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Harpoon Stone Tips and Sea Mammal Hunting on the Oregon and Northern California Coasts

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IN the interior western United States, archaeologists have sometimes sought to determine whether projectile points were used with atlatl darts or with arrows by analyzing specimens with respect to variation in neck width (Thomas 1978; Corliss 1980). Such an approach represents use of a morphometric variable, often in lieu of impact damage (Bergman and Newcomer 1983; Odell and Cowan 1986) or edge damage (papers in Hayden 1979). Damage is often not present. Considerations of size, shape, bilateral symmetry, basically triangular shape, and ends that may be pointed, notched, or stemmed, as well as ethnographic information alone often lead to the categorizing of a group of artifacts as "projectile points." Resulting classifications are relevant to functional and thus adaptational concerns and also to temporal concerns because of the late Holocene (ca. 2,500 to 1,500 B.P.) shift from the atlatl and dart or spear to the bow and arrow. The dating of this transition is unclear. Hanes (1977) believed it occurred ca. 2,500 B.P. in southeastern Oregon; Pettigrew (1981) placed it ca. 1,700 B.P. in northwestern Oregon.

Gould (1966) addressed a similar problem of assigning projectile points to specific functional categories that may ultimately prove temporally sensitive. He was working on the coast of northern California with mostly late prehistoric (post-1,000 B.P.) materials thought to post-date the transition from atlatl and dart to bow and arrow. Because his materials were from a coastal site, the possibility that some stone projectile points were used on arrows while others were used on harpoons had to be considered. While Gould (1977:161) later reported that his distinction of the two functional categories was made "with size, not shape, as the main criterion," in this paper we follow his original discussion (Gould 1966) as it is more detailed.

When Gould (1966) published his report on the archaeology of the Point St. George site, he used the direct historical approach to assign triangular stone projectile points to functional categories. In short, his native informants suggested that "large hollow- [concave-] base and smaller flat- [straight-] base points" with relatively shallow concave bases were tips for unilaterally barbed bone/antler harpoons used to hunt sea mammals, whereas "small and finely finished hollow- [concave-] base points" with long barbs and relatively deep concave bases represented arrowheads (Gould 1966:56-57). Those criteria, based on size and shape, subsequently were used by other researchers on the northern California coast to assign triangular points recovered from other sites to specific functional classes (e.g., Milburn et al. 1979). Also, stone points identified as harpoon tips have been used to infer exploitation of distant (> 500 m.) offshore habitats (Jobson and Hildebrandt 1980) and the prehistoric existence of seaworthy canoes, which in turn imply complex sociopolitical organization (Hildebrandt 1981, 1984).

Since the identification of triangular stone points as harpoon tips appears to be significant to our understanding of southern Northwest Coast prehistory, we here review criteria used to distinguish harpoon tips from arrow tips, and present the Oregon coast record of harpoon stone tips and relevant zooarchaeological data. We suggest that large triangular points may signify exploitation of one or two particular species of pinniped, regardless of the onshore or offshore location of those species. Throughout our discussion, the term *projectile point* is used to denote both harpoon stone tips and arrow points.

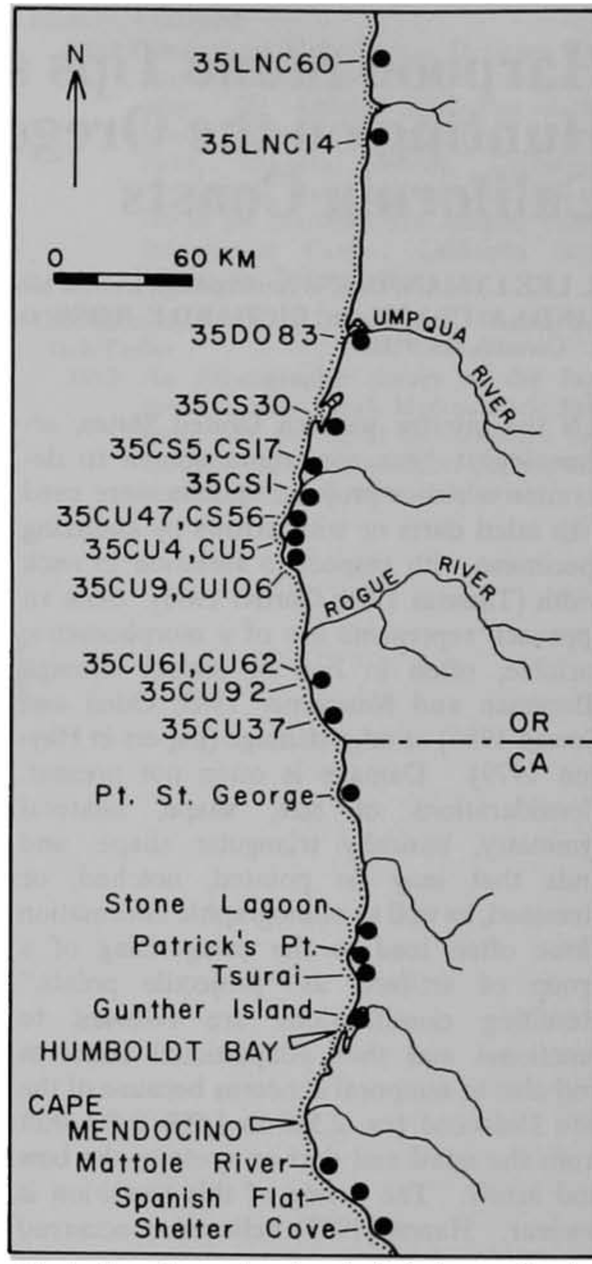

Fig. 1. Locations of archaeological sites and other places mentioned in text.

THE PROBLEM

Jobson and Hildebrandt (1980) reviewed the ethnographic and ethnohistoric evidence for the presence of oceangoing canoes on the northern coast of California (see also Hudson 1981). They listed the modern "distribution of environments containing intensively occupied marine mammal haulout grounds greater than 500 m. offshore, and the occurrence and frequency of archaeologically recovered stone harpoon tips," and concluded that "both offshore habitats and harpoon tips increase in abundance to the north" of Humboldt Bay (Jobson and Hildebrandt 1980:169-170). They cited the frequencies of harpoon tips recovered from seven northern California archaeological localities (Fig. 1; Spanish Flat was not considered by Jobson and Hildebrandt) as evidence supporting their hypothesis that seaworthy canoes occurred only north of Humboldt Bay in prehistoric times. The bridging assumption here is that a harpoon stone tip "is a good indicator of oceangoing canoe use" (Hildebrandt 1981:101), which presumes such stone points would not be used frequently, if at all, in mainland nearshore or onshore contexts.

This assumption can be attributed to Gould (1977:159), who reported that the presence of chipped stone harpoon tips supported his inference "that seagoing dugout canoes around forty feet long had been used by historic Tolowa for offshore fishing and sea lion hunting." In his original report concerning these canoes, Gould (1968:28) noted that while such canoes were used historically to exploit distant offshore rookeries, sea lions "were often taken" from these rookeries by clubbing them. In a later paper, Gould (1975:154) noted that "the preferred method for killing sea lions was to land on the [distant offshore] rookeries and club the animals to death, although animals in the water were often harpooned." Curiously, harpoon tips came to imply 40-ft.-long seagoing canoes to Jobson and Hildebrandt (1980; Hildebrandt 1981), despite Gould's (1975:154) comment that "no doubt many sea lions were taken by individual hunters or small groups of men on the rookeries that lay close inshore. For this, all that was needed was the small (about 15 ft. long) river dugout canoe together with clubs and harpoons." In short, then, the assumption that harpoon stone tips imply seagoing canoes is invalidated by Gould's comments and by data indicating that harpoon tips were used to hunt sea lions in *both* "close inshore" and distant offshore settings.

Jobson and Hildebrandt (1980) noted the correspondence in geographic distributions of ethnographically reported oceangoing canoes, historically documented sea lion rookeries, and frequencies of archaeologically recovered harpoon stone tips. We do not question the ethnographic data. The prehistoric distribution of rookeries has been discussed at length elsewhere (Lyman 1988, n.d.). We focus here on the assumption that archaeologically recovered harpoon stone tips imply the presence of seaworthy canoes. Jobson and Hildebrandt's conclusion that such canoes occurred only north of Humboldt Bay in prehistoric times hinges on their ability to distinguish stone points used on arrows from those used on harpoons. However, they did not describe their analytic procedure.

Because we wished to perform similar analyses with materials recovered from sites on the Oregon coast, we attempted to replicate the frequencies of harpoon tips reported by Jobson and Hildebrandt (1980). Our attempt at replication involved reviewing the original site reports, which are the apparent sources of Jobson and Hildebrandt's information. We suspect we have been able to reconstruct their analytic procedure because we can replicate the frequencies they report. We believe Jobson and Hildebrandt tallied the number of illustrated stone projectile points labeled as "harpoon tip" or "possible harpoon tip" in the original site reports, regardless of the reported frequencies of such points.

Since Jobson and Hildebrandt (1980) did not take into account the criteria first described by Gould (1966) for distinguishing harpoon tips from arrow tips, and since these criteria were applied only to collections from Point St. George, Stone Lagoon, Mattole River, and Shelter Cove by the original investigators, we believe it is necessary to recalculate the frequency of harpoon tips from those northern California sites.[1] The seminal research in that regard is Gould's (1966) report on the Point St. George site. In the following section we review size and shape variation in triangular points recovered from northern California coastal sites.

VARIATION IN PATRICK'S POINT TRIANGULAR POINTS

Milburn et al. (1979) suggested that Gould's (1966) size criteria for distinguishing the functional categories of "harpoon tips" and "arrow points" were reasonable for the general group of points they termed "Patrick's Point Triangular." Milburn et al. (1979:132) suggested that the distinction of harpoon tips from arrow points based on basal width "must be considered tentative due to the small size of the sample." They

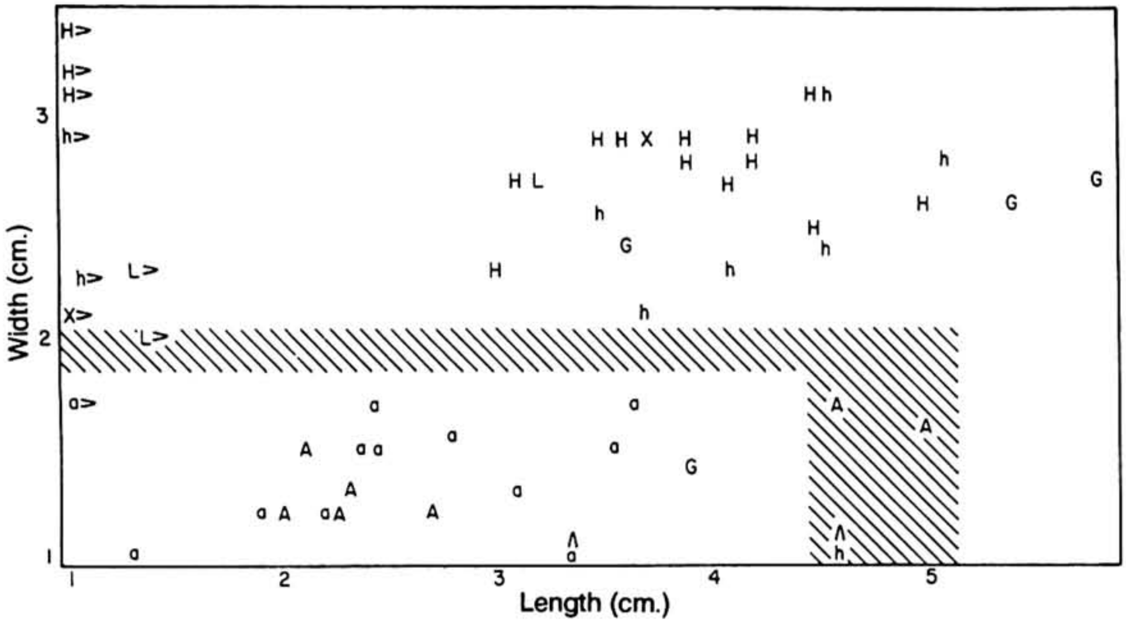

Fig. 2. Bivariate plot of triangular stone point length and width. H, identified as harpoon tip by Gould (1966); A, identified as arrow tip by Gould (1966); X, identified as harpoon or arrow tip by Gould (1966); h, identified as harpoon tip by Milburn et al. (1979); a, identified as arrow tip by Milburn et al. (1979); L, reported by Levulett (1985); G, illustrated by Loud (1918). Arrow pointing to right indicates unknown length; arrow pointing up indicates unknown width. Shaded area is inferred boundary between harpoon and arrow tips.

apparently considered only the 24 triangular points recovered from Stone Lagoon. Hildebrandt (1981:105), citing Milburn et al. (1979), suggested that "the minimum size of harpoon [stone tips] is approximately 2.1 cm. in basal width," but the manner in which that value was derived is not clear in Milburn et al. (1979) or in Hildebrandt (1981).

We measured the maximum width and the total length of the 22 triangular points illustrated by Gould (1966:Pls. 9, 10) using dividers and the illustrated scale, to the nearest 0.1 cm. Similar measurements were published by Milburn et al. (1979) for 21 of the triangular specimens from Stone Lagoon that were illustrated and classified either as arrow or harpoon tips. Those length and width values are plotted on the bivariate graph in Figure 2. That plot shows a clear separation of harpoon tips (N = 24) and arrow points (N = 19) as they were identified by Gould (1966) and Milburn et al. (1979). Points identified as harpoon tips have an average length of 4.09 cm. (sd = 0.59), whereas points identified as arrow tips have an average length of 2.78 cm. (sd = 0.95); those values are significantly different (Student's t = 5.027, p < 0.001). Points identified as harpoon tips have an average width of 2.75 cm. (sd = 0.33) whereas points identified as arrow tips have an average width of 1.42 cm. (sd = 0.22); those values are significantly different (t = 14.833, p < 0.001). In general, harpoon tips are $\geq$ 2.0 cm. wide and arrow points are $\leq$ 1.9 cm. wide. Length ranges overlap to a greater degree than width ranges, but arrow points ($\leq$ 5.0 cm.) tend to be shorter than harpoon tips ($\geq$ 3.0 cm.). While this sample of "known" points is small (N = 43), the plot in Figure 2 can serve as a heuristic device until a larger sample is available.

The two points Gould (1966) labeled as "harpoon or arrow tip" clearly fall in the

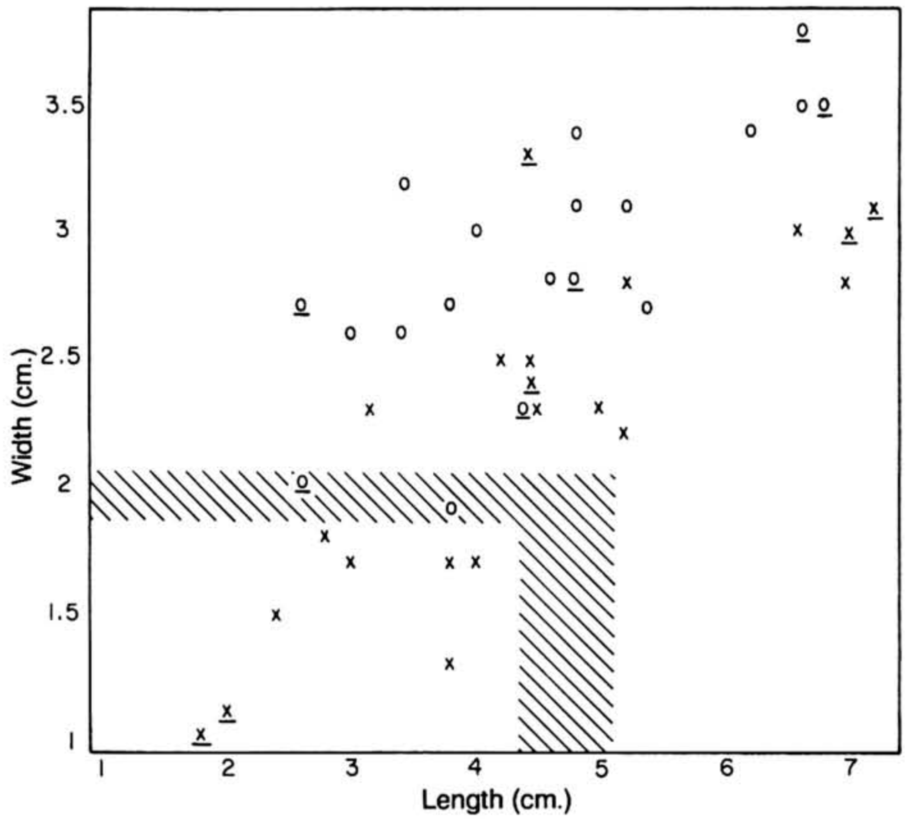

Fig. 3. Bivariate plot of triangular stone point length and width for specimens from Patrick's Point (x) and Tsurai (o). Underlined symbols represent specimen dimensions reported by Elsasser and Heizer (1966). Shaded area is inferred boundary between harpoon and arrow tips (from Fig. 2).

size and shape range of harpoon tips (Fig. 2). We measured the four triangular specimens illustrated by Loud (1918:specimens 6 and 18 in Pl. 14, specimens 3 and 5 in Pl. 15) from Gunther Island, using dividers and a ruler, converting the observed measurements to actual size measurements based on Loud's scale. Three of those specimens fall in the harpoon tip range; the fourth falls within the arrow point range (Fig. 2). Similarly, two of the three triangular points reported by Levulett (1985:564), according to her published measurements, fall within the harpoon tip range; the third falls on the width division for the two functional categories (Fig. 2), making an assignment of this point to a functional class tenuous.

Finally, we used dividers and the scale published by Elsasser and Heizer (1966:112, 126) to derive measurements of the illustrated points recovered from Patrick's Point and Tsurai. We also noted the measurements they provided for six points from each of those sites (Elsasser and Heizer 1966:21, 70-71). The scatter plot of points from Patrick's Point and Tsurai (Fig. 3) indicates that both harpoon tips and arrow points are present, insofar as the plot in Figure 2 is an accurate discriminatory device. Size and shape variation embodied in Figure 2 did not play a role in classifying specimens as harpoon tips at Patrick's Point and Tsurai; Elsasser and Heizer (1966), apparently being unaware of Gould's (1966) ethnohistoric data,

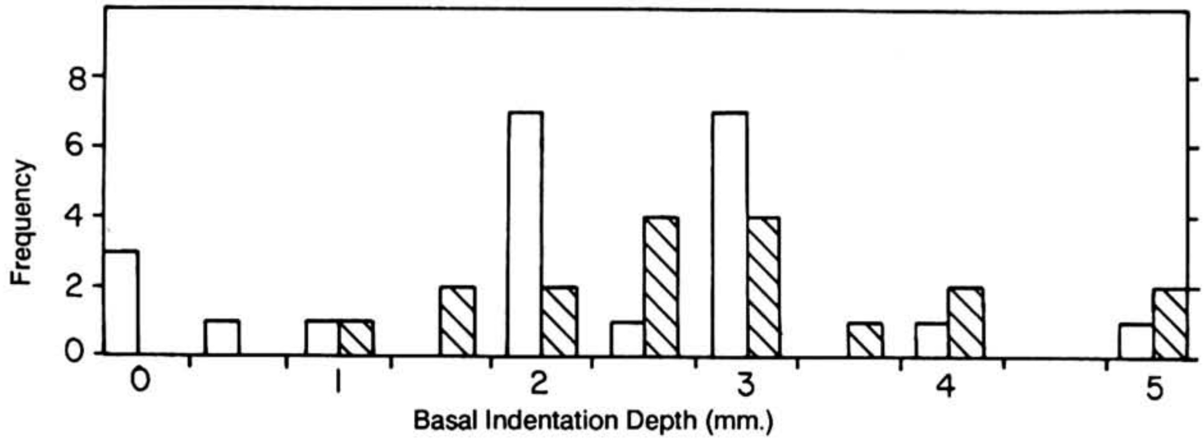

Fig. 4. Frequencies of basal indentation depths for triangular stone points from Point St. George and Stone Lagoon identified as arrow (shaded bars) and harpoon (unshaded bars) tips.

suggested that all triangular points from those two sites represented harpoon tips.

Because Gould (1966) suggested that harpoon tips tend to have less deeply concave bases than arrow points, we also compiled data on depth of basal concavity of triangular points from Point St. George and Stone Lagoon. Twenty-two points identified as harpoon tips by the original researchers (seven from Stone Lagoon, 15 from Point St. George) and 18 arrow points identified as such by the original investigators (11 from Stone Lagoon, 7 from Point St. George) formed our data base. We found Gould's suggestion to be evident in those data. Points identified as harpoon tips had less basal concavity (mean = 0.215 cm., sd = 0.134) than points identified as arrow points (mean = 0.287 cm., sd = 0.112); that difference is statistically significant ($t = 1.8$, $p < 0.05$). The ranges of basal concavity depth, however, overlap almost completely; only points identified as harpoon tips have flat bases *in this sample* (Fig. 4). We note, however, that some straight-based points described and/or illustrated by Elsasser and Heizer (1966; their Type 3) are small enough to be classified as arrow points (Fig. 3). Thus, a straight base alone does not indicate that a point is a harpoon tip.

FREQUENCY DATA

Our analysis of attributes of triangular points from northern California coast sites (Figs. 2, 3) indicates the frequencies of harpoon stone tips listed in Table 1, column 2. These frequencies are derived from the original site reports cited in the previous section. We note that additional triangular points were recovered from Gunther Island by H. H. Stuart during his excavation of that site, but size and shape data are unavailable for those specimens (Heizer and Elsasser 1964). Moreover, Moratto (1973:Plate 7) illustrated one small triangular "arrow point" and five large triangular "harpoon tips" he recovered from Stone Lagoon. We consider none of these additional specimens in the following discussion because, as will become clear, data in column 2 of Table 1 are at best nominal scale, and even these presence/absence data seem to be a function of sample size, measured as excavated volume per site.

Jobson and Hildebrandt (1980:170) interpreted their data on harpoon tips in presence/absence (nominal scale) terms when they noted that Tolowa and Yurok sites "all contain composite harpoon tips . . . [whereas examined Wiyot, Mattole, and Sinkyone sites]

Table 1

FREQUENCIES OF PROJECTILE POINTS, EXCAVATED VOLUMES, ETHNOGRAPHIC TERRITORY, AND FREQUENCY OF STELLER'S SEA LION REMAINS IN NORTHERN CALIFORNIA SITES

Site	Harpoon Stone Tips Frequency	Other Projectile Points Frequency	Total Projectile Points Frequency	Percent Classed As Harpoon Tips	Approximate m.^{3} Excavated	Ethnographic Territory	Percent of Pinniped Steller's Sea Lion
Point St. George	17+?	40+?[a]	57+?	29.8	1,800	Tolowa	94.8
Stone Lagoon	12	105	117	10.3	51	Yurok	21.8
Patrick's Point	13+	6	176	?	350	Yurok	–[b]
Tsurai	17+	1+?	90	?	?	Yurok	–
Gunter Island	3+?	43	46	6.5?	100	Wiyot	40.4
Mattole River	0	4	4	0.0	45	Mattole	–
Spanish Flat	0	22	22	0.0	39	Sinkyone	–
Shelter Cove	2	9	11	18.2	40	Sinkyone	66.7

[a] Illustrated points; includes 3 "probable arrowheads" in Plate 5, 1 "probable arrowhead" in Plate 8, and 4 "projectile points or knife blades" in Plate 9 (Gould 1966).
[b] Dashes denote "no data."

Table 2

FREQUENCIES OF PROJECTILE POINTS IN CENTRAL AND SOUTHERN OREGON COAST SITES

Site	Frequency of Triangular Points		Total of Typeable	Percent of Total that
	Large	Small	Projectile Points	are Large Triangular Points
35LNC14[a]	13	7	41	31.7
35CS17[a]	7	17	76	9.2
35CS5	1+	?	?	—[b]
35CS1[a]	21	96	654	3.2
35CS56[a]	2	22	41	4.9
35CU47[a]	3	16	19	15.8
35CU4[a]	1	8	16	6.2
35CU5[a]	1	18	20	5.0
35CU9[a]	1	2	19	5.3
35CU106[a]	9	13	22	40.9
35CU92[a]	5	52	93	5.4
35CU61/62	1+	?	?	—
35CU37	1?	5	31?	—

[a] For these sites, comparing frequency of large triangular points to total typeable points, Kendall's *tau* = .552, $p < 0.05$; excluding 35LNC14 and 35CU106, *tau* = .718, $p < 0.02$.
[b] Dashes denote "no data."

show a lack of harpoon tips." They maintained that the presence of harpoon tips correlated with the ethnohistoric presence of oceangoing canoes and exploitation of distant (> 500 m.) offshore marine mammal habitats. A single harpoon tip from Wiyot, Mattole, or Sinkyone territory, where distant offshore marine mammal habitats are absent, would thus invalidate the status of harpoon stone tip *presence* as a signature criterion implying oceangoing canoes and exploitation of distant offshore habitats. Data in Figure 2 indicate that harpoon tips have been recovered from Gunther Island in Wiyot territory and from Shelter Cave in Sinkyone territory.

Because presence/absence data do not corroborate Jobson and Hildebrandt's (1980) hypothesis, frequency data might be used. Jobson and Hildebrandt (1980:170) noted, for instance, that harpoon tips "increase in abundance to the north" of Humboldt Bay. In this case, one might propose that harpoon tips would be more frequent in sites whose occupants actively hunted offshore than in sites whose occupants seldom, if ever, hunted sea mammals in distant offshore environments. Such a proposition would allow an occasional harpoon tip to be found south of Humboldt Bay within the context of Jobson and Hildebrandt's model. One could then calculate the proportion of projectile points that seem to represent harpoon tips to control for potential sample size effects. As the data in Table 1 (especially column 5) make clear, those proportions are unknown for Point St. George, Gunther Island, Patrick's Point, and Tsurai. The proposition thus can not be evaluated given our assessment of the available data.

Absolute frequencies of recovered harpoon tips are unknown for four of the eight cases listed in Table 1. Further, the three least intensively sampled sites (Mattole River, Spanish Flat, Shelter Cove) have produced the fewest harpoon tips or any other kind of projectile points. We thus suspect that additional excavation of Mattole and Sinkyone sites will produce more harpoon tips. If this suspicion is correct, and presence/absence data regarding harpoon tips are a function of sample size measured as the volume excavated per site[2], then only the harpoon tip *presence*, not absence, data in Table 1 may be considered valid. To help understand and evaluate the significance of harpoon stone tips in sites on the northern California coast, we now turn to data from sites of similar age on the central and southern Oregon coast.

"HARPOON STONE TIPS" ON THE OREGON COAST

At least 13 sites on the central and southern Oregon coast have produced large triangular concave- or straight-based points (Fig. 1, Table 2). The frequency of this point form in those sites correlates with the size of the total projectile point assemblage (Kendall's *tau* $= 0.552, p < 0.05$), suggesting that the abundance of those large points is at least in part a function of sample size measured as the total number of projectile points recovered.[3] That correlation improves markedly when the two sites with the highest relative frequencies (> 30%) of large triangular points are omitted (*tau* $= 0.718, p < 0.02$). What, then, might the significance be of those two sites with high relative frequencies?

To answer the question just posed, data in Table 2 must be screened and harpoon tips distinguished. Frequencies of large triangular points from sites listed in Table 2 are not all based on precisely the same set of morphometric criteria. Data for nine of the sites are derived from Pullen (1982). For those nine sites, we recorded frequencies of Pullen's Type 10 ("small triangular, concave base") under column 3, and Pullen's Type 11 ("large triangular, concave base") under column 2. Pullen's Type 12 (triangular, straight base, not distinguished by size) is included along with his other types in the total under column 4; actual frequencies in columns 2 and 3 thus should probably be greater than reported in Table 2. We do not have morphometric data for Pullen's (1982) Type 11 points, but assume those points would meet the criteria we have derived for harpoon tips.

We derived measurements (using dividers, ruler, and published scales) for points illustrated by Berreman (1944) from 35CU37 and for points illustrated by Newman (1959) from 35CU47. We also recorded measurements reported by Ross (1977) from 35CU9 and by Newman (1959) from 35CU47. Clark (1988) measured all triangular points recovered from 35LNC14 (Fig. 5). All measurements are plotted in Figure 6. That figure, when compared with Figure 2, suggests that harpoon stone tips are present on the central and southern Oregon coast, but does not explain why those stone tips should have high relative abundances at 35LNC14 and 35CU106. To explore the question further, we now turn to faunal data.

Detailed faunal data are available only for one site listed in Table 2. Analysis of the mammalian fauna from 35LNC14 (400 to 150 B.P.) indicates that 994 (86.1%) of the recovered pinniped remains (total NISP [number of identified specimens] = 1,155) represent Steller's sea lion (*Eumetopias jubatus*). Of those Steller's sea lion remains, 745 (74.9%) represent adult males, 173 (17.4%) represent adult females, and 57 (5.7%) represent newborns (19 specimens could not be satisfactorily assigned to age-sex class). Given known behavior of this taxon (Orr and Poulter 1967; Gentry and Withrow 1978), it seems that 35LNC14 represents a site occupied by people focusing sea-mammal hunting efforts on a Steller's sea lion rookery--a rookery not historically documented (see Lyman [1988, n.d.] for more complete discussions of this fauna and the faunas mentioned below). We note that 130 m.[3] of midden were excavated at 35LNC14. The sample of points from 35CU106 listed in Table 2 was collected by amateurs (Pullen 1982), thus faunal and excavated volume data are unavailable for that sample.

Site 35LNC14 has no distant (> 500 m.) offshore islands or rocks associated with it today. There are, however, numerous basalt stacks within 250 m. of the mean tide line, and within approximately 50 m. of the low tide line. Site 35CU106 also has several offshore rocks within 200 m. of shore. Furthermore, limited testing of 35CU106 produced a small sample of faunal remains, the major constituents of which seem to represent Steller's sea lion and California sea lion (*Zalophus californianus*) (Minor et al. 1980). Finally, Orford Reef, some 9 km. northwest of 35CU106 (6 km. offshore), today is a haulout area regularly used by Steller's sea lions (Pearson and Verts 1970; Mate 1975).[4]

Sites 35CU106 and 35LNC14 have near-shore habitats suitable for Steller's sea lions, and given the clear dominance of this taxon in the faunal assemblage of one of them, we believe that the high relative abundances of large triangular points (harpoon tips) at these two sites indicate exploitation of that large sea lion. We suspect that excavation of 35CU106 will result in the recovery of an abundance of Steller's (and/or California) sea lion remains.

The following inferences seem appropriate. First, large triangular points on the Oregon coast represent harpoon tips used mainly for the two largest pinniped taxa regularly found along the central and southern coast of Oregon. In fact, Gould (1966: 57) reported that "harpoons were used for hunting *large* [emphasis added] sea mammals (principally sea lions)," but did not specify the taxon. Kroeber and Barrett (1960:116-

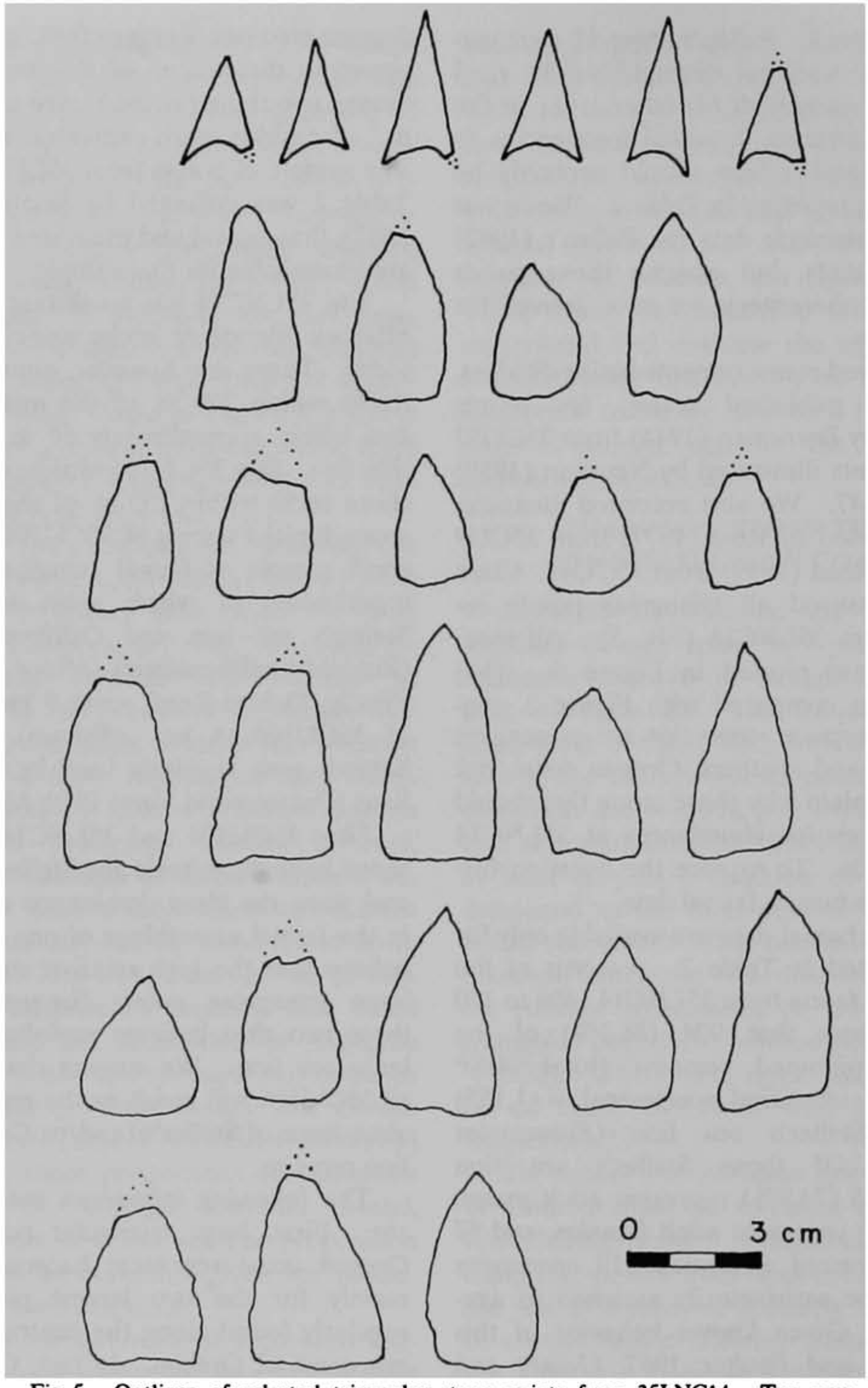

Fig. 5. Outlines of selected triangular stone points from 35LNC14. Top row, "small" concave-based points. Second row, straight-based points falling on or near the transition between large and small points. Third row, straight-based points too small to have tipped harpoons according to the model in Figure 2. Fourth, fifth, and sixth rows, harpoon tips.

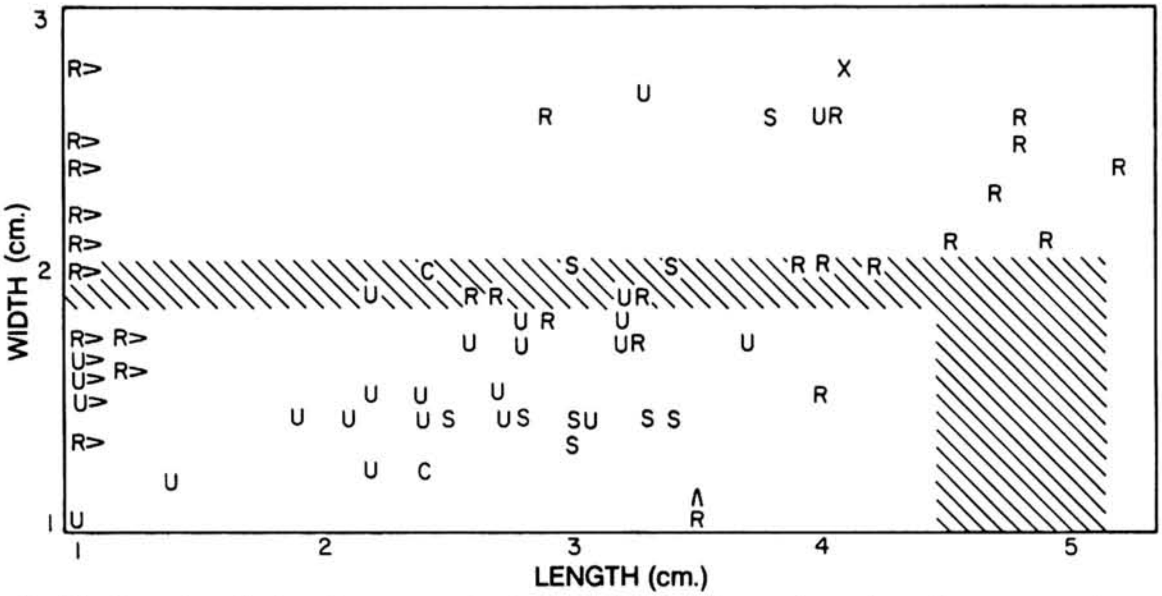

Fig. 6. Bivariate plot of triangular stone point length and width for specimens from Oregon coast sites. C, 35CU37; S, 35CU47; X, 35CU9; R, 35LNC14; U, 35DO83. Shaded area is inferred boundary between harpoon and arrow tips (from Fig. 2). Arrow pointing to right indicates unknown length; arrow pointing up indicates unknown width.

121) seemed to imply that Steller's and California sea lions were hunted with harpoons, whereas harbor seals (*Phoca vitulina*) were much less frequently taken with such weapons.

Second, sites 35LNC14 and 35CU106 represent sites associated with sea lion haulout areas or rookeries, and might be considered special-purpose sites at which hunters exploited sea lions. Large triangular points (harpoon tips) are thus found in greatest relative frequencies at those two sites because those points were intensively used there, and were lost (some perhaps embedded in carcass portions discarded in the 35LNC14 midden, as suggested by Gould [1966:57] for Point St. George) and/or broken and discarded there. Harpoon stone tips are relatively rare at other sites listed in Table 2 due to their curation and/or caching at sea lion hunting sites, and probably were only occasionally used and lost at these other sites. Additional study of the covariation of relative frequencies of large triangular points with relative frequencies of sea lion remains is necessary to further evaluate these inferences, but many of the requisite data are unavailable in Oregon contexts. We explore such covariation in California contexts in the final section of this paper.

Two other sites that have been extensively sampled on the Oregon coast provide indirect corroborative evidence for our inferences. Site 35DO83 (3,000 to 50 B.P.) is located on an estuary approximately 4 km. from the open ocean (Lyman 1988, n.d.). A volume of 115 m.^{3} of midden was excavated, and produced 168 typeable projectile points. Of these, 34 are triangular with straight or concave bases. (In addition, 27 small triangular points display minute side-notches, and are not considered in the general triangular point category under discussion here.) Field catalog measurements are available for 24 of these 34 points; only two (8.3%) of these 24 are commensurate in size and shape with harpoon stone tips (Fig. 6). A total of 1,453 pinniped remains have been identified from this site; 1,302 (89.6%) represent harbor seal and 65 (4.5%) represent Steller's sea lion.

Site 35LNC60 (3,000 to 300 B.P.) is located on a small cove adjacent to the open ocean and onshore rocks. A volume of 64 m.[3] of midden was excavated, and produced 10 typeable projectile points, none of which are triangular concave- or straight-based forms (Bennett 1988). A total of 173 pinniped remains have been identified from this site; 117 (67.6%) represent harbor seal, and 29 (16.8%) represent Steller's sea lion. Our inference regarding the near-exclusive use of large triangular stone points (harpoon tips) for hunting Steller's (and California?) sea lions is not refuted by evidence from sites 35DO83 and 35LNC60 where such points are relatively rare or absent, and Steller's sea lions are clearly a minor part of the exploited fauna.

DISCUSSION AND CONCLUSIONS

If our inferences regarding the functional significance of large triangular points on the Oregon Coast are correct, then the data in Table 1 take on a meaning different from that described by Jobson and Hildebrandt (1980). Only Point St. George produced large triangular points in an *apparent* relative abundance (29.8%) approximating that of 35LNC14 and 35CU106. Point St. George also is the only California site with a relatively large sample of pinniped remains (NISP = 267), of which 253 (94.8%) are Steller's sea lion (Hildebrandt 1984). All other samples of pinniped remains from those northern California coast sites listed in Table 1 are less than half as large (range of NISP = 5 to 105), and thus potentially are ambiguous indicators of hunting foci. For example, Shelter Cove (total pinniped NISP = 54), which has the second highest relative frequency of large triangular points (18.2%), also has the second highest relative frequency of Steller's sea lion remains (66.7%), which our inferences would lead us to predict. Stone Lagoon (pinniped NISP = 101) and Gunther Island (pinniped NISP = 52), however, have frequencies of large triangular points (10.3% and 6.5%, respectively) and Steller's sea lion (21.8% and 40.4%, respectively) quite different from what our inferences would lead us to predict. Whether our inferences and thus our predictions are wrong, or whether some or all of the samples are nonrepresentative, or both, cannot yet be determined.

The bridging assumption that harpoon stone tips imply hunting at distant offshore loci, the use of oceangoing canoes, and thus relatively complex socio-political organization (Jobson and Hildebrandt 1980; Hildebrandt 1981, 1984) seems unfounded by the available data. While we do not suggest that the assumption and its corollaries are wrong, harpoon stone tip data we have described here are interpreted to indicate the hunting of sea lions, particularly Steller's sea lions, whether in onshore, near-shore, or distant offshore environments. Additional research on the covariation of frequencies of harpoon stone tips and pinniped remains may require modification of our inference, or lend support to it.

Finally, we note that we have labeled small triangular projectile points "arrow points" after previous researchers, but we have not argued that those small points are *not* harpoon tips. They may well be harpoon tips, but for fishing spears or fishing harpoons rather than harpoons used to hunt sea mammals (Bennyhoff 1950). Such small triangular (usually) concave-based points are known, for example, in late prehistoric contexts in the lower (Tisdale 1986), middle (Wilson 1979), and upper (Simmons 1981; Pettigrew and Lebow 1987) reaches of Oregon's Rogue River (Fig. 1). Those specimens tend to display average lengths (approximately 2.5 cm.) and widths (approximately 1.8 cm.) commensurate with the size of points identified as "arrowheads" by Gould's (1966) informants. Because salmon (*Oncorhynchus* spp.) was an important resource for those interior peoples (Drucker 1937), perhaps some of these "arrowheads" actually tipped fishing gear. Blood-residue analysis may be the only way to test that conjecture. Clearly, the occurrence of triangular stone points in the western Oregon-California border area requires much additional study.

NOTES

1. In her final report, Levulett (1985:220) described three triangular stone points recovered from the Shelter Cove and nearby Spanish Flat sites: "The [two] concave base points are relatively large and may have functioned as harpoon tips, while the smaller straight base specimen probably served as an arrow point." It is unclear if the small specimen Levulett described is the one Jobson and Hildebrandt (1980:169 fn.) mentioned as resembling "stylistically harpoons from northern sites [but] much smaller." The larger two specimens may have been recovered after Jobson and Hildebrandt's research was completed.

2. Gould (1966:28) indicated that excavators of Point St. George did not consistently screen site sediments. It is also unclear if Gould illustrated all triangular points recovered from that site. Loud (1918) may not have consistently screened excavated sediment at Gunther Island, and probably did not illustrate all recovered triangular points. Given these and other potential between-site differences in collection techniques and reporting procedures, we suspect that even ordinal-scale correlation of excavated volume per site with numbers of recovered points per site might be invalid.

3. We tallied frequencies of large triangular points for 35LNC14 from Figure 6. All points on the transition (shaded) area (length 4.5 to 5.1 cm. and width 1.9 to 2.0 cm., inclusively) were not classified as large or small, but were included in the total of typeable projectile points in Table 2.

4. Major differences between late prehistoric and historic use of the Oregon and northern California coast by pinnipeds are indicated by historic biological (e.g., Bonnot 1928; Rowley 1929) and zooarchaeological (Lyman 1988, n.d.) data.

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