 3 feet, but continued in considerable abundance below that depth to the bottom. However, mussel was the principal constituent at all depths.

Calcined shell was not observed in the larger mound. Neither were ashes conspicuous, except for one streak 2 inches in thickness

[7] The only species especially noticed were: 24 specimens of a univalve, *Purpura crispata;* 4 specimens of large mussel, *Mytilus californianus;* and 3 specimens of abalone, *Haliotis rufrescens.* In excavations at the Ellis Landing mound still other species were encountered. See N. C. Nelson, *op. cit.*, 376. E. W. Gifford, Composition of California Shellmounds, this series, XII, 1–29, 1916, shows that the typical mounds of San Francisco bay, like those described in the present paper, contain about 30 to 40 per cent of mussel.

close to the bottom, at a depth of 9 feet. On the other hand, patches of ashes and calcined shell were numerous in the smaller mound. In one bed of calcined shell and ashes 8 or 10 feet in diameter about 2 feet below the surface, there were 70 lumps of baked pink clay moulded in small mussel shells. This clay might possibly have served as a paint of poor quality.

Human bones.—Skeletal material was abundant in the larger mound, but almost entirely lacking in the smaller. There was an abundance of calcined shell in the smaller mound, so that possibly cremation of the dead was here resorted to. The larger mound showed one case of probable cremation, the incomplete skeleton of a young person, no. 12–3448. The bones were found in a heap and show slight signs of calcination.

Mammal bones.—Both mounds held a fair abundance of mammal bones, principally from marine mammals such as seals and sea otter, with a trifling representation of deer, coyote, and other land mammals. Among the rarer bones was a large whale vertebra found in the larger mound.[8]

Bird bones.—Bird bones are of interest because of their unusual numerical importance in the smaller mound. They were so plentiful that only a small proportion was saved. About a third of those brought to the University consisted of ulnae, radii, and tibiae whose ends had been broken off. These are the bones most commonly used for making beads and whistles. Examination of the collections from other mounds reveals that these bones usually have the extremities broken off.[9]

Fish bones.—Only 17 specimens of fish bones were large enough to attract attention and be saved. However, the presence of fish bones in any mound is best revealed in the finer siftings of material. That the larger mound was preëminently the location of a fishing village is proved by the large quantities of net sinkers, 61 per cent of all artifacts being such implements. As relatively fewer sinkers but many more bird bones were found in the smaller mound, an interesting contrast of mode of life is apparent.

Rocks and pebbles.—If a study of all the San Francisco bay mounds should be made from the viewpoint of a geologist, it is prob-

[8] For a list of mammal species represented in the neighboring mounds at Ellis Landing and Emeryville, see N. C. Nelson, *op. cit.*, 378; Max Uhle, *op. cit.*, 18.

[9] Immense quantities of both bird and mammal bones are to be found in the Emeryville mound, but the only species of birds identified are geese, the canvas-back duck (*Aythya valllisneria*), and the cormorant (*Phalaerocoras*). See Max Uhle, *op. cit.*, 18. Five artifacts from Stege were made from radii and ulnae of pelicans.

able that each mound would reflect the character of the rocks to be found within a radius of less than five miles. Few regions show a greater variety of either sedimentary or igneous rocks, and mounds no farther apart than Emeryville and Stege apparently differ considerably. As an example of the multiplicity of rocks in this region, the creek bed at the mouth of Wildcat cañon, three miles from the mounds here described, is littered with boulders of all sizes up to twelve feet in diameter. In a space less than 500 feet long rhyolite, greenstone schist, serpentine, actinolite, glaucophane schist, quartz, calcite, and other minerals are readily found. These as well as other varieties are present in quantities on the beach, where they have been washed out by the tides. They are for the most part uninjured by fire, a condition in marked contrast to the burnt stones found on the beach at Ellis Landing. No fireplaces or heaps of cooking stones were found at Stege, though such are commonly met with in other mounds. In the shaft of the larger Stege mound small pebbles were abundant from the top to the bottom.

HUMAN REMAINS

In the smaller mound, only 8 human bones are known to have been found. These include 2 adult femora, 2 adult humeri, and 2 infant bones. But in the few days of plow operations observed in the larger mound the skeletons of 11 individuals were exposed and 5 others were revealed by the digging and caving in of the shaft. Of these one case is of special interest.

Incomplete skeleton, no. 12–3445, of a person about 20 years old, with a diseased left femur, due to a wound in the hip bone, half an inch from the socket, where there is a fragment of imbedded obsidian. The obsidian point is broken off even with the bone, the dimensions of the exposed surface being 5 by 8 mm. An X-ray picture of the bone indicates that it was penetrated by the arrow point to the depth of 13 mm. The arrow, at the time of striking, was descending at an angle of about 30 degrees from the horizontal. The condition of the bone surrounding the socket, as well as the condition of the head of the femur, indicates that the person lived possibly a year after he was wounded.[10] A fragment of charmstone and 4 large obsidian knives were in association with this skeleton.

[10] At the Ellis Landing mound, at a depth of 11 feet, was found a left femur, no. 12–2340, which had also been pierced by an implement of obsidian that had broken off even with the posterior surface of the great trochanter. The implement had a thickness of 6 mm., a width of 19 mm., and an X-ray picture indicates that it penetrated the bone to a depth of about 35 mm. The bone was fractured to a length of 5 cm. and, as there is no sign of healing, it is evident that the person soon succumbed to his wound. As in the above-mentioned hip bone, the implement (probably an arrow, but possibly a spear) entered at a downward angle of about 30 degrees from the horizontal, and both persons seem to have been in flight, as the implements entered from behind. See Pope in this series, XIII, pl. 64.

IMPLEMENTS OF BONE

Nearly all of the bone implements came from the smaller mound. They consist of 7 deer (?) bone awls, 1 awl-like fish bone, 11 tubular bird bone beads from 23 to 160 mm. long and from 4 to 20 mm. in diameter, 1 bead of marine mammal bone, 2 whistles 7 mm. in diameter and 75 to 90 mm. in length, and 2 objects meriting description.

Scraper.—For this implement was utilized the scapula of a deer. It has a dozen notches on one of its edges and perhaps had as many on the other edge before a portion of the bone was broken off. Uhle found a dozen such fragmentary notched bones at Emeryville and described them at some length, remarking on their wide distribution in other parts of the world.[11] Since then, the University has obtained other specimens from the bay shellmounds and from central Nevada. A Northern Paiute Indian states that scapulae were used both for scraping wooden awls and arrow foreshafts, and for scraping the hair from skins.

Rectangular slab.—This object was made of whale bone. It is 128 mm. long, 48 mm. wide, and varies from 5 to 8 mm. in thickness. It is entirely flat on one side, while the other side has a portion of its face flattened. Such an object might have been used for abrading wood, as the cellular structure of the bone imparts roughness.

IMPLEMENTS OF STONE

The number of specimens of each class of fragmentary or complete stone objects in the larger mound is as follows, the figures in parentheses referring to the smaller mound.

Chipped implements: obsidian knives, 9; obsidian arrow point, 1; worked obsidian, 1; white flint knife, 1.

Sinkers: girdled, 304, (6); 2-notch, 192 (3); 3-notch, 26; 4-notch, 3; 1-notch. 2; anchor, 1.

Pestles: cylindrical, 23; tapering, 8, (3); for paint, 4, (1); crude, 5; fragments, 53, (4).

Mortars: food, 24, (4); paint, 4 (1); pitted stones, 3.

Various: hammer stones, 21, (2); worked globular stones, 35, (3); charmstones, 42 (2); worked greenstone schist, 21; whetstones, 31; problematical and miscellaneous objects, 15, (1).

Total, stone objects, larger mound, 829; smaller mound, 30.

No obsidian refuse was found in the mounds, nor any chert flakes such as are numerous in the Emeryville mound.[12] Evidently the

[11] Max Uhle, *op. cit.*, pp. 76–78, pl. 9, fig. 17, 1907. See also N. C. Nelson, The Ellis Landing Shellmound, *op. cit.*, 393, pl. 46, fig. 6, 1910.

[12] Max Uhle, *op. cit.*, pl. 6, 1907.

Stege mounds were not sites for manufacturing chipped implements, perhaps because suitable materials were scarce in the immediate vicinity.

SINKERS

The larger mound yielded 527 sinkers, 82 of them fragmentary. The largest, the smallest, and an average-sized specimen of the various types are illustrated on plate 18. The specimens range in weight from 125 to 760 grams, the average being 284 grams (10 oz.). Those with two notches run about a tenth lighter than the three-notched or girdled ones.

Girdled sinkers.—In form, the girdled sinkers may generally be described as of oval shape or at least rather 'thickish' elliptical. A few, about two dozen in number, are thin elliptical pebbles, such as are commonly notched on opposite edges. In general, the groove is very slight, barely sufficient to keep an encircling cord from slipping, provided it be tightly tied. In all, there were scarcely a half-dozen in which the groove was of any great depth. Three of the more deeply notched ones are shown on plate 18. With a single exception (pl. 18, fig. 5), the groove is always transverse to the major axis.

Two-notch sinkers.—While the girdled type inclines toward spherical or oval shape, the two-notched type tends more to the disk or flat elliptical shape. About a third of the two-notched sinkers are flat, parallel-sided ellipses, a third are somewhat oval in shape, and the remainder between the two extremes. Typical shapes and notchings are shown on plate 18, figures 1 and 8. Figure 10 shows a unique form. It is parallel-sided and rectangular. Like all other sinkers, it is a stone just as found in nature, except that two opposite edges have been shaped by pecking. Figure 9 shows the largest specimen, 597 grams (21 oz.). It is unusually deeply notched. One specimen, no. 1–23441, is a fragment broken from the side of a pestle.

Three and four-notched sinkers.—The sinkers having three notches are natural sandstone pebbles somewhat triangular in cross-section. Similarly the few four-notch sinkers are rectangular in cross-section.

Material.—All the sinkers described above, as well as the 82 fragmentary specimens, are natural, unfashioned pebbles, generally of sandstone or dense, granular, igneous rock, hard to distinguish in some cases from sandstone. Undoubtedly some are basalt. The colors vary from gray to almost black, with occasionally a bluish tinge. Specimens

of exceptional material include: 4 of granitic igneous rock, 2 of rhyolite, 1 of vesicular basalt, 2 of quartzite, 3 of greenstone schist, 1 of glaucophane schist, 1 of limestone, and 1 of silica-carbonate rock.

Problems regarding fishing.—The sinkers described above are heavy in weight in comparison with those from other regions.[13] Hence they introduce a problem as to how far out into the bay the fishermen ventured with craft no more substantial than bundles of bulrushes. The sinkers appear to indicate that they went well out even where the current was strong.

In connection with the area of shallow water off the Oakland–Richmond beach, it is also of interest to note that the West Berkeley mound, occupying a central position, contains an abundance of net sinkers, while the Emeryville mound near the south end of the stretch has almost none, and the Ellis Landing mound at the northern extremity comparatively few. The sinkers from West Berkeley average considerably smaller than those from Stege.

One specimen of sandstone, shaped much like the small sinker shown as figure 4 of plate 18, is, because of its weight (3940 grams), considered an anchor. The dimensions are 235, 103 and 103 mm. It is roughly rectangular in cross-section and is girdled on three sides.

PESTLES AND MORTARS

Short cylindrical pestles.—The prevailing type of pestle in the larger mound is short and cylindrical. The lengths of 22 specimens vary from 80 to 155 mm., with an average of 112. The diameter varies from 52 to 74 mm., with an average of 62. Most of the pestles were used equally on both ends, which are usually rather flat, although in several specimens they are somewhat rounded. This short cylindrical type of pestle has been found in neighboring mounds, although probably no mound can produce specimens so numerous or so short as those from Stege.

Tapering pestles.—All the specimens of tapering type of any great degree of completeness are shown on plate 18. Their dimensions are given in the explanation of the plate. They will be seen to have a great variety of form, figure 15 being very short and figure 12 of a

[13] L. L. Loud, Ethnogeography and Archaeology of the Wiyot Territory, this series, XIV, 364, 387, 1918, states that 50 Humboldt bay specimens range in weight from 1.1 to 5.5 ounces (31 to 156 grams), while the heaviest of 42 specimens from the ocean coast near the mouth of Mad river weighs only 7.5 ounces (213 grams).

unique, bulging form, tapering toward both ends. Figure 20, although incomplete, is the longest specimen in the collection.

Paint pestles.—There are 5 pestles which because of small size are to be considered paint or medicine pestles. Figure 17 of plate 18 is apparently a naturally shaped pebble of sandstone, although of unusually attenuated form. Figures 14 and 18 show a tapering form. They could have been used at either end. No. 1–23282 is an elongated pebble, 107 mm. in length, of poor grade sandstone, with indications of use at one end. It was found in association with body no. 12–3443. No. 1–23682 is somewhat large for a paint pestle—122 mm. in length and 50 mm. in diameter. It was used on one end only, and is of blue glaucophane schist.

Material.—Of the 101 complete and fragmentary pestles about half appear to be sandstone. Nearly as many are of some granular rock, which approaches the texture of compact basalt, but is often somewhat lighter in color. Four specimens (figs. 12, 13, 15, 21 of pl. 18) are unusually light in color and of granite-like compactness. One of these was identified by Professor Andrew C. Lawson as arkose sandstone—that is, sandstone derived from the disintegration of granite, and consequently rich in feldspar. Three specimens are of a blue glaucophane schist such as covers about three square miles of the adjacent hills. Two specimens (pl. 18, fig. 16) are of greenstone schist. One specimen (fig. 11) is a brown, vesicular andesite.

Mortars.—One large mortar of basalt, broken into 7 fragments, was found in the smaller mound at a depth of several feet. A restoration showed the diameter to be 350 mm. and the height 225 mm. It is of fair symmetry of form. The pit is 150 mm. deep and rounded at the bottom. Numerous fragments of other mortars do not show a high degree of workmanship. They are made of either sandstone or basalt.

Paint mortars.—Externally all the paint mortars are naturally shaped stones, except possibly a fragmentary specimen from the smaller mound. The materials of which they are made include: 3 of sandstone, 1 of some dense igneous rock like basalt, and 1 of vesicular rhyolite. Their sizes are: maximum diameters, 80–136 mm.; minimum diameters, 80–92 mm.; height, 50–65 mm.; diameter of pit, 50–60 mm.; depth of pit, 7–24 mm.

HAMMER STONES

Pebble hammers.—There are 23 objects which are certainly hammer stones, as proved by their bruised or fractured ends. There is considerable variety in both shape and weight, so much so that there are possibly two classes of implements. The smaller specimens ranging in weight from 80 to 300 grams are probably pecking stones, and were used for shaping implements or for other very light work. In fashioning implements from granular materials the undesirable portions of rock are crumbled away by a rapid series of blows with a light hammer. The heaviest pebble hammer stone, 545 grams in weight, and several somewhat smaller specimens, would be sufficiently heavy for use where greater blows were needed, such as in roughly blocking out implements before the pecking process began.

More than a third of the pebble hammer stones are of unknown igneous rocks, the remainder seeming about equally divided between rhyolite, quartzite, dense conglomerate, and sandstone, of which the last-mentioned is a very unsuitable material.

Worked globular hammer.—This is an important type of implement and has not been previously described. Thirty-eight specimens were found. Most of the specimens are globular, 60 to 85 mm. in diameter, but there is a tendency to have several flat faces; for example, one hammer has six sides with the corners and edges worked off to make the object roughly globular. Though their use might be somewhat conjectural, they are probably a form of hammer stone, as they are almost always made of compact durable materials, which are present in great variety.

CHARMSTONES

Although charmstones are widely distributed in central and southern California and have been repeatedly illustrated and described by previous writers,[14] they are always of interest because of their almost limitless diversity of form. Charmstones have been found in nearly every excavated site about San Francisco bay, although they are scarcely numerous enough to be considered plentiful. The 42 specimens from the larger Stege mound are an unusual number to be obtained at a single site and present a remarkable variety of form;

[14] Uhle, *op. cit.*, 51–56; N. C. Nelson, *op. cit.*, 388. For a more extended bibliography, see article "Plummets" *in* Handbook of American Indians, Bull. 30, Bur. Am. Ethn.

but they also show an unusual lack of finish, both as regards symmetry of form and polish. All the complete specimens, as well as several that are fragmentary, are illustrated in plate 19. In only a few instances has any attempt been made at polishing, and in no case did the polishing reach perfection. Nearly all of the specimens show the peck marks, while many are only crudely blocked out.

Material.—Greenstone is the prevailing material of which the Stege charmstones are made, although there are a few of other material, as follows: 5 of sandstone, 2 of basalt, and 1 of actinolite. Two of the sandstone specimens came from the smaller mound. Figure 8 of plate 19 shows a specimen of a most unusual material, with one exception[15] never before found, to the writer's knowledge, in any California shellmound. It is a green crystaline rock, actinolite ($CaMg_3Fe_3Si_3O_{12}$), with properties similar to nephrite and jade.[16]

WORKED GREENSTONE SCHIST

The stone implements include about 40 specimens of worked greenstone schist. Besides these, 12 probably are in the first stage in the manufacture of charmstones, as they are roughly blocked out in the general form of charmstones; they remained unfinished, or were broken in the progess of manufacture. Two other fragmentary specimens look more as though intended for pestles.

There was one specimen of greenstone schist roughly pecked into a disk 97 mm. in diameter, lens-shaped in cross-section, 25 mm. thick. The largest piece of worked greenstone schist found on the mound weighs 1113 grams (39 oz.). It is roughly pecked on all sides, being shaped somewhat like an apple seed, with the dimensions of 137 mm., 94 mm., and 58 mm. After recent storms, the writer found so many pieces of greenstone schist, some of them slightly worked and others unworked, that no attempt was made to save them.

There was considerable trade by exchange among Indians, and it is probable that certain villages became noted as manufacturing centers for particular articles. In any event, the larger Stege mound was a manufacturing site for implements of greenstone schist. It is

[15] N. C. Nelson, *ibid.*, 389, says, "In one instance the attempt has been made to dress and fashion a piece of actinolite."

[16] Charmstones, with their various other names such as lucky-stones and medicine stones, were supposed by the Indians to possess a strong spirit and to have supernatural powers. Similarly in Europe, certain stones were formerly supposed to cure disease; for example, nephrite, the "kidney stone," and jade, the "stone of the side."

probable that the inhabitants got their material from the mouth of Wildcat cañon, three miles distant, where, in the bed of the stream, there are greenstone schist boulders of all sizes—up to 13 feet in diameter.

WHETSTONES

Thirty-one specimens of longish whetstones were found. Most are of sandstone, but some of igneous rock with the texture of basalt. All are of materials such as would be expected in an abrading implement. There are but few complete specimens, most of them being broken off. Some partially worked whetstones and charmstones of sandstone are indistinguishable.[17] The whetstones of the present collection are from 30 to 48 mm. in width (average 39 mm.), and from 20 to 35 mm. in thickness (average 26 mm.). Five complete specimens are from 106 to 123 mm. in length (average 118 mm.).[18] Three specimens are shown on plate 20, figures 5 to 7.

Inasmuch as the larger Stege mound was a manufacturing center for greenstone objects, it is probable that the whetstones were used in the finishing process after the rock had first been brought into shape by pecking. The same remarks apply equally to the mound at Ellis Landing, where whetstones have been found and where Nelson states that more than 70 charmstones were obtained.[19]

While the preceding description applies to the ordinary type of whetstone, there is one specimen which had originally been a cylindrical pestle 167 mm. in length and 60 mm. in diameter. One side, however, had been so flattened by use as a whetstone that it was only 34 mm. thick. Such a whetstone could have been used in polishing large implements, as for example, other pestles.

VARIOUS STONE OBJECTS

Perforated disk.—A problematical object of glaucophane schist (pl. 20, fig. 13) has the sides roughly flat and parallel, the thickness varying from 12 to 16 mm., and the diameters from 115 to 126 mm.

Cylindrical stone.—Plate 19, figure 1, shows an object made of basalt. It is a symmetrically fashioned cylinder 42 mm. in diameter

[17] One complete charmstone from Ellis Landing, no. 1–13276, has also been used as a whetstone, as shown by two flat faces.

[18] Five complete specimens from Ellis Landing are longer, 138 to 164 mm. (average 149 mm.).

[19] N. C. Nelson, *ibid.*, 386, 388.

and 39 mm. long. Similar objects, although rare, are occasionally found in various parts of California. They are often classed as ear or lip plugs. This is however one of the largest specimens seen, weighing 128 grams. It was found in association with a skeleton. The writer has no suggestion to make as to its use.

Girdled stone.—The specimen shown as figure 15 of plate 19 is of unusual form for a charmstone, very few similar specimens having been found previously in the San Francisco bay mounds. Also, it is made of an unusual material for charmstones—a very poor grade, loose-textured sandstone. A few roughly similar specimens have been found in the Sacramento Valley and at Humboldt bay,[20] although the latter region produces no charmstones of the "plummet" form.

CONCLUSIONS

The Stege mounds are smaller than the Ellis Landing, West Berkeley, and Emeryville mounds situated on the same Oakland–Richmond beach, and at first seemed likely to reveal less of prehistoric importance. But analysis of their artifact contents reveals interesting differences. Thus it shows that the larger Stege site was a place where greenstone was manufactured; whereas the smaller one, although so near by, abounds in bird bones and bone implements, ash layers, and calcined shells, materials which are almost lacking in the larger mound. The explanation that the smaller mound was a mere camp-site or hunting station of a permanent village situated on the larger, seems disproved by the occurrence of burials in both. There seems to have been a difference, also, as regards stone implements, although the small number of such pieces recovered from the smaller mound makes comparisons less incisive. Mortar and pestle fragments constitute 43 per cent of the stone artifacts in the smaller mound, only 15 per cent in the larger; for sinkers, the respective proportions are 30 per cent and 63 per cent.

Similar differences appear among all the mounds of this stretch of beach. West Berkeley is notably rich in sinkers. The Furlong exploration yielded about 147 of these pieces, 136 other stone implements, 54 artifacts of materials other than stone—all now in the University Museum of Anthropology. A later excavation by J. Peterson produced 12 sinkers out of 82 artifacts. This makes the frequency of sinkers at West Berkeley 38 per cent. Fishing must have been an important occupation.

[20] L. L. Loud, *op. cit.*, 364, pl. 17, fig. 8.

The Emeryville mound, on the other hand, is almost lacking in these implements. Uhle indeed speaks of "about 18 sinker-like stones,"[21] but most of these are charmstones or perforated stones. Of girdled or notched sinkers, there were apparently only two or three. This conclusion is confirmed by the fact that a shaft sunk to the bottom of the mound by Nelson in 1906 did not produce a single sinker among 67 implements.

Ellis Landing, it seems likely, stood intermediate between West Berkeley and Emeryville. Nelson obtained about 50 sinkers from the upper layers, and a dozen more from the bottom of his shaft.[22] Peterson in a brief exploration got 12 sinkers and 19 other artifacts.

On the basis of the findings in these mounds it might be imagined that the differences merely reflected environment: that the waters about West Berkeley, Ellis Landing, and Stege were favorable, and those near Emeryville unfavorable, for net fishing, much as Gifford found the shell constituents of mounds on all parts of San Francisco bay to agree rather closely with the modern frequency of molluscan species in the vicinity.[23] But such an inference is vitiated by the striking discrepance between the two Stege mounds, which lay only a hundred yards apart. This discrepance is difficult to explain except on the basis that these two mounds were occupied by people following somewhat different modes of subsistence, and therefore presumably living at different times. Such a conclusion might then apply also to the other mounds, the cultural variations between these being due to relative age as well as to environment.

What the respective periods of the several mounds actually were, there seems to be no present means of determining. The probability of chronological differences, however, emphasizes the need of further intensive exploration of small as well as large mounds. The problems of prehistory in this area, especially the gradual development of its culture, can be solved only with fuller and more exact data. But the present study suggests that the problems are soluble.

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[21] *Op. cit.*, 50.
[22] *Op. cit.*, 387.
[23] *Op. cit.*, 7.

PLATE 18

Sinkers and Pestles

Figs. 1–10, sinkers, .3 natural size; all, except possibly fig. 5, from mound no. 300.

Fig. 1. 1–23446, 120 × 97 × 22 mm., 437 grams.
Fig. 2. 1–23784, 85 × 55 × 50 mm., 299 grams.
Fig. 3. 1–23413, 125 × 70 × 60 mm., 760 grams.
Fig. 4. 1–23392, 78 × 41 × 31 mm., 129 grams.
Fig. 5. 1–23523, 56 × 44 × 35 mm., 125 grams.
Fig. 6. 1–23394, 99 × 66 × 16 mm., 178 grams.
Fig. 7. 1–23408, 86 × 62 × 62 mm., 459 grams.
Fig. 8. 1–23822, 72 × 50 × 27 mm., 139 grams.
Fig. 9. 1–23451, 144 × 95 × 27 mm., 597 grams.
Fig. 10. 1–23445, 105 × 67 × 34 mm., 435 grams.

Figs. 11–21, pestles, .26 natural size. Figs. 14, 17, 18, paint pestles. Fig. 11, of vesicular andesite; figs. 12, 13, 15, 21, of arkose sandstone; figs. 16, greenstone; all others of sandstone or igneous rock. Fig. 15, 17 from mound no. 298; all others from mound no. 300.

Fig. 11. 1–23629, 225 × 71 mm.
Fig. 12. 1–23379, 163 × 68 mm.
Fig. 13. 1–23371, 135 × 62 mm.
Fig. 14. 1–23367, 111 × 54 mm.
Fig. 15. 1–23492, 115 × 62 mm.
Fig. 16. 1–23380, 163 × 66 mm.
Fig. 17. 1–23491, 135 × 38 mm.
Fig. 18. 1–23683, 123 × 48 mm.
Fig. 19. 1–23358, 89 × 57 mm.
Fig. 20. 1–23382, 240 × 60 mm.
Fig. 21. 1–23376, 155 × 64 mm.

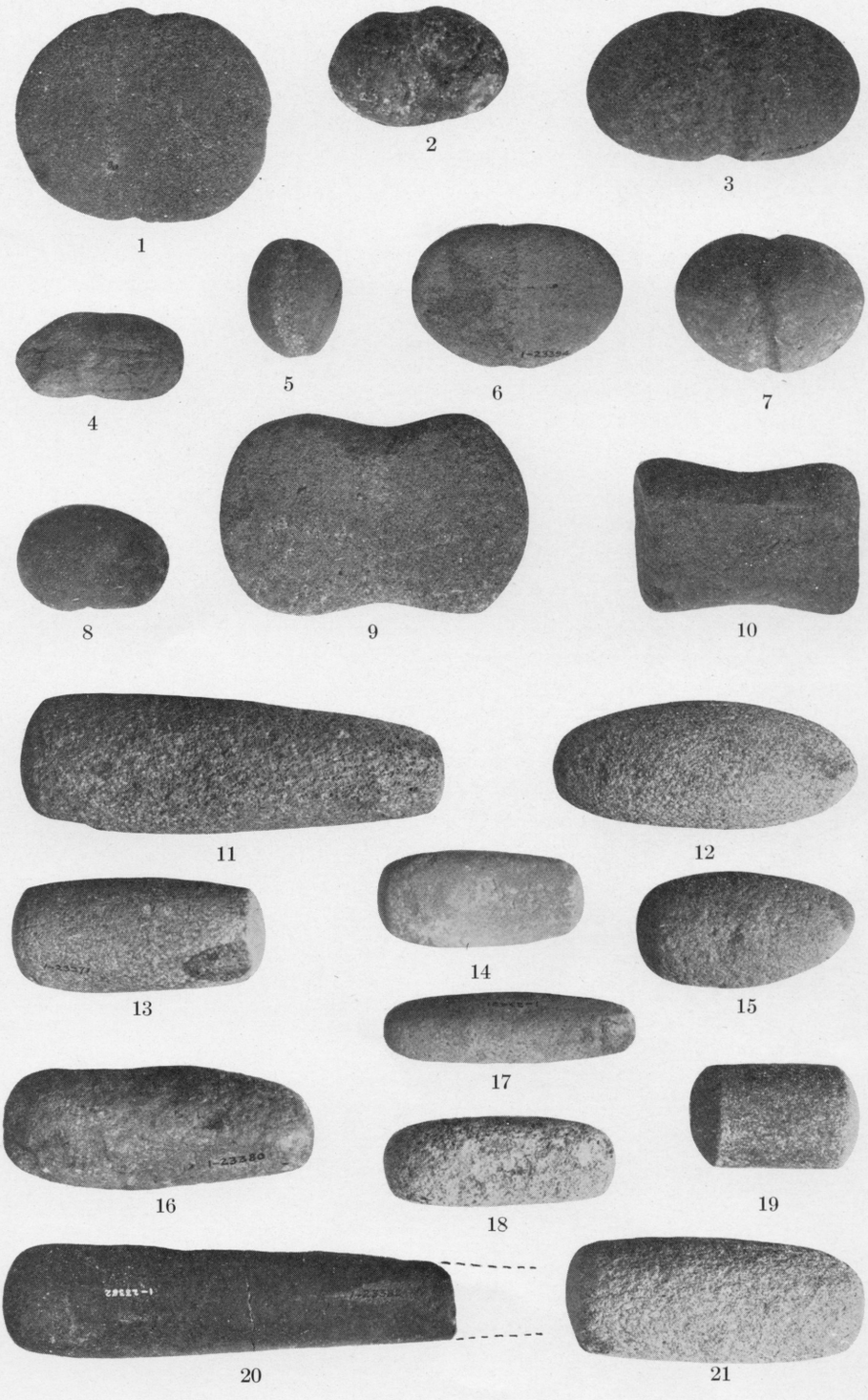
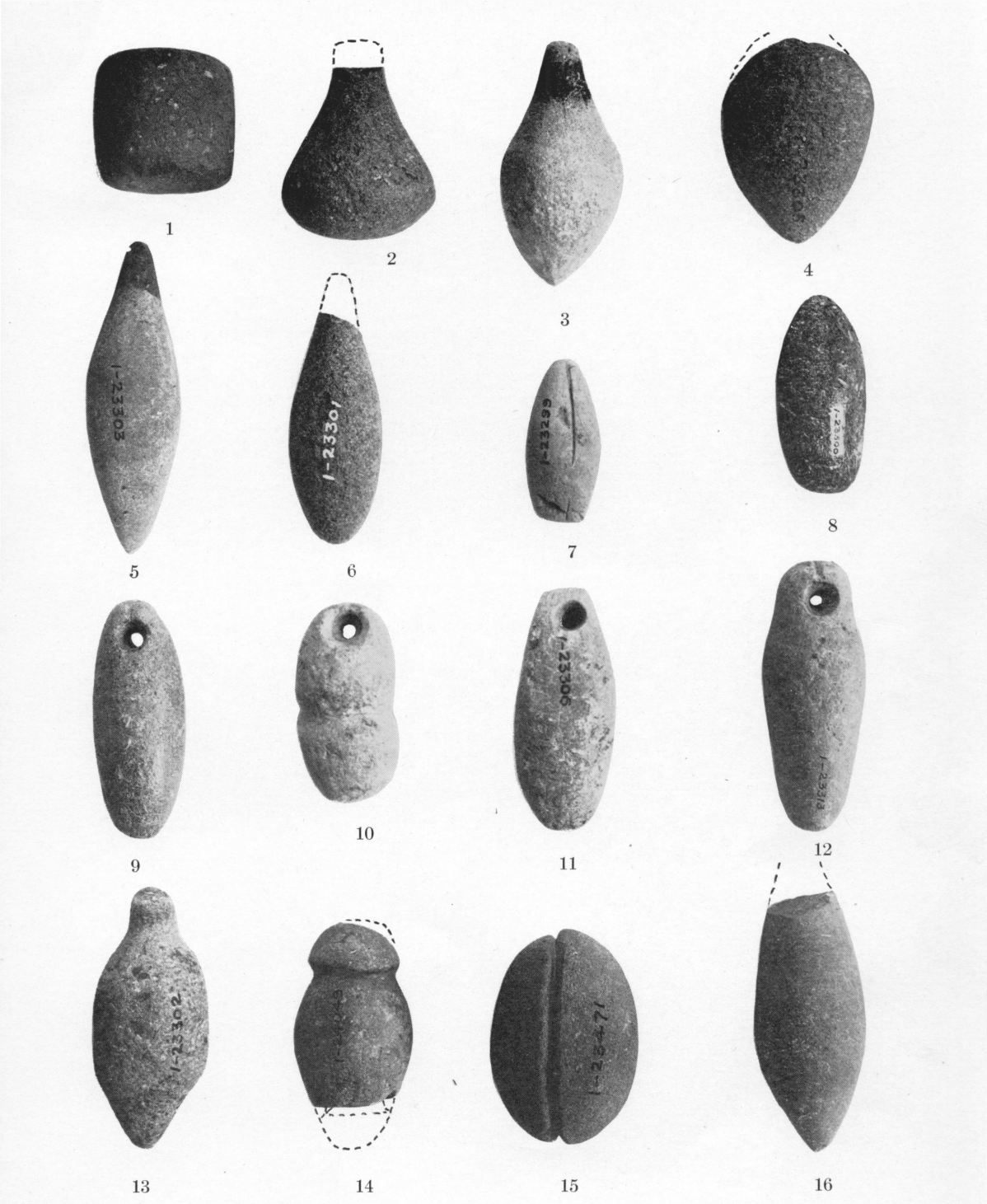


PLATE 19

CHARMSTONES

Fig. 1, cylindrical stone; fig. 15, girdled stone; all others, charmstones of the "plummet" type. Figs. 1, 2, 6, of basalt; fig. 8, actinolite; figs. 5, 15, 16, sandstone; all others of greenstone. Figs. 3, 9, 10, obtained in excavating a shaft in mound no. 300 at depths of 3.7, 2, and .5 feet; figs. 15 and 16, from mound no. 298; all others, from mound no. 300. All .5 natural size.

Fig. 1. 1–23522, 39 × 42 mm.
Fig. 2. 1–23304, 51 × 46 mm.
Fig. 3. 1–23258, length 74 mm.
Fig. 4. 1–23305, 61 × 45 mm.
Fig. 5. 1–23303, 98 × 30 mm.
Fig. 6. 1–23301, 73 × 29 mm.
Fig. 7. 1–23299, 51 × 23 (× 14) mm.
Fig. 8. 1–23300, 63 × 27 mm.
Fig. 9. 1–23257, 75 × 29 mm.
Fig. 10. 1–23256, 63 × 32 (× 27) mm.
Fig. 11. 1–23306, 77 × 32 (× 18) mm.
Fig. 12. 1–23313, 85 × 32 mm.
Fig. 13. 1–23302, 82 × 36 mm.
Fig. 14. 1–24049, 60 × 37 mm.
Fig. 15. 1–23471, 65 × 44 mm.
Fig. 16. 1–23469, 80 × 34 mm.



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