Stone Tools in Ceramic Contexts: Exploring the Unstructured

Joan M. Gero
Massachusetts/Amherst

Classification procedures are usually undertaken in archaeology either to address chronological questions or to sort cultural influences by mapping spatial relations between prehistoric populations. In both cases, "types" are established as necessary units of meaning by the stipulation of redundancies (Dunnell 1971:44). However, the danger exists that it can become simple archaeological reflex to sort items unquestioningly into piles of more similar and less similar, and, in the process, to ignore those classes of items which will not sort themselves neatly.

In this discussion, I wish to address the archaeological utility and contribution of non-structured categories of items, beginning with the characterization of an assemblage of stone tools which fits the description of "unstructured," an assemblage which does not sort neatly for all that it spans more than one thousand years of Peruvian prehistory. I want to argue thereafter that cultural information is available to us through what might be called "the negative evidence" as well as from highly distinctive cultural features. Most specifically, I would like to use this discussion to suggest that stone tools, unspectacular as they often are, represent an important source of cultural information which we cannot afford to neglect.

Under the auspices of the Huaricoto Project, directed by Drs. Richard Burger, Abalardo Sandoval and Lucy Salazar Burger, I had the opportunity to analyze a sample of lithic materials recovered from the first two field seasons at the highland temple site of Huaricoto in the Callejón de Huaylas,

Peru. My sample was taken from three sectors of the site, identified and dated by the project directors: from a deep habitation/refuse area dating to the late Early Intermediate period and into the Middle Horizon (yielding a total of 5770 lithic artifacts); from a stratified pit and series of floors within the Early Horizon temple itself (269 artifacts); and from a series of terraces dating through the Initial period and the Early Horizon building phases of the Huaricoto temple (3048 artifacts). A small sample of preceramic materials was recovered from the deepest levels in these sectors and is included in this analysis, although this sample of only 38 tools is unreliably small.

The lithic artifacts from Huaricoto have been distinguished in three basic categories: debitage (the unused by-products of tool manufacture), bifaces (including projectile points), and flake tools (which exhibit some evidence of use, whether or not they have been retouched in any way). This study will focus primarily on the flake tool component of the assemblage.

Until the last period of site occupation, the ratio of flake tools to bifaces is fairly constant (between three and eight times as many flake tools as bifaces), but in the late Early Intermediate period, this ratio jumps up to 25 times as many flake tools as bifaces, marking a significant drop in the biface representation. (Of course, these distributions could simply reflect shifting tool-use and tool-discard patterns within discrete contexts of the site.) Debitage frequencies remain low throughout the site sequence except for one dense concentration of shale chipping debris in a very well demarcated area of the Initial period terrace sector, where a workshop is clearly indicated. Interestingly, only the final shaping and thinning phases of biface manufacture are represented in this workshop, corresponding nicely to the high proportions of (shale) bifaces which characterize the Initial period lithic assemblage.

The raw materials utilized in the Huaricoto assemblages are, throughout the sequence, dominated by extremely local materials, and this trend becomes even more pronounced in the last period of site occupation when roughly 90% of the flake tools are seen to be composed of the sandstones, granites, quartzites and metamorphosed sedimentary rock available as river cobbles from the Rio Santa or the Rio Marcara, both flowing within 500 m. of the site (Table 1). Smaller amounts of rhyolites, volcanic tuffs, shales, slates and caliz are indicative of materials which, though also local, are probably not being taken from the riverbed sources; artifacts made of these materials seldom exhibit any cortex remaining on their exterior surfaces, suggesting that they were either mined from outcrops in the plutonic Cordillera Negra or from stratified beds on either side of the Rio Santa. High quality, non-local or rare lithic materials such as obsidian, clear quartz or fine-grained cherts are virtually absent in the

Table 1. Raw Materials of Huaricoto Flake Tools.

	METAMORPHOSED SHALE	QUARTZITE	SANDSTONE	GRANITE	RHYOLITE/TUFF	SLATE	CALIZ	SHALE	CHERT	QUARTZ	OBSIDIAN
EARLY INTERMEDIATE PERIOD (n=636)	392 61.6%	85 13.4%	58 9.1%	32 5.0%	7 1.1%	7 1.1%	10 1.6%	37 5.8%	6 1.0%	1 .15%	1 .15%
EARLY HORIZON (n=57)	21 36.8%	7 12.3%	3 5.3%	3 5.3%	1 1.7%	5 8.8%	5 8.8%	8 14.0%	2 3.6%	1 1.7%	1 1.7%
INITIAL PERIOD (n=221)	68 30.7%	45 20.4%	20 9.1%	4 1.8%	6 2.7%	6 2.7%	19 8.6%	47 21.3%	6 2.7%	-	-
PRECERAMIC PERIOD (n=38)	11 39.3%	15 17.8%	4 14.3%	-	-	5 17.8%	1 3.6%	1 3.6%	-	1 3.6%	-

flake tools of all cultural periods although they occur in small percentages in the biface samples.

A third critical characteristic of the Huaricoto ceramic-period lithics is that the amount of flake modification, or retouch, is extremely low, averaging throughout the sequence only between two and three retouch scars per flake tool. Moreover, between 32% and 49% of the utilized flake tools consistently exhibit <u>no</u> retouch whatever (Table 2). This observation has

Table 2. Distribution of Retouch Scars on Huaricoto Flake Tools.

	0	1	2	3	4	5	6	7	8	9	>9	average
EARLY INTERMEDIATE PERIOD (n=523)	166 31.8%	55 10.5%	65 12.4%	54 10.3%	45 8.6%	29 5.5%	32 6.1%	17 3.3%	14 2.7%	13 2.5%	33 6.3%	3.26
EARLY HORIZON (n=66)	32 48.6%	7 10.6%	2 3.0%	6 9.1%	5 7.6%	3 4.5%	3 4.5%	4 6.1%	-	1 1.5%	3 4.5%	2.36
INITIAL PERIOD (n=199)	86 43.2%	24 12.1%	27 13.6%	17 8.5%	15 7.5%	8 4.0%	4 1.9%	4 1.9%	3 1.4%	4 1.9%	7 3.5%	2.12
PRECERAMIC PERIOD (n=27)	7 25.9%	3 11.1%	1 3.7%	2 7.4%	4 14.9%	1 3.7%	3 11.1%	2 7.4%	-	2 7.4%	2 7.4%	3.78
TOTALS (n=815)	35.7%	10.9%	11.7%	9.7%	8.5%	5.0%	5.2%	3.2%	2.1%	2.5%	5.5%	

important ramifications: the shapes of flake tools are not being determined by deliberate modification processes but, rather, shape is largely conditioned by the structure of the raw material and by such technological factors as the striking implement employed, the direction, force and placement of the primary blow, and by the morphology and topography of the prepared nucleus or nodule surfaces. Without evidence of deliberate retouch, introduced either during the initial manufacturing episodes or later, to rejuvinate dulled edges, classifications based on tool shapes such as "discoidal" and "trianguloid" are meaningless. Furthermore, no purpose would be served in comparing the shapes of Huaricoto lithic tools with shape classes of tools reported from comparable ecological or temporal contexts, such as

Lynch's Quishqui Puncu materials (1970), or MacNeish's Formative sequence from the Ayacucho Basin (1980).

As an alternative to shape classes, one could attempt groupings based on sets of metric measurements chosen to reflect technological constraints. That is, patterned variability in flake tool dimensions could reveal more tightly specified production of tools in some cultural periods than in others. Summary ratios representing various proportions in flake tool dimensions were therefore calculated (Table 3), each designed to capture a different technological aspect of production. (For example, tool length multiplied by tool width offers a rough measure of fracture surface area which also approximates the force required to detach the flake (Phagan 1980:256).) However, for all the calculated proportions in the Huaricoto flake tools, extremely high degrees of variability are evident, and no categories of restricted or specialized production can be designated.

Table 3. Ratios Summarizing Huaricoto Flake Tool Dimensions

	TOOL LENGTH / TOOL WIDTH	TOOL WIDTH / TOOL THICKNESS	FLAKE LENGTH* / FLAKE WIDTH	TOOL LENGTH X TOOL WIDTH	LENGTH X WIDTH / THICKNESS
EARLY INTERMEDIATE PERIOD (n=523)	$\bar{x}$ = 1.53 SD = 1.04 CV = 68.02	$\bar{x}$ = 2.59 SD = .90 CV = 34.75	$\bar{x}$ = 1.20 SD = .63 CV = 52.48	$\bar{x}$ = 25.20 SD = 18.67 CV = 74.08	$\bar{x}$ = 14.66 SD = 7.30 CV = 49.63
EARLY HORIZON (n=51)	$\bar{x}$ = 1.43 SD = .25 CV = 17.92	$\bar{x}$ = 2.79 SD = .89 CV = 31.90	$\bar{x}$ = 1.17 SD = .35 CV = 29.68	$\bar{x}$ = 22.32 SD = 19.45 CV = 87.12	$\bar{x}$ = 14.58 SD = 9.1 CV = 62.41
INITIAL PERIOD (n=199)	$\bar{x}$ = 1.48 SD = .34 CV = 22.70	$\bar{x}$ = 3.03 SD = 1.46 CV = 48.25	$\bar{x}$ = 1.14 SD = .36 CV = 32.06	$\bar{x}$ = 15.31 SD = 15.03 CV = 98.14	$\bar{x}$ = 13.01 SD = 8.47 CV = 65.12
PRECERAMIC PERIOD (n=38)	$\bar{x}$ = 2.14 SD = 2.35 CV = 109.80	$\bar{x}$ = 2.82 SD = 1.02 CV = 36.08	$\bar{x}$ = 1.27 SD = .57 CV = 44.45	$\bar{x}$ = 26.76 SD = 23.38 CV = 87.35	$\bar{x}$ = 20.75 SD = 23.36 CV = 112.56

$\bar{x}$ = mean SD= standard deviation CV = coefficient of variation, or $100 \times \frac{SD}{mean}$

*The flake length/flake width statistics are based on smaller sample sizes (Early Intermediate Period=361; Early Horizon=42; Initial Period=156; Preceramic=20) because not all flake tools exhibited identifiable striking platforms or other technological orienting features.

Finally, we might seek meaningful lithic units related to tool functions. Evidence for different kinds of use applications was observed for the sample of Huaricoto flake tools, including the length and character of each working edge, the presence of striations, polish and microchipping which can be associated with particular patterns of use (such as cutting, sawing, scraping, hacking, abrading, etc.), patterns of tool edge damage which are indicative of the relative hardness or softness of the material being worked by the tool, and measurements of tool angles, including both spine-plane and edge angles.

Comparing these various lines of evidence, certain associations of variables are clearly repetitive, such as low tool angles, striations parallel and close to the working edge, and regularized edge morphologies which convincingly identify a cutting function. However, these associated variables do not associate invariably nor do they regularly co-occur with any particular tool shape. Furthermore, frequencies of these (or other identified functions) do not pattern themselves by cultural levels at Huaricoto. Most often, a single tool exhibits several use applications, sometimes on distinct segments of the tool perimeter, as shown in Table 4,

Table 4. Number of Working Edges per Flake Tool.

	1	2	3	4	5	6	$\bar{x}$
EARLY INTERMEDIATE (n=521)	132 25.2%	168 32.5%	116 22.2%	73 14%	24 4.6%	8 1.5%	2.45
EARLY HORIZON (n=61)	12 20%	14 23.3%	16 26.7%	12 20%	6 10%	-	2.76
INITIAL PERIOD (n=212)	28 13.2%	48 22.6%	59 27.8%	50 23.6%	19 9%	8 3.8%	3.04
PRE-CERAMIC (n=27)	4 14.8%	11 40.7%	4 14.8%	6 22.2%	1 3.7%	1 3.7%	2.70
TOTALS (n=820)	176 21. %	241 29.4%	195 23.8%	141 17.2%	50 6.1%	17 2.1%	2.74

but also frequently superimposed on a single portion of the tool edge (Table 5).

Table 5. Number of Working Actions per Working Edge on Huaricoto Flake Tools.

	WORKING EDGES SHOWING ONE WORK ACTION	WORKING EDGES SHOWING TWO WORK ACTIONS	WORKING EDGES SHOWING THREE WORK ACTIONS
EARLY INTERMEDIATE PERIOD (n=523 tools)	832 64.9%	431 33.6%	20 1.6%
EARLY HORIZON (n=61 tools)	128 75.3%	40 23.5%	2 1.2%
INITIAL PERIOD (n=199 tools)	393 66.0%	189 31.8%	13 2.2%
PRECERAMIC PERIOD (n=27 tools)	50 69.4%	22 30.6%	

Edge angles can also vary widely on the same working edge, in part because little retouch has eliminated thick portions of the edge. Thus, a vast majority of all the tools are complexly multi-purpose, although some trend can be noted through the Huaricoto sequence towards using fewer and longer portions of the tool perimeter for single function activities. By and large, however, the Huaricoto lithic use strategies defy clean typological sorting into functional categories.

Mention must be made of one noteable exception to the untypological functional mess at Huaricoto: a particular repetitive form occuring in the last period of site occupation (Figure 1). This is a distinctive thick, squared-off flake tool with two or three vertically defined sides and the remaining segment of the perimeter steeply beveled at an angle of between 70° and 90°. The entire "bottom" surface of the tool is left covered with smooth cortex, so that the tool can function as a scraper-plane, gliding on the cortex surface where parallel striations can be noted at right angles

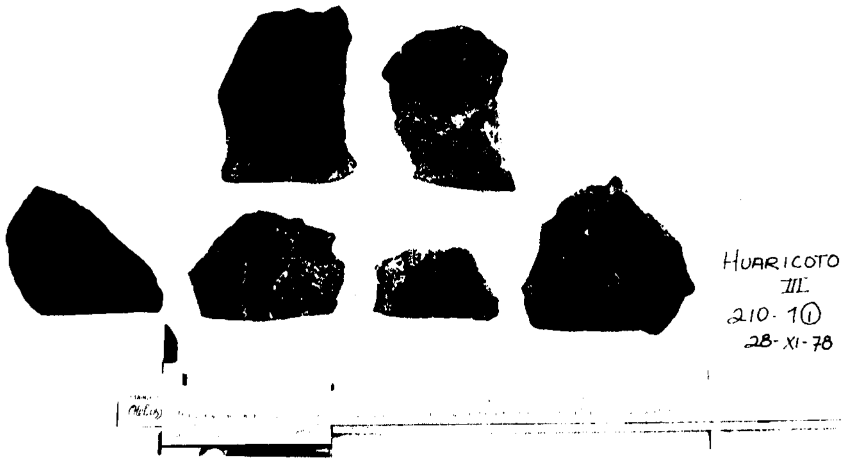

Figure 1. Early Intermediate Period scraper-planes

to the beveled edge. Significantly, Lavallee reports identical rectangular cobble scraper-planes from the Huaraz period at Chavin de Huantar, interpreting them as wood-working implements (Lavallee 1969-1970: 198-201, Lamina 3D).

Because similar appearing tools have been reported in the Southwestern United States as cactus-defleshing implements, and to check the function of these Huaricoto tools, I reproduced a set of replicas of the tool form from local materials and applied them to the leaves of the Fourcraea occidentalis Trel., known locally as maguey blanca or penqua. Both water-soaked leaves and unsoaked leaves were planed, cortex side of the tool pressed against the waxy coating of the plant leaf, trying to remove the waxy coating to extract the plant fiber. For this purpose, however, the Huaricoto-type scraper-plane proved highly ineffective, consistently tearing the fibers and ripping them off along with the waxy leaf-cover, forcing the conclusion that this tool's application was for harder materials, most likely against wood as Lavallee had surmised.

The Huaricoto tools, then, are for the most part produced to have neither specific shapes nor particular functions. Shape seems to be determined mostly by circumstances of initial flake-blank removal with little additional retouch, and functions are casually assigned and frequently overlapping on the same tool or even on the same working edge. Moreover, only small percentages of the analyzed tools are discarded with broken working edges (in contrast, for instance, with the biface samples, where tips and blades are frequently broken and snapped, or entire bifaces are reworked and reduced), suggesting again that flake tools were generally seen as expendable after a short use-life.

In interpreting these finds, there is, at first, something counter-intuitive about the casualness and lack of structure in this class of material culture, something which violates expectations about conditions of social complexity. Our understanding of the Formative economy in which Huaricoto would have been participating is that production was becoming increasingly specialized and narrowly-focused on maize agriculture, calling forth a more specialized lithic use-strategy and higher investments in tool manufacture; greater energy capture from the environment should perhaps correspond to greater energy investments in tool production. Moreover, if trade networks were expanding through the Early Horizon and between the Early Intermediate period polities, higher quality stone could have been made available, and curatorial or conservative strategies of lithic use should be apparent. Finally, the sequence of cultural periods at Huaricoto is long enough to expect significant change in stone-using patterns through time and through the changes in the function of the site itself.

To make sense of this unstructured assemblage, then, we must focus on some factor that is common to all the Huaricoto lovels but which dis-

tinguishes them from highly structured classes of lithic artifacts familiar to us, like the Paiján complex on the Pampa de Cupisnique, where 85% of the identified tools were bifaces or projectile points (Chauchat 1975:90), or like Malpass' assemblages from Campanario, Casma, where 78% of the lithics were bifaces (Malpass 1982). I propose an interpretation which compares lithic use-strategies of sedentary, agricultural populations, particularly in the highlands, with lithic use-strategies of mobile, transhumant or foraging peoples.

In mobile societies, moving through an annual round is likely to include scheduled stops in areas where high quality stone can be acquired, and these highly selective raw materials are then curated for use in less well-endowed areas. This is particularly important since mobile strategies require few tools to do all tasks, so that the quality of the stone used becomes especially critical (Frison 1968; Shott 1982). Mobile societies can afford to, and are under pressure to, rely on high quality stone resources.

In contrast, sedentary and agricultural people in the highlands locate permenant sites in relation to topographic and hydraulic features of the landscape. The demand for flat parcels of well-watered land make river terraces and flood plains (or mounds above flood plains) convenient settlement areas of the early Formative periods, where stone may be conveniently gathered as river cobbles for casual and ready consumption. Evidence of river-cobble dependence for lithic resources is extremely common at highland Formative period sites and at Huaricoto in particular.

A second consequence of mobility is that stone, heavy and dense, has to be economically packaged in a minimum number of tools to satisfy all work requirements on the road. Tool versatility is assured by retouching a tool into a general form which maximizes the working perimeter with uniformly

thinned edges (Keeley 1980; Shott 1982). This generalized tool or preform can then be carried through different environmental zones and reworked in slight modifications as new tool applications are required. At the same time, retouching the tool strengthens the working edges and prevents uneven breakage, thereby conserving the tool. The highly typological tool classes of the preceramic periods are largely accounted for by a narrow range of generalized bifaces or preforms which are erroneously interpreted as single-purpose "projectile points" by many investigators.

In sedentary, agricultural situations, however, tool versatility and conservation are not selected for; common stone is abundant. Rather, the sharpness of an unretouched edge is often desired, without worry about edge damage and resource replenishment. Stone can be and apparently is used expediently and casually when relying on common raw materials. (In this context, it should be recalled that the Huaricoto bifaces, made of less common, non-river-cobble materials, and heavily ground or chipped, are obviously curated and reworked in very pronounced conservational efforts.)

Finally, I argue that mobile and sedentary populations provide very different social contexts for the production and use of lithics, and that this social context also determines to a great extent how formally structured an assemblage will be. In mobile societies, work is public and few other material culture classes are as ubiquitous as stone tools which will therefore emerge as effective media for transmitting social information. In contrast, the function of transmitting social information is not well suited for stone tools in more complex, sedentary circumstances, where other more visible and plastic classes of material culture are available for these purposes (Gero 1983).

The lack of structure and the lack of change in the Huaricoto lithics,

then, is a product of both material and social conditions of existence and follows logically from them. This insight into the Huaricoto lithic assemblages may also help account for the dearth of lithic studies reported from other Formative sites where, according to the expectations laid out here, assemblages are likely to be comparably unstructured. However, it is only through a willingness to research and report on non-classifiable, non-redundant classes of material culture that archaeological questions and understandings can continue to grow.

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