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**CALIFORNIAN FISH SPEARS AND HARPOONS**

**By**

**J. A. BENNYHOFF**

**UNIVERSITY OF CALIFORNIA PRESS**

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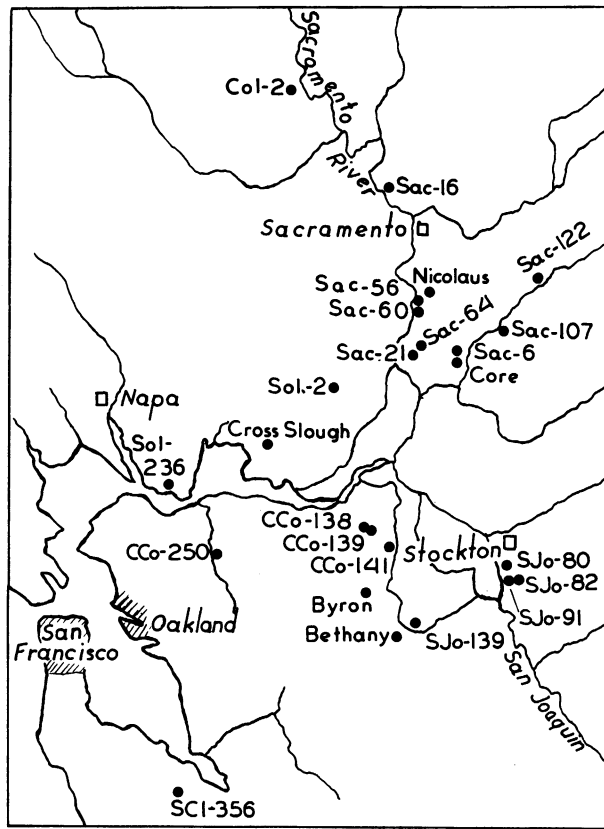
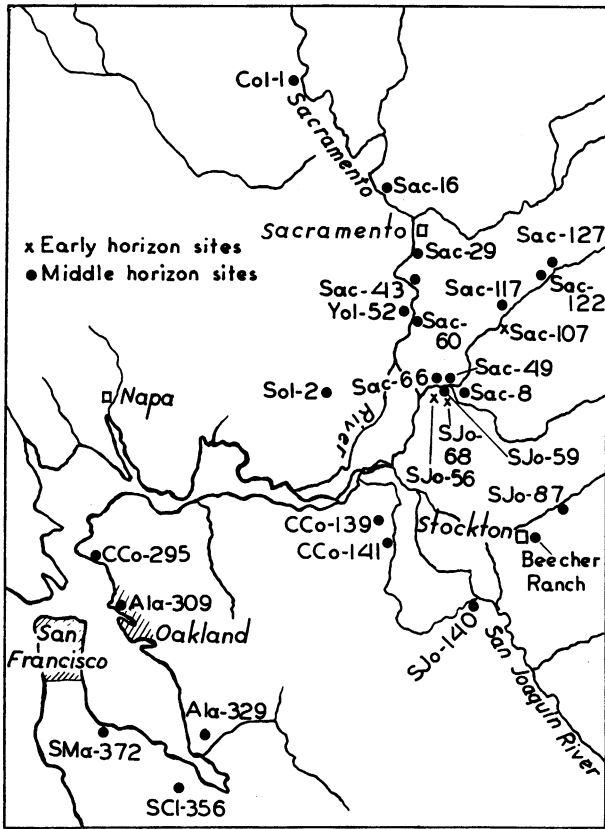
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	LITTORAL ZONE	INTERIOR VALLEY ZONE	
	COASTAL PROVINCE	INTERIOR PROVINCE	
MIDDLE HORIZON	<b>ELLIS LANDING FACIES</b> Ala-309 Ala-329 CCo-295 SCI-356	<b>MORSE FACIES</b> Sac-66 Sac-60	<b>BRAZIL FACIES</b> Sac-43 <b>ORWOOD FACIES</b> CCo-141
EARLY HORIZON	(UNKNOWN)	<b>WINDMILL FACIES</b> Sac-107 SJo-56 SJo-68	

a

	LITTORAL ZONE	INTERIOR VALLEY ZONE	
	COASTAL PROVINCE	INTERIOR PROVINCE	
LATE HORIZON, PHASE I	<b>EMERYVILLE FACIES</b> CCo-250 SCI-356 Sol-236	<b>HOLLISTER FACIES</b> CCo-138 Sac-6 Sac-21 Sac-60 Sac-107	

b

Map 1. Settlements and Culture Sequence in Central California: Temporal and Areal Relationships  
 a. Early and Middle Horizon Settlements. b. Late Horizon Settlements

# CALIFORNIAN FISH SPEARS AND HARPOONS

By

J. A. BENNYHOFF

## INTRODUCTION

Fish spears and harpoons are among the most generally used implements of primitive fishermen. Too often, however, mere mention is made of their presence, with the assumption that their specific forms are unimportant details. This has been largely true of California since its discovery, as well as for most of the territory between the Eskimo and the Yahgan. The wide distribution of these implements suggests their early invention, but insufficient examples have been published to reveal any extensive relationships. The early study made by Mason (1902) constitutes the only available source for harpoons of the whole New World, and in it the hemisphere is treated in a summary fashion. This work and the ethnological reports from the state emphasize the presence of the toggle harpoon in California, while excavation has since produced an interesting variety of fishing implements.

The present paper therefore discusses essentially only the forms found archaeologically in California and their distribution within the state. Both temporal and areal differences are apparent, with the suggestion of local development of certain types, while the presence of still different types is obviously due to diffusion from centers outside the state.

As a convenience, in the following descriptions the typology set up by Gifford (1940) has been followed wherever possible, the major difference being that in this paper separate types have not been established on the basis of material, but arbitrarily on that of form only. Much of the terminology used is that presented by Drucker in his Northwest Coast Survey.<sup>1</sup> Special appreciation is expressed for the guidance and assistance of Dr. R. F. Heizer, at whose suggestion this study was begun. I am grateful also to Professor E. W. Gifford for access to the University of California Museum of Anthropology (UCMA); to Mr. F. Fenenga for his interest and for his valuable knowledge of Central Californian archaeology; and to Mr. C. Chard for information concerning site CCo-138. Tracings and information on Central and Southern Californian harpoons in other institutions were

obtained from Mr. A. Woodward of the Los Angeles County Museum, Mr. N. C. Nelson of the American Museum of Natural History (AMNH), Dr. N. M. Judd of the U. S. National Museum (USNM), and Mr. E. K. Burnett of the Museum of the American Indian, Heye Foundation (MAI-HF). Dr. H. H. Stuart, of Eureka, California, kindly made available for study his Northwestern California collection. The site designations using county symbols employed herein are those assigned by the University of California Archaeological Survey. Sites not yet recorded in the Survey files or those of uncertain identification are referred to by name or previous number. A concordance of new and old site numbers is given on page 323.

A total of 603 pieces is discussed in this report, 462 of which are in the UCMA. More than nine-tenths of the specimens are made of antler, probably deer or elk. Most of the bone pieces are small, simple artifacts, particularly of fish spear type MM2 and simple harpoon type II, since the thinness and curvature of most bones would be ill-suited to the manufacture of the larger specimens. Except for whalebone pieces (type W) and three of bird bone (W1a) from Southern California--in part a reflection of the island habitat of the users--all other bone specimens are of unidentifiable long bone.

Fish spears and harpoons were occasionally included as grave furniture, 150 occurring with 37 burials and 24 with 10 cremations. They occurred with both male and female burials. Those of type 00 perhaps had some other function than that of mere utilitarian implements, since large numbers were often buried with individuals. This is especially characteristic of type 002, for Schenck and Dawson<sup>2</sup> record as many as 51 and 31 included in individual graves. It is probable that fishing and sea-mammal hunting were the primary, if not the only, uses of these implements, though birds or beaver and other aquatic mammals may have been taken with them. However, the only indication that they may have served as lances for warfare is a dubious artistic arrangement of "Weapons of War"<sup>3</sup> containing a sea-mammal harpoon point permanently attached to a shaft.

<sup>1</sup>Drucker, 1943, pp. 34-39; most of the terms are self-explanatory or referred to by illustrations. "Enclosed" refers to barbs which are larger than the intervening spaces; "isolated" barbs are smaller than these spaces. "High" and "low" refer to the relative proportion of length of barb to thickness of shaft.

<sup>2</sup>Schenck and Dawson, p. 369. The 28 specimens from Beecher Ranch, referred to by Meredith, in Moorehead, 1900, p. 272, may have been with a burial also.

<sup>3</sup>Powers, fig. 1, p. 53.

The operational principle of the fish spear is quite different from that of the harpoon, although the terms are often used synonymously. A fish spear consists usually of a bone, antler, or wood point permanently attached, often by means of foreshafts, to a simple shaft retained in the hand. The harpoon has a detachable point, connected by a retrieving line to either a simple or composite shaft. Two basic types of har-

poon, as defined by Jochelson,<sup>4</sup> were present in California: (1) the simple harpoon, "with a head that retains its original position after striking an animal" (both single-piece and composite heads were used); (2) the toggle harpoon, "in which the head assumes a transverse position when an obstruction is encountered." Except for a simple bipointed type, only composite varieties of the toggle harpoon were known in California.

#### FISH SPEARS

This category includes various types of artifacts, for many of which several uses have been suggested.

##### UNBARBED TYPES

MM3a (fig. 1, a-c). Short length (5.5 to 6 cm.); nearly spherical cross section; simple sharp tip; bowed, unbarbed shaft; notch on outside of shaft near square base. One specimen from site SJo-56 (fig. 1, b) has a raised girdle one-third of the distance from the point, and a grooved base opposite the notch. Total of 17 specimens, 8 with 4 burials and 4 with 1 cremation. Distribution: SJo-56 (1); SJo-68 (11); Sac-107 (5). (Lillard, Heizer, and Fenenga, pp. 26, 32, 41, pl. 20, fig. 1; Heizer, 1949, p. 28).

The notched base and the fact that nine of these points were found in groups of three at sites SJo-68 and Sac-107 suggest their use as tridents. Four tip fragments were found with a cremation at SJo-68, but more points may originally have been present.

MM2b (fig. 1, k-u). Medium to short length (11.5 to 4.0 cm., but average is closer to 6.5 cm.); thin elliptical cross section; simple sharp to spatulate tip; unbarbed; great variability in shaft shape, which is usually asymmetrical, with a tendency for the side opposite the basal foot to be straight; oblique distal end with unilateral footlike base. A pair from Sac-66 had seven serrations on upper shaft on side opposite basal foot (fig. 1, o). Total of 47 specimens, 12 with 8 burials, 7 with 2 cremations. Distribution: Sac-66 (29); Sac-122 (1); Ala-309 (4); Sma-372 (1); Sac-43 (4); Sac-60 (4); CCo-139 (2); Sonoma County (2, Gaffney collection). (Gifford, 1940, pp. 183, 232; Uhle, pl. 9, figs. 11-13; Lillard and Purves, pl. 10; Heizer and Fenenga, fig. 1, no. 18; Lillard, Heizer and Fenenga, pl. 19, a-e, f, g. The three types set up in Lillard *et al.*, are here considered as one, since types 2 and 3 have only one or two examples.)

A variety of uses has been proposed for these artifacts. Uhle<sup>5</sup> suggested their utiliza-

tion as arrow points, similar to implements of the Bororo,<sup>6</sup> but the pieces seem needlessly specialized for such a use. Schenck<sup>7</sup> interprets them as composite fishhooks. At the Early horizon site of SJo-68 the assemblage shown in figure 1, j was uncovered *in situ*.<sup>8</sup> The blade-like object has been considered an MM2b type,<sup>9</sup> although both tip and base are atypical. Its purpose is difficult to imagine since the hook is complete in itself and needs no supporting member. It has been suggested that it acted as a wiggling lure to attract fish. That all implements of this type found in the succeeding horizon had a similar use seems doubtful. In no other instance were these blades found associated with curved fishhooks or with any artifact suggesting a composite fishhook. The numerous rounded tips would make them unfit for fishhook barbs. Use as a shank would imply wooden barbs, though the opposite combination, that is, wooden shanks and bone barbs, is the usual native construction. One general characteristic which should be noted is the tendency for the side opposite the basal projection to be straight, lacking the angularity needed in a composite fishhook to separate the barb from the shank. This straight side would be an advantage if the implement were lashed against a shaft (possibly grooved as in fig. 1, u) to be employed as a fish spear; the attaching cord would then be held in place by the projecting foot (see fig. 1, t). Many retain evidence of binding at the basal end. At site Sac-66 twelve of the twenty-nine found were definitely paired. The four examples from Sac-60 were found with one burial. This again suggests a bipointed fish spear. Dull, roundish points would be less of a hindrance when the implement was applied with the quick thrusting force of a spear. The frequent outside angularity and tapered distal ends would tend to hold the prey, but escapes were a circumstance which perhaps led to the acceptance of barbed types instead. That barbs were not essential to success is indicated by the unbarbed leisters used by some historic tribes.

<sup>6</sup>Lowie, fig. 53, b, p. 425; or the Bororo harpoon, Mason, 1902, fig. 14, p. 217.

<sup>7</sup>Schenck, p. 226, pl. 43 FH.

<sup>8</sup>Lillard, Heizer and Fenenga, no. 9, p. 7.

<sup>9</sup>Beardsley, 1947, p. 152.

<sup>4</sup>Jochelson, p. 53.

<sup>5</sup>Uhle, p. 75.

Other unbarbed artifacts discussed here as fish spears are even more problematical. Few specimens have been found, and it is their general similarity which prompts their inclusion here.

MM2a (fig. 1, d, e). Short length (4.6 to 5.3 cm.); elliptical cross section; simple tip; unbarbed; basal shoulder on face, or slight groove on lower half of face with transverse ridge midway in length. Total of 3 pieces. Distribution: Ala-309 (3). (Gifford, 1940, pp. 183, 232; Uhle, 1907, pl. 9, fig. 15; Schenck, p. 227, fig. 6, pl. 43W.)

Uhle and Schenck proposed that specimens of type MM2a were used as arrow points and fishhooks, respectively, but the objections noted in the discussion of type MM2b apply here also. The shoulder or groove and the straight back of type MM2a would allow their hafting as fish spears. Their shortness is, however, a major deficiency.

MM2d (fig. 1, f-h). Medium to short length (11 to 7 cm.); thin elliptical cross section; simple medium-sharp tip; unbarbed; elongate trianguloid shaft constricted in lower half, which often lacks polish and retains traces of binding. Total of 7 specimens, 5 with 3 burials. Distribution: Sac-16 (1); Sac-29 (3); Sac-43 (2); Yol-52 (1).

The few examples of this type prevent any definite conclusions as to use. Their angularity and isolated occurrence suggest they may have been barbs of composite fishhooks. The constricted base would also permit their attachment as fish-spear points, and because of their general similarity to type MM2b they are included as having the same use.

MM2e (fig. 1, i). Medium length (9 cm. restored); rectangular cross section with one edge rounded; simple pointed tip; trianguloid shaft, with notches staggered on each side of upper edge; notched base. Only a single fragment, from CCo-250, has been found, and it is tentatively included because of its notched base and general form.

A variety of other archaeological specimens, primarily from Southern California, could have served as fish-spear barbs. Certain of Gifford's<sup>10</sup> types U2 and U3 quite possibly served as prongs of the tridents, *fisgas*, often referred to by early Spaniards (see p. 303). De Laguna<sup>11</sup> would also include larger examples of types T1b, T1h, T2b1, and T2c,<sup>12</sup> but the uses of such simple artifacts are so manifold that no definite function can as yet be suggested without evidence of the position of the specimens *in situ*.

<sup>10</sup>Gifford, 1940, pp. 177, 223.

<sup>11</sup>De Laguna, p. 212, fn. 637.

<sup>12</sup>Gifford, 1940, pp. 176, 177.

## BARBED TYPES

That the barbed fish spears developed from type MM2b is suggested by their distribution, the similarity of bases, and one example, figure 1, k, which with some certainty can be considered a specimen reworked, after loss of its barb, into an MM2b. It was found at site Sac-43, one of the two Interior province sites sharing both barbed and unbarbed examples, and probably represents a transitional form.

These barbed specimens provide greater evidence of use as fish spears. Meredith<sup>13</sup> refers to a newspaper account of the finding of a group of these implements in which "2 of the specimens were bound to a rod or staff, as if it had been used as a gig or spear." Schenck and Dawson<sup>14</sup> illustrate such a reconstruction. Rock Creek mound produced "four or five pair." Large numbers of these barbed specimens were often buried with the dead, and the even numbers frequently found suggest original pairing. Decomposition and the possibility that unhafted points were included would account for the odd numbers which also occur.

Many pieces could not serve as fishhooks, as suggested by Schenck in an earlier publication,<sup>15</sup> for in them the barb occasionally projects beyond the shoulder or is of such length as to touch any straight shank laid against the flat edge. To explain this one must suppose that an obtuse-angled or curved shank of wood was employed. That an arrangement of this sort is possible is illustrated by an actual specimen<sup>16</sup> collected during the Vancouver voyage along the Pacific Coast, Hawaii, and Tahiti, for which no location is stated. (See fig. 7, m.) It is quite possible that both the fish spear and fishhook are represented, since the variation is so great. Figure 1, d' in particular suggests a fishhook. But the rare occurrence of these artifacts in the Late horizon and their complete absence among historic tribes argue against any widespread use as fishhooks. The substitution of the less advanced unbarbed composite hooks of historic tribes for barbed fishhooks is difficult to explain. On the other hand, the abandonment of the fish spear after the entrance of the harpoon is easy to understand.

OO1 (fig. 1, v-z, a'-e'). Medium to short point (12 to 8 cm., with average around 10 cm.); thin rectanguloid to elliptical cross section, with flat edge often extending on barbed side from below the barb to the base; simple sharp tip; one high (occasionally low) unilateral barb; oblique shouldered lower shaft frequently straight on barb side; unilateral footlike base, on side

<sup>13</sup>In Moorehead, p. 272.

<sup>14</sup>Schenck and Dawson, pl. 80, a, pp. 368, 369.

<sup>15</sup>Schenck, fig. 4, p. 226.

<sup>16</sup>Dalton, pl. XVI, fig. 22, p. 245.



opposite from barb. Specimens in figure 1, d', e' lack this foot but were apparently notched for attachment. Total of 40 specimens, 19 with 4 burials. Many are only basal fragments and may be type 003. Distribution: Ala-309 (1); Ala-329 (1); Col-1 (4); Sac-8 (1); Sac-16 (2); Sac-29 (1); Sac-43 (13); Sac-66 (1); Sac-117 (2); Sac-49 (8); SCl-356 (2); SJo-59 (1); Sol-2 (1); Yol-52 (2). (Gifford, 1940, pp. 184, 233; Schenck, pl. 43 Z, p. 226; Lillard and Purves, pl. 10; Heizer and Fenenga, fig. 1, no. 16.)

002 (fig. 2, a-e). Medium to short point (11.5 to 6.5 cm.); thin rectangular to elliptical cross section, with flat edge extending on barb side from below barb to base; simple sharp tip with notch at base; one high, angular, unilateral barb; concave arc of shaft below barb extends out to apex of shoulder in middle of shaft; beveled shoulder extends to base; unilateral foot-like basal projection on side opposite barb. Notching may occur on the arc of the shoulder, occasionally on both sides. Four or five notches is the usual number, but Meredith<sup>17</sup> records twenty-eight on one specimen. Set off from type 001 by more careful workmanship and notched tip. Total of 128 specimens, 85 with 4 burials.<sup>18</sup> Distribution: CCo-141 (2); SJo-87 (31); SJo-140 (7); Beecher Ranch (28); Bethany (52); Rock Creek (8). (Gifford, 1940, pp. 184, 233; Moorehead, fig. 412, no. 3, p. 273; Heizer and Fenenga, fig. 1, no. 15; Lillard, Heizer, and Fenenga, pl. 29, g.)

003 (fig. 2, f-j). Long to medium point (14.5 to 9.5 cm., with average at 12 cm.); medium elliptical cross section, with flat edge occasionally extending from below barb to base; simple sharp tip; two medium to high, enclosed, unilateral barbs; shaft, occasionally shouldered, tapers to constricted base with unilateral footlike projection on nonbarbed side. Total of 12 specimens, 7 with 2 burials. Some of the 001 fragments may be of this type. Distribution: Sac-8 (1); Sac-43 (7); Sac-122 (1); Sac-127 (1); Yol-52 (1); Ala-309 (1). (Gifford, 1940, type NN1b, pp. 183, 233. Complete pieces excavated since indicate that the example illustrated there is not to be identified with marine forms used ethnographically in Northwestern California [ibid., p. 237, fig. 23], and a new type has been established; Schenck and Dawson, pl. 80, p.)

### HARPOONS(?)

W1a (fig. 2, k-t). Medium point (16 to 6.5 cm.); cross section varies with bone used, from curved to thin elliptical; simple sharp to medium tip; one (occasionally two) low, usually convex, occasionally concave, unilateral barb; conical or spatulate base. One of antler, three bird-bone, two whale-bone, and six mammal-bone specimens. Total of 13. Distribution: Hum-67 (1, Stuart collection); Col-2 (1); CCo-295 (1); San Nicolas Island (8 [5 in AMNH, Terry collection]); Channel Island area (1, illustrated in Amsden); San Francisco shellmound (1, in Oakland Public Museum). (Gifford, 1940, pp. 178, 224; the specimen from Hum-67 listed as W1 [p. 178], should be changed to type II; it is a tip fragment [see Loud, pl. 21, fig. 13] so the base type cannot be given. Fig. 2, k, illustrated in Amsden, p. 26; fig. 2, r, in Stuart collection; fig. 2, l, and four other examples in AMNH.)

Type W1a is one of those generalized forms more easily dealt with in a typological classification than in a discussion of function, for no one use can be assigned to it. The smallness and fragility of the specimens preclude their use in hunting large game. The low barb and small size could be suited to fish harpoon arrows, and the grooved base of figure 2, n suggests a line attachment. It is doubtful whether figure 2, l represents a line hole, in view of the distribution of this form of attachment. The double-barbed example from the Channel Islands (fig. 2, k) may have been the point of a small composite harpoon. Possibly the Southern Californian pieces served as prongs of the tridents so often referred to in the early Spanish accounts of the region. In one translation these tridents are described as being of bone, with a single barb,<sup>19</sup> but if the term *figas* was the original Spanish word, as seems likely, it could also be translated "harpoon," and could more aptly apply to type W1b, described on page 304. Harrington, in describing the Costanoans, records fish spears with one or two points, each having a barb.<sup>20</sup> Perhaps related is the Tachi Yokuts single-pointed harpoon, having a hooked point and made of a pelican wing bone.<sup>21</sup> Although there is no evidence of the barbed fishhook in the regions where the type W1a specimens were found, the small size of some, especially the San Francisco Bay pieces, would make them suitable for use as fishhooks. An ethnographic specimen is known from the Yahi,<sup>22</sup> and figure 7, n, o shows prehistoric fishhooks with wooden shanks and bone barbs obtained from Humboldt Cave in west central Nevada.

<sup>19</sup>Pages, p. 51.

<sup>20</sup>Harrington, nos. 52-54, p. 7.

<sup>21</sup>Gayton, p. 15.

<sup>22</sup>Gifford, 1940, fig. 24, p. 237.

<sup>17</sup>In Moorehead, p. 272.

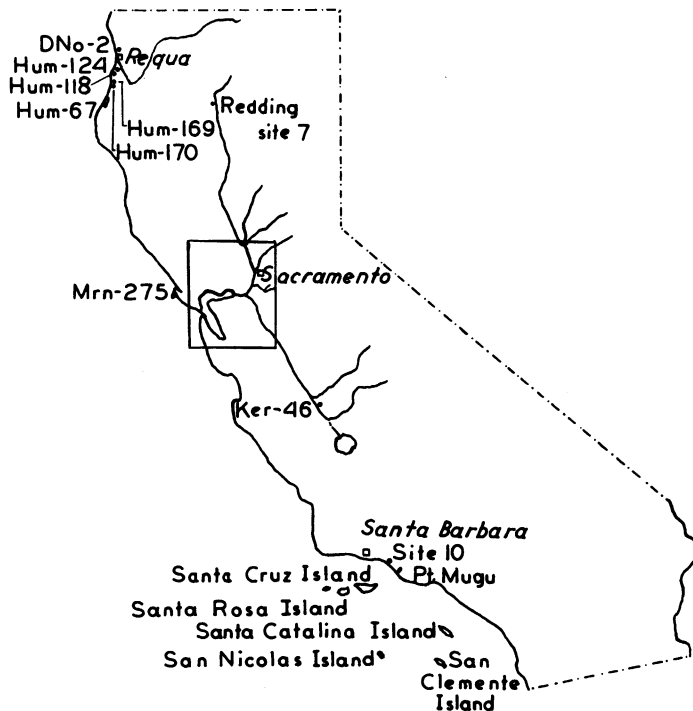
<sup>18</sup>If the 28 specimens reported by Meredith, ibid., from Beecher Ranch were found with a burial, the burial associations of type 002 would increase to 113 with 5 burials.

## SIMPLE HARPOONS

Various forms are included in this group, differentiated chiefly by the location of barbs, which are either unilateral or bilateral placed in opposed or staggered position.

## NORTHWESTERN CALIFORNIA

The typology proposed by Gifford (1940, p. 183) is inadequate to deal with the variation exhibited by harpoons from Northwestern California acquired since his publication appeared. A new typology is therefore substituted, using the following symbols: I, large unilaterally barbed simple harpoons for hunting sea mammals in Northwestern California; II, small unilaterally barbed simple harpoons used for fishing and small game in Northwestern California;



Map 2. Archaeological Sites

capital letters, method of line attachment (A, bilateral line shoulder; B, bilateral line guard; C, unilateral line guard; D, line hole); Arabic numerals, tip variations (1, simple tip; 2, slotted tip; 3, grooved tip with inset); lower case letters, barb variations (a, simple barb; b, hooked barb). The number of barbs has not been used as a criterion in classification, for harpoons were frequently reworked after barbs had been broken off. Three forms range in length from very long to quite short; since this range appears to reflect a difference in the game hunted, separate types have been designated on the basis of size.

IA1a (fig. 4, j-l). Long point (20 to 12 cm.); heavy oblate elliptical cross section or rounded anterior face, flat posterior; simple sharp or rounded tip; two (occasionally one or three) high, enclosed (occasionally isolated), unilateral barbs; bilateral opposed line shoulder with maximum projection on barb side; broad truncated base, beveled laterally and on the edges, or occasionally rectangular. Total of 5 definite, 1 probable.<sup>23</sup> Distribution: Hum-67 (6 [3 in the Stuart collection]). (Gifford, 1940, pp. 183, 233; Loud, pl. 21, fig. 3.)

IA2a (fig. 4, m, n, p-r). Long point (18 to 15 cm.); heavy oblate elliptical cross section or rounded anterior face, flat posterior; rounded, slotted tip; two high, enclosed, unilateral barbs, with torque;<sup>24</sup> bilateral opposed line shoulder with greater projection on the barb side (occasionally line guard on side opposite barbs, as in fig. 4, m); broad truncated base. No complete specimens found, but one base fragment and one tip fragment found together define the type. Total of 9 definite specimens, 7 probable. Distribution: Hum-118 (16).

IIA1a (fig. 4, s-x). Medium to short bone point (10.5 to 5.5 cm.); thin to medium elliptical cross section; simple sharp tip; two high, enclosed, unilateral barbs; bilateral opposed line shoulder with greater projection on barb side (occasionally line guard on side opposite barbs, fig. 4, u, or unilateral line shoulder, fig. 4, t); broad truncated base. Total of 9 definite specimens, 3 probable. Distribution: Hum-67 (4, Stuart collection); Hum-118 (5 definite, 3 probable).

IB1a (fig. 5, a). Long point (17 to 14 cm.); heavy elliptical cross section; simple rounded tip; two medium, high, enclosed, unilateral barbs, occasionally with torque; bilateral opposed line guard; truncated base. Total of 2 definite specimens, 3 probable. Distribution: Hum-118 (1 definite, 1 probable); Hum-169 (1 definite, 1 probable); Hum-170 (1 probable).

IB2a, IB2b (fig. 5, b-g). Long point (18 to 13.5 cm.); heavy elliptical cross section, flat on barb side; rounded, slotted tip; two high, enclosed, unilateral barbs, with torque; bilateral opposed line guard; truncated base; occasionally incised; one fragment is made of bone. Total of 19 definite specimens, 10 probable. Distribution:

<sup>23</sup>Probable specimens consist of fragments which retain a trace of some diagnostic feature or those which came from significant depths at Hum-169 or Hum-118, where a stratigraphic succession of harpoon types was found.

<sup>24</sup>The term "torque" is used when one barb is intentionally offset from the medial plane of the harpoon. Most frequently it is the lowest barb which is twisted to the right or left (fig. 6, a) but occasionally both barbs exhibit some degree of torque (fig. 6, b).

subtype a, with simple barbs, Hum-118 (15 definite, 8 probable); Hum-170 (2); subtype b, with hooked barbs (fig. 5, g), Hum-169<sup>25</sup> (2 definite, 2 probable).

IIBla (fig. 5, j-p). Medium to short bone point (12 to 5 cm.); thin to medium elliptical cross section; simple sharp tip; two (occasionally one) low to medium high, enclosed (occasionally isolated), unilateral barbs; bilateral opposed line guard; truncated base; often incised. Total of 19 definite specimens, 3 probable. Distribution: Hum-67 (1, Stuart collection); Hum-118 (14 definite, 2 probable); Hum-169 (3); Hum-170 (1 definite, 1 probable).

IC1a (fig. 5, h, i). Long point (16 to 14.5 cm.); heavy elliptical cross section; simple sharp tip; two high, isolated, unilateral barbs; unilateral line guard on barb side; truncated or rectanguloid base. Total of 2, both in Stuart collection. Distribution: Hum-67 (1); Mad River Beach site (1).

IC2b (fig. 6, a-f). Long point (20 to 17 cm.); heavy elliptical cross section; flat on barb side; rounded, slotted tip; two high, enclosed, unilateral barbs with hooked tips and torque; unilateral line guard on barb side; truncated base; occasional incising. Total of 20 definite specimens, 1 probable (some of the 8 probable IB2a may be type IC2). Distribution: Hum-118 (4, one reworked into punch); Hum-169 (19 definite, 1 probable; two reworked into punches; 4 in Stuart collection); Hum-124 (2, Stuart collection).<sup>26</sup>

IC3b (fig. 7, d'). Long point (27 and 18 cm.); heavy elliptical cross section; grooved tip, with inset for triangular metal point (point is beveled on edges and has a projecting stem for attachment); two (or one) high, enclosed, unilateral barbs with hooked tips; unilateral line guard on barb side; truncated base. Total of 2 ethnographic specimens, one from the Tolowa (fig. 7, d'; also Gifford, 1940, fig. 23, type NN1b), and one from the Yurok (Gifford, 1940, fig. 21, type NN1a).

Both specimens also display the same type of attaching line, made of deerskin with the hair left on, with a short slit on the nonbarbed side for a strong double binding.

IIC1a (fig. 6, g-1). Medium to short point (12 to 7.5 cm.); medium elliptical cross section; simple sharp tip; one, or two enclosed, unilateral barbs; unilateral line guard on barb side; truncated base. Total of 4 definite, 1 probable. Distribution: Hum-67 (1, Stuart collection); Hum-118 (2); Hum-169 (1 definite, 1 probable).

ID (fig. 6, j). Single base found, 5.5 cm. long; heavy elliptical cross section,

with flat edge on shoulder side; unilateral line shoulder, with biconically drilled line hole in upper corner; broad spatulate base, beveled on both sides of shouldered edge. Total of 1, from Hum-67. (Loud, p. 384, pl. 20, fig. 8, a, b.)

The use of type I simple harpoon is well authenticated in reports on historic Indians. The slotted tip, stone point, and distinctive harpoon shaft (fig. 7, c'), as well as the manipulation of the harpoon, are described in detail for the Yurok of site Hum-169 by von Loeffelholz.<sup>27</sup> Kroeber gives an account of the use of large two-barbed specimens by the Yurok sea-lion hunters.<sup>28</sup> After disguising themselves in bear or deer skins, they stationed themselves on convenient rocks and barked to attract attention. After an animal had been harpooned "no attempt was made to hold the bulky prey, but it was followed by boat, the shaft regained, and then at first opportunity the victim was speared again. Sometimes a canoe was dragged out to sea for half a day before the animal was dispatched." Driver gives a somewhat similar account, stating that a redwood float or drag was attached by rope to the harpoon.<sup>29</sup> The Bear River<sup>30</sup> sea-mammal hunters considered the task so dangerous, on account of their unstable canoes, that all possible precautions were observed first. The Coast Yuki<sup>31</sup> employed the implement only from the shore, with swimmers retrieving the quarry.

It can thus be assumed that the large type I harpoons were employed in hunting large sea-mammals, particularly sea lion and seal. In dealing with the use of archaeological specimens from Gunther Island, Loud suggests that "sharks, a kind of dog fish"<sup>32</sup> were harpooned but he identifies no such faunal remains from the sites he refers to. The smaller harpoons (type II) are not mentioned ethnographically. Although their shape is the same as that of larger examples, their small size is unsuitable for large sea-mammal hunting. The smallest (e.g., fig. 4, u, v) were probably used to harpoon salmon and other fish while the medium-sized examples (e.g., fig. 4, s) were perhaps employed more often for sea otter.

A characteristic projectile point of stone having a concave base (fig. 4, n, o) has been identified as the form used to insert in the slotted tips of the large harpoons. A stone tip was found imbedded in a sea-mammal rib from Hum-118.

A secondary use may be noted for large harpoon points. After breakage their tips were fre-

<sup>25</sup>Waterman, 1920, site 31, rect. K, map 33.

<sup>26</sup>Ibid., site 35, rect. I, map 31.

<sup>27</sup>Von Loeffelholz, p. 120.

<sup>28</sup>Kroeber, 1925, p. 86.

<sup>29</sup>Driver, 1939, no. 283, p. 380.

<sup>30</sup>Nomland, 1938, pp. 111, 112.

<sup>31</sup>Gifford, 1939, p. 335.

<sup>32</sup>Loud, p. 381.

quently reworked into pointed implements (figs. 5, b, e, and 6, f, g), probably to be used as punches, with the base serving as a convenient handle. One specimen illustrates the initial grooving necessary to cut off the broken barb (fig. 4, r). A total of six finished specimens is known, including two type IC pieces from site Hum-169 (not illustrated). Two slotted tips were found which had been cut off just below the slot (fig. 4, u). The tips of two probably IIA specimens were apparently sharpened for use as awls (fig. 4, x).

Occasionally, specimens of types IB2, IIB, (fig. 5, b, j, l, o, p) and IC2 (fig. 6, d, f, i) bear incised patterns on their bases and barbs. These may represent property marks needed, after a successful hunt, to determine the owner of the fatal harpoon. Since the incising is not characteristic, however, these lines more likely reflect the native desire for decoration which pervaded Northwestern California. At present the known incised harpoons are limited to site Hum-118. Short horizontal lines around the base and heterogeneous scratches, perhaps resulting from manufacturing techniques, are the most common motifs.

Bilaterally barbed sea-mammal harpoons, unsupported by actual museum specimens, are illustrated in two ethnographic reports. The Coast Yuki<sup>33</sup> obtained a harpoon with single bilateral barbs from the north. A complete description is given of the whole implement as well as of its use. The method of attachment is noteworthy (fig. 7, p), for an archaeological specimen would probably not be recognized as a harpoon, but would be considered a fixed projectile point. This is also true of several British Columbia ethnographic pieces<sup>34</sup> whose simple bases show no special means of line attachment. The Tolowa<sup>35</sup> bilaterally barbed harpoon (fig. 7, b'), of different form and with a line hole, is significant in view of the rarity of this type of line attachment in California.

#### CENTRAL CALIFORNIA

The following artifacts from Central California are also included as harpoons, though some specimens may represent fish spears. There is no evidence of the use of the simple harpoon among the historic Indians of the area. Conclusive proof that the principle of the harpoon was known in the Sacramento Valley is afforded by one carbonized specimen from site Sac-16, now in the State Indian Museum at Sacramento (fig. 4, a). The harpoon point was inserted in the split end of a wooden rod, which still retained evidence of binding. The split ended in a round hole, through which passed a fiber cord, now a

charred remnant. To the rear of this hole the wooden rod tapered to a narrow stem. The inference is that this assemblage represents a simple harpoon, the detachable point originally having been fastened by a line passing from its base through the hole in the shaft or foreshaft. The stemlike projection suggests that the fragment may have been a nondetachable foreshaft inserted in a cane or hollowed-out wooden shaft. Judging from ethnographic use of the toggle harpoon, it may be safe to assume that the implement was not thrown, but only thrust, at its target, probably salmon and other large fish, and that the short pay-line was therefore no hindrance. The (pitched?) binding or some impediment inserted in the split end would hold the line in the foreshaft after the harpoon point had been pulled out.

Further evidence of the harpoon principle in the artifacts under discussion is the frequent presence of developed facilities for line attachment, including various line guards, line shoulders, and grooves. Some specimens have no such features (fig. 3, l, m), but pitch or asphalt was probably utilized to make the connecting line secure and the foreshaft may have been the detachable element, or some special means of wrapping and knotting may have been employed, as in certain ethnographic specimens (see fig. 7, p, and fn. 34). At the same time the possibility that these artifacts are fish spears cannot be ruled out entirely. Unbarbed leisters were used by some historic tribes, along with toggle harpoon, and such groups as the Yahgan<sup>36</sup> and Seri<sup>37</sup> had both the simple harpoon and fish spear, while the Ona borrowed the Eastern Yahgan harpoon form but applied it as a fish spear.<sup>38</sup>

One other aspect of this problem may be mentioned. It is frequently found that basal ends of stone projectile points predominate at habitation sites, the explanation being that the broken bases were not replaced on retrieved shafts until the return to camp. This might also account for the occurrence of fragmentary fish spear points, while it would be less true for harpoons. But apparently this is not a valid assumption. In Northwestern California basal fragments exceed tip fragments by a ratio of five to four, indicating perhaps that broken harpoons were often brought back to camp. A similar preponderance of bases is found in the Central Valley for types regarded as harpoons, whereas tip fragments predominate for types considered to be fish spears. The greatest number of fragments are medial sections, probably resulting from decay or accidental breakage at the site. It is therefore felt that the original assumption is not applicable to perishable items, and the ratio of fragments may be regarded as fortuitous. Since many fragments occurred with

<sup>33</sup>Gifford, 1939, fig. 6, p. 335.

<sup>34</sup>Teit, 1900, fig. 222, g; idem, 1906, fig. 87; Barnett, no. 34, p. 279.

<sup>35</sup>Drucker, 1937b, fig. 2, p. 237.

<sup>36</sup>Mason, 1902, pl. 2.

<sup>37</sup>Hardy, p. 290.

<sup>38</sup>Lothrop, fig. 36, p. 82.

burials, it may be correct to assume that decomposition is largely responsible; the large number of whole points included as grave furniture and the rarity of joinable fragments found with burials do not provide evidence of the "killing" noted for other utilitarian objects in this area.

Gifford<sup>39</sup> suggests that the unilaterally barbed types were possibly correlated with marine mammals, whereas those with bilateral barbs were associated with fluvial uses and fishing. Fuller information does not support such a broad generalization, but type I (Gifford, type NN1) was probably used in the taking of marine forms, whereas NN2 is characteristically an implement for river fishing. Unilaterally barbed types from the fluvial Delta region have been classed as NN3.

#### Unilaterally Barbed Types

NN3a (fig. 3, q). Medium point (9 cm. restored); medium elliptical cross section; simple sharp tip (?); two convex, enclosed, unilateral barbs; unilateral line shoulder on barb side; rectanguloid base. One fragment, from CCo-138.

NN3b (fig. 3, r-t). Long point (26 to 24 cm.); rectangular to curving cross section conforming to original shape of antler; simple medium sharp tip; three convex, isolated, unilateral barbs; unilateral spurred base on either edge. Figure 3, t has the suggestion of a bilateral line shoulder. One medial fragment from site Sac-21 is included in this type, although the base may have been different. Total of 10. Distribution: CCo-138 (9); Sac-21 (1). (Lillard, Heizer and Fenenga, pl. 29, U.)

#### Bilaterally Barbed Types

NN2aI (fig. 2, u-z). Medium point (13 to 9 cm.); flattened to heavy elliptical cross section; simple sharp tip, often long; four (most numerous) or five enclosed (occasionally isolated, fig. 2, u, y) barbs, bilaterally opposed; bilaterally opposed line shoulder, or projecting line guard (fig. 2, u), occasionally staggered (fig. 2, v, w); variable base: simple rectanguloid (fig. 2, z), truncated (fig. 2, u, v), occasionally with lateral bevel (fig. 2, x). Total of 27 specimens, 2 with 2 burials, 3 with 1 cremation. Distribution: Sac-6 (3); Sac-21 (7); Sac-64 (2); CCo-138 (15).

NN2aII (fig. 2, a'-d'). Medium point (10 to 8.5 cm.); medium elliptical cross section; simple sharp tip of variable length; three convex, enclosed, bilaterally opposed barbs, with occasional tendency to angularity (fig. 2, c', d'); bilaterally opposed line shoulder; rectanguloid or truncated

base, often with lateral bevel, occasionally with faces beveled on sides and end (fig. 2, c'). Total of 6 specimens, 2 with 2 cremations. Distribution: Sac-6 (1); Sac-21 (1); Sac-107 (1); Sac-122 (1); CCo-138 (1); Nicolaus (1).

NN2aIII (fig. 2, e'-i'). Long to medium point (15 to 12.5 cm.); cylindrical cross section; very long, sharp, simple tip; three angular, enclosed, ridged (fig. 2, g', i') barbs, bilaterally opposed; bilateral line shoulders, slightly staggered; rectangular base, with lateral bevel and sides and end of faces beveled. This type is exceedingly uniform and shows the most careful workmanship. Total of 6 specimens. Distribution: SJo-80 (2); SJo-82 (1); SJo-91 (2); CCo-141 (1). (Gifford, 1940, type NN2a, pp. 184, 233; Heizer and Fenenga, fig. 1, no. 14; Moorehead, fig. 412, no. 4, p. 273).

NN2aIV (fig. 7, k). Long point (16 cm.); triangular to flattened elliptical cross section; long simple sharp tip; single, low, bilaterally opposed barbs; deep bilateral notches serve for line attachment; stemmed base; probably made from axillary border of elk scapula. Single specimen, from Sac-16.

NN2bI (fig. 3, a-j). Long to medium point (17 to 8 cm.); great variation in width; flattened to heavy elliptical cross section; simple medium to sharp tip; enclosed (some isolated), convex (occasionally concave or angular), bilaterally staggered barbs, the number of which varies from four to six (one specimen has 2, while 5 barbs are most typical); unilateral or bilateral opposed or staggered line shoulder (occasionally line guard); rectangular, truncated-spatulate, or spatulate base. On occasional examples from CCo-138 the barbs on one side are longer than on the other (fig. 3, d). An equal number of barbs on each side is characteristic of both NN2a and NN2b. Figure 3, j is probably a reworked specimen, having three barbs on one side and four on the other, the result, quite likely, of a broken tip. Total of 19 specimens, 3 with 3 burials. Distribution: CCo-138 (7); CCo-139 (1); Sac-6 (1); Sac-21 (6); Sac-56 (1); Sol-236 (1); Cross Slough (1); Sacramento Valley, site unknown (1). (Gifford, 1940, type NN2b, pp. 184, 233; Lillard, Heizer and Fenenga, pl. 29, h, i, v, w; one in Stuart collection).

NN2bII (fig. 4, a-g). Long to medium point (15 to 9 cm.; one lacking tip is over 15 cm.); variable width; flattened elliptical to cylindrical cross section; simple sharp tip, often long; three (one specimen, fig. 4, a, has 2 barbs on one side, 3 on the other, perhaps the result of breakage) isolated (occasionally enclosed or ridged), frequently angular, bilaterally staggered convex barbs; bilaterally opposed or staggered line shoulder (rarely projecting line guards and one grooved); rectangular to truncated

<sup>39</sup>Gifford, 1940, p. 183.

or spatulate base, occasionally laterally beveled. Total of 10 specimens, 2 with 2 burials, 1 with 1 cremation. Distribution: CCo-138 (5); Sac-16 (1); Sac-21 (1); Sol-2 (1); Cross Slough (1); Nicolaus (1).

Out of a total number of 73 type NN2b specimens, only 28 could be typed. Of the remaining 45 fragments, 3 were found with 3 burials, 6 with 2 cremations. Distribution of fragments: CCo-138 (31); CCo-250 (1); Ker-46 (1); Sac-6 (3); Sac-21 (1); Sac-60 (5); Cross Slough (2); unknown site (1).

NN2c (fig. 3, k-p). Long heavy point (20 to 13 cm.); flattened to heavy elliptical cross section; simple sharp tip, sometimes long; 8 to 5 convex (occasionally concave), enclosed (occasionally isolated), bilateral barbs, with indefinite placement (both opposed and staggered on the same harpoon); bilateral line shoulder (1 bilateral line guard) or no special line attachments; variable base, with emphasis on simple rectangular, but occasionally spatulate (fig. 3, n) or truncated. The bulges on the right side of the harpoon shown in figure 3, p are evidently the remnants of broken barbs which have been smoothed and rounded. Total of 9 specimens, 4 with 2 burials, 1 with 1 cremation. Distribution: Sac-21 (1); Sac-107 (2); SJo-139 (1); Bethany (2); Byron (1); Core (2).

NN2d (fig. 4, h). Long point (12.5 cm.); thin, bowed cross section; medium sharp tip; two low, enclosed, bilaterally staggered barbs; wide, pointed, spatulate base. Single specimen, from CCo-138.

In general, among the bilaterally barbed harpoons, no conclusive associations seem to exist between type of barb and type of line attachment or base. There is a multiplicity of forms, but examples of most types are not numerous enough to support generalizations about the linkage of specific features, and too few basal fragments are known to necessitate the establishment of anything more than the broadest of inclusive types of line attachments and bases.

The uniformity and distribution of type NN2aIII imply that the inhabitants of the south Delta recognized an ideal form of harpoon; all specimens known so far, from various sites, display the bilateral line shoulder and rectangular base associated with three angular, enclosed, ridged, bilaterally opposed barbs. However, only four complete specimens have been found. The unilateral line attachment is restricted to type NN2bI at present, but this may be because the sample of basal fragments of other types from CCo-138 is inadequate.

Local preferences, expressed by an emphasis on certain forms at particular sites, are more apparent than linkages of construction features, and may ultimately provide definite indications of relationships between sites which can only be suggested now. More samples from each site are needed, however. The inhabitants

of Sac-66 and Nicolaus made great use of the bilaterally opposed line shoulder with truncated base. This form of bilateral line shoulder also occurs as Sac-6, Sac-16, and Sac-107 and at the four NN2aIII sites. The unilateral line shoulder and line guard are restricted to CCo-138 and CCo-139, except for single examples of the line shoulder at Sac-21 and Sac-60. Also dominant at CCo-138 are the bilaterally staggered line shoulder and line guard. Sac-21 yields several examples of bilateral line shoulders and guards which show just the slightest degree of stagger. Sac-56 and Sol-236 have the staggered line shoulder also. A long spatulate base with bilaterally opposed line shoulders is shared by sites Sac-6 and Sac-107.

#### SOUTHERN CALIFORNIA

Records left by early Spanish explorers leave no doubt of the presence of the harpoon. Father Ascension, who sailed with Vizcaino, in discussing Santa Catalina Island, remarks: "At the end of the pole they fasten a harpoon made of fish bone [whalebone?], and to this they tie firmly a long strong line like twine...When this is fast in the fish, they give it the line if it is a large one, and follow it."<sup>40</sup> Costanso, who accompanied Portolá, wrote of the San Diego area (Diegueño territory):<sup>41</sup> "Their harpoons (*fisgas*) are several yards long, and the point is a very sharp bone inserted in the wood; they are so adroit in throwing this weapon that they very rarely miss their mark." The Santa Barbara Indians (Chumash) also knew "all the arts of fishing."<sup>42</sup>

Members of the Martinez Expedition<sup>43</sup> in 1792 noted: "They also fish with tridents (*fisgas*) and harpoons made of shell and flint." It thus appears that the word *fisgas* was used loosely for both fish spear and harpoon but, since Costanso mentions that the weapon was thrown, harpoon is probably the proper translation. In Priestley's translation, Pages describes the tridents; if *fisgas* is the original term, it may mean harpoon. "The tridents they use are of bone; the barb is well shaped and well adapted to its use."<sup>44</sup>

None of these descriptions is complete enough to allow identification of archaeological specimens. However, the following types perhaps correspond to the bone points referred to in some of the Spanish chronicles. These artifacts are considered harpoons because of their long length and conical bases, which were probably

<sup>40</sup>Wagner, p. 236.

<sup>41</sup>Costanso, p. 33.

<sup>42</sup>Ibid., p. 49.

<sup>43</sup>Martinez, p. 44.

<sup>44</sup>Pages, p. 51.

fastened permanently in the hollowed-out end of a detachable foreshaft.

W1b<sup>45</sup> (fig. 6, l-p). Long point (23 cm. average); heavy elliptical to cylindrical cross section; low, convex (occasionally concave), unilateral single barb (rare examples have as many as 6 barbs, fig. 6, l); conical, occasionally spatulate base. Usually of whalebone, occasionally of ribs. Total of 23 specimens. Distribution: San Nicolas Island 16 (9 in AMNH [Nelson, pp. 203, 208]; 4 in UCMA [Gifford, 1940, pp. 178, 224, type W3; the last W1 illustrated by him, *ibid*, p. 224, is also included, since it is 12.1 cm. long in its present fragmentary condition]; 2 in SI [Rau, p. 142, figs. 222, 223]; 1 in Moorehead, fig. 362, no. 7); Santa Barbara coast 5 (3 in AMNH [Nelson, p. 203]; 2 in SI [Abbott and Putnam, p. 224]); Santa Cruz Island 2 (1 in Santa Barbara Museum of Natural History [Orr, p. 117, type W4]; 1 in MAI-HF [Hodge, p. 223]). Santa Catalina, an unknown number of single barbed specimens referred to by Hodge, page 226. San Nicolas Island is probably also represented in the MAI-HF, for only types unique to the island were listed on pages 227-229 of Hodge's guide.

W2 (fig. 6, q, r). Long to medium point (18 cm. is the only measureable example); heavy elliptical cross section; simple sharp tip; single low, bilaterally opposed barbs; long narrow shaft ending in conical base. Asphaltum used for attachment. Usually of whalebone. Total of 2, both from San Nicolas Island. (Moorehead, fig. 358, no. 4; fig. 362, no. 2).

Sea otters, highly prized for their fur by the Chumash and Gabrieleño,<sup>46</sup> were apparently one of the main targets; other sea mammals and large fish were harpooned.

#### COMPOSITE HARPOON ARROWS

Other composite specimens are smaller and can probably be regarded as harpoon arrows, to be used in fishing. A bipointed bone piece forms both the point and barb, being lashed into the grooved tip of a wooden foreshaft at an angle. Woodward found a foreshaft of this sort in Big Dog Cave on San Clemente Island at a depth of ten inches, a depth which "can be safely associated with the historic period." The specimen is 16.5 cm. long, with a shallow, slightly diagonal groove in the upper end surrounded by tar and lashing marks (fig. 7, d). The opposite end is tapered for insertion in the

<sup>45</sup>Gifford (1940, p. 178) and Orr (p. 117), set up four types differentiated as to material (bird or mammal bone) and length. In the present report these four types have been reduced, on the basis of length, to two.

<sup>46</sup>Kroeber, 1925, pp. 630, 634.

#### COMPOSITE SIMPLE HARPOONS

Several composite simple harpoons are known from Southern California; in these the foreshaft becomes the body of the harpoon, and a stone point and bone (or wood?) barb are lashed on with string and asphalt. The only ethnographic specimen known from the Chumash is of this type, collected by the Vancouver Expedition of 1790-1795 from Santa Barbara,<sup>47</sup> shown in figure 7, z. Many of Gifford's types U2 and U3<sup>48</sup> would be of the proper size and shape to serve as similar harpoon barbs. However, these curved artifacts are also like fishhook barbs illustrated by Bowers<sup>49</sup> and Heye,<sup>50</sup> and it will require special study to separate them according to use. Their employment as toggle points has been suggested,<sup>51</sup> as well as their use as prongs of fish spears,<sup>52</sup> perhaps the tridents of the historic groups. It is thus impossible to identify harpoon barbs until a detailed study of all such problematical artifacts from the Channel Islands reveals diagnostic differences.

While digging in Big Dog Cave on San Clemente Island,<sup>53</sup> Woodward found a composite-harpoon foreshaft at a depth of ten inches. The specimen (fig. 7, a), 23.5 cm. long, consists of a chert point fastened with tarred cordage to a cylindrical wooden foreshaft. There is a slight shoulder 3 cm. back from the tip with a shallow ovoid socket, 1.3 cm. long, 0.5 cm. wide, for the attachment of a bone barb. An encircling line shoulder provides means for line attachment. The conical base probably fitted into a socket in the harpoon shaft. It is very like the Vancouver specimen in size, type of point, placement of barb, and basal form, though it came from an island occupied in historic times by the Gabrieleño. Woodward believes that the barb was of the type shown in figure 7, b, c, and refers to other barbs from "Wihatset village on Mugu lagoon and from Simomo village site just north of Mugu on Calleguas creek."<sup>54</sup>

arrow shaft, probably of cane. The barb, as reconstructed by Woodward (fig. 7, e), would seem

<sup>47</sup>Read, pl. XI, fig. 2, p. 106. Dalton, pl. XV, fig. 8; on p. 231: "The British Museum possesses several other harpoon-ends of this type from Santa Barbara, 2 of them belonging to the present collection."

<sup>48</sup>Gifford, 1940, pp. 177, 178, 233.

<sup>49</sup>Bowers, p. 575.

<sup>50</sup>Heye, fig. 10, p. 84.

<sup>51</sup>Gifford, 1940, pp. 177, 178.

<sup>52</sup>De Laguna, p. 212, fn. 637.

<sup>53</sup>Woodward, pp. 284, 285.

<sup>54</sup>Personal correspondence from A. Woodward, June 21, 1948. Fig. 7, a-e, taken from tracings made by him.

to correspond with type T2bII of Gifford.<sup>55</sup> Robinson<sup>56</sup> illustrates a similar example from Point Mugu. Possibly those arrow points shown by Irwin were harpoon arrows.<sup>57</sup>

T2bII (fig. 7, g-j). Short length (3 to 7 cm.); circular or elliptical cross section; curved or bowed laterally; bipointed; asphaltum wrapping in middle. Total of 12 in UCMA. Distribution:<sup>58</sup> Santa Cruz Island, sites 100 (1), 138 (1), 135 (1), 147 (6); Santa Rosa Island (2); site 10, Ventura County (1).

Nelson illustrates a "dart point,"<sup>59</sup> found on San Nicolas Island, which also may be a harpoon arrow (fig. 7, f).

#### TOGGLE HARPOON

Only the composite variety of toggle head was known in California, except for a simple bipointed type, and the identification of most archaeological specimens is virtually impossible because of the lack of detailed ethnographic descriptions and the frequent simplicity of toggle points. Kroeber<sup>60</sup> states that "the [toggle] harpoon was probably known to every group in California whose territory contained sufficient bodies of water. The Colorado River tribes provide the only known exception..." He then describes this rather homogeneous fishing implement: long, slender, thrusting shaft; single or, more often, double foreshaft often with unequal prongs; simple bone or wood socketed toggle head wrapped with string and pitch, with a short line fastening them to the foreshaft (fig. 7, x, y). A three-pronged harpoon is recorded for the Central Miwok.<sup>61</sup> Although probably this harpoon was most often used with a thrusting action, Bartlett<sup>62</sup> describes how it is thrown. In one variant, one point was bound fast to the shaft, while the other detached like a harpoon.<sup>63</sup> The salmon was apparently the most important game sought with the implement, which is mentioned for most of the Indians living within the range of the salmon. However, some groups restricted the use of the harpoon, e.g.,

<sup>55</sup>Gifford, 1940, pp. 177, 223.

<sup>56</sup>Robinson, p. 150.

<sup>57</sup>Irwin, fig. 7, p. 21.

<sup>58</sup>Sites given in this paragraph refer to map in Olson, p. 2.

<sup>59</sup>Nelson, fig. 3, d, pp. 204, 205.

<sup>60</sup>Kroeber, 1925, pp. 815, 816.

<sup>61</sup>Barrett and Gifford, p. 189; another unique variation of the Miwok is a tip of obsidian, described by Curtis, 1924, p. 131.

<sup>62</sup>Bartlett, p. 33.

<sup>63</sup>Kato: Driver, 1939, no. 239, p. 313. Hayfork Wintu: Voegelin, 1942, no. 256, p. 174. Some Northern Mono and Northern Yokuts groups: Driver, 1937, no. 157, p. 112; Aginsky, no. 156, p. 399; Gayton, p. 146.

the River Patwin employed it for pike but not for salmon.<sup>64</sup> Use of the harpoon was denied by all Pomo groups living on Clear Lake, presumably because of the absence of salmon.<sup>65</sup>

Sargent gives an interesting account of the use of the toggle harpoon by the Wintu:

"At this instant a long black stick shoots into the water, very like a pitchfork with long, slender candle extinguishers on each point. These caps are about four inches in length and an inch around at the base, made of wood, and tipped with a splint of the deer's shinbone, which is sharp and strong. The whole is smeared with tar; then each end of a two-yard rope is fastened into the side of each cap. The middle of this rope is firmly attached, with slack-line by a slip-noose to the handle of the spear, about half-way up. When thrust into the fish, the spear goes with such force that it pierces through; the little caps come off the two prongs and turn, and the fish swims clear of the spear, held only by the rope, that tightens on the handle with the strain. This spear mutilates the fish, but secures many more than could be taken with hook and line."<sup>66</sup>

Chever, probably describing Nisenan Indian practices, gives an account of toggle fishing by torchlight on the Feather River.<sup>67</sup>

Most, if not all, of the ethnographic reports from California emphasize the importance of varied nets, weirs, dams, and poisons<sup>68</sup> in the capture of large quantities of fish, particularly for storage. The toggle harpoons, fish spear, and fishhook were subsidiary implements, to be used more for supplying daily needs. The development of two functional families of net and weir fishermen among the Patwin<sup>69</sup> implies considerable antiquity of specialization in technique, as does the common insistence in the first-salmon ceremony that the first fish be caught with a net or some means other than the spear or harpoon.

Information available indicates that the actual toggle varied considerably. The most easily recognized is the three-piece spurred type used especially in northern California (fig. 7, t). Examination of ethnographic specimens suggests consistent differences in spur and point type, the attaching lines, and the cross section between Northwest and Central Califor-

<sup>64</sup>Kroeber, 1932, p. 278.

<sup>65</sup>Gifford and Kroeber, no. 208, p. 134, groups Ha, Ci, Ko, El.

<sup>66</sup>Sargent, p. 441.

<sup>67</sup>Chever, p. 137.

<sup>68</sup>Distribution of nets and poisons given by Hewes, 1942b, fig. 33, p. 105.

<sup>69</sup>McKern, p. 248.



nian toggles,<sup>70</sup> as well as between those possessed by ethnic groups within each area.

Limited excavation has produced several varieties of toggle spurs, differentiated by the form of channel and socket end primarily. The typology proposed by Drucker<sup>71</sup> has been expanded here.

Ia (fig. 5, x-z). Short length (5.5 to 7.5 cm.); variable cross section; simple rectanguloid socket end, occasionally simple sharp end (fig. 5, y); central channel broken by medial ridge; pointed barb end. Total of 4 definite, 1 probable. Distribution: Hum-67 (2); Hum-169 (2 definite, 1 probable). (Gifford, 1940, type MM1, pp. 183, 232; Loud, p. 381, pl. 21, fig. 12, a, b).

Ib (fig. 5, a'). Short to medium length (5.5 to 9 cm.); variable cross section; forked socket end; central channel broken by medial ridge; pointed barb end. Total of 2 definite specimens (a paired couple are counted as 1), 1 probable. The probable spur is an unfinished specimen; since home manufacture is thus demonstrated, the tip was probably to be forked. Distribution: Hum-169 (3).

Type II, with scarfed tip, has not been found in California.

IIIa (fig. 5, b'). Short length (4 to 6 cm.); triangular cross section; rectanguloid socket end; central V-shaped channel; simple sharp barb-end. Total of 1. Distribution: Hum-67 (1, Stuart collection).

IIIb (fig. 5, c'-g'). Short length (4 to 6 cm.); triangular cross section; forked socket-end; central V-shaped channel extending from three-quarters of length to full length; simple blunt barb-end. One specimen from Hum-169 (fig. 5, e') and one from DNo-2 display flaring sides and better workmanship and may represent a subtype. Total of 10. Distribution: Hum-118 (5); Hum-169 (4); DNo-2<sup>72</sup> (1).

One unfinished toggle from Hum-169 (11 in. deep) cannot be typed.

Other areas yield different varieties of composite toggle harpoons. The Sinkyone two-piece spurred type<sup>73</sup> probably refers to the three-piece variety. The Klamath-Modoc<sup>74</sup> area had an unspurred type with a single long, bone, awl-like point and pitched base (fig. 7, w), not too different from that of the Yahi.<sup>75</sup> Driver<sup>76</sup>

elaborates on a similar straight, unspurred type found in the Southern Sierra Nevada, usually made of cannon bone with only the front end pointed, the base forming the socket. Both shape and material emphasize the similarity of this toggle point to awls, and it would be difficult to identify such archaeological specimens. The Wintu<sup>77</sup> also made an unspurred toggle with a very short bone point, so generalized that, by itself, it would be problematical (fig. 7, v). Thus very few archaeological specimens have been suggested as points of composite harpoons.

T1f (fig. 5, t-v). Short length (2.2 to 4.0 cm.); rectangular to cylindrical cross section; bipointed, often with body broadest near the abruptly beveled base; bone. Total of 11. Distribution: CCo-141 (1); Col-1 (1); Redding site 7 (7); Hum-118 (1); Hum-169 (1). (Gifford, 1940, pp. 177, 222). The form of these artifacts appears needlessly specialized for use as gorges or composite hooks, but they might well serve as points in the Wintu-type toggle; the largest would fit into a three-piece toggle spur.

U1 (fig. 5, r, s). Short length (5 to 8 cm.); flat elliptical cross section; sharp tip; blunt base; bone. Total of 8. Distribution: Hum-117 (1); Hum-169 (7). These specimens from Northwestern California are suggested as the tips of the three-piece spurred toggle harpoon point. The artifacts fit in the larger spurs satisfactorily, and there is a similarity with ethnographic specimens from the Yurok and Wailaki (fig. 7, t; Gifford, 1940, figs. 1, 13, 16). Small chipped stone points (such as fig. 5, q) may have been used in some small specimens.

The Central Yokuts claimed a bipointed toggle point with a string tied around the middle, sometimes in a medial groove, apparently similar to pieces often called gorgehooks. The size varied from 2 inches to 4 inches. The single or double foreshafts were sometimes made of deer tibiae. One Chukchansi specimen in the UCMA is made of metal, possibly a rake tine.<sup>78</sup> "One informant claimed the point was drilled and the cord tied through the hole. This seems unlikely as no such attachment is reported from any other Yokuts or neighboring tribe."<sup>79</sup> However, this is the same as the Nisenan harpoon point, seen before 1870,<sup>80</sup> which consisted of a bipointed toggle with a medial line hole, attached to a quill which served as the socket

<sup>70</sup>Gifford, 1940, pp. 183, 186.

<sup>71</sup>Drucker, 1943, fig. 4, p. 39.

<sup>72</sup>Waterman, 1920, site 10, rect. A, map 5.

<sup>73</sup>Nomland, 1935, p. 154.

<sup>74</sup>Barrett, pl. 22, fig. 4, p. 251.

<sup>75</sup>Waterman, 1918, pl. 9.

<sup>76</sup>Driver, 1937, no. 151, p. 112.

<sup>77</sup>Du Bois, fig. 6, p. 128.

<sup>78</sup>Driver, 1937, no. 151, p. 112; Gayton, fig. 10, j, k, pp. 72, 75.

<sup>79</sup>Gayton, fn. 182, p. 75.

<sup>80</sup>Chever, p. 137; Beals illustrates the implement, fig. 1, p. 341; fig. 7, q herein.

(fig. 7, q). The Indians of Yosemite Valley (Southern Miwok) employed the bipointed type of toggle harpoon without a line hole, similar to the Central Yokuts form.<sup>81</sup>

Since the toggle harpoon was used in most of California and nails were easily substituted for the point in the post-contact period, it may be correct to assume that many other specimens now included in Gifford's "Bipointed Objects" (type T) and some of the type U examples were points of the composite harpoon. The greatest difficulty with this supposition is that no bone artifacts have been found in the Central Valley which are distinctive enough to be classed as composite harpoon spurs. Several possible explanations may offer a solution: insufficient excavation of Phase II settlements; unspurred toggles (either awl-like, bipointed, or Wintu-type); or wooden spurs like those some-

times used by the Pomo,<sup>82</sup> River Patwin,<sup>83</sup> Maidu,<sup>84</sup> and Miwok.<sup>85</sup> Some of these groups also had the three-piece spurred toggle of bone or antler, so the use of unspurred toggles seems most likely, with a late diffusion of the spurred type across the Central Valley.

The presence of single-piece toggle harpoon heads of Arctic type<sup>86</sup> on San Nicolas Island has occasionally led investigators to assume aboriginal contact.<sup>87</sup> However, as pointed out by Heizer,<sup>88</sup> there is historical evidence of the occupation of the Channel Islands by Aleut sea-mammal hunters imported by Russian fur traders in the early nineteenth century, and this provides an adequate explanation for the occurrence not only of single-piece toggle heads, but also of the ground slate point, spear-throwers, and certain other foreign objects found on the islands.

#### ANALYSIS

Recent years have seen the postulation of a temporal sequence in Central California,<sup>89</sup> as derived from the archaeological record. Three successive horizons have been proposed and work is now under way to explore the possibilities of refining these broad periods in order to reconstruct the cultural development within each.

There are serious limitations of the extent to which one element can be used to indicate relationships between settlements, for as many traits as possible must be studied to gain insight into the position of a culture in relation to its surroundings. However, suggestions can be made in order to stimulate further study which will verify or refute the tentative conclusions. The amount of material from Central and Northwestern California is sufficient to indicate not only areal affinities, but also changes through time, with the implication that these fishing and hunting implements are perhaps useful "time bearers" and key traits in the unraveling of local prehistory.

Perhaps the greatest handicap is the variable sample obtained from each mound. Some sites have been thoroughly tested by scientific excavation, whereas others are represented by single pieces unaccompanied by data. To this disparity in the number of artifacts per site is added the perishable nature of bone and antler and the fortuitous ratio of fragments. Burial associations, so essential in present studies of California archaeology, are rare in comparison with the number of artifacts. Nevertheless, the

findings seem important enough for consideration.

#### EARLY HORIZON FISH SPEARS

MM3a. Type MM3a is a characteristic culture element of the Early horizon, being found at three of the four settlements recognized as Early. The greatest number of specimens come from site SJo-68, which is apparently the latest of the Windmiller facies settlements.<sup>90</sup> Cremation appears earliest in Central California at site SJo-68, and it should be noted that type MM3a occurs with both extended burials and cremations at this site. No examples have yet been found from any Middle horizon site; apparently the use of this probable trident was abandoned at the close of the Early period.

#### MIDDLE HORIZON FISH SPEARS

MM2b. If the specimen shown in figure 1, j is included in this type, the form first appears in what may be the close of the Early horizon at SJo-68. However, its aberrant form and associations suggest that it should be excluded from consideration as an MM2b. All other examples seem limited to the Middle horizon. The local center appears to have been the Morse facies of the Interior province, from whose settlements come 74 per cent of the specimens. Of these, 64 per cent came from Sac-66, 10 per cent from

<sup>81</sup>Illustrated by Godfrey, p. 62, and described by Clark, p. 37.

<sup>82</sup>Gifford and Kroeber, nos. 209, 211, p. 173; bone spurs seem to have been more common.

<sup>83</sup>Ibid., no. 211, p. 173; since bone and antler are denied as materials, wood must have been used.

<sup>84</sup>Dixon, fig. 49, p. 196; bone or hard wood.

<sup>85</sup>Curtis, 1924, p. 131, wooden spurs; Barrett and Gifford (p. 189) and Godfrey (p. 62), bone spurs.

<sup>86</sup>Nelson, fig. 3, e; Hodge, p. 229.

<sup>87</sup>E.g., Leroi-Gourhan, pp. 381, 382.

<sup>88</sup>Heizer, 1947, pp. 150-152.

<sup>89</sup>Lillard, Heizer, and Fenenga; Cook and Heizer; Beardsley, 1948.

<sup>90</sup>Heizer, 1949, fn. 15, p. 13.

Sac-60. The greatest variation in form occurred at Sac-66, as shown by figure 1, l-p. Its absence from other settlements of this facies (Sac-113, Sac-73, and Sac-107B) as well as the nearest Middle settlement SJo-142 suggests a time difference, or may be due to insufficient sampling of these sites. Its presence in the Brazil facies is also definitely of the Middle culture period. Little is known of Sac-122 or CCo-139, but the inference is that these also are Middle horizon settlements. Since the type is lacking from Orwood facies, another time or culture difference is perhaps indicated (see type 002).

In the Littoral zone type MM2b is of rare occurrence. Of the four specimens from Ala-309, three were found in Level VIII (probably Middle) and one in Level V, which would be close to the transition to Phase I of the Late horizon. Too little is known of site SMa-372 to establish relationships, but it is probably representative of the Middle horizon. Such temporal associations are indicated by associated artifacts for two specimens from Sonoma County, in the Gaffney collection. It is thus apparent that these artifacts, though widely distributed, were not typical of the Bay culture, for they occur in the high levels of only one (Ala-309) of ten sites definitely placed in the Middle horizon. This suggests that possibly the development of this type in the Interior province was late, and that Sac-66 and Sac-60 were among the latest Morse facies settlements to be occupied.

001. Type 001 adds to this last-mentioned possibility. Only two Interior sites, Sac-66 and Sac-43, share MM2b and 001. One example from Sac-43 (fig. 1, k) is evidently an 001 specimen which was reworked into an MM2b, probably after loss of its barb. This supports the assumption of a developmental transition from the unbarbed to the barbed type. Site Sac-43 yielded 37 per cent of type 001, but the rarity of MM2b at the same site suggests some other center of development, while Sac-66 is excluded by the rarity of type 001.

In view of the proximity of Sac-43 to Sac-60 it seems apparent that Brazil facies was probably later in time than Morse facies, with only a slight overlap at Sac-66 and Sac-43. This theory is strengthened by the additional occurrence of type 003 at Sac-43 and its absence in the Morse facies.

Other Middle horizon specimens in the Interior province come from Sol-2, Sac-117, SJo-59, Yol-52 and a northward extension to Col-1. This wide distribution may justify the inclusion of specimens from such unplaced sites as Sac-16, Sac-29, Sac-8 and Sac-49 in the Middle period, though some may represent survivals into early Phase I times of the Late horizon. Since the type occurs all around Morse facies settlements, it could be expected that, if these sites had been occupied, the more advanced fish spear would have been adopted.

Again, this type is rare in the Littoral zone, one specimen occurring at each of the three Middle horizon sites, Ala-309, Ala-329,

and SCl-356. The shallow depth of the Ala-309 specimen within Middle strata and the absence of the implements from the numerous other settlements of the Ellis Landing facies suggest a belated entrance from the Interior Valley. The sites yielding these fish spears may be the latest Middle sites on the Bay. One other specimen from SCl-356 was found in strata assigned to the Emeryville facies of Phase I, indicating probable retention of type 001 at this site.

The workmanship seems to have little relation to time. Both crude and well-shaped specimens were found with the same burial at Sac-43, and frequently both kinds occur at the same site. There may be a geographical correlation, since all specimens from Sac-49 (fig. 1, v, y) exhibited the careful workmanship typical of the area to the south, including Orwood facies (see type 002).

002. This type, though essentially the same as 001, is distinguished by the angular barb and more careful workmanship. The sites at which the type is found form a distinct unit at the south of the Delta. Their location at CCo-141 was in Middle horizon strata. None of the other sites have been placed temporally. SJo-140 produced two aberrant examples resembling type 001, but it would be difficult to say whether it was the earliest site to receive the type in the area, or was only peripheral. All 31 pieces from one burial at SJo-87 differ from the general type in being wider and in having a thinner, more rectangular cross section. Since no other examples are known from the site, it cannot be said whether they represent the work of one man or a site difference. Meredith refers to a burial "in a mound in San Joaquin County"<sup>91</sup> which had two bilaterally barbed harpoons in association with one type 002 fish spear. The distribution of these harpoons characterizes Phase I of the Late horizon. Therefore, Bethany mound may represent another period of cultural transition and suggests a late development of type 002, an assumption strengthened by the restricted distribution. The absence of shared types between CCo-139 (with type MM2b) and Orwood facies (with type 002) also emphasizes this lateness. The fact that all sites yielding type 002, besides CCo-141 and Bethany, lack harpoons suggests that SJo-87, SJo-140, Beecher Ranch, and Rock Creek sites may also be considered Middle horizon settlements.

A large number of pieces were often buried with the dead, but more excavation is needed to ascertain the significance of this trait. A specialized fishing occupation may be indicated (the SJo-87 specimens suggest the work of one man) or perhaps some ceremonial value was attached to the implements.

<sup>91</sup>Moorehead, fig. 412, nos. 1, 2, 3, p. 273. Two harpoons (fig. 3, l, m herein) in the MAI-HF, from Bethany mound, are so similar that there can be no doubt of their identity with those illustrated in Moorehead.

The better workmanship of all type 001 specimens at Sac-49 may indicate an influence from this southern area.

003. The double-barbed fish spear appears closely associated with the single-barbed type. It is first noted in the Middle horizon of the Interior province, with no examples from the Morse facies. Of the nine specimens known, six were associated with one burial at Sac-43, along with eight of type 001. The burial association of one specimen at Sac-127 also establishes the Middle culture period, while the lack of any other type suggests a late adoption at this site. Probably there were Middle horizon settlements at Sac-49, Sac-122 and Yol-52. The specimens from Sac-49 again show the most careful attention to finish. The only Littoral zone occurrence of the type is at Ala-309, where a single specimen was found at a depth of fifteen feet, probably late Middle horizon strata.

MM2a, MM2d, and MM2e. Type MM2a is limited to Level VIII of Ala-309. The depth would suggest a Middle horizon occurrence. Burial associations at Sac-43 and Sac-29 allow definite placement of type MM2d in the Middle horizon, and the specimens from Sac-16 and Yol-52 are tentatively assigned to the Middle period also. The single MM2e specimen was found at site CCo-250, which according to our present knowledge exhibits only Phase I traits of the Late horizon. The unique form of this artifact may indicate a different use than that of the types being discussed, but it is also possible that the Middle form of fish spear was retained at this site.

Despite the inadequacy of the material, there is considerable agreement between the conclusions suggested by fish spears and those indicated by the Middle horizon archaeological remains as a whole. These Middle period specimens are now being studied by Fenenga, who has found the same temporal relationships between Sac-43, Sac-60, Sac-66, and Sac-127 as suggested in this discussion. There is also similar agreement between the conclusions presented herein and those of Beardsley (1947) regarding the Littoral zone. The retarded entrance of Interior traits is apparent, as well as the unusual relationship of Ala-309 with the Interior province during the Middle horizon and of its close association with the settlements of the south end of the Bay. One factor in the delayed diffusion of the fish spear toward the west may have been a greater emphasis on net fishing in the Littoral zone, as suggested by the frequent occurrence of probable net sinkers in the settlements of the Ellis Landing facies.<sup>92</sup>

Nothing can be said as yet of the origin of these fish spears. Development from the Early horizon type MM3a is improbable owing to the dissimilarity in form and the seemingly late appearance of the Middle horizon types after the Early leister had apparently fallen into disuse. However, nothing similar has appeared in the surrounding regions. The Middle horizon culture

seems to have been well established before the appearance of type MM2b. The localized distribution in the center of the Interior province does not suggest any simple diffusion from the outside. The distribution of types 001, 002, and 003 again supports the hypothesis of this central focal point. The similarity of MM2b to 001 strengthens the possibility of local invention of the latter, with 002 and 003 as later developments. At the same time, artifacts from the Eskimo area bear at least a superficial resemblance to type 001, though they are classed as compound fishhook barbs.<sup>93</sup> Mathiassen<sup>94</sup> illustrates "leister prongs" *in situ*, but it is also possible to interpret them as fishhooks. Both Collins and Mathiassen illustrate artifacts,<sup>95</sup> apparently similar to MM2b, which are also considered fishhooks; but these specimens have sharp tips and an angularity on the side opposite the foot, to allow separation from the shank, which are lacking in most California specimens. Implements having a form similar to type 003 but a different use include a Hawaiian netting needle (fig. 7, 1) and an Eskimo bird spear point.<sup>96</sup>

The abandonment of the fish spear in the Interior zone can with some certainty be ascribed to the entrance of the simple harpoon, marking the inception of the Late horizon. The implement was retained into the Late horizon in the Littoral zone, which never received the harpoon, but seems to have been replaced by other fishing implements, especially by nets.

W1a. This type shows considerable variation; if there were more specimens, it would be feasible to separate the Central and Northern California variants (fig. 2, t, r, respectively) from those of Southern California. Nothing is known of the temporal associations of the Southern California pieces. In Central California, the specimen from site CCo-295 can be placed in the Middle horizon. Nothing is known of the associations of the fish spear from site Hum-67 in Humboldt Bay; the artifact does not seem to be a characteristic trait for the area. Figure 2, s comes from the Colusa province at Col-2, of Phase II strata; this provenience further emphasizes the dubiousness of the inclusion of this specimen in this group. The simplicity, rare occurrence, and difference in form (and function?) of these artifacts confuse any conclusions concerning their significance.

#### NORTHERN MARITIME HARPOONS

Scientific excavation has been limited in Northwestern California and there is detailed information only on sites Hum-118 and Hum-169.

<sup>93</sup>Collins, pl. 75, figs. 6, 7.

<sup>94</sup>Mathiassen, pl. 12, figs. 8, 9.

<sup>95</sup>Collins, pl. 75, fig. 8; Mathiassen, pl. 22, fig. 1 (no suggested use).

<sup>96</sup>Nelson, E. W., fig. 42, no. 8, p. 149.

<sup>92</sup>Beardsley, 1948, p. 12.

The sequence of harpoons revealed stratigraphically at these two sites can probably serve as a guide for the placement of scattered finds made elsewhere in the area. Harpoon points were found throughout site Hum-117 to a depth of 144 inches; the maximum depth of the mound was 156 inches, indicating that fishing and sea-mammal hunting had been basic economic pursuits along the coast for centuries.

The limited occurrence of type IA1a at site Hum-67 suggests that the extreme variation in base form and number of barbs may be the result of individual preference. Though utilizing the bilateral line shoulder, the forms do not exactly parallel Hum-118 forms. This type may be the earliest form found at Hum-67, judging from the depth association of the bilateral line shoulder at Hum-118. The IA2a and IA1a specimens from Hum-118 were found only in the lower half of the shellmound. The examples of IA1a from Hum-67, though varying in detail, are probably of the same general period.

At Hum-118 all the IB1a and IB2a specimens were found in the upper half of the site, above 60 inches, indicating the replacement of the line shoulder by the line guard as a means of line attachment. This replacement probably also occurred at Hum-67, where one IB1a was found. The harpoon with the bilateral line guard was found in the lower levels only of Hum-169, from 42 to 71 inches. Limited excavation on Hum-170 yielded only harpoons with bilateral line guards, one type IB1a, two type IB2a, and two IB1a. This site had not been occupied within the memory of informants who had lived at Hum-169, and it is not recorded on any map of Trinidad Bay since its discovery in 1775. Harpoons of type IB1a also came from the upper levels of Hum-118, extending as deep as 76 inches, and the lower levels of Hum-169 from 30 to 67 inches.

More extensive relationships appear with type IC. Four examples of type IC2b came from the upper levels of Hum-118, overlapping with type IB2a. Nineteen IC2b specimens were found in the upper levels at Hum-169, and two similar harpoons came from Hum-124, both sites being historic villages. The unilateral line guard is also a feature of the ethnographic type IC3b. Two IC2 specimens from Hum-118 exhibit a slight indentation on the side without barbs, opposite the lower edge of the line guard. An ethnographic harpoon from the Tolowa (fig. 7, d') has a similar indentation. Two type IC1a were found in the upper levels of Hum-118, and the harpoons of this type from Hum-169 and Hum-67 are probably correlated in time. Single IC1a specimens came from Hum-67 and the Mad River Beach site; the Stuart collection has two ethnographic specimens from the Requa Reservation, which are probably of Wiyot origin.

The last change in sea-mammal harpoons (type IC3b) is limited to single ethnographic pieces from the Yurok and Tolowa. The antler tip was modified for the attachment of stemmed metal points, replacing those of aboriginal stone.

The frequent occurrence of the same methods of line attachment at Hum-118 and Hum-67 indicates that this major modification of harpoon points was not a local phenomenon, but affected the whole sea-hunting industry in this area. Since other features vary locally, it is probable that home manufacture was more important than trade. Conclusions are hampered by the difference in the two sites: the occupational deposit at Hum-118 contained abundant harpoons and sea-mammal bones, whereas Hum-67 was essentially a burial mound with a minimum of harpoons. The oldest hunters yet known from the area employed the bilateral line shoulder; this eventually gave way to the bilateral line guard and this, in turn, yielded to the unilateral line guard, whose lateness is emphasized by its stratigraphic position, wider distribution (sites evidencing late occupation being the more numerous), and ethnographic occurrence. Two barbs seem to have been the preferred number in the area, with a small number of single-barbed specimens, especially at Hum-67. Many of these last represent harpoons which have been reworked after breakage of the second barb. Only one three-barbed piece was found. Barbs with torque (figs. 4, s, 6, a, b) appear to have been used throughout the whole period, with an increasing emphasis in later times. The hooked barb (figs. 5, g, 6, a-c) is limited to ethnographic specimens and type IC, except at Hum-169 where type IB2b also has this feature; an origin at or near Hum-169 may be indicated. It is interesting that the basal forms are duplicated on both the hunting and fishing harpoons. The range of IB extends as much as 16 inches deeper than IB at Hum-118, so the bilateral line guard may have been introduced in fishing first.

The slotted tip is the dominant form throughout the mound at Hum-118, Hum-169, and elsewhere in coastal Yurok territory. However, no examples occur at Hum-67 or at Mad River Beach, both within Wiyot territory ethnographically. Since the region did receive the same basal forms as farther north, the simple tip appears to be characteristic of this southern area. Likewise, no hooked barbs have been reported from sites in Wiyot territory.

Type ID is found only at Hum-67, and may represent a trade piece from farther north, since the type was not found elsewhere archaeologically. The only other examples of the line hole noted in California are in two ethnographic illustrations, unsupported by actual museum specimens. One is from the Tolowa,<sup>97</sup> the other is a Nisenan toggle harpoon.<sup>98</sup>

#### Wider Distributions

Ethnographic information indicates that the sea-mammal harpoon was probably used intensively by most coastal groups of Northwestern Cali-

<sup>97</sup>Drucker, 1937b, fig. 2, p. 237. (See fig. 7, b' herein.)

<sup>98</sup>Beals, fig. 1, p. 341. (See fig. 7, q herein); Chever, p. 137.

California as far south as the Mattole,<sup>99</sup> while the Sinkyone "speared" sea-mammals from canoes.<sup>100</sup> Gifford<sup>101</sup> records for the Coast Yuki a sea-lion harpoon head with single bilateral barbs, which were obtained from the north. Unilaterally barbed types were probably the aboriginal form; they are apparently of rather recent adoption among this Central Californian group, and the bilateral barbs may well be a postcontact development, unless the memory of the informant is faulty.

Discussion of distributions to the north is hampered by the paucity of comparative material. Type IA, with the bilateral line shoulder, the earliest yet found, seems to be restricted to California. The closest resemblances seem to be simple harpoons from the Aleutians, but none are very similar.

Type IB, with the bilateral line guard, is more widely distributed. The closest occurrence is just across the border in Oregon, at Lone Ranch Creek.<sup>102</sup> Many elements of former culture were shared between Hum-118 and the Oregon shellmound, but, although a representative sample was obtained from the latter site, only one simple harpoon was found. This is in sharp contrast to the 71 specimens from Hum-118, 29 from Hum-169, and even the 5 from two test pits at Hum-170. It would appear that sea-mammal hunting was of much greater economic importance to the prehistoric occupants of Yurok territory than to those of the Chetco. This is supported by the greater abundance of elk and deer bones at Lone Ranch Creek, whereas at Hum-118 sea-mammal bones were found in excessive quantity, often in layers, to the virtual exclusion of land-mammal bones. That the slotted tip never was used at Lone Ranch Creek is suggested by the small size and rarity of concave base points.<sup>103</sup> A tip fragment of a small harpoon (II?) was found in the Willamette Valley.<sup>104</sup>

Type IB corresponds in base type with Drucker's type I,<sup>105</sup> which he finds to be characteristic of the Straits of Georgia-Puget Sound aspect.<sup>106</sup> Future excavation may well reveal a continuous coastal distribution of this basal form from British Columbia to California. One specimen is known from the Interior Tsimshian,<sup>107</sup>

though other types are characteristic of this Northern aspect.

One type IC2 specimen, lacking the hooked barbs, was collected from the Tlingit.<sup>108</sup> Type IC3 occurs ethnographically in identical form among the Tolowa. The hooked barbs and either the slotted or grooved-inset tip were used by the Naltunne Indians of Oregon.<sup>109</sup> "Large harpoon heads of bone, tipped with obsidian" were found at a site just south of Port Orford, Oregon.<sup>110</sup> Type IC1a was apparently used on the Upper Columbia.<sup>111</sup>

Except for the Naltunne and Tlingit specimens, the only slotted tips noted were those of the Haida harpoons,<sup>112</sup> although these may be more closely related to certain Aleutian forms which are made for a different type of point, with a stemmed rather than a concave base.<sup>113</sup>

The closest occurrence of the line hole outside California is in specimens from the Upper Columbia,<sup>114</sup> Vancouver Island,<sup>115</sup> and the Lower Fraser River.<sup>116</sup>

The following interpretation is derived from the inadequate information available. Centuries before white contact the simple harpoon entered Northwestern California as a diffusion from some northern center. The form for both long and short harpoons probably included a simple tip, usually one or two unilateral barbs, occasional torque, and bilateral line shoulders.

An apparently uniform culture was found at Hum-118 from top to bottom, and the fact that such diagnostic elements as zoömorph clubs ("slave killers")--one from the very lowest level of the shellmound--tubular pipes,<sup>117</sup> steatite dishes, antler wedges, bell-shaped mauls, and similar items were already in use, indicates that much of the Northwestern Californian cultural pattern had been established before site Hum-118 was first occupied. The

<sup>108</sup>Leroi-Gourhan, fig. 622, p. 342. Specimen in British Museum.

<sup>109</sup>Mason, 1902, fig. 18, p. 225.

<sup>110</sup>Johnson, p. 50.

<sup>111</sup>Collier, Hudson, and Ford, p. 79, pl. 9, 1.

<sup>112</sup>Drucker, 1943, fig. 3, k, p. 38, type III, table 8, p. 120.

<sup>113</sup>Jochelson, fig. 9, p. 55; fig. 54 B, p. 82; pl. 23.

<sup>114</sup>Collier, Hudson, and Ford, p. 79, pl. 9, h, j, l.

<sup>115</sup>Smith, 1907, fig. 150, p. 368; Curtis, p. 66.

<sup>116</sup>Smith, 1903, fig. 18, d, e; fig. 50, a.

<sup>117</sup>The tubular smoking pipe is not found in Central California until Phase I of the Late horizon, when it appears in all provinces. If a southern origin is assumed for the pipe, a relative dating may be applied to Northwestern California, placing the sequence of harpoons being dealt with here later in time than the inception of Phase I in Central California. Some of the cremations described by Loud (pp. 354-356) have most of the characteristics of preinterment grave-pit burning (Schenck and Dawson, pp. 334-336), which also appears in Central California for the first time in Phase I.

<sup>99</sup>Driver, 1939, no. 285, p. 314, lists the Tolowa, Wiyot, Yurok, and Mattole.

<sup>100</sup>Nomland, 1935, p. 153.

<sup>101</sup>Gifford, 1939, fig. 6, p. 335. (Reproduced in fig. 7, p herein.)

<sup>102</sup>Berreman, pl. V B, no. 28.

<sup>103</sup>Ibid., type NBB, p. 29, pl. VII, A, nos. 15, 16.

<sup>104</sup>Leatherman and Krieger, fig. 24, E, pl. 28, G. Only the tip was found so the basal type cannot be given.

<sup>105</sup>Drucker, 1943, fig. 3, a, b; pp. 36, 38.

<sup>106</sup>Ibid., table 8, p. 120.

<sup>107</sup>Ibid.

zoömorph clubs from Hum-118 are noteworthy since most of these come from Hum-67, indicating probable contact at some time between the occupants of these two sites.<sup>118</sup> Local residence had been of sufficient duration, however, to develop variant forms of harpoons. Thus the Hum-118 harpoon, with such features as the slotted tip, occasional combination of line shoulder and line guard, and the less variable base form differs from the implement of the not-too-distant Hum-67 with its simple tip, inconsistent number of barbs, and changeable base form.

Whether the slotted tip for concave-base points was an invention of Northwestern California or was derived from unknown forms ancestral also to those of the Tlingit, Haida, and Aleut cannot be said at present. The slotted tip as a structural feature is extremely characteristic of the Yurok ethnographically and of their territory archaeologically. In addition to its use on the sea-mammal harpoons, the Yurok employed barbed arrows with slotted tips;<sup>119</sup> one fragmentary archaeological specimen was found at a depth of 19 inches at Hum-118 (fig. 5, w). The Yurok toggle spurs have a corresponding forked tip, with archaeological counterparts only from sites within Yurok territory, one of which is an historic Yurok village. Just why the distribution of the improved tip remained so restricted is difficult to understand, though groups which did not depend so much on sea hunting may have regarded the slotted tip as an unnecessary complication.

After a considerable lapse of time the line guard displaced the line shoulder as a means of line attachment, all along the coast. It is probably accidental that excavation should reveal the greatest concentration of these harpoons at the peripheries of their most intensive use, namely in Northwestern California and the Straits of Georgia-Puget Sound aspect of Drucker. The theory might be entertained that figure 4, n, v represents a developing stage of the line guard.

The hooked barb was added to type IB2 at Hum-169, but was not accepted by the Hum-118 inhabitants until the unilateral line guard came into use. Finally the outside line guard was eliminated, producing type IC, a form which was just coming into use at Hum-118 when the site was abandoned. Since Hum-170, having bilateral line guard types of harpoons, is not shown on maps of Trinidad Bay since its discovery, types IB and IIB were probably in use before 1775. Although the unilateral line guard was accepted at Hum-67 and Mad River Beach site, the hooked barb was not; again, this is perhaps a reflection of the diminished importance of sea hunting

to the south. Type IC gradually increased in popularity till it became dominant in the historic period among the Yurok, Tolowa, and some neighboring Oregon tribes.

Stratigraphic position will have to determine when the line hole (type ID) made its appearance in the area. The occurrence of this form of line attachment has been very sporadic south of the Northern aspect of the Northwest coast. In general, there is a suggestion of late entrance by trade. Bilateral barbs, represented only by drawings of two ethnographic specimens,<sup>120</sup> apparently made a very late appearance, quite possibly during the historic period.

Just as most articles of the material culture of Northwestern California, particularly of the Yurok, exhibit greater technological perfection than is found in the implements of surrounding regions,<sup>121</sup> so harpoons from former Yurok territory display certain specializations which connote more careful workmanship, such as the slotted and forked tip, the hooked barb, and incised patterns.

Sea-mammal hunting was evidently an intensive industry along this coast and may have contributed substantially to the condition of economic surplus out of which developed the interior subclimax on the Klamath River: it might be speculated that the apparent late spread of the unilateral line guard north and south, and the hooked barbs north, is an expression of the radiation to be seen in numerous cultural traits from the Yurok focus.

The only unilaterally barbed marine harpoon from Central California is a medial fragment from Mrn-275 on the Marin coast. The unique character of the piece in the area has already been cited as suggesting a transmission from a northerly region by some wounded sea mammal.<sup>122</sup> There is no evidence that the Indians around San Francisco Bay ever used the harpoon for hunting sea mammals. Clubs were used by the coastal Pomo.<sup>123</sup>

#### CENTRAL FLUVIAL HARPOONS

The present distribution of bilaterally barbed harpoons in Central California indicates that they are typical only of Phase I of the Late horizon. The majority occur in Hollister facies settlements, listed in figure 9, b. With two exceptions, discussed below, only Phase I determinants are associated with harpoons found with burials. No association of these implements with clamshell-disk beads is known. One harpoon fragment from Sac-56, placed in Phase II by present information on the site, may indicate retention of the implement at this site, or may

<sup>118</sup>Loud, pp. 370, 374, pl. 18. Dr. Stuart, of Eureka, has a large collection of zoömorph clubs from Hum-67 also.

<sup>119</sup>Gifford, 1940, fig. 20, p. 237; von Loeffelholz, fig. 47a, b (nonbarbed); for similar Hupa specimens see Mason, 1889, p. 227, fig. 100, pl. 22.

<sup>120</sup>Drucker, 1937b, fig. 2, p. 237; Gifford, 1939, fig. 6, p. 335.

<sup>121</sup>Kroeber, 1925, p. 1; Waterman and Coffin, pp. 30-33.

<sup>122</sup>Heizer, 1944, p. 397.

<sup>123</sup>Loeb, p. 169.



suggest a Phase I occupation of the untested part of the site. No other occurrence of harpoons in the Mosher facies is known. The complexity of the bilaterally barbed forms, the rarity of complete specimens and burial associations, and the scarcity of bases confuse the problem of possible relationships within Central California.

Type NN2c has some indications of early occurrence. Included with one burial at Bethany mound were two type NN2c harpoons (fig. 3, l, m) and one type O02 fish spear typical of the Middle horizon. This association suggests a period of transition, marking the beginning of Phase I of the Late horizon, at least in the south Delta. The occurrence of both fish spear and harpoon together may indicate the adoption of a new trait by a resident population. The generalized features of flat, concave, multiple barbs and simple bases lacking attachments also imply an early unspecialized form, when compared with other types, contrasting with the more common harpoon of this area, type NN2aIII. The SJo-139 and Byron site pieces are fragmentary or too poorly described to be definite, but are not NN2aIII.

Another burial association, at Core mound, consisted of two type NN2c harpoons (fig. 3, k), two large obsidian blades (34 and 32 cm. long, respectively), and one pipe, with an extended burial. Although the pipe establishes Phase I, the obsidian blades seem most characteristic of the Middle horizon, though they are extremely rare. Again, however, a period of transition may be represented. The other occurrences may represent later modified forms; the Sac-21 specimen (fig. 3, p) has specialized line attachments, while the Sac-107 pieces (fig. 3, n, o) seem to represent local deviations.

In view of the burial associations, the impression is gained that type NN2c represents the earliest form of Central California harpoon. The Bethany specimens might represent the prototype, but it is improbable that all the variation found in the Delta was of local origin. It can be proposed that various undifferentiated forms were earliest, with an emphasis on long, rather heavy points, having numerous concave or convex barbs with no established placement and either no specialized means of line attachment or bilateral line shoulders. It is doubtful whether all other forms of attachment were developed in Central California, but the limited distribution in the area of such types as the unilateral line shoulder and unilateral and bilateral line guard, as well as the number of unique harpoon types, convincingly argues in favor of considerable local inventiveness.

On the basis of quantity and diversity of the remaining types, the center of development appears to have been the Hollister facies. There are numerous indications that these related settlements are probably later expressions of Phase I than Bethany or Core sites. CCo-138 and Sac-21 are foremost in quantity and variation not only of harpoons, but of other

traits as well, and presumably represent fully developed Phase I settlements. From an analysis of CCo-138 made by Chard (n.d.), it would appear that this site was occupied in late Phase I and early Phase II times. (No harpoons occurred with burials having clamshell-disk beads). Partial explanation of the multiplicity of artifact forms probably lies in the fact that CCo-138, Sac-6, and Sac-21 have been more thoroughly excavated than other sites being considered. This factor, plus the unknown duration of Phase I or the number of occupants of a settlement, prevents any valid conclusion at this time regarding the importance of fishing. CCo-138, Sac-6, and Sac-21 are the only sites yielding more than four harpoons. If the simple harpoon was of as little importance in fishing in Phase I as the toggle harpoon was for the historic Indians--as its infrequent occurrence at most sites, rarity of burial associations, and lack of standardized types suggest--then the Valley groups may have accepted the implement passively, whereas, because of the environmental stimulus, the Delta inhabitants welcomed it. Fishing, no doubt, did assume a larger economic role in this area of swampy tule marshland, dissected by sloughs, although the number of mortars and charred acorns indicate that balanophagy was of undiminished importance in the economy. However, greater intensity of use rather than antiquity may be responsible for the increased variation in forms of harpoons from the Hollister facies.

Harpoons with bilaterally staggered barbs (NN2b) have the widest distribution, being the only type which spread outside the Delta. The fragment from Ker-46 in the southern San Joaquin Valley stresses this dispersal, but the rarity of the implement indicates its slight importance in the area. Little can be said of the two subtypes, owing to the limited number of examples. NN2bI would be a natural derivative from NN2c (possibly the SJo-139 and Byron specimens represent NN2bI), with a spread through the Delta into the Bay province. The retarded entrance of harpoons into the Littoral zone is indicated by the retention of the Middle horizon fish spear into Phase I times at site SCl-356, which never received the harpoon, and also at site CCo-250 (assuming type MM2e is a fish spear), which probably acquired the harpoon late. Sol-236 is the only Bay settlement which received the implement, and this fact emphasizes both the fluvial character of these harpoons and the culture lag of the Alameda province in Phase I. The Sol-236 specimen (fig. 3, a) is more like type NN2c than like the CCo-138 examples of NN2bI. No occurrence of harpoons is reported from the Napa area.<sup>12a</sup> Type NN2bII extends from CCo-138 to Sac-16, along the Sacramento River. The peripheral occurrence and rarity of the harpoon at Sac-16, associated with preinterment pit

<sup>12a</sup>The fish spear from Clear Lake referred to by Hewes, 1942a, p. 100, is not one of the types considered here. The harpoon illustrated by Beardsley (1948, pl. 1) for the Late coast culture is an error.



burning, suggest a late arrival at this site.

The limited distribution of the NN2a type would imply a later local emphasis on the opposed placement of barbs. If certain specimens included in NN2c, in which a close approach to the opposed placement sometimes occurs, represent an already established NN2aI type, it is difficult to understand why there should be such limited retention, unless staggered barbs exhibit functional superiority, which is not apparent. The production of opposed barbs, then, would seem to be a simple modification of the staggered position or possibly a crystallization of the opposed position from a prototype in the south Delta having accidental placement, with a delayed diffusion northward. The form and distribution of type NN2aIII provide the best argument for the existence of a recognized ideal pattern of harpoon construction. This type is found in a region which seems to have emphasized artistic elaboration and superior workmanship, as evidenced, for example, in the fish spears of the Middle horizon, the angular serrations of the margins of projectile points and "Stockton curves," and the balance and symmetry of the type NN2aIII harpoons. One possible reconstruction might derive this southern form as the first type NN2a, itself a refinement of the earlier unspecialized NN2c in the south Delta. Influence may then have been exerted to the north.

The effect of this pattern seems rather definite in type NN2aII. The CCo-138 example (fig. 2, d') exhibits slightly ridged barbs, some angularity, and a somewhat rectanguloid base. These features are also typical of certain NN2bII's from the site (fig. 4, d) which perhaps underwent the same influence. The Sac-107 specimen (fig. 2, c') retains the southern base form and some angularity of barbs, while the Sac-21 and Nicolaus inhabitants may have applied the three-barb idea to their own local style of barb and base form (fig. 2, a', b'). The distribution of NN2aIII and NN2aII may reflect the stimulated contacts attendant on the cultural efflorescence in the Delta at this time. Possibly a further modification occurred at Sac-21, with the acceptance of the opposed barb position resulting in a shift from NN2bI to NN2aI; the limited distribution of the latter type would support a late origin. Type NN2aI is most typical of Sac-21. The conditions under which the CCo-138 pieces were found are not clear, hence their significance is problematical; the type is not characteristic of the site numerically and may represent a brief period of influence or trade from Sac-21. The Sac-6 specimens are only tip fragments. However, the above assumptions have not yet been adequately corroborated. Very little is known of the temporal or cultural relationship between the south Delta and the Hollister facies.

A general sequence of change can be proposed as a tentative working hypothesis: the earliest harpoons in Central California (type NN2c) were long, heavy points, with no estab-

lished placement of barbs, and bilateral line shoulders or no special means of line attachment. It was not long before the staggered placement of barbs came to be preferred and was most widely distributed (type NN2b). A later restricted emphasis on opposed barbs (type NN2a) seems indicated for the south Delta and the Hollister facies. A reduction in number of barbs and over all size of harpoons may be a general trend through Phase I. (The size difference may be functional to some extent, since the extremes in proportions of the implements shown in figs. 3, b and 4, c must represent a difference in intended targets.) New variations in the forms of line attachment were developed, with local preferences becoming established. The significance of the emphasis on three barbs is problematical and may be the result of chance variation. It is associated with traits which appear to be both early and late developments, being found with large size (fig. 4, c) or generalized form and indefinite barb placement (fig. 4, e). Since our present information on the relative contemporaneity of Phase I settlements is inadequate, these trends in harpoon construction will be only suggested, and no attempt will be made to arrange the sites in a detailed temporal sequence until more field data are collected.

Our knowledge of intersite relationships is hampered by the rarity of specimens from most sites. CCo-138 and Sac-21 share five of eight types, with frequent similarity of special features, and the occupation of these sites must be considered at least partly contemporaneous. The CCo-138 inhabitants placed greater emphasis on both unilateral and staggered line attachments and barbs and developed a greater number of types. The unilateral attachment may have been developed at CCo-138, spreading thence to CCo-139, Sac-21, and Sac-60.

The thorough excavation of Sac-60 revealed a short Phase I occupation of this site. Its location between Sac-21 and Nicolaus, the absence of type NN2aII, and the sharing of the unilateral line shoulder with CCo-138 suggest that the Sac-60 inhabitants had late contact with CCo-138.

The similarity of Sac-21 and Nicolaus specimens is especially marked, and a resettlement of Sac-21 residents may be represented. The distribution of the ridged barb and rectanguloid base suggests a south Delta influence on the Hollister facies, being most marked at CCo-138. Sac-6, Sac-107, and Sac-122 perhaps had close cultural relationships also.

The archaeological field must be extended before the conditions surrounding the initial introduction of the bilaterally barbed harpoons can be discerned. It is apparent that the implement is typical of Phase I of the Late horizon, a period which is distinguished by the appearance of certain diagnostic traits in the Marin, Bay, Delta, and Colusa provinces of Central California.<sup>125</sup> However, these determinants

<sup>125</sup>Lillard, Heizer, and Fenenga, pp. 79, 80; Heizer, 1941, pp. 106-108; Beardsley (1948, pp. 17, 18).

vary in number and kind in the different areas, a variation which raises the problem of the nature of the stimulus which produced the Late horizon. "Late culture, in its general tenor, is an outgrowth from that of the preceding Transitional [Middle] period."<sup>126</sup> Certain earlier elements disappear, many more merely change their form, and a few foreign traits are encountered, among the most distinctive of which are the harpoons. At present the Delta region seems to be the center of harpoon development and dispersal, though this is also the area of greatest excavation. The bulk of the Phase I inventory of the Delta province is not registered in the Colusa province until Phase II, and it was assumed, in the absence of burial associations, that the occurrence of harpoons also followed this pattern,<sup>127</sup> because of their full development in Hollister facies and their rarity to the north. However, at present, the simple harpoon is found only on the periphery of the Colusa province, Sac-16 being the northernmost occurrence of the implement. This necessitates the assumption that harpoons bypassed the Colusa province in their original entrance of the Delta.

From only two settlements is there sufficient material to allow placement in the Sandhill facies, and even these are not as well sampled as those of the Hollister facies. Therefore it may be premature to claim that the harpoon is absent in the north. In addition, more specimens are needed from Sac-16, as well as more adequate information on the cultural affiliations of this site. If existing data are representative, diffusion of harpoons within Central California seems to spread from a Delta center. The largest number of specimens, the greatest variation (including the simplest forms), and the clearest intersite relationships all are found in the Delta. Sac-16, with two specimens, one aberrant (type NN2aIV), seems to represent the maximum diffusion northward. If so, simple group-to-group diffusion seems unlikely as a method of entrance, though the harpoon may have appeared before the occupation of the Sandhill facies (only two sites at present), or bypassed them by following the Feather or American River. The extreme variation in the Delta could then be ascribed to more intensive use. Equally possible is the entrance of a migrant group or there may have been special contacts between the Delta inhabitants and foreign groups beyond the Sacramento Valley.

Nothing definite can be said of the center from which it is assumed that the Central Californian types were derived, for archaeological investigation has not been extensive enough to reveal forms showing any particular similarity. A theory of development from unilaterally barbed marine forms found to the south might be entertained, but this would be an extreme view. Entrance from the west is negated by an apparently

complete absence in the Marin, Napa, and Bay areas (Sol-236, though on the Bay, can be considered peripheral to the Delta, in view of the distribution of harpoons). Sierran groups may have passed it down the rivers flowing into the Delta from the east. A northern origin, among groups dependent upon the salmon, seems most likely, however. Northwest California, Oregon, Washington, and British Columbia are dominated prehistorically by the unilaterally barbed simple harpoon;<sup>128</sup> however, since most of the excavation in these regions has been done at coastal sites maritime implements are often represented. The bases of many lack line attachments, perhaps implying their use as arrow or spearheads. The variety of line attachments found in Central California is nowhere represented in this southern Northwest Coast area, though the barb forms are much more heterogeneous. A very significant feature is the rarity of the line hole in this region, a fact which is in agreement with data from California and may indicate the late appearance of this character in the south.<sup>129</sup>

Bilaterally barbed specimens are rare,<sup>130</sup> with little similarity to Californian pieces, but future archaeology may reveal more types. The California occurrence is isolated from the main distribution to the north as outlined by de Laguna.<sup>131</sup> The southernmost occurrence of either opposed or staggered barbs appears to be among the northern Salish groups, the closest resemblance at present being to ethnographic specimens from British Columbia--the Lillooet,<sup>132</sup> Thompson River,<sup>133</sup> and Kwakiutl.<sup>134</sup> All seem to lack line shoulder and guards, or line holes, but their harpoon principle cannot be questioned.

One other aspect of this problem may be mentioned. Archaeology reveals an efflorescence of cultural development in the Delta province in the Late horizon. White contact may have shifted the center northward, for Kroeber found the culture climax to be more in the Valley proper, though rarity of informants from the Delta may have influenced this conclusion. At any rate the Delta province in that region exhibits the most developed forms of the Kuku cult, for which some antiquity must be admitted.

<sup>128</sup>Northwest California: figs. 4, 5, 6, herein; Loud, pl. 21, figs. 3, 13. Oregon: Berreman, pl. V, B, no. 28; Laughlin, 1943, fig. 24, pl. 28 G. Washington-British Columbia: Collier, Hudson, and Ford, pl. 9; Hill-Tout, pl. 1, p. 109, pl. 3, p. 111; Rau, fig. 228, p. 145; Smith, 1907, figs. 104, 122, 123, 141, 150, 159; idem, 1903, figs. 16, 17, 18, 50, 52; idem, 1900, fig. 337; idem, 1899, fig. 20. Most of the greater distribution to the north and east is outlined by de Laguna, pp. 200, 201.

<sup>129</sup>Cf. areas farther north, such as Drucker, 1943, fig. 38.

<sup>130</sup>Smith, 1903, fig. 19.

<sup>131</sup>De Laguna, pp. 199-200.

<sup>132</sup>Teit, 1906, fig. 87.

<sup>133</sup>Idem, 1900, fig. 222, g.

<sup>134</sup>Barnett, no. 34, p. 279.

<sup>126</sup>Lillard, Heizer, and Fenenga, p. 79.

<sup>127</sup>Ibid., p. 80.

Kroeber's<sup>135</sup> derivation of the stimuli for these societies from the Southwest rather than the Northwest Coast appears valid, but it might be noted that the appearance of harpoons, presumably with northern affiliations and perhaps indicating the entrance of a migrant group, suggests the possibility that some of the features of the cult may also have stemmed from the northern center.

While the simple harpoon may have lingered into early Phase II times in isolated areas of the Delta, no association with Phase II determinants has yet been uncovered, and the implement can be considered characteristic only of Phase I. It is therefore necessary to seek some explanation for the abandonment of this type of implement, which contrasts sharply with the continuity, often with elaboration and expansion, of most other Phase I culture elements into Phase II.

It is known that early mining operations of the 1850's so muddied the rivers that fish spears and harpoons were useless in both Northern and Central California, but there is no evidence to support any similar clouding of the rivers at the end of Phase I. Nor is there yet any indication of belligerent invasions or war-like neighbors which might have made fishing dangerous during this period of change. The continuance of net sinkers does not support the theory of taboos against fishing; other methods of fishing, such as nets, weirs, and poisons, may have merely become dominant, but there does not appear to be any difference in the abundance of net sinkers between Phases I and II which affected the Interior zone as a whole.

It is therefore felt that the best explanation for the disappearance of the simple harpoon is that it was replaced by the toggle harpoon. Evidence supporting such an entrance has been presented under the distribution of toggle types. The new form would be superior in many ways. The operational principle of the toggle, which virtually ensured the capture of a harpooned fish, was a marked improvement over the simple harpoon whose low barbs probably allowed more pierced fish to wriggle off the point. As the toggles were small, they could be used on two foreshafts, providing greater chances of hitting the elusive target. The breakage of the long, slender simple harpoon must have been a recurrent disadvantage which the shortness of the toggle point eliminated. The manufacture of this shorter point required less careful workmanship than the fragile multibarbed harpoons, especially if the earliest toggle was of the awl-like or bipointed variety.

It may thus be suggested that the appearance of the toggle harpoon, as a diffusion from northern centers, was welcomed in Central California, and its superiority recognized to the exclusion of the simple harpoon. The lack of association between clamshell-disk beads and

harpoons in the Delta province suggests that the toggle harpoon entered before clamshell-disk beads. Present evidence would indicate that the simple harpoon had diffused northward only as far as site Sac-16. The Colusa province is in the direct path of the most probable entrance of the toggle harpoon, i.e., along the Sacramento River from the northern center of use of this implement. The absence of the simple harpoon in the Sandhill facies supports the hypothesis that the toggle harpoon had entered this area before clamshell-disk beads, preventing a further diffusion of the simple harpoon beyond Sac-16. The toggle harpoon may have spread southward, replacing the earlier harpoon, to be followed closely by the disk beads. It is significant that the simple harpoon is absent from all but one settlement which used clamshell-disk beads throughout its occupation.

Little can be said of the other types of Central Californian harpoons, because of their limited distribution. The single example of type NN2aIV from Sac-16 may represent an early form, but is more likely a degenerate specimen. Types NN2d and NN3a both represent local specializations of CCo-138. Their rare occurrence suggests the work of single individuals. Type NN3b is present at CCo-138 and probably at Sac-21. All specimens from CCo-138 seem to have been found together in Phase I strata. The unique base and limited distribution suggest an original development in Central California, perhaps at CCo-138, toward the end of Phase I. In its lack of interest in unilateral types this region contrasts with most other fishing areas.

#### SOUTHERN MARITIME HARPOONS

Little can be said about harpoons from Southern California since for most specimens detailed data as to their location are lacking. Only certain composite pieces have any temporal associations, which Woodward would place in the historic period.<sup>136</sup>

"Bone harpoons are rare in the Chumash collections, and when occurring are provided with several barbs, while the Shoshonean islanders had numerous harpoons, but all of the single barb type."<sup>137</sup> This observation should be validated by a complete study of the various scattered collections from the Channel Islands. Among the published artifacts three single-barbed specimens were found in Chumash territory, and the multibarbed specimen shown in figure 6, j came from San Nicolas Island, though trade or any number of explanations could account for this. Until the number and distribution of multibarbed pieces is available, speculation is fruitless, but they would appear to be rare and their concentration in Chumash territory might be accidental.

<sup>136</sup>See p. 304 herein.

<sup>137</sup>Hodge, p. 216.

<sup>135</sup>Kroeber, 1932, pp. 408-412.

The years of "pot-hunting" which ravaged the mainland and nearest islands may be responsible for the great concentration of specimens from the islands inhabited by the Gabrieleño, particularly San Nicolas, the least disturbed of them, which became the focal point for later scientific excavation. It is also possible that the Chumash preferred the composite forms, for there is no implication by the early Spanish observers that the Gabrieleño did a greater amount of sea-mammal hunting or fishing.

The great abundance of harpoon points from San Nicolas Island is in striking contrast to their rarity in the other islands, and in view of the considerable archaeological collections from San Miguel,<sup>138</sup> this preponderance does not seem due solely to the isolated position of San Nicolas. Their numbers would seem to confirm Kroeber's proposal that the restricted island environment forced attention to the sea with an emphasis on sea-mammal hunting; sea-otter furs were probably the major export to the mainland, in return for which the Nicoleño obtained necessities lacking on their island.<sup>139</sup>

Nothing can be said of the antiquity of these types of simple harpoon, since the locations within the mound of the great bulk of specimens are unknown. Present information stresses the use of harpoons by the late cultures, but an analysis of possible harpoon barbs should reveal greater antiquity. They are not included in the cultural inventories of any of the successive periods proposed for the region.<sup>140</sup> There is not enough material for proper comparison with surrounding areas. The coast north of the Chumash was probably ill suited to sea-mammal hunting. The location of these artifacts implies a marine use, substantiated by early Spanish accounts. These accounts indicate that the harpoon was used by the Diegueño, though no specimens from their territory have been noted. Harpoons were also used in Baja California, at least in the lower half among the Waicura and Pericue; a multibarbed specimen of wood has been illustrated by Shelvocke.<sup>141</sup> Actual pieces are known from the Seri.<sup>142</sup>

Unfortunately both Seri specimens are made with iron points, so the aboriginal form is unknown. The unbarbed turtle harpoon is admirably suited to the puncture of the carapace, and McGee suggests that, aboriginally, both point and foreshaft were made of sea-mammal teeth. Such a form would be unsuited for securing large fish and sea mammals, so the barbed harpoon point of bone may well be the aboriginal fishing form. Otherwise, the use of this single barb,

with the point fixed in a detachable foreshaft, would be an odd coincidence in view of the proximity of similar forms in Southern California and the peninsula.

"What is typical of Seri habits is that the harpoon shaft is also used for poling, and the harpoon cord as anchor rope, tow-line along shore, sheet rope, and for tying a blanket to a mast and pole to serve as sail...The whole harpoon...dismounted...seems regularly to be taken on a transport voyage."<sup>143</sup> This integrated function does not imply recent introduction of this implement to the Seri. They once used a bi-pointed fish spear,<sup>144</sup> but other factors may be responsible for its apparent abandonment.

The wide use of this implement in this peripheral region suggests antiquity, which scientific excavation must determine. There is no satisfactory explanation of a recent adoption, and a very early entrance may be inferred for these Southern Californian, Pericue, and Seri harpoons.

Quite likely the Santa Barbara shafts and foreshafts represent developments from types similar to the Seri harpoon of cane or mesquite root. The Pericue form seems to lack a foreshaft, but this was perhaps omitted by the artist. It may be noted that the stone head, affixed unilateral barb, shouldered base, and detachable foreshaft of figure 7, a, b all find counterparts in the harpoons from the coast of Peru and Chile.<sup>145</sup> A specimen showing superficial resemblance to Southern Californian archaeological forms is that found at a Developmental Pueblo site in Utah.<sup>146</sup> Although its use was probably different, it may have developed from the same ancestral type, or may represent trade.

The harpoon or harpoon arrow with the bi-pointed bone tip (fig. 7, d, e) also occurs on the Chilean coast<sup>147</sup> and is widely used on the great rivers of the Amazon and Orinoco basins. The Natchez,<sup>148</sup> and probably other tribes of the eastern United States, had a similar form.

#### HISTORIC FISHING HARPOONS

While the toggle harpoon was widely distributed in California among the living Indians, the implement has been recognized archaeologically only in the northern part of the state. Ethnographic Yurok toggle spurs in the UCMA conform to type IIIb, having the open channel and forked socket-end. The specimens are somewhat

<sup>143</sup>Kroeber, 1913, p. 21.

<sup>144</sup>Hardy, p. 290.

<sup>145</sup>Mason, 1902, fig. 13, p. 215; Bird, pl. 123, j, k.

<sup>146</sup>Gilllin, fig. 22, p. 171.

<sup>147</sup>Bird, pl. 123, fig. p.

<sup>148</sup>Swanton, p. 58; the bi-pointed arrow point was also common (see Tyzzer).

<sup>138</sup>Heye, 1921; Nelson, 1936.

<sup>139</sup>Kroeber, 1925, p. 634.

<sup>140</sup>D. B. Rogers, 1929; M. R. Rogers, 1929; Olson, 1930.

<sup>141</sup>Shelvocke, facing p. 224; see also Costanso, p. 15.

<sup>142</sup>McGee, figs. 20, 21, pp. 187-193; Coolidge and Coolidge, pp. 121, 122, 258.

larger and exhibit flaring sides (fig. 7, r) similar to single specimens from the historic sites Hum-169 and DNo-2. Three other examples of type IIIb from Hum-169 occurred at depths of 26, 36, and 54 inches. Only one of this type from Hum-118 has a complete socket-end, but at least three others seem to have had forked ends also.

One specimen of type IIIa, with a rectangular socket-end, is known from Hum-67. The type may be present at Hum-118, but complete artifacts are needed to verify this.

Toggle type Ia is represented by three specimens from Hum-169 found at a depth between 5 and 48 inches. The two aberrant specimens from site Hum-67 may represent subtypes, but more examples are needed. These Humboldt Island pieces are extreme deviants, being larger, flatter, and cruder than usual type I specimens, with either an atypical socket-end (fig. 5, y) or barb-end (fig. 5, x). The flat cross section is more like Yuki and Coast Yuki ethnographic toggle spurs than other examples of type I, though no adequate comparison can be made when the spurs are assembled in a toggle point. Although Kroeber<sup>149</sup> states that the Yuki obtained their toggle points from the Wailaki, museum specimens from the two groups are not similar.<sup>150</sup> An ethnographic spur from the Karok is also large and flat (fig. 7, g). A general increase in height and width seems indicated between the earlier archaeological specimens and the ethnographic toggle spurs.

Two toggle spurs having the medial ridge and probably the forked tip (type Ib) occurred in the top 24 inches of Hum-169, while a pair of specimens were found at about 72 inches. An unfinished spur at 11 inches depth is larger than type IIIb and may represent type I.

Type IIIb was apparently the characteristic form of toggle harpoon in territory occupied historically by the Yurok. Type I entered relatively late and co-existed with type III at Hum-169. The forked tip of type Ib was probably a local modification.

Finished toggle spurs occurred as deep as 67 inches at Hum-118, and only one unfinished piece was found below this, at 124 inches. This perhaps indicates an increase in use of the toggle harpoon in the later period of occupation. Although two spurs comprise one toggle point, over twice as many small simple harpoons (type IIB) came from the same strata as toggle type IIIb at Hum-118. There were nine toggle spurs compared to five small simple harpoons at Hum-169. It is therefore evident that the toggle harpoon was slow to replace the small simple harpoon in fishing, but apparently the implement became increasingly popular among the later occupants of the area. Toggle spurs will probably be found more frequently in sites along riverbanks.

<sup>149</sup>Kroeber, 1925, pp. 152, 174.

<sup>150</sup>Gifford, 1940, figs. 8, 13, p. 236.

Data on northern distributions are limited. Type IIIa occurs at Lone Ranch Creek<sup>151</sup> and Ballard<sup>152</sup> sites, both in southern Oregon. Type I is found in the Willamette Valley,<sup>153</sup> the Dalles-Deschutes,<sup>154</sup> and is common in the Straits of Georgia-Puget Sound aspect.<sup>155</sup> As with the bilateral line guard of the simple harpoons, the toggle spurs with medial ridge extend to the Gulf of Georgia, but no farther. Toggle spurs with scarfed tips (type II) were used by the Tlingit.<sup>156</sup>

It thus appears that the toggle harpoon is of considerable antiquity in Northwestern California, occurring to a depth of 124 inches at Hum-118. Possibly the first settlers at this site knew of the toggle harpoon but, if so, they made little use of it until the late occupation. Although the more intensive use of the implement is represented in the same levels as those showing the shift to the bilateral line guard in simple harpoons, more dependence was apparently placed on the small simple harpoon for fishing at Hum-118. The occupants of Hum-169 employed the toggle harpoon more often.

The type I toggle spur occurs from Humboldt Bay to Vancouver Island; this wide distribution might indicate that it is the older form. However, the medial ridge is a superior device mechanically, providing a firm resistance to the push of the toggle point as it enters the target. In addition, the limited occurrence of this type in Northwestern California, in late sites, indicates a more recent entrance. It is therefore suggested that type I represents a late diffusion from the Straits of Georgia-Puget Sound center down the coast, with sporadic acceptance. The Hum-67 pieces may represent degenerate copies.

The simple open channel and rectangular socket-end (IIIa) seem to be features of the earliest form of toggle point in Northwestern California, being found from southern Oregon to Humboldt Bay, and possibly in the lower levels of Hum-118. By the time this implement was in popular use at Hum-118 the tip had been forked; increasing size and flaring width seem to have been developing trends which led to the historic toggle spurs. To date, the forked tip is restricted to former Yurok territory.

One aspect of the toggle harpoon should be kept in mind, namely that in the finished toggle point the distinguishing features of a toggle spur are concealed by the string-and-pitch binding. Therefore diffusion of the various forms

<sup>151</sup>Berremans, pl. V, B, nos. 29, 30.

<sup>152</sup>Leatherman and Krieger, pl. VIII, fig. 14. It may be noted that no toggle spurs were found at Schwenn site, which has indications of greater age.

<sup>153</sup>Laughlin, pl. 28, F, p. 226.

<sup>154</sup>Strong, Schenck, and Steward, pl. 6, j, n.

<sup>155</sup>Drucker, 1943, type I, pp. 39, 120, fig. 4, a, p. 40.

<sup>156</sup>Leroi-Gourhan, fig. 712, p. 364.

might depend to some extent on observation of the manufacture of the individual spurs. Thus the concealment of the forked socket-end may account for the seemingly limited distribution of this feature. The sporadic occurrence of toggle type Ia in Northwestern California may result from trade, but there is evidence that type Ib was made locally at Hum-169.

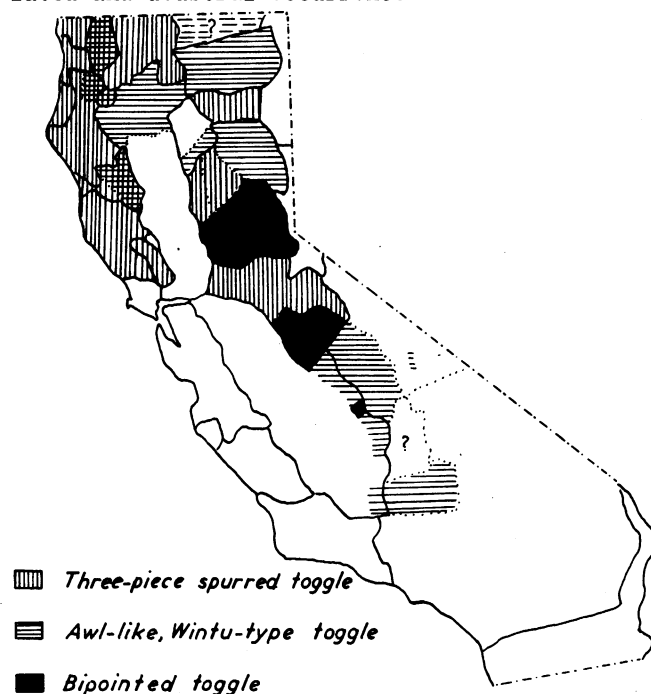
Toggle heads having flat points with scarfed spurs which form a blade slot<sup>157</sup> do not seem to have entered California, nor is there any evidence of the leister harpoon.<sup>158</sup>

The remaining archaeological specimens are so generalized that diverse uses can be proposed for them, and few specimens can be isolated as toggle spurs or toggle points with any surety. The type T1f can best be singled out as possible toggle points, and the occurrence of the type at Redding site 7, in territory occupied historically by the Wintu, is especially significant. It has been proposed that the specimens were used in the Wintu-type toggle, although specimens from Hum-118 and Hum-169 may have been used in the three-piece type. Two other occurrences have been noted farther south, at Col-1 and CCo-141, but both specimens were unassociated and their cultural affiliations are unknown, though Phase II is possible. The other type T examples have equally valid claims to use as varied fish-hooks and are not restricted to Phase II levels. The type U1 specimens described herein are all from Northwestern California. The artifacts are so simple that many uses are possible; the other pieces included by Gifford (1940, p. 177) are not considered to be harpoon points because of their location. The awl-like type, if found archaeologically, probably could not be distinguished from basketry awls.

Thus the data obtained by excavation are inadequate because of their rarity and the lack of associations of the specimens. The four types used ethnographically--three-piece spurred, awl-like, Wintu-type, and bipointed--with regional variation and wide distribution, do not support late diffusion in post-Contact times which is suggested by the apparent absence of the toggle head archaeologically in Central California, particularly in view of the subsidiary position of the harpoon in comparison with nets, weirs, and poisons. Unfortunately, ethnographic reports are too frequently not specific enough to allow any satisfactory distribution of the four types to be given (see map 3).

The three-piece spurred type is concentrated in Northwestern California and much of the Central culture province. It is particularly entrenched along the coast, with all groups from the Tolowa through the Wappo making

use of it.<sup>159</sup> To the east, the distribution is less uniform, the type being found among the Shasta, Atsugewi, Valley and Foothill Maidu,<sup>160</sup> Plains, Northern, and Central Miwok,<sup>161</sup> and perhaps the Patwin,<sup>162</sup> while its possible presence among the Tübatulabal<sup>163</sup> appears to be an isolated and doubtful occurrence.



Map 3  
Ethnographic Distribution of  
Toggle Harpoon Types

<sup>159</sup>Northwest California: Driver, 1939, no. 231, p. 313; Gifford, 1940, pp. 185, 186, fig. 1, p. 236, figs. 15, 16, p. 237; Essene, no. 163, p. 6. Yuki: Gifford, 1940, fig. 8, p. 236; Foster, fig. 13, p. 171; Essene, no. 164, p. 6. Coast Yuki: Gifford, 1929, fig. 7, pp. 335, 336. Pomo: Gifford and Kroeber, no. 209, p. 211. Wappo: Driver, 1936, p. 191; the barbed point mentioned was probably similar to the Pomo three-piece type.

<sup>160</sup>Voegelin, 1942, no. 244, p. 56; Dixon, fig. 49, p. 196. In an article dealing with the Valley Maidu, Miller, p. 206, illustrates a pair of Wintu-type toggles, but Mountain Maidu or Yahi implements may be represented.

<sup>161</sup>Curtis, 1924, p. 131, describes three-piece toggles, with wooden spurs but obsidian tips, for the Miwok in general; Barrett and Gifford, p. 189, refer to an obsidian-tipped fish spear used in the higher mountains; the same authors mention the two-pronged harpoon for the Plains and Northern Miwok, while the Central Miwok are said to have had a three-pronged harpoon (unique); the toggle for all groups was the "common Californian type" (spurred?).

<sup>162</sup>Gifford and Kroeber, no. 208, p. 134. Since antler and bone are denied as materials by the River Patwin, wood must have been used. The "toggle head of antler (bone), pitch and cord" of the Hill Patwin is also applicable to the Wintu type, which quite possibly extended to the Patwin.

<sup>163</sup>Information is conflicting. It is assumed that the barbed toggle head referred to by Voegelin, 1938, p. 14, is three-piece. However, in Driver, 1937, nos. 147, 151, pp. 62, 112, a Kern River Tübatulabal informant denied any harpoon, but the Bankalachi claimed the nonspurred type.

<sup>157</sup>Ibid; Drucker, 1943, type II, p. 39, fig. 4, b, p. 40; Smith, 1907, pp. 309, 310, fig. 160, p. 388.

<sup>158</sup>E.g., Ray, fig. 8, p. 60. Hewes, 1942a, p. 95, states that the trident fish spear was not found south of the Columbia, except among the Umatilla.

The awl-like type was used by the Klamath- (Modoc?)<sup>164</sup> and Yahi.<sup>165</sup> The Wintu-type is found among the Wintu,<sup>166</sup> Yuki, and Yahi.<sup>167</sup> Although the distinction between the awl-like and Wintu-type toggles can be made with museum specimens, it has not been done in the published literature, and for the remaining groups it is necessary to treat both as variants of a "non-spurred" type.<sup>168</sup> Non-spurred toggles are found among the Karok, Chimariko (?), Hupa,<sup>169</sup> and Hayfork Wintu<sup>170</sup> in the Northwest (the first three groups had both non-spurred and three-piece toggles); the Achomawi and Mountain Maidu in the Northern Sierras;<sup>171</sup> and the Western Mono and many of the adjoining Yokuts, Kawaiisu, and one Owen's Valley Paiute group.<sup>172</sup>

The Nisenan,<sup>173</sup> Southern Miwok,<sup>174</sup> and Central Foothill Yokuts<sup>175</sup> used bipointed specimens.

The Northern Paiute and Washo<sup>176</sup> possessed the toggle harpoon, but it is not specified whether Californian types were employed or the distinctive form used by the Snake River Shoshone<sup>177</sup> and probably the Humboldt River Shoshone.<sup>178</sup>

The southernmost limit of the toggle harpoon in California is not clear. Drucker<sup>179</sup> found no knowledge of the implement in Southern California, although only informants from the interior were available. Opinion was divided among the Luiseño as to the aboriginal use of the harpoon.<sup>180</sup> Coastal groups like the Chumash

and Diegueño probably had little use for this fluvial implement, and no indication of its use has appeared in the area; the single, barbed toggle noted by Harrington<sup>181</sup> for the Chumash may refer to the simple harpoon. The toggle harpoon may have been known to most groups living near suitable rivers, though in the south, where the salmon were absent, it most likely was of much less importance. The muddy Colorado and most of the Mojave Desert apparently were barriers to the further southward diffusion of the composite toggle harpoon.

The distribution and antiquity of the single and double foreshafted harpoon have been discussed by Hewes and de Laguna.<sup>182</sup> Little attention has been given to the toggle head itself, which exhibits marked variation, though most composite specimens noted north of California and the Klamath Indians were of the three-piece spurred type. One exception is a pair of Wintu-type toggles (fig. 7, u) which were presented to the UCMA in 1877 by the Alaska Commercial Company. They are labeled "spear points used by Alaska Indians in spearing salmon." These Alaskan tips are of bone, while all Californian specimens of this type have metal points.

The following description of the Tahltan salmon harpoon indicates it resembles the Californian bipointed type:

"A salmon spear of primitive type was described [as] a blade...about three inches in length, pointed at both ends, and sharpened along one edge. A line of twisted sinew or hide passed through a hole about the center and was secured to a twelve foot shaft near the head. One end of the toggle-like blade fitted in a socket in the end of the shaft...."<sup>183</sup>

The Haida probably used a related form.<sup>184</sup>

Little can be done with these occurrences of non-spurred and bipointed toggles along the Northwest Coast until their presence is corroborated by additional specimens. However, there is the suggestion that these two types once had a wider distribution, surviving only on the northern and southern peripheries of the area dominated by the composite spurred toggle harpoon; perhaps they were stages in the development of the spurred form.

The simplicity and wide discontinuous distribution of the non-spurred types in California suggest an earlier diffusion than that of the three-piece spurred type. It is improbable that three successive forms of the toggle harpoon could have passed through the Delta region in Phase II and historic times. The broken and

<sup>164</sup>Barrett, p. 251, pl. 22, fig. 4. The Modoc denied the harpoon, Voegelin, 1942, no. 240, p. 56.

<sup>165</sup>Waterman, 1918, pl. 9.

<sup>166</sup>DuBois, fig. 6, p. 128; Voegelin, 1942, no. 245, p. 56.

<sup>167</sup>Specimens in the UCMA.

<sup>168</sup>Driver, 1937, no. 151, p. 112, and 1939, no. 232, p. 379, specifically refers to the Klamath type (Barrett) rather than the closer Wintu type (Du Bois) for those groups included in footnotes 169 to 172 herein, but he may not have intended to distinguish between the awl-like and Wintu types; the Yokuts specimen sketched by Gayton, p. 72 (fig. 7, y herein) suggests the Wintu type.

<sup>169</sup>Driver, 1939, no. 232, p. 313.

<sup>170</sup>Ibid., no. 232, p. 379.

<sup>171</sup>Voegelin, 1942, no. 245, p. 56.

<sup>172</sup>Driver, 1937, no. 147, p. 63.

<sup>173</sup>Beals, fig. 1, p. 341 (fig. 7, q herein); Chever, p. 137.

<sup>174</sup>Godfrey, p. 62, illustrated. Clark, p. 37: "Their spears were small poles pointed with a single tine of bone," having a "string fastened near its center" to retrieve the fish.

<sup>175</sup>Gayton, p. 75; Driver, 1937, no. 151, p. 112.

<sup>176</sup>Stewart, no. 272, p. 371.

<sup>177</sup>Steward, no. 272, p. 276, fig. g, h, p. 221.

<sup>178</sup>Ibid., pp. 227, 228.

<sup>179</sup>Drucker, 1937a, p. 44.

<sup>180</sup>Sparkman, p. 200.

<sup>181</sup>Harrington, nos. 46-51, p. 7.

<sup>182</sup>Hewes, 1942a, pp. 96-102; de Laguna, pp. 194-198.

<sup>183</sup>Emmons, p. 87.

<sup>184</sup>Niblack, pl. 29, fig. 137, p. 289; fig. 137e, p. 289, from the Tlingit, is perhaps a variant form.



often peripheral distribution of the bipointed toggle suggests that it is the oldest form of toggle harpoon in California. The toggle principle is reduced to its barest essential in this implement, and it is possible that the type represents parallel simplification in different areas. However, such a theory seems unlikely for any group which did as much fishing as the Nisenan or Southern Miwok. Instead a tentative linkage is proposed between the Californian bipointed toggle and the similar forms in use among the Tahltan and Haida. This type may well be related to the simplest single-piece, open-socket toggle head found in the Bering Sea region,<sup>185</sup> but more information on these forms is needed.

It may be impossible to determine when the bipointed type of toggle harpoon entered California. No suitable perforated artifacts have been found archaeologically, and even grooved specimens would resemble gorge hooks. So far no charred remnants of toggle harpoons have been identified in pre-interment grave pit burnings, in which we often find perishable materials which have been preserved. The limited retention of the bipointed form suggests that it was less efficient than the more complex toggles. The type may therefore have spread through the Valley during Phase I times, to be accepted by fishermen using the simple harpoon; but it may have lacked the superiority necessary to displace the simple form. It is also possible that the toggle is earlier than the latter, though the fact that the bipointed toggle survived into the historic period, while the simple harpoon did not, may indicate the later entrance of the toggle form.

#### SUMMARY

Although fish spears and harpoons are found in all three culture areas of California, their forms and temporal associations do not imply any close historical connection. It is not sufficient to list the harpoon as a culture element found throughout California; some distinction must be made between marine and fluvial uses and between various specific shapes, the only guide available to us in the determination of wider prehistoric relationships. Therefore, an arbitrary typology has been defined as an aid in the discussion of these implements. The present paper is confined primarily to a descriptive analysis, since existing information is too limited to support any extensive discussion of the effect of the fish spear and harpoon on the aboriginal culture.

The sea-mammal harpoon is a characteristic element of the Northwest Coast culture area and is well represented on the shores of northern California, extending back in time to some an-

The awl-like and Wintu-type toggles are basically the same; the peripheral distribution and simple form (including the less efficient foreshafts of equal length) both indicate an earlier origin and spread than the three-piece type. Presence of both the non-spurred and spurred toggles among such groups as the Karok and Hupa support the conclusion derived from the distribution that the non-spurred types were in very general use at one time in California. If the southern Sierra harpoons do represent diffusions from a northern center, it is improbable that the Sacramento-San Joaquin River regions were bypassed in the transit southward. The double foreshafts and more complex toggle probably represent improvements over the bipointed type which were sufficient to cause the abandonment of the simple harpoon in Central California.

The distribution of the three-piece spurred toggle suggests that the main route of diffusion was from the Klamath River southward, west of the Coast Range, with late extensions eastward to the Atsugewi, Maidu, and Miwok. Excavation in northern coastal sites indicates that the spurred form was not in common use until relatively late times even in extreme northwestern California. One Pomo informant living on the upper headwaters of the Russian River stated that the toggle harpoon had been introduced to his group, replacing the older fish spear.<sup>186</sup> The simplicity and perishable nature of non-spurred toggles, the frequent use of wooden spurs (Maidu, River Patwin, and Miwok), and the proposed later acceptance of the spurred toggle head all contribute to the nonrecognition of the toggle harpoon in Phase II or historic settlements archaeologically.

Small harpoons for hunting small mammals and for fishing were used throughout the same period as the larger harpoons.

Harpoons are now the only element found in sufficient quantity to demonstrate a sequence of forms and hence can be used as time-bearers in this area. Three basic forms of line attachment serve as fundamental distinctions and occur in both large and small harpoons from Hum-118 and Hum-67. The two latest forms are found at Hum-169. The earliest form recognized is the bilateral line shoulder, which in time was succeeded by the bilateral line guard, the only form which has a wide distribution at present, occurring as far north as British Columbia and south to Humboldt Bay. This type, in turn, was gradually displaced by the unilateral line guard, in use ethnographically among the Yurok and Tolowa. Emphasis on two unilateral barbs, occasionally with torque, appears to persist through the entire period. Numerous variants

<sup>185</sup>Leroi-Gourhan, type A, pp. 356-361, fig. 688, p. 358; Larsen and Rainey, pl. 83, nos. 3, 4, 5, p. 165; other references in both.

<sup>186</sup>Gifford and Kroeber, no. 210, p. 173; one Mono informant claimed the harpoon was modern, Driver, 1937, no. 147, p. 112.



and particular structural features will become of increasing importance as the area known archaeologically is expanded. At present the slotted tip, of long duration at Hum-118, and hooked barbs, appearing in the late occupation of this site, are concentrated archaeologically in the area occupied by the Yurok in historic times and seem to expand a short way into Oregon ethnographically. Neither feature seems to have spread southward; no specimens are known from within former Wiyot boundaries. It is suggested that such local elaborations provide archaeological evidence of an intensive sea-hunting industry among the former inhabitants of Yurok territory and that this may have been a contributing factor in the development of the subclimax centered among the Yurok at the time of white contact.

The extension of sea-mammal harpoons to the Coast Yuki would appear to be a late intrusion of a Northwestern pattern into Central California. Harpoon points were traded in from the north, hunting was done only from the shore, and no other use of the implement is recorded from Central California.

The three-piece toggle point, the most common salmon harpoon of ethnographic California, is known archaeologically only along the northern coast. Two basic types have been designated, one having a V-shaped channel, the other a central groove interrupted by a medial ridge. Possibly the first form to enter California had the V-shaped channel and rectanguloid socket-end, found from about Coos Bay, Oregon, to Humboldt Bay. At Hum-117 this type was modified by the addition of a forked tip. Elaboration continued, until the form used ethnographically by the Yurok was produced shortly before the historic period.

The medial-ridge type of toggle spur has the widest distribution, from the Gulf of Georgia to Humboldt Bay. It is felt that its sporadic occurrence in California is more likely due to a late diffusion from the north. Both forms of toggle spur co-existed at Hum-169.

Central California produces a large variety of fluvial implements used in fishing. A trident fish spear is limited to the Early horizon. The occupants of certain later facies of the Middle horizon may well have fished with unbarbed, bident fish spears, type MM2b. They are most characteristic of the Morse facies. They seem to have been succeeded by a single-barbed form, type 001, which quite possibly was a local development from the unbarbed type. Though centered in the Brazil facies, type 001 is more widespread, occurring at numerous sites from San Francisco Bay to the Colusa province. Type 003, with two barbs, was apparently a slightly later

invention. Type 002, exhibiting more careful workmanship, is restricted to the south Delta.

The use of these barbed fish spears was terminated by the entrance of the simple harpoon, signifying the inception of Phase I of the Late horizon. The earliest occurrence of the harpoon is in the Delta, associated with Middle culture traits. The prototype may have been a rather generalized harpoon with no fixed placement of its multiple bilateral barbs nor specialized line attachments other than rare bilateral line shoulders. A multiplicity of forms was soon produced, demonstrating considerable local inventiveness. The greatest use of these implements occurred in the Delta province, particularly in the Hollister facies. The south Delta again developed a form showing more care in manufacture and artistic elaboration. Site CCo-138 also seems to have been a center of modification, having two unique types and a minor emphasis on unilateral line shoulders, line guards, and barbs. The different types provide useful clues to close relationships between certain settlements. It has been suggested that the simple harpoon entered the southern margin of the Colusa province in Phase I from the south, as well as the periphery of the Littoral zone. No wider distribution can at present be given, though the closest resemblances would seem to be in the Gulf of Georgia-Puget Sound area.

The absence of the simple harpoon in Phase II of the Late horizon would seem to result from the entrance of the non-spurred toggle harpoon as a diffusion from the north down the Sacramento River system. Types without spurs would seem to have spread as far as the southern Sierras. Three-piece spurred toggle heads apparently were late in entering the Interior province, and have not been recognized archaeologically.

The data from Southern California are most unsatisfactory. A variety of forms is known, as would be expected from an area in which the sea provided the main livelihood. However, no temporal significance can be stated, and a possible diagnostic difference between Chumash and Gabrieleño harpoons cannot as yet be substantiated.

Both composite and simple harpoons are known archaeologically; the composite specimens were found with late associations, while no depth can be given for the one-piece harpoons. They are perhaps related to the Seri and Lower California specimens, and might well be the oldest form in California. A study of artifacts which may be barbs of composite harpoons might provide needed answers to the problem of antiquity in Southern California.

CONCORDANCE OF SITE NUMBERS

The site designations employed in this paper are those recently assigned by the University of California Archaeological Survey (CAS) and use county symbols. For convenience they are here correlated with the site numbers appearing in previous reports on California archaeology.

A: new number equated with old site number.

B: old number equated with new site designation.

Sites whose names appear in the text but are not listed below have not yet been assigned county symbols or have not been discussed in previous publications.

A

<u>New</u>	<u>Old</u>	<u>New</u>	<u>Old</u>	<u>New</u>	<u>Old</u>
Ala-309	N.309	Sac-6	C.6	SC1-356	N.356
Ala-329	N.329	Sac-8	C.8		
		Sac-16	S.16	SJo-56	C.56
CCo-138	C.138	Sac-21	S.66	SJo-59	C.59
CCo-139	Simone	Sac-29	S.29	SJo-68	C.68
CCo-141	C.141	Sac-43	S.43	SJo-80	C.80
CCo-250	N.250a	Sac-49	C.15	SJo-82	C.82
CCo-295	N.295	Sac-56	S.56	SJo-87	C.87
		Sac-60	S.60	SJo-91	C.91
Col-1	S.1	Sac-64	S.64	SJo-139	C.139
Col-2	C.2	Sac-66	C.66	SJo-140	C.140
		Sac-107	C.107		
Hum-67	site 67	Sac-117	C.117	SMa-372	N.372
		Sac-122	C.122		
Ker-46	site 11	Sac-127	C.127	Sol-236	N.236
Mrn-275	site 275			Yo1-52	S.52

B

<u>Old</u>	<u>New</u>	<u>Old</u>	<u>New</u>	<u>Old</u>	<u>New</u>
C.6	Sac-6	C.68	SJo-68	C.122	Sac-122
C.8	Sac-8	C.80	SJo-80	C.127	Sac-127
C.15	Sac-49	C.82	SJo-82	C.138	CCo-138
C.56	SJo-56	C.87	SJo-87	C.139	SJo-139
C.59	SJo-59	C.91	SJo-91	C.140	SJo-140
C.66	Sac-66	C.107	Sac-107	C.141	CCo-141
N.236	Sol-236	S.1	Col-1	S.64	Sac-64
N.250a	CCo-250	S.2	Col-2	S.66	Sac-21
N.295	CCo-295	S.16	Sac-16		
N.309	Ala-309	S.29	Sac-29	Simone	CCo-139
N.329	Ala-329	S.43	Sac-43	site 11	Ker-46
N.356	SC1-356	S.52	Yo1-52	site 67	Hum-67
N.372	SMa-372	S.60	Sac-60	site 275	Mrn-275

## BIBLIOGRAPHY

### ABBREVIATIONS

AA	American Anthropologist.	MAI-INM	Indian Notes and Monographs.
AAA-M	Memoirs, American Anthropological Association.	SI	Smithsonian Institution.
A Ant	American Antiquity.	-C	Contributions to Knowledge.
AJPA	American Journal of Physical Anthropology, new series.	-MC	Miscellaneous Collections.
AMNH	American Museum of Natural History.	-R	Report.
-AP	Anthropological Papers.	UC	University of California.
-B	Bulletin.	-AR	Anthropological Records (CED, Culture Element Distributions).
-MJ	Memoirs, Jesup North Pacific Expedition.	-PAAE	Publications in American Archaeology and Ethnology.
BAE	Bureau of American Ethnology.	UCMA	Museum of Anthropology, University of California, Berkeley.
-B	Bulletin.	USNM	U. S. National Museum.
-AR	Annual Report.	-R	Report.
MAI-HF	Museum of the American Indian, Heye Foundation.	UW-PA	University of Washington, Publications in Anthropology.
-C	Contributions.		

- 
- Abbott, C. C., and F. W. Putnam  
1879. Implements Made of Bone. Report upon U. S. Geographical Surveys West of the 100th Meridian, Vol. 7. Washington.
- Aginsky, B. W.  
1943. CED:XXIV--Central Sierra. UC-AR 8:393-468.
- Amsden, C.  
1930. Homo Californianus. Masterkey, 3:21-29. Los Angeles.
- Barnett, H. G.  
1939. CED:IX--Gulf of Georgia Salish. UC-AR 1:221-296.
- Barrett, S. A.  
1910. The Material Culture of the Klamath Lake and Modoc Indians of Northeastern California and Southern Oregon. UC-PAAE 5:239-292.
- \_\_\_\_\_ and E. W. Gifford  
1933. Miwok Material Culture. Public Museum of the City of Milwaukee, Bull. 2, pp. 117-376.
- Bartlett, J. R.  
1854. Personal Narrative of Explorations and Incidents in Texas, New Mexico, California, Sonora and Chihuahua. Vol. 2, New York.
- Beals, R. L.  
1933. Ethnology of the Nisenan. UC-PAAE 31:335-414.
- Beardsley, R. K.  
1948. Culture Sequences in Central California Archaeology. A Ant 14:1-28.
- n.d. Temporal and Areal Relationships in Central California Archaeology. Ph.D. thesis (1947), University of California, Berkeley. MS.
- Berreman, J. V.  
1944. Chetco Archaeology. General Studies in Anthropology, 11. Menasha, Wis.
- Bird, J. B.  
1946. The Culture Sequence of the North Chilean Coast. BAE-B 143:587-594.
- Bowers, S.  
1883. Fishhooks from Southern California. Science, 1:20. Cambridge, Mass.
- Chard, C. A.  
n.d. Hotchkiss Report. MS.
- Chever, E. E.  
1870. The Indians of California. American Naturalist 4:129-148. Salem, Mass.
- Clark, G.  
1910. Indians of the Yosemite Valley and Vicinity. Yosemite Valley, Calif.
- Collier, D., A. E. Hudson, and A. Ford  
1942. Archaeology of the Upper Columbia Region. UW-PA 9:1.
- Collins, H. B., Jr.  
1937. Archaeology of St. Lawrence Island, Alaska. SI-MC 96:1.
- Cook, S. F., and R. F. Heizer  
1947. The Quantitative Investigation of Aboriginal Sites: Analyses of Human Bone. AJPA 5:201-220.
- Coolidge, D., and N. R.  
1939. Last of the Seris. New York.
- Costanzo, M.  
1910. The Narrative of the Portola Expedition of 1769-1770. Academy of Pacific Coast History, Publ. 1:4. Berkeley.
- Curtis, E. S.  
1914. Indian Days of Long Ago. New York.  
1924. The North American Indian. Vol. 14. Norwood, Mass.

- Dalton, O. M.  
1897. Notes on an Ethnographical Collection from the West Coast of North America (More Especially California, Hawaii and Tahiti), Formed During the Voyage of Captain Vancouver 1790-1795. Internationales Archiv für Ethnologie, 10:224-245.
- Dixon, R. B.  
1905. The Northern Maidu. AMNH-B 17:119-346.
- Driver, H. E.  
1936. Wappo Ethnography. UC-PAAE 36:179-220.  
1937. CED:VI--Southern Sierra Nevada. UC-AR 1:53-154.  
1939. CED:X--Northwestern California. UC-AR 1:297-434.
- Drucker, P.  
1937a. CED:V--Southern California. UC-AR 1:1-52.  
1937b. The Tolowa and Their Southwest Oregon Kin. UC-PAAE 36:221-300.  
1943. Archaeological Survey of the Northern Northwest Coast. BAE-B 133:17-132.
- Du Bois, C.  
1935. Wintu Ethnography. UC-PAAE 36:1-148.
- Edge-Partington, J., and C. Heape  
1898. Ethnological Album of the Pacific Islands, Vol. 3. London.
- Emmons, G. T.  
1911. The Tahltan Indians. University of Pennsylvania Museum, Anthropological Publ., 4:1. Philadelphia.
- Essene, F.  
1940. CED:XXI--Round Valley. UC-AR 8:1-98.
- Fages, P.  
1937. A Historical, Political and Natural Description of California. Translated by H. I. Priestley. Berkeley.
- Fenenga, F.  
n.d. The Archaeology of Central California: The Middle Horizon. MS.
- Foster, G. M.  
1944. A Summary of Yuki Culture. UC-AR 5:155-244.
- Gayton, A. H.  
1948. Yokuts and Western Mono Ethnography. UC-AR 10:1-301.
- Gifford, E. W.  
1939. The Coast Yuki. Anthropos, 34:292-375.  
1940. Californian Bone Artifacts. UC-AR 3:153-238.  
\_\_\_\_\_ and A. L. Kroeber  
1937. CED:IV--Pomo. UC-PAAE 37:117-254.
- Gilllin, J.  
1940. A Barbed Bone Projectile Point From Utah. A Ant 6:170-171.
- Godfrey, E. H.  
1941. Yosemite Indians. Yosemite Nature Notes, 20:49-72. Stockton, Calif.
- Hardy, R. W. H.  
1829. Travels in the Interior of Mexico, 1825, 26, 27 and 28. London.
- Harrington, J. P.  
1942. CED:XIX--Central California Coast. UC-AR 7:1-46.
- Heizer, R. F.  
1941. The Direct Historical Approach in California Archaeology. A Ant 7:98-122.  
1944. Artifact Transport by Migratory Animals and Other Means. A Ant 9:395-400.  
1947. Historic North Pacific Culture Influences in the Santa Barbara Region. Masterkey, 21:150-152. Los Angeles.  
1949. The Archaeology of Central California. I: The Early Horizon. UC-AR 12:1-84.  
\_\_\_\_\_ and F. Fenenga  
1939. Archaeological Horizons in Central California. AA 41:3.
- Hewes, G. W.  
1942a. The Ainu Double Foreshaft Toggle Harpoon and Western North America. Washington Academy of Science, Journal, 32:4.  
1942b. Economic and Geographical Relationships of Aboriginal Fishing in Northern California. California Fish and Game, 28:103-110.
- Heye, G. C.  
1921. Certain Artifacts from San Miguel Island. MAI-INM 7:17-211.
- Hill-Tout, C.  
1895. Later Prehistoric Man in British Columbia. Royal Society of Canada, Proceedings and Transactions, ser. 2, 1:103-122.
- Hodge, F. W., ed.  
1922. Guide to the Museum, 2nd Floor. MAI-INM 31.
- Irwin, M. C.  
1946. Museum Leaflet, 21:18-21. Santa Barbara Museum, Santa Barbara.
- Jochelson, W.  
1925. Archaeological Investigations in the Aleutian Islands. Carnegie Institute, Publ. 432. Washington.
- Johnson, F. R.  
1944. Fishhooks. Illinois State Archaeological Society Journal, 2:49-51. Fairbury, Ill.
- Kroeber, A. L.  
1913. The Seri Indians. Southwest Museum Papers, 6:1-60. Los Angeles.  
1925. Handbook of the Indians of California. BAE-B 78.  
1932. The Patwin and their Neighbors. UC-PAAE 29:253-424.
- Laguna, F. de  
1947. The Prehistory of Northern North America as Seen from the Yukon. A Ant, Memoir 3.
- Larsen, H., and F. Rainey  
1948. Ipiutak and the Arctic Whale Hunting Culture. AMNH-AP 42.
- Laughlin, W. S.  
1943. Notes on the Archaeology of the Yamhill River, Willamette Valley, Oregon. A Ant 9:220-229.
- Leatherman, K. E., and A. D. Krieger  
1940. Contributions to Oregon Coast Prehistory. A Ant 6:19-28.

- Leroi-Gourhan, A.  
1946. *Archéologie du Pacifique-Nord. Travaux et Mémoires de l'Institut d'Ethnologie*, 47:325-412. Paris.
- Lillard, J. B., R. F. Heizer, and F. Fenenga  
1939. *An Introduction to the Archeology of Central California*. Sacramento Junior College, Publ. in Anthro., Bull. 2. Sacramento.
- Lillard, J. B., and W. K. Purves  
1936. *The Archeology of the Deer Creek-Cosumnes Area, California*. Sacramento Junior College, Publ. in Anthro., Bul. 1. Sacramento.
- Loeb, E. M.  
1926. *Pomo Folkways*. UC-PAAE 19:149-406.
- Loeffelholz, H. F. and K. F. von  
1893. *Die Zoreisch-Indianer der Trinidad-Bai. Mitteilungen der Anthropologischen Gesellschaft in Wien*, 23: 101-123.
- Lothrop, S. K.  
1928. *The Indians of Tierra del Fuego*. MAI-C 10.
- Loud, L. L.  
1918. *Ethnography and Archaeology of the Wiyot Territory*. UC-PAAE 14:221-426.
- Lowie, R. H.  
1946. *The Bororo*. BAE-B 143:419-434.
- McGee, W. J.  
1898. *The Seri Indians*. BAE-AR for 1895-1896, 17:1.
- McKern, W. C.  
1922. *Functional Families of the Patwin*. UC-PAAE 13:235-258.
- Martinez, J. L.  
1938. *California in 1792; the Expedition of José Longinos Martinez*. Translated by L. B. Simpson. San Marino, Calif.
- Mason, O. T.  
1889. *The Ray Collection from the Hupa Reservation*. SI-R, 1886, App.  
1902. *Aboriginal American Harpoons*. USNM-R for 1899-1900.
- Mathiassen, T.  
1927. *Archaeology of the Central Eskimos. Report of the Fifth Thule Expedition*, IV:2.
- Miller, M. L.  
1896. *The So-called "Diggers."* *Appleton's Popular Science Monthly*, 50:201-214.
- Moorehead, W. K.  
1900. *Prehistoric Implements*. Cincinnati.
- Nelson, E. W.  
1899. *The Eskimo about Bering Strait*. BAE-AR 18:1.
- Nelson, N. C.  
1936. *Notes on the Santa Barbara Culture. Essays in Anthropology Presented to A. L. Kroeber*, pp. 199-209. Berkeley.
- Niblack, A. P.  
1890. *The Coast Indians of Southern Alaska and Northern British Columbia*. USNM-R 1888, pp. 225-386.
- Nomland, G. A.  
1935. *Sinkyone Notes*. UC-PAAE 36:149-178.
1938. *Bear River Ethnography*. UC-AR 2:91-126.
- Olson, R. L.  
1930. *Chumash Prehistory*. UC-PAAE 28:1-22.
- Orr, P. C.  
1948. *Additional Californian Bone Artifacts. Appendix, in E. W. Gifford, Californian Shell Artifacts*, UC-AR 9:115-132.
- Powers, S.  
1877. *Tribes of California. Contributions to North American Ethnology*, III.
- Rau, C.  
1884. *Prehistoric Fishing in Europe and North America*. SI-C 25.
- Ray, V. F.  
1932. *The Sanpoil and Nespelem*. UW-PA 5:1-237.
- Read, C. H.  
1892. *An Account of a Collection of Ethnographic Specimens Formed during Vancouver's Voyage in the Pacific Ocean. Journal of the Royal Anthropological Institute*, Vol. 21. London.
- Robinson, E.  
1933. *Fishing Arrows from Southern California*. *Masterkey*, 7:149-150. Los Angeles.
- Rogers, D. B.  
1929. *Prehistoric Man of the Santa Barbara Coast*. Santa Barbara.
- Rogers, M. R.  
1929. *The Stone Art of the San Dieguito Plateau*. AA 31:454-467.
- Rostlund, E.  
n.d. *A Distributional Study of Primitive Fishing in California*. MS. M.A. Thesis (1946), University of California, Berkeley.
- Sargent, L.  
1880. *Fishing on the Winnemae. The Californian*, 2:439-443. San Francisco.
- Schenck, W. E.  
1926. *The Emeryville Shellmound: Final Report*. UC-PAAE 23:147-282.  
\_\_\_\_\_ and E. J. Dawson  
1929. *Archaeology of the Northern San Joaquin Valley*. UC-PAAE 25:289-414.
- Shelvoke, G.  
1928. *A Voyage Around the World. Seafarer's Library Edition*. San Francisco.
- Smith, H. I.  
1899. *Archaeology of Lytton, British Columbia*. AMNH-MJ I:III.  
1900. *Archaeology of the Thompson River Region, British Columbia*. AMNH-MJ I:VI.  
1903. *Shell-heaps of the Lower Fraser River, British Columbia*. AMNH-MJ II:IV.  
1907. *Archaeology of the Gulf of Georgia and Puget Sound*. AMNH-MJ II:VI.
- Sparkman, P. S.  
1908. *The Culture of the Luiseño Indians of Southern California*. UC-PAAE 8:187-234.
- Spinden, H. J.  
1908. *The Nez Percé*. AAA-M 2:3.

- Steward, J. H.  
1941. CED:XIII--Nevada Shoshoni. UC-AR  
4:209-360.
- Stewart, O. C.  
1941. CED:XIV--Northern Paiute. UC-AR  
4:361-446.
- Strong, W. D., W. E. Schenck, and J. H. Steward  
1930. Archaeology of the Dalles-Deschutes  
Region. UC-PAAE 29:1-154.
- Swanton, J. R.  
1911. Indian Tribes of the Lower Missis-  
sippi Valley and Adjacent Coast of the  
Gulf of Mexico. BAE-B 43.
- Teit, J.  
1900. The Thompson Indians of British  
Columbia. AMNH-MJ I:IV.  
1906. The Lillooet Indians. AMNH-MJ II:III.
- Tyzzar, E. E.  
1936. The "Simple Bone Point" of the Shell  
Heaps of the Northeastern Algonkian  
Area and Its Probable Significance.  
A Ant 1:261-279.
- Uhle, M.  
1907. The Emeryville Shellmound. UC-PAAE  
7:1-106.
- Voegelin, E. W.  
1938. Tübatulabal Ethnography. UC-AR 2:1-90.  
1942. CED:XX--Northeastern California.  
UC-AR 7:4-252.
- Wagner, H. R.  
1929. Spanish Voyages to the Northwest Coast.  
California Historical Society. San  
Francisco.
- Waterman, T. T.  
1918. The Yana Indians. UC-PAAE 13:35-102.  
1920. Yurok Geography. UC-PAAE 16:177-314.  
\_\_\_\_\_ and G. Coffin  
1920. Types of Canoes on Puget Sound.  
MAI-INM 6.
- Woodward, A.  
1941. Notes and News. A Ant 6:284-285.

## EXPLANATION OF FIGURES

### Figures 1-7

Fig. 1. Early and Middle horizon fish spears. a. Type MM3a, site SJo-68, 1-49054. b. Type MM3a, site SJo-56, L-19229. c. Reconstructed form of Early horizon fish spear, site SJo-68, 1-73521. d. Type MM2a, site Ala-309, 1-8915. e. Type MM2a, site Ala-309, 1-26175. f. Type MM2d, site Yol-52, 1-13551. g. Type MM2d, site Sac-43, L-19385. h. Type MM2d, site Sac-16, L-11457. i. Type MM2e, site CCo-250, Johnson collection M-19. j. Fishhook assemblage found in situ, site SJo-68, 1-49056, 1-49055. k. Type MM2b (reworked type 001), site Sac-43, L-19898. l. Type MM2b, site Sac-66, L-12812. m. Type MM2b, site Sac-66, 8-34. n. Type MM2b, site Sac-66, L-18297. o. Type MM2b, site Sac-66, L-18301. p. Type MM2b, site Sac-66, L-18306. q. Type MM2b, Sac-122, L-12790. r. Type MM2b, CCo-139, 1-53962. s. Type MM2b, site Ala-309, 1-8738. t. Reconstructed form of Middle horizon fish spear, site Sac-66, L-13169, 1-56344. u. Alternative method of binding fish spear points to shaft. v. Reconstructed form of type 001 Middle horizon fish spear, site Sac-49, 1-56246 (2 specimens). w. Type 001, site Col-1, 1-38046. x. Type 001, site Sol-2, 1-72969. y. Type 001, site Sac-49, 1-56246. z. Type 001, site Col-1, 1-38107. a'. Type 001, site Yol-52, L-13590. b'. Type 001, site Sac-43, L-19995. c'. Type 001, site SCl-356, 1-16910. d'. Type 001, site SCl-356, 1-16909. e'. Type 001, site Sac-8, 1-56195.

Fig. 2. Fish spears and harpoons from Central and Southern California. Fish spears, a-t. a. Reconstructed form of type 002 Middle horizon fish spear, site SJo-87, Barr 2264. b. Type 002, site SJo-140, Barr 1092. c. Type 002, site SJo-140, Barr 1077. d. Type 002, site SJo-140, Barr 1099. e. Type 002, site SJo-87, Barr 2249. f. Type 003, site Sac-43, L-19913. g. Type 003, site Sac-43, L-19946. h. Type 003, site Sac-49, 1-56247. i. Type 003, site Yol-52, L-13467. j. Type 003, site Sac-127, L-18740. k. Type W1a, Channel Island area. Same size as average Channel Island circular shell fishhook, illustrated in Amsden, p. 26. l. Type W1a, San Nicolas Island, AMNH, Terry collection, T14611. m. Type W1a, San Nicolas Island, 1-15953. n. Type W1a, San Nicolas Island, 1-15950. o. Type W1a, San Nicolas Island, 1-15951. p. Type W1a, San Nicolas Island, AMNH, Terry collection, T14606. q. Type W1a, San Nicolas Island, 1-15952. r. Type W1a, site Hum-67, Stuart collection, Eureka. s. Type W1a, site Col-2, 1-29485. t. Type W1a, site CCo-295, 1-11259. Harpoons, u-z, a'-i'. u. Type NN2aI,

site Sac-21, L-19091. v. Type NN2aI, site Sac-21, L-19140. w. Type NN2aI, site Sac-21, L-19130. x. Type NN2aI, site Sac-21, L-19137. y. Type NN2aI, site CCo-138, 1-53776. z. Type NN2aI, site CCo-138, 1-53776. a'. Type NN2aII, Nicolaus site, L-13783. b'. Type NN2aII, site Sac-21, L-19133. c'. Type NN2aII, site Sac-107, L-16386. d'. Type NN2aII, site CCo-138, Johnson collection, 12-1. e'. Type NN2aIII, site CCo-141, Barr 3364a. f'. Type NN2aIII, site SJo-91, Barr 2104. g'. Side view of f', showing ridged barbs. h'. Type NN2aIII, site SJo-91, Barr 2124. i'. Side view of h', showing ridged barbs.

Fig. 3. Late horizon harpoons. a. Type NN2bI, site Sol-236, 1-22307. b. Type NN2bI, site CCo-138, 1-49276. c. Type NN2bI, site CCo-138, 1-53776. d. Type NN2bI, site CCo-138, Johnson collection, 1-21. e. Type NN2bI, site CCo-138, 1-49193. f. Type NN2bI, site CCo-138, Johnson collection, 3-17. g. Type NN2bI, site Sac-6, 1-82419. h. Type NN2bI, site Sac-21, L-11495. i. Type NN2bI, site Sac-21, L-11559. j. Type NN2bI, site CCo-139, Johnson collection, A-2. k. Type NN2c, Core site, Martine collection, Sacramento. l. Type NN2c, Bethany site, MAI-HF, Dreisher collection, 4/2772. m. Type NN2c, Bethany site, MAI-HF, Dreisher collection, 4/2772. n. Type NN2c, site Sac-107, L-16385. o. Type NN2c, site Sac-107, L-16381. p. Type NN2c, site Sac-21, L-19090. q. Type NN3a, site CCo-138, Johnson collection, 1-49469. r. Type NN3b, site CCo-138, L-53747. s. Type NN3b, site CCo-138, Johnson collection 1-19. t. Type NN3b, site CCo-138, 1-53747.

Fig. 4. Harpoons from Central and Northern California. Central California harpoons, a-h. a. Type NN2bII, as found in situ, site Sac-16, California State Indian Museum, Sacramento. b. Type NN2bII, Nicolaus site, L-13782. c. Type NN2bII, site Sac-21, L-11496. d. Type NN2bII, site CCo-138, Johnson collection, 23-2. e. Type NN2bII, site Sol-2, 1-80411. f. Type NN2bII, site CCo-138, 1-49972. g. Type NN2bII, site CCo-138, L-18442. h. Type NN2d, site CCo-138, 1-53809A. Northern California harpoons, i-x. i. Cut-off tip of harpoon point, deep levels of site Hum-118, Patrick's Point State Park (PPSP) no. 1480. j. Type IA1a, site Hum-67, Stuart collection, Eureka. k. Type IA1a, site Hum-67, Stuart collection, Eureka. l. Type IA1a, site Hum-67, 1-18428. m. Type IA2a, site Hum-118, PPSP 1465. n. Example of concave base point for slotted tip of harpoons, site Hum-118, PPSP 1219 (harpoon), PPSP 197. o. Concave base point,

site Hum-169, 1-115787. p. Type IA2a, site Hum-118, PPSP 409. q. Type IA2a, side and front views showing torque, site Hum-118, PPSP 1292. r. Type IA2a, evidencing grooving preparatory to making a new tool from broken harpoon, site Hum-118, PPSP 2057. s. Type IIA1a, site Hum-67, Stuart collection, Eureka. t. Type IIA1a, site Hum-67, Stuart collection, Eureka. u. Type IIA1a, site Hum-118, PPSP 1453. v. Type IIA1a, site Hum-118, PPSP 755. w. Type IIA1a, site Hum-118, PPSP 862. x. Type IIA1a, reworked into awl, site Hum-118, PPSP 1510.

Fig. 5. Northwestern California harpoons. Simple harpoons, a-p. a. Type IB1a, site Hum-118, PPSP 1530. b. Type IB, reworked into punch, site Hum-118, PPSP 44. c. Type IB2a, site Hum-118, PPSP 402. d. Type IB2a, site Hum-118, PPSP 1785. e. Type IB, with reworked tip, site Hum-118, PPSP 576. f. Type IB2a, site Hum-118, PPSP 1066. g. Type IB2b, site Hum-169, field 2071. h. Type IC1a, site Hum-67, Stuart collection, Eureka. i. Type IC1a, Mad River Beach site, Stuart collection, Eureka. j. Type IIB1a, site Hum-118, PPSP 270. k. Type IIB1a, site Hum-118, PPSP 2238. l. Type IIB1a, site Hum-118, PPSP 1417. m. Type IIB1a, site Hum-118, PPSP 1275. n. Type IIB1a, site Hum-67, Stuart collection, Eureka. o. Type IIB1a, site Hum-118, PPSP 283. p. Type IIB1a, site Hum-118, PPSP 1805. Possible toggle harpoon tips, q-v. q. Possible stone tip, site Hum-169, field 22. r. Type U1, site Hum-169, field 2. s. Type U1, site Hum-169, field 822. t. Type T1f, Redding site 7, 1-37230. u. Type T1f, Redding site 7, 1-37366. v. Type T1f, site Hum-118, PPSP 427. w. Barbed arrow point fragment from Northwestern California, site Hum-118, PPSP 544. Toggle harpoon spurs, x-z, a'-g'. x. Type Ia, site Hum-67, 1-18429. y. Type Ia, site Hum-67, 1-8430. z. Type Ia, site Hum-169, field 4-121. a'. Type Ib, site Hum-169, C-5. b'. Type IIIa, site Hum-67, Stuart collection, Eureka. c'. Type IIIb, site Hum-169, field 1903. d'. Type IIIb, site Hum-118, PPSP 1688. e'. Type IIIb, site Hum-169, field 4-16. f'. Type IIIb, site Hum-118, PPSP 1777. g'. Type IIIb, site Hum-169, field 2353.

Fig. 6. Harpoons from Northern and Southern California. Northern California harpoons, a-j. a. Type IC2b, site Hum-169, Stuart collection, Eureka. b. Type IC2b, site Hum-169, Stuart collection, Eureka. c. Type IC2b, site Hum-169, field 4-15. d. Type IC, site Hum-118, PPSP 1995. e. Type IC2b, site Hum-118, PPSP 751. f. Type IC, with reworked tip, site Hum-118, PPSP 1678. g. Type IIC1a, reworked after loss of first barb, site Hum-118, PPSP 2174. h. Type IIC1a, site Hum-169, field 4-14. i. Type IIC1a, site Hum-67, Stuart collection, Eureka. j. Type ID, site Hum-67, 1-18423. k. Type I fragment from Central California, site Mrn-275, 1-54693. Southern California harpoons, l-r. l. Type W1b, San Nicolas Island, AMNH, Terry collection, T14462. m. Type W1b, San Nicolas Island, 1-15954. n. Type W1b, Santa Cruz Island, illus-

trated in Orr, p. 117, type W4. Actual size is 9 in. o. Type W1b, "Santa Barbara," illustrated in Abbott and Putnam, fig. 103, p. 224. p. Type W1b, San Nicolas Island, 1-15955. q. Type W2, San Nicolas Island, illustrated in Moorehead, fig. 358, no. 4. Size not stated. r. Type W2, San Nicolas Island, illustrated in Moorehead, fig. 362, no. 2. Probably about 18 cm. long.

Fig. 7. Various fishing implements. Composite harpoon points and barbs, a-j. a. Composite harpoon foreshaft from Southern California, San Clemente Island, Los Angeles County Museum. b. Restoration of point of a by Woodward. c. Type of barb associated by Woodward with sea-mammal harpoon. d. Composite harpoon arrow from Southern California, San Clemente Island, Los Angeles County Museum. e. Restoration of point of d by Woodward. f. "Dart foreshaft" from San Nicolas Island, AMNH, Terry collection, illustrated by Nelson, fig. 3, d, p. 205, size not stated. g. Type T2bII composite harpoon arrow barb from Southern California, site 30, Santa Rosa Island, 1-6537. h. Type T2bII composite harpoon arrow barb from Southern California, site 147, Santa Cruz Island, 1-31268. i. Type T2bII composite harpoon arrow barb from Southern California, site 135, Santa Cruz Island, 1-37159. j. Type T2bII composite harpoon arrow barb from Southern California, site 147, Santa Cruz Island, 1-31237. k. Type NN2aIV harpoon from Central California, site Sac-16, L-11580. l. Hawaiian netting needle (see p. 309), 9-1/2 in. long, illustrated in Edge-Partington and Heape, pl. 10, no. 11. m. Fishhook collected by Vancouver Expedition somewhere in the Pacific, illustrated by Dalton, pl. XVI, fig. 22. Length 21 cm. n. Barbed fishhook from Humboldt Cave, Nevada, 1-43040. o. Barbed fishhook barb from Humboldt Cave, Nevada, 1-43041. p. Harpoon point of the Coast Yuki, illustrated in Gifford, 1939, fig. 6, p. 335. q. Nisenan salmon harpoon, illustrated in Beals, fig. 1, p. 341. Size not stated. r. Yurok toggle spur (same as archaeological type IIIb), 1-1654. s. Karok toggle spur, 1-1825 A. t. Yurok toggle plank, with metal tip, 1-1946. u. Southeast Alaskan (Tlingit?) toggle point, 2-2757. v. Wintu toggle point, illustrated in Du Bois, fig. 6, p. 128. w. Klamath toggle point, awl-like type, 1-12768a. x. Wailaki toggle harpoon, illustrated in Hewes, 1932b, fig. 34, a. Size not stated. y. Yokuts toggle harpoon, illustrated in Gayton, fig. 10, j, p. 72. Total length, 15-20 feet. z. Santa Barbara (Chumash) harpoon, collected by Vancouver Expedition, illustrated in Read, pl. XI, fig. 2, Over 37 in. long. a'. Possible harpoon shaft, probably from Santa Barbara, collected by Vancouver Expedition, illustrated in Read, pl. XV, fig. 8, 70 cm. long. b'. Tolowa harpoon, illustrated in Drucker, 1937b, fig. 2, p. 237. Size not stated. c'. Yurok harpoon from Requa, California, illustrated in Hewes, 1942b, fig. 34, b. Size not stated. d'. Tolowa harpoon, type IC3b, with metal point, 1-2444.



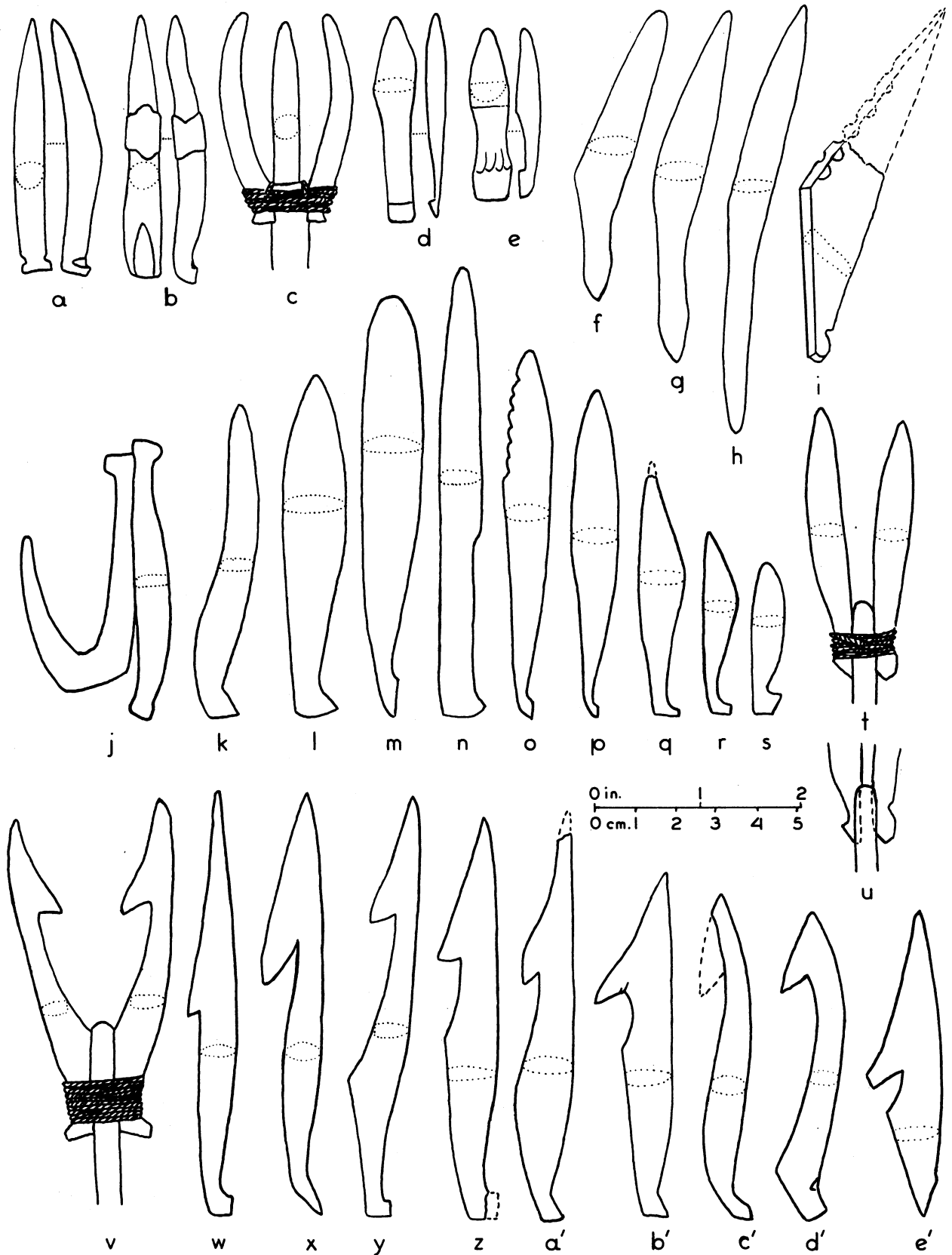


Fig. 1. Early and Middle horizon fish spears

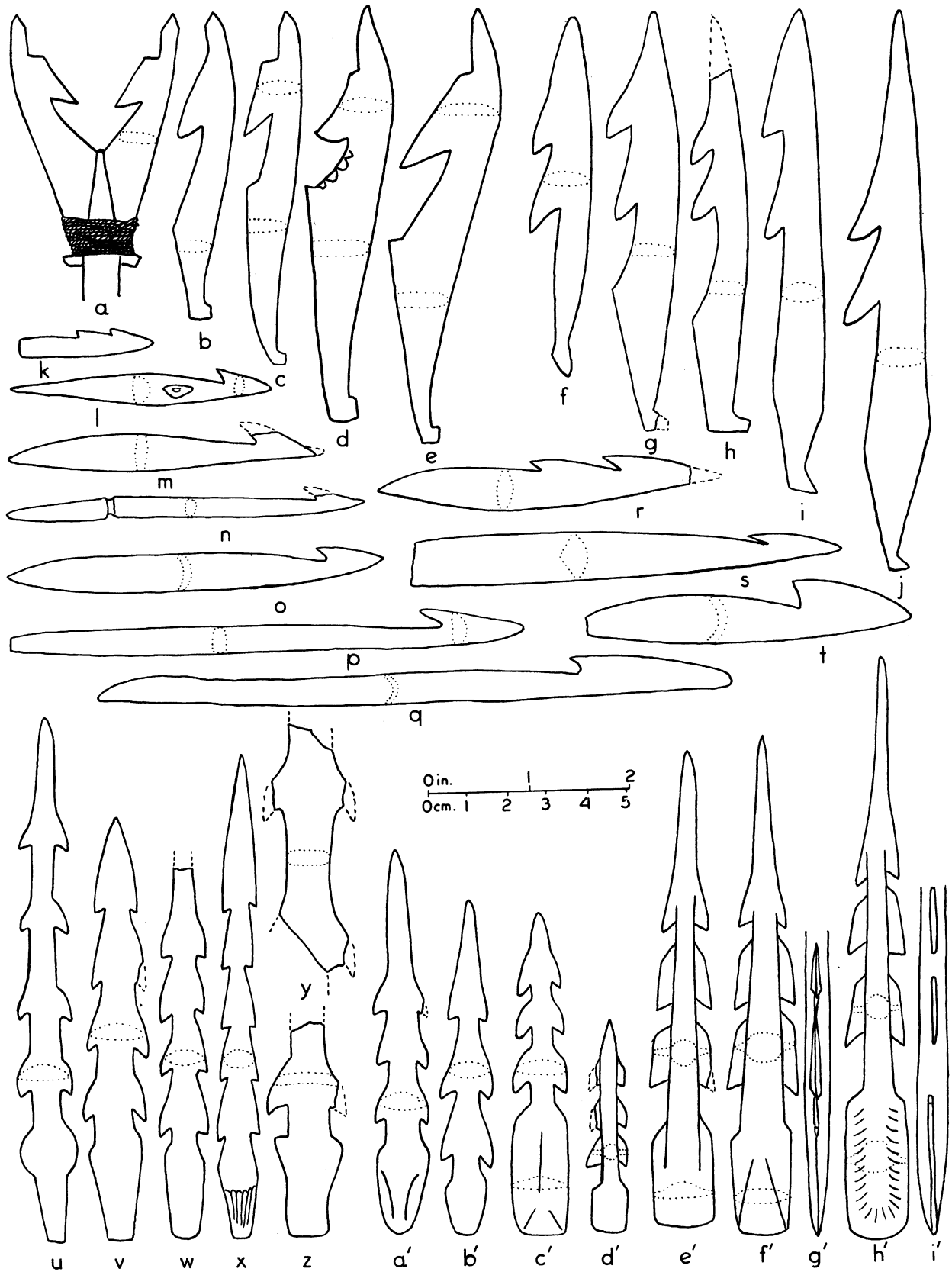


Fig. 2. Fish spears and harpoons from Central and Southern California

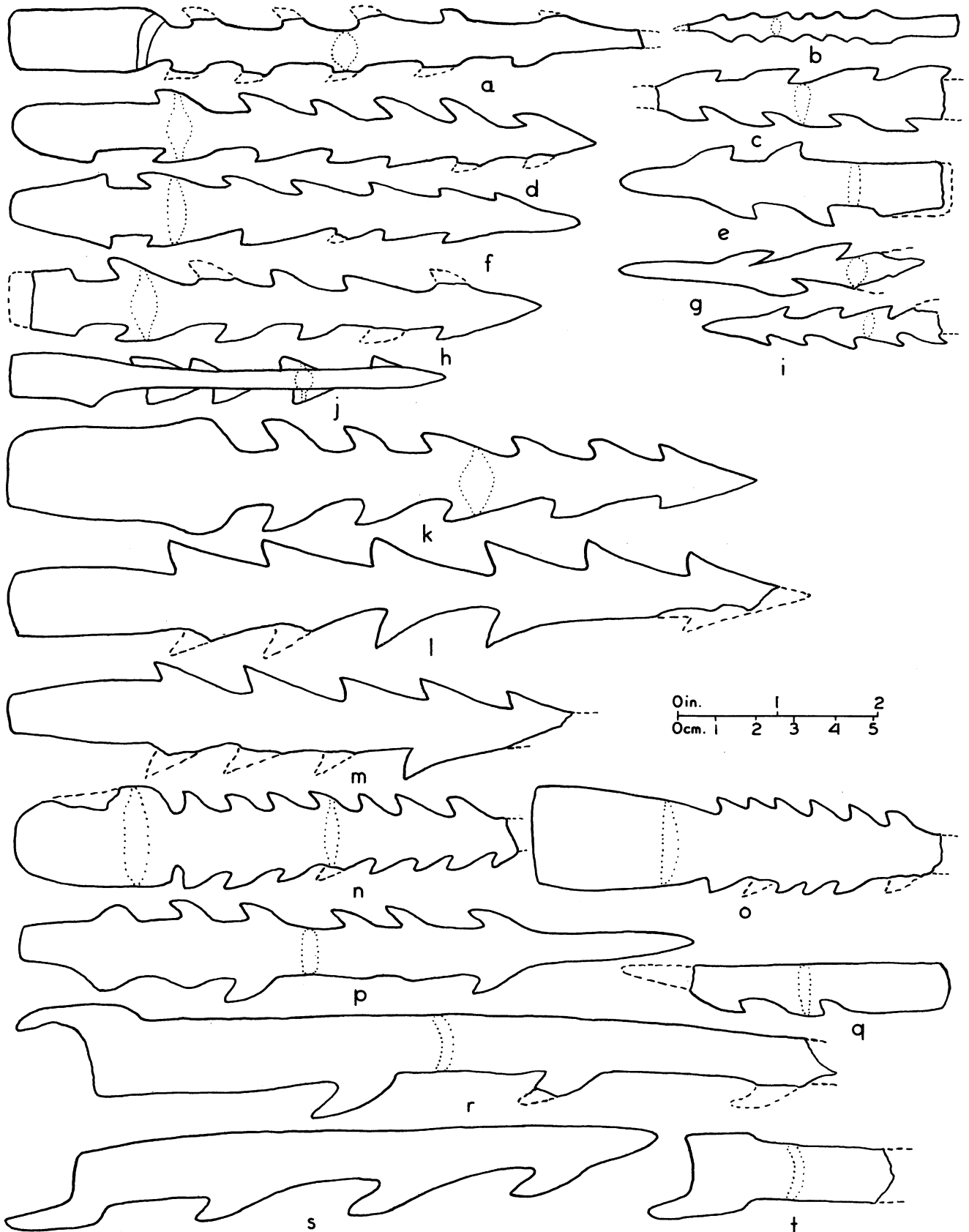


Fig. 3. Late horizon harpoons

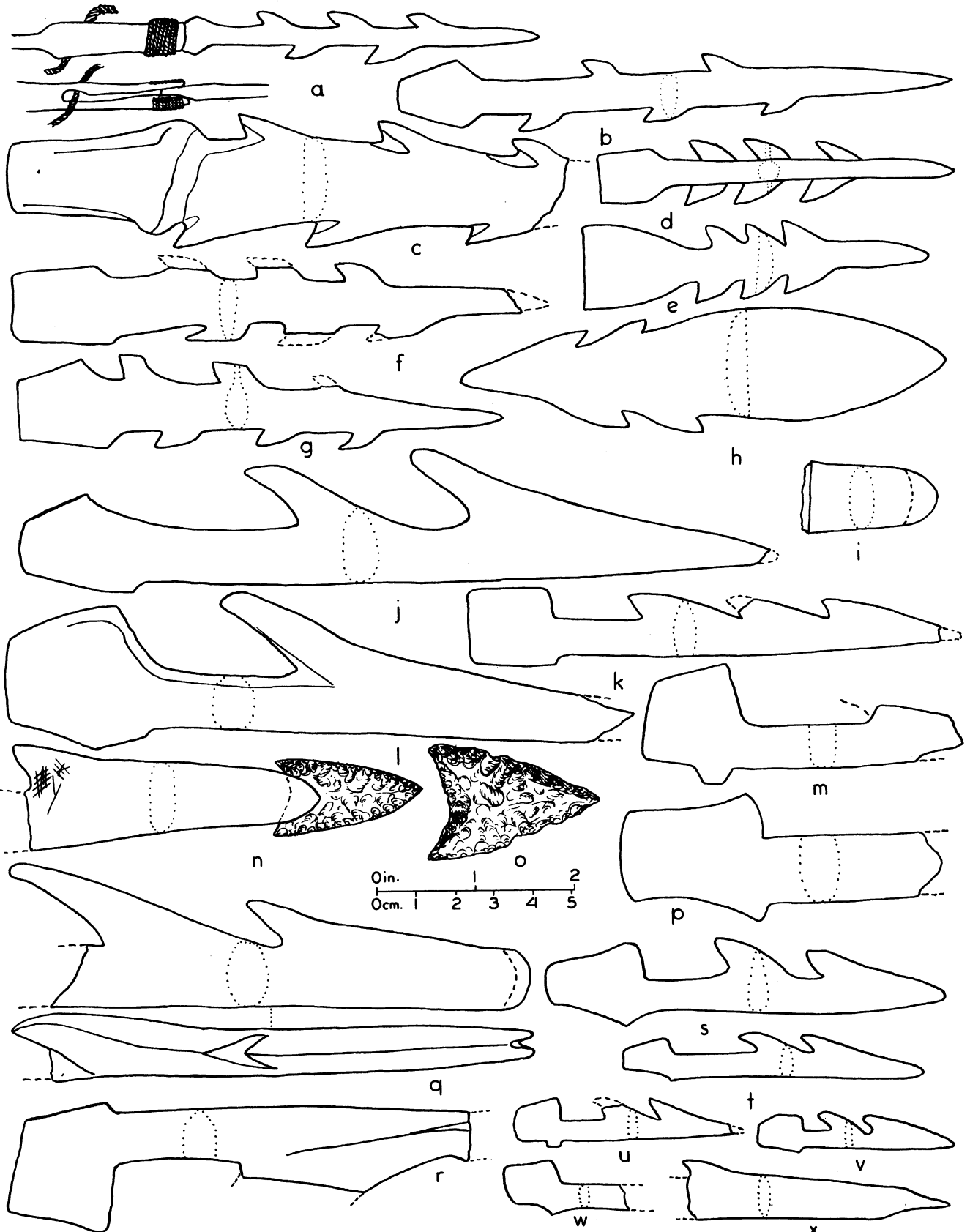


Fig. 4. Harpoons from Central and Northern California

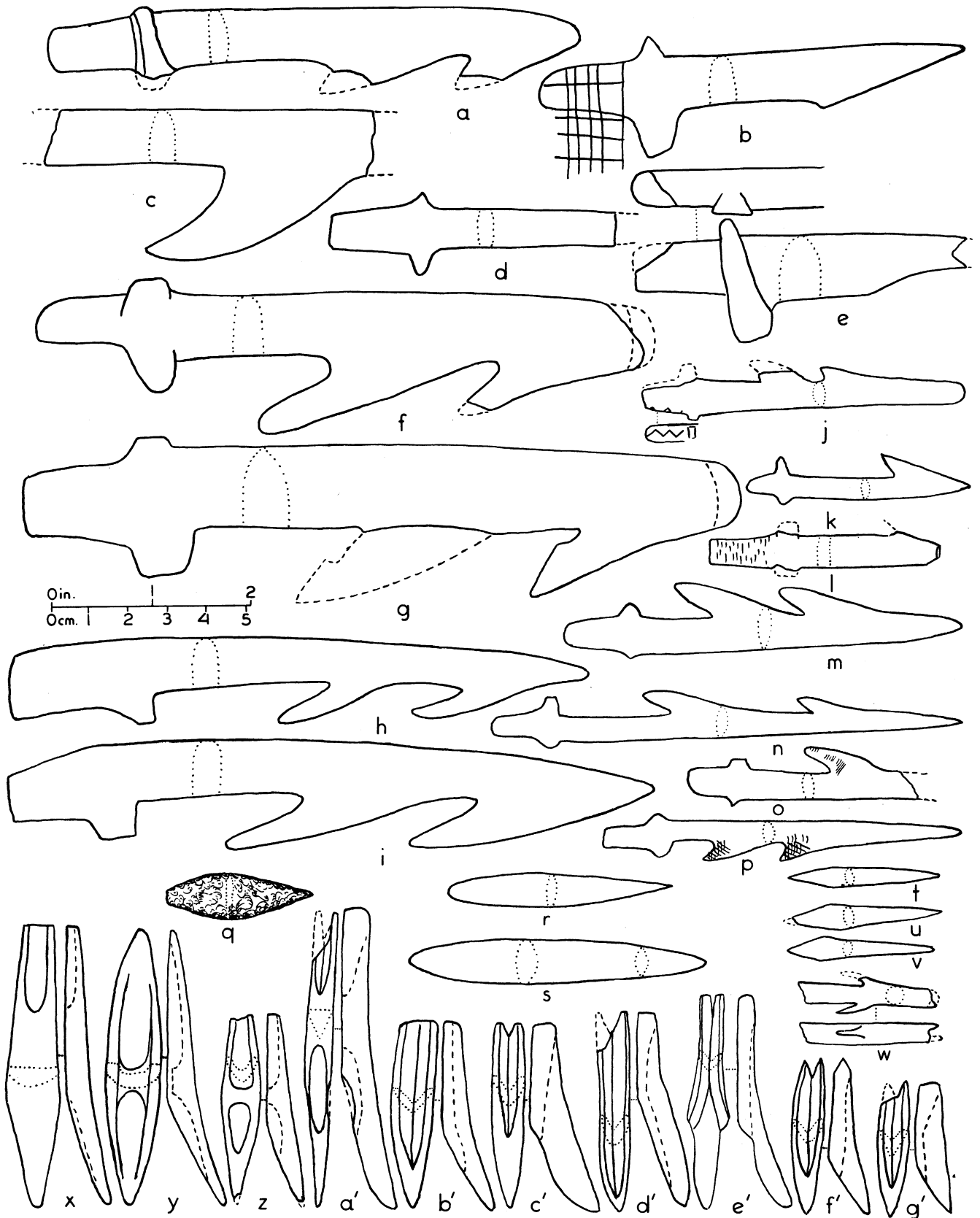


Fig. 5. Northwestern California harpoons

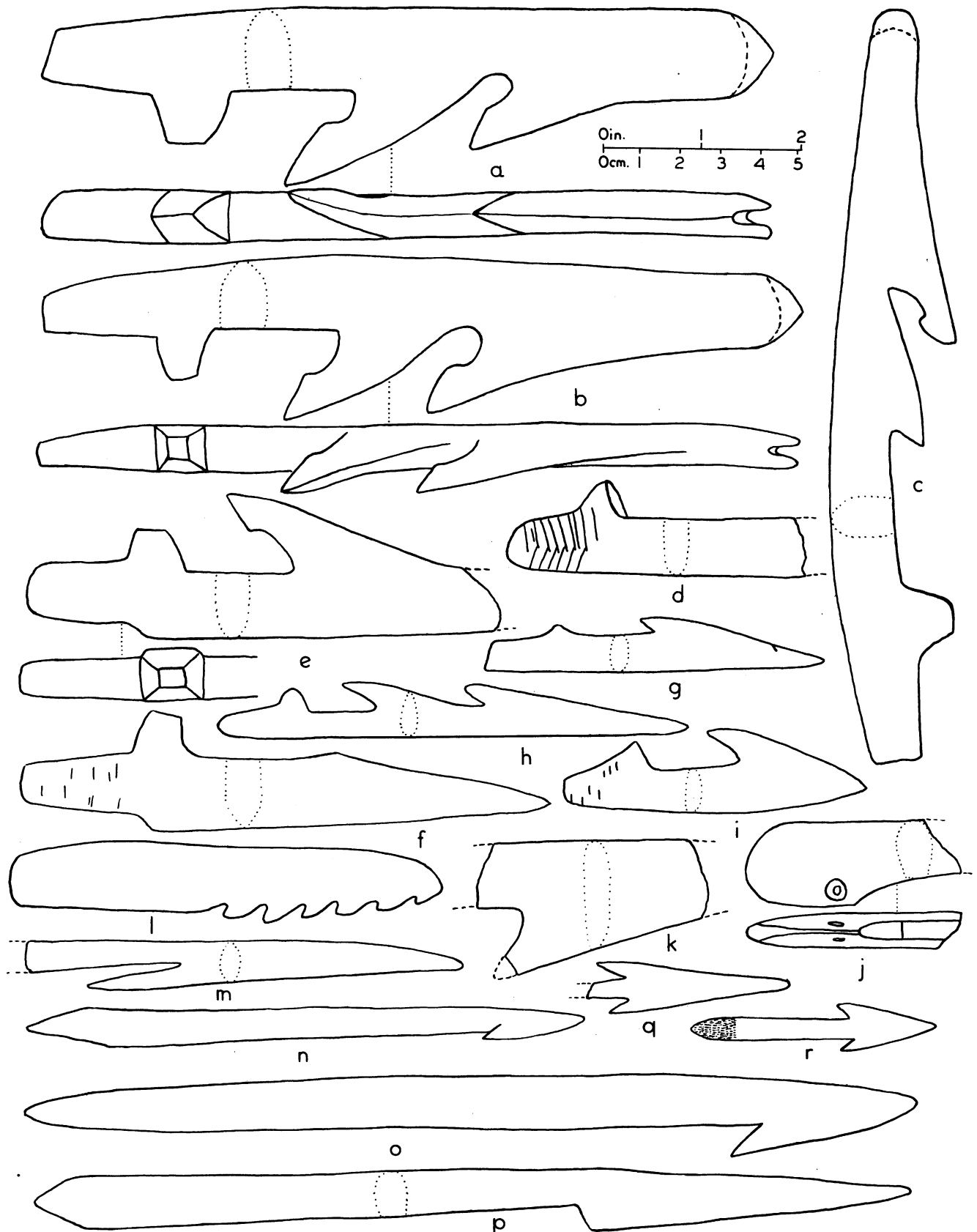


Fig. 6. Harpoons from Northern and Southern California

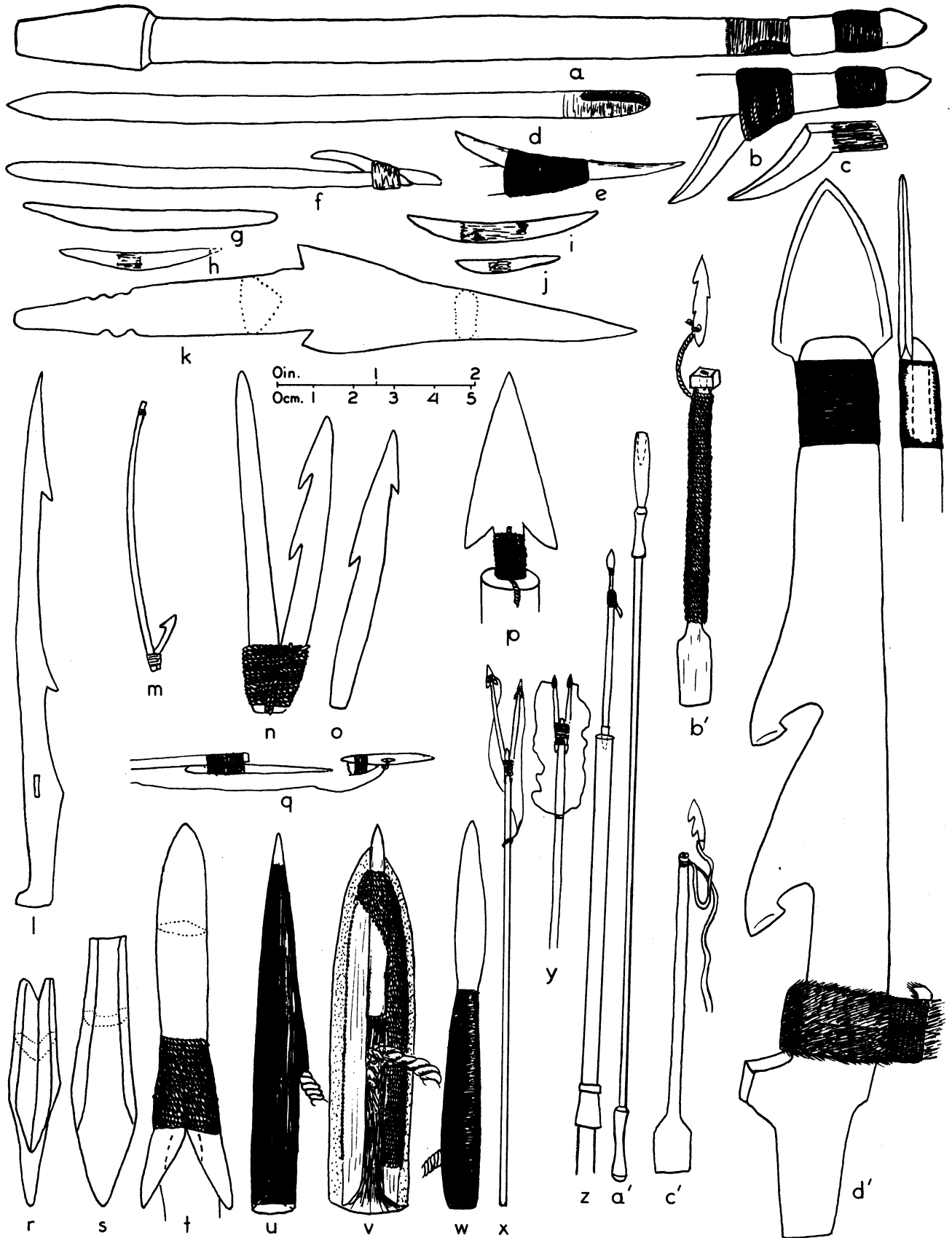


Fig. 7. Various fishing implements