Prehistoric Village Archaeology in South-Eastern Turkey

The eighth millennium B.C. site at Çayönü: Its chipped and ground stone Industries and faunal remains

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1982

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PREFACE

In late 1962 Halet Çambel, head of the Prehistory Section of Istanbul University, and Robert J. Braidwood, of the Oriental Institute and the Department of Anthropology of the University of Chicago, completed plans - on behalf of their respective Universities - for the formation of the Joint Istanbul-Chicago Universities' Prehistoric Project. Actual field work began in the autumn of 1963 with surface surveys in the vilayets (provinces) of Siirt, Diyarbakir and Urfa in southeastern Turkey.

The results of the surveys indicated several sites with surface yields that suggested assemblages of very early village farmers. One of the most promising of these was the mound called Çayönü Tepesi, near Ergani in the northern part of the Diyarbakir vilayet.

Since the first season of excavation at Çayönü in the spring of 1964, there have been seven further autumn campaigns. We have had financial support not only from our two Universities but also from the Directorate General of Museums and Antiquities of the Turkish Ministry of Culture and in the form of grants from friends of the Oriental Institute, from the National Science Foundation, the Wenner Gren Foundation, the American Schools of Oriental Research, the National Geographic Society and - in the form of student training fellowships - from the Ford Foundation.

A considerable portion of this financial support was committed to having colleagues from the natural sciences on our actual field staffs. This had already proved to be a valuable aspect of the earlier Oriental Institute Prehistoric Project efforts in Iraq and Iran in the 1950s.

Beginning with the 1978 field season, we were joined by Wulf Schirmer, director of the Institut für Baugeschichte of Karlsruhe University, and his assistants and students. The Karlsruhe team has been with us each succeeding season bringing its own independent financing. Without its enthusiastic interest and aid - given the surprising amount of architectural evidence which Çayönü has yielded - we could never have accomplished what Karlsruhe has made possible.

What follows here is first an overview concerning our work at Çayönü, including our general conclusions as of the end of the 1981 autumn campaign. Next come three reports. The first of these, chapter 2, is that of Charles L. Redman (Department of Anthropology, State University of New York at Binghamton) covering in detail the chipped stone artifacts recovered during the 1968 and 1970 field seasons. While Redman's report was essentially completed

in 1974, it will certainly stand as a broad comprehensive description of the flint and obsidian inventory of the main prehistoric phase of Çayönü. As mentioned below (p.9 and note, p.49) Redman's references to contexts reflect our chronological and stratigraphic understandings through the time of our 1972 field season: these understandings are no longer current.

The second report, chapter 3 (pp.73-174) by Michael K. Davis (permanent field assistant to the Prehistoric Project since 1970), is concerned with the heavier ground stone inventory for each season, from the beginning through 1980. Davis's chronological and stratigraphic treatment reflect our understandings as of the end of the 1980 field season. Davis uses only four contextual sub-divisions (one less than does Redman), these being the four sub-phases of building remains identified within the main prehistoric phase by 1980: the earliest available levels sub-phase, the grill plan sub-phase, the cell plan sub-phase, and the uppermost levels sub-phase (see p.7)

The third report, chapter 4 (pp.175ff.) by Barbara Lawrence (Museum of Comparative Zoology, Harvard University) deals with the faunal material recovered at Çayönü through the 1978 field season. In this report, Lawrence is mainly concerned with the problem of the appearance of domestic animals. Her evidence for domesticated sheep and goats - through 1978 - comes from certain findspots within what we all call the uppermost levels sub-phase (it being important to note that we cannot yet specify just how this sub-phase began or how the cell plan sub-phase ended, pp.7-9. Lawrence has opted to designate the animal bones - all wild - coming from contexts in the earlier three sub-phases (earliest available, grill plan and cell plan) as of one general horizon which she calls the "earlier levels"*.

We anticipate further seasons of fieldwork at Çayönü and therefore there will certainly be further emendations of some of the generalities we offer here. So far, in southwestern Asia, no other site of the same general time range and cultural level has yet been exposed in so broad an area. As exposed areas increase, however, the complexity of a settlement becomes increasingly manifest. It is not surprising, therefore, that there are difficulties in arriving at precise understandings. Unfortunately for us, the original inhabitants of Çayönü did not arrange either their settlement or their activities for the convenience of future archeologists.

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*The word "earlier" in Lawrence's usage, will be italicized to emphasize that it includes all three earlier sub-phases, and to distinguish it from our more specific "earliest available levels" sub-phase (see note, p.192).

CHAPTER 1

THE ÇAYÖNÜ EXCAVATIONS: Overview Through 1981

by Robert J. Braidwood and Halet Çambel

THE GENERAL BACKGROUND

Although the idea was not completely original with him, it was V. Gordon Childe who - during the 1930s - actively focused attention on what he called the "neolithic" or "food-producing revolution" (Childe 1935; Trigger 1980). Implicit in Childe's interest and enthusiasm for the idea was the matter of how the very beginnings of food-production came about and of how an effective village-farming community way of life was achieved. There was also little question in Childe's mind that one very likely region in which evidence for his "revolution" might be sought was southwestern Asia. Nevertheless, field research that was pointed directly toward the recovery of such evidence did not begin until after World War II.

During its first (1947-48) field season in the Zagros hill country in northeastern Iraq, the University of Chicago Oriental Institute's Prehistoric Project began work at the early village site of Jarmo. The explicit intention of the Project was the investigation of an early village-farming way of life. In the 1950-51 field season, excavations at Jarmo were expanded and an even earlier settlement, Karim Shahir, was also examined (Braidwood and Howe, et al. 1960).

Soon, the attention of various archeologists turned to the same research focus in the Levant region and here, too, important evidence on early village beginnings began to be recovered. At Tell es-Sultan - Jericho, where excavations on later levels were being resumed, tentative pre-war probings that had exposed an early village horizon were now, also, successfully expanded. Mallaha, an impressive open air site with an assemblage of epipaleolithic Natufian materials, also yielded stone founded house remains that were round. The Natufian had hitherto been known only from cave sites (Perrot 1968). In more recent years, much has been learned of the various aspects of both the Natufian and of the still earlier Kebaran epipaleolithic assemblages that preceded it. In addition, various sites with post Natufian materials have also been examined (Bar-Yosef 1980).

In brief, both in the Levant and in the Zagros regions, it appears that - following an earlier level of upper paleolithic manifestations that are regionally variant - an epipaleolithic (or "mesolithic", cf. Clark 1980) or incipiently village-like level of activities can be roughly demonstrated. Perhaps the best understood of the materials of this incipient level are those of the various aspects of the Natufian. They occur from the Levant coast eastwards possibly to the middle courses of the Euphrates river valley (Cauvin 1978). The general Natufian inventory, as now available, suggests a sort of inchoate approach to settled village life. However, save that they had the domesticated dog, there is no firm evidence as yet that the Natufian people were actual producers of domesticated foods.

The apparent equivalent of the general Natufian level, east of the Euphrates, is the evidently incipient village assemblage first seen by the Prehistoric Project at Karim Shahir in 1951 and presently encountered at Zawi Chemi Shanidar (Solecki 1981) and in brief tests at Asiab in the Zagros and at M'lefaat on the piedmont near Mosul. As a generalization, the inventory is roughly analogous to that of the Natufian although the artifactual details are different. Again, round house remains occur. There are indications that sheep, and possibly goats, were herded (or manipulated in some way). On the whole, however, the incipient range along the Zagros is unfortunately not so well understood as its counterpart in the Levant, where the Natufian exposures are far more numerous.

A next and probably intermediate step is even less clear. We still lack detailed understanding of the probable transitions from the above mentioned incipient village assemblages to those of effective village-farming communities - the next general level. At the moment, there are probably somewhat better hints from the Levant in the so-called PPNA materials (Bar-Yosef op.cit.) and perhaps from the Damascene Aswad (de Contenson 1979; also van Zeist and Bakker-Heeres 1979), than in anything now available from the Zagros region.

However, with the onset of the effective village-farming community range of activity (say following about 7500 B.C., in Libby, uncalibrated terms), our understandings may well be better for the Zagros region than is yet the case for the Levant. There are roughly comparable inventories not only from the Zagros flanks sites, such as Jarmo, Sarab, Guran, and Ganj Dareh - with Ganj Dareh probably the earliest available example - but also from sites on the piedmont such as Ali Kosh and the yet unexcavated Tamarkhan, as well as one or more new but yet unpublished occurrences in the Hamrin salvage area. Furthermore, Magzalia and the somewhat later sites, Tell Sotto (Bader 1979; Munchaev and Merpert 1981), and Umm Dabaghiyah (Kirkbride 1975) show that the same general type of early village assemblage was present west of the

Tigris in the Mosul region. Several-roomed rectilinear house remains are characteristic. There is clear evidence of domesticated wheat, barley, and some pulses, and of sheep, goats and, presently, pigs being kept. As time went on, portable pottery vessels were added to the inventory and obsidian tools (very rare in the incipient range sites) came into common usage.

A roughly similar inventory, but different in detail, also occurs in the Levant and in regions (now semi-arid) reaching eastwards to the middle Euphrates. While at first, in the Levantine area, there seems still to have been considerable dependence upon hunting, both domesticated animals and plants soon appeared. House remains show rectilinear several-roomed plans. The over-all area of the settlement sizes increased. As in the Zagros region, obsidian brought down from the Anatolian sources becomes common and portable pottery vessels presently appeared (Bar-Yosef op.cit.). One further characteristic of the Levantine early village assemblage is the appearance of an apparent cultic attention to human skulls, which were plastered over and often given inset eyes of shell.

It remains to note that we have, as yet, far less evidence for really early village-farming communities on the Iranian or Anatolian plateaus. The site of Zaghe, near Qazvin, Iran, may represent a late aspect of the general early village level. For Anatolia, we know far too little of basal Hacilar. In addition, Aşikli, another so-called protoneolithic site in Anatolia, has never actually been excavated, while Suberde (the "hunter's village in neolithic Turkey") has no direct evidence of domestication of either plants or animals (Bordaz 1973). Furthermore, as of the early 1960s, the whole upper drainage region of the Tigris and Euphrates river systems in southeastern Turkey was still a virtual terra incognita archeologically, especially as regards its late prehistory.

The general time span for all of the early village-farming community range of activities, both in the Levant and in the Zagros, covers about a millenium and a half (ca. 7500-6000 B.C., in Libby, uncalibrated terms). Presumably the incipient range lasted until about 7500 B.C. Just how early it began and which different aspects it had are still reasonable questions.

ÇAYÖNÜ AND ITS PREHISTORIC OCCUPATION

The Joint Istanbul-Chicago Universities' Prehistoric Project was formed, in 1962, in full consciousness of the archeological terra incognita in the upper Tigris - Euphrates drainage basins. We reasoned that this region ought to yield useful evidence of the beginnings of a food-producing way of life (Çambel and Braidwood 1980:36). As the result of our surface surveys in the autumn of

1963, the site called Çayönü was selected for excavation.

Çayönü, now a smoothly shaped low mound of somewhat over three hectares in area, rises almost five meters above the surrounding plain. It lies just north of a perennial stream (a tributary of the upper Tigris) that drains the small plain of Ergani. This plain spreads out southward from the foot of the first slopes of the eastern Tauros mountains. To the south of the stream itself (and of Çayönü) there is a low limestone ridge beyond which stretches the broad Diyarbakir plain. The general environmental situation at the time of the site's occupation must have been quite favorable for both a hunting-collecting and a simple food-producing economy (Erinç 1980).

From our first 1964 exposures onward, it has been clear that the main occupation at Çayönü was indeed that of a very early village-farming community. The occurrence of pottery, apparently restricted to one or two minor later occupations, mainly on the northeast quadrant of the mound - generally substantiated by our intensive surface survey (Redman and Watson 1970) - became evident in our 1968 season. No building remains pertaining to the pottery have yet been excavated.

Otherwise, what we have recovered belongs to the site's main prehistoric occupation.

This main prehistoric occupation of Çayönü has yielded a group of radiocarbon age determinations, of which the seven most reliable samples so far assayed cluster about the half millenium, 7250 to 6750 B.C. (Libby, uncalibrated; see Çambel and Braidwood op.cit.: 50-51).*

THE STRATIGRAPHY AND BUILDING REMAINS AT ÇAYÖNÜ

So far, almost ten percent of the area of the mound (i.e., the area which in all probability contains building remains but excluding the yet untested lower talus slopes) has been exposed in the nearer surface and middle depths. There are, however, so far only three very restricted probes which go down into sterile soil itself. As our field seasons have progressed, it has become increasingly clear that in spite of the smoothly sloped present profile of the mound, as seen from the plain, the stratigraphy within Çayönü is far from being a series of orderly horizontal levels.

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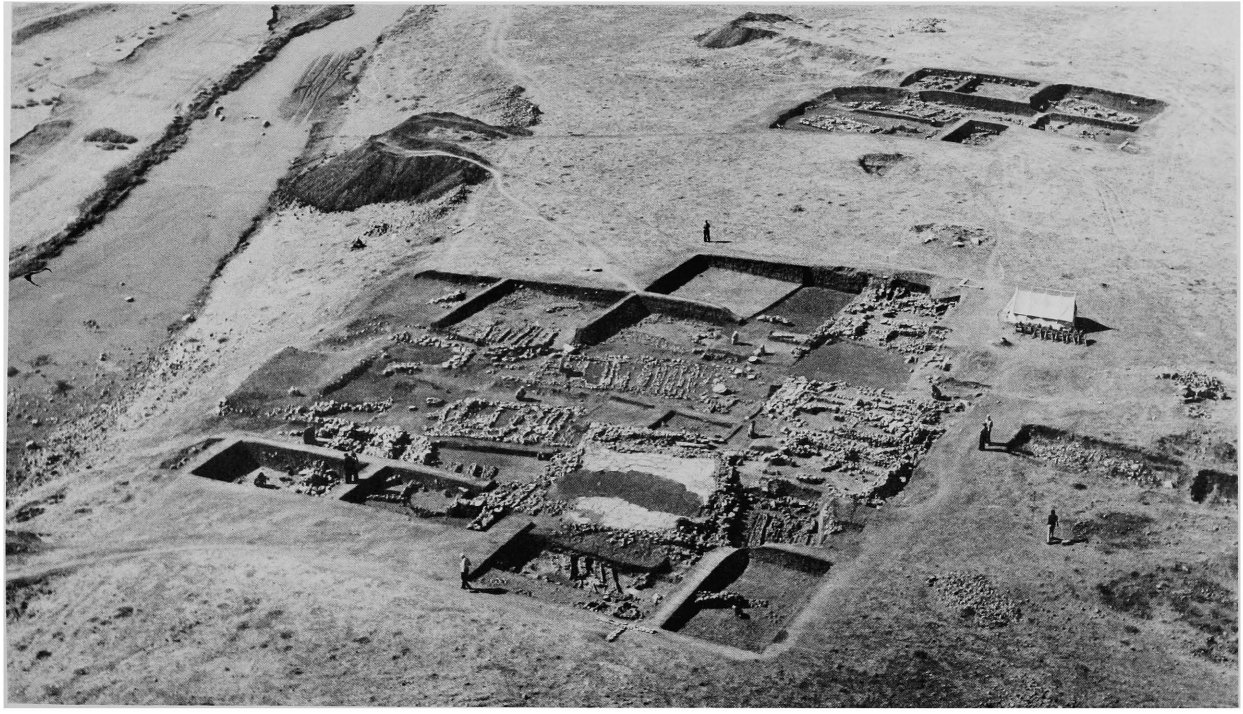
*In late September, 1981, the Groningen laboratory informed us of four more assays: GrN-10358, KE 6-1, 7230 B.C.±80; GrN-10359, KE 6-5, 7100 B.C.±140; GrN-10360, KW 8-1, 7350 B.C.±140; GrN-10361, KW 6-5, 7340 B.C.±110 (all Libby, uncalibrated). All four samples were of charcoal and came from reliable contexts within the so-called earliest available levels sub-phase.

Our excavations have been concentrated in two main areas. One of these stretches from the center of the mound southward toward the slope to the stream; the other area lies toward the west-southwest (Pl. 1.I).

By the end of our 1970 field season it seemed that we were merely dealing with an orderly sequence of the remains of five distinct building plan types (Braidwood, Çambel, et al. 1971). As the 1972 season ended, we believed that we might have a hint of one more plan type, but it is worth quoting from our preliminary report on that season's excavations (Braidwood, Çambel, et al. 1974: 568) to the point that -

> ....some of our earlier generalizations and interpretations were overly simplistic.
>
> An example of this, which followed our 1970 season, was our assumption of a five-part stratigraphic succession in the major prehistoric occupation of Çayönü. The expanded 1972 exposures indicate that these five "phases" (which we shall henceforth refer to as sub-phases of the major prehistoric phase of occupation) were in fact an apparent succession of architectural plan types. In no case, however, have we yet encountered this apparent succession in one complete stratigraphically conformable series, all superimposed in one single exposure. There is also, now, a hint of still another plan type, but we have no proof as yet that the major prehistoric phase was made up of six such sub-phases over the whole mound's area. We do feel assured that the sequential order we suggest is essentially correct. This sequence runs (from earliest to latest): (a) basal pits, (b) curved wall, (c) grill plan, (d) broad pavement plan, (e) cell plan ex "burned-brick phase", and (f) large-room plan. Nevertheless, since these were not all exposed in sequential stratigraphic order in one single trench, but in different trenches and at different depths, the exact correlations are yet to be worked out by interlinking the trenches. It is - for example - possible that the basal pits may have been due to outdoor activity adjacent to the curved-wall or grill-plan buildings and also possible that one or another of the broad-pavement buildings may have been continued in use during the cell-plan sub-phase. Hence we are increasingly reluctant to number the sub-phases consecutively.



Pl. 1.I Çayönü, air view to the southwest. Foreground - main area; right background - western area; left background - perennial stream. Courtesy the Turkish Army, November, 1981.

The same sense of caution regarding our "stratigraphic and chronological" understandings, as of about 1974, appears in the introduction to our first Istanbul University volume of general reports (Çambel and Braidwood 1980: 45-47), with a further down-playing of the term "sub-phase". An even more marked retraction from our earlier simple five or six part scheme appears in the preliminary report on the work of the 1978-79 seasons (Braidwood, Çambel, Schirmer, et al. 1981). This report takes no account of the problematical "basal pits" and the "curved wall sub-phases" and stresses (loc.cit.:251) that "Within Phase I, the main prehistoric phase of Çayönü, there are - in terms of construction - at least four sub-phases of building activity" (our italics here). The building remains considered in the report on the 1978-79 fieldwork are those of

> (a) what we now call the uppermost levels sub-phase, consisting so far of the apparently more-or-less complete foundations of two or three buildings, in near surface contexts, having rather large single or two roomed plans - which we first called the "large-room sub-phase",
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> (b) the cell plan sub-phase
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> (c) the grill plan sub-phase, and
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> (d) what we now call the earliest available levels sub-phase, which includes the quite fragmentary remains of several different types of plans, one being of a round or ovoid building with a wattle-and-daub wall (not the ephemeral "curved wall" of 1972).

The "broad-pavement" plan type had been considered in our earlier reports as representing a sub-phase in itself, in both a stratigraphic and chronological sense. By 1981, however, it had become clear that the flagstone floored example of a broad pavement plan came at least with the earliest grill plan remains while the terrazzo floored example of the same broad pavement plan type over-bedded grill plan remains. We are now convinced that the remains of the broad pavement plan type represent buildings of some very special non-domestic purpose - whether sacred or secular in intent - and that this plan type persisted over several sub-phases.

Detailed descriptions of the above mentioned various types of building remains, so far recovered at Çayönü, are in the process of being made by our Karlsruhe colleagues. Brief accounts and illustrations of the plan types are available in our 1978-79 seasons' report and in the first Istanbul University volume. We offer here only very brief descriptions of selected examples of the cell and grill plan types (which we think were structures of domestic purpose), and also a brief description of the broad pavement plan type.

The cell plan remains consist of rather high stone foundations for rectangular buildings (ca. 5.0 m wide by 8.0 m long). Normally, the long axis of these cell plans runs north-northeast. The interiors were divided into a number of small cell-like rooms, usually too small to be considered as anything but storage bins. We believe that the tops of the stone foundations bore the mud brick upper and outer walls of the buildings and also bore beams upon which was constructed the main living floor of the cell plan buildings. Especially in the western area, cell type plans appear immediately under the surface and some of the uppermost of these examples do not conform exactly - in orientation or detail - to the standard just described.

This presents a problem: are various of the now available building traces, from what we are calling the uppermost levels sub-phase, simply degenerations of the earlier standard cell type plan?

The grill plan remains have stone foundations which are less high than those of the cell plans: the foundations indicate long rectangular buildings (ca. 5.0 m by 12.5 m) with the long axis to the north-northwest. The northern half of this plan type - the grill portion itself - has a series of closely set cross walls, that we assume served as joists upon which floors were built. The openings between the cross walls would thus have served to aereate the floors. The southern portion of the overall plan consists of a pebble pavement beyond which - in some of the better preserved examples - are the foundation remains of two or three small cell-like rooms at the southernmost end of the plan.

There are several clear instances in which grill plans are overbedded by cell plans. It is noteworthy, however, that cell plan remains have not, so far, been encountered much to the south of the general east-west central axis of the mound. On the otherhand, wherever sufficient depths of exposure have been made, both in the mound center and toward the south - even as far as the slope toward the stream - grill plan remains have been encountered. We feel quite positive that the cell remains were those of houses and also tend to think such was the case with the grill plan remains. We are, however, puzzled by the relatively small yield of artifacts in the grill remains.

The more impressive example of the two broad pavement plan building remains was the later and larger example, which was provided with a fine reddish-orange terrazzo floor, about 7.5 m by 10.0 m in size. The pavement of the earlier and smaller example was of carefully set flagstones. The long axes of these two examples run roughly east-west, with the buildings' original openings undoubtedly to the south (unfortunately, in both cases, the southern portions of the plans are incomplete). Pilasters were used on the interior wall faces. In the terrazzo floored example, pairs of white lines (composed of white marble tesse-

rae) in the floor accented the positioning of the north-south pilasters.

As of the 1980 and 1981 field seasons, at least two more individual instances of distinct building plan remains appeared, but neither of these is fully cleared, nor can these remains yet be fitted into our four part sub-phase scheme given in the 1978-79 report. The first of these new building remains had small rooms with exceptionally heavy stone walls that rose to a considerable height. Portions of these walls had a plaster facing and in two of the small rooms there were clusters of human skulls. The presence of the skulls (which totaled at least forty) and certain details of the still incomplete plan suggest that this also may not simply have been a domestic structure. (While they are not plaster covered, the disembodied skulls recall the attention given to skulls at this same general time in the Levant).

The other plan, suggested by building remains only partially exposed at the end of the 1981 season, appeared to be of a rectangular building with rounded corners and with its long axis lying in an east-west direction. In all probability it represents a domestic structure. The remains appear to be an example of earlier building activity on a high portion of the original mound core; their absolute elevation is essentially that of nearby cell plan remains.

The situation thus described, complicated as it may be, clearly adds up to the fact that our earlier suggestions of an orderly succession of five or six stratigraphically and chronologically ordered sub-phases do not correspond to the presently available evidence. It becomes increasingly clear that the stratification at Çayönü is indeed far from being one of layer-cake horizontality. This must be born in mind when the reports which follow are used. Redman's report (pp.17-71) on the 1968 and 1970 seasons' chipped stone materials is cast within the understandings we had at the end of the 1970 season. Davis's (pp.73-174)treatment of the ground stone was finished in 1980 and conforms to our thinking as given in the 1978-79 seasons' report. Lawrence's (pp.175ff.)report, utilizing the faunal materials available through the 1978 season, underlines our difficulty in understanding the relationship of the <u>end</u> of the cell plan sub-phase to the uppermost levels sub-phase. We still face the problem of whether the uppermost levels sub-phase is a distinct stratigraphic and chronological entity.

THE ÇAYÖNÜ ASSEMBLAGE OF THE MAIN PREHISTORIC PHASE

At first glance, the apparent difference between the grill plan type of building remains and those of the cell plan type might suggest a fair degree of change. On the otherhand, the general artifactual inventory seems to

show a fairly high degree of stability throughout the main prehistoric phase. There were, in the normally accepted sense, no portable pottery vessels although we did recover several heavy platter-like or basin-like examples of very coarse and lightly baked clay (when the house where they were in use was burned?). There were also examples of lightly baked clay figurines of animals and of humans - usually pregnant females - although in no such numbers as is usual from the Zagros sites.

The overwhelming bulk of artifacts fall within the chipped and heavier ground stone categories, both reported on in detail in this volume by Redman and Davis. Linda Braidwood (1979) has considered the possible linkages which the Çayönü flint and obsidian artifacts have with the chipped stone of other sites. Of particular use, in her opinion, are backed obsidian blade tools with striations along the edge (p.42 and Figs. 2.14;2.15), seen at Shimshara (Mortensen 1970) and to a small degree at Jarmo in the Zagros. The same obsidian implement was recovered in a surface survey at Boy Tepe, a site in the Keban salvage region north of Çayönü (Whallon 1979:246) and subsequently in the Karakaya salvage region near Malatya at a site called Cafer Hüyük (Özdoğan 1977:57), now being excavated by Jacques Cauvin. Also noteworthy in the Çayönü chipped stone industry are the tanged implements: rare (and questionable) projectile points, tanged end scrapers and perforators. Some tanged implements were also reported from Shimshara. The same obsidian backed blades and tanged chert implements - rare projectile points, tanged end scrapers, burins and perforators - were found at Fakhariyah in north Syria.

As to the heavier ground stone category - a group of artifacts rarely given adequate attention - we know of no study so far that is as exhaustive as is Davis's. However, since a comparable amount of detail is not otherwise available from other Near Eastern sites, he has little opportunity to establish linkages. It might be noticed, for example, that Çayönü, while it has a variety of ground stone pestles, is almost without stone mortars, an artifact quite normal to the Jarmo assemblage.

It is within the variety of smaller objects of fine-grained stone, such as "bracelets", stone bowls, smoothed balls, and grooved stones, that Çayönü shows its closest correspondences with the Jarmo assemblage. The same generality could be made for the Çayönü bone tools, save for certain long ovoid plaques of bone, pierced and showing signs of string wear (cf. Çambel and Braidwood 1980: pl.46:19). P.E.L. Smith (personal communication) has recovered the same type of bone artifact at Ganj Dareh.

Since Çayönü lies barely twenty kilometers downslope from the Ergani Maden copper lode, which is still being mined, it is not too surprising that we have recovered a fair number of both malachite and even of native copper

fragments. The malachite encountered, most often as formless fragments, usually appears as beads or pendants when it is in the form of artifacts. The native copper pieces themselves - which we have recovered at the rate of about five to ten pieces per season - show a marked proportion of attempts to beat the pieces into the form of simple pins, hooks, reamers and small flat sheets. There are also, however, simple unworked small hunks of the metal.

The hard gumbo-like consistency of the Çayönü matrix makes the clearance of human skeletal material very difficult, and the badly preserved condition of the bones also tends to make precise age and sex determination very difficult. There is, however, no question but that - unlike Jarmo - burial within the site and actually within the cells or in the small southern cell-like divisions of the grill plans was quite normal. The bodies were flexed but in no fixed orientation. In several cases, there were remains of strings of beads; in other cases neatly sawed-off tines of deer antlers and teeth of large artiodactyls were part of the burials.

THE NON-ARTIFACTUAL EVIDENCE

Here we face something of a surprise. Lawrence's section underlines the fact that the appearance of domesticated animals came rather late within the span of the main prehistoric phase of Çayönü. The evidence she treats runs only through the 1978 season, however, and there may well be some qualification in the future when the faunal remains of the 1980 and 1981 seasons are fully analyzed and when our understandings of the exact nature of the transition from the standard cell plan type of building remains to those of our so-called uppermost levels sub-phase becomes more clear. As of now, however, Lawrence asserts firmly that all her evidence is for a sudden appearance of domestic sheep in certain units of the upper levels (p.). There was, as her following report shows in detail, an adequate supply of the bones of wild artiodactyls and of wild pig, from the beginning of the main prehistoric phase until towards the end, when the shift to domesticated caprines set in. Hence, it appears that for much of the site's duration, the people of Çayönü depended on hunting for their animal protein supply, for hides, and the raw material for bone tools. A general point sometimes has been made, regarding the appearance of animal domestication, of the possibility that some degree of manipulation of gregarius wild animals may have taken place. (In such a case, it is reasoned, the bones would not yet exhibit the osteological traits identifiable as those of domesticated animals.) In the instance of the Çayönü faunal material, however, Lawrence is convinced that such was not the case. The marked rise in the proportion of caprine bones in the upper levels negates the possibility. The story of precisely how domesticated animals came into use at Çayönü is not yet finished.

As for domesticated plants, both the wheats (einkorn and emmer) and certain pulses were available from the beginning (Stewart 1976, 1981; van Zeist 1972) but, curiously, domesticated barley is not evidenced. In his part of our 1978-79 report (Braidwood, Çambel, Schirmer, et al. 1981:256) Stewart makes a particular point of this lack and also wonders whether a possible decline in the supply of hunted meat may have accelerated crop production.

As well as the evidence pertinent to matters of animal and plant domestication and of hunting, there are significant traces of food-collection. Finds of fish bones (very fragile in any case) are relatively rare but some quantity of river clams and the bones of turtles have been recovered. There are also the remains of collected plant foods, especially of nuts such as wild almonds and pistachios (which Stewart notes to have been the primary oil seed used), and also the remains of hackberry and the pips of grapes.

Unfortunately we are not yet well off as to the identification of the possible source areas of the various stones and minerals of which the Çayönü artifacts were made. To our minds, even the current suggestions as to the various possible sources of Anatolian obsidian (Gale 1981) depend on still very incomplete surveys of only some of the possible source areas and of the exact nature of individual obsidian flows. Ideally, for the obsidian, a wide ranging survey across various national frontiers, undertaken by experienced vulcanologists, is what is needed but may hardly be a realistic hope. Also, for other minerals utilized at Çayönü, the matter of positive identifications and of sources still remain unfinished business.

CONCLUSION

In sum, the Çayönü assemblage - as a gross generality - conforms to those of other early village-farming community occurrences of both the Zagros and the Levantine regions. In detail, however, the Çayönü assemblage has - in the main - a complexion of its own.

Our 1963 surface surveys in the southeastern vilayets did not yield traces of a preceding incipient level which, as we suggested above, is available in both the Zagros and the Levantine regions. We have speculated (Çambel and Braidwood 1980:37) that the traces of this earlier level may well be found at lower elevations, further south, perhaps in the Mardin region. Whatever may prove to be the case in this matter we do not yet know the more specific antecedents of the Çayönü assemblage and of the culture it represents. Given the surprising variety and complexity of the Çayönü architectural forms and of the level of social organization they must imply - at the time of the very threshold of effective food-production -

the identification of Çayönü's antecedents presents a real challenge in culture history. So, too, will the results of a careful analysis and interpretation of the evidence which Çayönü itself has and will, hopefully, continue to yield.

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CHAPTER 2

THE ÇAYÖNÜ CHIPPED STONE INDUSTRY: the 1968 and 1970 Excavation Seasons

by Charles L. Redman

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INTRODUCTION

The Joint Prehistoric Project of Istanbul University's Prehistory Section and the University of Chicago's Oriental Institute has conducted three seasons of excavations in the Diyarbakir province of southeastern Turkey. This research is concerned with collecting data and testing hypotheses relevant to the origins of settled village life and the domestication of plants and animals in the Near East During 1964, 1968, and 1970 the Joint Prehistoric project centered its excavations and intensive surface survey on the early village site of Çayönü (38° 16'N, 39° 43'E), a low oval mound of about 250 m by 150 m adjacent to a tributary of the upper Tigris River (Çambel and Braidwood 1980;

Braidwood, Çambel, and Watson 1969; Braidwood, Çambel, Redman, and Watson 1971; Braidwood, Çambel, Lawrence, Redman, and Stewart 1974). The following interim report is a description of the chipped stone industry recovered during the 1968 and 1970 seasons of excavation

The locations of excavations on the mound of Çayönü were determined with respect to several different goals. During the first season, two major areas were opened near the highest point on the mound. One was on the slope of the mound that had been steeply eroded by the adjacent stream (Fig. 2.1:K 11-16). A larger exposure was made at the summit of the mound to uncover prehistoric structures (Fig. 2.1:K2-9).

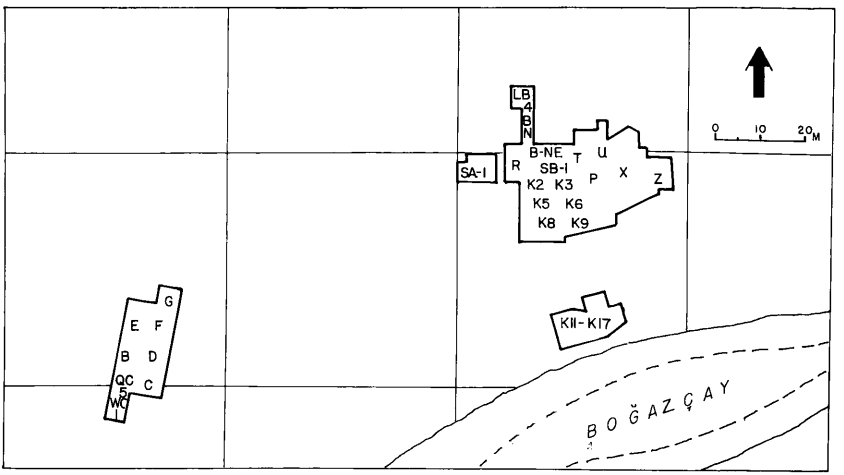


Fig. 2.1 Plot plan for Çayönü indicating excavation units for the 1964, 1968 and 1970 field seasons.

An intensive systematic surface collection was carried out at the beginning of the 1968 season in an attempt to discover different areas of the site that would aid in the location of future excavations (Redman and Watson 1970). One area was selected in order to expose lower levels of the site (Fig. 2.1:WC1 and QC5). The analysis of the surface collection showed that by excavating in this area we would not have to remove the overburden of later levels which occurs at the center of the site. Another excavation unit was placed in an area where the results of the controlled surface collection implied that there would be deposits of a proto-historic ceramic occupation (Fig. 2.1: LB4). Other excavations were located adjacent to the earlier exposure near the summit of the mound (Fig. 2.1: SB1 and SA1.)

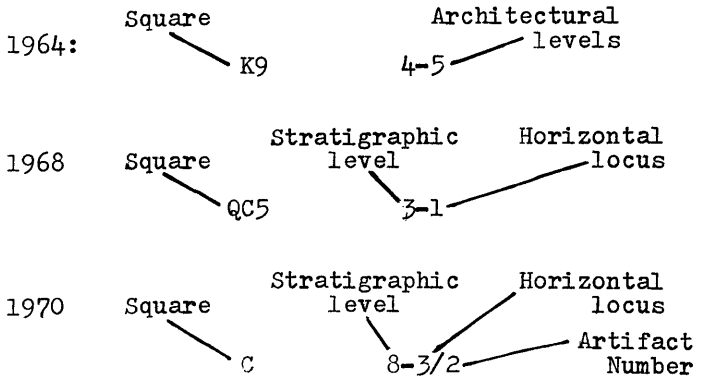
During the 1970 season the area of excavation was considerably extended. A large area adjacent to the previous

work on the summit was opened to expose more architectural remains of the later preceramic levels (Fig. 2.1:P, T, U, X, and Z). Portions of the previous season's exposures were continued down to lower levels (Fig. 2.1:R and S), and in one six-by-six meter square (R), sterile soil was reached. Another large area was uncovered adjacent to the 1968 exposure on the western edge of the mound in an attempt to uncover more architecture from the early levels of Çayönü (Fig. 2.1:B, C, D, E, F, and G). In two of these squares sterile soil was reached (C and E).

Over the course of these three seasons approximately 900 square meters of Çayönü have been exposed, which is about 3% of the mound's area. During these excavations, over 1300 cubic meters of earth have been moved, which is about 1.5% of the estimated volume of the mound. On the basis of the soundings that reached sterile soil (C, E, and R), it is estimated that the maximum depth of cultural deposit on Çayönü is about 4 to 5 meters. By integrating evidence from the intensive systematic surface collection and the three seasons of excavation, it is possible to approximately outline the location and extent of the occupation areas of each of the ancient communities of Çayönü.

When practical, the basic units of recording and analysis were architectural features. This reflects our assumption that prehistoric activities took place with respect to location of existing architectural features. Thus, when possible, recording by architecture replaces the preliminary grid system of arbitrary units. A flexible system of recording and excavation techniques was used, during the digging in 1970, adjusting the size and margins of the exposure area of the excavation unit to the type of deposit being unearthed.

Our labeling system reflects this procedure by including more precise notation for more detailed observations, while enabling the majority of the pieces to be labelled precisely with only three digits. The excavation units were named somewhat differently each season (single letter and number, two letters and one number, or only a single letter), but the systems are interchangeable. The first letter(s) represents the major horizontal excavation unit (5 by 5 meters square), the first number is the stratigraphic level within that square, and the number after the dash is the horizontal locus within the units from which the artifacts came. By using a dash to set off the two notations (level and locus) a minimum number of figures can be used. This saved time in labeling, an important consideration because we had fifty thousand pieces of chipped stone to label from the 1970 season alone. If material was found on a floor or in another situation where the exact context seemed important, then an extra digit after a slash was added to give each artifact a unique number that could be used in describing it, identifying it in a photo, or in placing it on a map.



SYSTEM OF ARTIFACT ANALYSIS AND CLASSIFICATION

The goal of the artifact analysis is to produce information related to patterns of prehistoric behavior. We are attempting to record the morphological attributes and spatial distribution of artifacts that reflect the different activities of the prehistoric occupants of Çayönü. Fundamental to this approach is the discovery of the use or uses of each kind of tool. Therefore, the two primary aspects of analysis are first, determining the function of the recovered artifacts, and second, hypothesizing what activities were being performed. This artifact analysis incorporates the results of preliminary classification to help direct later stages of the research. In addition, the results of the later stages of research are used to refine the initial categories that had been utilized. This constant interplay between previous concepts on the one side, and the on-going results of research on the other, demands an efficient program of analysis. The organizational effort required is worthwhile because of the potentially productive nature of this type of integrated research strategy.

This interim report on the Çayönü chipped stone industry is a primary stage in the total research design. What is reported here already involves aspects of the original classification system plus innovations discovered during the course of research. More important, future analyses will incorporate additional information produced during the preparation of this report, and subsequent artifact analysis will begin with the improved system as the initial stage. Consequently one should not expect the following to be the ultimate, definitive report on the nature of the Çayönü chipped stone artifact inventory. This article is a description of my best current understanding of the uses and the nature of the Çayönü chipped stone material, but it is only the present stage in an on-going process that hopefully will yield greater understanding and more accurate representation as the fieldwork and analyses continue.

In the analysis of the chipped stone pieces from Çayönü I utilized a modification of a typological system developed by Linda S. Braidwood and Bruce Howe on the basis of their work with similar sites in the Near East. The types are based on shape and edge use variations that are divided into separate categories according to a series of attributes determined through experience with chipped stone artifacts. These types form the basis for later observations and analysis. Because these types are based on decisions made by the researcher it is important to define their essential attributes objectively. To improve the consistency of classification it is best to have one researcher make all final decisions.

QUANTITATIVE ANALYSIS OF THE INDUSTRY

The exact nature of the statistical and quantitative procedures that one uses in analyzing data depends on the goals of the research and the assumptions made about the data. Quantitative analysis serves three basic functions: description, inference, and hypothesis testing. In the artifactual analysis of the Çayönü material I am interested in all three aspects of quantitative analysis and have initiated a broad statistical program. The preliminary form of analysis is the recording of the artifacts excavated and an analysis of their distribution in the site. The information for these descriptive analyses should include counts of artifact types (Tables 1 and 2), diagnostic ratios of types (Table 3), and for special purposes, measures of individual attributes (e.g., weights in Table 4; lengths in Fig. 2.3; or cross sections in Fig. 2.5). These three forms of data were used for different aspects of the Çayönü distributional analyses. The recordings have been made according to the division of the excavated levels into five sub-phases* which apparently run in stratigraphic succession (Fig. 2.2). This division is the background against which the differences in the proportions of artifacts that were utilized during each sub-phase of the prehistoric occupation of Çayönü are recognized and measured.

Photographs and drawings of objects in the Çayönü chipped stone industry are included to add a visual dimension to the verbal and metric descriptions. Equally important are the tables and graphs that present the quantitative distribution of artifacts as they occurred in the five sub-phases of the Çayönü sequence. This involves detailed tables

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*The major prehistoric phase of occupation at Çayönü has been divided into five sub-phases. It is not certain that there are not more than five sub-phases, but the relative order of the ones thus far discovered is generally agreed upon. The sub-phase designations are abbreviations of the major feature found in these levels and from earliest to latest are: 1 or B.P. for basal pits, 2 or G.P. for grill plan, 3 or B.P.P. for broad pavement plan, 4 or C.P. for cell plan, 5 or L.R.P. for large room plan, see Figure 2.2.

of the quantity of each type of artifact, divided according to its place in the stratigraphic sequence of sub-phases. In addition, numbers of artifacts are recorded that were found in several culturally significant units. (Tables 1 and 2).

Despite problems with a quantitative approach, I believe that it is a necessary step in archeological analysis. The identification and description of individual pieces is an important part of any archeological analysis, especially in terms of dating. However, research left at the stage of listing diagnostic artifacts is inadequate. It is not acceptable to describe a site by a few characteristic pieces, as though everything could be understood in terms of these "typical" objects. Instead, it is necessary to observe and to record all of the artifacts. The changing statistical patterns of common as well as of distinctive artifacts produce information about the prehistoric behavioral systems. Quantification is a necessary part of archeological analysis. Quantification does not replace the study of distinctive pieces, but is complementary to it. Each type of analysis adds its own form of information from which can be learned a much fuller picture of the lifeways of the people who inhabited the archeological site than is possible with only one technique or the other.

Counting is particularly relevant when one is concerned with distinct tools. The utility of counting is diminished when analyzing pieces that were not used as distinct tools. Chipped stone debris can shatter in any number of ways and it may not be particularly important how many fragments were broken off a core. In order to record these pieces accurately it would be useful to employ weighing as an additional means of measurement. Weight is a more relevant feature than numbers when one is calculating the amount of material such as obsidian brought to a site, or the amount of material wasted in a manufacturing process. Measuring the weight of pieces is also valuable in providing data for assessing changes in the size of individual pieces and in the relative weights of different types of artifacts. Weight is also a crucial feature of any implement that relies on momentum for its cutting function, such as an axe or an adze.

The basic goal of this report is not to offer a definitive statement about the past communities at Çayönü, but to present a clear and complete description of the chipped stone industry as I understand it, and of some of the ways it has been analyzed. An effort has been made to present the data so that it can be utilized by other researchers who want to check our conclusions or to incorporate the data into their own research. Later revisions and even substitutions, are expected, but it would be wrong to allow this anticipation to prevent us from communicating our findings until all of the work is completed on this very important site. This Interim Report has been prepared in the hope that others will find the early publication of our material worthwhile and useful in their own work.

CHIPPED STONE PIECES

Chipped stone pieces are the most common type of artifact found at Çayönü. Two raw materials are used for the fabrication of these implements: obsidian and flint. A wide variety of tools are made from these materials and are utilized in many different ways. We study their form and distribution because artifacts give an indication of the prehistoric behavior of their users. A morphological system of classification has been used. Shape, size, utilized edges, and raw material are the basic attributes of the classificatory scheme. It is believed that the recording of these attributes and their distribution across the site are accurate reflections of changes in the activities and technology of the prehistoric community. All the material recovered from the 1968 and 1970 seasons that came from unambiguous excavation contexts has been classified and tallied. Levels were not tabulated if there was a possibility of mixture. These were eliminated because the results might obscure the patterns discovered by analyzing data from uncontaminated excavation contexts. Following this guideline, three-fourths of the total excavated material was analyzed and tallied as presented in Tables 1 and 2. Retouched tools and special pieces from the unanalyzed levels were sorted and subjected to the same detailed measurements and observations as the tools from the tallied levels.

Tables 1 and 2 represent the results of the classification of approximately 46,000 chipped stone pieces according to the typological system described above. The chipped stone pieces were initially divided into two groups: obsidian or siliceous stone (flint, etc.) pieces. The obsidian is not available locally. There is trace-element evidence that some of the obsidian was brought from sources near Lake Van, about 200 km. to the northeast (G. Wright 1969). During the occupation of Çayönü, trading networks involving obsidian were widespread in the Near East (Renfrew, Cann, and Dixon 1966; G. Wright 1969). The flint was supposedly available in the immediate vicinity. Most of the flint used for making artifacts was a high quality, light brown material that may have come from deposits in the nearby mountains, stream cobbles found in the adjacent, now seasonal, stream, or from nodules in the limestone outcrops across the stream. These limestone outcrops are currently being quarried for gravel and flint. The basic quality of the flint from these outcrops seems too poor to have been the source for the Çayönü inhabitants, but they may have removed most of the easily reachable high quality material.

The next step of the analysis is to divide all of the chipped stone pieces according to size. Pieces over ten millimeters wide are considered "normal" size, and those less than ten millimeters are "microlithic". This is an arbitrary measure determined in part by the form of the piece and its state of preservation. Other measures of size are also influenced by form and preservation, hence,

this dimension was considered adequate as a first approximation.

In order to determine which dimension would be most appropriate for dividing the artifacts by size, numerous measurements were made on a large sample of the pieces. On the basis of this study it appears that any universal division by size such as we used is only useful in a preliminary analysis. Since major variations exist between the range of sizes of different artifact types it would be best to measure the dimensions of every piece and then separate them according to the natural groupings observed.

When dealing with a large assemblage of chipped stone pieces (46,000), it is clear that detailed measurements on all of the pieces is impractical considering the normal limits of time and personnel. It is possible to discover the parameters of a large population by making measurements on only a sample of it. Statisticians have carefully worked out the limits of accuracy and reliability for certain sampling procedures, such as random sampling (Redman 1974:22). If there are over 1,000 pieces in a category then measurements on 10% of the total will yield reasonably accurate results. If the number of pieces is smaller than 1,000 pieces the proportion of the population measured must be larger. To gain sufficient statistical reliability concerning tool types that occur in limited numbers (less than 100 pieces), most, if not all, of the pieces must be measured (at least 50% sampled). On the other hand, with types such as utilized blades, it is possible to measure a small proportion (under 10%) of them and still have a very accurate knowledge of their size distribution and other characteristics.

To demonstrate the utility of sampling, measurements were made on all of the obsidian blades and blade fragments from many of the levels in the units excavated during the 1970 season. These measurements and observations on blade shapes were made on 1853 pieces. Two samples, the first of 10% of the blades and the second of 20% of the blades, were taken by means of a random start and a regular interval among the recorded obsidian blades. The results of both samples were extremely close to the values derived from measuring every piece. The distribution of values in the 10% sample (mean = 25.6 mm; standard deviation = 10.3) is not statistically different from that in the entire population (mean = 25.2 mm; std. dev. = 10.7). The 20% sample is even closer (mean = 25.3; std. dev. = 10.4).

Figure 2.3 is a graph of the distribution of obsidian blade and blade fragment lengths from the 1853 pieces measured (shaded bars), and from a 20% sample (hatched bars). In addition to the similarity demonstrated by the mean values, the visual comparison is quite close. I suggest that it would be better to measure only a sample of the pieces in more numerous categories and to utilize the time saved to make additional observations.

After division by raw material and size, the chipped stone pieces are classified into various categories based on form, technology, and utilization. The classificatory system takes into account other characteristics, such as pieces with sheen, flakes and blades with traces of cortex, and cores and core fragments that have been utilized in ways other than as cores. Altogether the chipped stone pieces were divided into over three hundred categories.

The counts of artifacts in each of these categories are presented in the framework of the five stratigraphic segments and related time sub-phases identified during excavations (see Fig. 2.2). The usefulness of the sub-phase divisions does not rely on whether or not they reflect distinct cultural complexes. The hypothesis that the sub-phases represent chronological units is a reasonable one that can be tested by the data that has been assembled in this report. In addition to the tabulation of pieces in each sub-phase, counts are given for several cultural complexes identified during excavation. R 20-2 is a cache of flint pieces found in the sub-phase B.P. deposits. EF 2 is the best preserved of the grill building foundations from sub-phase G.P. U 9 is a multi-cell burnt structure from the sub-phase C.P. levels. U 4 is a single room structure attributed to sub-phase L.R.P. I suggest that total counts for each sub-phase are more accurate representations of the relative frequencies of artifact types throughout the excavation than are counts of individual cultural complexes in each sub-phase.

* * * * * *

Çayönü's chipped stone industry was produced by skilled stone workers. In the earlier levels, flint was the primary material used for making implements; in the later levels, obsidian became equally common. The overall focus of the chipped stone industry was on blades and blade fragments that were utilized or retouched into distinct tools. Retouched pieces account for about 10% of the flint in each of the sub-phases of occupation (see Fig. 2.4). Of that 10%, less than half can be identified as distinct tool types. The vast majority of implements were blades modified only by utilization. Utilized blades and flakes must have served many purposes. The manufacturing of blades reached a high level of efficiency with the use of pyramidal and parallel-sided blade cores, both microlithic and normal size. Blades with evidence of a lustrous sheen are increasingly common in the later sub-phases, but account for only 11% of the flint blades found in these later sub-phases, while in the earlier sub-phases they total 6% or 7% of the blades. Flint and obsidian pieces, with attention to their tips as the main feature were present in all sub-phases, but were most abundant during sub-phase G.P. (2.5% of total pieces including a single cache of 150 pieces) and diminished in the later sub-phases (sub-phase L.R.P.--0.5% of total pieces). Scrapers were an important element in the chipped stone industry with their proportion increasing during the later

sub-phases, going from 0.6% of total pieces in sub-phase B.P. to 1.5% of total pieces in sub-phase L.R.P.

The obsidian assemblage is predominantly a blade industry. There are obsidian scrapers made in forms similar to the flint scrapers. There are some obsidian pieces with tip attention as their main feature, but they are proportionally not as common as their flint counterparts. By far the most abundant distinct tool made at Çayönü is the backed blade. This backed blade, often steeply backed on both edges, is distinguished by linear striations on the ventral surface and is described in detail in the section of this report on obsidian tools.

The relative importance of obsidian as a raw material for the Çayönü chipped stone industry has been the subject of detailed investigations. The ratio of the number of obsidian pieces to flint pieces has been calculated for each surface collection and excavated level (Redman 1973). The value of this ratio varies with each excavation unit; in addition, the total ratio for each sub-phase changes significantly. It is clear that the value of the ratio of obsidian to flint pieces increases with each successive stratigraphic sub-phase. The ratio for the artifacts from the sub-phase B.P. is 0.05; the sub-phase G.P. 0.20; the sub-phase B.P.P. 0.52; the sub-phase C.P. 0.98; and the sub-phase L.R.P. 1.02. The increasing proportion of obsidian found in the remains from each successive sub-phase of the site's occupation could be related to its availability in a trading network (Renfrew, Dixon, Cann 1966; G. Wright 1969), or to its changing utilization by the prehistoric inhabitants of Çayönü, or to both factors.

* * * * * *

The proportion of microlithic pieces in each excavation level varies and may be related to the activities being performed there. Our excavations show that during the earliest sub-phase at Çayönü the proportion of microliths was the lowest (6%--sub-phase B.P.), while during most of the occupation it had an intermediate value (c. 15%--sub-phases G.P., B.P.P., & C.P.), and during the final occupation it had the highest of any time during the prehistoric sequence (24%--sub-phase L.R.P.). The average weight of different types of pieces from each of the stratigraphic segments varies widely at Çayönü (Table 4). The variations in average weight and ranges of individual weights could be related to types of raw material available, techniques of manufacture, or modes of utilization.

Blade Cores (Fig. 2.7:1-6; Pl. 2.I:1-9)

The blade cores used by the Çayönü inhabitants were usually made with care. The most characteristic types, the pyramidal and parallel-sided cores, are found in approximately equal numbers (Tables 1 and 2). The one-directional variety is somewhat more numerous than the bi-directional

type. Multidirectional, amorphous shaped cores of both flint and obsidian are also found. Micro blade cores of flint were infrequently found in comparison with the great number of larger flint cores (c.9%). As regards obsidian cores, however, which were much rarer, the micro cores formed a greater proportion (c.25%). Pressure or possibly indirect percussion techniques were used for detaching blades from microlithic and most macrolithic size cores. Many of the cores and core fragments were utilized also in cutting and scraping activities. The number of artifacts obviously re-utilized in this manner varies in the different levels, with the highest proportion being re-used during sub-phase L.R.P. (c.30%).

One-directional pyramidal: This type of core seems to be the single most characteristic core of the Çayonu flint assemblage, and to a lesser degree, of the obsidian assemblage. Figure 2.7:6 is a classic example of this type of core. On most macrolithic size cores only a fraction of the perimeter was used for striking blades, while considerable effort was put into the preparation of the core's crested back and periodic removal of the striking platform. On the microlithic examples (Fig. 2.7:1,2; Pl. 2.I:1,3-6) a greater portion of the perimeter was used for detaching blades. In some cases the entire perimeter was utilized, which gives the core a "bullet" shape. The angle of the striking platform and the side of the blade core is related to the manner of detaching blades. This angle varies, but is generally greater on microlithic cores (50^{o} -80^{o} than on macrolithic sized cores (40^{o}-70^{o}).

Bi-directional pyramidal: There were far fewer examples of this type of core than of the one-directional variety (about one-fifth as many). A greater proportion of the perimeter of the striking platform was used for detaching blades and less attention was given to preparation of the crested back (Pl. 2.I:2). In flint, this type of core was almost completely restricted to sub-phases B.P. and C.P., with only two examples from later context.

One-directional parallel-sided: Finely executed parallel-sided cores also characterize the Çayönü flint and obsidian industries. These parallel-sided cores are one-directional and bi-directional in approximately equal numbers. Some of these have a triangular shape when seen from the side (Fig. 2.7:4; Pl. 2.I:7,8). The angle of the striking platform for most of these cores ranges between 60^{o}-90^{o}.

Bi-directional parallel-sided: The bi-directional parallel-sided cores often exhibit a "barrel" shape which characterizes both the normal size variety and the less frequent microlithic cores (Fig. 2.7:3,5; Pl. 2.I:9).

Multidirectional: This generalized category includes many kinds of amorphous shaped cores. Some of these are re-used one-directional or bi-directional cores from which the worker attempted to take blades off in one or more directions.

Blade Core fragments (Fig. 2.7:7-10; Pl. 2.I:10)

These were frequent in both flint and obsidian. Considerable care was put into the preparation and maintenance of the cores while they were still useable, and hence the debitage from shaping is abundant. High concentrations of blade core fragments in the debris help to outline areas of ancient blade manufacturing. Often the fragments themselves were re-utilized as cutting and scraping tools.

Core tablets and platforms: Core tablets are faceted flakes of blade cores roughly rectangular in cross section, removed from the striking platform of cores to revive them (Fig. 2.7:8). Core platforms are often removed after it becomes too difficult to strike any more blades from that position (Fig. 2.7:7).

Crested blades: These blades are shaped during the initial trimming of a blade core. The two dorsal faces are covered with scars from flakes struck from the central ridge. The crested blade has a triangular cross section (Fig. 2.7:9; Pl. 2.I:10). Seen in profile the blade has more arch than normal blades. On some crested blades only one of the dorsal faces is covered by flaking scars. It has been suggested (Mortenson 1971:18), that these are produced through widening the flaking perimeter of the blade core (Fig. 2.7:10).

Flake Cores (Fig. 2.8:1; Pl. 2.I:11,12)

Flake cores are not as diagnostic of the Çayönü industry as are blade cores because most retouched tools were fashioned on blades, and hence less effort and care was exercised in the manufacturing of flakes. Pyramidal flake cores made of flint occur in some numbers, but may be partially the result of failures in the preparation of blade cores. The discoidal shaped flake core is distinctive but very rare. Figure 2.8:1 and Plate 2.I:12 illustrate an example of a one-directional type in coarse flint, while Plate 2.I:11 portrays a fine multidirectional discoidal core in lavender flint that has had flakes removed in two directions.

Multidirectional and spheroidal cores are the most common flake cores in both flint and obsidian. Very little preparation went into the production of these cores. Often fragments of the old blade cores would be re-used in this fashion..

Unmodified (waste) Pieces

Over 25% of the pieces of chipped stone found at Cayönü do not seem to be modified by human use or purposeful fabrication (see Fig. 2.4). These pieces are probably the waste from the manufacturing of the flint and obsidian implements.

More than 25% of the flint pieces recovered at Çayönü show no obvious signs of use compared with less than 20% of the obsidian pieces. Not only was a higher proportion of obsidian than flint pieces utilized, but also in general, each obsidian piece shows more evidence of use than does each flint piece. In many situations it is difficult to determine whether any single piece has been modified by use or was scarred during manufacture, deposition, or recovery (see Tringham et al., 1974). In order to minimize the subjective element in deciding what constitutes an unmodified piece, final divisions were made only by me to insure that the classification was consistent from one level to the next.

Most of the unmodified pieces were either flakes or chips, as would be expected with manufacturing debris. About 12% of the total number of unmodified flint pieces were in the form of blades, which implies that these pieces may have been intended for use, but never were used. If one assumes that this proportion is also applicable to flakes, then it can be inferred that of the unmodified pieces about 25% were actually meant to be used, while the other 75% were the debitage from the process of manufacturing flint implements. The proportion of unmodified blades made of obsidian to those made of flint is somewhat higher (c. 20%) just as the proportion of blades in the total obsidian industry is higher than in the total flint industry.

The proportion of unmodified microlithic pieces of flint to all unmodified flint pieces is roughly the same as the proportion of microliths in the total flint industry, varying between 5-20% for each sub-phase. However, the proportion of obsidian unmodified pieces that are microlithic in the total obsidian industry is considerably higher (c. 33% of unmodified pieces are microlithic while slightly over 20% of the total obsidian pieces are microlithic). This is reasonable if one assumes that there was a greater tendency to utilize every available obsidian piece, hence only the small and otherwise unusable pieces were left unmodified.

The primary step in the manufacturing of flint blades is chipping the cortex off the core. These decortification flakes are common at Çayönü, accounting for about 10-20% of the unmodified pieces in most levels.

Use Modified Blades (Figs. 2.8:2; 2.9:1,2)

Use modified blades and blade fragments are the single most-common category of implements found at Çayönü in both flint and obsidian (Fig. 2:4). The Çayönü chipped stone is predominantly a utilized blade industry (Figs. 2.8:2; 2.9: 1,2). These blades and blade fragments have a variety of sizes ranging from 83 mm to 5 mm in length, 39 mm to 5 mm in width, and 15 mm to 2 mm in thickness (sample of 504 measured blades). The average size of a utilized blade from Çayönü is 31 mm long, by 15 mm wide, by 4 mm thick.

The general cross-section of these blades is most frequently triangular or trapezoidal. Often the core preparation is slightly skewed which produces a scalene triangle or irregular trapezoid shaped cross-section. Among flint blades, the most common type of cross-section is an irregular trapezoid (32%), followed by isosceles triangle (28%), scalene triangle (23%), trapezoid (10%), and multiple (7%).

Obsidian blades exhibit a similar pattern; the irregular trapezoid cross-section is most common (35%), the scalene triangle next (25%), the regular trapezoid third (21%), and the triangle or multiple cross-section is least frequent (10% each). Whereas the most common cross-section in sub-phase B.P. is the trapezoid, and in the sub-phase G.P. the scalene triangle, in sub-phase B.P.P. the irregular trapezoid becomes dominant and remains dominant in sub-phase C.P. and L.R.P. (Fig. 2.5). This may reflect a shift in the technology which would encourage the procedure of pressing off blades from a position on the core, directly under where a previous blade had been detached.

Very few of the obsidian blades were found in an unbroken state (less than 1%). This could be due to any one of several causes: breakage while striking the blades off of the core, preparation of the blade for use, the activities they were being utilized for, or as a result of some incident connected with their deposition or recovery. The majority of pieces (64%) were middle fragments that had been broken at both ends. I suggest that this proportion is too great to be explained solely by accidental reasons, and infer that some of the activities these blades were utilized for required middle segments of sections of a predetermined length. The proportion of total obsidian blades that are middle fragments increases significantly from the earlier levels (sub-phases B.P. through B.P.P. = 57%) to the later levels (sub-phases C.P. and L.R.P. = 77%). This is additional evidence that points to increasing specialization of tools and attention to the form of tools.

Over 75% of both the flint and the obsidian blades found at Çayönü are use modified. Only 12% to 13% of the blades have been retouched into more specialized tools. The formal division made within the rather large category of use modified blades was based on the relative intensity of the use to which each blade had been subjected. As of yet, no objective measures of utilization have been developed and widely accepted. It is also beyond practical time limits to do a detailed quantitative microscopic study of each of the tens of thousands of blades. As a means of making some division, all of the utilized blades (and flakes) were divided into "intensely utilized", "moderately utilized", or "slightly utilized" on the basis of macroscopic observation (naked eye or 3X hand lens). Subsequently, I have studied the nature of utilization on a sample of the flint blades. It is hoped that this study and the research of others will lead to a useable, objective system of classification.

According to the definition used here there are three categories of utilization based on edge wear. Those which have only a few scattered shallow scars are taken to be slightly utilized, while those with many deep scars, to the point of being jagged are considered intensely utilized. The blades with edges that fall in between are categorized as moderately utilized. Clearly, this is a continuum of increasing wear (and implied utilization) of pieces, whose scars were caused by a series of different kinds of activities; it is only a first step in any meaningful analysis of these implements. Because of the relatively subjective nature of this division, it is necessary to have one person make the final decisions to keep the results reasonably consistent.

The proportionate balance between "intensely utilized", "moderately utilized", and "slightly utilized" flint blades remains relatively constant from sub-phase to sub-phase with about 14.3% of the blades being categorized as intensely utilized. This proportion jumps to over 23% of the flint blades showing intense use during sub-phase L.R.P. The proportion of intensely utilized flakes also increases during this final preceramic sub-phase. There could be a number of reasons for this increase in the degree of utilization of each piece. One explanation is that there was a shift in the function of these pieces. Another possible explanation is that it is related to a decrease in stone procurement and primary tool manufacturing during this final sub-phase which may have been a difficult period for the last inhabitants of Çayönü (the site was apparently abandoned and resettled one or two thousand years later).

The proportion of obsidian utilized blades is relatively constant over the total period of occupation at Çayönü. A higher proportion of obsidian blades have evidence of intensive use than is exhibited by the flint blades. Over 20% of the total blades examined were classified as intensely utilized blades.

Further data were collected on a sample of flint blades from many of the excavation plots. These data include the length and position of the utilized edge(s). The nature of the modification, and which surface(s) was scarred was also recorded. An evaluation was made of the motion that would have produced this modification. The different types of motion include slicing, sawing, scraping, steep scraping, notched scraping, graving, rotary motion, and piercing. These are empirical judgments based on experiments, and on the morphology and the traces of use exhibited by the implement.

Use Modified Flakes

Almost as abundant as use modified blades are use modified flakes. These pieces have a variety of forms and sizes and probably were not as carefully made as the blades. The flakes are divided into four general shapes. Parallel sided flakes are broader and less even than blades, but in a few

cases the difference is minor. Some flakes have a basically round shape with a convex edge for use. Many of the flakes are broadest at the bulb of percussion and tapered toward the opposite end; these are referred to as contracting flakes. The most common category is expanding flakes, which are broadest at the end opposite the bulb of percussion. These offer a flat to convex edge at the distal end for utilization.

Less than 20% of the retouched tools found at Çayönü were made on flakes. This contrasts sharply with the almost equal number of modified blades and flakes (c. 55% blades, 45% flakes). One could infer that while many of the utilized blades were initially intended to be made into tools or were used as substitutes for these retouched pieces, most of the flakes were probably intended for use without retouch or for different activities than their retouched counterparts. These utilized flakes may have served a generalized function so that almost any shaped piece would have been adequate.

It is interesting to note (Table 1) that for the first four sub-phases there are more use modified flint blades than flakes, but for sub-phase L.R.P. the utilized flakes outnumber blades 5 to 4. This is another reflection of the shift in the composition of the chipped stone inventory in the final prehistoric sub-phase. The proportion of utilized obsidian blades and flakes shows the opposite tendency (Table 2), the ratio of blades to flakes being about 3 to 1 for the four early sub-phases and increasing to 7 to 1 for sub-phase L.R.P. The relative proportion of intensely utilized flint flakes is similar to the distribution of intensely utilized flint blades. During sub-phase L.R.P. a significantly higher proportion of these intensively utilized pieces were used than during earlier sub-phases.

Retouched Blades and Flakes (Fig. 2.9:6; Pl. 2.III:4)

Most of the retouched pieces do not fit into established categories of distinct tool types. Depending on their shape, these artifacts are classified as retouched blades or retouched flakes. Retouched blades are far more numerous than retouched flakes in both flint and obsidian. In both raw materials there are about five times as many retouched blades as retouched flakes. This ratio shows some minor patterning with the flint pieces; during sub-phases B.P. and G.P. blades accounted for about 86% of these pieces, while during sub-phases B.P.P., C.P., and L.R.P. blades accounted for 79%. This decreasing proportion of retouched blades is counterbalanced by a slight increase in the total proportion of these retouched pieces. During all of the sub-phases, retouched blades and flakes composed a greater proportion of the obsidian industry (c. 10%) than the flint industry (c.6%).

These pieces have been divided into categories on the basis of four kinds of retouch. The first variety, flat retouch, is made up of long, sometimes wide, scars which usually form an acute angle with the surface from which they

were struck. This type of retouch is not common, making up about 6% of both retouched blades and retouched flakes of flint, and about 10% of those of obsidian. Steep retouch consists of long scars, sometimes over-lapping, that form an angle greater than 45° with the surface from which they were struck. This type of retouch is frequently used for backing pieces or preparing edges to be used as scrapers. Of the retouched flint and obsidian blades and flakes, approximately 20% have steep retouch. The most common type of retouch for both flint and obsidian pieces is nibbled retouch. This retouch consists of short narrow scars usually on an edge that had been sharp. This dulls the edge and strengthens it for cutting or for a form of scraping. Over 66% of both flint and obsidian retouched blades and flakes exhibited this type of work. As with the preceding types of retouch, it is possible that some of the pieces on which it is found were not retouched before they were employed for work, but that the retouch is the result of the activity for which they were used. The fourth category of retouch, denticulated and notched, is common on flint blades, but less common on flint flakes and obsidian pieces. Denticulated retouch consists of deep scars flaked off the edge of a blade with an interval of blade edge left in between (Fig. 2.9:6; Pl. 2.III:4). This "serrated" edge is effective in cutting and scraping, and seems to have been used often in activities that resulted in a sheen on the blade. This is the only category of retouch in which the majority of blades evidence sheen. About 10% of the retouched flint blades exhibit denticulated or notched retouch while for flint flakes, and obsidian blades and flakes, the proportion is about 5%.

The proportion of blades that have retouch is almost the same for obsidian and flint, ranging between 12% and 19% for each of the five sub-phases. In both flint and obsidian this proportion increases from the lower to the upper levels. Also the proportion of the total number of pieces that are retouched blades or flakes increases for the later sub-phases. With flint the proportion of retouched pieces ranges from 5% for sub-phase G.P., to 9% for sub-phase C.P., while in obsidian this measure goes from 8% for sub-phases B.P. and G.P., to 13% for sub-phase B.P.P., and 12% for sub-phase L.R.P. These implements clearly make up an important element in the Çayönü chipped stone industry, as they require careful preparation by their makers and are more numerous for all sub-phases than artifacts identified as distinct tool types.

Blades With Sheen (Fig. 2.9:3-6; Pls. 2. II:14; 2.III:4,5)

Approximately 7% of all the flint blades found at Çayönü have traces of a lustrous deposit on one or more of their edges. The most reasonable explanation for this phenomena is that these pieces were used in the cutting of plant material, either for harvesting or some other form of cutting or scraping. Because this function is widely acknowledged, these pieces are often referred to as sickle blades and the luster as sickle sheen. This sheen is found almost exclusively on blades (869 pieces) with only three flakes

exhibiting sheen. There is great diversity in the size of the blades. The number of blades exhibiting sheen are evenly divided between pieces that have been modified by use and those with retouch. Within the category of use modified blades, the highest proportion of blades that have sheen are the intensely utilized pieces while the most numerous are the moderately utilized blades (Fig. 2.9:4,5; Pl. 2.III:5). The most common type of retouched blades exhibiting sheen are the nibbled pieces, although only 33% to 25% of the total number of nibbled pieces have sheen. Therefore, even though this type of blade was often employed in activities resulting in sheen, these were not its only uses. Unlike the proportion of nibbled retouch pieces with sheen, over half of the blades with denticulate retouch are found to have sheen. It is possible to infer that one of the primary uses, if not the sole use, of these denticulated pieces was as sickle blades (Fig. 2.9:6; Pl. 2.III:4). A significant number of sickle blades are steeply backed (36). These form only a small proportion of the total number of blades with steep retouch, most of which we can assume were designed for purposes other than sickle blade use.

Often the sheen is not obvious, especially since less than perfect lighting makes it difficult to observe. Consequently, the number of blades with sheen may be greater than is reported in Tables 1 and 3, but hopefully this underestimation is consistant for all levels. In some cases the sheen is very distinct and it is possible to record very precisely the extent of the luster (Fig. 2.9:3; Pls. 2.II:14; 2.III:5).

Two hundred and sixty blades with sheen have been subjected to a series of detailed measurements and observations. The mean size of these blades is 34 mm long, 12 mm wide, and 3 mm thick. On the average, blades with sheen are longer, narrower, and thinner than blades without sheen. Their most common cross section is trapezoidal (32%) followed by triangular (26%), scalene (20%), irregular trapezoidal (19%), and multiple (3%). In most cases blades have sheen primarily on one of their surfaces, occurring equally on the ventral surface (46%) or dorsal surface (41%). About 13% of the blades have significant sheen on both surfaces. This supports the inference that these blades were employed usually in a scraping or pulling motion rather than a sawing or slicing motion. The extent of the sheen on most blades is distinguishable and covers only a portion of the surface. On the average, the length of the sheen is 75% of the length of the blade and the depth is less than 25% of the width of the blade (2 mm on the ventral surface; 3 mm on the dorsal surface). Another distinctive feature is that on most blades there is significant sheen along only one edge (88.5%). This implies that the blades were not rehafted on the reverse edge after the first edge was exhausted.

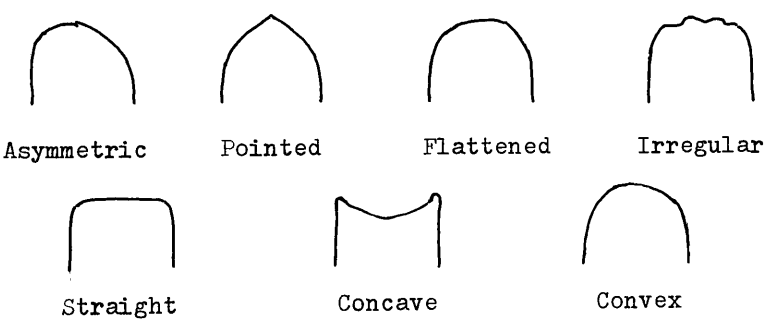
The proportion of blades used in activities that resulted in sheen increased throughout the period of occupation at Çayönü, going from 6% of the blades during sub-phase G.P., to 11% of the flint blades during sub-phase L.R.P. This

increase probably reflects the growing importance of activities such as cutting and harvesting plant material during the later sub-phases of the site's occupation.

Scrapers (Figs. 2.9:7-10; 2.10:1-8; Pl. 2.I:13-18)

Flint and obsidian pieces that were purposefully shaped into scrapers are a specialized type of tool. These scrapers occur on blades, flakes, and cores. Although the proportions vary from level to level, approximately equal numbers of scrapers were made on blades, flakes, and cores. Based on their form, they can be classified as end scrapers, side scrapers, circular, or steep scrapers. The most common type of scraper, especially in the flint assemblage is an end scraper on a blade (Fig. 2.10:1,2,4,7,8; Pl. 2.I:13-17). There are about as many end scrapers as there are all other types together. In the excavated levels that were analyzed, 107 flint end scrapers on blades, and 39 made of obsidian, were found. End scrapers on blades manifest several variations. Six of the pieces had scraping edges on both ends (Fig. 2.10:1; Pl. 2.I:16). This modification may have been done when one end was exhausted, or to aid in hafting, or for a special type of activity. Other end scrapers on blades have had their butt ends worked. The pieces in Figure 2.10: 2 and Plate 2.I:15 were probably fashioned in the latter way to aid in hafting or holding.

The shape of the edge that was used for scraping would have a significant effect on what the implement could be used for. These edges have a variety of shapes and I have categorized them using a system devised for Upper Paleolithic scrapers (Movius, David, Bricker, and Clay 1968).

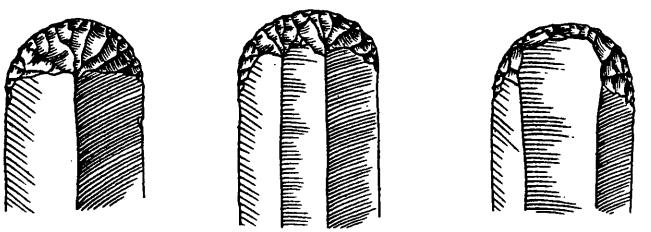


(After Movius, David, Bricker and Clay 1968)

The working edge on end scrapers on blades is asymmetric (27% of flint, 33% of obsidian), pointed (0% of flint, 3% of obsidian), flattened (33% of flint, 30% of obsidian), irregular (7% of flint, 5% of obsidian), straight (15% of flint, 14% of obsidian), concave (3% of flint, 2% of obsidian) or convex (15% of flint and 9% of obsidian).

On the basis of scars from use it seems that the primary motion to which end scrapers on blades and most of the other types of scrapers were subjected was not like a push plane. The long axis of the piece probably would be held at an acute angle (approaching the perpendicular) to the surface of the material being scraped, and the piece moved with the ventral surface of the scraper forward and with the retouched scraping edge in contact with the material. It has been suggested that this type of implement could be effectively employed to scrape and soften hides and skins in this manner (Semenov 1964). Scars of varying sizes on the dorsal surface of most scrapers attest to this type of motion, although they suggest a diversity of materials on which they might have been used. In almost every case the ventral surface of the blade near the working edge is free from any scarring, which implies that these pieces were used with a motion drawing them in the direction of their long axis.

On the flint scrapers, even under the microscope (low magnification, c. 30 power), no rounding of the scraping edge could be observed. However, on several obsidian pieces very pronounced rounding was observed at the extremities of the working edge and sometimes along the side of the piece. It is unclear whether this rounding was the result of the utilization of the piece or was a means of preparing the edge for subsequent retouch or to aid in holding the tool.



Convergent Retouch | Semi-convergent Retouch | Non-convergent Retouch

(after Movius, David, Bricker, and Clay 1968)

The retouch on the working edge can be divided into three different types (Movius et al., ibid). These are: convergent, semi-convergent, or non-convergent. Of these three types, semi-convergent retouch is the most common on both flint (44%) and obsidian (48%) end scrapers on blades. Non-convergent was second in frequency in obsidian (32%) with convergent retouch being used on only 20% of the obsidian pieces. Convergent and non-convergent retouch were used equally on the flint pieces. Much of the retouch on the working edge is probably the result of the utilization of the piece and not of purposeful retouch before the implement was used. Consequently, in the classification system one can differentiate between scrapers which were shaped primarily by purposeful retouch and those which were shaped largely by their use.

A number of pieces that have been classified as side scrapers on blades, are formed by either use or retouch. These are pieces, on steeply retouched thick blades, that seem to have been fashioned into a distinct scraping tool. There is a continuum between this category and what is classified as steeply retouched blades. Separation is based on whether the form of the blade lends itself to scraping; if not, the tool is designated as being steeply retouched or backed.

About 35% of the scrapers found at Çayönü were manufactured on flakes (Fig. 2.9:7-10; Pl. 2.I:18). These flakes have different shapes, depending on how they were struck off of their cores. Some flakes are narrow at the bulb of percussion and expand towards the distal end (21%); while others are broadest at the bulbar end and contract from there (20%). Another shape of equal frequency (21%) is rectangular flakes, while round flake scrapers are more common (38%) than rectangular flakes. These flake scrapers are primarily end scrapers; less than 33% of them are side scrapers. The shape of the end varies and - in the sense of Movius et al. (op.cit., p.13) - the degrees of arc of the rounded utilized edge range from 50° to 200°. If the degree of arc of the retouched edge covers more than 200° of the circumference of a round flake, then the piece is categorized as a circular scraper (Fig. 2.9:8). In general, the working edge of a flake scraper is far more convex than the relatively flat edge of a blade scraper. This would suggest that their functions may have differed. The flake scraper is more effective in scraping out grooves, or in working with very pliable material, yet has the disadvantage of having less leverage and being more difficult to hold. Consequently, many of the flake scrapers, as well as some of the blade scrapers, were probably hafted.

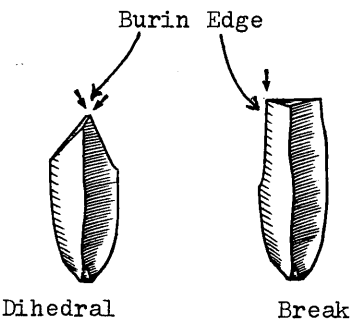
In the manufacturing of many of the scrapers, the basic technique was to shape the working edge with wide deep scars and to finish the preparation with smaller secondary flaking that actually forms the working edge (Pl. 2.I:18). Scars from use or from re-sharpening are of this secondary nature or more often of a tertiary type, smaller, less regular than the secondary type, and appearing as battering along the edge.

Steep scrapers were rare at Çayönü but occurred in both flint and obsidian (Fig. 2.10:5). These pieces are distinguished by the height and narrowness of the scraper and its very steep retouch. A significant number of pieces were classified as core scrapers (59 flint, 16 obsidian). These are predominantly blade cores that have been re-used as scrapers (Fig. 2.10:3,6). The working edge may be at the edge of the striking platform or it may be along the crested ridge. Many of the cores found at Çayönü have been re-utilized after they ceased to function as cores. The distinction between re-utilized cores and core scrapers is based on the amount of purposeful re-shaping and the type of working edge that is formed.

Scrapers are the only kind of distinct tool type fabricated on flakes. During the first four sub-phases of occupation at Çayönü, blade scrapers were more frequent than flake scrapers, but this relationship is reversed during the fifth sub-phase. Almost equal numbers of obsidian blade and flake scrapers are found in each of the occupation levels. The proportion of obsidian scrapers to total pieces of obsidian does not change significantly from the earlier to the later levels as does the proportion of flint scrapers. Whereas during sub-phases B.P. and G.P., flint scrapers made up only 0.7% of the flint assemblage, they accounted for 1.9% of the assemblage during sub-phases C.P. and L.R.P. The kinds of activities that flint scrapers were associated with, clearly increased from the earlier to the later sub-phases. This may be associated in some way with the introduction of domesticated sheep and goats and an increasing use of hides.

Burins (Fig. 2.12:1-4; Pls. 2.I:19-23; 2.III:6)

Burin-like implements are another type of tool found at Çayönü. Almost all of these are flint (51 out of 55) and all occur on blades. Burins are made by taking off long thin flakes (spalls) from one or more of the edges of the blade. I have categorized the burins according to the manner in which the striking platform was prepared and the burin flake taken off (Movius et al., ibid).



(after Movius, David, Bricker, and Clay 1968)

The most common type of burin found at Çayönü was the "break burin" in which the striking platform for the spall removal is the unmodified broken or snapped end of a blade fragment (Fig. 2.12:3,4; Pl. 2.I:20,22,23). The second type of burin found at Çayönü results from two diagonal blows which form a dihedral angle toward the center of the blade (Fig. 2.12: 1,2; Pl. 2.I:21). On these pieces the burin angle may be as little as 45°. Consequently they were probably used for purposes somewhat different from those of the other types of burins.

Burins may have been used for a variety of functions. They have been closely studied in context of Upper Paleolithic industries and are not as frequent in early village

assemblages such as Çayönü. The firm, sharp edge which is produced by the burin blow makes an effective engraver. These incisions could be for decorative purposes or they might be a method of making grooves for more functional purposes such as cutting. The direction of pressure is commonly thought to result from moving the burin with the spall side forward. However, the use scarring on some of the Çayönü break burins implies that the snapped edge was in the forward position (cf. scarring on spalled side, Pl. 2.III:6).

It is interesting to note that the distribution of burins for the different sub-phases of the site's occupation is clearly limited. Fifty-two of the burins were found in deposits of sub-phases B.P., G.P., or B.P.P., while only three burins were found in deposits of sub-phases C.P. and L.R.P. This sharp decline suggests that whatever burins were being used for during the earlier sub-phases, this function was either eliminated or was performed by a tool other than a burin. If it is assumed that engraving, especially of bone, was the primary function of burins, then the distribution of incised bones is somewhat problematical. All eight of the pieces classified as incised are from deposits of sub-phases B.P.P., C.P., and L.R.P., with five of the pieces being found in sub-phase C.P. and L.R.P. deposits. The mutually exclusive nature of the temporal distribution of burins and incised bones suggests that they were not associated in a manufacturing activity. The distribution of bone needles is much more like that of burins. If one examines the eyes of these needles closely, it is clear that some sort of sharp stone implement would have been necessary to "incise" these holes. The burins might have been used with bone and finely ground stone pieces, such as bracelets whose sub-phase distribution is similar to that of the burins.

Pieces with Tip Attention as Main Feature (Perforators)
(Figs. 2.6; 2.11:1-15; 2.12:6; 2.13:1-4; Pls. 2.II:1-12; 2.II:1-3)

Implements with a wide range of work on their tip as the major feature of their modification are grouped initially into one large category, perforators. This includes pieces that were utilized as drills, punches, projectile points or even knives. As a part of the preliminary tally (Tables 1 and 2), these pieces are divided on the basis of size and degree of modification. This broad classification is further subdivided into ten categories based on the nature of the retouch and morphology of the tip (Fig. 2.6). Extensive measurements and observations were recorded for a large sample of the pieces. Flint pieces of this type are far more common than obsidian pieces (10 to 1), even in deposits where obsidian is relatively abundant.

The most common type of obsidian piece with tip attention as its main feature is one with flat retouch on either or both ventral and dorsal surfaces (Fig. 2.13:3,4). This category accounts for half of the obsidian pieces with tip

attention found at Çayönü. Some of the artifacts classified as having flat retouch could also be thought of as fitting into the category projectile points, but were not so classified because their morphology suggested that they were more like knives or perforators than projectile points.

Another common type of flint and obsidian piece with tip attention is pointed in shape and retouched only on the ventral surface (Fig. 2.11:7 is an example of this type in flint). The ventrally retouched pointed pieces could be effective as small projectile or perforator points. Other pieces have retouch along one edge on the ventral surface and along the other edge on the dorsal surface so that if the piece were turned in a rotary fashion a sharp edge would be forward all the time (Fig. 2.11:6 is an example of this type in flint). These pieces with alternate retouch could function as reamers or drills used in a single directional rotary motion.

Accounting for about 30% of the abundant flint pieces with tip attention is a category referred to as drills. The long cylindrical points, formed by retouch on these pieces, could be used for perforating a hole with either direct pressure or rotary motion (Fig. 2.11:1,4,5; Pl. 2.II: 8,10-12). About 85% of these drills were found in subphase G.P. deposits and about 66% of those in a single cache of flint pieces adjacent to the foundations of a grill building (QC5, Level 3). These drills are made on blades or blade-like splinters (see Fig. 2.11:2,3 for use-modified examples), and over half of the pieces found are of a microlithic size. Many of these tiny drills are very fragile and demonstrate quality craftmanship both in their manufacture and in their use. These pieces were probably used for drilling holes or depressions into bone or wood pieces, and perhaps to perforate or to ream the holes in some of the stone beads or pendants. Many of these drills must have been hafted in order to use them. From the nature of their retouch and wear marks it appears that these tools were used with either direct pressure two-directional rotary motion, or a single directional rotary motion. The rotary motion may have involved some kind of bow drill or other mechanical device. The alternate retouch and traces of wear on a few of the pieces confirm the use of single directional motion (Pl. 2.II:10 which is also Pl. III:2).

The second most common flint perforator category, as in obsidian, is that of artifacts with pointed tip and ventral retouch (Fig. 2.11:7,8,14). Many of these pieces are of a small triangular shape (Fig. 2.11:7) and could have functioned as projectile points. Others are made on longer blades and have retouch far down the side and often at the base; here other uses are implied. The next most frequent category also consists of pointed pieces, but in this case with dorsal retouch (Fig. 2.11:9,15). These pieces have a steeper angle of retouch near the point than do pieces with ventral retouch. Another common category are pieces with retouch on the ventral surface along one edge and dorsal surface on the other (Fig.

2.11:6). These alternate retouched pieces could be utilized effectively in a rotary manner.

Artifacts that fit the classic notion of projectile points are relatively scarce at Çayönü. These are long narrow pieces that have been worked at one end for attachment to a shaft and retouched at the other into a point (Figs. 2.12:6; 2.13:1,2; Pl. 2.II:1-6). These pieces may have functioned more effectively as heads for hand-held lances rather than as parts of projectiles. Of the artifacts classified as "tanged pieces" from Çayönü, some may not have been used as projectiles or lance heads, but rather as perforators (Fig. 2.13:2; Pl. 2.II:2,3) while others may have served as knives (Figs. 2.12:6; 2.13:1; Pl. 2.II:1,6). In so far as one would expect to find projectile points deposited in a settlement, they are uncommon at Çayönü. If projectile points were common, they were composed of other types of chipped stone, perhaps used in a composite fashion or were made in a shape not directly identifiable as a projectile point.

Other categories of flint pieces with tip attention include those with flat retouch and two types of pieces with rounded tips, one with ventral retouch and the other with dorsal retouch. These round tipped artifacts would not have been used as normal perforators or projectile points, so their function is somewhat different from the other pieces in this general category. The artifacts with dorsal retouch (Fig. 2.11:12) make good scrapers because of the steep angle of their retouch. Some of the examples classified under tip attention are very similar to what might be called steep scrapers, although they are not as thick as steep scrapers. The rounded, ventrally retouched pieces are not similar to any other type of tool at Çayönü (Fig. 2.11:13; Pl. 2.III:3). From the morphology of the tool, it seems that some sort of scraping function, especially in grooves, would be the most efficient use of this tool (see Fig. 2.10:5 and p. for discussion of similar pieces considered as scrapers).

In only one case was the perforator point formed other than by chipping. This example on a flint blade--found in building U4 of sub-phase L.R.P.--was finely ground to create a dull point (Pl. 2.III:1). This piece could have served as a reamer. In general, the technique of grinding flint was almost non-existent at Çayönü and it is possible that this ground implement was brought in from elsewhere.

The relative frequency of the types of tip attention is similar for each of the different sub-phases except for the abundance of drills and microdrills for sub-phase G.P. deposits (Table 1 and Fig. 2.6). The most common types of perforators are the same for flint and obsidian, except that pieces with flat retouch are the most numerous category of obsidian and drills are the largest flint category. Tip attention is not a major category of obsidian tools. Only during sub-phase B.P.P. does it account for as much

as 10% of the total retouched obsidian pieces. For all sub-phases there are many more pieces with tip attention made from flint; only for sub-phase C.P. do the obsidian pieces account for as much as 33% of the total number of pieces with tip attention. Contrary to this pattern, pieces with tip attention are the most common type of tool in the flint inventory. The proportion of retouched flint pieces that have tip attention as their main feature falls below 10% only for sub-phase L.R.P. For the other sub-phases it is 15% or higher, and for sub-phase G.P., perforators account for 33% of the retouched pieces. Activities which involve piercing, drilling, and specialized forms of cutting and scraping are important during all sub-phases of the Çayönü occupation and it appears that flint served as a better raw material for implements to perform these particular tasks than obsidian.

Backed Blades (Figs. 2.14:1,2; 2.15:1-3; Pl. 2.II:15-18)

Backed blades are very rare in the flint industry, but comprise the most frequent type of obsidian tool at Çayönü. This tool type has several unique attributes which make it a distinctive implement that may have been used for one or more tasks. These pieces are obsidian blades that have been steeply retouched along one or both edges on the dorsal surface. This retouch is usually very regular, the scars extending up the full thickness of the blade, transforming the blade's trapezoidal cross section into a nearly rectangular cross section. The retouch does not extend along the edges all the way to either the bulbar or distal end so the piece maintains its original blade width at those points (Fig. 2.15:1). Because of the brittle nature of obsidian, many of the pieces are broken before recovery (Fig. 2.15:3; Pl. 2.II:18).

The most distinctive attribute of these obsidian backed blades is obvious traces of wear on their ventral surface (Pl. 2.II:15). These wear striations are finely ground into the surface and are oriented parallel to the long axis of the blade. The striations vary in intensity from a few lightly incised scratches to heavy grinding over much of the surface. In most cases it is possible to differentiate the individual striations, while sometimes the tool has been used so often that all of the striations have overlapped to the point of seeming like an area of constant abrasion. In about 33% of the examples discovered only one edge has been retouched. These blades exhibit the wear striations on the ventral surface below the edge that is retouched, but there are no striations on the ventral surface adjacent to the unretouched edge. Clearly there is a relationship between the steep retouch and the linear striations. In almost every case the striations are parallel to the retouched edge, but some pieces do have striations that are somewhat diagonal to the retouched edge. The striations seldom cover the entire ventral surface of the piece, normally extending about 5 mm in from the retouched edge. Hence, most pieces have an area running down the center of the ventral surface that has no

striations. Often the striations are heavier on one side than the other which implies a certain independence in the use of the two edges. Occasionally there are backed blades with striations transverse to the long axis of the piece, and usually on the bulbar end of the ventral surface. These striations may have been made during the use of the piece or may have been an attempt to flatten out the bulbar end.

Obsidian backed blades and fragments are common in all of the occupation levels at Çayönü except for sub-phase B.P., where only one example was recovered. They occur in a wide range of sizes from 200 mm to 9 mm long and all sizes in between (average 33 mm long). This somewhat enigmatic tool type merits more extensive investigation than other unexplained pieces, because of its great abundance. Four hundred forty-five of these pieces have been found at Çayönü in the tallied levels, which makes it by far the most common tool type made of obsidian. Its ubiquitous presence in all but the lowest levels of the site implies that it was an integral element in the technological inventory of these early village people. In some ways the great abundance of these backed blades is an aid to their explanation because there are many examples to study, but it is a disadvantage to any single explanation because there is always an exception to any functional hypothesis that has been set up. One explanation for this situation is that these backed blades were probably used for a variety of functions in several different activities.

If the steeply retouched edge had been used for scraping, then the use striations would have been perpendicular to the edge. Since the direction of the striations is parallel to the edge, it would seem to imply that the retouch was for a different purpose, perhaps for firming the working edge so that it could be used for grinding or cutting. The striations seem to have been produced by some fine grained hard substance that came repeatedly in contact with the obsidian in a linear motion. This motion could involve cutting or grinding. The substance causing the striations must have been at least as hard as the obsidian itself. This could have been some form of stone, impurities such as sand in a softer medium, a grinding compound added to aid in the abrasion, or fragments of the obsidian glass itself. Experiments should be conducted to determine the abrasive effect of these different materials on obsidian. Judging by the parallel alignment and even nature of the striations, I infer that the backed blade was the mobile element in the grinding or cutting process and that its motion may have been restricted by some sort of guide.

One of the possible uses for these implements could be in the shaping of finely ground stone objects such as bracelets. By moving the backed blade up and back across the inside of a rough bracelet the blade would come in contact with the stone along its two edges and not down the center. This agrees with evidence of manufacturing techniques observed on several of the limestone bracelets. Although this is a

possible use, it clearly was not the sole use in that pieces with wear striation on only one edge could not have been used in the manner suggested.

Backed blades could also have been used for cutting objects by abrading a groove. The blade would be held at an angle so that the edge at the juncture of the steep retouch and the ventral surface with the striations would serve as the cutting edge. This could be used for making deep grooves in materials such as bone, wood, or stone. The groove enables the craftsman to neatly break the piece by force. A grinding compound might be added to aid in the cutting of harder substances. Utilization of the above methods for cutting is possible, but one would expect to find some striations along the ridges of the steep retouch on the backed blades if they were so used, which is not the case. Also, pieces with irregular edges such as the one in Figure 2.14:2 would not have been effective for cutting in this manner. Cutting or fine grinding of small stone objects like beads is another possible use, but is one not clearly supported by the evidence.

On the basis of a detailed microscopic examination I am not able to offer any single interpretation for the use of obsidian backed blades. Rather, I view them as multi-purpose implements that were used in a number of different ways for general grinding and cutting activities. The wide range of sizes of backed blades reinforces the notion of several different functions for this tool type.

The obsidian backed blade is only introduced in quantity during the second sub-phase of occupation at Çayönü and increases in relative frequency during each of the successive sub-phases (sub-phase G.P., 2.9% of obsidian; sub-phase L.R.P., 5.3% of obsidian). This shows a general tendency toward wider use of these implements during later sub-phases.

Miscellaneous (Fig. 2.12:5; Pls. 2.II:7,13; 2.III:7)

There are a number of other types of chipped stone tools that do not fit into the categories already discussed, but none of the types have many examples. Unlike many of the terminal Pleistocene cultures of the Near East, the Çayönü industry does not include large numbers of small geometrics. The only distinctive geometric found at Çayönü comes from the protohistoric levels and is not microlithic in size. These are flint blades that were steeply backed into the shape of a crescent with a straight blade edge. These pieces are usually 20-30 mm long and have been found only in the levels that follow the main prehistoric phase (not included in Tables 1 and 2). Similar pieces were found nearby in the top levels of Gerikihaciyan (see Çambel and Braidwood, 1980).

There are a series of pieces with tangs that are not classified as projectile points because they are not pointed. These items could have been used as blunt projectile points

or as hafted blades.

There is one obsidian piece from deposits of sub-phase B.P.P. that deserves a special note (Pl. 2.II:7). It is unique in the Çayönü assemblage, both as to morphology and the technology of manufacture. This artifact probably served as a knife or perhaps as a projectile point. Its most distinctive feature is the long flat retouch on one surface. The "ripple flaking" on this piece is the only example from Çayönü of its kind. Considering that this kind of work required special skill, it is possible that this piece was brought to Çayönü from elsewhere, or that there is a major aspect of the Çayönü obsidian industry that is still unknown to us.

A dark gray flint artifact from a sub-phase C.P deposit is another unique Çayönü artifact (Fig. 2.12:5; Pl. 2.II:13). This is a large blade with retouch on both ends forming points. The edges of the blade have been slightly scarred, implying some use. The pointed ends are more appropriate for being fitted into handles than for use as drills or points. Thus, this artifact may have functioned as a two-handled draw-knife.

There are a number of pieces in both flint and obsidian that have definite evidence of severe burning. The most striking examples are a series of long obsidian blades recovered from one of the burnt structures of sub-phase C.P. These pieces turned molten, bubbled, and bent because of the heat and pressure from the collapsing building (Pl. 2. III:7). It is perhaps possible, because an inordinate proportion of the burnt pieces are very long obsidian blades, that the burning was purposeful. In this case the twisting might not have been accidental, but the intent of the burner. In either case, these long blades covered with burned mud-brick are spectacular artifacts.

SUMMARY

On the basis of the distribution of chipped stone artifact types found in the deposits of the different sub-phases of occupation during the 1968 and 1970 field seasons, it would be unwise to speak of a single Çayönü chipped stone industry. Clearly, there are major differences between the sub-phases in terms of types present and changing proportions of tools. In some cases a tool type seems to have been introduced during the sequence of occupation, such as obsidian backed blades during sub-phase G.P., and in other cases some seem to have gone out of use, such as burins during sub-phases B.P.P. to C.P. Despite the significant differences between the chipped stone inventory from one level to another, the overwhelming impression is of continuity, at least within general bounds. Although the proportions of types may have changed during the occupation (such as scrapers increasing in number from only 0.6% of the assemblage for sub-phase B.P., to 1.5% for sub-phase L.R.P., or the ratio of obsidian to flint pieces changing

from .06 to 1.02 during the prehistoric period of occupation), the breaks in sequence do not seem sufficiently abrupt to suggest a cultural or population discontinuity. Rather, I interpret these changes as normal in the functioning and development of an active community that is successful in its adaptation, and that interacts with groups around it and with those at great distances. In order to document a distinctive change, such as one that might accompany a long hiatus or a reoccupation of the site by different peoples, one would expect to find significant differences in many aspects of the remains of the community, all changing at one time. This is not the case with the various quantitative and qualitative measures made of the Çayönü chipped stone inventory. Differences did exist, to a certain degree between the sub-phases, but these differences were spread out over each of the four possible transitions between the sub-phases. The vast majority of the assemblage remained the same over each transition, strong evidence for the general continuity of occupation during the main prehistoric phase at Çayönü. This overall picture of diversity and change within a generally similar complex of tools is probably an accurate reflection of the developmental situation that the Çayönü people were experiencing.

ACKNOWLEDGMENTS

The above report is the result of the combined efforts of the members of the Joint Prehistoric Project of Istanbul University and the University of Chicago. My deep appreciation goes to the directors of the project, Halet Çambel and Robert J. Braidwood, who enabled me to do this study and aided me at various points of the investigation. Archeology students from Turkey, the United States, Sweden, and France were instrumental in the classification and illustration of the artifacts discussed in this report. This research was supported by grants from the National Science Foundation, the Oriental Institute of the University of Chicago, and the Ford Foundation Archeological Traineeships.

Most important was the help and encouragement I received from the Joint Prehistoric Project's two Lindas. Linda S. Braidwood devised and instructed me in the general system of classification for the chipped stone tools, and provided needed advice at various stages of the analysis. My wife, Linda, was responsible for carrying out a major share of the analysis, integration of the results, and the preparation of this report. In addition, I wish to thank Ayşe Ozkan for her excellent drawings.

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ILLUSTRATED ARTIFACTS: MATERIALS AND FINDSPOTS

Fig. 2.7 Blade cores (1-6) and blade core fragments (7-10): 1. flint B 3-0/2, 2. flint QC5 2-0/10, 3. flint WC1 1-0/2, 4. flint QC5 2-0/9, 5. flint R 5-8/1, 6. flint QC5 1-0/1, 7. flint R 11-4, 8. flint K6 4-5, 9. obsidian D 2-1/1, 10. flint QC5 4-0/8

Fig. 2.8 Flake core and large blade: 1. flint G 3-1/1, 2. obsidian R 2-10/4

Fig. 2.9 Use modified blades, blades with sheen, and scrapers: 1. flint QC5 41, 2. flint U 3-3/1, 3. flint R 19-0, 4. flint P 1-2, 5. flint F 3-0/1, 6. flint R 2-5, 7. obsidian QC5 4-0/1, 8. obsidian SA1 1-0/1, 9. obsidian G 3-0/1, 10. flint U 3-3/1 Note: dotted lines on nos. 3-6 indicate extent of sheen.

Fig. 2.10 Scrapers: 1. flint F 3-0/1, 2. flint C 2-2/1, 3. flint QC5 3a, 4. obsidian R 6-5/1, 5. flint C 1-0/1, 6. obsidian R 5-8/1, 7. obsidian D 3-0/1, 8. obsidian SA1 3-0/4

Fig. 2.11 Pieces with tip attention as their main feature: 1. flint QC5 3-0/19, 2. flint QC5 3-1, 3. flint QC5 3-1, 4. flint F 5-0/2, 5. flint B 3-0/1, 6. flint B 4-0, 7. flint R 7-4, 8. flint K9 2, 9. flint R 11-0/1, 10. flint R 12-1/1, 11. flint EF 1-2, 12. flint C 1-0/2, 13. flint R 9-5, 14. flint R 20-2, 15. flint R 14-0/1

Fig. 2.12 Burins, and pieces with tip attention as their main feature: 1. flint QC5 4-0/60, 2. flint R 20-9, 3. flint P 5-18, 4. flint U 3-4, 5. flint S 0-0/3, 6. flint B 4-0/1

Fig. 2.13 Pieces that might be projectile points: 1. obsidian S 0-1/1, 2. flint T 1-1/1, 3. obsidian S 0-0/1, 4. obsidian S 0-0/2

Fig. 2.14 Large double backed obsidian blades: 1. R 3-0/2, 2. R 3-0/1

Fig. 2.15 Backed obsidian blades: 1. R 6-5/1, 2. E 3-0/1, 3. U 4-7/1

Pl. 2.I Cores (1-9, 11, 12), crested blade (10), scrapers (13-18), and burin-like pieces (19-23): 1. flint QC5 2-0, 2. flint U 5-48, 3. flint B 1-0, 4. flint U 4-23, 5. flint QC5 2-0/10, 6. flint P 5-18, 7. flint WC1 1-0/3, 8. flint QC5 2-0/9, 9. obsidian R 5-8/1, 10. obsidian D 2-1/1, 11. flint E 4-0/1, 12. flint G 3-1/1, 13. flint R 18-0, 14. flint U 5-24, 15. flint WC1 1-0/7, 16. flint F 3-0/1, 17. obsidian R 6-5/1, 18. flint U 3-3/1, 19. flint P 5-18, 20. flint F 2-0, 21. flint R 20-9, 22. flint R 16-0, 23. flint P 8-16

Pl. 2.II Pieces with tip attention (1-12), miscellaneous tools (13-14), and backed blades (15-18): 1. flint B 4-0/1, 2. flint R 12-1, 3. flint T 1-1/1, 4. flint U 5-48/1, 5. flint P 1-8/1, 6. obsidian S 0-1/1, 7. obsidian R 5-8, 8. flint B 3-0, 9. flint B 3-0/1, 10. flint U 5-49, 11. flint B 5-0, 12. flint QC5 3-1, 13. flint S 0-0/3, 14. flint R 19-0, 15. obsidian R 4-0/5 (magnified), 16. obsidian R 6-5/1, 17. obsidian R 6-7/1, 18. obsidian U 4-7/1

Pl. 2.III Microphotographs (1-6: magnification about 10 power) of pieces with tip attention (1-3), blades with sheen (4-5), and a burin (6): 1. flint U 5-24, 2. flint U 5-49, 3. flint R 9-5, 4. flint R 2-5, 5. flint P 1-2, 6. flint R 14-3, 7. burned obsidian blade from R 2-10/1, scale 1:1

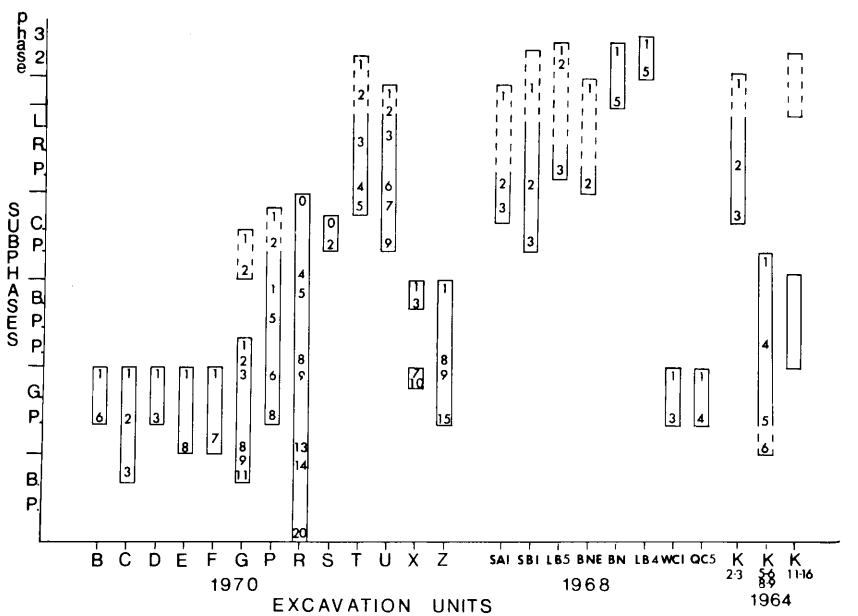


Fig. 2.2 Chart of tentative correlations of levels in different excavation units from the 1964, 1968, and 1970 field seasons. (See note, p. 9; however, the correlations suggested here are no longer current. Eds.)

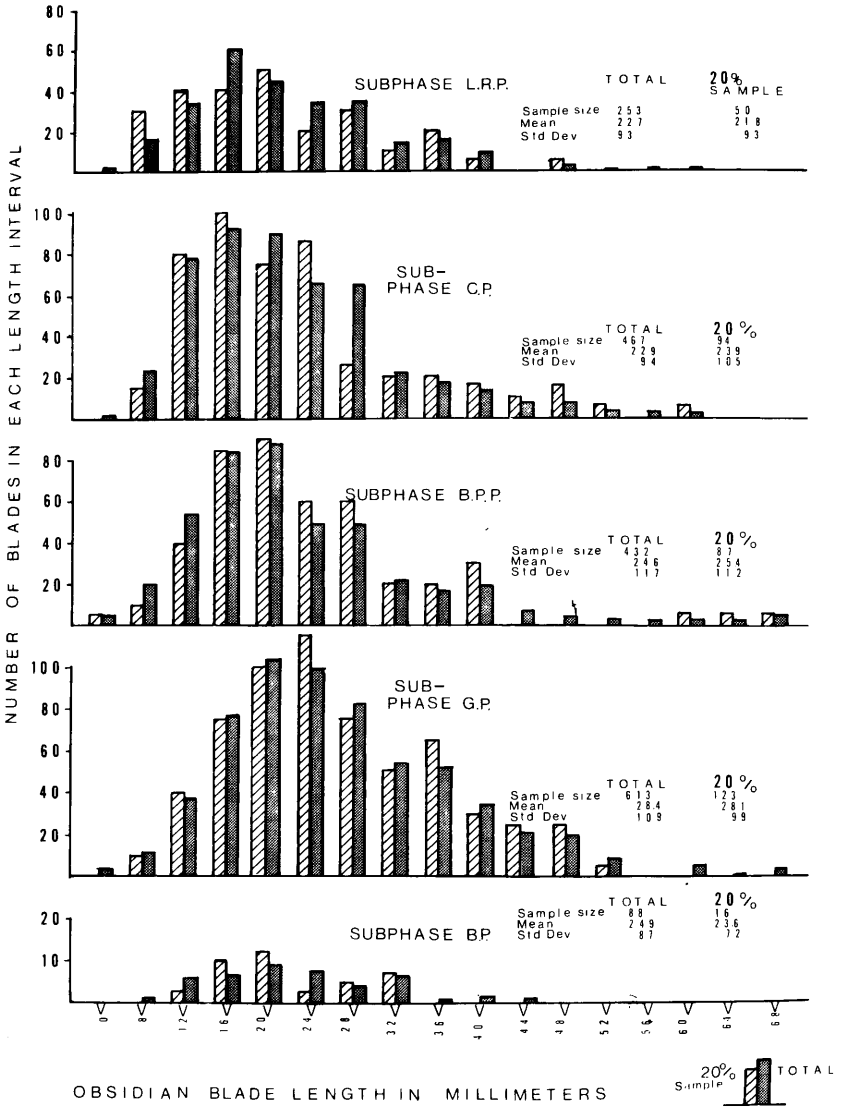


Fig. 2.3 Distribution of obsidian blade and blade fragment lengths (with data from all pieces measured compared to the 20% sample). A cache of unusually large sized pieces is not included.

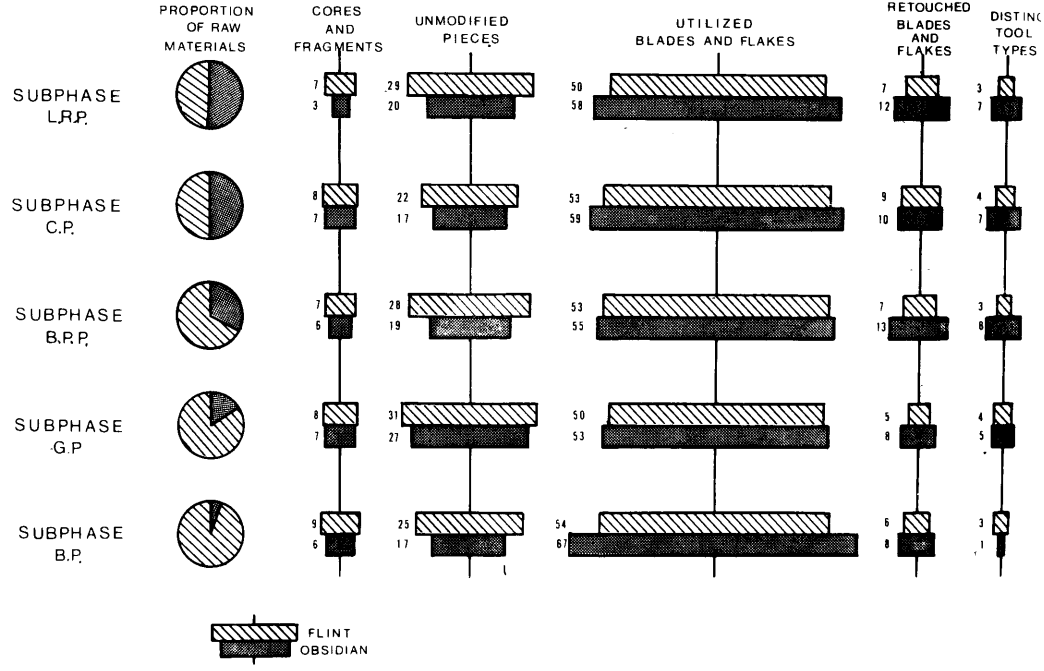


Fig. 2.4 Relative Proportions of occurrence of basic flint and obsidian types by the sub-phases recognized in 1964, 1968 and 1970

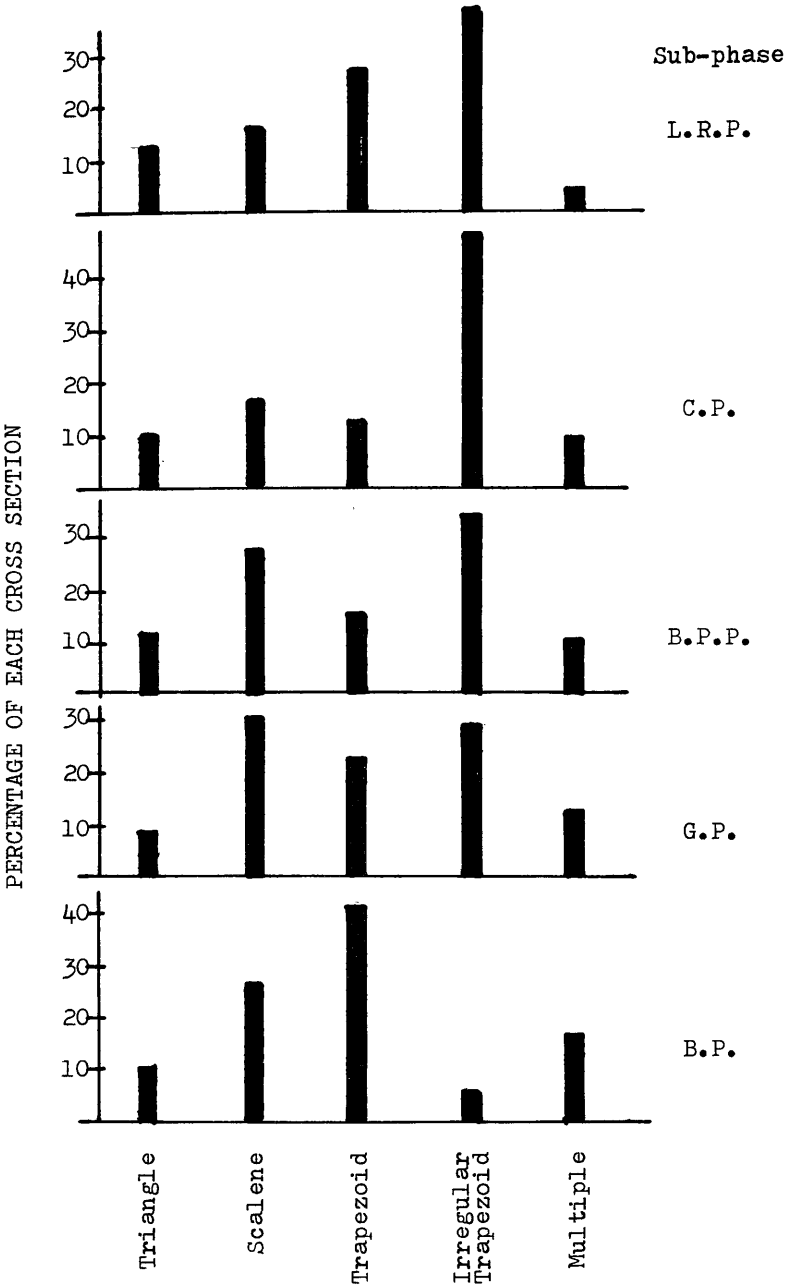


Fig. 2.5 Proportions of obsidian blade cross sections tallied by the sub-phases recognized in 1964, 1968 and 1970

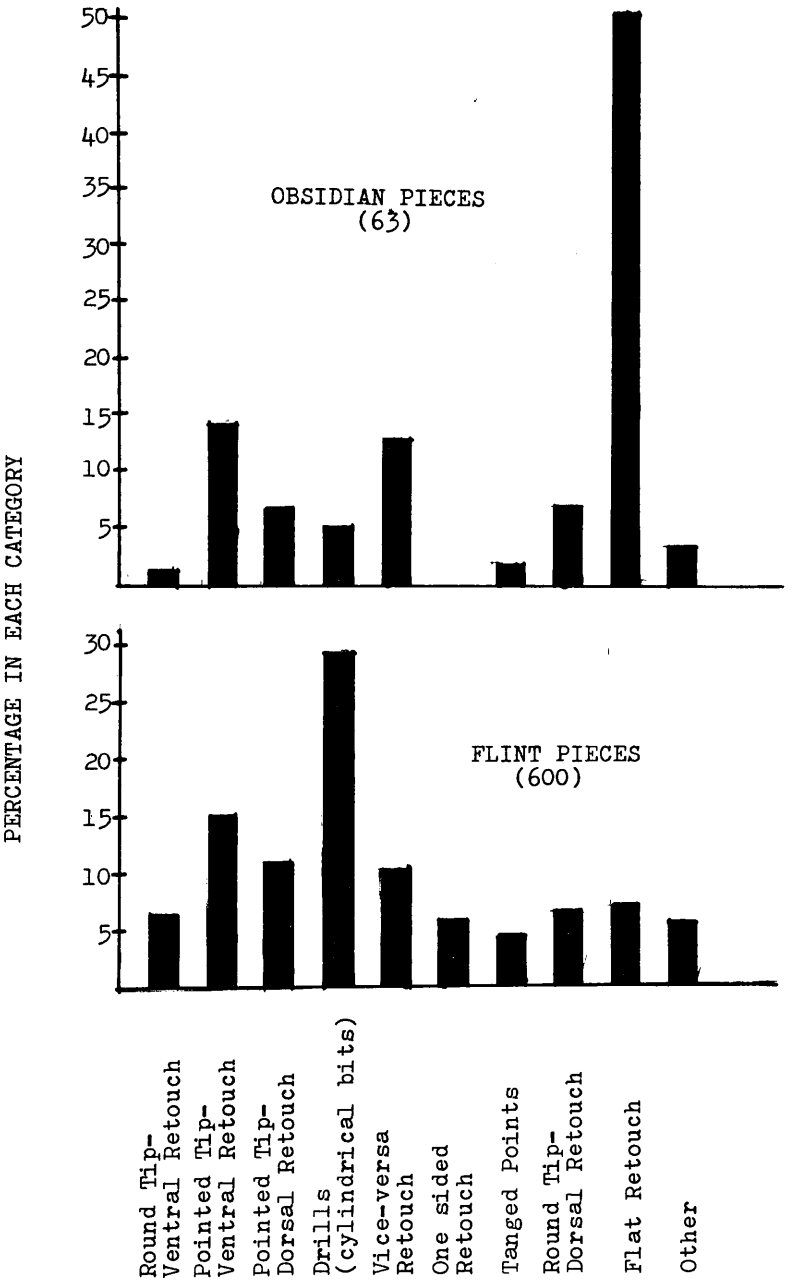


Fig. 2.6 Proportions of different types of pieces with tip attention as their major feature

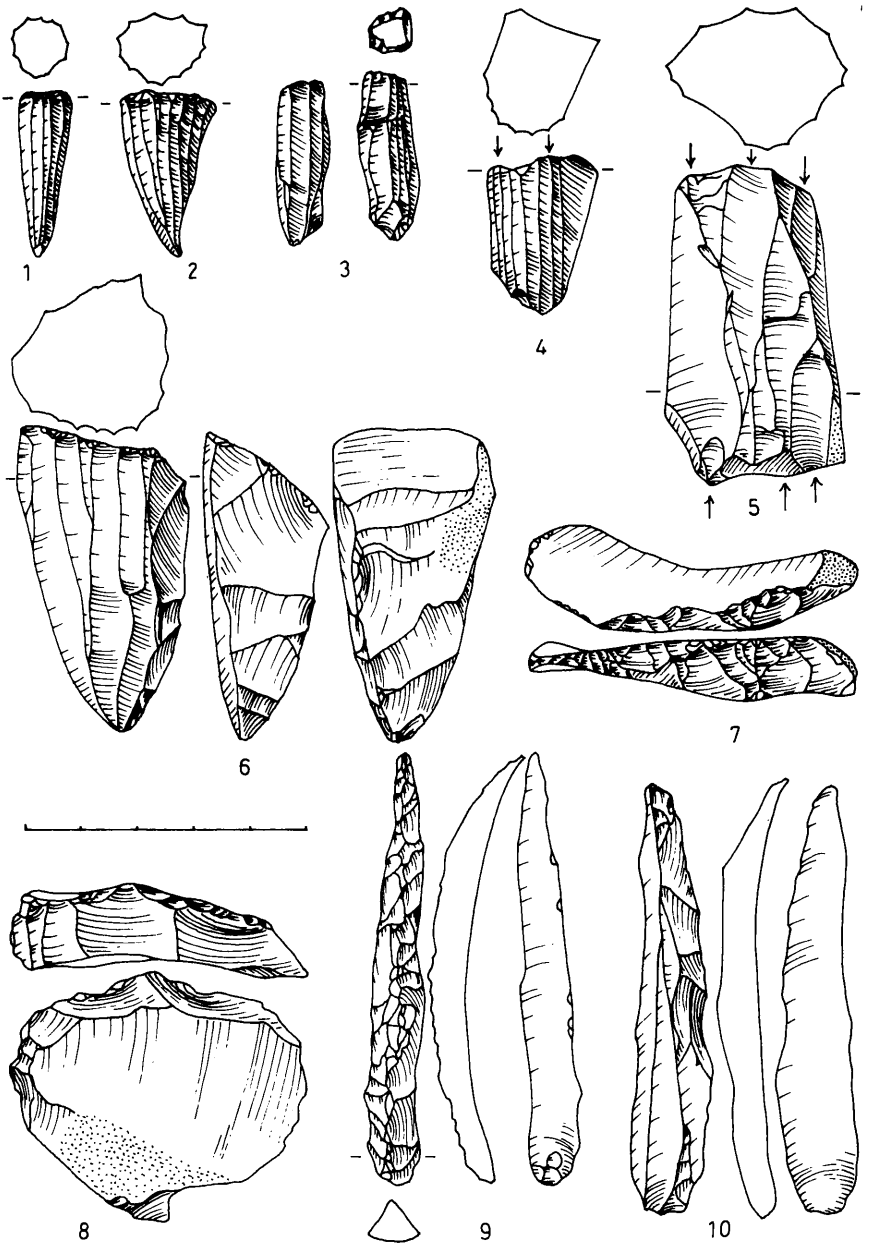


Fig. 2.7 Blade cores (1-6); blade core fragments (7-10)

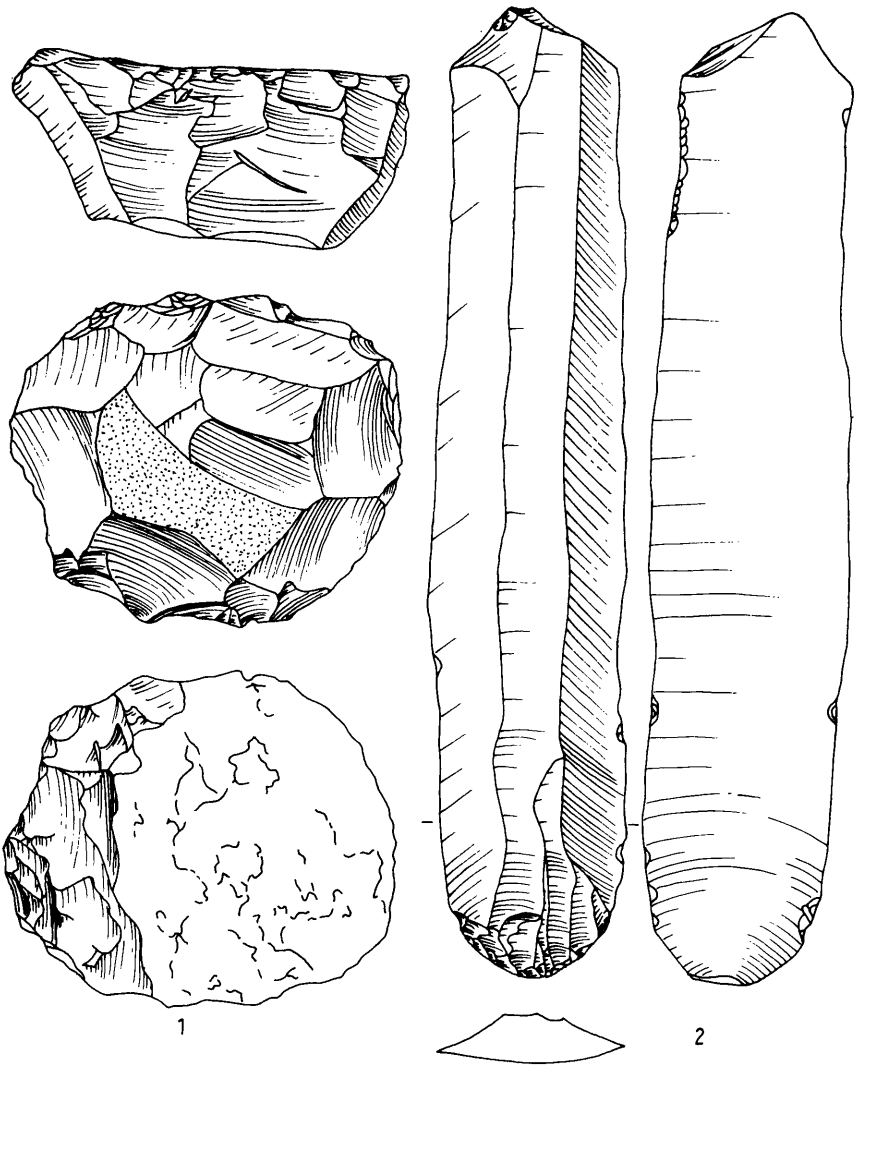


Fig. 2.8 Flake core and large blade

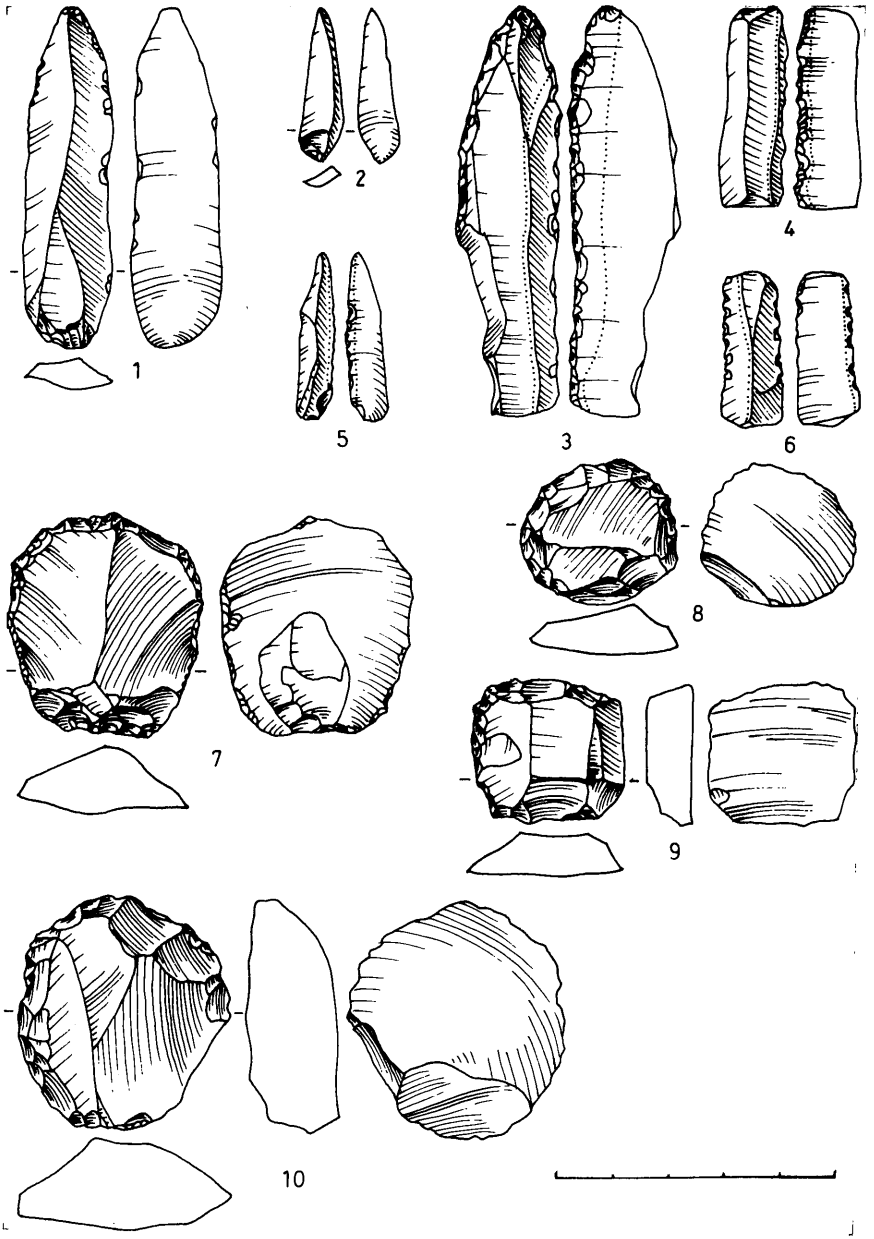


Fig. 2.9 Use modified blades (1,2); blades with sheen (3-6); scrapers (7-10)

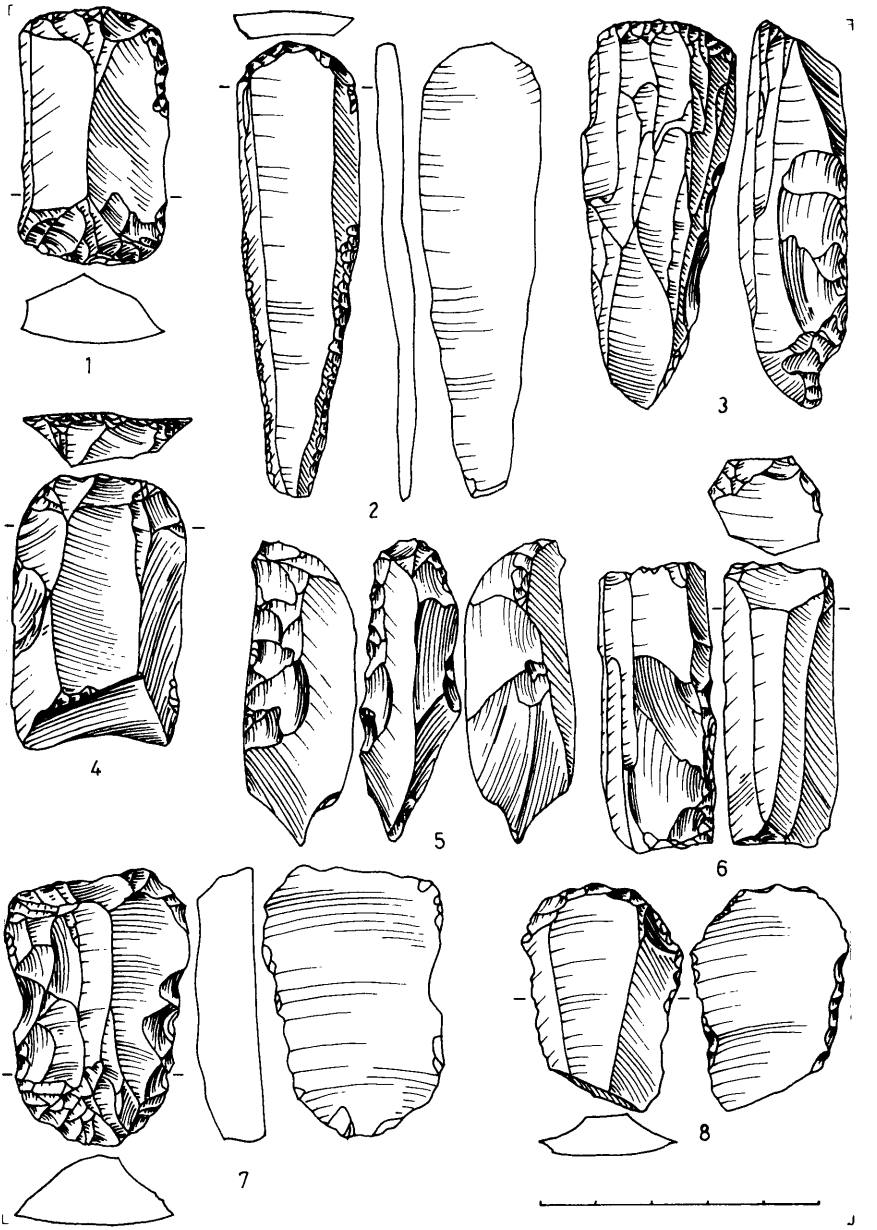


Fig. 2.10 Scrapers

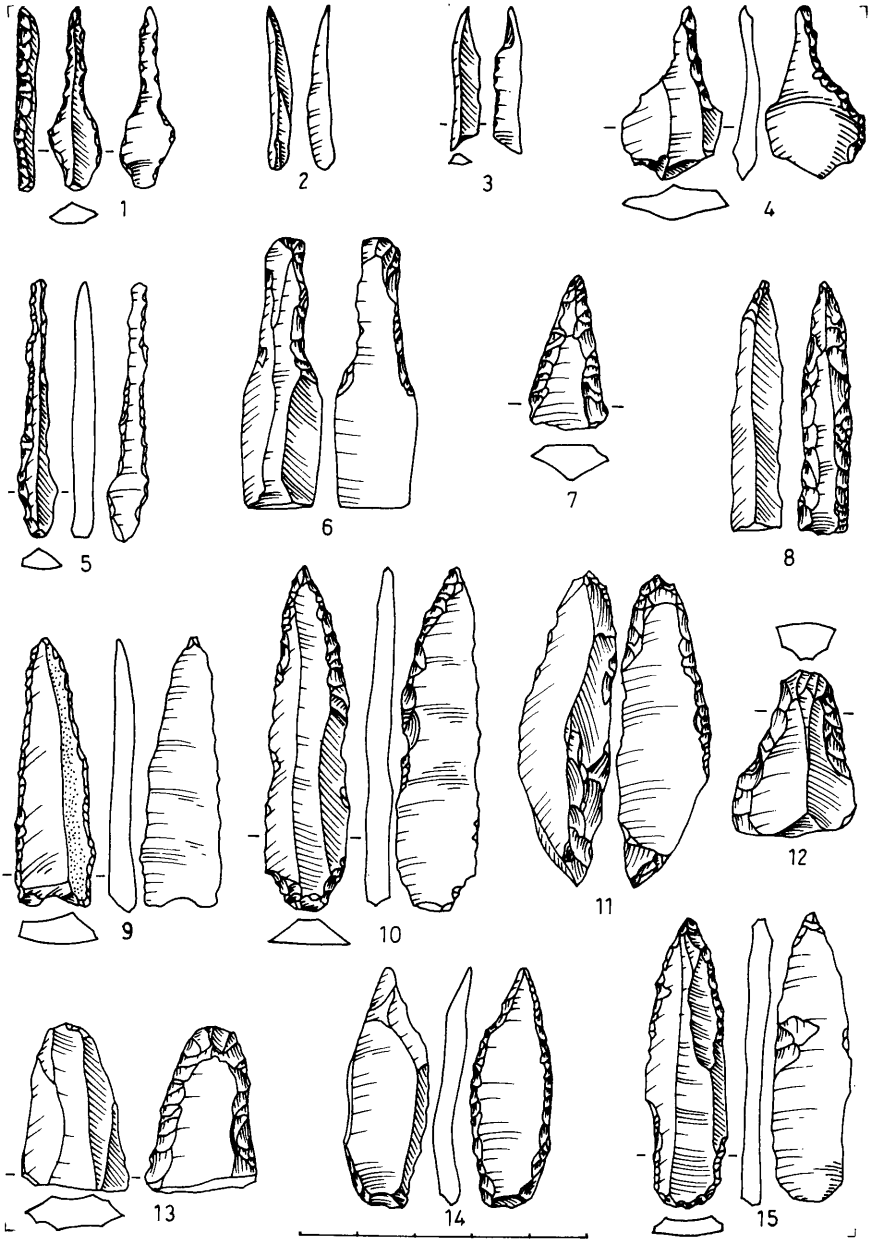


Fig. 2.11 Pieces with tip attention as main feature

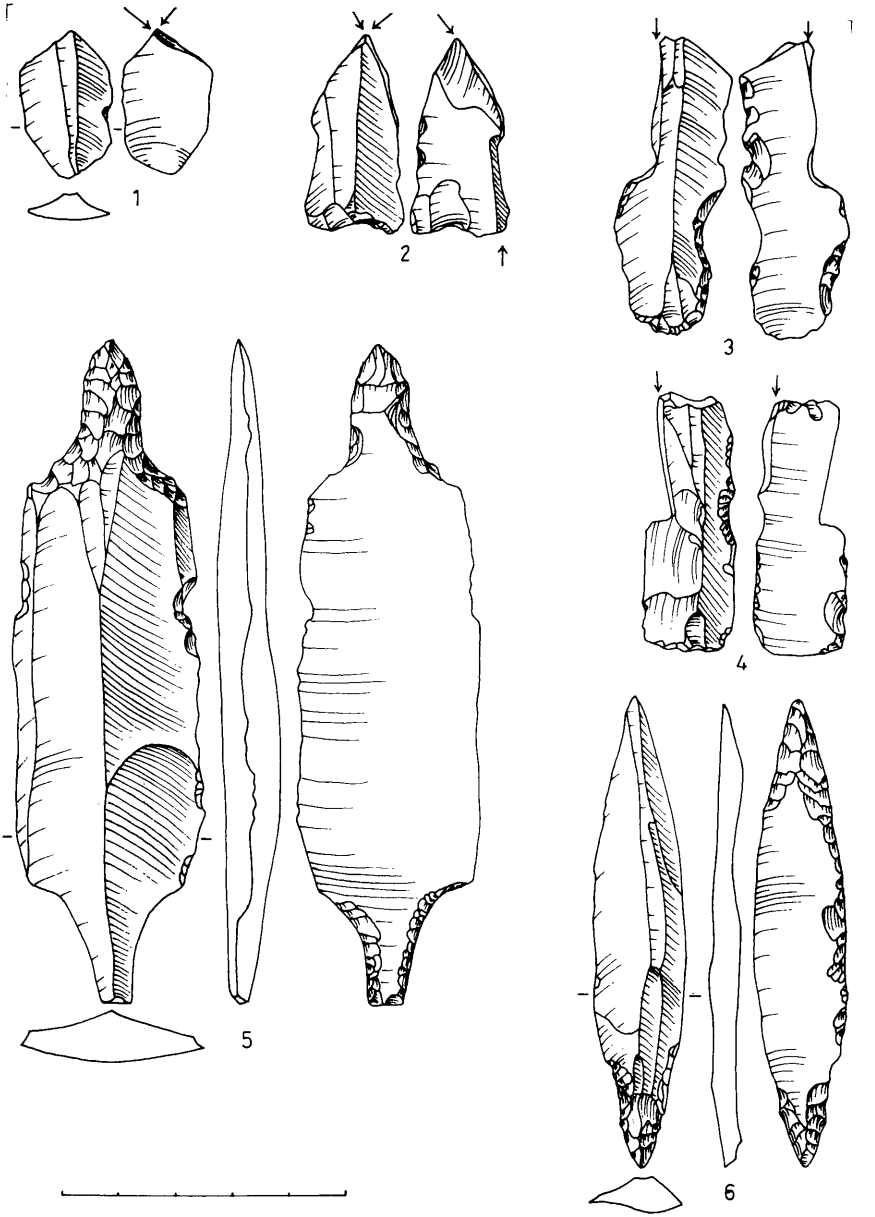


Fig. 2.12 Burins (1-4); pieces with tip attention as main feature (5,6)

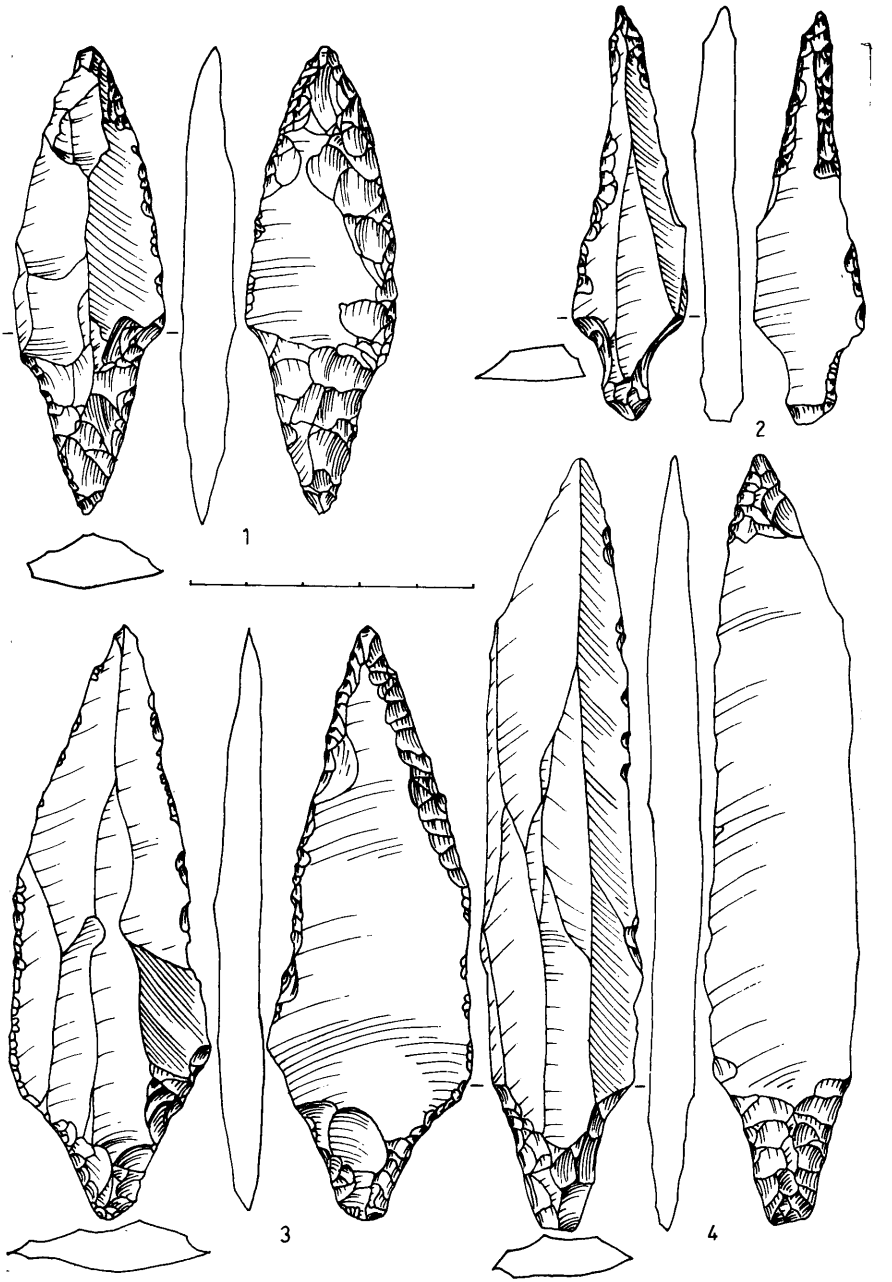


Fig. 2.13 Projectile points (?)

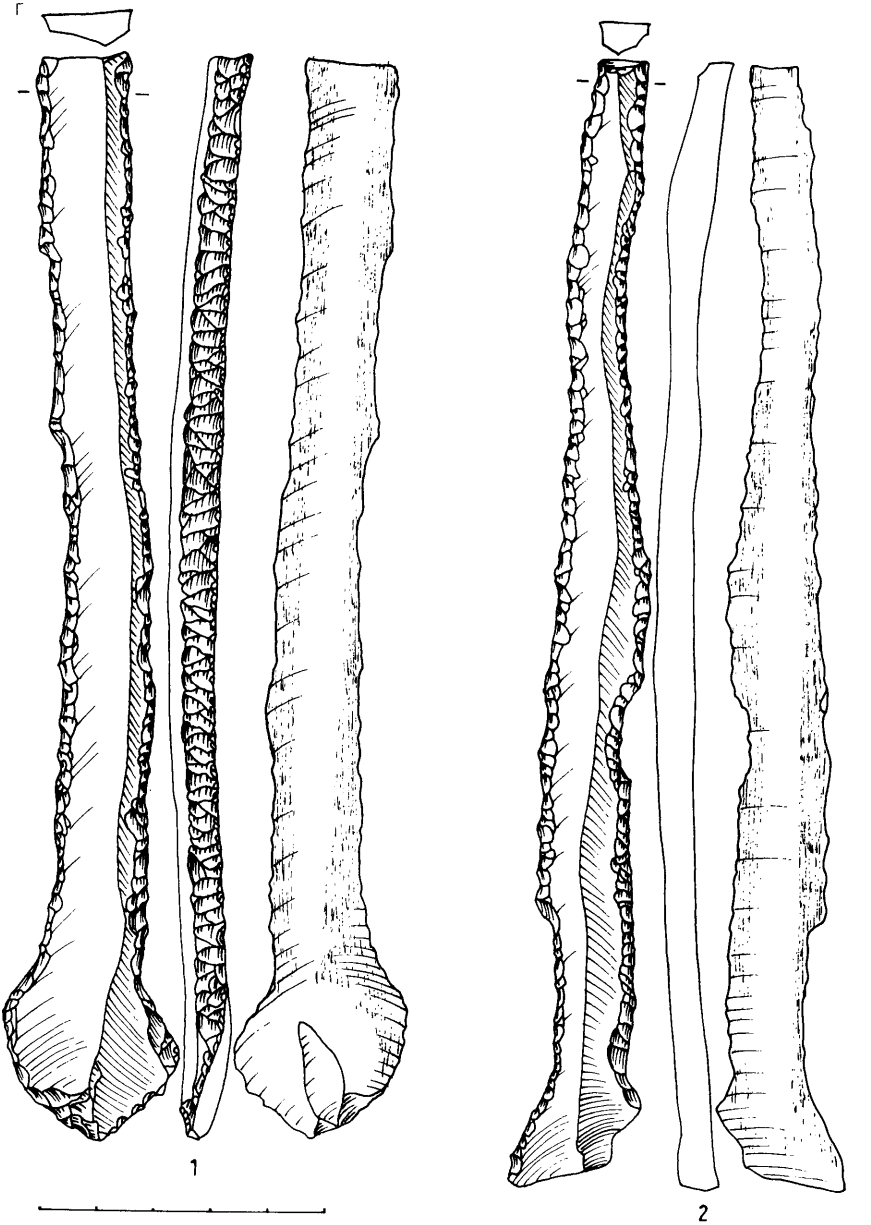


Fig. 2.14 Large double backed obsidian blades

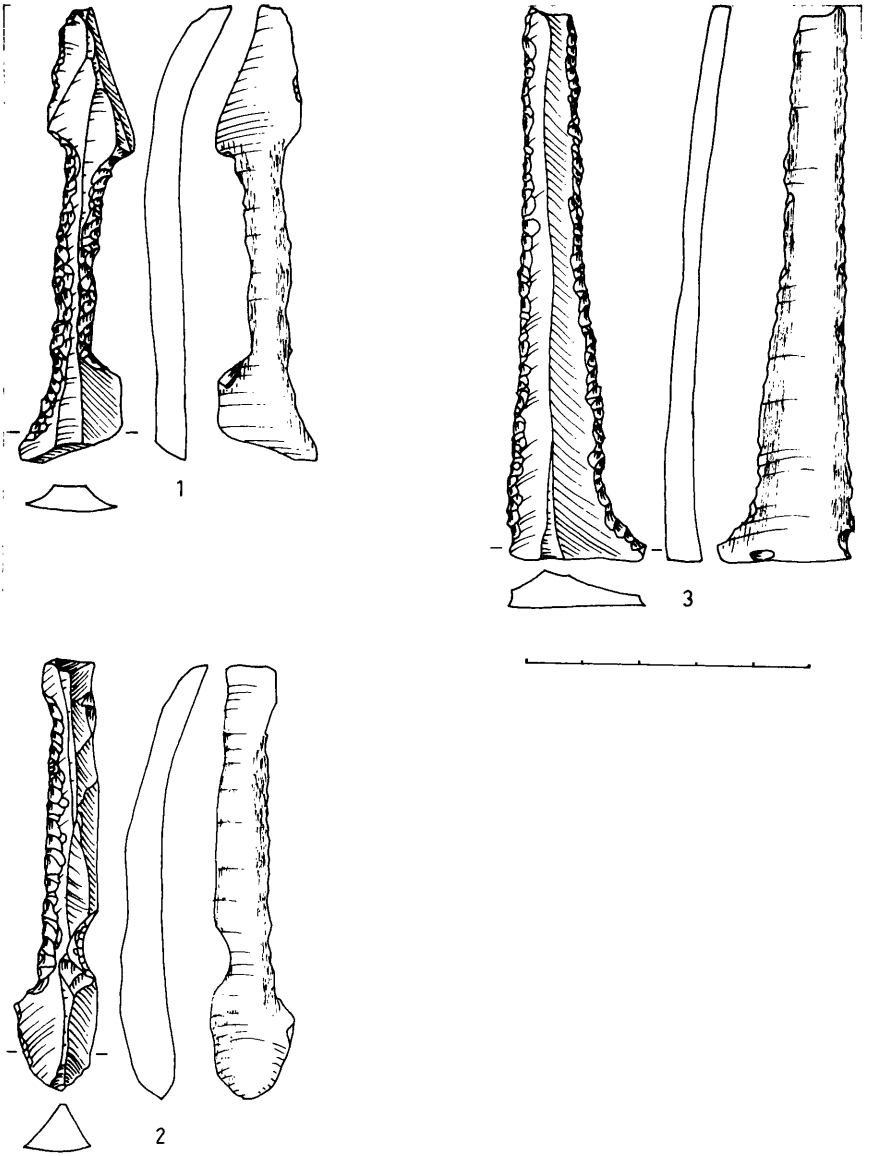
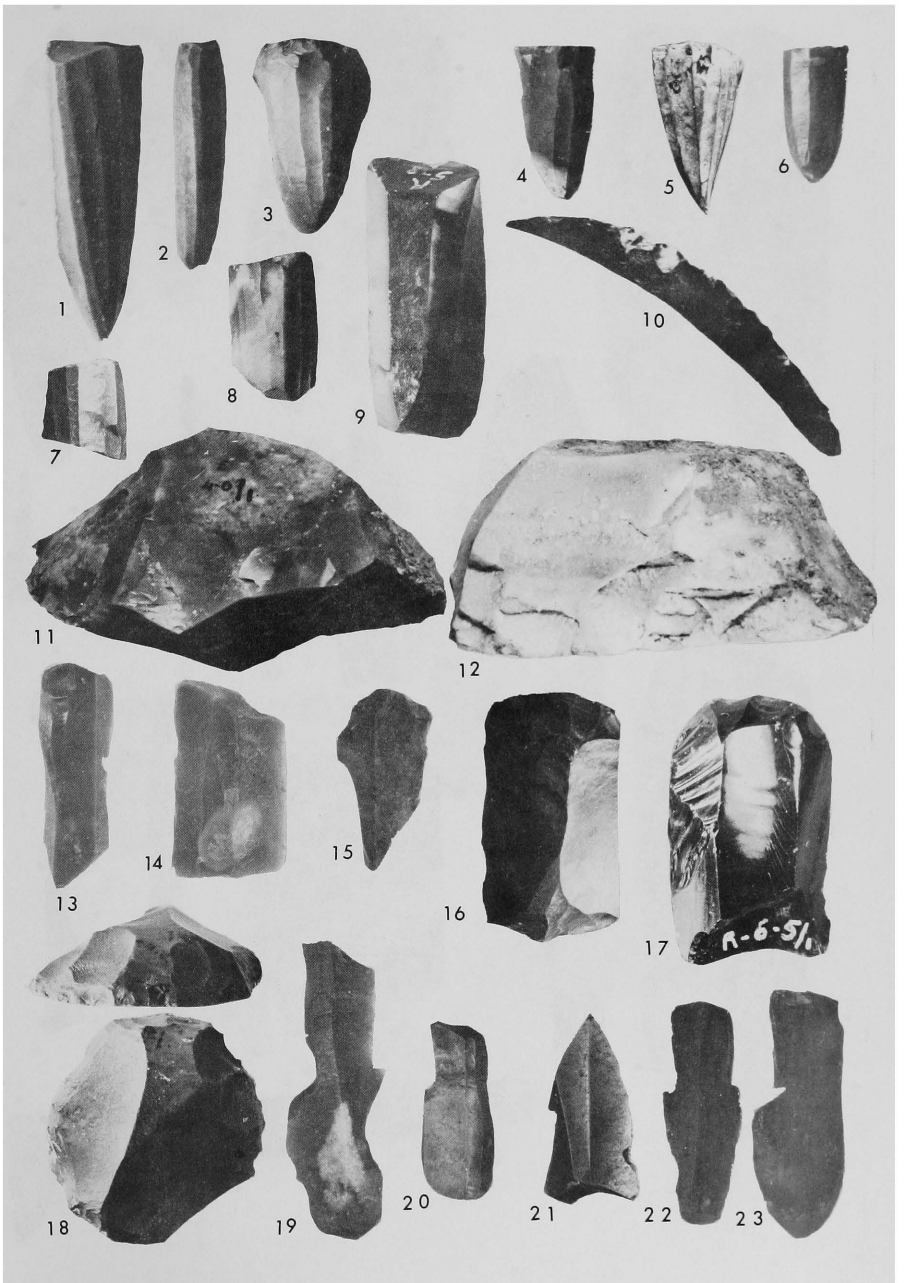
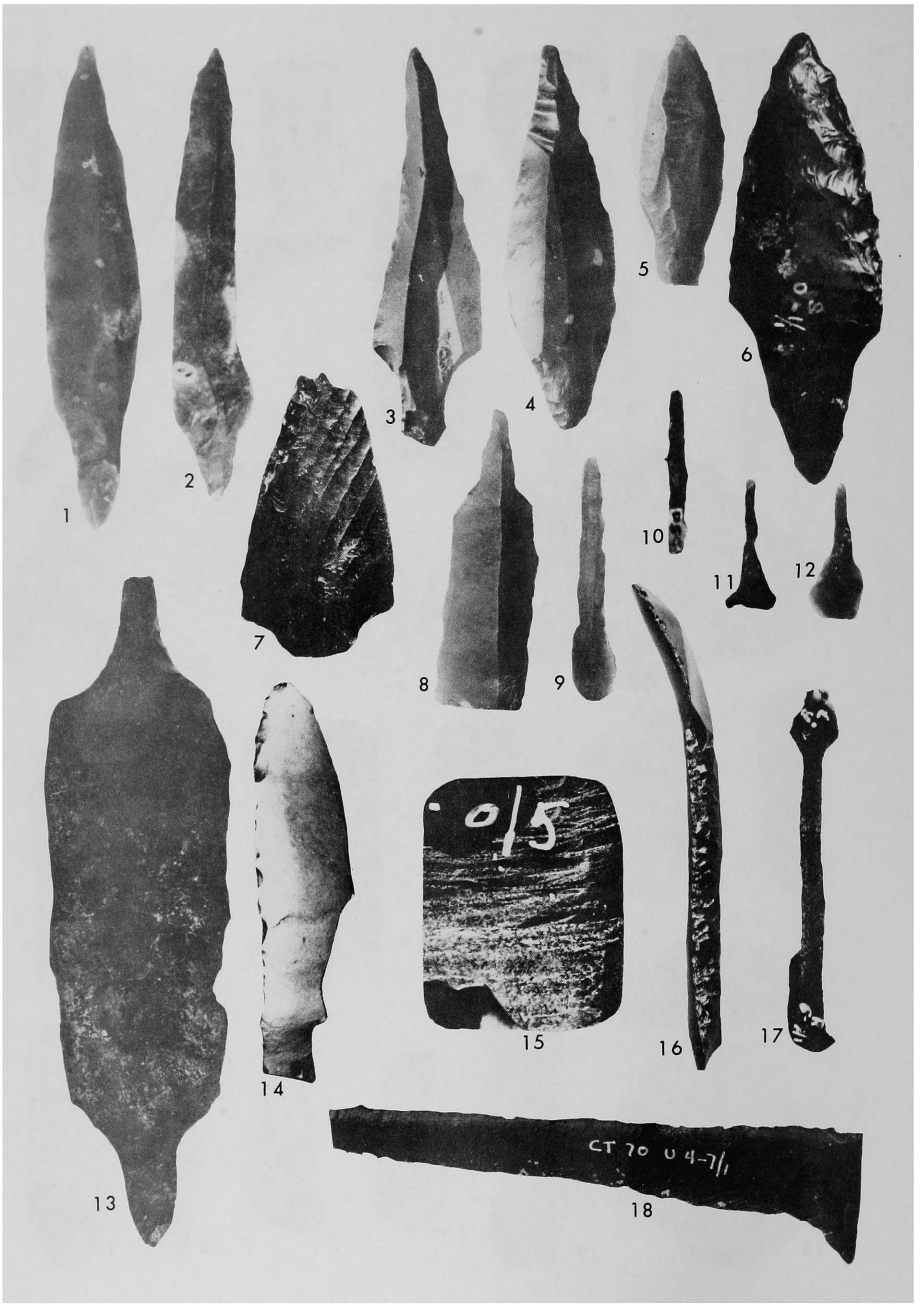


Fig. 2.15 Backed obsidian blades



Pl. 2.I Cores (1-9,11,12); crested blade (10); scrapers (13-18); burin-like pieces (19-23)



Pl. 2.II Pieces with tip attention (1-12); miscellaneous tools (13,14); backed blades (15-18)

Pl. 2.III Microphotographs (1-6: magnification about 10 power); burned obsidian blade (7)

EXPLANATION OF THE TABLES

Table 1 Flint pieces by types; over 34,000 pieces (ca. 75% of the 1968 and 1970 inventory) divided into stratigraphic sub-phases and listed by morphological types. Various sub-totals have been included to aid in comparisons. Four culturally meaningful contexts have been included separately but their contents are also included in the sub-phase tallies (cache R 20-2 in the sub-phase B.P.; building EF 2 in sub-phase G.P.; building U 9 in sub-phase C.P.; and building U 4 in sub-phase L.R.P.)

Table 2 Obsidian pieces by types: over 11,000 pieces (ca. 75% of the 1968 and 1970 inventory) divided into stratigraphic sub-phases and listed by morphological types. Various sub-totals have been included to aid in comparisons.

Table 3a Diagnostic ratios of types of flint pieces: selected comparisons are made to facilitate interpretation of changes between the five sub-phases and/or the four cultural units.

Table 3b Diagnostic ratios of obsidian pieces: selected comparisons are made to facilitate interpretation of changes between the five sub-phases and/or the four cultural units.

Table 3c Diagnostic ratios of types of flint and obsidian pieces combined: selected comparisons.

Table 4 Average weight for flint and obsidian pieces: weights for total number of flint and obsidian pieces (i.e., items 8, 16, and 17) are calculated on the entire analyzed sample of over 45,000 pieces (34,500 flint and 11,100 obsidian). The figures for specific tool types are based on weighing about 20% of the examples from the analyzed levels or about 9,000 pieces.

TABLE 1. TABULATION OF FLINT PIECES BY TYPE

Flint Pieces by Category		Sub-phase designations				Cache	Buildings		
		BP	GP	BPP	CP	LRP	R20-2	FF2	U9	U4
Blade Cores	**Size**									
1-directional, pyramidal:	normal	26	42	16	3	4	5	1	0	2
	normal-utilized	0	0	0	1	0	0	0	1	0
	micro.	4	6	3	2	0	0	0	0	0
	micro.-utilized	0	0	0	0	0	0	0	0	0
bipolar, pyramidal:	normal	5	14	1	0	0	5	1	0	0
	normal-utilized	2	0	0	0	1	0	0	0	0
	micro.	1	0	0	0	0	0	0	0	0
	micro.-utilized	0	0	0	0	0	0	0	0	0
1-direct.,parallel-sided:	normal	8	35	3	2	0	0	1	0	0
	normal-utilized	0	1	0	1	0	0	0	0	0
	micro.	0	4	0	0	1	0	0	0	1
	micro.-utilized	0	2	0	0	0	0	0	0	0
bipolar,parallel-sided	normal	14	29	1	3	1	3	0	0	0
	normal-utilized	0	1	0	0	0	0	0	0	0
	micro.	0	5	0	0	0	0	0	0	0
1-directional,other:	normal	1	5	1	2	0	0	0	0	0
multidirectional:	normal	24	25	0	3	2	16	0	0	1
	normal-utilized	0	7	0	3	1	0	0	0	0
	micro.	0	2	0	0	0	0	0	0	0
Blade Core Fragments										
tablets and platforms:	normal	87	145	30	24	9	20	6	7	1
	normal-utilized	0	29	1	2	1	0	0	0	0
	micro.	2	18	3	0	0	0	0	0	0
	micro.-utilized	0	7	0	0	0	0	0	0	0
crested blades:	normal	68	114	24	16	6	17	6	2	0
	normal-utilized	1	23	2	1	2	0	0	0	0
	micro.	0	27	6	3	0	3	0	0	0
	micro.-utilized	0	4	0	0	0	0	0	0	0
various fragments:	normal	120	178	51	42	11	47	6	5	3
	normal-utilized	4	52	10	8	5	0	2	1	0
	micro.	7	13	4	3	2	0	0	1	0
	micro.-utilized	0	9	0	1	1	0	0	0	0
Flake Cores										
1-directional,pyramidal:	normal	2	14	3	0	0	0	0	0	0
1-directional,discoidal:	normal	1	3	0	1	0	0	0	0	0
multidirect.,discoidal:	normal	6	2	0	0	2	0	0	0	0
	normal-utilized	0	1	0	0	1	0	0	0	0
	micro.-utilized	3	2	0	0	0	0	1	0	0
multidirect.,spheroid:	normal	23	69	7	24	7	10	3	1	2
	normal-utilized	1	32	1	6	3	0	0	1	1
	micro.	0	2	1	0	0	0	0	0	0
	micro.-utilized	0	2	0	0	1	0	0	0	0
Flake Core Fragments:	normal	211	472	140	81	27	55	11	7	11
	normal-utilized	7	112	14	9	21	0	0	0	13
	micro.	7	25	2	3	3	0	1	0	0
	micro.-utilized	0	3	0	0	1	0	0	0	0
SUBTOTALS										
Total blade cores		85	178	25	19	10	29	3	1	4
Total blade cores and core fragments		385	797	156	119	47	116	26	15	9
Total flake cores		36	127	11	31	14	10	4	1	3
Total flake cores and core fragments		261	739	167	121	66	55	16	8	27
Total cores and core fragments(all kinds)		644	1536	323	240	113	181	42	23	36
Unmodified(waste) Pieces	**Size**									
Blades and fragments	normal	123	546	113	54	32	10	4	6	12
	normal w/cortex	22	42	8	4	5	6	2	0	2
	micro.	31	120	20	16	16	3	3	1	0
	micro. w/cortex	2	2	1	0	3	0	1	0	0
Flakes and fragments	normal	813	2575	562	234	165	200	29	14	72
	normal w/cortex	363	320	65	25	9	99	3	5	2
	micro.	47	435	104	35	35	25	0	1	4
	micro. w/cortex	0	13	5	1	1	0	0	1	0
Misc.chips and chunks	normal	308	1148	346	246	137	125	8	17	60
	normal w/cortex	70	122	14	12	6	55	1	0	1
	micro.	9	229	93	33	43	3	2	0	8
	micro. w/cortex	0	38	2	0	0	0	0	0	0
SUBTOTALS										
Total unmodified blades and fragments		178	710	142	74	56	19	10	7	14
Total unmodified flakes and fragments		1223	3343	736	295	210	324	37	21	78
Total unmodified chips and chunks		387	1537	455	291	186	183	11	17	69
Total unmodified pieces (all kinds)		1788	5590	1333	660	452	526	58	45	161
Use Modified Blades and Flakes										
Intensely utilized blades	normal	223	478	205	93	56	30	17	3	16
	normal w/cortex	6	19	13	5	0	1	0	0	0
	normal w/sheen	39	86	29	14	12	4	1	1	6
	micro.	10	51	8	3	12	7	0	0	0
	micro. w/cortex	1	1	0	0	0	0	0	0	0
	micro. w/sheen	1	2	0	0	0	1	0	0	0
Moderately utilized blades	normal	675	1562	586	307	146	158	43	22	48
	normal w/cortex	61	115	35	12	2	19	3	0	1
	normal w/sheen	51	96	31	34	11	22	1	2	2
	micro.	36	292	65	36	20	13	0	0	4
	micro. w/cortex	0	2	1	0	0	0	0	0	0
	micro. w/sheen	5	0	0	0	1	5	0	0	1
Slightly utilized blades	normal	912	1396	382	269	67	376	39	23	26
	normal w/cortex	160	116	27	12	4	59	1	1	1
	micro.	66	474	119	58	11	24	5	3	6
	micro. w/cortex	3	14	0	3	0	0	0	0	0
Intensely utilized flakes	normal	54	206	92	31	47	9	4	2	11
	normal w/cortex	7	21	7	1	5	4	0	0	1
	micro.	0	6	9	0	4	0	0	0	3
Moderately utilized flakes	normal	377	2114	426	206	152	95	14	11	28
	normal w/cortex	142	217	57	20	36	66	4	1	3
	micro.	18	74	22	8	14	14	0	0	0
	micro. w/cortex	0	5	0	0	0	0	0	0	0
Slightly utilized flakes	normal	545	1370	334	311	123	87	33	18	57
	normal w/cortex	217	232	39	116	20	84	1	3	1
	micro.	78	136	69	35	31	42	1	0	2
	micro. w/cortex	12	8	0	0	2	9	0	0	0
SUBTOTALS										
Total Use Modified Blades		2249	4784	1501	843	544	723	110	55	104

TABLE 1. Continued, next page.

TABLE 1. TABULATION OF FLINT PIECES BY TYPE, (CONT.)

Flint Pieces by Category		Sub-phase designations				Cache		Buildings		
		BP	GP	BPP	CP	LRP	R20-2	EF2	U9	U4
SUBTOTALS (CONT.)										
Total Use Modified Flakes		1450	4389	1045	725	434	410	61	36	107
Total Use Modified Blades and Flakes		3699	9093	2546	1568	778	1133	171	91	211
Retouched Blades and Fragments										
Flat retouch	normal	13	47	19	11	3	0	1	2	2
	normal w/sheen	1	5	1	4	0	0	0	0	0
	micro.	0	1	0	0	0	0	0	0	0
Steep retouch	normal	44	123	41	42	13	3	2	3	4
	normal w/sheen	2	22	4	5	3	0	0	2	1
	micro.	9	5	2	1	2	5	0	0	0
Nibbled retouch	normal	162	375	136	87	32	21	18	6	12
	normal w/sheen	70	108	51	39	20	18	4	0	8
	micro.	6	38	4	0	1	6	0	0	0
	micro. w/sheen	12	6	1	1	1	11	0	0	0
Denticulated & notched	normal	16	29	16	11	7	3	2	1	2
	normal w/sheen	17	45	14	9	4	0	2	0	0
	micro.	0	1	0	1	1	0	0	0	1
	micro. w/sheen	0	3	0	0	0	0	0	0	0
SUBTOTAL										
Total retouched blades and fragments		352	808	289	211	87	67	29	14	30
Retouched Flakes and Fragments										
Flat retouch	normal	5	7	4	5	1	0	0	0	0
	micro.	0	0	0	0	1	0	0	0	0
Steep retouch	normal	12	34	22	13	11	0	2	0	4
	micro.	2	1	1	9	0	1	0	0	0
Nibbled retouch	normal	34	84	41	24	8	5	2	1	5
	normal w/sheen	0	0	3	0	0	0	0	0	0
	micro.	2	0	0	1	0	1	0	0	0
Denticulated & notched	normal	1	8	4	3	2	0	1	0	2
SUBTOTALS										
Total retouched flakes and fragments		56	134	75	55	23	7	5	1	11
Total retouched blades and flakes		408	942	364	266	110	74	34	15	41
Distinct Tool Types: Scrapers										
End Scraper on blade	normal by use	6	13	7	10	1	4	0	0	1
	normal by retouch	16	32	12	7	3	2	0	2	3
Side scraper on blade	normal by use	0	5	6	8	0	0	0	0	0
	micro. by use	0	0	0	1	0	0	0	0	0
	normal by retouch	0	7	0	6	3	0	0	0	0
	micro. by retouch	0	0	0	1	0	0	0	0	0
End scraper on a flake	normal by use	3	8	3	1	4	0	1	0	1
	normal by retouch	2	7	1	5	3	0	0	0	1
Side scraper on a flake	normal by use	3	8	0	1	3	0	0	0	2
	normal by retouch	1	2	1	4	7	0	0	0	1
	micro. by retouch	0	0	1	0	0	0	0	0	0
Circular scrapers	normal by use	3	13	1	6	1	1	0	1	1
	normal by retouch	3	3	5	4	2	2	0	0	2
Steep scrapers	normal by retouch	0	2	0	0	3	0	0	0	0
Core scrapers	normal by use	7	21	3	1	2	0	0	0	1
	micro. by use	0	0	0	1	0	0	0	0	0
	normal by retouch	3	16	4	1	0	3	0	0	0
SUBTOTALS										
Total blade scrapers (end & side)		22	57	25	33	7	6	0	2	4
Total flake scrapers(end,side, & circular)		15	41	12	21	20	3	1	1	8
Total scrapers (all kinds)		47	135	44	57	29	12	1	3	13
Distinct Tool Types: Miscellaneous										
Burins	normal	14	24	10	1	2	5	0	0	0
Truncated pieces	normal	0	3	0	0	0	0	0	0	0
	micro.	0	2	0	0	0	0	0	0	0
Perforators	normal	48	175	53	29	10	12	5	1	3
	normal w/sheen	0	2	2	0	0	0	0	0	0
	micro.	16	209	6	11	1	8	0	0	0
	micro. w/sheen	0	1	0	0	0	0	0	0	0
Perf: poorly defined	normal	43	44	23	17	3	7	3	0	1
	normal w/sheen	1	0	0	0	0	0	0	0	0
	micro.	4	108	3	2	1	1	0	0	1
	micro. w/sheen	1	0	0	0	0	0	0	0	0
Fabricators	normal	0	3	0	1	0	0	0	1	0
Backed blades,both edges	normal	0	3	3	5	4	0	0	1	4
	micro.	1	0	0	0	1	1	0	0	1
Backed blades, one edge	normal	0	6	5	3	1	0	0	0	1
	micro.	1	4	0	0	0	1	0	0	0
Geometrics(backed crescents)	normal	0	4	8	1	3	0	0	0	0
	micro.	0	1	0	0	0	0	0	0	0
Tanged pieces	normal	2	9	3	5	0	0	0	0	0
	micro.	0	1	0	0	0	0	0	0	0
Miscellaneous	normal	0	0	0	1	0	0	0	0	0
SUBTOTALS										
Total perforators		113	539	87	59	15	28	8	1	5
Total Misc. Distinct tool types		131	599	116	75	26	35	8	3	11
Various Types not included above										
Rolled pieces	normal	5	3	12	4	2	3	0	0	2
Pecked pieces	normal	4	20	4	6	7	0	3	1	2
Burned pieces	normal	1	7	1	2	3	0	0	0	0
Large fragments with use	normal	0	9	0	3	2	0	0	0	0
Flaked pebble disks	normal	2	6	5	9	1	1	2	0	1
Other struck pieces	normal	94	252	55	37	29	5	0	1	18
Other misc. pieces	normal	76	87	34	47	15	1	2	2	11
TOTAL FLINT PIECES OF ALL TYPES		6899	18279	4837	2974	1567	1971	321	184	507

TABLE 2. TABULATION OF OBSIDIAN PIECES BY TYPE

Obsidian Pieces by Category		Sub-phase designations					Cache	Buildings		
		BP	GP	BPP	CP	LRP	R20-2	EF2	U9	U4
Blade Cores	**Size**									
1-directional, pyramidal	normal	2	11	7	2	0	1	0	0	0
	micro.	0	5	1	1	1	0	0	0	1
bipolar. pyramidal	normal	0	4	1	0	1	0	0	0	0
1-direct.,parallel-sided	normal	0	8	14	1	1	0	0	0	1
	micro.	0	4	0	0	0	0	1	0	0
bipolar, parallel-sided	normal	1	2	0	2	1	1	0	0	1
	micro.	0	2	0	1	0	0	0	0	0
1-directional, other	normal	0	0	0	0	1	0	0	0	0
	micro.	0	0	0	0	1	0	0	0	0
multidirectional	normal	0	0	1	0	0	0	0	0	0
	micro.	0	1	1	0	0	0	0	0	0
Blade Core Fragments										
tablets and platforms	normal	6	30	30	17	3	0	0	2	0
	normal-utilized	0	2	0	0	0	0	0	0	0
	micro.	0	10	13	5	0	0	0	0	0
crested blades	normal	4	21	17	5	3	4	0	0	1
	normal-utilized	0	2	0	0	0	0	0	0	0
	micro.	0	5	4	2	0	0	0	0	0
	micro.-utilized	0	2	0	0	0	0	0	0	0
various fragments	normal	5	32	25	51	10	0	0	2	1
	normal-utilized	2	2	0	1	9	2	0	0	7
	micro.	0	20	1	9	2	0	0	0	0
	micro.-utilized	0	0	0	1	0	0	0	0	0
Flake Cores										
1-directional,pyramidal	normal	0	1	0	0	0	0	0	0	0
multidirection-discoidal	normal	0	1	0	0	1	0	0	0	0
multidirection-spheroid	normal	0	4	1	3	3	0	0	0	1
	micro.	0	1	0	0	1	0	0	0	1
Flake Core Fragments	normal	5	63	29	102	11	0	0	51	1
	normal-utilized	2	9	0	2	3	2	0	1	0
	micro.	0	7	0	0	4	0	0	0	0
SUBTOTALS										
Total blade cores		3	37	25	7	6	2	1	0	3
Total blade cores and fragments		20	163	115	98	33	8	1	4	12
Total flake cores and fragments		7	86	30	107	23	2	0	52	3
Total cores and core fragments (all kinds)		27	249	145	205	56	10	1	56	15
Unmodified (waste) Pieces										
Blades and fragments	normal	23	159	50	42	38	3	0	2	9
	normal w/cortex	0	2	0	4	0	0	0	0	0
	micro.	3	80	31	4	22	0	4	0	6
Flakes and fragments	normal	24	404	142	164	108	3	1	6	38
	normal w/cortex	1	7	1	2	0	0	0	0	0
	micro.	1	104	110	73	47	0	0	4	10
	micro. w/cortex	2	9	0	0	0	0	0	0	0
Misc. chips and chunks	normal	16	147	87	101	40	0	3	3	21
	normal w/cortex	0	2	1	0	2	0	0	0	0
	micro	1	82	55	104	56	0	0	0	12
	micro w/cortex	0	4	0	0	0	0	0	0	0
SUBTOTALS										
Total unmodified blades and fragments		26	241	81	50	60	3	4	2	15
Total unmodified flakes and chips		45	759	396	444	253	3	4	13	81
Total unmodified pieces (all kinds)		71	1000	477	494	313	6	8	15	96
Use Modified Blades and Flakes										
Intensely utilized blades	normal	35	235	257	236	97	8	0	17	46
	micro.	5	29	28	41	03	0	0	0	3
Moderately utiliz.blades	normal	61	531	334	519	253	24	5	25	107
	micro.	8	121	78	160	154	1	0	0	20
Slightly utilized blades	normal	52	364	212	235	138	12	3	24	47
	micro.	12	162	108	95	75	3	1	0	18
Intensely utilized flakes	normal	11	79	41	37	17	2	1	4	4
	normal w/cortex	1	0	0	0	0	0	0	0	0
	micro.	1	5	1	5	3	0	0	0	2
Moderately utiliz.flakes	normal	20	178	144	129	44	4	0	13	27
	normal w/cortex	0	3	1	0	0	0	0	0	0
	micro.	1	19	16	3	10	0	0	0	5
Slightly utilized flakes	normal	46	176	119	180	41	6	9	19	25
	normal w/cortex	9	4	4	0	0	0	0	0	0
	micro.	14	44	36	83	4	0	0	2	0
	micro. w/cortex	0	2	0	0	0	0	0	0	0
SUBTOTALS										
Total Use Modified Blades		173	1442	1017	1286	800	48	9	66	241
Total Use Modified Flakes		103	510	362	437	119	12	10	38	63
Total Use Modified Blades and Flakes		276	1952	1379	1723	919	60	19	104	304
Retouched Blades and Fragments										
Flat retouch	normal	3	29	22	19	14	0	0	1	8
	micro.	1	2	1	1	1	0	0	0	0
Steep retouch	normal	6	53	37	56	29	0	0	3	12
	micro.	0	4	3	7	6	0	1	0	3
Nibbled retouch	normal	18	121	130	111	102	4	4	13	23
	micro.	2	18	26	22	10	0	0	1	0
Denticulated & notched	normal	1	4	14	12	16	0	0	0	6
	micro.	0	2	0	5	5	0	0	0	0
SUBTOTAL										
Total retouched blades and fragments		31	233	233	233	183	4	5	18	52
Retouched Flakes and Fragments										
Flat retouch	normal	0	8	16	13	3	0	0	1	0
	micro.	0	0	0	0	1	0	0	0	2
Steep retouch	normal	1	16	16	9	3	0	0	0	0
	micro.	0	0	2	3	0	0	0	0	1
Nibbled retouch	normal	2	31	51	22	8	0	1	0	0
	micro.	0	4	0	0	0	0	0	0	1
Denticulated & notched	normal	0	2	3	0	1	0			
SUBTOTALS										
Total retouched flakes and fragments		3	61	88	47	16	0	1	1	4
Total retouched blades and flakes		34	294	321	280	199	4	6	19	56

TABLE 2. Continued, next page.

TABLE 2. TABULATION OF OBSIDIAN PIECES BY TYPE, (CONT.)

Obsidian Pieces by Category		Subphase designations BP	GP	BPP	CP	LRP	Cache R20-2	Buildings EF2	U9	U4
Distinct Tool Types: Scrapers										
End scraper on a blade	normal by use	0	4	0	6	4	0	0	0	0
	normal by retouch	0	9	8	6	2	0	0	0	1
Side scraper on a blade	normal by use	0	4	2	2	2	0	1	0	1
	normal by retouch	0	1	1	0	3	0	0	0	0
End scraper on a flake	normal by use	0	5	3	1	3	0	0	0	0
	normal by retouch	0	7	8	2	1	0	0	0	0
Side scraper on a flake	normal by use	0	3	0	4	2	0	0	1	1
	normal by retouch	0	0	1	3	0	0	0	0	0
Circular scrapers	normal by use	0	0	0	0	3	0	0	0	1
	normal by retouch	0	7	4	0	0	0	0	0	0
Steep scrapers	normal by retouch	0	1	0	1	0	0	0	0	0
Core scrapers	normal by use	0	1	8	0	0	0	0	0	0
	micro. by use	0	0	0	0	1	0	0	0	0
	normal by retouch	0	3	1	2	1	0	0	0	0
SUBTOTALS										
Total blade scrapers (end & side)		0	18	11	14	11	0	1	0	2
Total flake scrapers (end, side, & circular)		0	22	16	10	9	0	0	1	2
Total scrapers (all kinds)		0	40	27	24	20	0	1	1	4
Distinct Tool Types: Miscellaneous										
Burins	normal	2	1	0	0	0	0	0	0	0
	micro	0	1	0	0	0	0	0	0	0
Burin spalls	micro	0	1	0	1	2	0	0	0	0
Perforators	normal	2	8	49	17	1	1	0	1	0
	micro	0	1	2	0	0	0	0	0	0
Perfor., poorly defined	normal	0	5	3	5	0	0	0	0	0
	micro.	0	1	0	0	0	0	0	0	0
Fabricators	micro	0	1	0	0	0	0	0	0	0
Backed blades, both edges	normal	1	45	50	81	42	0	0	1	10
	micro.	0	18	8	10	15	0	0	0	3
Backed blades, one edge	normal	0	34	33	46	24	0	0	0	7
	micro.	0	8	17	9	4	0	0	0	3
Geometrics	normal	0	1	0	0	0	0	0	0	0
Tanged pieces	normal	0	3	0	7	0	0	0	0	0
Miscellaneous	normal	0	0	3	1	1	0	0	1	1
	micro.	0	0	0	1	0	0	0	0	0
SUBTOTALS										
Total perforators		2	15	54	22	1	1	0	1	0
Total backed blades		1	105	108	146	85	0	0	1	23
Total miscellaneous distinct tool types		5	128	165	178	89	1	0	3	24
Various Types not included above										
Burned pieces	normal	0	0	1	9	0	0	0	0	0
Other misc. pieces	normal	0	2	0	0	0	0	0	0	0
TOTAL OBSIDIAN PIECES OF ALL TYPES		413	3665	2515	2912	1596	81	35	198	499
TOTAL FLINT AND OBSIDIAN PIECES		7312	21944	7352	5887	3163	2052	356	382	1006

TABLE 3a. DIAGNOSTIC RATIOS OF FLINT PIECES

	Sub-phase designations BP	GP	BPP	CP	LRP	Cache R20-2	EF2	Buildings U9	U4
Blade cores to all cores	.702	.583	.694	.380	.417	.744	.429	.500	.571
Blade cores & fragments to all cores & fragments	.595	.519	.483	.496	.416	.641	.619	.652	.250
Pyramidal blade cores to pyr. & parallel sided	.633	.446	.833	.500	.714	.769	.667	1.000	.667
Blade cores: microlithic to total	.059	.107	.120	.105	.200	.000	.000	.000	.250
Flake cores: microlithic to total	.083	.047	.000	.000	.071	.000	.250	.000	.000
Blade cores: utilized to total	.024	.062	.000	.211	.100	.000	.000	1.000	.000
Flake cores: utilized to total	.111	.291	.091	.194	.357	.000	.250	.000	.333
All cores & fragments: microlithic to total	.051	.092	.056	.038	.088	.017	.119	.000	.028
All cores & fragments: utilized to total	.028	.187	.087	.129	.327	.000	.071	.043	.417
All cores to total flint	.018	.017	.007	.017	.015	.020	.022	.011	.014
All cores & fragments to total flints	.093	.084	.067	.081	.072	.092	.131	.109	.071
Unmodified waste pieces: microlithic to total	.050	.150	.169	.129	.217	.059	.190	.067	.075
Unmodified waste pieces to total flint	.259	.306	.276	.222	.288	.267	.181	.265	.318
Intensely utilized blades to all utilized blades	.124	.135	.170	.136	.233	.061	.164	.073	.212
Intensely utilized flakes to all utilized flakes	.042	.053	.103	.044	.129	.032	.066	.056	.140
Utilized blades to all utilized pieces	.608	.517	.590	.538	.442	.638	.643	.604	.493
Utilized pieces: microlithic to total	.062	.128	.115	.088	.122	.102	.058	.044	.081
Utilized pieces to total flint	.536	.497	.526	.527	.496	.575	.533	.495	.416
Retouched blades: microlithic to total	.043	.067	.024	.014	.057	.328	.000	.000	.033
Retouched flakes: microlithic to total	.071	.007	.013	.182	.043	.286	.000	.000	.000
Retouched blades to retouched blades & flakes	.863	.858	.794	.793	.791	.905	.853	.933	.732
Blade scrapers to total scrapers	.468	.422	.568	.579	.241	.500	.000	.667	.308
End scrapers to total scrapers	.574	.444	.523	.404	.379	.500	1.000	.667	.462
Total scrapers to total retouched pieces	.080	.081	.084	.143	.176	.099	.023	.143	.200
Total scrapers to total flint	.007	.007	.009	.019	.019	.006	.003	.016	.026
Pieces with tip attention: microlithic to total	.186	.590	.103	.220	.133	.321	.000	.000	.200
Pieces with tip attention to all retouched pieces	.193	.322	.166	.148	.091	.231	.186	.048	.077
Pieces with tip attention to total flint	.016	.029	.018	.020	.010	.014	.025	.005	.010
Total retouched pieces: microlithic to total	.072	.227	.034	.073	.055	.289	.000	.000	.046
Total retouched pieces to total flint	.085	.092	.108	.134	.105	.061	.134	.114	.128
Total distinct tool types to total flint	.026	.040	.033	.044	.035	.024	.028	.033	.047
Unmodified blades to total blades	.064	.114	.073	.066	.115	.023	.067	.092	.095
Utilized blades to total blades	.809	.756	.777	.747	.706	.894	.738	.724	.703
Retouched blades to total blades	.127	.130	.150	.187	.179	.083	.195	.184	.203
Total blades to total flint	.403	.340	.399	.379	.311	.410	.464	.413	.292
Proportion of utilized blades with sickle sheen	.043	.039	.040	.057	.076	.048	.018	.055	.135
Proportion of retouched blades with sickle sheen	.290	.234	.246	.275	.322	.433	.207	.143	.300
Retouched sickle blades to total sickle blades	.520	.511	.556	.547	.519	.453	.750	.490	.391
Blades with sickle sheen: microlithic to total	.095	.032	.007	.009	.037	.266	.000	.000	.087
Blades with sickle sheen to total blades	.072	.060	.070	.094	.111	.079	.054	.066	.155
Blades with sickle sheen to total flint	.029	.021	.028	.036	.034	.032	.025	.027	.045
Total flint pieces: microlithic to total	.057	.138	.115	.088	.135	.094	.081	.038	.065

TABLE 3b. DIAGNOSTIC RATIOS OF OBSIDIAN PIECES

	Subphase designations					Cache	Buildings		
	BP	GP	BPP	CP	LRP	R20-2	EF2	U9	U4
Blade cores to all cores	1.000	.841	.961	.700	.600	1.000	1.000	-	.600
Blade cores & fragments to all cores & fragments	.741	.655	.793	.478	.589	.800	1.000	.071	.067
Pyramid.blade cores to pyramid.& parallel sided	.667	.556	.391	.429	.500	.500	.000	-	.333
Blade cores: microlithic to total	.000	.324	.080	.286	.333	.000	1.000	.000	.333
Flake cores: microlithic to total	.000	.143	.000	.000	.200	.000	.000	.000	.500
All cores & fragments: microlithic to total	.000	.229	.138	.093	.161	.000	1.000	.000	.133
All cores & fragments: utilized to total	.148	.068	.000	.020	.250	.400	.000	.018	.466
All cores to total obsidian	.007	.012	.010	.003	.006	.025	.029	.000	.010
All cores & fragments to total obsidian	.065	.068	.058	.070	.035	.123	.029	.283	.030
Unmodified (waste) pieces: microlithic to total	.099	.279	.411	.366	.399	.000	.500	.267	.292
Unmodified pieces to total obsidian	.172	.273	.190	.170	.196	.074	.229	.076	.192
Intensely utilized blades to all utilized blades	.231	.183	.280	.215	.225	.167	.000	.258	.203
Intensely utilized flakes to all utilized flakes	.126	.165	.116	.096	.168	.167	.100	.105	.095
Utilized blades to all utilized pieces	.627	.739	.737	.746	.871	.800	.474	.635	.793
Utilized pieces: microlithic to total	.149	.196	.194	.225	.358	.067	.053	.019	.158
Utilized pieces to total obsidian	.668	.533	.548	.591	.576	.741	.543	.525	.609
Retouched blades: microlithic to total	.097	.112	.129	.150	.120	.000	.200	.055	.058
Retouched flakes: microlithic to total	.000	.066	.023	.064	.062	-	.167	.000	.000
Retouched blades to retouched blades & flakes	.912	.793	.726	.832	.920	1.000	.833	.947	.929
Blade scrapers to total scrapers	-	.450	.407	.583	.550	-	1.000	.000	.500
End scrapers to total scrapers	-	.625	.704	.625	.450	-	.000	.000	.250
Total scrapers to total retouched pieces	.000	.087	.053	.050	.065	.000	.143	.043	.048
Total scrapers to total obsidian	.000	.011	.011	.008	.013	.000	.029	.005	.008
Pieces with tip attention: microlithic to total	.000	.133	.037	.000	.000	.000	-	.000	-
Pieces with tip attention to all retouched pieces	.051	.032	.105	.046	.003	.200	.000	.043	.000
Double backed blades to total backed blades	1.000	.600	.537	.623	.670	-	-	1.000	.565
Backed blades: microlithic to total	.000	.248	.231	.130	.224	-	-	.000	.261
Backed blades to total retouched pieces	.128	.227	.211	.303	.276	.000	.000	.043	.274
Backed blades to total obsidian	.002	.029	.043	.050	.053	.000	.000	.005	.046
Total retouched pieces: microlithic to total	.077	.132	.115	.122	.153	.000	.286	.043	.107
Total retouched pieces to total obsidian	.094	.126	.204	.165	.193	.062	.200	.116	.168
Total distinct tool types to total obsidian	.012	.046	.076	.069	.068	.012	.029	.020	.056
Unmodified blades to total blades	.113	.126	.061	.032	.058	.056	.222	.023	.049
Utilized blades to total blades	.752	.753	.764	.820	.767	.873	.500	.767	.782
Retouched blades to total blades	.135	.122	.175	.149	.175	.073	.278	.209	.169
Total blades to total obsidian	.557	.523	.529	.539	.654	.679	.514	.434	.617
Total obsidian pieces: microlithic to total	.123	.213	.215	.222	.320	.049	.229	.035	.174

TABLE 3c. FLINT AND OBSIDIAN RATIOS

	Sub-phase designations					Cache	Buildings		
	BP	GP	BPP	CP	LRP	R20-2	EF2	U9	U4
Obsid. cores & fragments to all cores & fragments	.040	.139	.310	.461	.331	.052	.023	.709	.294
Obsid. unmodified pieces to all unmodified pieces	.038	.152	.264	.428	.414	.011	.121	.250	.374
Obsidian utilized pieces to all utilized pieces	.069	.177	.351	.524	.542	.050	.100	.533	.590
Obsidian retouched pieces to all retouched pieces	.062	.216	.495	.548	.651	.040	.140	.523	.564
Obsidian blades to all blades	.076	.235	.408	.582	.682	.064	.108	.531	.675
Obsidian scrapers to all scrapers	.000	.229	.380	.296	.408	.000	.500	.250	.235
Obsidian tip attention to all tip attention	.017	.027	.380	.272	.067	.034	.000	.500	.000
Pieces with tip attention to all flint & obsid.	.016	.025	.019	.014	.005	.014	.022	.005	.005
Backed obsidian blades to all flint & obsid.	.001	.005	.015	.025	.027	.000	.000	.003	.023
Blades with sickle sheen to all flint & obsid.	.027	.017	.018	.018	.017	.031	.022	.013	.023
Obsidian microliths to all microliths	.115	.236	.495	.712	.669	.021	.235	.500	.725
Distinct obsid.tool types to all distinct tools	.027	.186	.545	.605	.665	.021	.100	.400	.538
Proportion of blades with retouch	.127	.128	.160	.165	.176	.082	.203	.198	.180
Total blades to total flint and obsidian	.412	.371	.444	.458	.484	.421	.469	.424	.453
Total scrapers to total flint and obsidian	.006	.008	.010	.014	.015	.006	.006	.010	.017
Total burins to total flint and obsidian	.002	.001	.001	.000	.001	.002	.000	.000	.000
Distinct tool types to total flint and obsidian	.025	.041	.048	.057	.052	.023	.028	.026	.052
Total flint and obsidian: microlithic to total	.061	.151	.149	.154	.241	.092	.096	.037	.119
Obsidian to obsidian & flint	.056	.167	.342	.495	.505	.039	.098	.518	.496
Obsidian to flint pieces	.060	.201	.520	.979	1.019	.041	.109	1.076	.904
Proportion of pieces from respective phase in each cultural unit						.281	.016	.065	.318
NUMBER OF EXCAVATION UNITS IN SAMPLE	18	61	19	34	17	1	12	9	8

TABLE 4. WEIGHTS OF PIECES IN GRAMS

	Sub-phase designations				
	BP	GP	BPP	CP	LRP
1. Unmodified pieces of flint	5.41	5.43	7.97	3.40	2.88
2. Intensely utilized blades of flint	5.26	3.32	2.48	3.06	6.94
3. Moderately utilized blades of flint	2.60	2.41	2.29	3.69	4.22
4. Total utilized blades of flint	2.78	2.63	2.39	3.92	5.07
5. Intensely utilized flakes of flint	4.92	4.30	3.47	4.89	4.28
6. Moderately utilized flakes of flint	6.68	6.27	4.96	6.08	4.01
7. Total utilized flakes of flint	6.80	4.01	4.84	5.20	3.83
8. Total flint pieces	6.44	5.68	3.84	7.40	8.19
9. Unmodified pieces of obsidian	.70	1.20	1.22	1.20	.80
10. Intensely utilized blades of obsidian	1.06	2.47	1.39	1.85	1.88
11. Moderately utilized blades of obsidian	.88	1.16	1.01	2.96	.84
12. Total utilized blades of obsidian	.87	1.47	1.05	2.97	.94
13. Intensely utilized flakes of obsidian	3.00	3.21	3.58	2.07	2.00
14. Moderately utilized flakes of obsidian	1.00	2.32	5.62	2.07	1.66
15. Total utilized flakes of obsidian	1.81	3.18	5.70	2.08	1.74
16. Total obsidian pieces	1.91	1.55	1.03	3.79	1.19
17. Total flint and obsidian pieces	6.08	5.13	3.09	5.29	4.44

CHAPTER 3

THE ÇAYÖNÜ GROUND STONE

by Michael K. Davis

INTRODUCTION

This section contains a record of the ground stone artifacts recovered during the first seven seasons of excavation at Çayönü (through 1980). Included in the descriptions are all of the obviously utilitarian artifacts except for smaller fine-grained stone bowls. Also excluded are small artifacts of fine-grained stone which are believed to have been for personal ornamentation or for other non-utilitarian purposes. In effect, the stone artifacts presented here are primarily large artifacts, presumably made for immediate practical uses. They were shaped by chipping and pecking and finished by grinding and, occasionally, polishing.

Most of the objects discussed here were made of basalt. There are extensive basalt occurrences about 20 km south of Çayönü on the Diyarbakir plain. Other raw materials include serpentine, steatite, granite, chert, sandstone and limestone. There is a good exposure of limestone just across the river, south of Çayönü. The exact sources of the other materials, however, await identification.

The report which follows is meant to be primarily descriptive. I plan a further study that will consider how the ground stone inventory reflects the daily life of the Çayönü inhabitants during the site's main prehistoric phase.

Ground stone artifacts are especially plentiful at Çayönü and demonstrate a wide range of morphological characteristics. Traditional categories such as pestles, handstones, and celts are represented by dozens of complete specimens and, in some cases, by scores of recognizable fragments. Taking into consideration the limited exposures in both the earliest now-available sub-phase and the rather restricted occurrences of contexts with the building traces first assigned to a "large room" sub-phase (see p.5), the ground stone industry appears to have changed little over the approximately half millenium of Çayönü's main prehistoric phase.

Although this collection illustrates limited morphological changes through time, it exhibits a wide spectrum of use-wear patterns. Diverse signs of superficial

abrasion, chipping, and erosion from use are observed on complete examples and especially on large numbers of fragments.

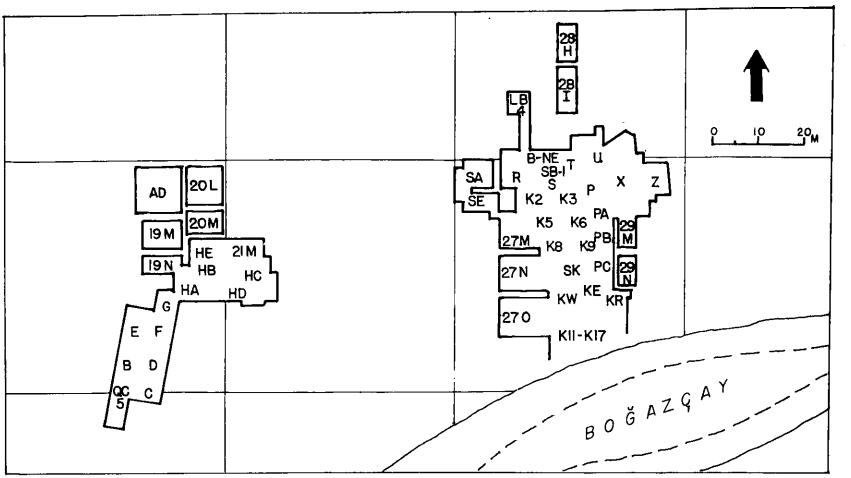


Fig. 3.1 Plot plan for Çayönü indicating excavation units for all the field seasons through 1980

Different types of artifacts are not necessarily evenly distributed in all of the contexts within a given subphase. Of particular value in connection with establishing the relationship between artifacts and households is the large quantity of complete specimens found within the fallen kerpiç (mud brick) debris of domestic structures that happen to have been burned. Within the seven best preserved instances of burned structures at Çayönü were found scores of ground stone artifacts. They represent a large number of the types defined in this report. Most of these objects were complete and are presumed to represent a household inventory of still useful possessions. In at least one instance we have the opportunity of comparing the distribution of similar types of artifacts in two adjacent contemporaneous structures. In addition, these sealed burned contexts permit us to observe the distribution pattern of specific types within the ground stone assemblage and the relationship of these to other artifacts of bone, clay, and chipped stone.

Were it not for the apparently unanticipated burning of household structures some nine millennia ago, such artifact relationships would be lost to us. In addition, some ground stone types that are well represented in the burned buildings are scarce - and in a few cases, even absent - in other excavated features at the site. The

reverse is also true. There are, in all probability, other as yet undefined distributional discrepancies that will be clarified as more of the site is revealed.

There would seem to be a definite relationship between the early village-farming communities in Southwest Asia and the development of ground stone industries. This relationship appears to be rooted in the process of the "settling in", taking place towards the end of the Pleistocene, that was characterized by a more thorough exploitation of given ecological niches. We feel safe in assuming a strong relationship between early stages of settled life and the development of the new, primarily heavy, ground stone inventory. As the development of specialized heavy stone tools would have facilitated more efficient exploitation of limited geographical areas, the increasingly sedentary modes of life also made feasible the development and use of a wider range of artifacts which, because of weight and size, would have been less adaptive to earlier more mobile ways of life.

In our earliest recognized occupation at Çayönü, the botanical evidence preserved in charred seeds, suggests that the inhabitants were already dependent on domesticated grain and perhaps other domesticated plants. At the same time, the ground stone industry appears to have reached a relative plateau of efficiency in quantity and morphological attributes. There is, so far, little evidence during the succeeding generations of the Çayönü main prehistoric phase for the development of new plant procurement systems or of new types of ground stone implements specifically designed for plant processing.

In grouping the ground stone for descriptive purposes and for tabulation, we have frequently found it useful to employ the traditionally used names for tool types as, for example, palettes, grinding slabs, and door sockets. We should caution, however, that these terms should not be misconstrued as definitive indicators of utility. Where feasible, we have preferred to categorize by using descriptions of form, size, stone type, and characteristics of plausible working surfaces.

(I had also, originally, intended to consider here a portion of a large flat stone basin with a sculptured human face on its edge, illustrated in our first Istanbul University report*, also certain large roughly dressed standing stones. The flat basin fragment with the relief sculptured head lay in one corner of an unusually large and evidently non-domestic building ["P" structure I], and was probably contemporary with the cell plan sub-phase.

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*Pl.41:2 in Çambel and Braidwood, eds. 1980. The Joint Istanbul-Chicago Universities' Prehistoric Research in Southeastern Anatolia, I. Istanbul: Edebiyat Fakultesi Basimevi.

The so-called standing stones, which were evidently not preserved to their original height, and in some cases consisted only of askew or tipped-over butts, occurred in association with several building remains, and in an open area in the central complex of our exposures, Fig. 3.1. Although the majority of the standing stones in the open area of the central complex can be attributed to the cell sub-phase, standing stones were undoubtedly used in at least one other sub-phase. Given the possible architectural implications of these finds, and that they should rightly be presented with detailed plot plans, I have decided to postpone their presentation here.)

In the artifact descriptions that follow, details of individual pieces are given in the general text if the types and sub types consist of only one or a few examples. Otherwise, the detailed information will be found in the tabulations in the appendix (p.153ff.). The abbreviations used in the tabulations are given on p.152.

The following abbreviations are used throughout the text:

b	breadth	ill	illustration
bas	basalt	inc	incomplete
bot	bottom	l	length
c	cell sub-phase	min	minimum
con	condition of the artifact (whole or fragmentary)	recon	shape can be reconstructed
		s-p	sub-phase
dep	depth	th	thickness
diam	diameter	u	uppermost levels sub-phase
est	estimated		
g	grams or grill sub-phase	wt	weight

Throughout the text and appendix all weights are given in grams. In the appendix all linear measurements are given in millimeters and, with a few exceptions (in which centimeters are used), millimeters are also the unit of measurement in the text. The measurements given are the maximum dimensions for all artifacts except for celts and grinding slabs: the breadth and thickness of celts are measurements taken at the mid-section of the implement; the thickness of grinding slabs is measured at the place of minimum thickness.

As regards the illustrations, long distance communication during the preparation of the figures unfortunately precluded absolute uniformity in the orientation of the sections. Sometimes the working surface is oriented to the drawing of the object, sometimes away from it.

A few words should be said about the numbering of artifacts. As the scope of our operations at Çayönü changed during the seven seasons of excavation, spanning seventeen years, and changes in objectives and of crews, our grid and artifact designation systems also evolved. The table below illustrates these changes with a few examples.

field season		square	level	locus	artifact number	collecting unit
1964	K2 2-3 =	K2	2-3			
1968	QC5 4-2 =	QC5	4	2		
1970						
1972	R 8-3/15	R	8	3	15	
1978						
1979	19N2-13/21 = 6//	19N	2	13	21	6//

And finally, as is evident in the following listing of categories, the ground stone was divided into gross categories based on distinctive morphological characteristics. These in turn were divided into types, and occasionally sub types, where we felt that size, form, stone type, and use-wear warranted this. Occasionally these sub types are, at present, represented by only one example.

CATEGORIES OF THE ÇAYÖNÜ GROUND STONE

*For easy identification of ground stone objects in the museum collections, we have marked each category of ground stone object with an arabic number. This is the number that precedes each category in this listing. Further, if the object represents a sub type, that number is also marked on the object. For example, a type 9 small, elongated cylindrical pestle is marked 1-9, a large polished cobble anvil, 7.

18 SPHERES (p.114)

type 1 Soft limestone, irregular spheres
" 2 Hard limestone spheres
a. perfect
b. nearly perfect
c. irregular
" 3 Basalt spheres
a. perfect
b. nearly perfect
" 4 Chert spheres
a. nearly perfect
b. irregular
" 5 Unidentified hardstone spheres
a. perfect
b. imperfect

19 POLISHED FLAT-SIDED COBBLES (p.116)

20 CHIPPED LIMESTONE DISCS (p.118)

21 MISCELLANEOUS OBJECTS (p.119)

1 Large, grooved, limestone slabs
2 Large, rectangular, sandstone block
3 Large, tray-like object
4 Large truncated cone
5 Three-sided, domed object
6 Loop-handle shaped object
7 White marble object
8 Faceted, polished object
9 Modified, celt-like object
10 Handle-like object
11 Large, pierced, ovoid forms
12 Drilled, oblate object
13 Drill-perforated spatulas
14 Small, round, drilled objects
15 Small, oblate form with "nutting" depressions
16 Small, thick, oval object
17 Small, flat-faced, oval object
18 Polished, cleaver-like cobble
19 Hammerstone
20 Small, crude, basin-like objects
21 Small, oval, chipped spatulas
22 Small, chipped and notched spatula
23 Long, chipped spatula
24 Large spherical object

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1 PESTLES

72 whole, 72 inc; basalt and other igneous rocks; 80-2600 g; Figs. 3.2:1-5; 3.3:1-8; 3.4:1-6; Pl. 3.III:5,6,8

The artifacts we have classified as pestles are purposeful forms, normally considerably longer than their breadths and with ends suitable and apparently used for pounding and/or pulverising. The Çayönü pestles have

been divided into eleven types on the basis of weight, variation in form, and material. Wear, distribution, and association were found, at least in part, to substantiate our type classifications.

All of the largest pestles are made of basalt as are some of the smaller ones. Two dozen small ones were manufactured from broken, medium to large sized celts. These comprise types 5 and 6. In form, pestles range from cylindrical, to conical, to bulbous ended. The transverse cross section at the working end is almost always oval and the surface of the working end varies from nearly flat to markedly convex but is normally moderately convex. Surface treatment of the working end ranges from rough pecked (presumably from sharpening) to smooth and in some cases polished. Use wear and lateral flake removal suggest a variety of functions dependent on size, form, and stone type, ranging from heavy pounding to light pecking to fine pulverising.

It is possible that most of the pestles were used in the hand directly, as there is little in the way of form or modification suggestive of hafting. The presumed handle ends (trunk and butt portions) of all the specimens are ovoid or round in cross section with ground-down surfaces. The four smallest types are smooth surfaced. All handle ends fit comfortably between thumb and fingers, or in the palm of the hand in the case of some of the smaller ones.

Since the pestle sample is small, and its occurrence essentially limited to burned buildings, it is difficult to say anything definitive about chronological distribution. However, we can say that a variety of pestle forms are present in all of the sub-phases. There is better evidence, moreover, for patterns of horizontal distribution. Large pestles of both types 1 and 2 were found almost exclusively in burned building context; ten large ones were found in a single burned house. On the other hand, very few fragments of any size pestle were found in other non-house features. The tables will show that the total weight of the fragments of the large pestles amounts to only one-fifth of the total weight of the complete examples. These distribution patterns may suggest that although a single household possessed and perhaps needed several pestles of large size, they may have been used outside the village and when broken in use not returned to the village.

Although one would expect large stone mortars for grain processing, there is almost a total lack of large size mortars on the site. There is, of course, the possibility that the mortars were made of a perishable material such as wood. However, in the light of the low frequency of pestle fragments, the large number of complete pestles, and the absence of recognizable mortars, there may be validity in the supposition that the pestles were used in mortars located outside the village - perhaps even on the

limestone bedrock outcropping just across the stream from Çayönü.

Type 1 Large, cylindrical to conical shaped pestles

29 whole, 43 incomplete; basalt; 530-2540 grams; Figs. 3.3:4,7; 3.4:1

These pestles range in profile from a cylindrical to an elongated cone shape and in length from 110 to 210 mm. Their working ends are generally only moderately convex and are perpendicular to the axis of the pestle suggesting right angle contact with the surface of the presumed mortar. A few examples with more convex working ends may indicate a more diagonal angle of contact. Large flake scars, running from the edge of the working surfaces up the faces, suggest heavy use (see Fig. 3.4:1). Resharpening of the working surfaces seems indicated by the pitted roughened surfaces of the working ends of many examples.

All type 1 pestles are sufficiently long handled that they could have been used in conjunction with shallow mortars, at least, without being hafted. Some are sufficiently heavy and thick in their trunk to suggest use with two hands. Distribution of complete examples of these as well as of type 2 large pestles is almost exclusively in burned building contexts. In one structure, two large pestles and two large handstones were found in close association, but besides this no other suggestive patterns of association were noted. In the above mentioned structures, from three to eight pestles of this type were found together in one room. The number of similar large pestles in a given household is surprising. It could imply that a number of slightly different forms were perceived as an essential part of a homemakers tool-kit, or that a large number of spares were maintained against loss through breakage. It is possible too, that at a certain time of the year an entire household might join in a pestle-oriented activity, such as husking wheat. A definite answer to this distribution quandary is beyond our present grasp.

Type 2 Large, bulbous pestles

5 whole, 11 incomplete; basalt; 712-1840 grams; Fig. 3.2:1-5

All examples of this type of large pestle are bulbous ended, some shorter ones taking a pear shape. Since their working end is bulbous they have more weight per working surface than those of type 1 that are of similar length. They also differ from the other large, non-bulbous, pestles in being frequently more convex and more pecked on their working surfaces. These characteristics may suggest functional differences between these and the other large

pestles of type 1. The differentiation may be further demonstrated by artifact association. Three pestles of bulbous type were found together in burned kerpiç in one structure (Fig. 3.2:4,5). No non-bulbous types were found in this sealed feature. On the other hand, in a burned cell house (U 9) there were three large non-bulbous pestles and no bulbous types. However, both types of large pestles were found in structures U 4, AD 5, and S.

Like the non-bulbous type 1 large pestles, type 2 is distinguished from other categories by a paucity of broken examples. Large flake scars on both types of large pestles suggest heavy-duty use from which one might expect a higher percentage of breakage than might occur in handstones, for example. However, the total weights of large broken handstones and of their companion grinding slabs is, in contrast to pestles, many times greater than that of complete specimens.

There is only one example of a type 2 pestle that gives some indication of having been hafted: the example Figure 3.2:2 has a slight outward flare on the upper end of its broken handle. It is also unique in its large size and unusually oblong bulbous end. Chronological distribution of the bulbous type appears to be restricted to the grill, cell, and uppermost layers.

Type 3 Small, stubby pestles

12 whole, 4 incomplete; basalt; 180-505 grams; Figs. 3.3:6,8; 3.4:5; Pl. 3.III:8

These small pestles have a length to breadth ratio of roughly 3 to 2 and in shape range from cylindrical to conical. Three fourths of them have double working ends and all have working surfaces that are smoother and less pitted than the average large pestle. All fit comfortably in the palm of the hand or between thumb and fingers. Extant wear indications, which include lateral chips removed from the edge of the working surface, suggest use in both light pounding and grinding. These working ends are generally slightly more convex than on the large pestle types. Judging from size and wear patterns these small pestles could have served a diversity of light functions. Unlike the large size pestles few examples of this pestle type were found in clearly burned buildings.

One example of a small basalt pestle of this type (Fig. 3.4:5)* recalls the general size and shape of some

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*This pestle (20M2-14/56) was unfortunately not included in the appendix tabulation. It is 56 mm long and 41 mm at the greatest breadth.
Note error in the appendix: HC 4-7/9 is 68 mm long.

of the marble "chess pawn" objects of Çayönü.* In the present basalt instance, however, the surface is pitted and there is chipping around the base characteristic of many of the more obvious pestle-like implements of Çayönü.

Type 4 Large, bulbous form with "eared" handle

1 recon; basalt; 1550 grams; Fig. 3.4:6

This large well-made form is unique in shape and in the type of stone from which it is made. It is of a hard fine-grained blue-green basalt-like stone at present only represented at Çayönü in this bulbous, unusual, handled pestle. In form it is roughly pear-shaped, oval in cross-section, and at its butt end there are opposing lateral ear-like extensions which create a long narrow oval shaped handle. Broken at its working end, the pestle, when used as building material in the foundation of a grill structure, was probably no longer functional. Considering the unique form and material of this piece we speculate that it may have been manufactured elsewhere.

Type 5 Celt fragment pestles with polished working ends

8 whole, 1 incomplete; serpentine and other igneous rocks; 80-350 grams; Fig. 3.3:1,2; Pl. 3.III:5

These are secondary use implements made primarily from medium sized, but also from large sized, broken celts. In all examples the broad mid-section of the original celt was fashioned into the working surface of the new tool. Most of the examples consist of the butt end although a few are the dulled bit end of the remains of celts. All of these pestles, like small pestle type 9 (cf. Fig. 3.3:5), fit comfortably between the thumb and fingers of the hand. The convex working ends of the type 5 pestles are polished. In half of the examples these ends are faceted. Those with working striations suggest grinding rather than pounding abrasion.

A difference in function between pestles made from celts (types 5 and 6) and the well represented basalt types is suggested by the pattern of horizontal distribution in the village. Pestles made of broken celts have a low frequency of occurrence within burned structures. Less than a fifth of these are in clear association with burned house debris compared with over four-fifths of the generally larger basalt varieties. These distributional differences coupled with differences of stone type, form preparation, and wear suggest no strong functional relationship with the basalt pestle types. Type 5 pestles are associated

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*See note p.75: op.cit. p.48 and pl. 46:5,6

with grill and cell layers.

Type 6 Celt fragment pestles with battered working ends

16 whole, 7 incomplete; serpentine and other igneous rocks; 110-400 grams; Fig. 3.3:3

These pestles, like type 5, are made from celt fragments. They too lack strong association with burned houses or with basalt pestle types. They differ from the type 5 polished-ended pestles made from celts in that their working ends are battered and often concave as if used for hammering tasks. They are found in association with all four sub-phases.

Type 7 Small, smooth, oval sectioned pestle shaft

1 incomplete; fine grained stone; 95 grams; Fig. 3.4:4

This example of the shank portion of a small pestle demonstrates characteristics not found in other Çayönü artifacts. The artifact is of an uncommon hard, fine grained, light grey stone and in form is straight sided and a perfect oval in cross section. Although its surface is ground smooth like our small pestles made from celts, its shape is not celt-like. The Çayönü example was found in the kerpiç of a burned cell structure.

Type 8 Small polished cylindrical pestle with barb

1 incomplete; fine grained igneous stone; 30 grams; Fig. 3.4:2; Pl. 3.III:6

The portion of a slightly tapered stone cylinder with a barb-like projection extending laterally from the keel-shaped end is, at present, a unique object among the Çayönü finds. It is made of a fine grained, dark grey serpentine-like stone and its surface is polished to a low luster. A re-ground broken section suggests that there was a second barb located opposite the preserved one. If our mental reconstruction is accurate, the end of the piece would have had the appearance of a blunt-ended arrow. The piece was found in association with the cell sub-phase.

Type 9 Small, elongated cylindrical pestles

2 whole, 1 incomplete; fine grained igneous stone; 55-218 grams; Fig. 3.3:5

The three examples of this type are distinguished by their long thin cylindrical shaft, polished surfaces, and by the fact that they are made of a hard fine grained

igneous stone instead of basalt. Two are of a dark grey granite-like stone and the third, a hard brown stone. The two complete examples have double working ends which are markedly convex. One of these pieces is quite smooth on these surfaces; the other appears to have been resharpened by pecking. One was found in clear context within a burned cell structure, another is cell sub-phase related.

Type 10 Medium, polished, tapered cylindrical pestle

1 incomplete; fine grained igneous stone; 360 grams; Fig. 3.4:3

This smooth, well made pestle with an almost polished surface is similar in elongated form and surface treatment to the much smaller pestles of type 9 (cf. Fig. 3.3:5). It is of a cylindrical form tapered at the butt end. It differs from other pestles of its size in being of finer grained grey igneous stone and in being more finished in form and surface treatment. It shares probable double-ended use with type 9. This piece is from the large room of a burned cell structure.

Type 11 Large pestle-like, block shaped cobble

1 incomplete; fine grained igneous stone; 1780 g

This natural cobble of fine grained igneous stone has an elongated flat sided form, square in cross section. The battering of its rounded end suggests hammer or pestle-like use. Pitting extends four centimeters up three of the sides. The fourth side is pitted over its full length and in surface character and slight convexity appears to have been used as a handstone for grinding purposes. This uniquely shaped implement, apparently versatile in function, comes from the large room of a burned cell structure.

2 MORTARS

1 whole; limestone; 20,000 grams

Stone mortars are surprisingly rare in our excavations at Çayönü. There is only one heavy-walled, semi-spherical basin that could possibly represent even a moderately efficient size for bulk processing. It is a shallow basin, 5 cm in depth and 22 cm in diameter, on the side of an irregular, rounded, natural limestone boulder. There is no sharp demarcation between the upper surface of the boulder and the gradual sloping basin. This is in contrast to the sharp edges of six smaller and steeper basins which we have classified as "door sockets". The uniformly smooth surface extending from the basin itself onto the margins of the adjacent surfaces indicates possible use in processing vegetable matter with a pestle.

The absence, in our excavations, of large stone mortars is significant in light of the occurrence of numerous hefty basalt pestles and of botanical evidence indicating the use of grain during the Çayönü main prehistoric phase. There are, however, perhaps a dozen basin (mortar-like) depressions on the table rock just across the stream from the site.

3 PALETTES

1 whole, 5 incomplete; basalt, limestone, granite; 125-2,350 grams; Fig. 3.10:2,3; Pl. 3.II:2

Six small palette-like forms have in common a small shallow round basin and flat base. Of these only one example (HC 3-0/12) is a complete example. All are fully ground but take rather diverse forms ranging from round with a flat face to a rather deeper semi-rectangular form. Their basins range from 8 to 32 mm in depth and from 60 to 88 mm in diameter. Surfaces of the basins vary from rough pecked to smooth. Only one fragment (U 4-28) came from a clearly burned structure. It has red pigment still adhering to recesses of both of its opposing basins and the surfaces adjacent to them. Judging from the size and form of the basins of these pieces they could well have served with some of the smaller pestle types.

4 LIMESTONE CONTAINERS

12 incomplete; 1,000-20,000 grams (estimated whole weight); Fig. 3.10:8,9

Considering the accessibility of limestone and the lack of pottery in the Çayönü main prehistoric phase it should be noted how infrequently this easily worked stone appears to have been used for making containers. There are about a dozen fragments of probable containers. They range from thick-walled bowl forms to large crude rectangular forms. Approximate basin diameters are from 160 to 420 mm with minimum wall thickness from 23 to 80 mm. All but one is flat-bottomed and all have interiors with irregular rough surfaces. Only one, (Fig. 3.10:8), shows signs of decoration. It is a bowl shape with two crude deeply incised lines running around its outer rim. No signs of use-wear were observed on any of the containers beyond general smoothing on the raised areas of the interior surfaces. The lack of use-wear that is characteristic of large modern mortars, coupled with the relative thinness of the walls of several of these pieces would seem to rule out substantial use as mortars.

All the examples are fragmentary, five coming from the earliest available levels, five from the grill sub-phase and only one from the cell sub-phase. Though our sample is small, the high frequency of the containers in associa-

tion with the earlier major layers and an almost total lack thereafter would suggest a discontinuation of use after the grill sub-phase. It is probably reasonable to assume that as the occupation of Çayönü continued, perishable materials such as wood or basketry were progressively used for various container needs.

5 HANDSTONES

118 whole, 911 incomplete; almost exclusively basalt; 120-5,000 grams; Figs. 3.5:1-9; 3.6:1-14; 3.7:2,4,5,7; 3.11:8; 3.14:2; Pls. 3.I:4,5; 3.II:1

The handstone category of ground stone artifacts is better represented in numbers at Çayönü than any other category. In total weight of whole and fragmentary pieces this category is second only to grinding slab remains. All examples except a handful were made from basalt and all were completely ground to their present shape. Shapes range from large, high vaulted forms suitable for efficient grain grinding tasks to small rectangular, discoidal, and cubical forms which together probably represent a multitude of functions. Included among these smaller handstones are many examples with secondary wear suggestive of hammer and anvil functions. All the artifacts classified as handstones share three characteristics. In size and shape they are convenient for grinding tasks and all have a degree of convexity on their broad working faces. These faces are pecked (sharpened) but superficially smooth as from use in various grinding tasks.

Comparable implements come under a variety of headings in the ethnographic and archeological literature. These include rubbers, grinders, mealing stones, mullers, and manos.* We have used the term "handstone" which Kraybill feels is most acceptable in archeology in this part of the world, although the New World term, mano, has a less ambiguous history of use.

The more than one hundred complete handstones have been divided into 15 types and four sub-types. This multitude of types was created in order that characteristics which might have functional or stylistic significance would not be lost to generalization. The characteristics we considered significant were weight, size, shape, condition of working surface, and form of the upper (presumed) handle portion. It was our reckoning that size of working surface and weight would be significant factors in the efficiency of the tools, that the curvature of the working surface might be indicative of the surface on which it was used, and that the shape of the upper portion could indicate control in handling. Finally it was decided that the

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*Kraybill, Nancy 1977 Pre-agricultural Tools for the Preparation of Foods in the Old World. In Origins of Agriculture. Charles A. Reed, ed. p.488. The Hague: Mouton.

general shape of the working surface, rounded or rectangular, might also have functional or stylistic significance.

The frequent association of several handstones of the same type found together or in similar architectural features suggests that our typology may often represent differences considered significant by those who used the artifacts. These associations may be noted in the listings in the appendix and are frequently mentioned in the type descriptions.

All but one of our types of handstones were found in burned structure contexts. Six examples of different types, were found in situ alongside complete grinding slabs. These six handstones (types 2,3,5,6,7, and 9), were in the upper weight range, weighing from 650 to 5,000 grams. They were associated with earliest available, cell, and uppermost main layers. The wide diversity of these handstones that were associated with grinding slabs suggests a variety of tasks performed with paired handstones and slabs. Since two was the maximum number of slabs found in any single building, this may indicate that different types of handstones were used in conjunction with the same slab. This does not preclude the possibility, however, that many, especially the smaller handstone types, may have had quite different mates.

Our sample of handstones is too small to make a definite statement concerning the chronological distribution of different types. Fragments which might bolster the sample are in all but a few of the larger types, difficult to distinguish as to type. However, the two largest sizes (types 1 and 2) do permit us to say something about their vertical distribution. Type 1, by far the best represented and most easily identified, suggests by its distribution that relatively heavy, broad faced handstones persisted throughout the Çayönü main prehistoric phase. This type, and a few other large types are conceivably the best candidates for certain kinds of efficient grain processing. Type 2, which includes the heaviest handstone, is represented by only two convincing examples, both from the uppermost layers; nothing definitive can be said of improved grain milling from these two occurrences. However, the fact that one of these examples was found in close association with an apparently unique broad flat slab may possibly suggest a change in grinding tasks.

In the descriptions and lists of the various types, the reader may assume (unless otherwise informed) that all examples are of basalt and that the working faces were pitted by sharpening and smoothed by wear. Type descriptions in the following text will deal only with complete or almost complete specimens unless otherwise stated.

Retained in the handstone category are examples, particularly in the smaller sizes, which may have served functions in addition to the grinding and abrading

activities which we speculatively associate with their broad surfaces. These additional functions are suggested by unpitted faces, chip removal from the ends and sides, by notches along the sides suggesting hafting and/or finger purchase and by "nutting" depressions.

The pitted depressions, or "nutting" depressions, are suggestive of the anvil-like use of certain other types of ground stone implements. These scar zones are centrally located on one or both broad surfaces of, for the most part, small handstones (cf. Figs. 3.5:6,7; 3.11:8; Pl. 3.I:5). The depressions are rough surfaced, lens shaped and generally a fraction of a centimeter deep and two to three centimeters in diameter. In addition to occurrence on small handstone types, nutting depressions are also found on the upper surfaces of a few large handstones (cf. Fig. 3.14:2), and on one or two polished flat-sided cobbles. The activity which caused the nutting depressions on these artifacts would thus appear to be a secondary use. Another indication of secondary use, often accompanying the nutting depressions on small handstones, is chipping and battering of the sides and ends. Some of these same small handstones also have purposeful indentations on their sides (cf. Fig. 3.5:4) as if made for finger purchase. These other secondary traits that frequently accompany the nutting depressions may suggest related activities or traits of a particular type of tool kit. The small handstone types 9,10, and 11 often exhibiting nutting and other secondary use characteristics were found in groups of as many as ten in a single cell of a cell house.

Type 1 Large, turtle-shaped handstones

16 whole, 383 incomplete; basalt; 600-4,000 grams; Fig. 3.6:1-3; Pl. 3.II:1

This form, best visualized as a low-backed turtle-shape, is the most common and one of the most distinctive types of handstones. The total weight of fragments of this tool type is twice that of the 16 complete specimens. In other ground stone categories only grinding slabs surpass this ratio. The distinguishing characteristics of this type are an oval shape and a vaulted upper portion convenient for holding with two hands. The working surface is slightly convex with greater convexity on the long axis. On some pieces the outer two to four centimeters of the ends has a greater curvature than the mid-section. The diameter of the curve in its mid-section ranges from ca. 45 to 150 cm. The length of these objects varies from 11 to 22 cm while the average weight is about 2,300 grams.

Most of these turtle-shaped handstones show signs of use only on their flat surfaces. Frequently the very ends of these surfaces are smoother than the mid-section, perhaps indicating contact with the sides of a trough. This differential wear offers support for the assumption

that they were used in a back and forth movement perpendicular to their axis.

Complete and fragmentary examples are well represented among the foundation stones of the various building plan types. Within the context of three burned domestic structures a total of seven examples were found. Although no handstones of this type were found in a direct relationship with complete grinding slabs, the probability is that they were so paired.

Type 2 Large, high vaulted handstones

2 whole; basalt; 2,100 and 5,000 grams;
Figs. 3.6:4,5; 3.7:4

Two of the largest handstones from Çayönü are a unique bread-loaf shape: a long oval with a steeply vaulted top. They show signs of grinding wear on their slightly convex lower surfaces. These handstones are of particular interest in that they have the highest weight to working surface ratio and thus would appear to have the greatest grinding potential of any of the handstones. Both are from the same burned house of the uppermost levels sub-phase. The larger (Fig. 3.6:4) was found beside an intact shallow-troughed grinding slab (Fig. 3.7:1) and is a perfect fit both in width and bottom surface profile for the sides of the trough. We found, by experimentation, that the pair could efficiently produce flour from hulled whole kernel wheat when the handstone was drawn in a back and forth motion along the length of the slab. The weight of the 5,000 g handstone was almost sufficient in itself to produce adequate friction for the grinding of the grain; added pressure, however, measurably improved efficiency.

Since the sample of the loaf-shaped handstones is small, it is not possible to determine whether their occurrence towards the end of the Çayönü main prehistoric phase indicates a new trend, perhaps in improved grinding efficiency. The similarity of this type in size and general shape to type 1 (cf. Fig. 3.6:1,2,3), the low vaulted turtle-shaped handstones, may represent a continuation of manufacturing traditions and perhaps purpose.

It should be noted that a miniature handstone (type 16) of almost identical form was also found in the uppermost levels sub-phase.

Type 3 Large, low, elongated handstones

1 whole, 2 recon; basalt; 1,270 grams;
Figs. 3.6:6; 3.7:5

This type consists of medium-large elongated hand-

stones. They are semi-rectangular low forms with very slightly convex and almost identical opposed working surfaces. The length of the illustrated example is 186 mm which is only slightly less than that of the largest loaf-shaped handstones (Fig. 3.6:4). The type 3 example and the loaf-form handstones were both found near a grinding slab (see above). Both handstones fit the breadth of that slab's trough. If both served with that slab, we may speculate that their efficiency for the same task would have varied since they differ in weight at a ratio of 1 to 4.

Examples of this elongated type were associated with grill, cell and uppermost layers. It should be noted that a "troughed abrader" (Fig. 3.14:4) was probably originally a handstone of this type.

Type 4 Large, broad, rectangular handstones

7 whole, 2 recon; basalt and sedimentary stone; 940-4,750 grams; Figs. 3.7:7; 3.14:2

The specimens may generally be described as large, broad, roughly rectangular handstones. In size and form they differ enough from the preceding type 3 handstones to merit a separate sub-type designation. Three examples have bifacial (opposed) working surfaces; these surfaces are flat when viewed in the mid transverse cross section but slightly convex in the longitudinal section. One example (Fig. 3.14:2) has an unusually wide, deep "nutting" depression (70 mm diam.; 5 mm depth) in the middle of one of its faces. The rough lenticular scar has defaced what must once have been an efficient grinding surface. Another handstone (Fig. 3.7:7) unifacially used, is distinguished from all other handstones in that it is made of a sandy sedimentary stone that has a surface layer of coarse-grained quartz-like material. This abrasive layer served as the grinding surface. This surface is also unusual in preparation and wear. Running down the center is a slightly raised section 8 cm wide. This section is smooth to the touch as if worn from use. Along both sides of this slightly pecked section are two rough, deeply pitted, 3 cm wide strips. This particular stone was apparently chosen because of its surface layer of hard, coarse-grained particles. It was found in a burned cell structure context next to a large basalt grinding slab (cf. Fig. 3.7:3) and the contour of the working surface matches that of the grinding slab's moderately deep basin.

Type 5 Medium, thick handstones

7 whole, 2 recon; basalt and fine grained basalt; 640-1,720 grams; Fig. 3.6:7,8

These medium-sized, thick handstones are ovoid-rectangular in shape. All but one were bi-facially used. In three of the examples, the two working surfaces have similar, slightly convex profiles. In five of the handstones, however, one working surface is distinctly more convex than the other. A significant difference between these and other large handstones is that the working surfaces of several examples are smoother and considerably less pitted. In addition, two are made of a more compact basalt. Because of their thickness these objects have a high weight to working surface ratio. One example was found within a cell plan building; five examples occurred beside one another within one structure of the uppermost levels sub-phase.

Type 6 Medium, broad, rounded handstones

7 whole, 3 recon; 570-1,430 g; Fig. 3.6:9,10

All of these medium-sized platter-like handstones appear to have been bifacially used. Their working surfaces vary in contour from almost flat, to slightly vaulted or turned up on the edges, reminiscent of type 1, the turtle-shaped handstone. On most examples the contours of the opposing faces is quite similar. Wear and form suggest that most were used for grinding in a single direction. As a result of their broad low form they have the lowest weight-to-working-surface ratio of the large handstone types. Four of these handstones have a "nutting" depression on one face. In five examples, the ends or sides were hammered.

Examples of this type were found in association with the earliest available, cell, and uppermost layers. A single example occurred in the burned kerpiç of domestic building remains from each of these sub-phases. One, (Fig. 3.6:10) was found next to a large slightly troughed grinding slab. Although the breadth of the handstone is far smaller than the width of the slab they were probably used together.

Type 7 Medium, high domed handstones

1 whole, 1 recon; basalt; 660 and 1050 grams; Figs. 3.6:11; 3.7:2

The high domed upper portion of these round handstones offers a comfortable fit between the fingers and the heel of the hand. The single working surface is slightly convex. Unlike the previously described large types, these do not appear to have had a preferred direction of movement. The examples are associated with the earliest and latest main layers. The complete specimen (Fig. 3.7:2) was found next to a large, almost flat topped, grinding slab (Fig. 3.7:6) in a burned earliest

available sub-phase structure. As with the above mentioned paired slab and handstone (Fig. 3.6:10 type 6), believed to be from the same structure, this slab is far broader than the width of the handstone.

Type 8 Medium, low domed handstones

5 whole, 1 recon; basalt; 410-695 grams; Figs. 3.5:1; 3.6:12

Round to rectilinear in shape, these medium to small sized handstones are typified by a slightly domed upper portion. Three appear to have been used on the upper curved surface as well as on the flat lower surface. The lower, primary working surface ranges from almost flat, to moderately convex. On two examples the greater convexity on one axis suggests use in a single direction in a narrow trough. Compared to type 7 (cf. Fig. 3.6:11) they offer less purchase in the hand and have less weight in ratio to the working surface. The difference in the shape of their working faces and their light weight would suggest versatility in light tasks. One (Fig. 3.6:12) retains a slight depression on top indicating it was made from the trough section of a grinding slab fragment. These handstones are from levels associated with grill, cell and uppermost main layers. A single example each was found in the burned rubble of a cell structure and of an uppermost levels structure.

Type 9 Medium, low vaulted handstones

13 whole, 4 recon; bas; 460-1,150g; Fig.3.6:13

These medium sized handstones are rounded-rectangular to oval in form. The low vaulting of their upper face is often lop sided along one or another axis. This asymmetry may have been intended to improve hand purchase. Working surfaces range from very slightly convex to turned up edges (as in Fig. 3.6:3 type 1) at the extremities of the long axis. Most appear to have been used on both surfaces in a direction perpendicular to their axis. Most examples, as with many of the smaller types of handstones, appear to have served other functions in addi tion to grinding. Several, especially those with smoother less pitted faces, have a slight "nutting" irregularity in the middle of one or both faces as if they had been used as anvils.* Some of these also have chipping and crushing on their ends which may indicate use as hammers. Two examples with chipped ends have opposed notches (finger purchase or hafting?) midway up their sides. Five with "nutting" depressions came from the burned cell

*See discussion of "nutting" depressions. p.89

structure AD 5. Several type 10 and 11 handstones from the same location also had similar signs of secondary use.

One example of type 9 was found beside a large, flat grinding slab in a burned building. Type 9 handstones are associated with the earliest available levels, grill sub-phase and cell sub-phase.

Type 10 Medium handstones with matching faces

10 whole, 3 recon; basalt and fine grained igneous rock; 450-1,050 g; Figs. 3.5:2; 3.6:14

This type differs from type 9 in only one characteristic. Unlike type 9 its upper face is not vaulted but instead is a mirror image of its opposed face. Several of these handstones also have "nutting" depressions and end chipping. One example has side notches. Another, (Fig. 3.5:2) is cleaver-like with large chips bi-facially removed, creating a rugged keel-shaped edge. The side opposite the cleaver-like edge is flat and fits the hand well. All examples but two are of basalt. One exception (U 6-1) is of a hard light green igneous stone. This one also differs from the others in being more symmetrical in form and being less pitted on one of its faces. Type 10 handstones have, so far, only been found in cell plan remains. They were found in three burned cell structures and have strong association with types 9 and 11 with which they share secondary use characteristics.

Type 11 Small, semirectangular handstones

29 whole, 2 recon; basalt and fine grained igneous rock; 190-535 g; Fig. 3.5:3-6; Pl. 3.I:4

Type 11 is comprised of small, semirectangular handstones having identical or almost matching working surfaces. In a few examples the upper surface is slightly vaulted but all show signs of having been bifacially used for grinding. Some of the smallest examples have only slightly pitted faces and thus would have had less abrasiveness. As with handstones types 9 and 10 most examples appear to have served multiple purposes as indicated by "nutting" depressions on their faces (cf. Fig. 3.5:6), chipped edges, and slight indentations in the middle of their sides suited to finger purchase (Fig. 3.5:4). Two specimens do not correspond very well with the normal shape range but seem to belong in this group rather than any other. One of these (R 12-1) belongs to an earlier sub-phase, and the other (K2 1-2) may be later than all the rest which are apparently cell sub-phase associated. Two thirds of the examples were found in burned cell structures and a group of six occurred in each of two separate cells.

Type 12 Palm-sized, round handstones

2 whole; bas; 380, 610 g; Fig. 3.5:7; Pl. 3.I:5

These small round somewhat dome-shaped handstones have slightly convex working faces. "Nutting" depressions are centrally located on both faces. The two examples were found near each other in association with a cell type structure.

Type 13 Small, thick, ovoid handstones

2 whole, basalt; 465, 800 grams; Fig. 3.11:8

This type is represented by only 2 examples. One surface of these oval shaped handstones has a truncated domed profile; the other surface is almost flat. Although heavily pitted, both faces were probably used for grinding and on one example (U 3-9) both faces have unusually well defined "nutting" depressions about 50 mm deep. They are cell and uppermost sub-phase related.

Type 14 Small, square or round handstones

5 whole; basalt; 230-300 grams; Fig. 3.5:8

The common denominators of this type are small size, round or square shape, and considerable thickness compared to breadth. These objects were bi-facially used. The contour of the faces ranges from slightly convex to moderately convex. Three handstones have "nutting" depressions on one face. All are of a shape and size convenient for holding between the thumb and two fingers. They are associated with grill, cell, and uppermost layers. Two are from burned cell structures.

Type 15 Small, cuboid or drum-shaped handstones

10 whole, basalt, 70-200 grams; Fig. 3.5:9

These are similar in general appearance to type 14. They differ, however, in being smaller and in being almost as thick as they are wide. A couple of the more cubical ones were used on more than two faces and only one has a possible "nutting" depression. Working surfaces are slightly to moderately convex. All are probably associated with grill or early cell sub-phases.

Type 16 Miniature, high vaulted handstone

1 whole; basalt; 380 grams

A single example of a small, elongated oval, high vaulted handstone gives the appearance of a miniature replica of the large type 2 handstones. Since it lacks obvious signs of grinding wear on its lower, slightly convex face it is possible that it was not intended for serious grinding purposes. One possible interpretation is that it was a child's toy. Like the two large type 2 examples, it appears to be from the uppermost levels subphase.

Handstone fragments:

In listing the fragments of handstones it was not possible, except in the case of the 364 distinctive turtle shaped handstone fragments (type 1), to group fragments into the typing system used for whole specimens. Instead of using the type designations, five groupings, based on general size range and thickness, were employed.

The following is a brief description of groupings A through E into which all handstone fragments, with the exception of type 1 fragments, were divided:

Group A. These are fragments from the largest and thickest handstones (with the exception of type 1) with estimated original weight of 2000 to 5000 grams. 39 fragments.

Group B. These fragments represent large handstones thinner than those in group A. Although some are oval shaped like type 1 handstones, they are generally flatter, and lack the characteristic vaulting of that common type. The probable weights of group B specimens, when whole, would have been from 1000 to 3000 grams. 27 fragments.

Group C. These fragments are from medium sized thick handstones with probable original weights of from 1000 to 3000 grams. 64 fragments.

Group D. These fragments are presumably from small to medium sized handstones of moderate thickness. They are calculated to have weighed less than 800 grams. 82 fragments.

Group E. This grouping is a catch-all for small fragments from predominantly small handstones. Where thickness could be determined, only the less thick and bulky types went into this grouping. 136 fragments.

6 GRINDING SLABS

7 whole, 472 inc; mainly basalt; 2,300-30,000 g; Figs. 3.6:15-21; 3.7:1,3,6,8-14; Pl. 3.I:7

Hundreds of fragments of troughed grinding slabs, some weighing many kilos, were found throughout the site. When combining the weight of these fragments with that of the few complete examples, the total weight is greater than that of all other basalt artifacts combined. Basalt was used for almost all examples. The exceptions are two more or less whole, unusually deep, narrow troughed specimens (HB 3-2/39 and HD 4-4/1, Fig. 3.6:20), the first of which was reused and is listed in the door socket classification. Both of these exceptions are of a hard grey-green stone and were found in the same area. The remaining specimens are of basalt similar to that used for handstones and pestles. The basalt is predominantly a light to medium grey, compact type. There are occasional exceptions as in the case of AD 3-30/4 (Fig. 3.6:15), which is of a more porous basalt.

The thickness of the grinding slabs (measured at the place of minimum thickness) ranges from 220 to ca. 30 mm. The length of the slabs is roughly a third greater than the breadth: the longest example is 520 mm. In all cases the trough follows the long axis. Although the heaviest whole examples in our collection weigh about 30,000 grams, the fragments of grinding slabs indicate that many of the grinding slabs must originally have weighed as much or even more than this. Grinding slabs take many shapes: some partially retain their original boulder form while others were chipped and ground to irregular or symmetrical ovoid and rounded rectangular shapes. The bottom surfaces range from flat, to keeled and irregular shaped, to various degrees of convexity. The less stable highly keeled form was doubtlessly set into the ground with stones to hold it in position. In most (if not all) examples one end is somewhat lower than the other. This is quite pronounced in some examples. Maximum height from the base to the rim on our complete examples is from 15 to 22 cm.

The grinding surfaces have troughs as deep as 13 cm and generally retain a uniform curvature no matter where their transverse sections are measured. This would indicate that a well fitting handstone would have a uniform grinding potential along the entire length of the trough. Longitudinally the trough sections range from nearly flat, on presumably newer slabs, to steeply concave on older ones. In fairly deep troughs the axial curvature ranges in diameter from 40 to 120 cm while the curvature of the width ranges in diameter from 18 to 48 cm (Fig. 3.6:15-21). The breadth of the base curve can be as little as 7 cm in a particularly deep example. The variation in curvature of troughs is an indication of the variety of handstones used on their surfaces. The terraced effect half way up the sides of some of the deeper troughs may also indicate this. The working surfaces of all troughs are roughened by pitting while superficially smooth to the touch. These changes in texture are presumably the effects of "sharpening" and use wear. Deep troughs are particularly evident on some slab fragments. In some cases the bottoms are

almost worn through (cf. Fig. 3.7:14). Frequently the sides of the troughs are fairly smooth and only slightly pitted, as one might expect from frequent contact with the ends of a handstone where grinding potential was little and thus resharpening less necessary.

Fragments of slabs were sometimes remade into smaller artifacts as is the case with two large pestles and two unusually small slabs (U 5 1-8 and AD 3-1/8). In addition, large pieces of slabs were often used in foundations or as paving stones and in two instances were apparently used as door sockets (Pl. 3.I:6 and HB 4-3/39).

Of our six complete heavy duty slabs, three had shallow to flat working surfaces, one was moderate in depth, and two were deeply troughed. The four least worn of these were found in the debris of burned structures of the earliest available, cell, and uppermost sub-phases. Each was in close proximity to one or two handstones. Two of the four associations between slab and handstone (Fig. 3.7:6 and KE 6-2/2 and 3) were apparently from a single small burned structure of the earliest available levels; one (Fig. 3.7:3 and 7) was in a cell structure, and the last (Fig. 3.7:1 with both 3.7:4 and 5) was found in an uppermost sub-phase context. In the two latter shallow troughed examples, the ends of the adjacent large rectangular handstones showed snug and convincing fits between the slightly raised side edges of the troughs. In the two earlier examples of almost flat surfaced slabs, the moderate sized rounded handstones believed to have been used on the slabs seem to have had less grinding potential, for not only was there small area of contact between the upper and lower stone, the handstones were also very light in weight.

Three fragments, all large portions of grinding slabs, were made of limestone. In trough shape, width and depth, they are varied but fall within the spectrum of those made of basalt. They differ from those of basalt in not having peck-sharpening in their troughed working surfaces. They are from the grill sub-phase or the uppermost levels sub-phase.

7 ANVILS - LARGE POLISHED COBBLES

2 almost whole; igneous rock; 3,850 and 5,450 grams; Fig. 3.14:1; Pl. 3.II:7

Fragments of two large polished anvils of a hard fine grained igneous stone appear to be from the same general context and have no parallel in size or surface treatment to anything else from Çayönü. One (Fig. 3.14:1), was found in two pieces in adjacent excavational units. It is apparently a natural round-sided cobble and is of dark grey granite. Its broad regular working faces are slightly troughed as if from use wear. These surfaces are still

polished at the edges but otherwise covered by a uniform zone of very fine pitting and hair line striations which generally run along the long axis of the trough. Three drill holes appear on one face within the pitted trough. They are separated from each other by about 60 mm and are of a uniform 5 mm in diameter and 2 mm in depth. The two fragments (U 3-6a and P 2-21) together weigh 5,450 grams. The length of the anvil is c. 260, the width 200 and the thickness 30-90 mm.

The other anvil fragment (Pl. 3.II:7) is of a similar grey stone but with a glossy finish. It too seems to be a natural form, its bottom face is relatively flat and unworked and its upper face is somewhat basin shaped apparently from use. Scars on the 100 mm diameter of the shallow (10 mm) working depression are far more obvious than on the above described anvil. Some of these deep scars appear crescentic in shape. There is polishing over the upper edges of the scars and fine multi-directional striations. The outer edges of the upper face are less scarred and more highly polished than the working depression. The fragment (U 4-21) weighs 3,850 grams; its length is 210, width 170 and thickness 70 mm.

Both examples are associated with a burned uppermost sub-phase structure.

8 CELTS

84 whole, 181 inc; serpentine, gabbro-dolerite and other igneous rocks; 5-932 g; Figs. 3.8:1-11, 13; 3.9:1-10; 3.10:1,4; Pls. 3.I:1,2; 3.II:4,5

Fully ground celts with polished bits are common to all four presently defined sub-phases at Çayönü. Hard fine grained grey igneous rock and a type of hard serpentine were the raw materials most frequently chosen for this implement category. However, some celts, especially small examples, are made of more colorful hard glossy stones. Further minerological analysis will be required before an adequate discussion of various qualities, types, and possible stone sources is possible. Manufacture appears to have been a process of chipping and grinding to form followed by polishing at least on the bit and occasionally over the whole surface. There are no celt blanks and few indications on whole celts to suggest that the technique of making several celt blanks at the same time, by means of "sawing" a prepared slab into segments, was prevalent at Çayönü. Instead, judging from a few apparently unfinished examples, it appears that each celt was made individually.

In form and size the collection is extremely varied. Celt weights range from almost a kilo down to 5 grams. Ratios of the bit width to weight are as little as 5 grams per centimeter of bit in the smallest example to 161 grams

per centimeter in the largest. Shapes vary from cylindrical to broad and flat. Celt butts are rounded to squared, and bit breadths range from narrower to considerably wider than the midsection. (It should be noted that the breadth and thickness measurements of celts, given in the appendix, are measurements taken at the midsection of the celts.) The transverse thickness of the bit end - measured between the two faces 10 mm up from the working edge - has a range of from 3 to 16 mm.

Surface treatment of the celts is also variable. Some, particularly the largest, are polished only within 10 mm of the bit edge. Others of this size have been polished halfway up their broad faces. Full polishing is not unusual but is restricted to the smallest celts, with the exception of one medium sized lustrous stone example.

The shape of the bit and its cutting edge is an important factor in many cutting tasks including woodworking. Most of the Çayönü bits have identically proportioned bevelling (with respect to the axis of the celt when seen in the longitudinal section), that is, they are axe-like. Nevertheless, some of the celts appear to have slightly adze-like bits and may even be heavily striated on a narrow facet that appears at the base of the shorter bevel. There is also considerable variation in the curve and the angle-to-axis set of the bit when it is seen full on. Some cutting edges are almost straight or curve evenly up from the center of the tool; others curve up more sharply on one side than on the other (Fig. 3.8:11,12). Varying degrees of curvature are also represented. In two long celts, the length of the cutting edge continues well up the side of the celt (see p.103 and, e.g., Fig. 3.9:10).

Use wear is a characteristic that could be of value in a more extensive study of the Çayönü celts. Chipping from use on the cutting edge is strongly pronounced on the large celts as one might expect if they were used for heavy tasks. However, large chip scars on the butt end are very common on small celts of broad shapes. Except for striations on or immediately adjacent to the cutting edge, use marks are uncommon. As most of our complete examples are from burned structures, the celts were probably in use when they were sealed beneath the tumbled structures. Owners of celts apparently kept these tools in good working order since obvious signs of use wear are normally obliterated by resharpening.

We chose a limited set of criteria in classifying the celts in order to simplify the descriptions and clarify possible functional and chronological differences. We reasoned that the weight of the celt and certain form characteristics could reflect a range of tasks to which the celt might be put. The listing in the appendix of whole or almost whole and presumed still usable specimens under nine types follows those criteria. In the discussion,

we have grouped some of the types that share certain characteristics.

Once familiar with the findspot letter-and-number designation system for Çayönü, the reader will note that several celts of a single type were frequently found in the same room of a burned structure. By moving back and forth between the type listings in the appendix it will also be apparent that almost the complete spectrum of types may occur in a single structure. It is not possible to be definitive about the chronological distribution of celt characteristics. In considering the limited number of specimens, however, especially from the earliest available and uppermost levels sub-phases, the presently available range of types in each sub-phase is suggestive of celt diversity throughout the chronological sequence at the site. It may follow that the diversity of general tasks in which the celts were used may also have remained constant through time.

Broken celts showing signs of secondary use or modification are listed under categories more closely related to the suspected new function. These may be found under the listings of pestle types 5 and 6, "digging tools", and as a "modified celt-like object" in the miscellaneous categories listing. Some celt bit fragments included in the celt fragment lists had been casually used for hammering on their broken ends and, as such, overlap with pestle type 6, though they do not show as many signs of secondary use as those listed as pestles.

Types 1-4 Normal shape celts (very large to small)

Type 1 very large: 3 whole, 17 inc; 615-592 g; Fig. 3.10:1,4
Type 2 large: 15 whole, 100 inc; 242-510 g; Fig. 3.9:7
Type 3 medium-sized: 24 whole, 26 inc; 92-232 g; Figs. 3.8:11; 3.9:4-6; Pl. 3.II:4,5
Type 4 small: 11 whole, 7 inc; 23-89 g; Figs. 3.8:4*; 3.9:3

These four celt types are grouped together because they are similar in shape. "Normal" shape celts comprise slightly over half of the total inventory. These celts have approximately a two-to-one length to breadth ratio and a three-to-two midsection breadth to thickness ratio. The thickness of the bit, at a point ten millimeters from the cutting edge, is greater than on almost all of the other celt types, with a maximum thickness of 16 mm. On the thinnest examples of these "normal" shape types, the bit thickness drops slightly below ten millimeters in only three examples. In other words, sturdy bits are

*(Fig. 3.8:4 is wrongly positioned in the appendix. It illustrates B 5-0.)

common to these types.

Most of these celts are polished only on their bits, but the polished area varies considerably from specimen to specimen and from face to face of single examples. A few of the medium sized (type 3) and small (type 4) examples are fully polished. One large example of type 2 (Fig. 3.9:7) is polished along the length of its flat faces and has a flattened butt end with some signs of pounding. Furthermore, it has two deep grooves running longitudinally along the middle of one face. These characteristics and its symmetrical bit, make it the best and perhaps only convincing example of a possible splitting wedge.

The bit of the "normal" celt types ranges from wider to narrower than the breadth of its mid-section in some examples with axe-like bits, and in a third of the examples with slightly adze-like bits. There is a considerable variation in the curvature of the cutting edge and the degree to which the edge is perpendicular to the axis. The cutting edge ranges from chipped to perfectly smooth; surprisingly a majority of the edges are still sharp and usable. Wear striations are normally obliterated by transverse abrasion marks over the polished section. Occasionally the mid-portions along the sides of a few celts have slight irregularities suggesting hafting. The butt ends are domed or slightly keel shaped. The few examples with signs of pounding on the butts may indicate secondary use after the bit was broken (HC 3-4/1, AD 2-32/3). Some of the smaller (type 4) celts have butts of a size and shape that will fit into antler hafts found in the same burned structures.

Examples of "normal" types, in one or all sizes are found in association with all sub-phases. Groups of each of the four types are found in burned cell rooms and frequently in association with other celt types.

Types 5 and 6 Broad celts (medium-sized and small)

Type 5 medium-sized: 5 whole, 7 inc; 28-110 g; Fig. 3.8:9,10; Pl. 3.I:1
Type 6 small: 5 whole; 16-23 g; Fig. 3.8:1

Types 5 and 6 are separated by weight into medium and small classifications. Weight is the only difference observed between them. The prominent characteristics of these two types are their wide bits, general breadth (with breadth to thickness ratios averaging better than three-to-one), and generally flattened butt ends. Most of the examples have somewhat adze-like slightly off-center bits. In two cases (Fig. 3.8:1 and 9), an atypical one millimeter wide facet running the length of one side of the blade had striations indicating localized friction during use. In the case of Figure 3.8:1 which had a

slightly asymmetrical bevel, the signs of use were on the shorter, less curved facet; quite the opposite that one might expect from adze-like use.

More varieties of stone were used in the manufacture of these types than for the larger celt types. One of the medium sized celts is a striking orange color and another is an unusual light brown colored stone. Two of the type 6 celts are of a highly lustrous fine grained stone. Most of the examples are fully polished although several have roughening on their sides from pecking, suggestive of hafting. The cutting edges are generally at right angles to the long axis and are uniformly straight and sharp. Butt ends generally show signs of pounding and, in a few instances, have scars extending down one face reducing the tool to a fourth of its original size. In these the bit is often still intact and presumably still used.

Whole and fragmentary examples of these types of celts are found in association with all sub-phases and within burned structures. Several examples come from within the U 9 cell structure and one example comes from within the round cornered building KE 6-4 and our earliest available levels sub-phase.

Type 7 Small, elongated celts

9 whole, 15 inc; 5-95 g; Figs. 3.8:5,7; 3.9:8-10

These medium to small sized elongated celts resemble modern chisels in form. They are three times or more as long as they are broad, and in mid-section range from almost round and oval to wide and flat. Some bits are broader and some are narrower than the mid-breadth of the shaft. Almost all of the bits are axe-like in section. The cutting edges range from straight to curved. In two examples (Fig. 3.9:9,10), the cutting edge extends halfway up the implement on one side. The bits are in various conditions from blunted to chipped to sharp. No work striations were observed. The materials used for this type of celt seem to be somewhat more varied than those used for the larger "normal" shaped types. In most of the type 7 celts the polish extends all the way up the faces. In some examples, such as Figure 3.9:9, whose blade is roughly 30° off the perpendicular, the polish extends no further than 1.5 cm from the cutting edge itself.

While several butts show signs of hammering, most examples show no signs of being pounded, and retain a domed or rounded keel shape butt. There are signs of hafting at the mid point on a few examples. Furthermore, some of the celts with oval cross-sections would have fit snugly into the hollowed out ends of antler hafts that were present in the excavations. Whole and fragmentary

examples of this type occurred in all sub-phases and in several burned structures of the cell and uppermost levels sub-phases.

Type 8 Small flat celts

17 whole, 2 inc; 23-80 g; Fig. 3.8:8, 13; 3.9:1,2

Type 8 celts are relatively flat, broad faced, small to medium sized forms. Their mid-section breadth-to-thickness ratio averages about 5 to 2. This type is a catch-all for small flat celts which lack either the width and/or butt shapes of types 5 and 6. Half of the bits have slightly adze-like profiles (see Fig. 3.9:1) and two examples show wear on a narrow facet above the cutting edge. As with several small celts of other types, several of these examples are of an especially fine grained, lustrous stone. Several are fully polished. This includes all of the smallest ones. The cutting edges range from straight to curved and from perpendicular to angled in relation to the long axis of the celt. The bits have the same wide range of scars and degree of sharpness of other small celts as well as a variety of wear patterns. The type is associated with all of the sub-phases. One (U 9-3/15) was found in a burned building cache with two other small celts so close together that they may have been in a pouch of some sort. The two others were of types 6 and 4.

Type 9 Very small, fragile celts

5 whole, 1 inc; 5-15 g; Fig. 3.8:2,3,6; Pl. 3.I:2

Type 9 celts are delicate as regards their size and fine thin bits. They are all fully polished and most of the examples still have sharp bits. Some are of lustrous fine grained stone. Two have butt battering on what appear to have been purposely squared ends. Four have slightly adze-like profiles. Considering their small size, they could only have served in light and fine cutting activities. Although the available examples are few, they are found in association with three of the sub-phases, grill, cell, and uppermost levels sub-phase. Only one (Fig. 3.8:3) was found in the remains of a burned house, and in the same cell room as the cache of various small celt types described above under type 8.

9 TROUGHED ABRADERS

10 whole, 11 incomplete; sandstone, sandy limestone, basalt, and granite; 320-3,600 grams; Figs. 3.10:7; 3.14:4

The single characteristic common to the artifacts

within this classification is the smooth-surfaced trough running along the axis on one or both faces. The artifacts themselves differ from each other in material although three fourths are of sandstone or sandy limestone. The shapes also vary although a large brick-like shape is fairly characteristic. One of the smaller ones is more spatulate in form and, together with two other examples, is of such a size and shape that part of it would sit comfortably in the palm of the hand. The three examples of harder stone types have the shape of broad handstones as well as the same surface treatment and were probably originally used for milling (Fig. 3.14:4). Almost all of the larger pieces are sufficiently flat on the bottom for stability if placed on the ground (Fig. 3.10:7).

The gradually sloping trough depressions are of various depths and range in width from 3 to 17 cm. They are apparently the result of use wear. Some of the depressions are several centimeters deep and at the lowest point are almost worn through to the other side. A slight faceting running lengthwise on the sides of the troughs suggests that whatever was causing this erosion was of a smaller size and different shape than the cross-section of the trough. In the troughs of two examples an asymmetrically worn groove runs the length of the bottom. Two such groove-troughed abraders were found together in a burned cell house (20 M 2). The troughs are smooth and unpitted, and in some cases have a section of highly reflective polish, five or six centimeters wide, running along the bottom. Frequently both faces of the implement were used, leaving troughs ranging from barely perceptible depressions to examples several centimeters deep. A couple of the broken examples show erosion suggesting continued use after breakage. The fact that at least one of these broken examples was found in a burned house, substantiates the impression that the implement's original form was of less importance than its abrasive surface.

Our sample of these implements may not be accurately representative of their distribution at Çayönü. This is due to several factors. One is the fragility of the sandstone; there is also the fact that, because of their rather amorphous form and the less obvious character of new shallow troughs, some of the abraders may not have been recognized and as a result not saved. The majority of those collected came from burned house contexts - in particular within cell structures. They are represented in association with all but the earliest available levels sub-phase.

The most common association in the small cell-rooms is with complete, still usable, celts. In the four rooms in which sandstone troughed abraders were encountered, they were more strongly associated with groups of celts than with any other category of surviving artifact. These associations include one troughed abrader (AD 2-22/13)

with two large celts; Figure 3.10:7 with two very large and five large celts; a third (U 9-3/10) with three small celts; and lastly, a hand sized spatulate shaped abrader, (U 9-1/19) with one large and four medium celts. We strongly suspect that at least these four troughed stones served as bit sharpeners for the neighboring celts. The shape and abrasiveness of the troughs, coupled with the fact that there are fresh resharpening striations on several of the celts obliterating the use wear patterns, strengthen this functional interpretation. All but one of the celts have sharp bits. Since this is an unusually high frequency of sharp bits compared with the total Çayönü celt population, it further argues the proposed relationship of the troughed abraders and the celts.

10 SMALL ABRADERS

The listing for this category must not be taken as indicative of actual quantities and distribution of such pieces at Çayönü. These are border line implements, at least in terms of being distinguishable from river cobbles, and would frequently not have been recognized and collected. We culled these multiformed possible abraders from our boxes of objects of questionable artifactual significance. These pieces have certain things in common: limestone or sandstone of gritty texture, at least one plain flattish smoothed surface, and a size small enough to be held in the hand.

Type 1 Elongated, rectangular abraders with rectangular transverse section

5 whole, 3 inc; limestone; 85-200 g. Fig. 3.11:1,2

At least one of the long flattish sides of these limestone rectangles is a smoothed planar surface. The grit of the stone seems slightly coarser than much of the limestone found on the site. All of the abraders appear to be natural small cobbles selected for their shape, perhaps because of their suitability for handling. They appear to be from at least the upper three sub-phases.

Type 2 Broad, multi-shaped abraders

4 whole, 7 inc; sandstone, pumice, limestone; 50-248 grams; Fig. 3.11:3

These range in form from round to rectangular, with one or opposed smoothed planar faces. Seven are of pink sandstone (including Fig. 3.11:3), two of buff pumice, and one of limestone, and one of sharply gritted red stone. All are associated with the cell and uppermost levels sub-phases but only a few are from burned structures.

Type 3 Rectangular slab, abrader-slicer

1 whole; gritty stone; 145 grams; Fig. 3.11:4

This fully formed piece is of a moderately hard gritty grey colored stone. It is rectangular and spatulate shaped with one of its long edges rounded over as if for convenience in handling. The opposite edge appears to be a blunted cutting edge, somewhat more worn in the center. Within a 15 mm band at this working edge, both faces have polished zones running the length of the implement. Striations run perpendicular to the edge and over the polished zone. Zones of parallel scratch marks are common over most of the surfaces of the piece, including the backed edge. This unique form was found in burned kerpiç of the grill sub-phase.

11 SLABS

Type 1 Large slabs

1 whole; 1 incomplete; limestone; 6500 and 2050 grams; Fig. 3.14:5

Two large limestone slabs recovered during excavation were modified to rectangular shape. They are not necessarily representative of the general distribution of such items because similar pieces, had they been encountered, might easily have been taken as architectural debris. Both are bi-planar and retain a uniform thickness. The large fragment is from a burned cell structure. It is carefully chipped around the edges to a neat rectangular form. Although both broad surfaces may be naturally flat, one surface is uniformly covered with fine pitting which appears to be artificial. The other slab (Fig. 3.14:5) is a complete semi-rectangular piece of sandy limestone. Covering its smooth upper surface and continuing over its artificially rounded edges is a material which looks like a thick coat of lime paint. The slightly irregular surface on this piece is smooth to the touch. No clear signs of use wear were recognized on either piece.

Type 2 Small slabs

23 whole; 22 incomplete; limestone; 30-940 grams

An odd assortment of limestone slivers is encompassed in this general category of small slab or spatulate forms. Those listed here may not be representative of the actual distribution of these rather amorphous forms in our excavation units. In some characteristics this category of objects overlaps with some of the more obvious groupings of artifacts such as "digging" tools, broad abraders, and chipped discs. But these small slab objects are less

well defined and seem for the most part to be natural forms. They range from flat rectilinear and ovoid slivers of cobbles to more irregular shapes. Their sizes range from 58 to 160 mm in length.

No characteristic wear patterns were observed on these objects. Save for blunting on the chipped edges of two or three examples and apparent smoothing from use on one face of several other examples, the working surfaces of the rest remain a mystery. One large half-round spatulate object from a burned structure (BNE-2) has one smooth face and crude chipping on its cleaver-like edge. These characteristics are reminiscent of earth digging tools but are not typical of other implements included in this category. It seems certain that this motley lot served a variety of casual functions. These objects are found in all of the major layers but are unusually plentiful in the earliest available levels sub-phase. As many as four were found in a single cell building, and three were from one room.

12 "DIGGING" TOOLS

10 whole, 3 incomplete; limestone, serpentine, igneous rock; 255-2,210 grams; Figs. 3.8:12; 3.10:10-12; Pl. 3.II:6

These artifacts are grouped together on the assumption that they served some sort of digging function. The traits that suggest this common function are a sharp broad flat chipped end and sufficient length to have been used directly by hand or in a haft. They are all rather crude implements whose toughness rather than neatness of working edge seems to have been favored. Four examples, all on the small end of the wide range of sizes, have notches half or two-thirds of the way up their sides (from the working end); these strongly indicate preparation for hafting. Three of the four examples are similar to each other in shape and in being fully chipped to form (e.g., Fig. 3.10:10; Pl. 3.II:6).

The implements as a whole differ from each other in several respects. Five are of limestone, one of serpentine, two of indeterminate sedimentary stone, and two are made from celts of granite-like stone (Figs. 3.8:12; 3.10:11). The tool lengths vary from 134 to 360 mm. The transverse sections of the butt ends include oval forms with diameters of 35 to 70 mm; broad butt ends with flat faces also occur.

It is the chipped bits of these objects that are the most convincing evidence for a digging function. All of the bits have ragged edges and three-fourths of the examples have clear indication of use wear on the bit end. This wear is evident in the recesses as well as on the ridges of the bit and flake scars. Particularly sugges-

tive of hoe or pick-like wear is the unifacial sheen appearing on the flat sides of six of the examples, extending up the side as much as six to eight centimeters. Two examples have faintly visible striations on the same face.

Judging by the possible ease and casualness of manufacture, and the abundant supply of sedimentary stone close at hand, these tools may have been considered highly expendable. Following this assumption one might expect to find many small fragmentary examples, but none exist in our collection. "Digging" tools come mainly from the cell sub-phase and were found in several burned structures. Two of these implements were found in each of two cell structures.

13 LIGHT WEIGHT VESICULAR BASALT OBJECTS

39 whole, 32 incomplete; 10-570 grams; Fig. 3.11:5-7; Pl. 3.III:7

Although this category includes a remarkable variety of forms, all the objects have one common characteristic: they are made of light weight, grey colored, bubbly basalt (or possibly in some instances of slag). The size range of these artifacts is not great, running from 35 to 136 mm in length. The weight range, however, is substantial (see above). Forms vary from flat-sided rectangles, squares and triangles to ovals, discoids, and more globular forms. A few examples are nondescript blobs but all, regardless of shape, seem to have been purposely modified. The manufacturing of this vesicular basalt into desired shapes would not have required great skill or effort as the material responds well to light pecking.

Objects with opposed flattish faces are typical of about half of the collection, but neither these, nor the more rounded examples have the uniformly plain surfaces from use that one might expect to find, for example, on abraders of hard surfaces such as wood. Their light weight and slightly irregular surfaces would also seem to preclude a grinding function. Only in a couple of examples did we detect a little sheen on the flatter surfaces. Nowhere else on the rough surfaces of these artifacts could we detect wear that might result from use.

Artifacts of this type were encountered in all subphases, and no stylistic changes were noted in the small sample. Like several other ground stone categories from Çayönü, most of the intact examples were found within burned domestic structures. In fact, all of the burned structures, including one from the earliest available levels sub-phase, yielded examples. The greatest accumulation of these objects came from the uppermost layers in one building. Here there were eight examples in the single room structure, four of which were of the flat broad-faced form (in various sizes) while the rest were

of various shapes. In none of the burned house contexts have we recognized patterns of association of the artifacts with other classes of artifacts or features.

We will not hazard a functional interpretation beyond stating that the light weight and brittleness of this stone may indicate that this class of artifact probably served purposes considerably different from similar-sized, but typically heavier stronger basalt implements such as handstones.

14 GROOVED STONES

7 whole, 21 incomplete; steatite-like and other moderately soft stones; 25-230 grams; Figs. 3.12:1-21; 3.13:1-4; Pl. 3.III:1

Most of the palm-sized grooved stones found at Çayönü are similar to artifacts found in early village contexts throughout the Near East. Twenty one of the Çayönü grooved stones are of steatite-like material of varying degrees of hardness. The rest are of other moderately harder stones. The raw material from which Çayönü grooved stones were made has not been tested and it is possible that the material which we define as "steatite-like" may actually be chlorite or some other material. It is, however, the attributes of being easily-abraded and of being heat retentive which are noteworthy in regard to our particular raw material.

At least eight of the Çayönü grooved stones appear to have been subjected to considerable heat. There were, however, even more uncalcined than calcined examples from burned structures.

The Çayönü grooved stones range from a rectilinear to an elongated oval shape, from 29 to 92 mm in length, and from 21 to 60 mm in breadth. The bottom (ungrooved) face of eleven of the examples is flat or approaching flatness. The upper face in all examples is to some degree convex, although in some the curvature is very slight. The surfaces of most of the examples are covered with coarse short striations, in some cases suggestive of manufacture. As for the grooves themselves, eighteen are "U" shaped (approximating a semi-circle) in cross-section and 13 "V" shaped. The grooves range in breadth from 30 to 21 mm. In all but one example (Fig. 3.12:19) the groove runs parallel to the long axis of the artifact. In all of the grooves there are striations, in general running parallel to one another and to the long axis of the groove. These striations range from fine to coarse and are often somewhat eroded on top by compaction or polish. This lustrous zone is particularly obvious in the "U"-shaped grooves. In few cases does this lustrous zone extend into the vertex of the "V" shaped grooves. It is possible in one case that the small "V"

shaped groove of a particular thin, white stone example may represent "sawing" and that the piece is the blank for another kind of artifact (Fig. 3.12:3).

Incised decoration occurs on four examples (Figs. 3.12:10,11; 3.13:1,3). On three of these, a deeply incised zig-zag pattern predominates, in one case interspersed between parallel lines. In two examples the designs are on the bottom (ungrooved) face of the artifact. Finer, more random-looking, incised lines appear on portions of others of the grooved stones (Fig. 3.12:7).

Grooved stones are associated with all sub-phases. Both complete and fragmentary examples have been found in burned cell and uppermost levels structures, but the proportion with clear association to "household" assemblages is not high by comparison with many of the other ground stone categories. The percentage of fragmentary to complete specimens is also relatively high. Judging from the variety of examples within this artifact category, in type of stone used and in size and shape of both the specimens and their grooves, it is possible that these implements were used in a variety of activities. There are two variable characteristics that seem to defy a single-function interpretation for all the items that we have classified as small grooved stones: the appearance of both "V" and "U" shaped grooves and the fact that the contour of the bottom along the long axis of the groove varies from concave to straight to convex depending upon the piece.

(Inadvertently in the appendix, c -instead of w- is used in the portion column to indicate wholeness. In addition, str is used as an abbreviation for straight in the long axis contour assessment, and as striation in the column headed str.)

15 SMALL POLISHED SPATULAS

1 whole, 16 incomplete; fine grained moderately hard grey and green stone; 9-100 grams (estimated weight); Fig. 3. 13:5-7; Pl. 3.III:3

This category is comprised of delicate well polished, flat faced pieces, many of them extremely thin. Only one complete example of this small tongue depresser-shaped artifact was recovered at Çayönü. It is semi-rectangular, relatively flat at the ends, and steep sided. These characteristics are not typical of the large majority of the preserved fragments. On the ten largest fragments, the sides demonstrate a gradual curve and/or the ends are rounded. In cross-sections of both the long and the short axis the faces are tapered. In most cases the tapering results in the faces meeting each other at the sides and ends, but in some examples the edges of the sides and ends are more rounded or squared off.

The surfaces of these objects are polished, but multiple striations mar the polished faces. The striations are generally parallel to (though some groups of striations are diagonal to) the long axis. On some examples the striations are shallow while on others they are deep. To what extent they result from manufacture or from use has not been determined. In three examples the ends of the pieces have small chip scars and on one example chips have been removed from the side. All four of these chipped examples originally had a sharp working edge. Polish now extends over the surface of the chips and in three cases into the recesses of the chip scars. It is probable that the chipping resulted from use. However, it is questionable whether the polishing over the chips is from use or remanufacture.

Fragments of small polished spatulas were found in association with all sub-phases. However, most of these artifacts, and particularly the larger better preserved fragments, were found in association with the earliest available levels sub-phase and grill sub-phase. This distribution may indicate diminishing or discontinued use of these unusually fine forms.

16 OBJECTS WITH LARGE DRILL HOLES

1 whole, 6 incomplete; several stone types; Fig. 3.13:8-11

These seven pieces have been grouped on the basis of one common characteristic: each has a large bi-directionally drilled hole. The diameter of the holes is about 2 cm where the conical shaped drilling depressions meet. These artifacts differ from one another considerably, but judging from shape, size, and type of stone they seem to be of three general types. Chronologically they seem to be associated with the cell and the uppermost levels sub-phases. It is possible that all may have been hafted.

Type 1 Drill-pierced oblate object

1 whole, 3 incomplete; limestone and other stones; 205 grams; Fig. 3.13:8,9

One complete oblate shaped stone and three fragments, all with smooth surfaces and centrally located perforations were found at Çayönü. The fragment of the largest object would suggest a diameter* of 80 mm and an

*Through error, the column in the appendix for all the large drilled hole objects, marked l, should read dia for diameter; the th column should read l for length, for this is the actual length of the object taken through the perforation.

original weight of about 700 g. Two of the pieces are of limestone, one of a dark igneous stone, and one of a handsome copper colored stone with reflective particles. The last example was apparently reused after breaking and the remains of its shaft-like hole now has surface wear similar to that on many of our grooved stone pieces. The one complete specimen (Fig. 3.13:8) is a more compressed oblate form than the others, and is of chalky, buff colored limestone.

The three examples that were found in good context fall within the cell sub-phase. Two of these, including the complete object, were from within burned structures.

Type 2 Drill-pierced, flat, elongated form

1 incomplete; Fig. 3.12:10

This fragmentary object, of a hard, fine-grained green stone, is broken midway through its perforation. The remaining portion is roughly triangular in plan. Its surfaces are well polished. The tapered end is blunt but the exact shape of the end is obscured by chip scars. We cannot say if these signs of percussion indicate its original use. The thickness of this drilled object at the perforation is 16 mm, the extant breadth is 62 mm, and the measurement from the middle of the perforation to the blunted end is 55 mm. This unusual piece was found among the architectural features of a grill type building.

Type 3 Ovoid or butt ended, drill-pierced objects

2 incomplete; basalt and granite; Fig. 3.13:11

These two fragments are such small portions of the original perforated artifacts, that it is impossible to visualize the original fully ground form. The fragments indicate an ovoid form with at least one large blunt end. The better preserved example - of granite - has signs of battering use on the end. The battering, shape and location of the drilled hole may suggest some sort of hafted hammer or axe-like tool. The second example - of easily broken porous basalt - would not have been suitable for heavy pounding use. The former example was found in good context, seemingly late in the cell sub-phase.

17 DOOR SOCKETS

6 whole; basalt, limestone, other hard stone; 15,000-50,000 grams; Fig. 3.11:10,11; Pl. 3.I:6

In addition to the one artifact classified as a possible mortar (see p.85) the present Çayönü inventory has six large stone artifacts with basins. These take a

number of forms. Two examples of a fine grained limestone seem generally to retain their natural slab and boulder forms. Of those made of basalt, one (Pl. 3.I:6) is on the second surface of a large deeply troughed piece of broken grinding slab and the other (Fig. 3.11:10) is fully ground to an unusual tear drop shape, with the basin on the single flat or slightly convex side. The fifth example has the basin in the deep trough of a grinding slab made of an unusual speckled hard white stone. A roughly triangular shape predominates within this artifact category.

The single shared characteristic of all six artifacts is the similarity of size of their centrally placed basins. In diameter, these depressions are all within some millimeters of each other, averaging about 110 millimeters across. All but one (HB 4-2/39) have a relatively sharply defined edge at the rim of the basin. In all the examples, the basin is semi-spherical except in one case (Fig. 3.11:11) which has a shallow flat bottomed basin. In addition, all the examples except this smooth basined example, still have pecking scars (presumably from manufacture) but are smooth to the touch in the bottom half or lower two thirds of the basin. This zoned smoothness is particularly sharply defined in one example (Pl. 3.I:6). This piece was found squarely placed on the top of an outside foundation wall of a burned cell structure, in a position indicative of a door socket. All of the other five pieces were found either in or near house foundations. Concentric striations are not evident in the depressions of these door sockets. Presumably, particles sufficiently hard to cause such striations were not present.

18 SPHERES

306 whole, 65 incomplete; limestone, basalt, chert, and other hard stones; Pl. 3.III:9

Well over three hundred small spherical forms were recovered at Çayönü, ranging from perfect smoothly ground balls to rough surfaced, irregular, hammered forms. They were made of a variety of materials including soft and hard limestone, basalt, chert, granite, and other hard stones. The general category is present in all subphases although not all the types (based on differences of material) are represented in each sub-phase. These artifacts have an especially high frequency in burned houses. This distribution partly explains the preponderance of spheres coming from the cell layers where most of the burned structures were located. However, even taking this into consideration, the very small numbers from the earliest available levels sub-phase and the grill sub-phase may be significant. It should be noted that many of the types occur together; thus the number of types given below may be greater than necessary.

We chose to divide the spherical artifacts into five groups based on stone type. These types are soft limestone, hard limestone, basalt, chert, and other hard stone. Within the type listings, spheres were grouped according to three form variations: perfect, smooth surfaced, ball-like forms; nearly perfect, occasionally smoothed spheres; and rough surfaced, irregularly shaped forms. These form groupings were further separated according to four size categories that are as follows: less than 30 mm, 30 to 40 mm, 40 to 50 mm, and 50 mm and greater. It remains to be seen whether the multiples into which the spheres were divided (stone type, form, and size) will reflect functional differences.

Within the type listings in the appendix, the artifacts are grouped for the most part according to diameter. The 1980 field season examples - although also grouped by diameter - were, however, added at the end of each type listing. (We note that a few of the fragmentary spheres of Type 1 listing are preceded by a b for "broken" instead of an f.)

Type 1 Soft limestone - irregular spheres

74 whole, 8 inc; 10-260 g; 20-68 mm diam.

This type is made of a soft limestone and the objects have powdery surfaces. All were roughly pecked into a shape approaching the spherical, but no examples of this easily worked material have a perfect spherical form. This type is represented in all but the earliest available levels sub-phase: about three quarters of the examples occur in the cell sub-phase, and many are associated with burned houses.

Type 2 Hard limestone - perfect to irregular spheres

66 whole, 25 inc; 15-485 g; 22-71 mm diam.

The perfect spheres of this type are smooth surfaced as are the smaller examples of near perfect form. The medium and large sized nearly perfect spheres and the irregular formed spheres of this type lack fully smoothed surfaces, and many have signs of wear suggesting use as hammers. Hard limestone spheres are restricted to the upper three sub-phases and particularly to the cell layers in which they are frequently found in burned house context.

(In the appendix type 2a listing, the correct diameter of AD 2-22/11 is 43 mm, that of AD 2-22/25 is 44 mm.)

Type 3 Basalt - perfect and nearly perfect spheres

34 whole, 8 inc; 10-450 g; 20-71 mm diam

All perfect and nearly perfect spheres that are made of basalt are fully ground on their surfaces. None of the examples of this stone type would be classified as irregular spheres. However, it should be noted that in material, size, and form the small cuboid and drum-shaped type 15 handstones might fit this category, were it not that their flatter surfaces seem to have been used for grinding rather than hammering purposes, and their distribution on the site is quite different from that of the typical spherical artifacts. Basalt spheres are from the upper two sub-phases and are well represented in burned cell houses.

Type 4 Chert - nearly perfect and irregular spheres

78 whole, 14 inc; 60-1100 g; 33-101 mm diam; Pl. 3.III:9

The surfaces of all the chert spherical objects seem to have been used in hammering as they have a rough bruised appearance. None are perfect spheres and most of them fit into the irregular sphere classification. Beside surface similarities to type 5 hard stone spheres, they also tend to be generally heavier than the limestone and basalt types. These probable chert hammers have been found in all sub-phases and show less clear association with the burned houses artifact assemblages than types 1, 2, and 3.

Type 5 Unidentified hard stone - perfect and imperfect spheres

54 whole, 10 inc; 10-650 g; 19-77 mm diam

Two types of hard stone are predominant in this type: a light grey-green granite-like stone, and a fine-grained, light grey stone. The dozen or so perfect spheres of this type grouping are perhaps noteworthy for their limited weight range (15 to 95 g). The majority of type 5 examples are imperfect spheres and in weight range, form, and hammered-like surface treatment show little difference from the chert examples of type 4 (cf. Pl. 3.III:9). All but one example of type 5 spheres are from the upper three sub-phases, many in burned cell house association.

19 POLISHED FLAT SIDED COBBLES

36 whole, 42 inc; fine grained igneous rock and limestone; 150-1,100 g; Fig. 3.10:5,6; Pl. 3.II:3

Highly polished, flat to slightly convex faces characterize this category of artifacts. The majority of examples are of a hard stone similar to granite. In addition, a majority of the examples retain their natural ovoid cobble form. When these implements have been bifacially used, they have a larger flattened working surface on one face than on the other. One third of the artifacts have a roughly rectangular, broad-faced shape which in several instances is a result of modification. In general, these rectangular forms have extensive opposed flat surfaces of more or less equal size. They are also thinner in section than the natural oval shapes. There may be a functional significance in the ratio of flat-surface to weight of the more rectangular pieces. However, both rectangular and ovoid forms seem to have a similar distribution at the site and are found together within the same burned structures.

Polished flat-sided cobbles are similar in form and size to some of the moderate sized handstones. They differ, for the most part, in stone type (a fine grained stone as against basalt), in the flatness, and in the polish of their surfaces. The thick, medium sized handstones of type 5, however, include some examples with form, and treatment of surface, and density of stone type which closely parallel characteristics of this category. Two examples, as on some handstones, have central pitting or "nutting" depressions on their upper surfaces. A flat-sided round cobble of hard white limestone is, at present, unique (AD 5-4/7:wt 430, l 78, b 78, th 54). Its working surface is flat but the upper surface is domed, making it fit nicely into the palm of the hand. It is from a burned structure.

In fact, these artifacts were frequently found in burned structures, mainly of the cell plan sub-phase. A total of eight examples were found within one cell structure with as many as three in a single cell. Although most of these flat-sided cobbles were found in the cell plan sub-phase context, a small number were found in the uppermost levels sub-phase, and in the grill plan sub-phase. Only one fragmentary example was found in the earliest available levels sub-phase.

As with several of the other ground artifact categories, we might have no complete examples of these objects - nor perhaps even recognize some of them as artifacts - were it not for the burned domestic structures.

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Understandably our various exposures yielded a great variety of unworked stones, including some of exotic minerals, but all natural in form and hence not artifacts in any true sense of that word. We took note of the occurrences of natural cobbles and pebbles, when they appeared as evident groups in what seemed to be closed contexts.

For example, three groups of cobbles appeared in 1972 in the operation SA, one group consisting of as many as 14 pieces in a soil heavy with burned kerpiç. Small natural pebbles, rounded by river-rolling, were for the most part of limestone or of a fine lustrous hard stone; some of these latter could conceivably have been used for burnishing. It is also possible, of course, that some of the pebbles and the cobbles had been brought up from the river banks or elsewhere, to serve as the blanks from which proper artifacts were to be formed, but were either discarded as unsuitable or not processed through some misadventure. There are instances of such things as three fragments of one large spherical igneous boulder (ca. 100 kilos in total weight), which presently defy functional interpretation. Other instances probably reflect little more than pure curiosity, such as a very large chunk of calcite crystal and numerous limestone concretions of appealing shapes.

20 CHIPPED LIMESTONE DISCS

152 whole, 40 inc; 10-365 g; Fig. 3.13:12,13

Chipped stone discs, while not manufactured by grinding, have been allotted for description to this discussion of Çayönü artifacts. Almost all of these small discs are of limestone*, probably of local stream bed derivation. Some still retain water rolled edges. It appears that little effort was required in their manufacture. Large flakes were removed either unifacially or bi-facially, often producing a relatively sharp but irregular edge on a disc form. Roughly 15% of our specimens were left unworked on a 20 to 30 millimeter portion of their circumference. This may be a concession to more comfortable use in the hand. About 40% were fully bi-facially chipped, the rest only unifacially. The typical disc might measure 60 mm in diameter, 15 mm in thickness, and weigh about 100 g, but the range of disc size is mainly from 35 to 85 mm (there are a few examples with diameters in the 90's and 100's). The smallest pieces fit comfortably between fingers and thumb while others are large enough to rest between the finger tips and the palm or heel of the hand.

Although the identification of use wear on the objects was difficult, it is our impression that aside from the probable blunting of the edges through use, the pieces were not drastically altered by use. Judging from the low frequency of broken examples - about one fourth of those found - the use to which the limestone discs were put was not a strenuous one. (The low ratio of broken ones may, of course, represent something else entirely.)

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*The 26 examples not made of limestone are given an asterisk in the appended tabulation.

The distribution of chipped discs chronologically and as to specific context may be meaningful. None has been found in levels clearly associated with the earliest available levels sub-phase and very few with the grill plan sub-phase. By contrast, three fifths of the examples come from levels associated with the uppermost levels structures. A significant quantity of these artifacts are from levels of an apparently large open area contemporaneous with the uppermost levels structures in what appears to be roughly the middle of the community. Almost half of the recovered examples come from this context. In one instance in this feature, three discs were found piled on top of one another. A possible utility of these objects was hide-scraping.

21 MISCELLANEOUS OBJECTS

Large, grooved, limestone slabs (No.21-1)

One of the two examples (KE 1-2) is a large slab of natural laminar limestone. The three preserved sides of this originally diamond-shaped slab also appear to be natural. Down the middle of the long axis and diagonal to the sides is a smooth surfaced groove with a parabolic shaped section. The groove begins within 250 mm of the preserved end and gradually descends to a depth of 40 mm in what appears to be the middle of the long axis. The remainder of the groove is missing. A few obvious axial striations appear at the base, near the end of the groove.

This object was found with the groove facing up and was oriented to the NNW. Less than a meter from it, at the same level, lay other large limestone slabs in a horizontal position. Among these was a second grooved slab.

The second slab (KE 1-4/1) is a portion of a large, natural, bi-plano piece of limestone. At least one end of the original piece is missing. There are two smooth surfaced grooves, one similar to that on the above example but steeper sided, and rounded to a "U" shape at the bottom. The remaining portion of this groove slopes downward from 10 mm in depth to 20 mm, but the breadth remains a constant 40 mm. This groove is placed off center on the slab. The other, shorter groove, also incomplete, is a broad asymmetrical "V" shape in section with a secondary small groove down its center. (The asymmetrical cross-section of this groove is similar to that of two troughed abraders from the 20M2 area that are believed to have functioned as celt sharpeners.) Both grooves have a few heavy striations along the flat surfaces of their sides. This much larger limestone slab was found with the grooves facing down. Both of the large, grooved, slabs may be related to the cell sub-phase. They may well have served as paving slabs.

con	artifact	s-p	wt	l	b	th
4/5	KE 1-2	c	100,000+	106+	640	70
1/2(?)	KE 1-4/1	c	50,000+	440+	630	70+

1st groove			2nd groove		
l	b	dep	l	b	dep
980+	50	0-40			
410+	40	10-20	13+	45	0-10

Large, rectangular, sandstone block (No.21-2)

A very large rectangular block of sandstone is unique in size and form. The straight sides and right angles of this fragment are unusually symmetrical. On the smooth flat face is a shallow pitted groove running parallel to one side and some 40 millimeters in from the edge. On the sides and opposing face remain zones of pitting from manufacture. This second face, flat and smooth along its edges, has raised rounded areas with roughened surfaces vaguely reminiscent of bas relief. No use wear patterns were recognized on this unusual fragment. It was found in the burned kerpiç of an unusual large walled, buttressed structure which is of grill plan sub-phase context, or perhaps somewhat later in time.

con	artifact	wt	l	b	th
1/4	29N2/20	11,000+	340+	210+	80

Large tray-like object (No.21-3)

This flat-sided piece of limestone appears to be a fragment of a large rounded tray. At the rim edge it has a slightly raised surface. If the curve of the outer edge is indicative of a fully round form, the "platter" would measure some 500 mm across. The slightly raised area of the upper surface is smooth to the touch as if from use. The piece was found just above a grill building wall and served as part of what appears to be the remains of a flag-stone pavement.

con	artifact	s-p	wt	l	b	min th	ill	rim portion b	rim portion th
1/8(?)	PB 4-2/1	c	6,800	390+	240+	25	14:3	90	45

Large truncated cone (No.21-4)

This fairly large object roughly approximates a truncated cone in shape with a dome-like protrusion at the base of the cone. It is not clear whether it was ground to shape from a light brown sandstone material or whether it was molded from a sandy plaster. (The artifact was found in a burned cell plan structure and has a burned appearance.) Its ends are flattened and its surfaces

smoothed. No signs of use could be observed on its surfaces.

con	artifact	s-p	wt	l	top diam	bot diam	ill	dome diam	dome height
w	R 1-8	c	3,200	180	155	111	14:8	78	22+

Three-sided domed object (No.21-5)

This fragment of soft brown stone is most unusual in shape. It can best be described as a high dome meeting a base with three sides. Part of the base end is missing. One of the three sides is somewhat concave, the others are more flat. The original surface is uniformly smooth. Wear is visible on the bottom half of the dome portion. Here, the smoothed grooves encircling the circumference of the dome are signs of wear that one might expect from rotation in a socket. In this zone the stone is also polished from compaction. The object was found in association with a cell type structure.

con	artifact	s-p	wt	l	b	th	ill
1/2(?)	HC 3-0	c	230	70+	60	50	III:4

Loop-handle shaped object (No.21-6)

This fragment of fine grained limestone is similar in form to that of the mid-section of a curved handle on a pottery jar. In section it is an elongated oval. The exterior face of this piece is covered with tiny bruises from pecking which seem to indicate a careful manufacturing procedure. The surfaces of the sides and interior face are smoothed to a low polish. No use wear was identified on this object. Its provenience is probably the burned kerpiç of a large cell structure. It is possible that this piece represents a portion of an unfinished bracelet, since its interior curve is within the range of smaller Çayönü "bracelet" fragments.

con	artifact	s-p	wt	l	b	th	ill	diam of curve interior	diam of curve exterior
f	BNE 1	u	70	53+	53	22	15:1	60	100

White marble object (No.21-7)

This unique piece of white marble is irregular in form and appears to be unfinished, judging from the remnant manufacture striations. There are localized natural imperfections in the stone which have left depressions on one side. It is a flat bottomed, vaulted form with no recognized parallels to any of the finished pieces at Çayönü. The material from which it is made looks the same as that used for many of the Çayönü "bracelet" fragments.

con	artifact	s-p	wt	l	b	th	ill
f	PB 2-0	c	100	75	37	25	15:2

Faceted, polished object (No.21-8)

The faceted surface of this well formed, polished fragment has no parallel in our inventory. It is made of a hard, black and white speckled stone. All four surfaces are convex. Slightly keel-shaped edges divide the four surfaces. Two subtly defined edges and the adjacent faces meet diagonally with the edge of the "end" portion. The piece shows no signs of pitting or of wear. It is probably of cell sub-phase derivation.

con	artifact	s-p	wt	l	b	th	ill
1/4(?)	SK 3-2	c	260	90+	63+	32+	15:7

Modified celt-like object (No.21-9)

This artifact looks like half of the bit end of a medium sized, flat sectioned celt which has undergone unusual modification. It is made of a light grey serpentine that is commonly used for celts at the site. The object has opposed axial grooves running down what would have been the center of the bit. One groove is ground and the opposite one is polished. What might have been the broken midsection of the celt has also been ground smooth. Its association is with a cell type structure.

con	artifact	s-p	wt	l	b	th	ill
1/4	HC 2-3/2	c	60+	65+	33+	18	15:5;III:2

Handle-like object (No.21-10)

This unusual stone object is ground on its surfaces in the same way as a well manufactured celt butt. However, it was apparently made to fit comfortably in the hand, similar to the handle of an implement. Unfortunately, only a suggestion is left of the supposed working end that might, for example, have served a chisel-like function. The working end is oval in cross section and has polishing striations around its circumference. The implement is from a context that may represent late grill or early cell sub-phase.

con	artifact	s-p	material	wt	l	b	th	ill
2/3	G 4-0	?	green stone	230	103	40	34	15:6

Large, pierced, ovoid forms (No.21-11)

Two extremely fragmentary pieces of basalt, ground to shape, appear to have large pierced holes of which only a portion is now suggested. The pierced holes were appar-

ently pecked to form, rather than drilled, and would have been somewhat more than 50 mm in diameter. When complete these objects may have been ovoid in plan, with two opposing flattish faces on which the holes were made. A transverse section of the remaining portions of the objects is round to oval. The thickness of each fragment, as measured from the surface of the hole to the outer diameter, is variable suggesting that the hole may not have been centered on the face of the artifact. These objects seem to be from the uppermost levels sub-phase.

con	artifact	s-p	wt	l	b	inside to outside	estimated diam of hole
f	HG 3-0	u?	185	47+	45	46	c. 50 mm
f	K8-9, sf-1	?				39	c. 70 mm

Drilled oblate object (No.21-12)

This is a fully ground, small, round-shaped fragment of basalt with moderately convex faces. Centered on the faces are opposing broad drilled depressions. The "V" shaped holes do not meet each other though they may have been intended to. The piece is associated with the uppermost levels sub-phase.

con	artifact	s-p	wt	diam	th	ill	diam of hole
1/2	T 5-0	u	290+	95	38	16:10	29

Drill-perforated spatulas (No.21-13)

Two thin rectangular perforated-spatulate pieces were recovered. Both have holes (of three and four millimeter diameters, respectively) drilled in the center of one end. The one complete example (Fig. 3.16:1) has a plain smooth surface and the other is covered with the chip scars of manufacture. The smooth piece is of a soft yellow sedimentary stone, the chipped one of pink limestone. If their purpose was ornamental, these objects are very plain. However, if they were utilitarian, we detected no wear patterns to suggest their function. Both examples may be grill sub-phase or earlier.

con	artifact	s-p	wt	l	b	th	ill
w	U 18-1	g	110	110	55	13	16:1
2/3	HG 18-0	?	30	55+	40	6	16:2

Small, round, drilled objects (No.21-14)

One compressed oblate form with a smooth surface (HB 3-9/18), and two chipped discs have centrally placed drilled holes. The oblate piece has holes drilled into both surfaces, the discs each have a hole drilled into

only one surface. The small round holes are only about five millimeters deep on these palm sized limestone pieces. One disc was found associated with grill levels and the other disc and the oblate came from within or in the immediate surroundings of a cell structure.

con	artifact	s-p	wt	diam	th	ill	drilled hole diam	drilled hole depth
w	G 10-0	g		53	10		7	3
w	HB 3-9/18	c	370	70	50	15:4	10	5
w	HE 3-0/13	c	115	76	17	15:3	11	7

Small oblate form with "nutting" depressions (No.21-15)

This symmetrically shaped smooth surfaced limestone oblate has small but relatively deep "nutting" depressions in the middle of both of its flattened faces. The artifact is identical in weight and type of stone, and similar in form to one of the above mentioned round drilled objects (see Fig. 3.15:4). Both objects are from adjacent cell buildings.

con	artifact	s-p	wt	diam	th	ill	"nutting" depression diam	"nutting" depression dep
w	HC 4-1/3	c	370	74	47	11:9	16	3

Small thick oval object (No.21-16)

This small piece of rounded rectangular transverse section and oval longitudinal section is of a dark grey, fine gritty stone. It is reminiscent of smaller specimens in our handstone category except for its longitudinally arched faces which meet and form blunt edges at the extremities. The surfaces are smooth and unpitted with prominent short longitudinal striations near the edges of the arched faces. In the middle of one face are signs of pecking or use as a "nutting" stone. The artifact was from a large burned cell structure.

con	artifact	s-p	wt	l	b	th	ill
w	R 2-10/10	c	415	90	63	42	15:8

Small flat-faced oval object (No.21-17)

This object has a smooth surface and is made of a medium hard light brown stone with reflective bronze colored specks. Its surfaces are unpitted but all are scratched with multi-directional striations of less than a centimeter in length. The pattern of these striations is uniform and extensive, even on the flattened face. They may represent preparation of the object rather than use. The piece is from a room of a burned cell structure.

con	artifact	s-p	wt	l	b	th	ill
w	AD 2-22/2	c	340	70	62	50	16:5

Polished, cleaver-like cobble (No.21-18)

This polished, relatively flat-faced cobble, is of a hard fine-grained black stone. One side is more bulbous and rounded in section and fits the hand comfortably. The opposite, narrower, side is blunted by chipping and crushing which presumably reflects the piece's use. Form, size, and wear are suggestive of use as a cleaver. This unique piece comes from within a burned cell structure.

con	artifact	s-p	wt	l	b	th	ill
w	AD 4-0/2	c	385	110	75	29	16:9

Hammerstone (No.21-19)

This modified limestone cobble was flattened at its butt end, possibly to fit in the palm of the hand at the base of the forefinger. The curved lower end is blunted and chipped from what appears to have been hammering use. This object is from the debris of a burned cell structure.

con	artifact	s-p	wt	l	b	th	ill
w	U 9-3/9	c	275	84	69	37	16:8

Small crude basin-like objects (No.21-20)

Four tiny to small, very crudely made objects of soft limestone are roughly round in shape and have depressions with irregular surfaces on one or both faces. The bottom of the largest example (Fig. 3.16:6), is somewhat flat while the bases of the two complete smaller examples are more spherical. The basin of the smallest example (Fig. 3.16:7; Pl. 3.I:3) is plain and smooth surfaced while the basins of the other three are irregular and show no obvious signs of wear smoothing. These pieces are from grill and cell sub-phase association, although none has been recovered from within burned house remains.

con	artifact	s-p	wt	l	b	th	ill	basin l	basin b	basin depth
f	HA 24-0	c	85+	53	49+	27		30	24+	5
w	HC 4-12/2	c	800	111	108	55	16:6	55	55	28
w	R 3-13	c	40	37	36	24	16:7 I:3	25	25	11
w	27N5 6//		295	79	70	42		45	43	10
								32	30	5

Small oval chipped spatulas (No.21-21)

There may be no functional difference between these elongated, chipped spatulate pieces of limestone and the chipped discs which occur in profusion at the site. However, we have chosen to set these two elongated pieces apart. Both are flat, and one example has bifacial chip-

ping at both ends. The other artifact has similar chipping on one end and down one of the long edges: the opposite edge is naturally rounded (Fig. 3.16:4). This backing may possibly accomodate a finger grip. The pieces are of the cell and uppermost levels sub-phase.

con	artifact	s-p	wt	l	b	th	ill
w	HB 4-2/35	c	45	75	36	11	
w	U 1-24	u	85	71	45	17	16:4

Small, chipped and notched spatula (No.21-22)

This small rectangular spatula is made of medium hard green stone. It is not ground but only bifacially chipped to form. There are opposed notches, with a width and depth of five millimeters, near one end. One notch is worn as if from hafting. The end furthest from the notches is thin and blunted by chipping apparently resulting from use. This unique piece is from a burned house of the uppermost levels sub-phase.

con	artifact	s-p	wt	l	b	th	ill
w	U 5-55/1	u	45	76	33	10	16:3

Long, chipped spatula (No.21-23)

This irregularly shaped, river-rolled sliver of hard limestone is cleaver-like in appearance. Half a dozen large long flakes have been struck from the end on both sides of the edge. The flake scars run about eight centimeters along the edge of the side creating a blunt ridge. They may either represent breakage from use or preparation for use. There is, however, no obvious wear or blunting on this edge. The sliver is long enough for ample hand grasp on its "handle" end. It was found in a room of a cell structure.

con	artifact	s-p	wt	l	b	th	ill
w	AD 5-3/13	c	565	255	55	20	14:7

Large spherical object (No.21-24)

This large fragment of white, hard, fine-grained limestone is slightly flattened on the top of its dome shaped portion. Its surfaces are smoothed to a low luster but no use wear was observed. It is not obvious whether this object was prepared in any way or is simply a natural shape. It was found in the rubble of a large burned cell structure.

con	artifact	s-p	wt	l	b	w	ill
1/2	R 2-10/8	c	3,300	85+	170	150	14:6

CONCLUSIONS

As previously stated, this is a purely descriptive report on the types of ground stone artifacts encountered during excavations at Çayönü. It is intended, through illustrations and descriptions of the types, to offer a general idea of the material. It is also designed to offer sufficient information on the total collection to be useful to those involved in the study of ground stone from other sites. Further, the arrangement of the listings of specimens according to their provenience makes it possible for those working on other groups of material from Çayönü to make distributional comparisons with the large quantities of ground stone artifacts. One anticipated advantage of list sharing is the potential of cross pollenization of ideas and observations between those working on different groups of artifacts. Ideally, this would happen while studies of the different groups are still in progress and before the final summary chapter on Çayönü is cast. Finally, it is especially hoped that this report will bring constructive response from colleagues working on collections of ground stone artifacts from other sites.

There is already indication that careful analysis of the ground stone inventory and its distribution can yield valuable information regarding the mode of life in an early village-farming community. It is less clear, however, just how much change in behaviour will be demonstrated by this collection. Throughout the approximately half millenium of the main prehistoric phase of Çayönü, the level of technological competence and the general diversity of implements seem, with few exceptions, to remain fairly stable. However, judging from the present evidence of marked change in other bodies of data from Çayönü, as for example in the architecture, in the arrangement of the settlement, and in the bone frequencies of certain species of animals, it would seem that patterns of behaviour within the community were far from being static. It is expected that with increased sample size from the earliest available and the uppermost sub-phases and with adequate analysis of the total collection, meaningful morphological and frequency changes will also be observed in the ground stone inventory. Presently, the horizontal distribution of ground stone artifacts demonstrates more clearly defined patterns than does the vertical. The horizontal distribution patterns, when studied in the full context of the features with which they are associated, should add significantly to a better understanding of life at Çayönü.

ACKNOWLEDGMENTS

I have many acknowledgments to make. First, I am now glad that Halet Çambel, Linda and Robert Braidwood maneuvered me into the study of the ground stone. It proves to be a fascinating perspective from which to view life in an early village-farming community. Professor Çambel softened the onerousness of the task by inducing Ayşe Baykal Seeher to work with me for two full seasons. Ayşe brought enthusiastic energy and a considerable knowledge of ground stone which she had learned while working at Demircihüyük. Without Ayşe's patient help and good judgment, I am sure the task would never have been completed.

I am most grateful, too, to all of the members of the Çayönü field staffs for the seasons from 1970 onwards. All of them aided me in one way or another. My special thanks go also to another Ayşe, Ayşe Ozkan, for her excellent drawings, and to Nezih Başgelen for the photography of the type collections.

I am especially indebted to Harriet B. Watrous for a rigorous first editing of my manuscript, as well as to this volume's editors. Additional thanks, for their patience and consideration, go to Geraldine Bergsma, Marcelino Rosado, Mark Bates, and to my long suffering parents, Dorothy and Harry Davis.

ILLUSTRATED GROUND STONE ARTIFACTS

Fig. 3.2

1. AD 5-6/8 Pestle, large, bulbous (type 2)
2. S 3-1/2 Pestle, large, bulbous - splayed handle (type 2)
3. U 2-5 Pestle, large, bulbous (type 2)
4. R 9-6 Pestle, large, bulbous (type 2)
5. R 9-4 Pestle, large, bulbous (type 2)

Fig. 3.3

1. C 4-0/2 Pestle (celt fragment) with polished working end (type 5)
2. B 5-0/1 Pestle (celt fragment) with polished working end (type 5)
3. D 2-1 Pestle (celt fragment) with battered working end (type 6)
4. AD 5-5/1 Pestle, large simple form (type 1)
5. AD 5-5/10 Pestle, small elongated (type 9)
6. HC 4-7/9 Pestle, small stubby shaft (type 3)
7. U 9-2/22 Pestle, large simple form (type 1)
8. AD 1-30 Pestle, small stubby shaft (type 3)

Fig. 3.4

1. U 4-22 Pestle, large simple form, reutilized grinding slab (?) (type 1)
2. 19N2-9/13 Pestle, small, polished cylinder with barb (type 8)
3. 20L2-12/30 Pestle, medium, polished tapered cylinder (type 10)
4. S 5-1/1 Pestle, small, oval sectioned shaft (type 7)
5. 20M2-14/56 Pestle (?) (type 3)
6 29N5-9/18 Pestle, large, bulbous form with "eared" handle (type 4)

Fig. 3.5

1. Z 3-1 Handstone, medium, low domed (type 8)
2. HB 3-4/8 Handstone, medium, with matching faces - side chipping from secondary use (type 10)
3. AD 2-22/15 Handstone, small, semi-rectangular - little surface pecking (type 11)
4. AD 5-2/15 Handstone, small, semi-rectangular - side finger hold notch (type 11)
5. HC 3-0/27 Handstone, small, semi-rectangular - end pounding, "nutting" on one face (type 11)
6. AD 5-2/17 Handstone, small, semi-rectangular - end and side pounding, "nutting" on one face (type 11)
7. HC 4-6/10 Handstone, palm-sized, round, "nutting" on one face (type 12)
8. P 2-18 Handstone, small, squarish (type 14)
9. D 3-0 Handstone, small cuboid (type 15)

Fig. 3.6

1. D 3-0 Handstone, large, turtle-shaped (type 1)
2. HC 3-3/2 Handstone, large, turtle shaped (type 1)
3. AD 3-0/3 Handstone, large, turtle-shaped (type 1)
4. U 5-56 Handstone, large, high vaulted (type 2)

5.	U 4-2	Handstone, large, high vaulted (type 2)
6.	U 4-55	Handstone, large, low, elongated (type 3)
7.	U 4-55	Handstone, medium, thick - very smooth surface (type 5)
8.	U 4-54	Handstone, medium, thick - smooth surface (type 5)
9.	HC 3-3/1	Handstone, broad, round (type 6)
10.	KE 6-2/3	Handstone, broad, round (type 6)
11.	SK 6-10/3	Handstone, medium, high domed (type 7)
12.	U 5-48	Handstone, medium, low domed - made from grinding slab (?) (type 8)
13.	AD 3-20/5	Handstone, medium, low vaulted - faceted upper face (type 9)
14.	HC 4-5/8	Handstone, medium, matching faces - side finger hold notch (type 10)
15.	AD 3-30/4	Grinding slab - mid-transverse section
16.	SK 6-10/1	" " " " "
17.	SA 9-9	" " " " "
18.	U 9-7/2	" " " " "
19.	SK 4-15/1	" " " " "
20.	HD 4-4/1	" " " " "
21.	AD 2-21/8	" " " " "

Fig. 3.7

1.	U 5-56	Grinding slab with associated handstones (Fig. 3.7:4,5)
2.	SK 6-10/3	Handstone, medium, high-domed (type 7)
3.	U 9-7/2	Grinding slab with paired handstone (7:7)
4.	U 5-56	Handstone, large, high vaulted (type 2)
5.	U 4-55	Handstone, large, low elongated (type 3)
6.	SK 6-10/1	Grinding slab with paired handstone (7:2)
7.	U 9-7/1	Handstone, large, broad, rectangular - with raised center strip on working face (type 4)
8.	AD 3-1/3	Grinding slab, small
9.	EF 2	Grinding slab - moderately deep trough
10.	S 4-0	Grinding slab - rounded bottom
11.	B 6-0	Grinding slab - off center base, deep trough
12.	U 5-48	Grinding slab - small
13.	SK 4-15/1	Grinding slab - flat bottom, moderate depth
14.	KW 5-10/1	Grinding slab - nearly worn through

Fig. 3.8 Celts, nos. 1-11, 13; digging tool, 12

1.	AD 3-27/2	Small, broad - polished (type 6)
2.	HC 2-7/1	Very small, fragile - polished (type 9)
3.	U 9-3/1	Very small, fragile - polished (type 9)
4.	B 5-0	Small, normal - half polished (type 4)
5.	SA 7-2/2	Small, elongated - polished (type 7)
6.	HC 3-0/0	Very small, fragile - polished (type 9)
7.	HA 9-0	Small, elongated - polished (type 7)
8.	HC 2-15/2	Small, flat - polished (type 8)
9.	U 8-1/1	Medium, broad - polished (type 5)
10.	U 9-6/3	Medium, broad - polished (type 5)
11.	U 9-3/22	Medium, normal - mainly polished (type 3)
12.	HC 4-5/17	Digging tool - celt reused (?)
13.	AD 1-21/9	Small, flat - chipped hafting grip (type 8)

Fig. 3.9		All are celts
1.	HA 25-1	Small, flat - striated surface (type 8)
2.	AD 4-0/1	Small, flat - unequal polish (type 8)
3.	U 9-3/13	Small, normal - unequal polish (type 4)
4.	EF 9-6	Medium, normal shape - unequal polish (type 3)
5.	U 9-1/5	Medium, normal shape (type 3)
6.	U 9-1/23	Medium, normal shape (type 3)
7.	AD 2-32/7	Large, normal - polished, hammered butt, splitting wedge (?) (type 2)
8.	R 3-0	Small, elongated - polished (type 7)
9.	U 3-15	Small, elongated - bit polish only, hafting marks (type 7)
10.	G 2-0	Small, elongated - polished (type 7)

Fig. 3.10		
1.	AD 2-22/10	Celt, very large, normal shape (type 1)
2.	HB 3-2/7	Palette, round
3.	G 8-1	Palette, round
4.	AD 2-32/4	Celt, very large, normal shape (type 1)
5.	U 9-2/21	Polished flat-sided cobble
6.	AD 5-2/1	Polished flat sided cobble
7.	AD 2-32/12	Troughed abrader - 2 working surfaces
8.	U 19-5/2	Limestone container - smooth outer and rough inner surface
9.	R 19-0	Limestone container, rough interior
10.	AD 5-6/10	Digging tool
11.	E 4-0	Digging tool - reused, polished, flat faced celt
12.	AD 5-8/1	Digging tool - ground to shape

Fig. 3.11		
1.	R 2-20	Small abrader, long rectangular (type 1)
2.	R 2-10/2	Small abrader, long rectangular (type 1)
3.	AD 5-4/3	Small abrader, broad rectangle (type 2)
4.	R 9-4	Small abrader, rectangular slab, abrader-slicer (type 3)
5.	KE 6-3/4	Light-weight vesicular basalt
6.	U 4-3	Light-weight vesicular basalt
7.	HC 4-2/4	Light-weight vesicular basalt
8.	U 3-9	Handstone - opposed "nutting" depressions (type 13)
9.	HC 4-1/3	Small oblate form - "nutting" depressions
10.	D 4-0	Door socket, fully ground to form
11.	U 9-5	Door socket, natural slab

Fig. 3.12		All are grooved stones
1.	S 4-1/4	Random striations on face
2.	U 3-55/2	Two "V" shaped grooves on the same face - steatite
3.	WC 1-1	
4.	X 10-5	Steatite
5.	R 3-11/1	
6.	S 5-2/1	Steatite
7.	Ct sf 78	Strong parallel scratches (surface find)
8.	F 8-1	Steatite
9.	SE 6-0	
10.	AD 0-10/1	Incised design top and bottom - steatite

11. G 4-0/1 Engraved design on top, incised lines on bottom - steatite
12. R 3-3 Random striations
13. KW 0-1/6 Random striations - steatite(?)
14. HB 3-6/1 Striations, engraved line on end - steatite
15. AD 3-30 Striations - steatite
16. HC 3-0/7 Deep channel in groove - steatite
17. U 9-0/2 Steatite
18. HG 22-0 Steatite
19. K5 4-5 Unusual short groove across width, striations - steatite
20. R 17-3 Steatite
21. X sf Steatite

Fig. 3.13

1. 19M2-8/52 Grooved stone, deeply incised design on bottom, striations on top
2. HB 3-2 Grooved stone, random striations
3. 27 0-1/3 Grooved stone, engraved design on bottom, unusually thick (reliable provenience?)
4. U 4-3/2 Grooved stone, striations on top, deep line incising on bottom
5. R 17-0 Small polished spatula, squared edge
6. R 7-6 Small polished spatula, blade like edge
7. R 13-0 Small polished spatula, squared edge
8. U 9-1/40 Drill pierced oblate object (type 1)
9. AD 5-4/16 Drill-pierced oblate object (type 1)
10. EF 9-6/1 Drill-pierced broad form (type 2)
11. SA1 3-9/1 Butt-ended drill-pierced object
12. Z 3-0 Chipped disc
13. SE 6-0 Chipped disc

Fig. 3.14

1. P 2-21 & U 3-6a Anvil, large polished with very fine pitting in mid-portions of both opposing faces
2. HB 3-4/7 Handstone - distinct "nutting" area (type 4)
3. PB 4-2/1 Fragment of large tray-like object
4. KW 5-2/3 Troughed abrader, reutilized handstone
5. KW 5-0/6 Slab, large, smooth upper surface (type 1)
6. R 2-10/8 Large spherical object - fragment
7. AD 5-3/13 Long chipped spatula
8. R 1-8 Large truncated cylinder, domed top

Fig. 3.15

1. BNE 1 Loop-handle shaped object
2. PB 2-0 White marble object
3. HE 3-0/13 Small round drilled object
4. HB 3-9/18 Small round drilled object
5. HC 2-3/2 Modified celt-like object
6. G 4-0 Handle-like object
7. SK 3-2 Faceted polished object
8. R 2-10/10 Small thick oval object

Fig. 3.16

1. U 18-1 Drill-perforated spatula - surface striations on smooth surface
2. HG 18-0 Drill-perforated spatula

3.	U 5-55/1	Small, chipped and notched spatula
4.	U 1-24	Small, oval, chipped spatula
5.	AD 2-22/2	Small flat-faced oval object
6.	HC 4-12/21	Small crude basin-like object
7.	R 3-13	Small crude basin-like object
8.	U 9-3/9	Hammerstone
9.	AD 4-0/2	Polished cleaver-like cobble
10.	T 5-0	Drilled, oblate object

Pl. 3.I

1.	AD 3-1/1	Celt, medium, broad bit - hafting traces (type 5)
2.	U 9-3/1	Celt, very small, fragile, fully polished (type 9)
3.	R 3-13	Small crude basin-like object
4.	AD 2-22/15	Handstone, small, semi-rectangular (type 11)
5.	HC 4-7/11	Handstone, palm-sized, round (type 12)
6.	S 4-0/2	Door socket, on upsided grinding slab portion
7.	SK 4-15/1	Grinding slab, deeply eroded trough

Pl. 3.II

1.	D 3-0	Handstone, large, turtle-shaped (lower surface) (type 1)
2.	HB 3-2/7	Palette (1/3 portion)
3.	U 9-2/21	Polished flat-sided cobble
4.	U 9-1/5	Celt, medium, normal shape (type 3)
5.	EF 9-6	Celt, medium, normal shape (type 3)
6.	AD 5-6/10	Digging tool, chipped to form, hafting traces
7.	U 4-21	Anvil, large, polished

Pl. 3.III

1.	HC 3-0/7	Grooved stone; deep channel at bottom of groove
2.	HC 2-3/2	Modified celt-like object
3.	HA 18-0	Small, polished spatula, very thin
4.	HC 3-0	Three-sided, domed object; wear striations and polish encircle base of dome
5.	R 5-0/1	Pestle, of celt fragment with polished working end (type 5)
6.	19N2-9/13	Pestle, small polished cylinder with single barb remaining (type 8)
7.	HC 4-2/4	Light-weight vesicular basalt object, three-faced
8.	HC 4-7/9	Pestle, small stubby shaft, double ended use (type 3)
9.	AD 5-4/11	Sphere, large, irregular form - chert (type 4b)

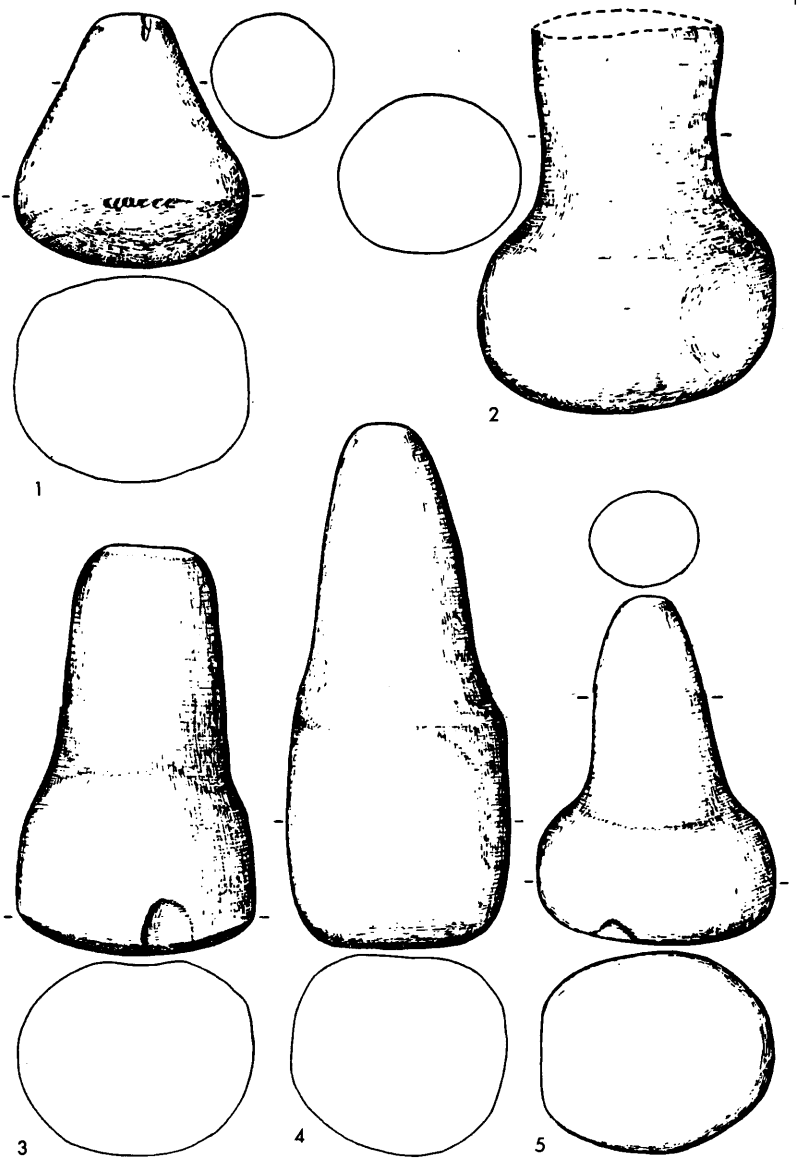


Fig. 3.2 Pestles; scale ca. 1:2

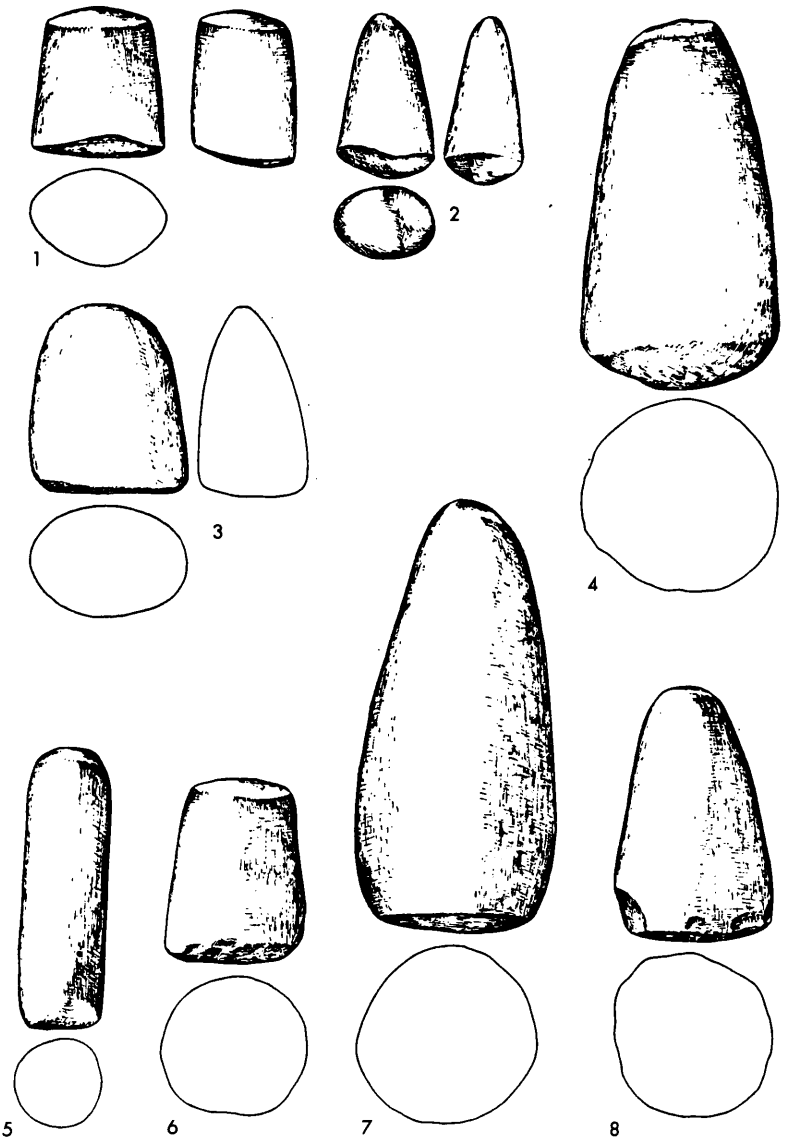


Fig. 3.3 Pestles; scale ca. 1:2

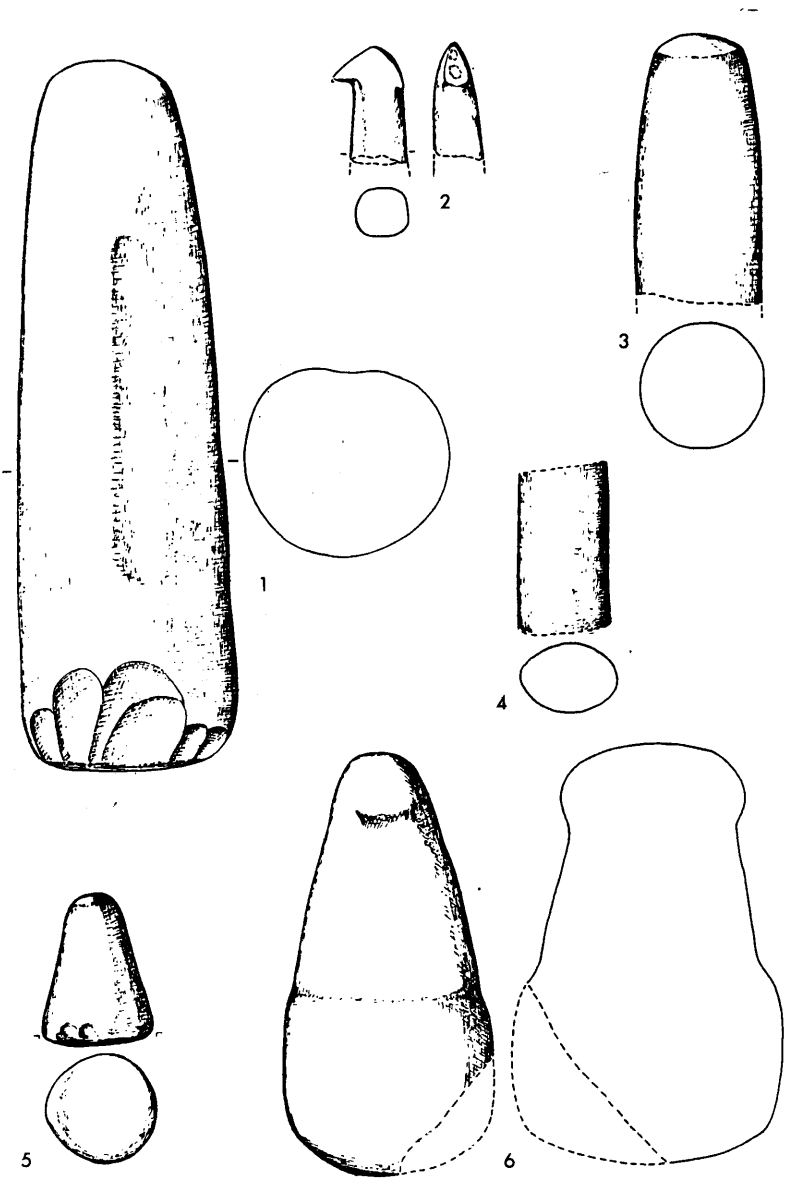


Fig. 3.4 Pestles; scale ca. 1:2

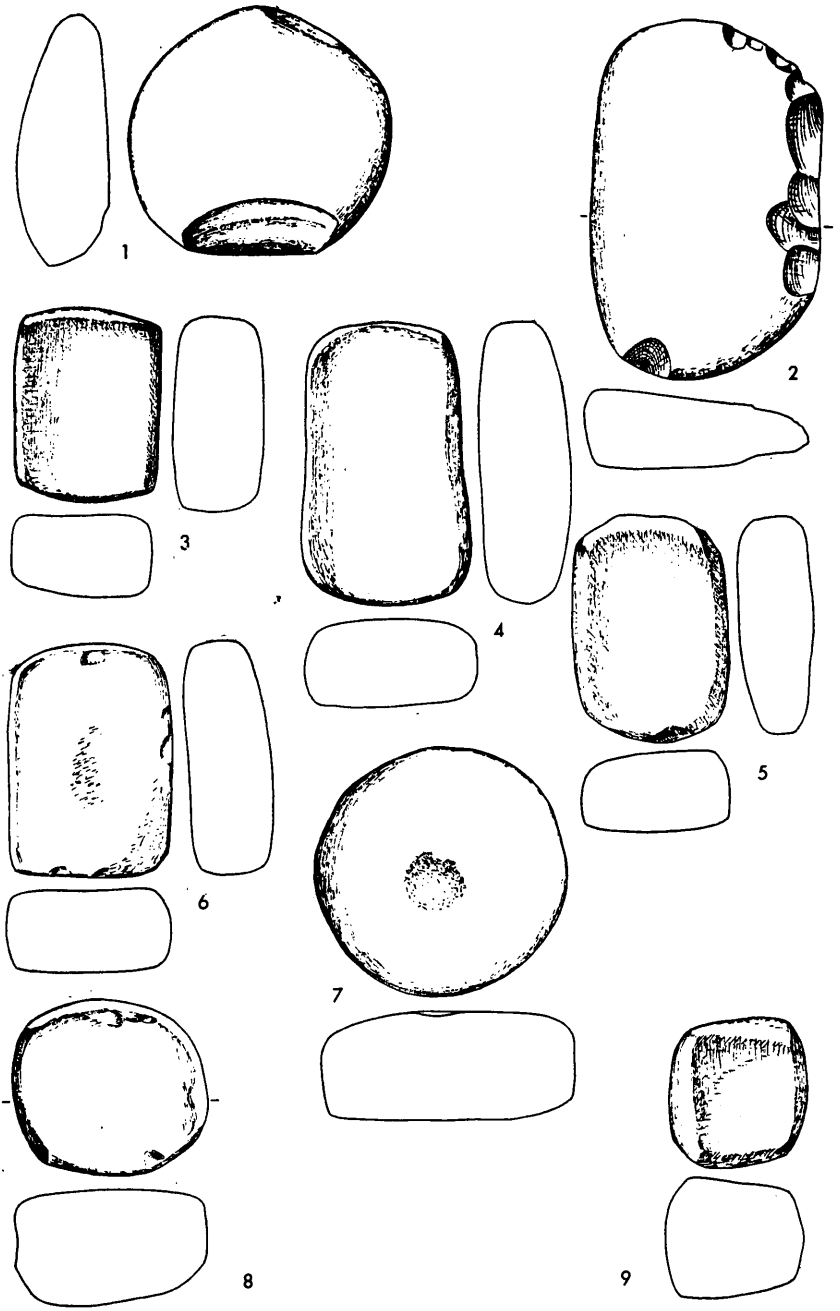


Fig. 3.5 Handstones; scale ca. 1:2

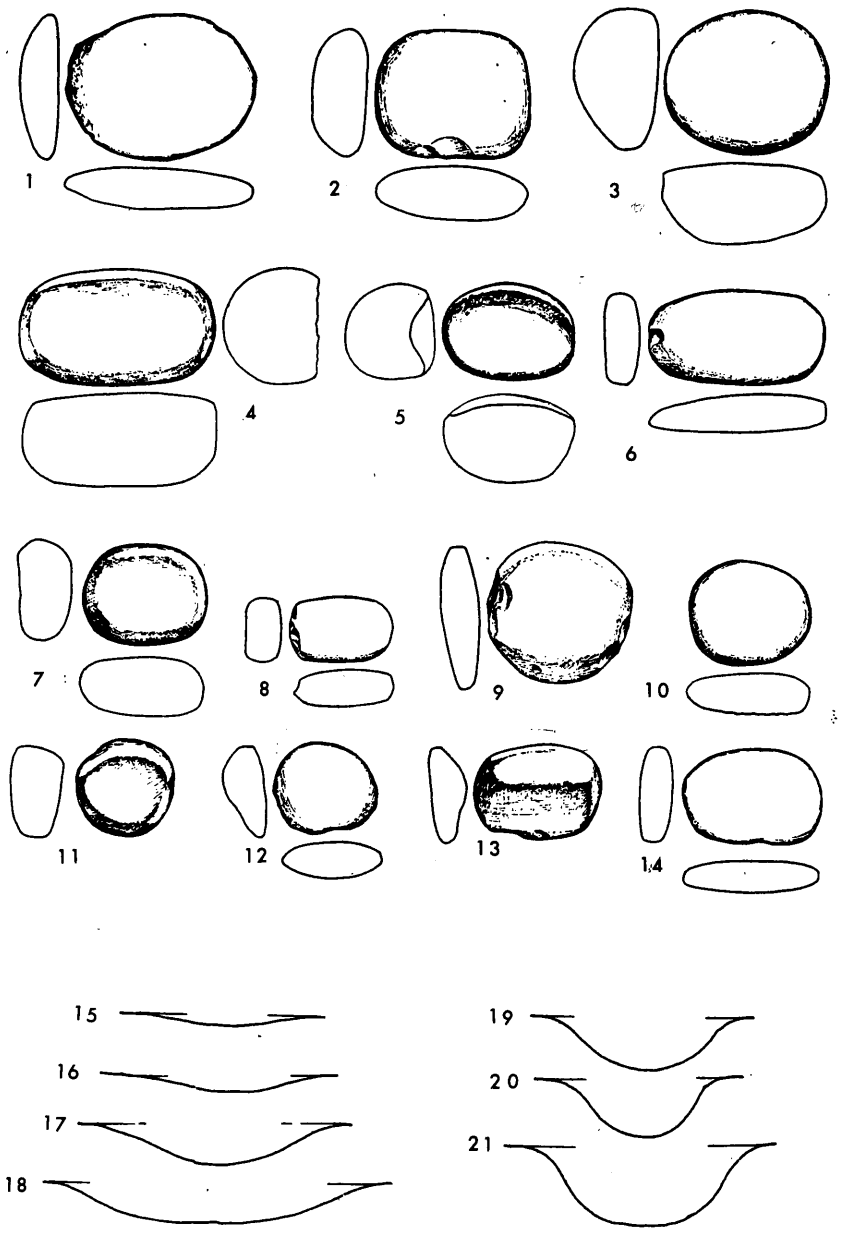


Fig. 3.6 Handstones and grinding slab sections; scale ca. 1:6

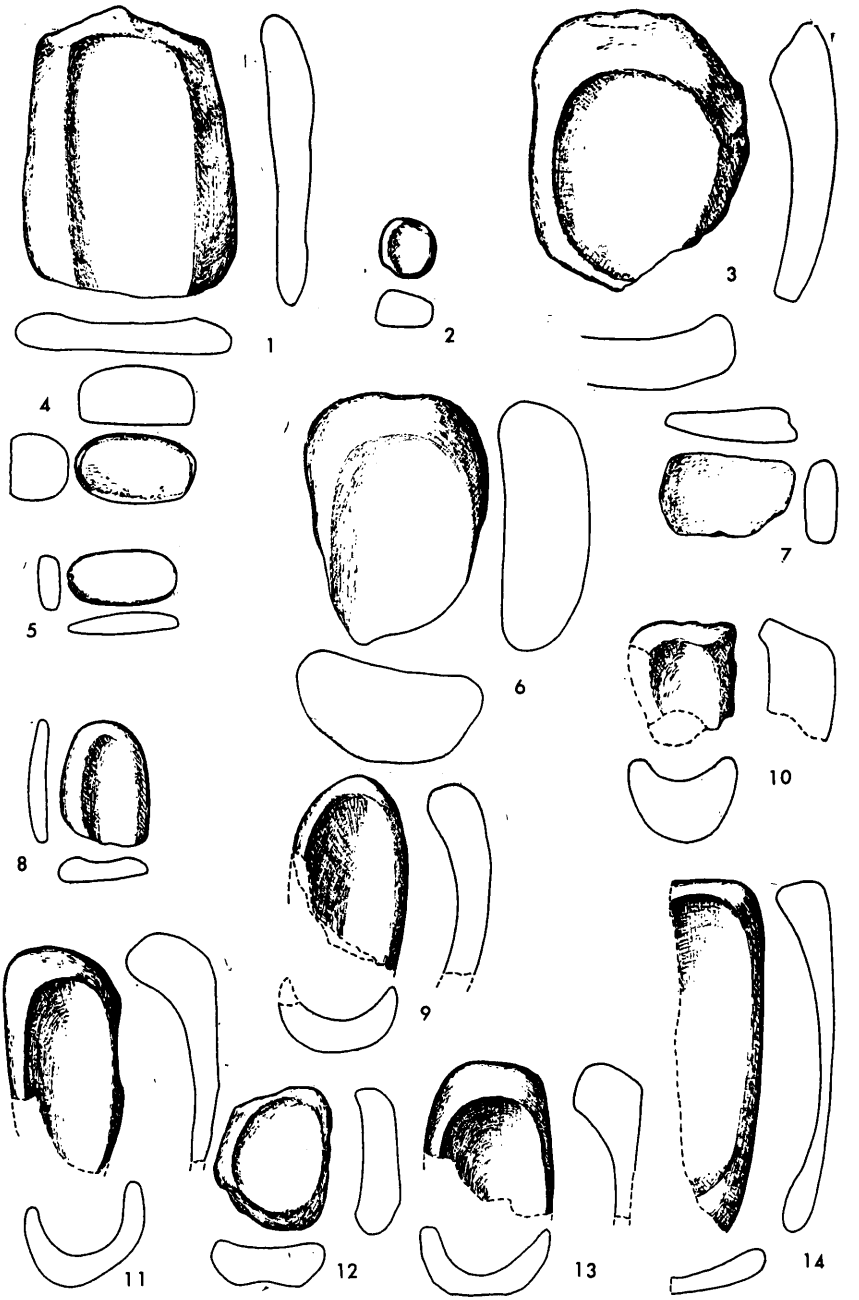


Fig. 3.7 Grinding slabs and handstones;
scale ca. 1:10

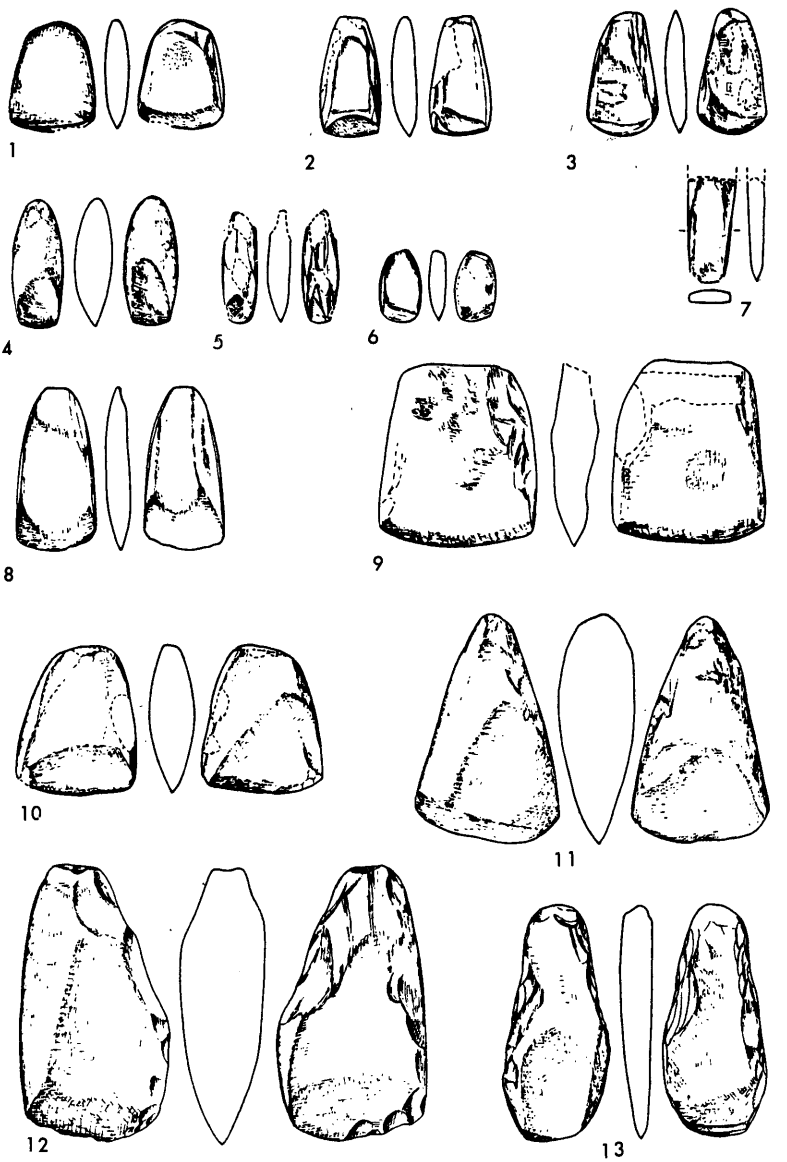


Fig. 3.8 Celts; scale ca. 1:2

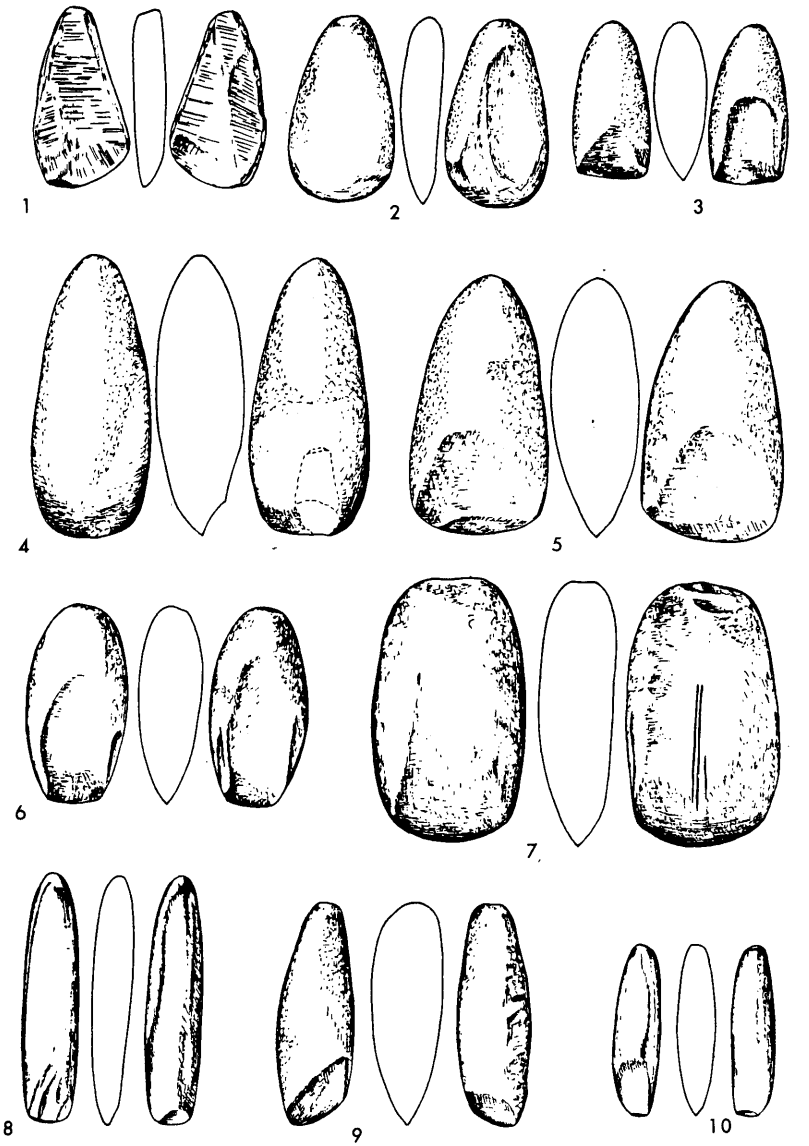


Fig. 3.9 Celts; scale ca. 1:2

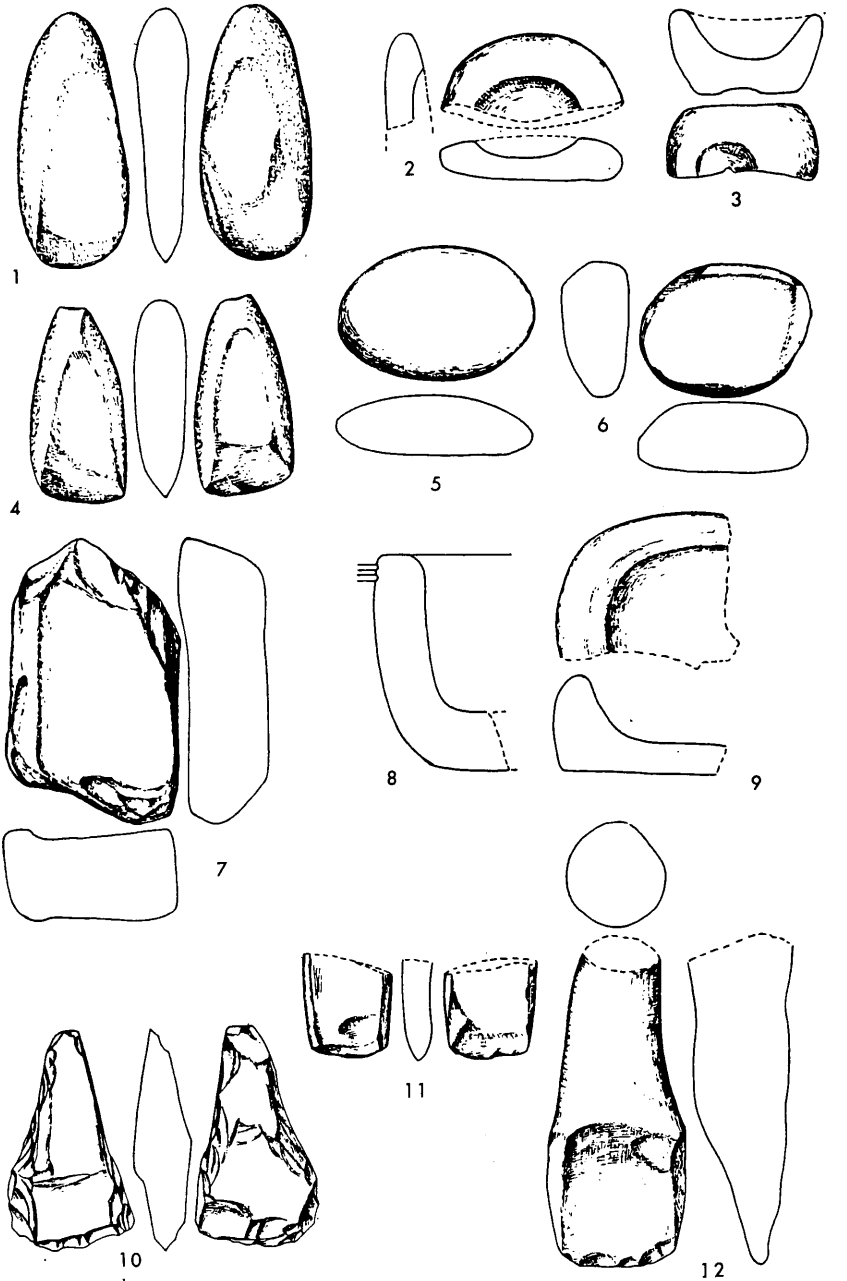


Fig. 3.10 Celts, palettes, polished cobbles, abrader, containers, and digging tools; scale ca.1:4

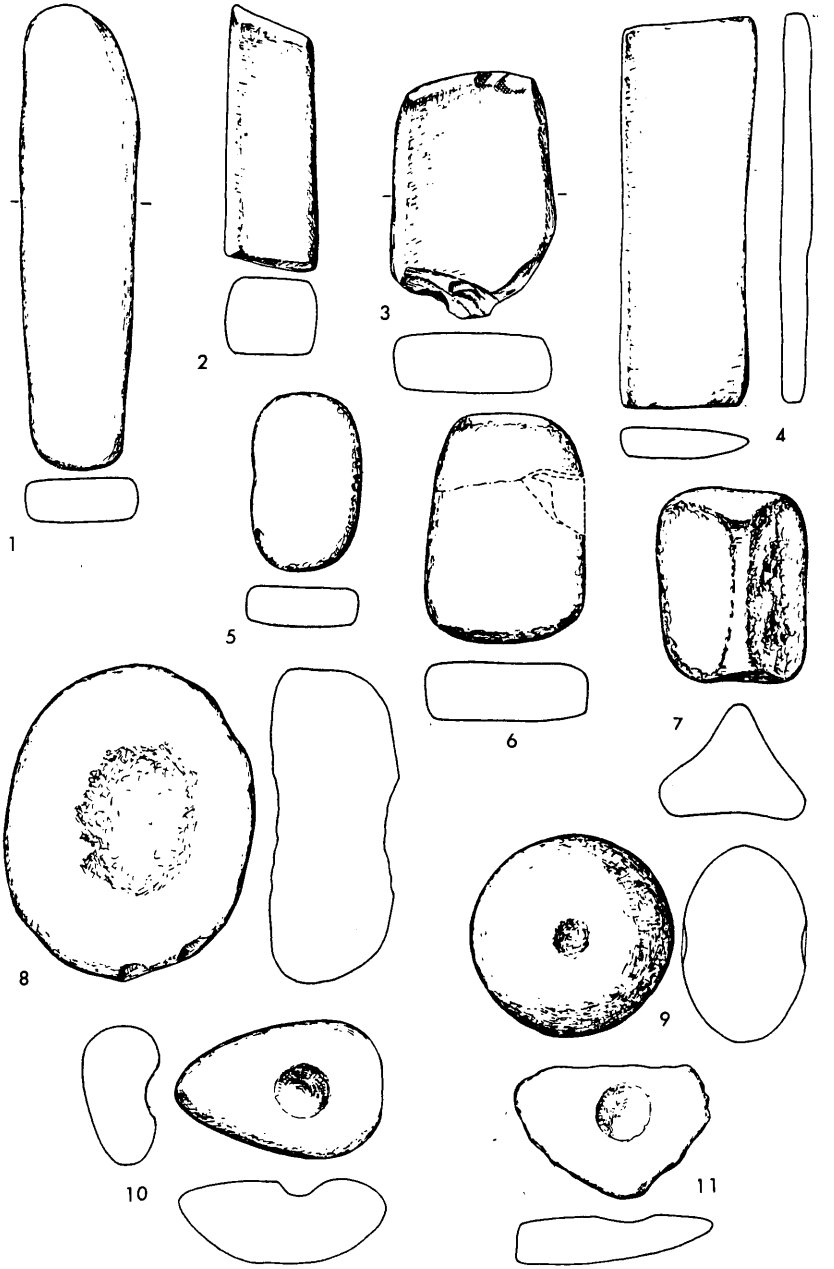


Fig. 3.11 Abraders, basalt objects, handstones, and door sockets; scales ca. 1:2 (1-9), 1:10 (10,11)

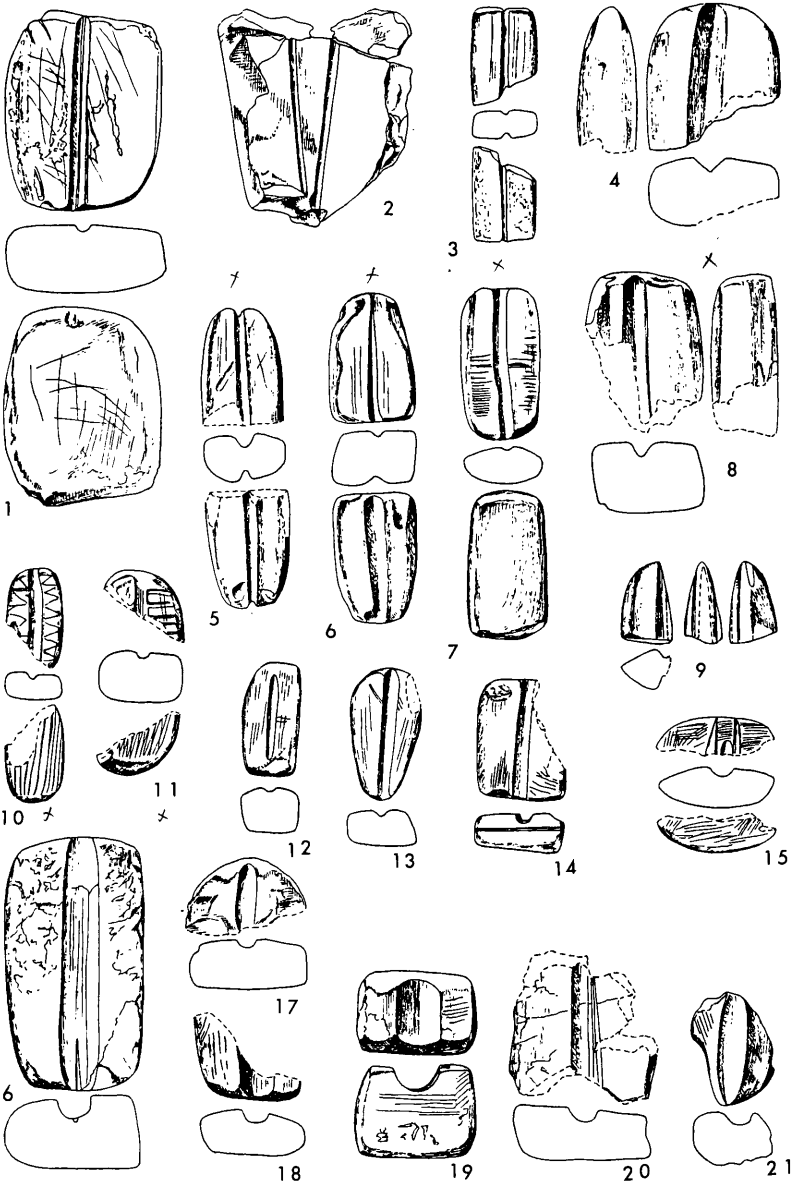


Fig. 3.12 Grooved stones; scale ca. 1:2

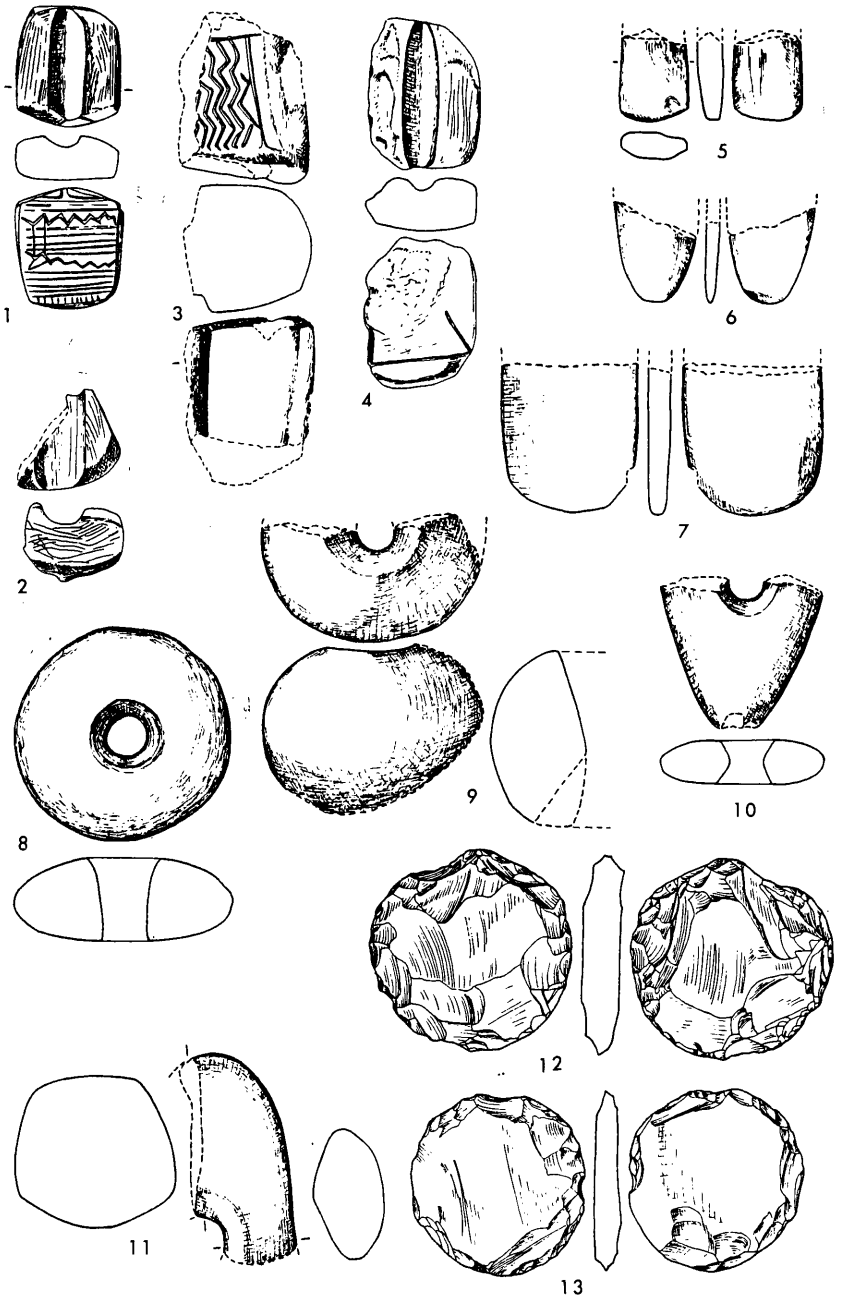


Fig. 3.13 Grooved stones, spatulas, drilled objects and chipped discs; scale 1:2

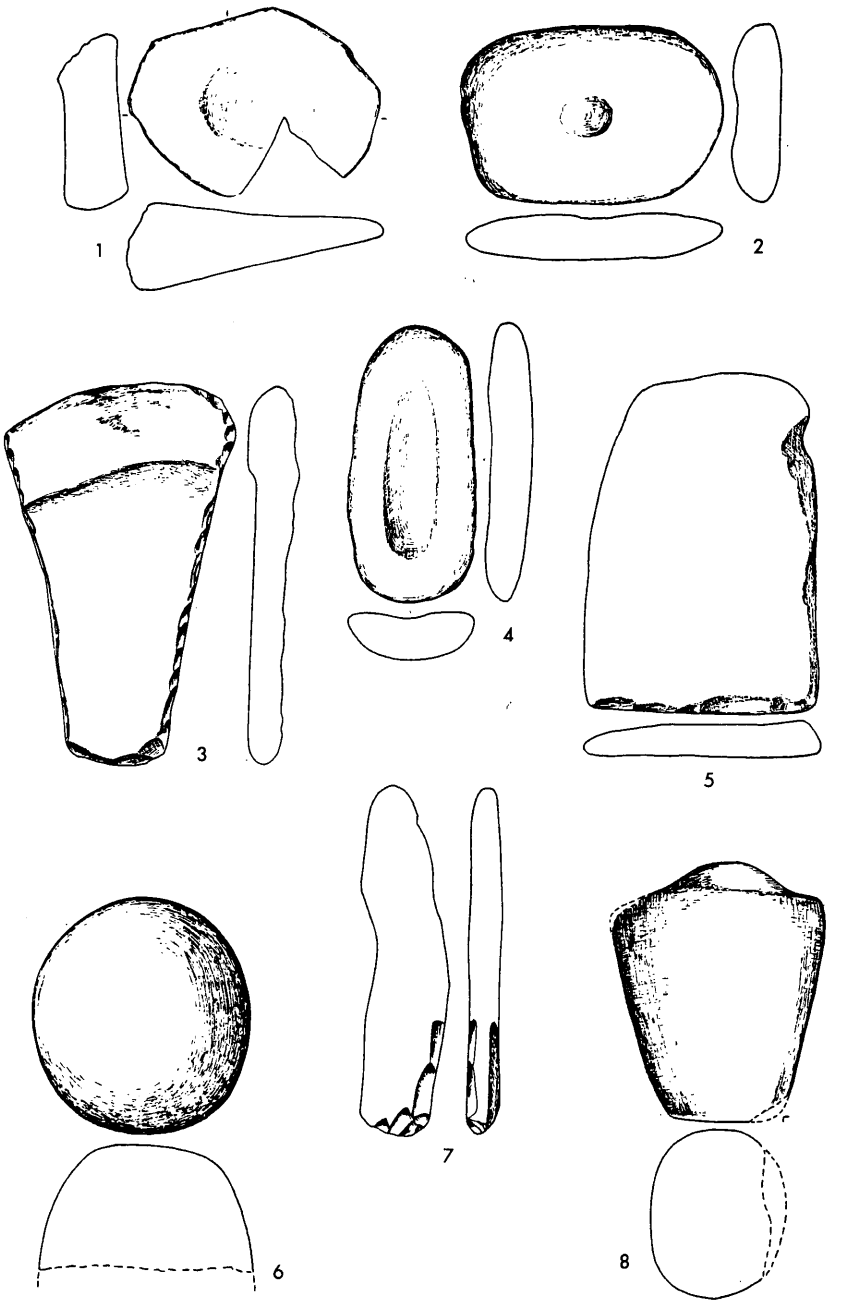


Fig. 3.14 Anvil, handstone, "tray", abrader, slab, sphere, spatula and cone; scales ca.1:6 (1-5), 1:4 (6-8)

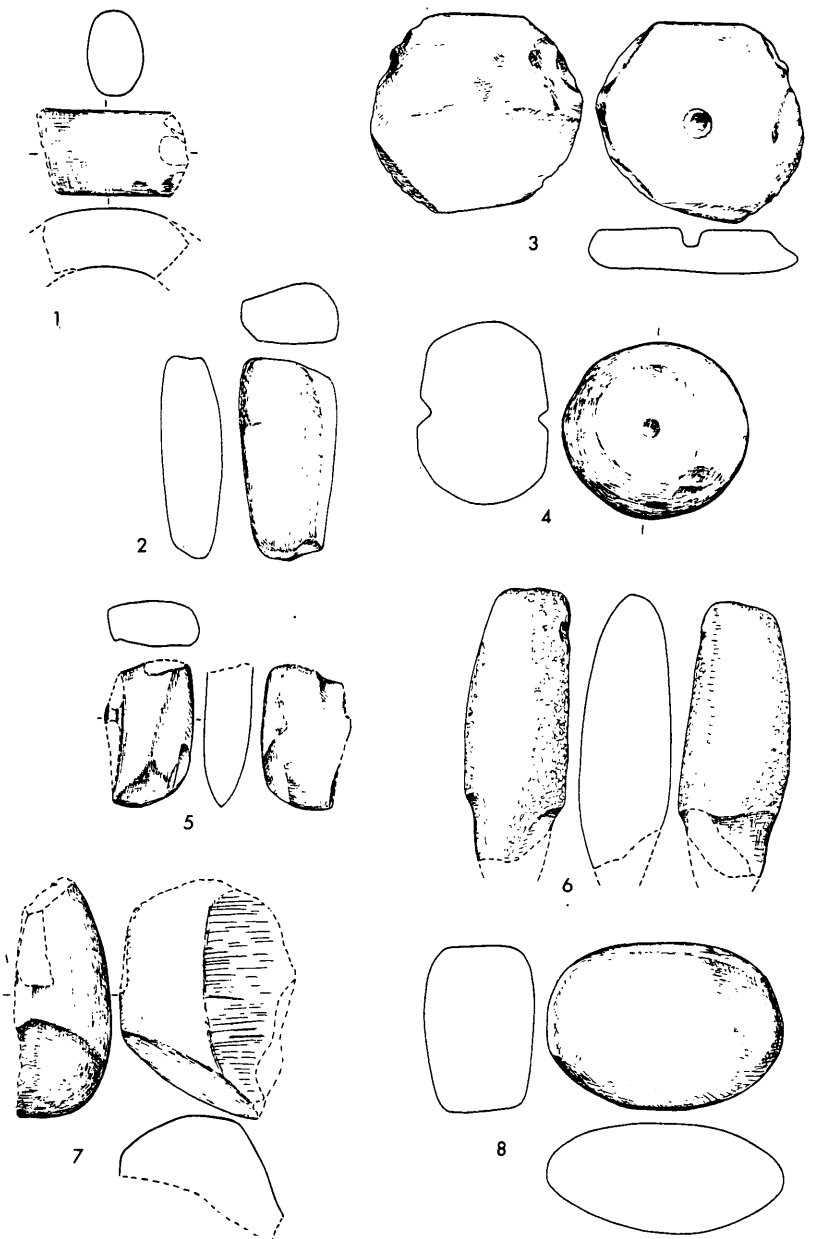


Fig. 3.15 Miscellaneous objects; scale ca. 1:2

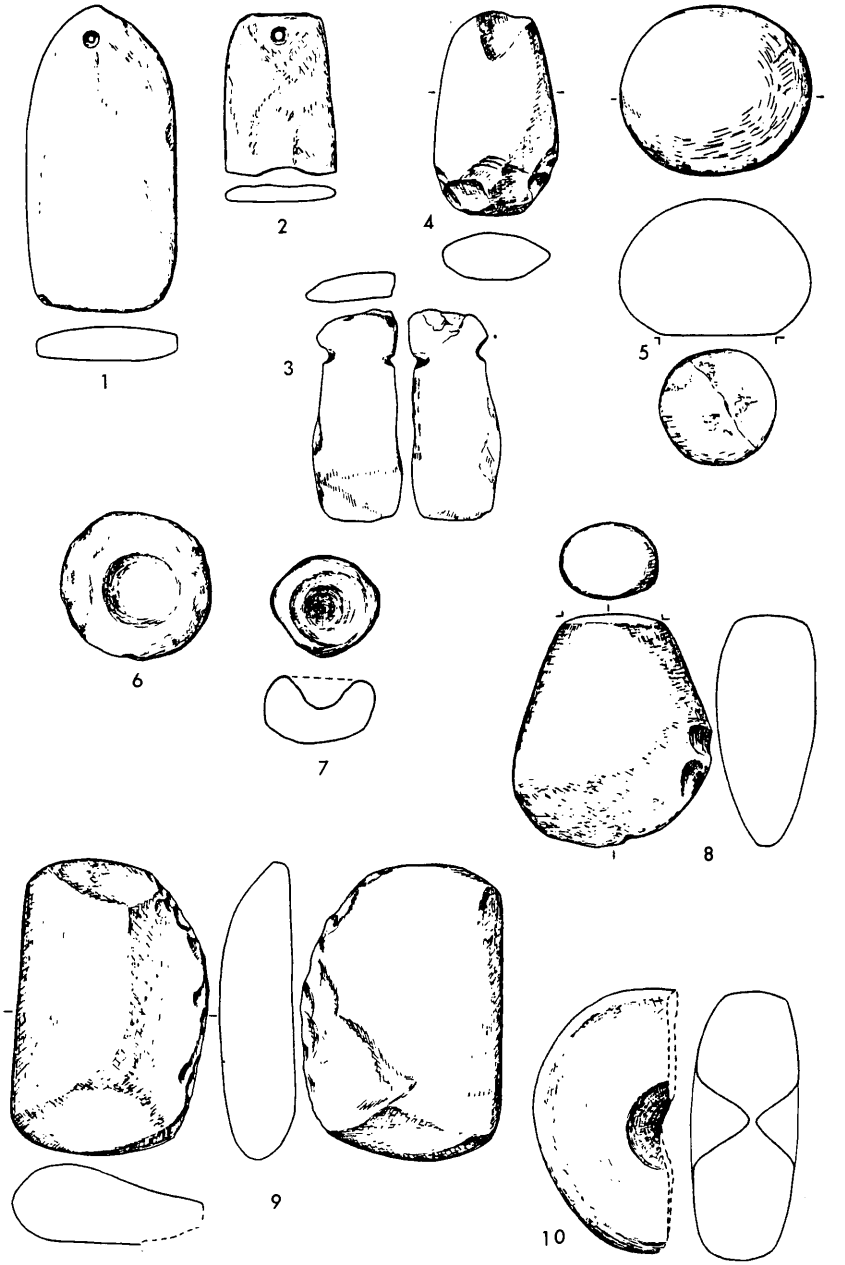
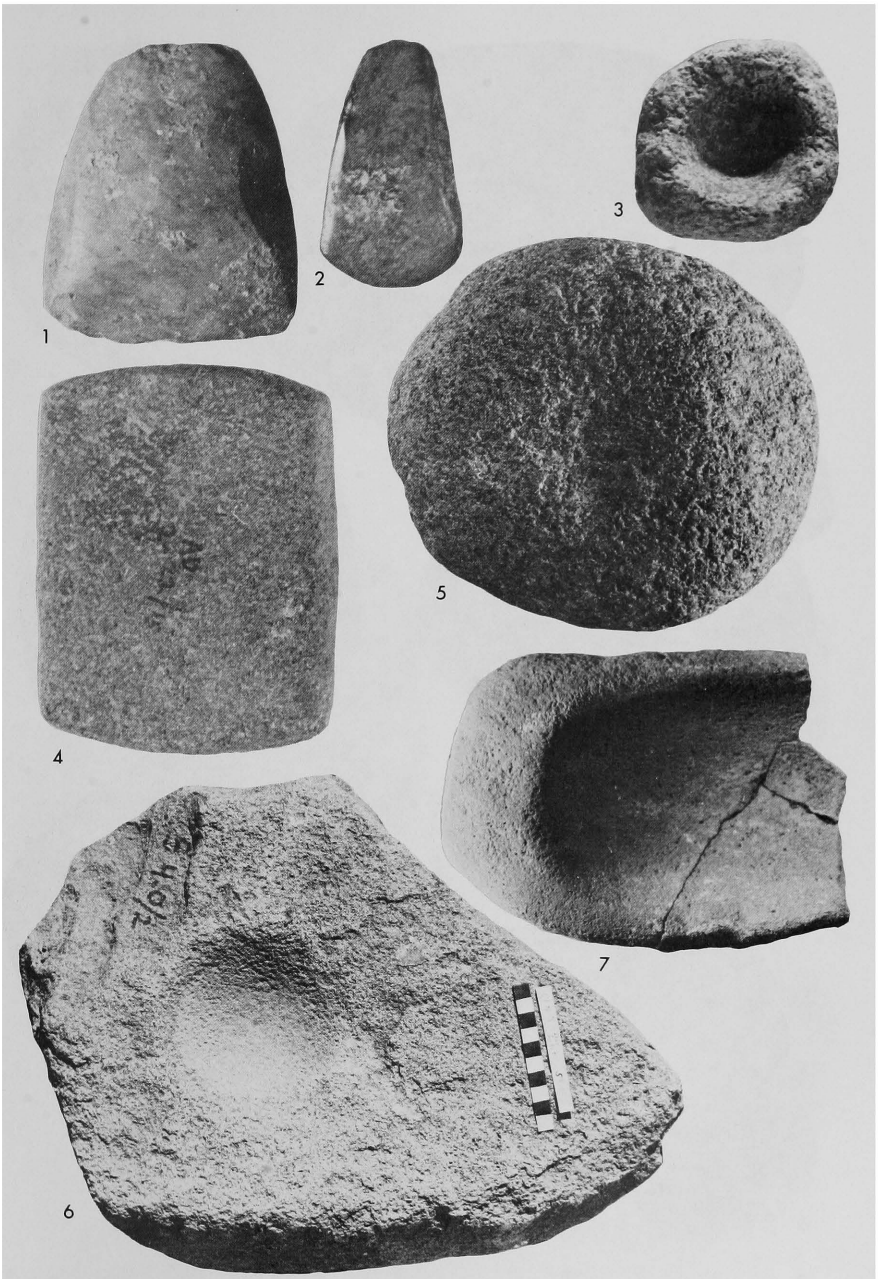
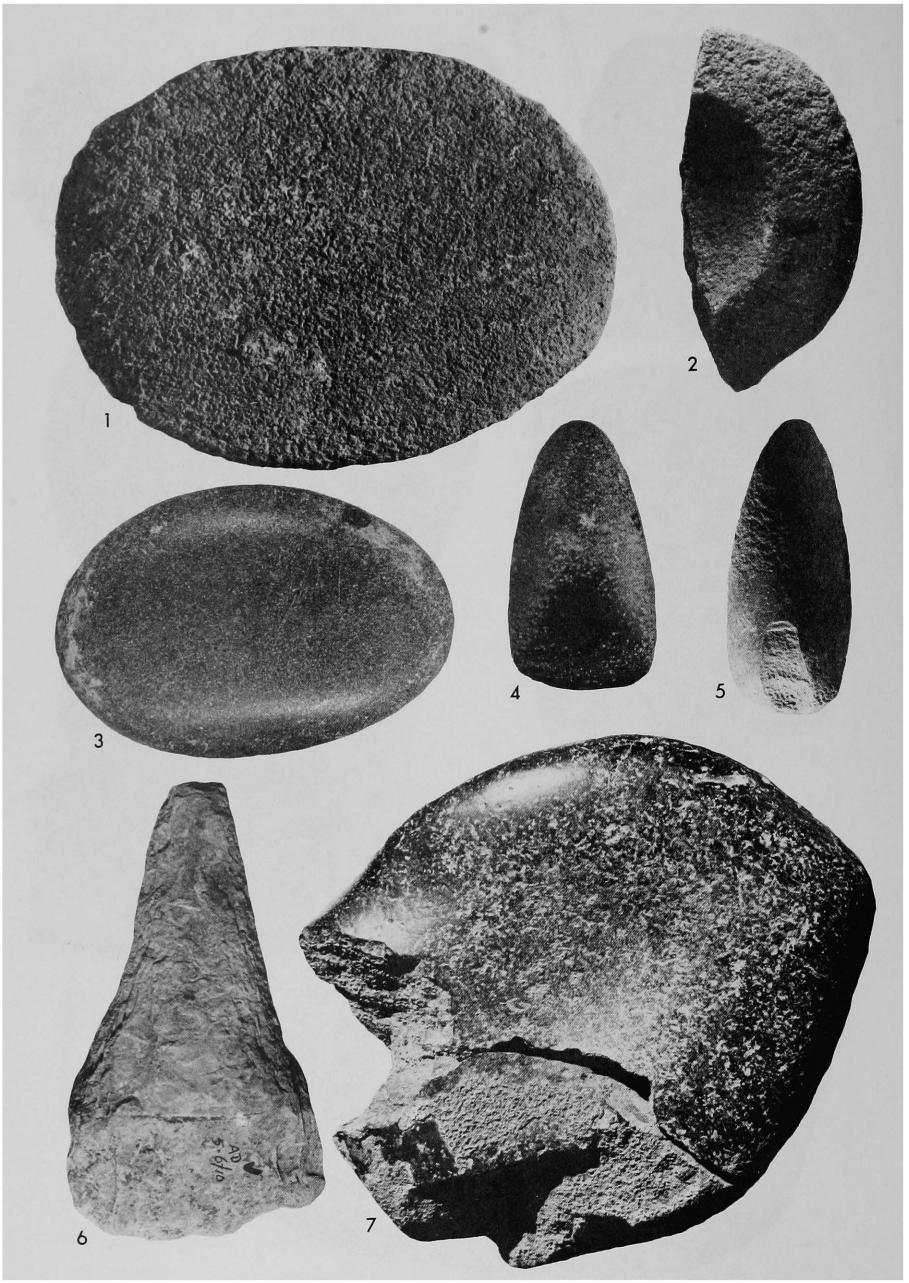


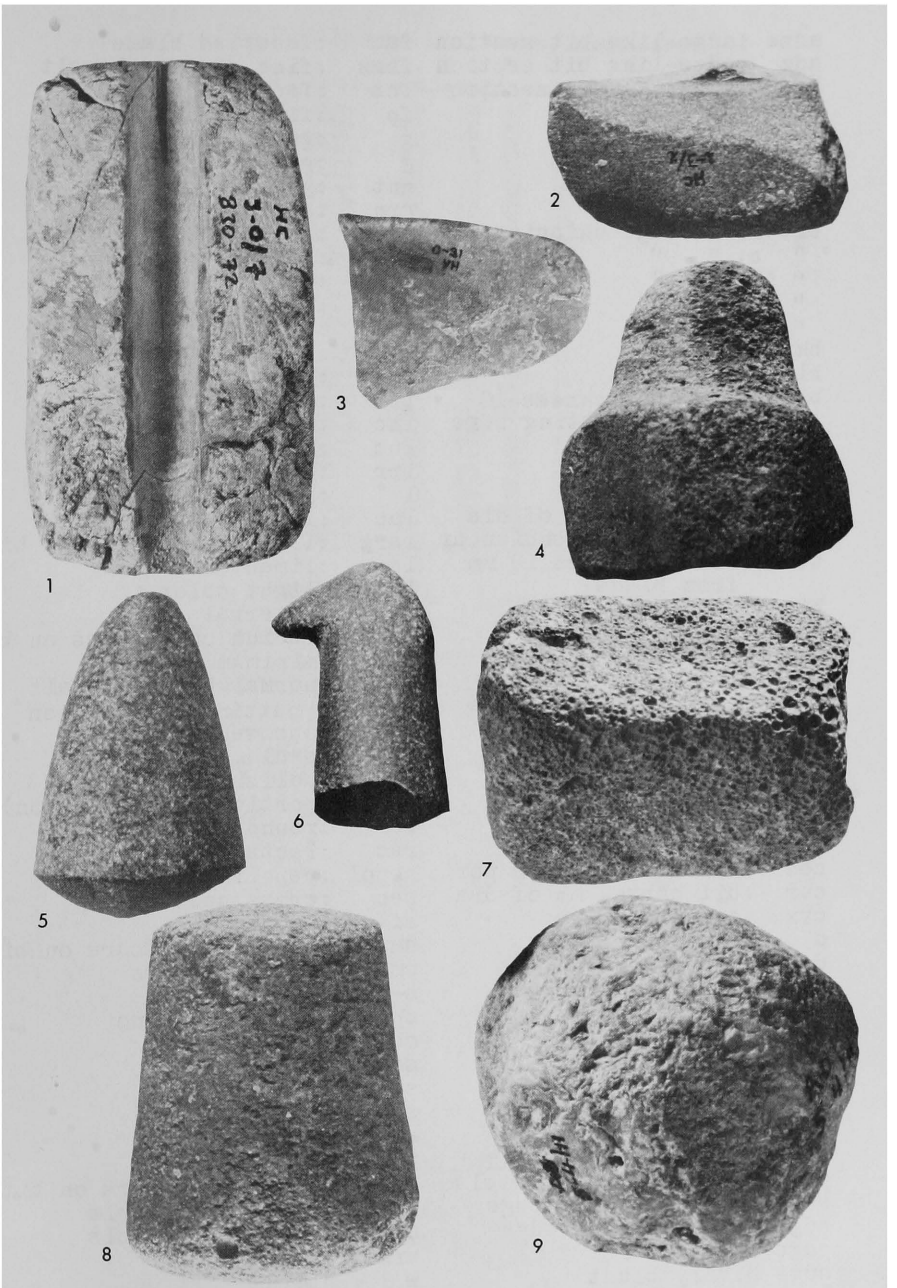
Fig. 3.16 Miscellaneous objects; scales ca. 1:2 (1-5 and 7-10), 1:4 (6)



Pl. 3.I Celts, basin, handstones, door socket and grinding slab; scales ca. 1:1 (1-5), 1:4 (6,7)



Pl. 3.II Handstone, palette, cobble, celts, digging tool and anvil; scale ca. 1:2



Pl. 3.III Grooved stone, celt(?), spatula, domed object, pestles, basalt object and sphere; scales 1:1 (1-3,5-9), 4:5(4)

ABBREVIATIONS USED IN THIS APPENDIX

adze :adze-like bit section
adz :adze-like bit section
axe :axe-like bit section
b :breadth
bas :basalt
bat :battered butt
bicvx:biconvex
bif :bifacial
bit :bif edge chipping,
" a: " " " entire
" b: " " " partial
" c: " " " little
" d: " " " none
bk :backed
bl :blade
blade blade thickness 10
th :mm from cutting edge
bl b :blunt bit
blk :black
brn :brown
bt c :bit curve,mm of dia
bt p :bit off perpendicular
bt t :bit thickness 10 mm
from blade
bt w :bit width
bu b :butt end broken
buf :buff color
but :butt
c :cell plan sub-phase
Ç :Çayönü
cal :calcined (fire)
cbas :coarse basalt
chp :chipped
conv :concave
col :color
con :condition - w or por
cur :bit curve, mm of dia
cvx :convex
d :diameter
de :double-ended
debl :debilitating chip
scars on bit
dep :depth
dia :diameter
diam :diameter
dp :depth
dr :dark color
e :earliest available -
ea : " " levels
edge a:narrow sharp edge
edge b:thick sharp edge
edge c:blunt
edge d:very blunt
est :estimated
f :fragmentary
fa 1 :por polished - 1 face
fa 2 : " " 2 faces
fac :facetted blade
fbas :fine grained basalt
fct :facetted surface
fp :finger purchase
g :grill plan sub-phase
g :grams
gnt :granite
grn :green
grns :greenstone
grv :groove
gry :grey
haf :hafting indications
ham :hammered
hv :heavy
ign :igneous rock
ill :illustration
inc :incomplete
inc :incised design
irr :irregular
l :length
lac :long axis contour
larg :large chip scars on bit
ls :limestone
lt :light color
mat :material
med :medium chip scars on bit
min :minimum
norbas:normal Çayönü basalt
nut :"nutting" depression
opg :opposed groove
ov :oval
pol :polish in groove
por :portion (also see con)
rd :round
rec :rectangular
repol :repolished
sec :cross section
sf :surface
sm :small chip scars on bit
smogrv:smooth groove
s-p :sub-phase
spc :specular stone
ss :sandstone
ste :steatite
str :striations
str :straight
surf :surface
th :thickness-mid
ty :tiny chip scars on bit
u :uppermost levels
um :uppermost levels
vrsm :very smooth
w :whole
wht :white
wt :weight
yel :yellow
// :collecting unit

1 PESTLES type 1 Large, simple form

con	artifact	s-p	mat	wt	l	b	th	ill	haf	fct	working end: chp	de
w	AD3-10/5	c	norbas	630	120	67	54				x	
w	AD3-10/6	c	fbas	950	145	63	53				x	
w	AD3-10/7	c	norbas	1520	185	63	54					
w	AD5-2/18	c	fbas	1180	130	64	63				x	
w	AD5-2/21	c	norbas	790	115	62	59					
w	AD5-3/12	c	norbas	1608	210	60	54				x	
w	AD5-4/1	c	norbas	892	135	60	60				x	
w	AD5-5/1	c	cbas	802	137	70	70	3:4				
w	AD5-6/3	c	norbas	542	110	65	53				x	
f	AD5-6/11	c	norbas	2135	210+							
w	AD5-6/9	c	cbas	635	113	57	57					
w	AD5-20/1	c	fbas	1045	153	53	50					
w	Gsf105		fbas	530	110	60	55				x	
w	HB1-6/1	c	norbas	630	117	52	42					
w	HB3-10/4	c	cbas	620	160	69	62					
w	R 2-10	c	norbas	1195	170	72	62					
3/4	S 0-10/1	c	fbas	1700	165+	54	48					
w	SK5-10/2	g	fbas	1730	225	70	54				x	
w	U3-14	u	fbas	1250	160	46	46				x	
w	U4-11	u	norbas	950	147	68	55				x	
w	U4-22	u	norbas	2540	255	70	67	4:1			x	
w	U4-25	u	cbas	1140	155	85	56				x	
w	U4-30	u	fbas	1075	155	58	55					
w	U6-0	-	norbas	895	155	65	43				x	
w	U9-1/47	c	norbas	1540	175	61	55					
w	U9-2/22	c	fbas	1270	160	57	52	3:7				
f	U9-6/24	c	norbas	510	130	55	32+				x	
w	19M2-8/54	c	norbas	1200	135	68	60					
w	19M2-9/45	c	-		170	65	55		x			
7/8	19M2-9/45	c	fbas	930	140	80	62				x	
w	19M2-13/22	c	norbas	770	110	66	61					
9/10	20L2-12/14	c	fbas	900	140	63	56				x	
w	20L-12/30	c	norbas		170	69	65		x		x	
w	20M2-9/38	c	norbas	1050	180	64	40				x	

1 PESTLES type 2 Large, bulbous form

w	AD5-6/8	c	norbas	712	93	87	74	2:1				
f	HC4-5/17	c	norbas	1800	145	100	77				x	
w	R9-4/2		norbas	850	122	82	63					
w	R9-4		norbas	730	115	74	71	2:5			x	
w	R9-6		norbas	1700	185	70	61	2:4				
2/3	S3-1/2	c	norbas	1840	140+	103	90	2:2	x		x	
w	U2-5	u	norbas	1220	148	86	66	2:3			x	

1 PESTLES type 3 Small, stubby shaft

w	AD1-30	c	norbas	455	94	60	52	3:8		x	
w	AD4-1/2	c	norbas	495	75	50	50			x	x
w	AD5-7/2	c	norbas	195	52	46	44				x
w	HA26-2		norbas	345	74	58	45				x
w	HB3-4/3	c	norbas	280	60	47	47				x
w	HC3-0/19	c	fbas	180	56	43	43				x
w	HC4-5/17	c	norbas	315	80	51	37				x
w	HC4-7/9	c	norbas	285	86	51	51	3:6;III:8		x	x
w	K10-11/2		norbas	320	86	53	48			x	x
f	KW5-7/1	g	norbas	350	85	53+	48			x	x
w	U2-55	u	norbas	355	97	55	51			x	
w	U4-21	u	norbas	505	90	50	50				x
w	X3-4		norbas	285	59	46	41				x

1 PESTLES type 4 Large, bulbous form, "eared" handle

5/6	29N5-9/18	g	1550	150	100	75	4:6	

1 PESTLES type 5 Celt fragments - polished ends

w	AD5-2/11	c	240	63	62	36				x	
w	B5-0/1	g	88	59	37	28	3:2;II:5	x			
w	G4-0/2		180	54	50	36	3:1	x			x
w	K16/2		200	70	52	33			x		
w	HC2-8/5	c	180	72	42	32			x	x	x
w	HC4-5/17	c	350	108	62	40			x		
w	HC4-5/17	c	215	63	73	39		x			
w	G sf78		85	51	43	30					
1/2	G sf		270	40+	63	48					

1 PESTLES type 6 Celt fragments - battered ends

con	artifact	s-p	mat	wt	l	b	th	ill	haf	working end: fct.	chp	de
f	AD4-10	c		110	68	20+	22				x	
w	AD5-8/6	c		285	77	43	27					
w	AD5-30/2	c		125	78	40	16				x	
w	D2-1			255	69	57	40	3:3				
w	E5-0	g		355	91	61	36				x(hoe?)	
w	G3-7	c		285	76	58	33				x	x
w	HC 0-0/4-0	c		245	97	52	27				x	
w	HC3-10/1	c		135	62	53	29					x
w	HC4-13/1	c		125	59	42	29					x
w	K5 sf-1	u		165	65	39	29					
w	KE6-0	e		-	95	60	37					
f	R4-5	c		280	77	50+	88					
w	R15-0	g		165	78	51	28					
f	T4-4	u		225	95	55+	29					
w	Z-15	g		215	95	46	16				x	
w	20L2-12/30	c		400	90	69	41					
w	29M sf/1	u		110	70	37	22				x	
w	29M5-43/12	g		115	75	33	26				x	
w	29N5-15-17				90	56	40				x	

1 PESTLES type 7 Small oval-sectioned shaft

1/3	S5-1/1	c		95	61+	36+	32+	4:4	

1 PESTLES type 8 Small polished cylinder with barb

1/2(?)	19N2-9/13	c		30	41+	21	19	4:2;III:6	

1 PESTLES type 9 Small, elongated form

w	AD5-5/10	c	gnt(?)	218	104	25	23	3:5	x
w	HB2-1	c	fbas	80	74	24	22		x
	K11-3		gnt(?)	55	32+	30	29		

1 PESTLES type 10 Medium, polished, tapered cylinder

2/3	20L2-12/30	c		360	94+	46	45	4:3

1 PESTLES type 11 Large, pestle-like cobble

3/4	20L2-12/30	c		1780	20+	78	64

1 PESTLE FRAGMENTS type 1

por	artifact	s-p	wt	por	artifact	s-p	wt	por	artifact	s-p	wt
but	AD0-0/0	c	160	but	KE3-0	c	210	but	X20-3		85
but	AD5-15/2	c	340	mid	KE5-0	g	80	mid	Z2-0		370
but	B5-0	g	280	mid	KW6-0	g	340	but	19M2-8/55	c	610
but	B5-0	g	340	but	P2-18	u	220	bit	19M2-9 8//	c	120
bit	E5-0	g		but	P4-0	c	210	mid	19M3 2//	c	120
but	HC1-15	c	80	but	QC5-3	g	230	but	19N3-9 8//	c	230
mid	HC3-4/4	c	840	but	R5-8	c	410	mid	20L1 3//	c	260
but	HG2-15		190	bit	R20-7	e	160	mid	27N2 3//	c	210
bit	HG4-0		180	mid	SB1-1		630	but	27N3 4//	c	190
but	HG9-0		290	mid	U1-1	u	570	but	2703 10//		90
but	K2 1-2		250	but	U21-5/2	g	540	mid	29M1 6//	c	230
mid	K 8T	g	130	mid	U22-5/5	g	410	but	29N5-15/14		850
mid	K9 4-5	g	650	mid	X10-5		210				

1 PESTLE FRAGMENTS type 2

mid	AD3-30	c	130	mid	F4-0		380	mid	HB4-0	c	170
bit	B3-0	c		mid	G10-0	g	90	mid	QC5-3	g	280
bit	E5-	g	330	but	HB3-9/15	c	260	mid	SK3-2/3	c	85

1 PESTLE FRAGMENTS type 3

but	AD-21/2	c	230	but	HB1-0	c	170	bit	X12-6	90

1 PESTLE FRAGMENTS type 6

bit	AD4-35	c	130	bit	HB4-5/2	c	55	bit	K9T	g	95
but	S 3-0	c	95								

2 MORTAR

con	artifact	s-p	mat	wt	l	b	th
w	SA9-9/1	u	ls	20000	450	400	180

3 PALETTES

con	artifact	s-p	mat	wt	l	th	ill	basin d	basin dep	shape
f	G8-1	g	bas	460	110	55	10:3	87	32	rd
f	HB3-2/7	c	bas	380	132	32	10:2 II:2	74	13	rd
w	HC3-0/12	c	ls	2350	155	33		88	15	rec
f	HG2-16		gnt	125	85+	28		62	08	rd
f	R13-2	g	ls	300	70+	50		60±	26	rd ?
f	U4-28	u	bas	450	117+	70		60±	15	rd

4 LIMESTONE CONTAINERS

con	artifact	s-p	wt	inc l	inc b	th	ill	basin est diam	basin est depth	min wall th	shape
f	C2-2	g		100	60			210			rd
1/5	E6-0	g	3560	260	200	160		400	108	58	rd
f	HD4-0/6	c	5650	180	170	110		220	80	80	rd
f	KE6-7	e	590	140	70			420		70	rd
f	KE6-7	e	2740	180	150	77			10	46	
f	KE6-7	e	980	160	100					73	not rd
f	KE6-7	e	2450	180	150	65					
f	KW5-XVI	g	5600	220	130	155			80	75	rec?
1/4	R19-0	e	1330	150	130	80	10:9	160	58	23	rd
f	SK5-10/3	g	13000	220	130	200			110		rec?
1/5	U19-5/2	g	5950	240	80	145	10:8	360	101	40	rd
1/4	28M4/9		5700	220	130	250		320	190	26	rd

5 HANDSTONES type 1 Large, turtle-shaped

con	artif	s-p	mat	wt	l	b	th	ill
w	AD3-0/3	c	bas	3400	175	150	85	6:3
w	AD5-1/12	c	bas	1168	160	105	41	
w	D3-0	g	bas	1820	210	155	40	6:1;II:1
3/4	D3-0	g	bas	2100	190	150	60	
w	DE baulk	g	bas	3100	205	160	68	
w	EF8-3	g	bas	1530	185	120	50	
w	EF8-3	g	bas	3000	225	145	62	
w	HC3-3/2	c	bas	2240	160	137	55	6:2
w	K2sf		bas	1165	141	131	38	

con	artifact	s-p	mat	wt	l	b	th	ill	face
w	KE5grill	g	bas	1700	180	136	50		
w	KE5grill	g	bas	2180	160	150	55		
f	KW5-7/3	g	bas	690	111	101	42		
w	U4-22	u	bas	2200	190	130	60		
w	U4-45	u	bas	3250	220	180	60		
w	U4-46	u	bas	4000	190	150	80		
w	U4-22	u	bas	2500	190	140	55		
w	U5-48	u	bas	600	115	100	43		
w	U10-0/1	c	bas	3430	240	150	50		

5 HANDSTONES type 2 Large, high-vaulted

con	artifact	s-p	mat	wt	l	b	th	ill	face
w	U4-2	u	bas	2100	140	100	100	6:5	
w	U5-56	u	bas	5000	220	110	120	6:4;7:4	

5 HANDSTONES type 3 Large, low, elongated

con	artifact	s-p	mat	wt	l	b	th	ill	face
4/5	EF8-3	u	bas	1250	150+	102	43		
w	U4-55	u	bas	1270	186	99	34	6:6;7:5	
4/5	U9-7/3	c	bas	890	120	86	45		

5 HANDSTONES type 4 Large, broad, rectangular

con	artifact	s-p	mat	wt	l	b	th	face	ill	face
w	K2,1-2	c	bas	2280	190	122	52			
w	K2,1-2	c		940	127	97	40			
w	HB3-4/7	c	bas	4750	275	190	47	J4:2	nut	
3/4	P6-8	c	bas	4400	230	165	85			
w	U9-7/1	c	ss	2450	245	155	59	7:7		
w	20L2-7/31	c	bas	1350	120	123	43			
7/8	20L2-8/33	c	bas	980	140	116	31			
w	20L2-11/37	c	bas	3800	210	180	60			
	20L2-11/66	c	ls	2420	160	134	67			nut

5 HANDSTONES type 5 Medium sized, thick

con	artifact	s-p	mat	wt	l	b	th	ill	face
3/4	AD2-31/4	c	bas	550	102	75	45		
3/4	F1-8	c	bas	655	120	91	46		
w	T4-6	u	gnt	640	93	77	44		vrsm
w	U2-10	u	bas	645	100	75	44		
w	U4-46	u	bas	1450	146	98	61		
w	U4-54	u	bas	960	115	92	46		
w	U4-54	u	bas	625	108	74	39	6:8	
w	U4-55	u	gnt	1720	136	109	61	6:7	vrsm
w	U5-55	u	fbas	1610	116	87	55		vrsm

5 HANDSTONES type 6 Medium, broad, rounded

con	artifact	s-p	mat	wt	l	b	th	ill	ends-sides
4/5	AD3-20/8	c	bas	1150	151	136+	36		ham
w	?sf?2		bas	570	101	98	35		
w	?sf?8		bas	830	125	113	35		ham
w	HB3-4/2	c	bas	1180	130	130	37		
w	HC3-3/1	c	bas	1430	154	154	36	6:9	ham
w	K2 sf		bas	1170	140	128	38		
w	KE6-2/3	e	bas	1110	127	113	43	6:10	
3/4	SO-10	c	bas	1120	150	110+	41		hm
4/5	U5-50	u	bas	580	98	97+	38		hm
w	28M6-/10		bas	1350	150	145	36		hm

5 HANDSTONES type 7 Medium, high domed

w	SK6-10/3	e	bas	1050	109	101	62	6:11;7:2	4/5	U2-0	"	bas	660	100	86+	51	

5 HANDSTONES type 8 Medium, low domed

w	KW5-7/3	g	bas	690	111	102	42		w	23-1	c	bas	410	94	91	31	5:1
w	R2-10/3	c	bas	570	102	84	39		9/10	20M2-11/50	c	ign	510	103	96	32	nut
w	U5-48	u	bas	600	111	98	39	6:12	w	29N5-15/13		bas	695	113	106	39	

5 HANDSTONES type 9 Medium, low vaulted

con	artifact	s-p	mat	wt	l	b	th	ill	face	ends-sides
w	AD2-22/12	c	bas	590	126	92	34			
w	AD3-0	c	bas	620	132	85	32		nut	ham
w	AD3-20/5	c	bas	940	138	101	40	6:13	smogrv	
w	AD5-1/12	c	bas	1150	156	105	39		nut	ham
w	AD5-2/16	c	bas	490	114	79	31		nut	
w	AD5-2/24	c	bas	480	100	66	35		vrsm nut	
4/5	AD5-2/26	c	bas	545	110	69+	41		nut	
4/5	AD5-2/42	c	bas	570	129	72+	36		nut	
w	EF8-1	g	bas	750	110	95	51			fp
w	HC2-9/4	c	bas	980	141	108	42		nut	
w	SK6-10/2	e	bas	620	115	80	49			
w	U18-1/2	g	bas	500	111	67	43			
w	19M2-23/23	c	bas	1015	147	83	47			fp
w	20L2-11/36	c	bas	790	119	88	40		vrsm	
9/10	20L2-11/45	c	bas	800	122	78	46			
w	29M5-43/13	g	bas	460	106	62	42			ham
9/10	29N5/19		bas	890	120	96	42		vrsm	

5 HANDSTONES type 10 Medium-sized, matching faces

w	AD3-20/4	c	bas	830	129	106	32		nut	ham	
3/4	AD5-2/2	c	bas	430	112	75	30		nut		
w	AD5-2/14	c	bas	690	135	92	29		nut	ham	
w	AD5-2/20	c	bas	420	119	85	26			ham	
5/6	AD5-7/11	c	bas	600	101	95	35				
w	G3-0	c	bas	518	118	80	28		nut		
w	HB2-2/2	c	ss	640	109	93	37		nut	ham	
w	HB3-4/8	c	bas	595	130	84	31	5:2		ham	cleaver-like
w	HC4-5/8	c	bas	930	151	104	33	6:14		fp	
w	U6-1		gnt	1050	133	97	39			ham	
w	U9-5/7	c	bas	450	90	79	32				
w	U9-6/5	c	bas	550	123	89	31				
9/10	21N1/4	c	bas	750	135	89	35		nut	ham	

5 HANDSTONES type 11 Small, semirectangular

con	artifact	s-p	mat	wt	l	b	th	ill	face	ends-sides
w	AD2-22/8	c	bas	330	97	58	32			fp
w	AD2-22/9	c	bas	390	94	66	36			ham
w	AD2-22/14	c	bas	340	82	60	35			ham
w	AD2-22/15	c	bas	250	70	53	33	5:3;I:4		
w	AD2-22/16	c	bas	265	91	57	26		nut	ham
w	AD2-22/27	c	bas	335	84	52	35		nut	fp
w	AD3-0	c	gnt	260	82	54	27		vrsm.	ham
w	AD5-1/2	c	gnt	250	87	64	22		vrsm	ham
w	AD5-2/4	c	bas	500	109	75	34		nut	fp
w	AD5-2/15	c	bas	390	104	63	30	5:4	nut	ham
w	AD5-2/17	c	bas	330	86	60	29	5:6	nut	ham
w	AD5-2/19	c	gnt	460	82	70	46			
w	AD5-2/23	c	bas	380	94	63	35			
w	HA2-9/12	c	bas	320	84	66	31		vrsm	ham
w	HB3-4/10	c	bas	320	95	57	30		vrsm	nut ham.fp
w	HC2-11/3	c	bas	400	101	79	30			grv
w	HC3-0/27	c	bas	260	83	56	24	5:5		ham
w	HC4-0/2	c	bas	390	102	77	27			ham
w	K2,1-2	c	bas	230	62	52	37		nut	
w	R12-1	g	gnt	470	83	73	40		nut	ham
w	S1-10	c	bas	190	69	50	30			
w	U9-1/42	c	bas	210	71	60	26			
w	U9-1/32	c	bas	300	78	60	35		nut	
w	U9-2/23	c	bas	320	85	64	31		nut	
w	Z2-0		bas	460	92	65	40		nut	fp
w	19M2-23/26	c	bas	520	100	83	35		nut	ham
3/4	20M2-9/40	c	gnt	310	80+	77	29			ham
w	20M2-14/53	c	bas	340	96	69	30			ham
w	20M2-16/63	c	bas	290	91	72	27			
4/5	29M-1/2		ign	280	85	68	28		vrsm	ham
w	29N5-15/16		bas	535	110	85	35		nut	ham

5 HANDSTONES type 12 Palm-sized, round

con	artifact	s-p	mat	wt	l	b	th	ill	face	con	artifact	s-p	mat	wt	l	b	th	ill	face
w	HC4-6/10	c	bas	610	91	91	42	5:7	nut	w	HC4-7/11	c	bas	380	80	72	38	I:5	nut

5 HANDSTONES type 13 Small, thick, ovoid

con	artifact	s-p	mat	wt	l	b	th	ill	face	con	artifact	s-p	mat	wt	l	b	th	ill	face
w	U3-9	u	bas	800	114	90	48	11:8	HNt	w	29M5-43/11	g	bas	465	87	72	42		HNt

5 HANDSTONES type 14 Small, square or round

con	artifact	s-p	mat	wt	l	b	th	ill	face	con	artifact	s-p	mat	wt	l	b	th	ill	face
w	AD2-32/11	c	f bas	230	66	60	34		nut	w	P2-1	u	f bas	250	65	64	39		nut
w	AD5-2/25	c	bas	270	60	56	42		nut	w	P2-18	u	bas	300	69	64	42	5:8	
w	EF9-6	g	bas	250	64	62	43												

5 HANDSTONES type 15 Small, cuboid or drum-shaped

con	artifact	s-p	mat	wt	l	b	th	ill	con	artifact	s-p	mat	wt	l	b	th
w	BO-sf		bas	120	44	42	35		w	G7-0	g	bas	105	48	43	33
w	D3-0	g	bas	200	54	50	45	5:9	w	R16-3	g	bas	150	48	45	38
w	D3-0	g	bas	190	55	48	44		w	KW3-0/4	c	bas	70	35	33	32
w	D2-1	g	bas	150	52	49	44		w	270 6//		bas	175	53	52	41
w	G3-0	c	bas	160	49	45	42		w	28M5/11	g	bas	190	54	50	49

5 HANDSTONES type 16 Miniature, high vaulted

con	artifact	s-p	mat	wt	l	b	th
w	K2sf	u	bas	380	88	46	39

por	artifact	s-p	wt	l	b	th
1/10	AD0-0/10	c	90	80	31	26
1/20	AD1-0	c	80	38	43	48
1/16	AD1-0	c	172	70	55	47
1/20	AD1-6	c	168	46	53	51
1/20	AD1-20	c	70	43	32	41
1/20	AD2-0	c	90	54	36	44
1/7	AD2-32	c	270	80	37	63
1/7	AD2-32	c	195	45	57	45
1/8	AD2-32	c	160	68	32	50
1/5	AD2-33	c	340	65	45	75
1/8	AD2-33	c	170	60	48	52
1/8	AD3-27	c	280	60	53	50
	AD3-30	c	180	70	38	65
1/8	AD3-10	c	420	78	73	45
1/16	AD4-10	c	139	48	68	33
1/16	AD4-10	c	230	67	67	37
1/6	AD-Baulk		320	85	60	44
1/6	AD-Baulk		235	105	39	65
1/10	AD-Baulk		160	74	40	42
	B3-1	c	210	95	65	36
1/4	B3-1	c	390	100	85	35
1/8	B4-0		140	40	30	55
1/6	B4-0		160	53	31	70
1/6	B4-0		270	90	32	45
1/15	B5-0	g	45	50	31	23
1/8	B5-0	g	150	50	43	40
1/6	B5-0	g	160	60	36	45
1/6	BN-1		370	90	42	90
1/10	BN-1		125	40	35	48
1/8	BN-1		160	40	37	85
1/9	BN-2		105	51	51	47
1/9	BN-2		120	50	30	54
	C2-1	g	100	60	45	53
1/4	D2-0	g	610	105	85	53
	E2-0	c	130	70	60	41
1/8	E3-0	c	100	53	30	55
1/8	E5-0	g	140	50	32	40
1/6	E5-0	g	310	83	41	65
1/5	E6-0	g	310	80	34	62
1/8	E6-0	g	160	43	43	43
1/6	E6-0	g	150	50	45	42
1/6	E6-0	g	120	50	40	
1/2	EF9-0	g	860	120	145	32
1/10	F6-0	g	80	50	38	29
1/5	G2-0	c	120	50	120	32
1/12	G2-0	c	70	28	34	60
1/8	G3-0	c	125	62	27	55
1/4	G3-0	c	330	65	60	38
1/6	G4-0	c	235	90	70	39
	G5-0	g	250	95	55	46
1/8	G7-0	g	175	55	40	35
1/12	G7-0	g	65	30	45	25
1/12	G7-0	g	50	40	30	25
1/8	G8-0		90	45	33	35
1/3	G8-0		70	35	30	50
1/10	G8-0		85	60	35	30
1/12	G8-0		50	30	30	35
1/6	G8-0		200	85	70	50
1/6	G8-0		215	80	60	41
1/3	G8-0		870	85	80	74
1/8	G8-0		175	85	33	55
1/15	G10-0		70	50	35	20
1/6	G11-0		160	70	36	60
1/10	HA4-8	c	128	60	79	47
1/8	HA5-0	c	256	72	58	50
1/4	HA5-1	c	765	102	108	57
1/20	HA26-2		104	45	32	68
1/7	HBO-0		155	70	45	41
1/8	HB2-2	c	115	33	33	80
1/8	HB3-2	c	125	55	52	55
1/8	HB3-2	c	120	85	31	55
1/7	HB3-2	c	180	73	37	47
1/6	HB3-2	c	275	55	45	47
1/5	HB3-2	c	300	88	43	63
1/10	HB3-2	c	100	50	37	45
1/12	HB3-2	c	85	35	45	30
1/12	HB3-2	c	110	55	43	32
1/12	HB3-2	c	40	65	30	15
	HB3-7	c	200	48	48	70
1/6	HB3-9	c	230	50		70
1/8	HB4-2	c	205	83	40	55
1/8	HB4-2	c	140	41	35	74
1/8	HB4-5/2	c	125	90	35	35
1/12	HB4-5/2	c	70	90	29	20
1/6	HCO-0/4-0	c	130	60	40	41
1/5	HCO-0/4-0	c	175	72	44	43
1/6	HCO-0/4-0	c	165	75	55	58
1/3	HCO-0/4-0	c	400	85	75	45
1/4	HCO-0/4-0	c	465	115	60	51
1/10	HC1-0	c	225	82	60	51
1/8	HC1-8	c	167	130	43	38
1/10	HC1-14	c	141	60	50	44
1/20	HC2-1	c	103	56	36	37
1/20	HC2-4	c	78	60	30	37
1/20	HC2-12	c	108	56	33	39
1/16	HC2-12	c	262	77	63	53
1/5	HC3-0	c	500	89	44	66
1/10	HC3-0	c	115	40	43	45
1/6	HC3-0	c	320	80	42	60
1/12	HC4-5	c	40	60	26	20
1/4	HC4-6	c	240	62	67	34
1/5	HC4-6	c	385	80	80	44
1/6	HC4-6	c	320	85	55	55
1/10	HC4-7	c	155	30	44	60
1/6	HC4-7	c	250	78	38	62
1/5	HC4-7	c	270	80	38	53

por	artifact	s-p	wt	l	b	th
1/5	HC4-7	c	520	112	45	70
1/12	HC4-7	c	110		50	
1/12	HC4-7	c	80	27	30	45
1/8	HC4-7	c	190	39	58	90
	HC4-10	c	310	65	40	45
	HC4-10	c	155	50	32	70
1/7	HC4-12	c	210	55	43	58
1/12	HD2-33	c	55	45	37	25
1/10	HD4-0	c	105		50	
	HE5-9	c	350	65	60	57
1/20	HG0-1		57	54	39	28
1/16	HG1-0		115	67	47	48
1/8	HG9-0		335	92	82	41
1/10	HG10-1		195	50	64	41
1/2	HG18-0		236	116	45	40
1/10	HG19-0		179	75	76	36
1/12	HG2-0		555	65	80	68
1/8	HG2-0		299	77	70	63
1/10	HG3-1		193	85	50	34
1/10	HG3-3		235	74	77	36
1/6	K12-2		270	55	38	81
1/5	K12-2		267			48
1/6	K12-2		220	66	48	50
1/9	K2sf		305	75	50	68
1/9	K2sf		150	80	30	45
1/5	K2 1-2		515	100	105	55
1/5	K2 1-2		240	110	45	55
1/12	K2-4		35			
1/12	K2,3sf	u	95	45	41	40
1/7	K3 4-5		180	70	36	55
1/6	K4 4-5		170	70	50	40
1/6	K5sf-1	u	220	70	51	60
1/8	K5sf-1	u	55	55	46	42
1/5	K5sf-1	u	158			49
1/12	K5-4	c	85	33	35	48
1/10	K5 4-5	g	135	46	45	45
1/12	K5 4-5	g	75	55	34	38
1/20	K5 4-5	g	20			10
1/20	K5 4-5	g	15	40	27	24
1/10	K5 4-5	g	130	46	40	50
1/6	K5 4 c		250	80	37	55
1/10	K5 4-5	g	130	65	38	44
1/5	K5-9 4-5	g	267	150		48
1/7	K5-9 4-0	c	235			38
1/4	K6 4-5	g	180	85	45	41
1/8	K6 4-5	g	60	20	40	41
1/5	K6 4-5	g	220	70	60	48
1/5	K6 4-5	g	300	66		60
1/6	K6 4-5	g	190	66	39	53
1/6	K6 4-5	g	160	55	45	50
1/5	K8,9sf-1	u	340	105	57	46
1/2	K8 1-2		1270	120	180	45
1/10	K8 1-2		115	37	40	60
1/12	K8 1-2		70	35	32	36
1/12	K8,9sf-1	u	70	52	35	?
1/10	K8,9sf-1	u	115	70	33	44
1/3	K8,4-5	g	250	74	92	36
1/12	K8,4	c	105	28	60	45
1/12	K8,4	c	85	45	34	36
1/12	K8,4-5	g	115	51	50	?
1/8	K8,9 1-3	c	190	70	35	42
1/3	K9 4-5	g	920	95	120	52
1/6	K9 4-5	g	175	50	65	36
1/6	K9T3-4		375	50	57	60
1/8	K11-3		120	55	43	48
1/12	KE1-0		85	36	30	42
	KE3-0	c	125	45	50	30
1/4	KE5-0	c	109	45	55	32
1/8	KE5-0		365	100	105	32
1/8	KE5-0		130	67	63	38
1/8	KE5-0		85	51	45	30
1/8	KE6-0	e	150	59	60	40
1/8	KE6-0	e	115	65	35	38
1/8	KE6-0	e	84	40	50	44
1/5	KE6-0	e	280	116	74	35
1/3	KE6-7	e	480	120	70	43
1/12	KW3-0	c	40	33	30	34
1/12	KW3-0	c	50	42	25	31
1/8	KR5-0	g	65	40	40	33
1/2	KW5 XVII	g	340	75	81	35
1/6	KW5 XVII	g	180	55	50	46
1/5	KW 6-3/1	g	335	110	60	34
1/4	KW5 XVI	g	280	80	60	33
1/6	LB4-3		310	78	61	46
1/8	LB4-3		210	56	52	55
	P1-18	u	20			
1/8	P2-18	u	140	60	40	55
1/8	P2-18	u	140	55	55	28
1/8	P6-16	c	150	75		57
	P2-18	u	25			
	P2-16	u	305	120	55	50
1/6	QC5sf		195	65	34	37
1/5	QC5sf		470	90	100	
1/10	QC5-1	g	145	50	55	45
1/5	QC5-1	g	225	70	65	38
1/12	QC5-1	g	80			
1/8	QC5-1	g	150	70	48	40
1/10	QC5-1-3	g	120	62	30	54
1/8	QC5 4-3	g	145	48	48	46
1/3	QC5 3-0	g	340	65	93	39
1/3	R0-0		1975	85	150	80
1/10	R5-7	c	150	55	45	36
1/6	R5-8	c	220	62	82	34
1/2	R6-0	c	1410	90	140	78
1/6	R12-1	g	160	70	70	27
	R12-8	g	140			

por	artifact	s-p	wt	l	b	th
1/10	R16-0	e	90	50	42	29
1/10	R16-0	e	130	38	50	40
1/10	R16-0	e	80	40	34	40
1/15	R16-1	e	40	36	30	32
1/8	R16-3	e	145	60	70	35
1/6	R17-0	e	220	65	55	43
1/8	R17-0	e	140	57	35	45
1/8	R17-0	e	220	48	50	57
	R17-0	e	25			
1/15	R17-0	e	70	52	20	30
1/8	R17-0	e	165	55	50	40
1/10	R18-0	e	105	50	63	35
	R18-0	e	120	115	30	38
1/7	R18-0	e	170	115	35	30
1/8	R18-0	e	130	50	36	55
	R18-0	e	35			
	R18-1	e	40	55	30	23
	R18-9	e	110	60	40	30
1/10	R19-0	e	90	50	35	43
1/10	R19-3	e	90	42	40	30
1/8	R20-2	e	115	50	36	40
1/6	R20-2	e	295	70	65	40
1/8	R20-2	e	160	60	50	40
1/8	R20-9	e	165	55	30	48
1/8	R21-0	e	270	65	45	45
1/12	R21-0	e	45	35	20	32
1/10	R22-0	e	105	50	26	36
1/6	R22-0	e	230	40	75	55
1/12	S1-10	c	265	98	57	43
1/10	SA1-2	u	120	70	45	48
1/5	SA1-2	u	500	95	76	50
1/8	SA9-3	u	500	77	72	63
1/5	SA13-9		615	120	90	49
1/16	SA13-9		225	72	62	50
1/5	SB1		40			40
1/10	SB1sf		160	45	60	55
1/2	SB1		670	95	102	50
1/6	SB1-1		400	80	60	55
1/5	SB1-2		390	80	80	49
1/8	SB5-2	u	260	70	70	33
	SB7-0	u	343	60	70	54
1/16	SB 7-10	u	225	62	66	40
1/12	SE8-0		286	83	83	34
1/10	SE8-10		82	46	38	44
1/20	SE8-10		76	46	44	32
1/10	SE16-0	g	230	57	78	35
1/8	SE11-0		211	90	65	44
1/2	SE13-0		1450	116	160	58
1/20	SE15-0	c	138	50	47	56
1/5	SK0-0		480	55	123	42
1/6	SK0-0		240	55	95	40
1/10	SK0-10		420	103	60	43
1/20	SK3-10	c	36			32
1/10	SK4-11	c	304	74	75	48
1/6	SK4-12/1	c	410	97	59	60
1/2	SK4-15/1	c	1090	97	159	58
1/20	SK4-15	c	130	80	37	39
1/8	SK4-15	c	247	83	67	47
1/10	SK4-15	c	182	79	50	41
1/4	T4-2	c	220	60	70	49
1/5	U1-55	u	230	53	55	59
1/6	U7-24		340	60	60	48
1/6	U2-8	u	270	95	55	58
1/5	U2-8	u	250	65	95	46
1/8	U2-8	u	290	75	50	50
1/3	U2-60	u	655	85	140	50
1/2	U3-12	u	1330	110	150	54
1/5	U3-4	u	330	70	85	40
1/3	U3-55	u	990	100	100	64
1/8	U3-55	u	105	45	55	44
1/15	U3-55	u	40	20	51	37
1/9	U3-55	u	75	25	56	39
1/6	U3-55	u	325	70	60	50
1/8	U3-55	u	160	53	90	35
1/8	U3-55	u	260	80	50	48
1/8	U3-55	u	160	60	50	55
1/5	U3-55	u	250	80	60	49
1/2	U3-12	u	3000	200	150	60
1/5	U3-65	u	310	120	55	44
	U4-55	u	25			
1/3	U5-3	u	570	120	70	56
1/6	U5-24	u	170	55	50	45
1/12	U5-48	u	65	48	45	20
1/5	U6-55		385	75	100	44
1/8	U7-1		150	40	45	50
1/8	U7-1		20			
1/8	U9-6		85	50	60	30
1/6	U10-0	c	215	85	60	29
1/20	U13-0	c	94	44	48	34
1/20	U15-0	c	210	53	30	27
1/2	X1-5		935	100	150	40
1/2	X1-9		620	90	100	52
1/10	X3-1		80	45	30	39
1/6	X3-1		180	65	65	41
1/6	X8-5		155	60	80	40
1/10	X9-5		110	50	37	33
1/10	X12-0		243	55	63	50
1/16	X15-6		83	80	55	34
1/8	Z7-2	c	130	57	37	50
1/15	Z8-2	c	40	50	20	31
1/4	Z8-4	c	240	55	65	40
1/10	Z8-6	c	65	33	55	30
1/6	Z9-2		275	60	110	34
1/8	Z10-2		120			
1/8	Z10-2		130	40	50	37
1/12	Z14-1	g	130	50	35	50
1/10	Z15-1	g	85	45	30	38
1/6	Z16-1	g	180	95	60	32

Continued, next page

5 HANDSTONE FRAGMENTS type 1, (cont.)

por	artifact	s-p	wt	l	b	th
1/5	19M1 2//	c	350	80	78	36
1/5	19M2 4//	c	350	70	112	33
1/8	19M3 7//	c	250	45	55	50
1/8	19M3 7//	c	175	45	40	40
1/8	19M3 7//	c	360	75	60	52
1/6	19M3 7//	c	250	65	57	40
1/10	19M3 7//	c	140	50	65	38
1/10	19M3 7//	c	90	35	43	40
1/10	19M3 7//	c	110	50	42	33
1/6	19M4 11//	c	490	120	80	38
1/8	19M4 11//	c	160	75	35	35
1/10	19N3 6//	c	140	60	42	35
1/6	19N3 6//	c	390	110	45	43
1/50	19N3-9 8//	c	20	30	20	25
1/15	20L 50//	c	70	70	20	32
1/8	20L 50//	c	220	70	60	
1/10	20L 50//	c	160	50	35	45
1/10	20L 16//	c	110	60	45	35
1/10	20L 40//	c	150	50	50	
1/10	20Lsf-1 2//	c	170	45	40	48
1/10	20Lsf-1 2//	c	200	35	50	55
1/8	20L1 5//	c	130	50	50	35
1/20	20L2 10//	c	90	35	30	
1/20	20L2 10//	c	60	30	20	50
1/8	20L2 36//	c	150	55	45	45
1/10	20L2-8 39//	c	250	50	55	51
1/10	20L2-10 22//	c	110	30	72	37
1/15	20L2-10 35//	c	80	45	45	30
1/10	20L2-10 35//	c	110	60	40	45
1/10	20L3 8//	c		50	25	45
1/8	20L3-14 31//	c	270	70	60	60
1/8	20L3-14 31//	c	310	50	60	44
1/10	20L3-14 31//	c	160	60	50	36
1/12	20L3 46//	c	230	35	70	47
1/20	20L3 46//	c	60	55	30	35
1/10	20Msf 1//	c	165	80	45	39
1/20	20M2	c	40	30	20	34
1/8	20M2 5//	c	170	40	80	33
1/8	20M2 20//	c	190	75	50	40
1/10	20M2 20//	c	130	50	50	35
1/8	20Nsf-1 1//	c	160	80	42	44
1/6	20Nsf-1 1//	c	530	80	90	47
1/10	20Nsf-1 1//	c	120	50	48	37
1/8	20Nsf-1 2//	c	270	70	65	38
1/6	21Msf 6//	c	370	60	70	52
1/8	21M2-2 8//	c	180	60	60	
1/20	21Nsf 1//	c	80	65	45	
1/8	27N5	g	380	60	70	50
1/4	27N5 6//	g	460	90	99	43
1/20	270sf 1//		50	40	20	35
1/4	270 6//		520	80	120	37
1/100	270-1 3//		5	30	10	
1/8	2703 10//		160	40	30	38
1/8	2703 10//		180	45	70	35
1/8	2703 10//		270	55	70	
1/20	2703 10//		65	50	30	
1/20	29M3 11//		60	40	40	32
1/5	29N 8//		330	82	68	43
1/4	290 0//		40	40	20	
1/8	290-1 1//		180	40	105	40
1/8	290-1 1//		330	80	62	48

5 HANDSTONE FRAGMENTS group A

1/6	AD-0-0/0	c	440	70	35	68
1/20	AD1-0	c	160	50	40	48
1/8	AD1-10	c	230	45	55	58
1/12	AD2-0	c	190	75	30	67
1/6	AD4-0	c	460	75	75	55
1/18	BN-1		120	40	50	40+
1/8	B5-0	g	210	56	40	52
1/20	HB2-3	c	50	40	80	20
1,6	HB3-4	c	180	72	55	53
1/12	HC0-0		250	70	53	40
1/30	HC1-14	c	90	20	80	50
1/8	HC3-9	c	340	70	50	50
1/16	HC4-12	c	120	50	45	53
1/16	HG0-1		110	40	35	58
1/6	K6,4-5	g	470	100	70	70
1/2	KW5-II/1	g	940	120	100	58
1/2	SA2-9/1		675	110	110	46
1/6	SB8-10		480	75	70	60
1/2	U5-24	um	800	90	100	42
1/6	U5-55	um	340	80	70	50
1/8	U6-55		240	63	50	65
1/3	U8-61	c	440	65	80	60
1/2	X1-9		630	80	100	52
1/12	19M2-13	c	200	50	40	50
1/20	19M3 7//	c	60	50	30	38+
1/8	20L 45//	c	160	70	60	30+
1/5	20L-10 14//	c	530	110	90	50+
1/3	20L2-8 39//	c	980	80	120	70
1/8	20L2-10	c	230	45	60	65
1/8	20L3 8//	c	180	60	35	58
1/12	20L3 46//	c	150	50	60	50
1/5	27N5	g	550	85	90	50
1/20	270 6//		100	40	40	40+
1/8	2702 4//		220	60	45	45
1/12	2703 10//		140	45	40	50
1/8	2703 10//		340	60	65	60+
1/6	270-3 10//		400	95	60	65+
1/6	29Nsf 1//		390	90	70	58
1/8	2901 1//		330	60	60	60+

5 HANDSTONE FRAGMENTS group B

1/3	AD1-30	c	430	115	55	30
1/6	AD3-3	c	280	80	55	35
1/2	AD5-7/2	c	470	85	85	30
1/3	B5 0	g	300	60	75	40
1/4	HA8-0	c	340	60	115	36
1/6	HB0-1	c	290	85	70	30
1/6	HB3-2	c	230	80	65	40
1/3	HB3-10/7	c	590	100	125	36
1/3	HB4-2	c	470	90	105	35
1/3	HB4-5-2	c	360	80	105	30
1/4	HC2-4-0	c	270	75	75	38
1/4	HC3-3	c	290	85	108	27
1/6	HC4-15	c	270	95	75	25
1/6	HC4-17	c	200	60	82	25
1/3	HD3-0	c	340	70	105	35
1/3	HD4-0	c	580	75	110	37
1/6	HG1-0	c	240	95	55	42
1/6	KF5-0		230	60	90	33
1/3	KR6-0		465	80	105	35
1/4	R17-0	ea	375	105	70	32
1/4	S3-0	c	340	80	80	28
2/3	SE8-0	um	560	95	105	30
1/6	SE14-0	c	300	100	60	40
1/2	X 1-5		950	110	145	39
1/4	20L 41//	c	440	90	80	32
1/6	20L3 8//	c	320	80	62	40
1/8	21M1-3 3//	c	210	70	61	28

5 HANDSTONE FRAGMENTS group C

1/3	AD1-0/1	c	230	60	80	38
1/8	AD1-0	c	80	40	40	40
1/6	AD1-0	c	230	-	-	44
1/3	AD1-10	c	230	50	65	48
1/6	AD2-20	c	190	40	50	45
1/3	AD3-30	c	190	55	62	35
1/2	AD3-30	c	640	100	100	35
1/6	B5-0	g	160	65	48	38
1/3	E6-0	g	270	60	75	35
1/8	G2-0	c	140	55	45	30
1/12	HA6-2	c	80	45	40	40
1/3	HA15-0	g	225	60	70	35
1/2	HA23-1		470	80	75	45
1/16	HB1-3	c	40	45	30	35
1/3	HB1-5	c	250	50	75	40
1/6	HB2-3	c	120	53	50	32
1/4	HC 0-0		250	60	65	40
1/6	HC1-11	c	170	55	40	42
1/4	HC1-15	c	280	70	70	42
1/4	HC3-0	c	165	60	60	30
1/4	HD3-6	c	230	58	60	34
1/3	HG2-0	c	320	60	80	42
1/4	HG2-0	c	280	50	90	55
1/8	HG13-1		110	55	40	43
1/4	HG14-0		180	50	55	39
1/4	K2-2		250	55	50	50
1/2	K3,1-2		290	55	70	42
1/4	K8-9sf-1	um	240	80	40	46
1/4	K11-3		230	66	85	30
1/4	K11-3		260	60	60	35
1/8	K15-1		90	65	30	38
1/2	KE1-0/2		550	68	77	51
1/6	KE2-0	c	170	70	50	43
1/4	KE3-0	c	180	60	40	38
1/2	KE5 grill	g	660	85	98	53
1/3	KE6-0	ea	280	63	85	44
1/2	KE6-1	ea	350	70	76	42
1/4	KR6-0	ea	280	50	85	34
1/8	KW3-0	c	100	40	30	28
1/6	P2-9	um	190	45	75	43
1/6	QC5-3	g	220	70	60	38
1/2	R7-6	c	290	60	70	38
1/2	R15-0	ea	360	70	75	40
3/4	R17-4	ea	1050	150	80	40
1/6	R19-0	ea	160	40	60	38
1/8	R22-0	ea	100	60	40	40+
1/3	SK3-10	um	320	65	80	45
1/6	SK16-0	c	190	60	55	38
1/8	SK1-15	c	110	35	40	36
1/4	SK3-2	c	240	50	80	30
1/12	U3-55	um	40	60	30	40
1/6	U3-55	um	100	50	40	44
1/3	U7-1		155	35	65	43
1/6	X12-0		130	50	40	31
1/8	X14-6		100	40	45	42
1/4	216-1	g	200	60	48	50
1/3	20M1 3//	c	290	52	82	40
1/12	20M2 16//	c	60	60	35	33
1/3	20Nsf1 1//	c	230	50	70	41
1/6	21Nsf 6//	c	200	65	45	45
1/4	21M1-1 4//	c	260	50	85	48
1/4	270 6//		190	50	65	50
1/6	270 6//		160	25	75	39
1/2	29N1		470	55	75	53

5 HANDSTONE FRAGMENTS group D

por	artifact	s-p	wt	l	b	th
1/3	AD0-0/0	c	180	46	75	40
1/6	AD2-0	c	90	50	40	32
1/2	AD2-21/5	c	330	75	80	30
1/2	AD3-30	c	160	55	65	33
1/3	AD4-35	c	90	35	60	28
1/2	AD4-35	c	200	45	65	35
1/3	AD5-4/2	c	280	65	100	28
2/3	AD5-4/15	c	400	100	85	38
1/2	AD5-5/11	c	250	65	80	28
1/2	B5-4	g	240	80	80	29
1/3	BN4-5		230	70	80	40
1/2	E4-0		330	75	80	30
2/3	E5-0	g	330	100	90	28
1/12	E6-0	g	30	55	15	24
1/2	E6-0	g	190	52	65	36
3/4	EF8-1	g	540	100	105	32
1/2	G2-0	c	310	65	85	28
7/5	G4-0		300	85	90	32
1/2	G6-0	g	360	80	95	30
1/2	G7-0	g	360	75	100	32
1/2	G8-0	g	380	80	95	35
1/2	HA3-8	c	230	60	80	28
1/4	HA15-0	g	160	45	50	32
1/4	HB0-1	c	90	32	45	30
1/2	HB2-1/1	c	280	80	75	26
1/2	HB2-3	c	180	60	70	25
2/5	HB3-2	c	280	70	85	34
1/3	HB3-2	c	285	80	82	30
1/3	HB3-9	c	130	45	80	28
1/2	HB4-5/2	c	230	60	90	32
1/2	HC0-0/4	c	200	70	80	26
1/12	HC3-15	c	60	45	40	30
1/8	HC4-3	c	50	45	30	25
1/3	HC4-12	c	180	45	90	26
1/2	HC4-19/5	c	190	60	65	27
1/3	HG2-1		140	65	60	30
1/2	HG-13-1		240	70	93	28
1/4	HG14-0		90	45	50	32
1/3	K6,1-2		130	40	65	30
1/2	K6,4-5	g	380	55	80	35
1/4	K8 T	g	160	75	60	32
1/4	K9T,4-5	g	130	55	55	31
1/2	K10,11-3		350	60	100	48
1/16	K11-2		50	30	20	32
1/2	KE5 grill	g	280	73	88	27
1/2	KE5-0	g	260	60	88	28
1/2	KE6-0	e	330	75	85	30
1/2	KE6-0	e	350	70	93	33
1/4	KE6-0	e	130	50	90	32
1/3	KW5-7	g	380	60	98	31
1/2	KR6-0		330	70	90	37
2/3	KR6-0		480	80	100	35
1/3	K9,4-5	g	80	40	60	30
1/4	P2-18	u	100	30	60	31
1/3	P5-18	c	230	65	85	23
1/6	PB2-0	c	80	60	50	25
1/3	QC5-4/8	g	330	65	95	35
2/3	R8-0		380	90	70	40
1/3	SA1-2	u	130	35	65	29
1/2	SE4-3/0	u	350	95	100	34
1/2	SE5-0	u	280	60	80	37
1/8	SE8-10	u	80	50	50	35
3/4	SE9-0		410	75	95	34
1/2	SE12-0		390	80	90	33
1/6	SE14-0	c	110	55	40	31
1/2	SE17-0	g	290	80	90	35
1/3	SK0-10		210	60	80	33
1/2	U2-6	u	230	75	60	27
1/3	U6-0		300	60	85	35
2/3	X1-9		480	110	80	35
1/2	X3-1		360	70	85	38
1/12	X14-6		50	30	30	32
1/2	19M4 11//	c	215	70	75	25
1/2	19N3 6//	c	150	53	65	26
1/4	20L 40//	c	115	70	50	25
1/2	20L 45//	c	170	40	65	31
1/3	20L-10 14//	c	155	45	75	23
1/2	20L2-10 35//	c	240	55	78	30
1/8	20Nsf 1//	c	55	30	30	25
1/2	20Nsf-1 1//	c	130	47	55	27
1/3	27N2 3//	c	330	75	85	30
1/2	2703 10//		240	46	73	34

5 HANDSTONE FRAGMENTS group E

artifact	s-p	wt	th
AD0-0/0	c	40	30
AD2-0	c	50	30
AD2-0	c	50	
Ad2-10	c	220	35
AD3-30	c	110	25
AD3-30	c	160	28
AD4-0	c	115	30
AD4-0	c	150	28
AD4-10 '	c	230	34
AD4-30/2	c	200	27
AD4-35	c	80	28
AD5-8/11	c	250	27
AD5-8/11	c	135	34
BN2		190	30
BN2		100	45
B2-1		260	30
G3-6	c	170	28
G8-0		90	31
HA1-0	c	170	30
HA2-8	c	120	30
HA15-0	g	130	42
HA21-0		140	33
HA26-3		45	29
HB0-0	c	190	28
HB1-3	c	70	33
HB1-3	c	110	30
HB1-5	c	135	27
HB2-3	c	80	35
HB2-16	c	130	28
HB3-2	c	150	30
HB3-2	c	140	34
HB3-2	c	210	30
HB3-2	c	140	33
HB3-6	c	40	25
HC0-0/4	c	190	33
HC0-0/4	c	220	30
HC2-3	c	200	26
HC2-4/4	c	200	30
HC2-15	c	100	28
HC4-1	c	70	23
HC4-18/3	c	150	30
HD3-2	c	190	30
HE1-0	c	170	35
HE3-0	c	110	31
HE3-0	c	80	30
HW4-7	c	150	33
HG4-2		100	25
HG18-0		160	31
HG19-0		120	33
HG19-0		170	28
HG20-0		60	28
HG23-0		270	33
HG23-0		270	30
K3,1-2		130	29
K9,4-5	g	210	24
K5,4-5	g	80	33
K6,4-5	g	110	25
K6,4-5	g	90	30
K6,4-5/1	g	230	25
K6,4-5	g	130	30
K8T,4-5	g	100	38
K8T,4-5	g	130	25
K9,4-5	g	60	29
K9T,4-5	g	100	24
K9T,4-5	g	100	32
K11-2		80	25
KE-P-KW		380	28
KR6-0		40	27
KR6-0		260	25
KW0/1		280	35
KW6-0	g	70	30
KW6-7	g	90	25
PA2-0	c	125	35
QC5-1	g	50	23
QC5-1	g	160	29
QC5-1	g	200	27
QC5-1	g	70	22
QC5-1	g	225	36
QC5-1	g	110	32
R1-0	c	90	34
R15-0		115	27
R17-0	e	80	29
R19-8	e	60	33
SB1		130	32
SE8-10		160	28
SE8-10		110	35
SK1-15	c	160	35
SK3-2	c	110	22
SK3-2	c	110	27
SK3-4	c	190	30
U3-55	u	75	38
U7-0		100	25
U7-0		220	31
U9-6	c	100	
U10-0	c	210	28
U12-8	c	150	35
U18-1	g	110	27
U21-5	g	200	25
X9-5		160	25
X13-0		100	30
X16-5		115	40
Z15-1	g	230	30
Z23-2	g	80	33
19M3 7//	c	160	30
19M3 7//	c	180	32
19M4 11//	c	170	30
19M4 11//	c	110	32
19M4 11//	c	140	37
19M4 11//	c	110	31
19N2-4 4//		90	26
19N2-7 2//	c	110	34
19N3-9 8//	c	145	28
20Lsf1 2//	c	90	31
20Lsf 2//	c	110	30
20L-8 45//	c	125	24
20L-13 27//	c	210	40
20L2-10 14//	c	90	32
20L2-11 24//	c	180	30
20L2-12	c	330	36
20L2-13 27//	c	85	32
20L2-15 20//	c	60	33
20M1 3//	c	90	29
20M2 20//	c	240	30
20M2 20//	c	100	25
20M2-7 7//	c	230	26
20Nsf1 1//	c	140	30
20Nsf-3 1//	c	200	26
21Msf 5//	c	60	36
27N5 6//	g	120	35
270 5//		70	36
270 6//		360	30
2702 4//		110	32
2702 5//		20	24
27N3 4//		220	33
29M3 11//		95	35
29M3 11//		110	37

6 GRINDING SLABS Whole examples

por	artifact	s-p	wt	l	th	ill
w	AD3-1/8	c	2,300	230	30	
w	AD3-30/4	c	20,000	400	140	6:15
w	KE6-2/2	e	30,000	450	150	
w	SK6-10/1	e	13,000	410	80	6:16;7:6
w	U5-48	u	7,000	250	60	7:12
w	U5-56	u	30,000	520	80	7:1
w	U9-7/2	c		500	140	6:18;7:3

por	artifact	s-p	wt	l	th	ill
mid	AD1-0	c	900	90	30	
	AD1-0	c	500	60	80	
mid	AD1-0	c	150	40	40	
side	AD2-0	c	150	50	30	
mid	AD2-0	c	100	40		
mid	AD2-0	c	75	40	36	
3/4	AD2-21/8	c	25,000	450	180	6:21
mid	AD2-22-1	c	500	120	40	
1/6	AD2-32	c	2,800	160	57	
mid	AD2-32	c	140	41	48	
mid	AD3-0	c	200	60	20	
mid	AD3-0	c	150	50		
side 1/8	AD3-0	c	500	120	40	
mid	AD3-0	c	75	40	15	
3/4	AD3-1/3	c	2,000	210	27	7:8
f	AD3-1/3	c	2,000	220	38	
side	AD3-23	c	80	50		
mid	AD3-27	c	340	65	40	
side	AD3-30	c	290	84	23	
side	AD3-30	c	520	120	25	
side	AD4-0	c	1,200	130	70	
end	AD4-10	c	250	50	37	
mid	AD4-10	c	250	65	22	
side	AD4-10	c	300	60	28	
side	AD4-35	c	140			
mid	AD5-8/11	c	115	65	36	
side	B3-1	c	370	125	26	
mid	B4-0		350	130	15	
1/6	B4-0		3,600	200		
side	B4-0		170	81	24	
side	B4-0		385	104	29	
side	B5-0	g	1,800	160	52	
3/4	B6-0	g	15,000	220	150	7:11
1/3	B6-0	g	5,700	340	125	
1/4	B6-0	g	10,000	220		
side	BN-2		590	130	58	
side	BN-2		605	70	65	
mid	BN-2		200	65	40	
mid	BN4-5		270		20	
side	BN4-5		470		35	
side	BN4-5		410		37	
side	BN4-5		1,500		66	
1/5	C1-0		4,200	240		
mid	C1-0		550	110	20	
mid	E5-0	g	120	60	18	
mid	E6-0	g	80	30	31	
1/4	EF0-3	g	5,700	300	100	
1/2	EF2	g	8,500	350	110	7:9
1/3	EF8-4	g		150	60	
1/4	EF8-4	g	3,300	160	50	
1/5	EF9-5	g	3,300	240	120	
side	EF11-12	g	1,650	140	42	
side	G2-0	c	850	120	51	
side	G3-0	c	370	75	42	
end	G7-0	g	1,100	96	43	
side	G8-0		120	46	46	
mid	G11-0		120	95	16	
side	G11-0		1,250	80	37	
end	HA3-9/3	c	2,000	150	70	
side	HA9-0	c	300	100	28	
side	HA14-0	g	300	60	17	
side	HA14-0	g	400	100	30	
end 1/5	HA14-0/3	g	600	130	13	
mid	HA20-2	g	50	50	25	
mid	HA23-0		150	55	37	
f	HB3-10/6	c	2,850	220	71	
f	HB3-7	c	960	170	53	
f	HB2-16	c		170	105	
end	HB 1-3	c	800	140	65	
mid	HB2-11/2	c	1,000	110	60	
end	HB2-3	c	200	50		
mid	HB3-10	c	80	55	17	
mid	HB1-5	c	150	56	20	
side	HB3-0	c	220	86	30	
side	HB3-2	c	250	78	36	
side	HB3-2	c	360	98	33	
side	HB4-2	c	180	74	50	
side	HB3-2	c	230	54	39	
side	HC0-0/4-0	c	280	75	32	
mid	HC0-0/4-0	c	340	70	56	
end	HC1-2	c	250	100		
end	HC1-0/2	c	300	60	30	
mid	HC1-12	c	400	70	53	
side	HC1-14	c	200	80	18	
side	HC1-1-14	c	150	44	44	
side	HC2?-0	c	1,000	70	52	
side	HC2-0	c	200	60	45	
mid	HC2-10	c	250	60	28	
mid	HC2-10	c	200	50	37	
side 1/7	HC2-11/1	c	1,900	170	20	
mid	HC2-12	c	400	60	55	
mid	HC2-12	c	200	60	40	
mid	HC2-12	c	75	40	25	
side	HC2-13/3	c	1,800	150	30	
side	HC-2-14	c	100	50	50	

por	artifact	s-p	wt	l	th	ill
side	HC2-15	c	300	80	70	
side	HC2-15	c	350	70	60	
side	HC2-15	c	175	50	43	
side	HC2-16	c	250	50	50	
side	HC3-0	c	160	64	23	
mid	HC3-0	c	250	54	38	
side	HC3-0	c	230	84	43	
side	HC3-0	c	750	115	35	
mid	HC3-0/3	c	300	60	55	
f	HC3-0/25	c	4,150	170	100	
f	HC3-0/26	c	2,500	150	33	
f	HC3-0/27	c	1,250	98	95	
f	HC3-2	c	1,150	115	62	
side	HC3-3	c	350	80		
mid	HC3-4/3	c	200	60	50	
mid	HC3-14	c	200	60	30	
mid	HC3-15/1	c	1,200	100		
side	HC3-15/2	c	300	70	24	
end	HC4-0	c	300	60	43	
side	HC4-2	c	420	72	57	
side	HC4-2	c	55	51	28	
side	HC4-6	c	210	71		
mid	HC4-6	c	370	80	63	
side	HC4-7	c	320	76	45	
mid	HC4-10	c	160	37	42	
f	HC4-19	c	600	88	47	
side	HD4-0/7	c	4,000	150	75	
7/8	HD4-4/1	c		380	220	6:20
side	HE 2	c	110	65	37	
side	HE3-0	c	620	105	77	
side	HE3-0	c	120	58	21	
mid	HE3-0	c	260	93	38	
mid	HG1-0		250	50	40	
mid	HG2-0		200	70	27	
mid	HG2-0		150	60		
mid	HG2-0		250	50	37	
mid	HG2-0		50	50		
mid	HG2-9/4		600	110	48	
mid	HG3-0		1,300	120	60	
end	HG3-0		600	110	58	
end	HG8-0		300	100		
side	HG10-1		200	70	30	
mid	HG12-1		150	50	30	
mid	HG13-0		200	45	40	
end	HG13-1		300	80	40	
mid	HG13-1		150	50		
mid	HG13-3		50	40	18	
mid	HG18-0		400	60	65	
mid	HG18-0		300	60	35	
mid	HG19-0		150	70		
mid	HG19-0		400	60	60	
side	HG19-0		300	50	33	
mid	HG19-0		500	60		
side	HG19-0		300	80	23	
side	HG20-0		500	80	60	
mid	HG20-0		100	60	15	
mid	HG21-0		250	60	50	
mid	HG23-0		100	40	40	
side	K5sf-1	u	270		40	
side	K5sf-1	u	150		33	
side	K5sf-1	u	130		31	
mid	K5sf-1	u	235		36	
side	K5sf-1	u	40			
mid	K5sf-1	u	210		37	
side	K5sf-1	u	365		38	
side	K5-sf,1	u	180			
side	K5,3	c	170		42	
end	K5,4-5	g	180			
side	K5,4-5	g	235		37	
side	K5,4-5	g	285		44	
side	K5,4-5	g	125		33	
side	K6 3	c	180		52	
side	K6 3	c	470		55	
mid	K6 3	c	170		24	
mid	K6,4-5	g	165	80	26	
side	K6,4-5	g	500		51	
mid	K6,4-5	g	1,600	180	40	
mid	K6,4-5	g	870		79	
side	K6,4-5	g	455	130	45	
mid	K6,4-5	g	1,405	150	74	
side	K6,4-5	g	190		30	
side	K6,4-5	g	370		56	
mid	K6-9,5	g	145	90	24	
mid	K8,sf1	u	210		42	
mid	K8,1-2		570		74	
mid	K8,1-2		160		37	
mid	K8,4-5	g			16	
side	K8,4-5	g	425		42	
side	K8,4-5	g	2,220		42	
mid	K8,4-5		310		26	
mid	K8,4-5		780		18	
mid	K8,4-5		180			
mid	K8,4-5		130		21	
side	K8-9,sf-1		470		55	
side	K8-9,sf1		210		9	

6 GRINDING SLABS Fragmentary, (cont.)

por	artifact	s-p	wt	l	th	ill
mid	K9,1-2		180		17	
mid	K9-4		180		44	
mid	K10-2		210		23	
side	K10,11-3		380		36	
side	K11-8		645		35	
side	K11-2		120		28	
side	K12-2		550			
Mid	KE XXVIII		6,500	200		
side	KE5-grill		2,080	170	60	
mid	KE5-0		390	100	34	
mid	KE5-0		1,600	150	46	
side	KE5-0		3,120	190	40	
side	KE5-0		550	90	54	
mid	KE6-0		90	90		
mid	KE6-0		70			
mid	KE6-0	e	200	80	34	
side	KE6-0	e	140	70	48	
end	KE6-0	e	120	60	55	
end	KE6-1	e	130	65	33	
1/4	KE6-7	e	1,150	140	69	
mid	KRO-10		60			
mid	KRO-10		380		60	
side	KR6-0		170			
side	KR6-0		140	43	42	
side	KR6-0		420	100	56	
side	KR6-0		630	150	46	
mid	KR6-0		250	110	21	
mid	KR6-0		850	90	55	
side	KR6-0		170	50	38	
side	KR6-0		205	65	45	
1/4	KR6-0		1,220	190	31	
1/2	KR6-0		30,000	220	60	
1/3	KR6-0		1,950	110	70	
1/5	KR6-0		720			
side	KR6-0		150	55		
1/6	KR6-2		1,100	160	63	
1/3	KR6-0/2		3,800	180	110	
mid	KWsf		340	100	22	
end	KWXXVIII	g	4,400	130	130	
side	KWXXVIII	g	1,300	120		
side 2/3 end	KWO-1-4		±23,000	470		
f	KW3-2/1	c	1,380	140	25	
side	KW4-0	g	570	110	50	
f	KW4-0	g	1,480	120	82	
f	KW4-0/6	g	625	83	39	
side	KW4-3	g	1,250	120	26	
1/6	KW5XVI	g	1,950	140	56	
1/4	KWXVII-1	g	2,300	160	110	
mid	KW5-XVII	g	270	70	41	
side	KW5-XVII	g	2,500	130	65	
f	KW5-0	g	1,080	130	54	
f	KW5-0/1	g	2,000	150	71	
side	KW5-1	g	515	95	27	
1/2	KW5-10/1	g		660	100	7:14
mid	KW6-0	g	335	70	43	
1/6	KW6-5	g	2,180	160	45	
side	P1-18	u	900	100	40	
side	P1-18	u	170	84	28	
side	P1-18	u	240	68	51	
mid	P1-18	u	220	106	21	
mid	P2-2	u	180	70	39	
side	P2-18	u	240	72		
mid	P2-18	u	2,400	150	60	
side	P2-19	u	320	73	28	
side	P3-18	u	300	76	49+	
side	P6-16	c	1,050	70	28	
end	P6-18	c	1,500	110	60	
mid	P8-18		2,700	220	85	
side	P8-18		1,250	240	90	
mid	PB2-0	c	190	75	29	
side	PC5-0	g	85	60	40	
mid	PC5-0	g	240	65	40	
side	Q9-5	g	250		23	
side	QC5	g	520		53	
mid	QC5	g	185		26	
mid	QC5-1	g	220		33	
side	QC5-1	g	75		37	
mid	QC5-1	g	170		33	
mid	QC5-3	g	150		47	
mid	QC5-3	g	320		36	
side	R4-0	c	370	78	45	
mid	R11-0	g	140		17	
mid	R14-4		420	90	30	
1/2	R19-4	e	5,200	300		
mid	R19-7	e	75	35	30	
mid	R20-2	e	250		35	
side	R21-0	e	150	55	41	
end	S2-0	c	600	110	55	
1/3	S4-0	c	8,500	180	150	7:10
mid	S4-0	c	400	80	15	
1/5	S4-0/1	c	11,500	180	190	
3/4	S4-0/2	c	30,000	470	180	
side	SA1-2	u			40	
side	SA2-12/2	u	500	60	70	

por	artifact	s-p	wt	l	th	ill
side	SA4-2	u	500	70	41	
side	SA6-0/5	u	700	110	40	
side	SA7-1	u	75		30	
mid	SA9-2	u	150	40	40	
end 1/5	SA9-2/2	u	1,500	170	35	
side 1/5	SA9-9	u	2,000	170	28	6:17
1/3	SA11-14/1		8,500	380	110	
mid	SA13-9		1,500	170	20	
mid 1/6	SA13-9		2,400	180	35	
side 1/7	SA13-9		1,500	170	15	
side	SA13-9		800	160	26	
end 1/5	SA13-9		4,000	220	10	
1/2	SA13-9/4		5,400	430	100	
mid	SA21-0		100	60	40	
mid	SB1-sf		320		45	
side	SB1		175		48	
side	SB1-1		75		29	
side	SB1-2		220		39	
side	SB1-2		1,100		58	
mid	SB1-2		670		65	
mid	SB1-2		1,000		33	
mid	SB1-2		540		75	
mid	SB5-10	u	600	100	27	
side	SB6-0	u	150	70		
side	SB6-0	u	150	50	40	
mid	SB7-0	u	350	70	32	
mid	SB7-0	u	400	70	60	
mid	SB8-0		250	60		
mid	SB8-10		200	60	30	
side	SB8-10		500	80	60	
mid	SB8-10		150	40	25	
side	SB8-10		150	50	+40	
side	SB8-10		400	110	30	
mid	SB9-0		500	100	75	
end	SB9-0		310	110	27	
mid	SE15-0	c	200	70	30	
end	SE15-0	c	100	50	25	
f	SK-0-0		6,400	200	120	
f	SKO-0/1		3,950	180	62	
side 1/5	SK1-10	c	1,700	150	43	
mid	SK1-15	c	150	40	28	
f	SKIV 2/1		4,250	170	100	
mid	SK2-2	c	250	50	45	
side	SK2-2	c	250	70	40	
mid	SK2-2	c	200	50	25	
mid	SK2-15	c	200	55	23	
mid	SK4-15	c	100	50	45	
end	SK4-15/1	c	600	110	40	
mid	SK4-15/1	c	150	50	30	
1/2	SK4-15/1	c	2,600	220	57	
3/4	SK4-15/1	c	12,000	280	110	6:19;7:13 I:7
mid	SK5-10	g	600	70	47	
1/4	SK5-10/1	g	6,500	320	83	
mid	SK7-12	e	150	45	40	
mid	T4-2	u	155	83	21	
mid	T4-2	u	305	77	29	
1/4	T5-1	c	2,800	170	130	
side	U1-4	u	210	60	38+	
mid	U1-55	u	450	60	80+	
mid	U1-55	u	65	45	26	
side	U1-61	u	595	110	76	
mid	U3-55	u	310	110	18	
mid	U4-0	u	540	140	28	
mid	U4-0	u	550	110	30	
mid	U4-3	u	285	78	25	
mid	U4-3	u	340	80	27	
mid	U4-3	u	125	96	28	
1/6	U4-6	u	1,050	140	45	
side	U4-23	u	1,400	140	70	
mid	U4-27	u	750	110		
1/4	U4-34	u	2,850	180	45	
mid	U4-37	u	200	90	54	
end	U4-37	u	5,000	130	62	
1/6	U4-40	u	5,500	190	90	
1/7	U4-44	u	4,700	180		
mid	U5-24	u	150	65	30	
f	U5-48	u		260	90	
mid	U5-48	u	530	133	22	
mid 1/4	U6-24		3,050	300	28	
side	U6-55		500	90	40	
mid	U6-55		510	107	29	
side	U7-1		320	64	56	
mid	U8-1	c	240	100	30	
mid	U8-1	c	340	105	22	
1/5	U9-0	c	450	250	170	
side	U9-0	c	140	80	35	
mid	U9-0	c	1,000	180	30	
mid	U9-0	c	430	86	42	
1/6	U9-0	c	1,650	150	75	
mid	U13-0	c	100	60	30	
end	U14-1	c	800	100	31	
1/2	U19-5/3	g	7,100	280	130	
end	U21-5/1	g	1,200	140	28	

6 GRINDING SLABS Fragmentary, (cont.)

por	artifact	s-p	wt	l	th	ill
mid 1/7	U22-5/3	g	4,000	220	60	
side	U22-5/3	g	700	90	24	
side 1/4	U22-5/4	g	5,500	250	45	
side	U22-5/6	g	2,500	140	20	
mid	U22-5/7	g	900	120	27	
1/8	U22-5/8	g	1,120	150	33	
side	X1-7		300	83	39	
1/6	X3-5		1,600	150	65	
r	X6-5		1,300	140	60	
side	X10-5		820	100	37	
side	22-5	c	1,280	150	55	
mid	24-0	c	275	75		
side	24-5	c	950	65	45	
side	27-2	c	210	55	26	
end	27-2	c	830	110	30	
mid	29-4		180	55	31	
mid	214-2	g	330	65	53	
mid	215-1	g	210	52	37	
mid	19Msf 1//	c	70	50	13	
side	19Msf 1//	c	800	120	25	
side	19Msf 1//	c	140	68	35	
side	19M2 4//	c	310	60		
mid	19M2 4//	c	170	50		
mid	19M2 4//	c	360	45	22	
mid	19M2-23 10//	c	1,350	150	35	
mid	19M3 7//	c	220	102	15	
mid	19N2-2 1//	c	110	60	35	
side	19N3-9 8//	c	2,550	160	70	
mid	20Lsf-1 2//	c	160	50	45	
side	20Lsf-1 2//	c	300	80	15	
mid	20Lsf-1 2//	c	230	50	30	
mid	20Lsf-1 2//	c	340	50	40	
mid	20L1 5//	c	190	90		
mid	20L2 10//	c	180	55	30	
side	20L2 10//	c	110	40		
side	20L2 10//	c	380	65	65	
side	20L2 10//	c	320	80		
mid	20L2 37//	c	410	80	40	
mid	20L2 37//	c	120	55	33	
mid	20L2-8 25//	c	260	85	30	
side	20L2-10 14//	c	160	40	40	
mid	20L2-11 24//	c	180	50	40	
side	20L2-11 24//	c	50	40	35	
end 1/6	20L2-11/39	c	3,600	170	40	
side 2/3	20L2-11/40	c	9,000	350	50	
end						
side	20L2-13 27//	c	170	60	50	
mid	20L3 6//	c	70	40	32	

por	artifact	s-p	wt	l	th	ill
side	20L3-M	c	250	60	75	
mid	20L-10 14//	c	460	80	75	
mid	20L-10 14//	c	340	100	20	
mid	20L11 13//	c	60	43	18	
side	20M1 3//	c	230	70		
mid	20M2 4//	c	100	55	30	
mid	20M2 20//	c	280	90	32	
side	20M2 20//	c	140	78		
side	20M2 21//	c	130	70	32	
mid	20M2 21//	c	130	60		
side 1/8	20M2-2/68	c	2,600	190	20	
side	20Nsf-1 1//	c	310	80	60	
mid	20N 8//	c	240	60	30	
side	20Nsf1 1//	c	110	70		
side	20N2 20//	c	1,700	150	85	
mid 1/2	20N2-2/13+	c	15,000	410	130	
mid	21M1 2//	c	110	60	40	
mid	21M1-3 3//	c	110	60		
mid	21M2 9//	c	190	50	55	
mid	21M5 6//	c	380	85	12	
side	21Nsf 1//	c	45	30	32	
side	21Nsf 1//	c	240	80	40	
side	21Nsf 1//	c	270	75		
mid	27Nsf 1//		180	70	25	
mid	27Nsf 1//		290	80	40	
end	27N3 4//	c	1,450	160	110	
mid	27N 5	g	230	70		
mid	27N5	g	1,370	165	10	
side	27N5	g	900	80	60	
side	27N5	g	1,220	130	40	
end	27N5	g	370	90	50	
side	270 5//		110	48	50	
side	270 6//		150	65	32	
mid	2702 7//		100	55	38	
mid	2702 4//		140	55		
mid	2702 4//		100	50		
mid	2702 4//		220	55	45	
mid	2702 7//		70	60	15	
side	270-3 10//		1,380	70	70	
mid	270-4 11//		800	100	30	
side	270-4 11//		2,700	150	100	
end 1/3	28M5/17		7,700	290	30	
side	28M5/17		2,200	160	45	
mid	29M 5//		2,200	200	13	
mid	29M3 1//		180	42	63	
side ?	29nsf 1//		360	120	30	
side	29N2-8 9//		880	90	45	

8 CELTS type 1 Very large, normal shape

artifact	g-p	wt	l	-mid- b	th	ill	fa 1	fa 2	bt w	bt t	bt p	bt c	axe	adze	ty	sm	med	larg	debl	fac	pl b	pat	bu b	hart
AD2-22/10	c	952	187	83	38	10:1	1/1	1/2	59	12	x	18	x		x							x		
AD2-32/4	c	615	150	66	35	10:4	1/1	1/2	66	14	x	20		x								x		
U3-13	u	635	150	67	40		1/4	1/5	52	12		12	x		x	x		x						x

8 CELTS type 2 Large (240-549 g), normal shape

AD2-22/6	c	288	111	55	31		1/3	1/4	49	13		12		x	x	x								
AD2-32/3	c	245+	80+	55	31		1/3	1/3	47	13	x		x		x				v			x		
AD2-32/5	c	242	90	53	31		1/1	1/2	55	14	x	10	x		x		v	x						x
AD2-32/6	c	470	134	57	37		1/4	1/4	50	15		9				x								
AD2-32/7	c	280	98	67	28	9:7	1/1	1/1	46	14		7	x		v									
AD2-32/14	c	340	111	57	37		1/3	1/3	50	15	x	22	x			x	x					v		
AD4-10/4	c	245	100	53	29		1/3	1/3	44	12		10			x	x								
AD4-12/2	c	243	103	52	29		1/2	1/3	42	12		10	x			x	x							x
HC3-4/1	c	302	104	54	34		1/5	1/5	39	14		6	x			x	x				x	v		
HB3-0/5	c	260	84	45	25		1/2	1/3	37	13		22	x		x		x		x					x
R9-4		300	110	53	31		1/4	1/4	53	16	x	12	x			x	x				x			
P9-4		428+	130	54	38		1/2	1/4	48	16	x	30		x		x	x				x			
U4-10	u	490	135	57	36		1/4	1/4	60	13	x	15	x			x		x	x			x		v
U4-15	u	258	94	54	30		1/4	1/4	57	11		13	x			x		x				x		
U9-1/44	c	380	120	55	31		1/4	1/4	37	13	x	19	x		x	x								x
U9-6/26	c	510	130	57	32		1/1	1/2	42	14	x	14	x			x								x
19M2-16/64	c	295	102	53	31		1/1	1/3	49	16		12	x			x	x					x		

8 CELTS type 3 Medium (90-239 g), normal shape

AD2-21/9	c	92	67	37	22				42	12	x	7	x											x
AD3-20/1	c	155	76	45	21		1/1	1/3	38	13	x	12		x		x	x							x
AD4-12/1	c	160	83	50	25		1/4	1/5	40	10	x	13	x		x	x	x							x
EF9-6	g	208	107	44	32	9:4; II:5	1/2	1/5	35	15	x	8	x			x	x	x	x					
HB2-11	c	190	93	48	28		1/3	1/3	45	13		10	x		x						x	x		
HB4-4	c	155	69	47	29		1/3	1/3	43	14		8	x											x(?)
HC3-0/3	c	110	94	37	18		1/1	1/1	32	11		6		v										
HC4-13	c	140	83	42	26		1/1	1/1	42	10	x	40				x	x							x
S-0-0	c	232	102	48	32		?	?	19	12	x		v							x				
U4-18	u	136	86	43	20		1/1	1/1	46	08	x	20		x										
U9-1/5	c	230	100	50	32	9:5; II:4	1/2	1/2	49	14	x	11			x	x								

8 CELTS type 3 Medium (90-239 g), normal shape, (cont.)

artifact	s-p	wt	l	-mid- b	th	ill	ra 1	ra 2	bt w	bt t	bt p	bt c	axe	adze	ty	sm	med	larg	debl	fac	bl b	bat	bu b	flat
U9-1/14	c	119	80	37	21		1/1	1/1	33	14	x	25		x		x								x
U9-1/23	c	132	74	37	22	9:6	1/1	1/1	19	12		10	x		x									x
U9-1/30	c	115	84	41	18		1/1	1/1	39	13		8	x			x						x		x
U9-3/22	c		82	52	23	8:11	1/1	1/1	53	13	x	16	x			x								
U9-3/27	c	145	90	41	27		1/1	1/1	36	14	x	10	x			x	x							
U9-4/3	c	100	80	39	22		1/2	1/2	36	14	x	10	x			x	x							
X2-11		110	68	38	26		?	?	41	14		12		x										
U9-4/3	c	100	80	39	22		1/2	1/2	36	14	x	10	x			x	x							
19M2-23/28	c	110	63	40	27		1/1	1/1	45	10	x	20	x		x	x						x		
20L2-11/69	c	95	74	42	18		1/1	1/4	47	10		30	x		x	x								
20L2-12/42	c	145	79	45	23		1/1	1/3	45	11	x	10	x		x									
20L3-12	c	105	68	43	23		1/1	1/1	46	11		8		x	x							x		
20L3/78	c	165	87	46	25		1/2	1/3	48	13		11	x			x					x	x		x

8 CELTS type 4 Small (23-89 g), normal shape

B1-0	c	50	58	28	15	8:4	1/1	1/1	22	11		5		x										
B5-0	g	23	46	23	14		1/1	1/2	12	9		4		x	x							x		
H22-3/2	c	63	63	33	19		1/4	1/4	27	11	x	20	x				x		x					x
H24-5/17	c	89	53	41	22		?	?	40	13	x	8	x									x		x
EP9-0	g	85	67	36	21		1/1	1/1	31	13		5	x			x	x					x		x
EP9-6	g	65	70	30	20		?	?	15	11			x									x		
K20-0/1		89	79	35	21		?	?	35	12		5	x											
R20-2	e	40	67	25	14		1/1	1/2	24	10	x	5	x				x							
SK3-2/4	c	39	54	29	16		1/1	1/1	26	10	x	7	x			x								
U9-3/13	c	50	58	19	19	9:3	1/2	1/4	26	11		18	x			x	x				x			
X8-5		38	62	25	16		?	?	20	10	x	20	x											

8 CELTS type 5 Medium (25-ca.110 g), broad bit

AD3-1/1	c	49	51	44	16	I:1	1/1	1/1	42	9	x	11		x	x	x						x		x
KE6-4/2	e	80	60+	49	15		1/2	1/2	50	11		16			x							x	x	
SB4-10	u	28	48	36	13		1/1	1/2	35	10	x	20		x	x	x	x					x		
U8-1/1	c	110	68	55	11	8:9	1/1	1/1	54	11						x				x		x		x
U9-4/2	c	110	60+	49			?	?	50	13		15	x									x		
U9-6/3	c	53	55	43	17	8:10	1/1	1/1	43	11	x	22		x	x	x	x					x		
20L1/9	c	40	48	35	15		1/1	1/1	39	11		20		x	x	x						x		
20M2-4/25	c	55	52+	48	12		1/1	1/1	49	7	x	14		x	x							x	x	

8 CELTS type 6 Small (15-24 g), broad bit

AD3-27/2	c	20	40	32	9	8:1	1/1	1/1	32	8		8		x	x		x			x				
AD4-10	c	16	44	37	7		1/1	1/1	30	6		16		x					x			x		
LB4-2		20	34	29	9		1/1	1/1	36	7		30	x		x									x
R12-1	g	19	41	29	9		1/1	1/1	35	7		10		x				x						
U9-3/14	c	23	42	29	10		1/1	1/1	28	8		40		x								x		x

8 CELTS type 7 Small (5-100 g), elongated shape

G2-0	c	34	64	17	14	9:10	1/1	1/1	20	8	x	40								x		x		
HA3-9	c	9	47+	14	5		?	?	10	3	x	30												
HA9-0		10	38+	17	6	8:7	1/1	1/1	11	4		30		x		x	x							
HB2-12/2	c	65	84	29	18		1/1	1/1	31	8		12				x					x	x		
R3-0	c	61	93	21	13	9:8	1/1	1/1	15	8		40				x					x			
R9-0		55	27	11	8		1/1	1/1	13	6		4	x			x								
S7-6	c	35	41	28	14		1/1	1/1	28	10		40	x			x					x			
SA7-2/2	u	5	41	14	9	8:5	1/1	1/1	8	6		4	x		x									
U3-15	u	95	85	29	27	9:9	1/4	1/5	22	10	x	24									x	x		x
U4-19	u	38	65	22	17		1/2	1/3	19	9		12			x									x
U9-0	c	20	47	20	14		1/1	1/1	14	9		5		x								x		

8 CELTS type 8 Small (25-80 g), flat shape

AD1-21/9	c	55	86	49	13	8:13	1/1	1/1	22	5	x	22		x		x						x		x
AD1-40/1	c	60	65	34	15		1/1	1/1	41	10		16		x				x						x
AD4-13/1	c	48	59	35	13		1/1	1/1	33	9		10		x		x	x					x		
AD4-0/1	c	65	69	39	16	9:2	1/1	1/4	34	9		4		x	x	x								x
HA25/1		40	65	36	11	9:1	1/5	1/5	32	9	x	8		x		x	x				x			
HA25/1		23	46	32	10		1/1	1/1	38	8	x			x		x		x	x			x		x
HB3-9/6	x	65	76	36	17		1/3	1/4	34	10	x	8		x		x						x		x
HC2-15/2	c	32	60	30	9	8:8	1/1	1/1	29	7		6	x											
HC-3-0/8	c	40	64	25	12		1/1	1/2	24	10		40	x									x		x
R20-2	e	47	55	29	15		1/1	1/2	30	10	x	8	x									x		x
SA8-1-/3	u	50	58	34	14		1/1	1/2	19	9		11	x			x	x					x		
U4-27	u	32	47	29	15		1/1	1/1	29	9		8	x		x	x								x
U9-3/15	c	80	74	36	18		1/1	1/1	39	12		14	x		x									
X3-0		75	76	33	15		1/1	1/1	39	10		10		x				x	x	x				
X6-5		45	64	29	16		1/5	1/5	19	11	x	8	x					x						
Z2-0	c	38	58	32	13		1/1	1/2	29	8	x	6	x											x
Ct sf- 78		75	78	42	13		?	?	39	10		14		x										x
20L2-7/55	c	45	+42	30	15		1/1	1/3	31	9	x	7			x							x	x	

8 CELTS type 9 Very small, fragile

E6-0	g	14	41	22	12		1/1	1/1	17	9	x	4								x				
HC2-7/1	c	15	43	23	9	8:2	1/1	1/1	20	8		8		x						x				x
HC3-0/0	c	5	26	15	6	8:6	1/1	1/1	11	6	x	3		x	x							x		x
HE3-0/3	c	10	34	20	9		1/1	1/1	20	8	x			x		x				x	x	x		x
U9-3/1	c	14	44	22	7	8:3; I:2	1/1	1/1	24	5		4		x	x					x				

8 CELT BIT FRAGMENTS type 1 Very large

por	artifact	s-p	wt	l	-mid- b	th	-bit- b	th	cur	axe	adz
1/3	AD4-10	c	250	70	73	36	26	14	90	x	
1/3	BM4-5		250	76	73	48					
1/5	K8-9sf-1		125	61	65	35	50	13	100	x	
2/5	SE6-0	u	230	65	67	43	54	14		x	
1/4	SK0-10		150	77			31	55	13	120	x	x
1/3	T5-0	c	215	58	76		30	62	14	180	x	
1/5	19M4 11//	c	110	48	80		30	59	9	100	x	
1/3	19N2-8/15	c	340	73	75		45	55	13	90	x	

8 CELT BIT FRAGMENTS type 2 Large

1/3	AD1-10	c	110	58	53	29	35	11	200	x	
1/2	D4-0		120	60	48	24	43	13	200	x	
1/2	HB3-3	c	110	60	58	21	52	10	120	x	
1/2	HC0-0/4	c	245	90	56	35	37	14	120	x	
2/3	HC2-8/8	c	325	95	57	36	41	14		x	
1/10	HD0-0/2	c	25	20			42	13	90	x	
1/5	HG0-1		80	48	55	30	36	13	50	x	
1/4	Ksf-1		100	68				14		x	
2/3	KW4-0/1	g	180	70	50	30	43	14	80	x	
1/3	P6-18	c	85	40	53	27	39	13	110	x	
1/2	R13-0		180	73	58	28	45	12	100	x	
2/3	R18-9	e	140	68	38	30	29	15	110	x	
1/2	R20-2	e	110	58	50	24	38	14	140	x	
1/2	SK1-2	c	160	66	59	37	35	13	90	x	
	U3-137	u	480	80	70	37	59			x	
1/3	Z16-1	g	75	51	57	25	46	12	100	x	
2/3	19N2-9/14		150	67	50	24	42	11	70	x	

8 CELT BIT FRAGMENTS type 3 Medium

1/2	E1-0	c	60	47	36	22	24	11	30	x	
2/3	HC4-5/17	c	85	54	38	22	42	12	110	x	
2/3	HC4-5/17	c	105	73	37	21	39	10	60		x
2/3	HG1-3/1	c	100	64	41	12	22	13			
1/3	K5,4-5	g	40	49	32	14	29	10	40		
1/2	KW5-7/2	g	70	50	41	21	39	11	90	x	
1/2	LB4-4		90	53	37	30	30	13	80		x
1/2	R7-2	c	80	43	43	23	47	12	190	x	
2/3	R18-0	e	85	58	35	23	37	12	70	x	
2/3	Z11-4	g	140	80	38	27	23	11	50		x
1/2	28N/2-C1		65	57	40	17	18	10	120		x

8 CELT BIT FRAGMENTS type 4 Small

1/2	K6-4	c	25	33	40	12	44	10	60	x	
2/3	K15-1		60	48	40	19	32	11	40	x	
1/2	KE1-0		35	36	35	18	36	10	60		x(?)

8 CELT BIT FRAGMENTS type 5 Medium, flat

2/3	HG14-0	e	35	39	54	13	49	8	130	x	
2/5	KE5-0	g	50	45	62	14	61	10	120		x
2/5	KR6-0		45	44	52	11	48	7	160		x

8 CELT BIT FRAGMENTS type 7 Chisel

1/2	R3-1	c	40	31	19	10	11	7	20	x

8 CELT BIT FRAGMENTS type 8 Chisel

1/2	G3-0	c	15	27	26	11	25	8	70	x

8 CELT BUTTS AND MID-FRAGMENTS type 1 Very large

por	artifact	s-p	wt	l	b	th
	AD5-1/11	c	520	136	63	37
1/4	B3-1	c	160	50	51	44
	EF8-3	g	560	110	65	43
1/2	HB4-2	c	280	92	64	33
2/5	K5,4-5	g	240	60	63	31
2/3	KE5-0	c	470	117	52	45
2/3	PC4-1/2		570	120	59	44
3/5	R12-1	g	300	92	54	40
1/2	SE4-10	u	260	79	67	32

8 CELT BUTTS AND MID-FRAGMENTS type 2 Large

1/3	AD2-0	c	85	77		25
1/3	AD2-20	c	160	65	55	37
2/3	AD3-10/1	c	90	71	39	24
	AD4-0	c	340	103	58	36
1/3	AD4-30/7	c	100	77	60	14
1/5	B4-2		85	48	60	31
1/3	B5-0	g	45	38	38	24
1/3	C1-0		150	96	57	
1/2	D2-1		115	55	45	28
2/3	D3-0	g	210	100	40	28
1/2	E3-0	c	135	53	57	27
1/3	E7-0	g	95	46	56	33
1/2	E7-0	g	190	74	52	28
1/3	EF9-5	g	160	80	47	20
4/5	F2-0	c	160	91	45	21
1/2	G10-0	g	75	58	38	18
1/2	HA4-0/1	c	160	64	73	27
1/5	HA12-0		80	27	55	41
1/3	HA14-0/2	g	120	65	68	24
1/2	HA20-1/1	g	160	72	47	27
1/2	HB1-4	c	95	56	43	23
4/5	HB3-3	c	245	89	51	31
2/3	HB3-4	c	110	76	37	23
1/3	HB4-2/1	c	80	45	55	32
1/3	HC3-1	c	140	57	58	28
1/3	HC3-15	c	85	78		22
1/3	HC4-3	c	95	50	42	30
	HC4-5/11	c	190	100	43	23
1/3	HG11-1		65	48	44	20
1/2	HG13-1/2		230	72	51	36
	HG13-1/1		435	128	58	36
1/2	HG15-0		145	81	52	29
1/2	K5,1-2		175	70	43	36
1/2	K6,4-5	g	200	68	57	29
1/3	K6,4-5	g	240	55	58	25
1/2	K6,4-5	g	115	55	64	19
1/3	K6,4-5	g	75	76	54	
	K8-5	g	255	119	43	32
1/3	K8-9,1-3	c	110	58	43	32
1/3	KE6-0	e	70	50	58	20
2/3	KW4-0/4	g	260	100	50	30
4/5	P1-22	u	350	120	50	37
1/6	P2-1	u	40	70		
1/2	QC5,6-3	g	260	67	50	43
	R6-2	c	440	120	55	38
	R7-6	c	380	127	57	33
1/3	R12-1	g	95	42	49	38
1/2	R15-2		110	72	47	26
1/2	R17-3	e	165	66	56	35
1/2	R17-4	e	240	80	58	42
1/5	R18-8	e	90	73		36
2/5	SE9-0	u	65	53	52	14
1/2	SE16-0	c	200	77	51	41
2/3	SK7-2		330	92	51	40
1/4	SK1-10	c	40	21	47	26
1/4	SK2-1	c	80	76	40	
2/3	SK2-2	c	230	87	50	23
4/5	SK3-2/1	c	250	96	52	30
1/2	SK5-10	g	220	83	48	42
1/2	SK7-12/1	g	85	58	43	28
1/6	T3-0	u	30	49		24
4/5	T4-7	u	400	112	64	38
1/2	T5-0	c	65	53	41	18
	U4-2	u	370	120	63	28

8 CELT BUTTS AND MID-FRAGMENTS type 2 Large, (cont.)

por	artifact	s-p	wt	l	b	th
	U4-10	u	500	133	61	34
1/3	U5-55	u	110	47	49	37
1/3	U6-55	u	65	41	35	27
1/2	X5-7		110	60	45	23
2/3	X8-5		185	108	38	30
4/5	X8-5		200	104	52	27
5/6	X10-5		240	100	46	30
1/3	X15-6		140	62	58	37
4/5	Z4-0	c	200	91	50	28
1/6	19M2-9 8//	c	105	56	37	40
1/3	19M3-7//	c	90	57	46	22
1/3	20I2-10-35//	c	190	61	53	38
4/5	20I3/57	c	360	104	60	40
3/4	20M2-11/70	c	390	105	60	35
2/3	28M5-14 3//		275	100	49	36
1/2	29M1/2	c	100	65	55	32

8 CELT BUTTS AND MID-FRAGMENTS type 3 Medium size

1/2	E6-0	g	70	67	30	21
2/3	G4-0		80	65	29	27
3/4	HA14-0/5	g	160	77	42	27
3/4	HA17-0/1	g	90	68	35	25
-c	HB3-2	c	160	77	43	28
1/3	HC4-3	c	30	28	40	12
1/2	KW3-0	g	70	60	37	16
3/4	R18-8	e	120	95	32	23
1/2	R19-0	e	60	52	29	27
1/2	R20-2	e	75	51	41	29
	SK3-0/3	g	125	73	39	23
4/5	19M2-8/58	c	110	81	46	18
1/4	19N3 6//	c	45	35	44	18
1/2	27Nsf-1		30	41	38	13
1/3	27N2/10		20	38	31	15

8 CELT BUTTS AND MID-FRAGMENTS type 4 Small

1/2	HA9-0/1		30	40	30	17
2/3	KE6-0/3	e	55	56	35	16
1/2	QC5-4	g	40	37	26	20
1/2	SK0-0		30	36	32	18

8 CELT BUTTS AND MID-FRAGMENTS type 5 Medium, broad

2/3	EF0		60	49	53	9

8 As above, but type 7 Chisels(*=unidentifiable celt fragments)

1/3	AD5-8	c	10	22	14	12
1/2	C1-0		35	50	23	18
1/2	E4-0		18	37	19	12
2/3	L7-0	g	35	59	21	19
1/2	G8-1	g	15	38	19	11
2/3	HC4-10	c	35	57	22	18
1/3	HE2-0/7	c	10	22	13	12
1/2	K9T,4-5	g	40	54	34	18
1/2	KE6-0	e	10	25	15	13
2/3	SK5-1/1	g	40	60	26	18
1/3	20M2/10	c	15	25	20	16
2/3	27N5 6//		85	82	29	27
1/4	AD2-32 *	c	25	39	27	8
1/10	B5-0 *	g	25	42	43	
1/10	P4-16 *	c	10	30		
1/10	X10-5 *		20	52		
1/10	19N2 4// *	c	10	27		
1/8	27N4 5// *	c	10	25		

8 CELT BUTTS AND MID-FRAGMENTS type 9 Delicate

1/2	19N3-7//	c	5	18	14	9

9 TROUGHED ABRADERS

con	artifact	s-p	mat	wt	l	b	th	ill	trough l	trough b	trough dp	work surf	remarks
w	AD2-22/13	c	ss	580	105	100	50		75	40	3	1	
w	AD2-32/12	c	ss	2,440	210	125	68	10:7	160	63	4	2	
w	AD4-1/1	c	ls	325	119	50	31		90+	30	3	1	
f	AD5	c	ss	960	152+	104+	42		135+	55+	24	2	trough groove
w	AD5-7/1	c	gnt	530	111	83	34		96	49	3	1	handstone
f	E6-0	g	ss	480	113+	65	48		96	58	7	4	
2/3	KW4-0	g	bas	3,190	195+	165	55		125	55	5	1	handstone
w	KW5-2/3	g	bas	3,600	295	140	48	14:4	130	65	6	1	handstone
f	P2-18	u	ss	550	140+	90+	55				35	1	
f	U4-30	u	ls	2,990	290+	135	56			235	40	2	
f	U5-7	u	ls	2,490	240+	130	46		230+	110	10	1	
w	U9-1/19	c	ss	320	105	80	30		100	80	2	1	palette
f	U9-3/10	c	ss	1,175	122	113	48		115+	100	5	2	
f	X2,1-2		ss	125	60+	60+	37		60+	60+	30	2	
w	20I2-12/43	c	ss	510	113	48	45		80	25	2	1	
w	20I3-80	c	ls	750	130	90	33		70			2	
w	20M2-9/37	c	ss	3,450	200	115	93		180	90	10	2	trough groove
									170	80	15		
w	20M2-9/44	c	ss	340	94	72	55		88	57	12	3	
									80	70	7		trough groove
1/2	20M2-9/65	c	ls	1,600	250+	160+	55		130+	120+	15+	2	
									150	50	15		trough groove
3/4	20M2-9/66	c	ss	1,750	160+	110+	55		150+	110+	5+	1	
1/3	20M2-9/67	c	ss	2,130	130+	120+	70		90+	90+	5+	2	trough groove

10 SMALL ABRADERS type 1 Elongated, square section

con	artifact	s-p	wt	l	b	th	ill	smoothed faces-ends		con	artifact	s-p	wt	l	b	th	ill	smoothed faces-ends	
f	HD4-0	c	50	43+	25	23		4		w	R2-20 *	c		168	43	16	11:1	2	
w	HE3-0	c	220	103	42	27		4		w	SA6-0	u	215	81	40	37		4	1
f	K5,4-5	g	20	35+	20	18		4		w	U3-60	u	85	75	31	22		4	
f	K6,4-5	g	60	72+	34	16		2		f	U4-0	u	65	55	26	25		4	
f	P6-18	c	35	50+	23	19		3	1	f	U5-24	u	90	55	34	20		4	
f	SE14-0	c	180	81+	37	31		1		f	X1-7		130	59	39	36		2	
w	R2-10/12	c	190	98	34	29	11:2	4+	2										

10 SMALL ABRADERS type 2 Broad, multi-shaped

con	artifact	s-p	wt	l	b	th	ill	smoothed faces
f	AD5-4/3	c	165	90+	62	23	11:3	2
w	HC1-9	c	50	62	57	17		1
w	HC2-10	c	240	79	55	29		2
f	K5-3	c	15	51+	40+	0		2
f	K5,4-5	g	15	51	19+	11		2
w	K8-3	c	100	68	45	17		2
f	K8-3	c	60	52+	40+	18		2
f	K9,1-2	c	210	89+	58	25		2
f	K9,4-5	g	45	39+	36	23		2
w	SL6-3	u	145	97	66	26		1
f	U6-0		50	52+	50	25		2

10 SMALL ABRADERS type 3 Rectangular, abrader-slicer

w	R9-4	145	145	48	12	11:4

11 SLABS type 1 Large

con	artifact	s-p	wt	l	b	th	ill
w	KW5-0/6	g	6500	360	250	35	14:5
1/2	U9-2	c	2050	240	190+	25	

11 SLABS type 2 Small

w	AD3-22/1	c	470	149	83	26	
w	AD5-4/7	c	90	95	71	11	
w	B5-0	g	230	120	60	22	
w	BN22	c	940	260	145	25	
w	K5,4-5		80	87	45	15	
f	K5,4-5		75	80	60+	10	
w	K5,4-5		320	130	57	23	
w	K6sf 1	u	30	73	35	8	
w	K6,4-5		40	64	51	12	
w	K8-9,1-3	c	85	64	60	13	
f	K8,1-2	c	70	56+	52	15	
f	K8,1-2	c	45	50+	45	14	
w	K8-9sf-1	u	55	58	58	9	
w	K8,1-2	c	255	108	94	17	
w	K9T3-4	c	210	130	53	18	
f	K10-11 2		55	85+	53+	9	
w	KE6-0	e	80	80	74	14	
f	KE6-0	e	180	86	78	21	
w	KE6-7	e	210	90	78	19	
w	KE6-9	e	390	160	85	22	
w	KR6-0		105	98	59	14	
f	KW5-6	g	350	113	98	23	
f	R9-0	g	60	46+	53+	20	
f	R12-10	g	85	65	46	18	
f	R12-10	g	175	84	65	20+	
f	R14-3	g	300	83+	95	29	
w	R20-2	e	440	90	93	30	
f	R21-0	e	75	55+	51	19	
w	R21-0	e	270	89	73	26	
f	R21-0	e	95	77+	67+	19	
f	SA8-2	u	90	67	47	19	
f	SE7-0	u	165	102	77	20	
f	U9-24	u	40	48	55	10	
f	U7-1	c	130	85+	65+	20	
f	U7-1	c	55	76+	42+	20	
w	U7-0	c	140	69	64	19	
w	U9-1/21	c	195	125	73	13	
f	U9-1/22	c	160	106	73	9	
w?	U9-1/53	c	320	146	122	6	
w	U9-3/26	c	380	112	89	22	
f	U9-5/8	c	570	130	91	35	
w	U9-6/19	c	225	130	178	19	
f	Z14-1	g	25	57	45+	7	
f	Z15-1	g	25	77+	49+	4+	
f	Z5-2	c	130	83+	59+	18+	

12 "DIGGING" TOOLS

con	artifact	s-p	mat	wt	l	b	th	ill	blade b	blade th	shape	haf	sheen
w	AD5-6/10	c	sed	590	163	68	43	II:6;10:10	90	25	tear	x	
f	AD5-8/1	c	ls	2,300	230+	104	66	10:12	90	20			x
f	E4-0		gnt	190	74+	67	21	10:11	60	15	celt		x
w	G3-0	c	sed	380	134	79	38		86	27	tear	x	x
w	HB3-4-12/3	c	ls	1,645	360	130	60		138	15			
w	HB3-4-12/1	c	ls	2,210	260	110	35		74	16			x
w	HC4-5/17	c	gnt	255	101	56	31	8:12	49	18	celt	x	
w	HC2-9	c	gnt	270	135	63	19		49	14			
w	HD4-5/1	c	ls	540	180	85	30		35	15		x	x
f	HC4-5/17	c	sed	265	100+	57	34		49	12	celt	x	x
w	U9-1/50	c	ls	555	210	75	25		85	10			
w	19N3-14/19	c	ls	430	125	60	42		75	14	tear	x	

Probable Digging tool blank:

w	AD5-6/1	c	155	109	28	

13 LIGHTWEIGHT VESICULAR BASALT OBJECTS

con	artifact	s-p	wt	l	b	th	ill
f	AD2-20	c	230	78	62	52	
w	AD2-32/19	c	255	101	79	48	
w	AD3-1	c	45	42	38	37	
f	AD4-1/1	c	90	66+	50	29	
w	AD4-11	c	90	74	61	29	
w	AD4-10/1	c	265	89	74	52	
w	AD5-1/3	c	570	115	104	44	
f	AD5-6/6	c	193	95+	69	45	
f	B5-0	g	155	111	59	14	
w	C3-1	g	500	123	89	41	
f	G2-3	g	70	75+	62+	25+	
w	HB0-1	c	45	51	42	26	
w	HB2-1	c	50	51	42	39	
f	HB3-4/8	c	55	61	47	20	
f	HC3-0	c	30	47+	42	23	
w	HC4-2/4	c	90	71	56	43	11:7;III:7
f	HC4-4	c	50	47	41	33	
f	HC4-5	c	45	55	51+	33	
w	HD3-1/5	c	55	62	55	24	
w	HD3-1/17	c	80	82	42	27	
f	HB0-0	c	30	54+	62	17	
f	HG0-0		35	45+	58	21	
f	HG8-0		50	67	63	29	
w	HG9-0		20	51	42	18	
f	K1 1-2		70	78	50	36	
f	K2 1-2		65	55	59	24	
w	K3 1-2		30	41	30	29	
f	K8 1-2	c	80	66	49	42	
w	K8 4-5	g	30	35	29	27	
w	K10-113		110	67	55	24	
w	KE6-5/5		300	122	90	48	
w	KE6-3/4	e		65	39	15	11:5
w	P1-16	u	240	95	95	29	
f	S4-4	c	460	147	80	37	
f	SB1sf		20	35+	53	18	
w	SE8-0	u	60	53	48	20	
f	SZ10-0		65	57+	64	23	
f	SK2-15	c	105	94+	55	40	
f	T2-1		140	93	64+	20	
w	U1-24	u	55	60	47	20	
f	U1-f	u	125	84+	84	23	
w	U3-7	u	168	112	74	21	

13 LIGHTWEIGHT VESICULAR BASALT OBJECTS, (cont.)

con	artifact	s-p	wt	l	b	th	ill
w	U3-3	u	175	110	75	22	
w	U3-8	u	140	119	75	32	
f	U4-3	u	70	81	55	20	
w	U4-3	u	100	78	63	22	11:6
w	U4-3	u	280	136	81	35	
w	U4-3	u	85	85	59	21	
f	U4-3	u	70	57+	62	27	
w	U4-31	u	350	135	98	22	
w	U4-33	u	140	78	61	28	
f	U4-41	u	260	81	73	37	
w	U6-24		230	79	74	28	
w	U9-0	c	100	96	68	24	
w	U9-3/6	c	100	66	41	26	
w	U9-6/6	c	40	57	44	21	
f	X1-0		40	75	34+	27	

con	artifact	s-p	wt	l	b	th	ill
f	23-0	c	30	61+	38	22	
w	CT79sf		90	61	59	26	
w	19M1/4	c	10	45	33	14	
w	19M2 4//	c	50	59	31	25	
1/3	19M2-9-8//	c	65	57+	55	20	
3/4	19M2-11 12//	c	100	65+	45	26	
w	20L 40//	c	90	70	42	40	
1/4	20L2-10/22	c	15	44+	28	23	
w	20M-2 21//	c	160	73	55	39	
f	20M1 3//	c	60	81	34	23	
2/3	20M2-11/52	c	300	92+	68	47	
1/2	20M2-7 7//	c	80	57+	68	39	
w	20M2-14/54	c	40	67	50	15	
w	20M2-14/57	c	300	93	80	43	

14 GROOVED STONES

por	artifact	s-p	sze	col	wt	l	b	th	ill	groove: sec	#	d	lac	pol	opg	inc	str	cal
4/5	ADO-10/2	c	x	grn	10	35	21	9	12:10	V	6	2	cnv	?		x	x	
1/6	AD3-30	c	x	grn	10			14	12:15	U	10	3		x			x	
c	Ct sf78			gry	35	53	28	12	12:7	U	7	1	irr			x	x	
1/3	F8-1	g	x	gry	65			24	12:8	V	8	5		?			x	x
1/5	G4-0/1	g	x	grn	10			17	12:11	U	5	2		x		x	x	
1/4	HB3-2	c	x	grn	40			27	13:2	U	12	6	str	x			x	
3/4	HB3-6/1	c	x	grn	30	42	33	13	12:14	U	7	3	str	x			x	
c	HC3-0/7	c	x	gry	230	92	50	27	12:16;III:1	U	15	7	str	x			x	x
1/5	HG22-0		x	gry	15				12:18	U	12	3					x	
c	K5,4-5	g	?	buf	75	29	43	33	12:19	U	19	7	str	x			x	x
1/2	KW5-2/4	g	x	blk	100		53			U	12	5	cvx	x			x	x
c	KW0-1/6		?	blk	30	47	26	13	12:13	V	8	3	cnv	x			x	
c	R3-3	c		red	25	40	21	9	12:12	V	4	2	cnv					
2/3	R3-11/1	c		wht	30		30	15	12:5	V	5	4	cvx		x		x	
1/2	R17-3	e	x	gry	50		52	18	12:20	U	11	5		?			x	v
1/4	R19-3/1	e	x	blk	15			10		V		3			?	x	x	
w	S4-1/4	c	x			76	60	26	12:1	U	6	2		x			x	
c	S5-2/1	c	x	grn	40	46	30	18	12:6	U	11	3	str	x	x		x	
1/6	SB6-0	u		blk	10			13	12:9	V		3	cvx	x	x		x	
2/3	U3-55/2	u	x	gry	160			29	12:2	V	3	1	cvx	?				x
4/5	U4-3/2	u	x	blk	60	53	41	19	13:4		15	5	cnv	x			x	
1/4	U9-0/2	c	x	grn	40		43	18	12:17	U	8	2	str	x			x	
2/3	WC 1-1			buf	10	?	23	8	12:3	V	4	2	str	?	✓		x	
1/3	Xsf		x	grn	25				12:21	U	10	3	cnv	x			x	x
1/2	X10-5		x	wht	50		48	23	12:4	V	12	5	cvx	x			x	x
3/4	19M2-3/52	c	x	grn	55	45	39	17	13:1	U	11	4	str	x		x	x	x
1/4	19N3 11//	c	x	gry	50	40	57	18		U	21	7	cvx	x		?	?	
1/5	270-1/3			gry	200	50	48	45	13:3	U	13+		str	x		x	x	

15 SMALL POLISHED SPATULAS

por	artifact	s-p	col	wt	l	b	th	ill	chp edge	repol	bl like end
1/3	B 4-0	c	grn,marble:	4	31+	22	4		x		✓
1/5	HA5-1	c	soapy,lt blue		45+	19+	5				
1/2	HA18-0	g	pink	9	44+	36	3	III:3	x		x
1/20	K2sf		gry	1			4				x
1/2	K8-4	c	brn,shale-like	7	52+	17	6				
1/10	LB4-4		gry	1			5				
1/10	P2-19	u	gry	1			4				
1/3	QC5-3	g	gry	5	24+	25+	5		x		✓
1/2	QC5-0	g	dr.gry		22+	20	5				
1/2	R7-6	c	green stone	9	35+	30+	5	13:6			x
1/2	R13-0	g	green stone	45	55+	51	9	13:7			
1/2	R14-4	g	soapy,yel-grn	5	33+	20	5		x		x
w	R15-0	e	soapy,yel-grn	9	31	19	5				x
2/3	R17-0	e	wht,l.s.	15	32+	25	10	13:5			x
1/5	SE 15-0	c	gry		27+	14+	4				
1/2	SK7-12	e	gry-grn	3	28+	19	3				
1/10	U14-0/1	c	gry-grn	1			5				

16 LARGE DRILL-HOLE-PIERCED OBJECTS type 1 Oblates

por	artifact	s-p	mat	wt	l	th	ill	hole dia
f	AD5-4/16	c	ls	245	80	62	13:9	14
f	E3-0	c	ign	110	56+	43		15+
f	K2 sf		spc	170	64	45		17+
w	U9-1/40	c	ls	205	77	29	13:8	14

16 LARGE DRILL-HOLE-PIERCED OBJECTS type 2 Broad form

1/2	EF9-6/1	g	grns	80	55+	16	13:10	12

16 LARGE DRILL-HOLE-PIERCED OBJECTS type 3 Ovoid

1/6	KR5-0		bas	180	70+	51+		25	1/4	SA13-9/1		gnt	240	76+	57+	13:11 20

17 DOOR SOCKETS

con	artifact	s-p	mat	wt	l	b	th	ill	socket dia-dep	
w	U4-0	g	bas	20,000	380	240	140	11:10	100	28
w	HE4-2/39	c	?	30,000	365	230	220		100	40
w	HC2	c	ls	30,000	420	310	210		140	50
w	S4-0/2	c	bas	30,000	470	360	180	I:6	110	20
w	U9-5	c	ls	15,000	360	240	85	11:11	95	9
w	28N/7		ls	50,000	550	430	220		100	68

18 SPHERES type 1 Soft limestone, irregular spheres

con	artifact	s-p	wt	dia	con	artifact	s-p	wt	dia	con	artifact	s-p	wt	dia
f	AD3-30	c		60	w	S-0-10	c	55	38	w	R3-3	c	20	23
w	BNE2		150	58	w	S-1-10	c	60	36	w	SK3-2	c	15	22
w	U-3-9	c	200	55	w	S(?)-2-4	c	45	32	w	U4-0	u	10	20
w	AD2-21	c	85	43	w	SE-16-0	c	45	33	w	U6-55		25	28
w	AD2-21/3	c	105	45	w	U9-0	c	55	36	w	U19-5/1	g	25	29
w	HC2-10	c	80	40	w	U9-0	c	55	35	w	19M2-8/49	c	260	68
f	KW3-0	c		45	b	U13-0	c		34	1/8	19N3 7//	c	20+	50
w	S6-0/1	c	70	40	b	U19-0	g		30	w	19M2-8/59	c	130	47
w	SA10-5	u	90	44		U20-5/2	g	30	31	w	20L3-35/70	c	130	49
w	U3-4	u	145	48	w	ADO-0/0-10	c	25	28	w	20M2 7/31	c	110	46
w	U6-24		105	45	w	AD2-22/2	c	30	28	w	27N3 4//	c	110	47
w	AD4-0	c	65	38	w	AD3-20	c	30	29	w	19M4 11//	c	40	33
w	AD5-4/4	c	35	31	w	B2-0	c	30	28	w	19N1-sf/6	c	85	39
w	EM1-2	g	45	35	w	E3-0	c	20	24	w	19N1 sf/4	c	35	30
b	EP1-2	g	+	30	w	G3-0	c	20	24	w	19N3/20	c	40	35
w	G2-0	c	30	30	b	HB2-2	c		27	w	20L/84	c	70	39
w	G7-0	g	45	33	w	HB3-2	c	10	21	w	20L 3 8//	c	35	31
w	HA7-0	c	55	36	w	HB3-2	c	30	28	w	27N1 sf/8		55	35
w	HB3-2	c	25	30	w	HB4-2	c	10	20	w	29L(?)2 49//		35	31
w	HB3-2	c	35	32	w	HB-HC-0	c	25	28	w	19M2-9/34	c	15	22
w	HB3-2	c	40	34	w	HC2-13	c	15	22	w	19M2-23/30	c	20	25
w	HB3-2/15(?)	c	70	36	w	HC3-0/28	c	25	29	w	19N2 11//	c	20	25
w	HB3-4/6	c	50	36	w	HC4-5	c	25	26	w	20L9 13//	c	30	29
w	HB3-10/6	c	65	37	w	HC4-7	c	15	23	w	2702 7//		20	28
w	HC2-12	c	60	38	w	HD4-0	c	15	22	w	29M3 11//	c	15	26
w	K8-4	c	40	31	w	K9 4-5	g	20	25	3/4	21M1-1 4//	c	20+	27
w	KW5-0	g	40	34	w	P2-18	u	20	20					
w	R-5-10	c	35	30	w	P5-0	c	20	25					

18 SPHERES type 2a Hard limestone-perfect spheres

w	AD2-22/7	c	215	53	w	U9-1/7	c	90	41	w	U9-5/5	c	50	33
w	AD2-22/22	c	195	53	w	U-9-2/3	c	110	43	w	U8-0/2	c	25	26
w	AD2-22/23	c	315	62	w	AD2-22/29	c	40	32	w	U9-6/8	c	15	24
w	AD5-8/9	c	300	63	w	AD5-15/1	c	65	35	1/2	20L2-8 39//	c	140+	61+
w	AD2-22/11	c	105	63	f	HB-HC-0-0	c	+	30	f	27N2 3//	c	20+	40+
w	AD2-22/25	c	110	64	f	HC2-15	c	+	37	w	19M2 4//	c	15	22
w	HC4-6/9	c	115	44	f	HE1-2	c	+	32	w	27N2 4//	c	30	26
f	P2-18	u	+	47	f	K6 4-5	g	+	38	w	27N5 6//	g	40	29
f	U-5-7	u		41	w	X7-7		40	32					

18 SPHERES type 2b Hard limestone-nearly perfect spheres

w	HA4-6/11	c	485	71	w	AD2-22/4	c	50	33	w	SA 13-2	c	35	32
w	HB3-9/14	c	345	56	w	AD2-22/10	c	75	39	f	K8 4-5	g	+	35
w	KB 7-2	c	230	55	w	AD2-22/18	c	45	34	w	U-3/24	u	45	33
f	SE 13-0	c	+	61	w	AD2-32/1	c	35	30	w	U9-1/54	c	40	32
w	U9-5/12	c	255	60	f	AD3-20	c	+	35	w	G2-0	c	30	28
f	AD4-35	c		40	w	HB2-3	c	75	39	f	K9 4-5	g	+	28
w	AD5-8/8	c	130	49	w	HC2-9/10	c	55	34	w	U17-2	g	25	27
f	B2-0	c	+	48	w	HC3-0	c	65	37	f	20L 3//	c	50+	41
f	HG11-0		+	46	w	HE 1-1/3	c	65	38	w	19N3-17 10//	c	15	22
w	S-0-10	c	125	47	w	S(?) 0-1	c	35	33	w	27M1 2//	u	15	24
w	U9-2/5	c	130	45										

18 SPHERES type 2c Hard limestone-irregular spheres

w	AD2-20	c	215	52	f	SE6-0	u	+	40	w	B2-0	c	50	35
f	AD2-21	c	+	57	w	SE8-0	u	80	43	w	BN-2		50	35
w	AD5-4/8	c	190	53	w	SE13-0	c	65	40	w	HG ?-0		35	31
w	HD3-1/2	c	340	60	w	SK13-0	c	75	40	w	K6-18	c	40	33
w	K9 4-5	g	160	51	f	SN14-0	c	+	43	w	R5-3	c	60	36
w	P 1-8	u	170	50	f	U 1-1	u		44	w	S(?) 6-4/4	c	40	31
f	SA-1	u	+	60	w	U4-52	u	125	46	w	U5-24	u	55	34
w	BNE-1		80	40	f	U9-1/34	c		49	w	U9-1/2	c	55	33
w	HB3-4/6	c	185	40	w	U9-1/41	c	120	47	w	AD4-0	c	20	26
f	HD3-10/6	c	+	42	f	AD2-31/1	c		34	w	HB3-9	c	25	27
w	K9 4-5	g	85	45	w	AD3-20/6	c	65	37	4/5	19M2-9/35		280	63
w	KW5-7/3	g	180	46										

18 SPHERES type 3a Basalt-perfect spheres

w	U9-1/3	c	180	51	w	F2-0	c	20	25	1/2	20M2 20//	c	145	53
w	U4-2/2	u	115	44	w	HB3-2	c	10	20	w	19N2-8/16	c	150	43
w	U9-2/1	c	140	47	w	HD3-0	c	10	20	w	19M2-23/27	c	60	36
w	AD2-20	c	35	30	w	K 15-2		30	28	1/3	20L2-8 25//	c	20	32
w	U9-1/18	c	55	33	w	SA 6-10/1	u	15	23	w	27M1 2//	u	30	28

18 SPHERES type 3b Basalt-nearly perfect spheres

con	artifact	s-p	wt	dia	con	artifact	s-p	wt	dia	con	artifact	s-p	wt	dia
w	BNE-1		225	55	w	U5-29	u	110	42	w	HB1-3	c	25	26
w	G3-0	c	155	51	w	U9-1/24	c	120	42	w	P2-18	c	25	29
w	HC-4-13/2	c	450	71	f	U9-1/45	c		48	w	19M2-8/48	c	160	51
f	X 3-1			53	w	AD2-22/21	c	55	35	w	19M2-8/51	c	65	37
w	U4-17	u	240	55	w	AD3-0	c	50	33	1/2	19N3 6//	c	40	39
w	U4-25	u	275	58	w	D2-0	c	65	36	w	19N2 11//	c	35	32
f	AD2-22/1	c	90	42	w	HE 1+2	c	45	30	w	20M2-7/30	c	200	54
w	AD2-22/24	c	100	40	w	R 5-8	c	35	30	w	29N1 2//		40	30
f	AD4-35	c		40	w	U8-0/1	c	80	38	3/4	19N1 11//	c	30	29

18 SPHERES type 4a Chert-nearly perfect spheres

w	AD5-1/15	c	355	57	w	U9-1/34	c	135	50	1/2	20L2-9 37//	c	300	79
w	HB3-4/4	c	290	55	w	D3-0	c	145	45	w	20M2-11/48	c	270	60
w	HC4-5/3	c	380	60	f	R12-1	g		46	1/3	27N5 9//	g	80	55
f	R 14-4	g		53	w	HC 4-1/11	c	95	39	w	29N5-15/15		420	69

18 SPHERES type 4b Chert-irregular spheres

				ill										
w	AD0-0	c	365	67	w	HC-VII-3-0/1	c	620	81	w	HB 0-4	c	185	48
w	AD4-1/3	c	365	59	w	HD 0-0	c	225	55	w	HC4-5/3	c	240	45
w	AD5-1/1	c	270	60	f	K6 4-5	g		72	f	HG12-1		+	49
w	AD5-4/11	c	415	66 III:9	f	K6 4-5	g		60	w	S 0-0	c	200	47
w	AD5-4/14	c	365	70	f	K8 1-2	c		70+	w	SE 14-0	c	145	45
w	AD5-4/18	c	560	82	w	K9 1-2	c	210	50	f	U-6-0		+	45
w	B 1-0	c	305	60	w	R 6-0	c	185	52	w	U9-2/5	c	160	46
f	B 5-0	g	+	70+	w	R 6-0	c	235	58	w	Z 12-2	g	125	41
w	B 5-0	g	200	51	w	R 6-9	c	275	63	w	G1-0	c	90	36
w	BN 4-5(?)		400	68	w	R 9-4		385	62	w	HA 6-0	c	115	39
w	EF 9-0	g	315	56	w	R-19-0	e	180	55	w	HC 2-10/1	c	65	33
w	hA2-8/1	c	190	53	w	R-21-3	e	180	51	w	HC 4-9	c	65	33
w	HA 16-0	g	200	55	w	R-21-3	e	420	70	w	KE 0-0		60	38
w	HB 3-2	c	210	52	w	S 0-10	c	400	60	w	KE 5-0	g	80	38
w	HB 3-9/19	c	285	63	f	S 4-0	c		62	w	U9-1/33	c	120	38
w	HB3-10/6	c	195	55	f	SE 0-0			60+	w	U9-6/2	c	95	39
f	Hd 4-2	c		62+	w	SK 2-2	c	210	52	w	19M2-23/29	c	130	55
w	HC 1-0/1	c	240	55	w	SK 3-0/2	c	250	58	w	20L2-13/44	c	470	83
w	HC 2-8/3	c	290	57	w	SK 3-10	c	230	57	w	20L3-14 31//	c	235	56
w	HC 2-9/8	c	275	62	w	U4-32	u	430	63	w	20M2-9/41	c	1100	101
w	HC 3-0/22	c	430	70	w	U4-42	u	465	73	w	20M2-11/49	c	500	66
w	HC 4-5/4	c	240	57	f	U5-24	u		60+	w	2701 2//	u	210	55
w	HC 4-5/7	c	460	74	w	U9-1/15	c	195	50	w	2703 10//		170	53
w	HC 4-5/10	c	540	75	w	U9-5/6	c	340	61	w	29M1 6//	c	290	67
w	HC 4-5/19(?)	c	175	53	w	AD 4-35	c	185	45	w	20M2-9/47	c	130	46
w	HC 4-6/14	c	580	70	w	AD 5-6/1	c	160	45	w	20M2-11/51	c	150	50
w	HC 4-7/10	c	235	58	w	HA 3-2	c	145	49					

18 SPHERES type 5a Hardstone-perfect spheres

w	K7-0	c	95	41	w	AD2-32/16	c	20	25	w	RO-8		25	27
w	U9-1/6	c	90	41	w	AD4-0	c	15	21	w	R5-13	c	25	25
w	K2sf		85	39	w	HC4-3	c	25	26	w	U9-2/15	c	25	28
w	U7-0		55	33	w	HE2-0/14	c	25	25	w	U 11-2	c	30	28
w	[illegible]		[illegible]	[illegible]										

18 SPHERES type 5b Hardstone-imperfect spheres

w	AD2-22/17	c	200	53	w	SA 13-9		270	58	w	AD 3-27	c	10	19
w	AD3-20/3	c	370	63	f	SE 5-0	u	+	60	w	E 3-0	c	15	21
w	AD5-4/13	c	365	65	w	U9-3/23	c	250	55	w	G7-6	g	15	21
w	AD5-8/7	c	535	78	f	AD4-30/4	c		40	w	HC 2-10	c	10	18
f	B1-10	c	+	70+	w	S 1-10	c	95	45	w	U9-1	c	15	22
w	B2-0	c	215	57	w	SE 8-10	u	100	43	w	U9-1/8	c	80	40
w	F2-0	c	200	53	w	SK4-15/1	c	110	45	w	U9-1/11	c	20	25
w	G3-0	c	650	82	w	SK7-12/2	g	150	45	w	U9-1/12	c	65	35
w	HC3-1/2	c	140	51	w	X 13-6		100	40	w	20L3-14/43	c	470	77
f	HC4-16/1	c	+	51	w	BNE2	c	50	35	w	20M2-7/34	c	230	57
f	K5sf-1	u	+	50	w	HA1-0	c	40	31	w	20M2-7/32	c	360	56
w	K5 4-5	g	270	59	w	R 9-4		85	38	w	20M2-7/29	c	380	66
w	K5 4-5	g	210	51	w	R20-2	e	65	33	1/2	20M1/1	c	130+	53
f	K8 1-2	c	+	60+	f	U 8-2	c		38	w	29N5-15/12		210	52
f	KE 3-0	c	+	53	w	U 9-3/2	c	75	37	w	19M2 4//	c	15	21
f	KW 5-7	g	+	61	w	BNE 2	c	80	38	w	2701 2//		10	20
w	R 7-6	c	515	70	w	AD 3-10	c	20	25	w	29N1 2//		25	29

19 POLISHED FLAT-SIDED COBBLES

con	artifact	s-p	mat	wt	l	b	th	ill	shape	bif	surface
w	AD0-0		gnt	455	90	58	54		ov		
w	AD5-1/20	c	gnt	950	125	97	44		ov		flat nut
w	AD5-2/1	c	gnt	960	128	99	49	10:6	ov	x	flat
w	AD5-4/2	c	gnt	400	112	65	28		rec	x	flat
	AD5-4/7	c	gnt	520	127	75+	31		rec	x	flat
w	HB3-2/20	c	gnt	1020	125	105	44		rec	x	bicvx
w	HB3-4/9	c	gnt	530	92	88	34		rec	x	flat
w	HB3-4/10	c	gnt	650	120	101	32		ov	x	bicvx
w	HB3-12/3	c	gnt	600	122	82	27		rec	x	flat
w	HC4-5/3	c	ls	390	99	71	37		ov	x	flat
w	R2-10/2	c	ls	1000	138	90	43		rec	x	flat
w	SA4-8	u	gnt	610	111	75	47		ov	x	bicvx
w	SE4-10	u	ls	420	96	77	37		ov	x	flat
w	T-48(?)		gnt	670	98	85	42		ov	x	
w	AD5-4/7	c	ls	430	78	78	54		rd		flat domed

19 POLISHED FLAT-SIDED COBBLES (cont.)

con	artifact	s-p	mat	wt	l	b	th	ill	shape	bif	surface
w	U4-52	u	ls	750	100	85	55				
w	U5-48	u	qtz	620	120	65	30		rec		flat ham
w	U9-1/37	c	gnt	315	110	68	22		rec	x	flat
w	U9-1/49	c	gnt	650	123	96	41		ov		bicvx
w	U9-2/7	c	gnt	610	122	69	32		rec	x	flat
w	U9-2/12	c	ls	520	109	82	35		ov	x	flat
w	U9-2/21	c	gnt	1000	146	101	43	10:5; II:3	ov		flat
w	U9-3/4	c	gnt	330	110	65	22		rec	x	flat
w	U9-5/9	c	gnt	640	104	77	52		ov	x	bicvx
w	U9-5/11	c	ls	750	120	105	34				flat
w	19N4/62	c	gnt	1100	112	94	62		ov		bicvx
w	19N3 11//	c	ls	150	76	59	20		ov		flat
w	20L2/34	c	ign	890	115	85	53		ov		flat
w	20L2-12/56	c	ign	640	109	89	34		ov	x	flat
w	20M2-9	c	ls	480	113	86	31		ov		flat
w	20M2-9/36	c	bas	570	115	86	38		ov	x	bicvx
w	20M2-9/39	c	bas?	1020	145	97	43		rec		flat
w	20M2-9/62	c	ign	425	91	82	37		ov	x	bicvx
w	20M2-14/59	c	ls	445	106	95	26		ov	x	flat
w	20M2-16/60	c	ls	460	103	75	38		ov		flat
w	20M2 18//	c	ls	320	84	73	33		ov		flat
3/4	20M2 20//	c	ls	630	142	87	33				flat

19 POLISHED FLAT-SIDED COBBLES - FRAGMENTARY

con	artifact	s-p	mat	wt	th	bif
1/2	AD0-0		ss	360	30	x
1/3	AD4-1/1	c	gnt	300	33	x
1/3	AD4-1/1	c	gnt	240	25	x
1/10	AD4-10	c	gnt	100	38	
1/2	AD5-21/11	c	gnt	300	22	x
2/3	AD5-3/13	c	gnt	450	30	x
1/2	AD5-8/3	c	gnt	340	28	x
1/4	B3-1	c	gnt	170	24	x
f	D2-1	c	gnt	75	25	x
f	G2-0	c	gnt	410	32	x
1/6	HA4-8	c	gnt	150	32	
1/2	HA3-10	c	ign	280	31	x
1/4	HB0-1	c	ign	140	40	x
f	HB2-3	c	gnt	450	40	
f	HC2-8/4	c		305	41	
f	HC3-4/2	c	gnt	510	56	
f	HC3-4/2	c	gnt	510	56	
f	HC3-0	c	gnt	340	34	
1/4	HC4-0	c	gnt	210	32	x
1/2	HG14-0		gnt	225	30	
f	K6,4-5	g	gnt	100	39	x

con	artifact	s-p	mat	wt	th	bif
f	K6,4-5	g	gnt	280	34	x
2/3	K8,1-2		gnt	560	50	x
f	K9T,4-5	g	gnt	110	60	x
f	K11T,4	g	gnt	290	34	x
f	KW4-0/2	g	gnt	390	28	x
f	S3-0	c	ls	670	39	x
f	SA 0-0	u		110	33	x
1/2	SE4-0	u	gnt	430	41	x
f	SE6-10	u	ls	230	49	x
f	SE14-0	c	gnt	240	33	
1/4	SK7-12/2	e	gnt	220	35	
1/2	U3-0	u	gnt	390	30	x
	U7-1	c	gnt	170	43	x
	U7-24	c	gnt	300	55	
1/3	U22-5/2	g		260	25	x
1/2	X1-0		gnt	310	30	x
	X1-0		gnt	310	30	x
1/2	19M2-8/56	c	ls	340	29	x
1/2	20L2-10/36	c	gnt	370	26	x
1/4	27N2 3//	c	bas	135	26	

20 CHIPPED LIMESTONE DISCS

con	artifact	s-p	wt	dia	th	ill	uk edge	bit a	bit b	bit c	bit d	edge a	edge b	edge c	edge d
f	AD 1-0	c		67	12		x			x			x	x	
w	AD 1-0*	c	10	36	8		?		x			x			
w	AD 2-0	c	365	105	30					x		x	x		
w	AD 3-0*	c	49	58	13		?		x				x		
w	AD 4-0*	c	72	14	14				x				x		
w	AD 4-35	c	35	52	10					x				x	
w	E 3-0	c	40	66	8		x				x			x	
f	EF 2-5	g	+	+	12		x				x			x	
w	HA 2-8	c	170	81	20		x		x					x	
f	HA 2-10	c	+	83	+		x			x				x	
f	HA 8-0*	c	+	+48	5						x				x
w	HB 1-3	c	73	58	17				x	x				x	x
w	HB 4-2/35	c	40	76x50	11					x		x			
w	HC 1-0	c	42	57	11		?			x				x	
w	HC 1-15	c	115	72	15		x			x				x	
f	HC 2-15*	c	+	+68	12					x					
w	HC 2-15	c	87	68	15		?			x		x			
w	K2 sf		40	55	11				x			x			
w	K2 sf		25	36	18					x				x	
w	K2 1-2*		70	55	20						x			x	
w	K2 1-2*		120	72	20		x		x					x	
f	K2 1-2*		90	62	14				x					x	
f	K2 1-2		60	45	12					x		x			
w	K2 1-2		30	47	10						x		x		
w	K2 1-2		20	40	8					x			x		
w	K3 1-2		85	64	13				x				x		
w	K3 1-2		50	51	14					x					x
w	K3 1-2		150	71	22		x		x					x	
w	K3,4 1-3		120	70	51				x				x		
w	K5,6 sf-0	u	80	66	20					x		x			
f	K5,6 sf-1	u	140+	81	22		x				x			x	
f	K5,6 sf-1	u	80	75	18		x		x				x		
w	K5,6 sf-1	u	70	60	16		x		x				x		
w	K5,6 sf-1	u	50	57	13					x				x	
w	K5,6 sf-1*	u	75	66	15		x		x			x			
w	K5,6 sf-1	u	155	70	22		x			x					x
w	K5,6 sf-1	u	40	60	12						x	x			
w	K5,6 sf-1	u	55	62	13				x				x		
f	K5,6 sf-1	u	35	54	10					x				x	
w	K5,6 sf-1*	u	40	56	12					x			x		
w	K5,6 sf-1	u	80	65	11					x			x		
w	K5,6 sf-1	u	80	58	18		x			x				x	
w	K5,6 sf-1	u	65	54	14						x			x	

20 CHIPPED LIMESTONE DISCS, (cont.)

con	artifact	s-o	wt	dia	th	ill	bk edge	bit a	bit b	bit c	bit d	edge a	edge b	edge c	edge d
w	K5,6 sf-1	u	70	60	14		x		x			x			
w	K5,6 sf-1	u	180	78	36		x	x				x			
w	K5,6 sf-1	u	120	67	21		x	x					x		
w	K5,6 sf-1	u	115	78	17		x	x				x			
w	K5,6 sf-1	u	245	83	33		x	x				x			
w	K5,6 sf-1	u	115	67	15					x			x		
w	K5,6 sf-1	u	240	80	27					x		x			
f	K5,6 sf-1	u	50	58	17		x	x					x		
w	K5,6 sf-1	u	100	64	21		x	x				x			
w	K5,6 sf-1*	u	115	67	21		x	x					x		
w	K5,6 sf-1	u	65	56	14					x					
w	K5,6 sf-1	u	45	48	13		x		x			x			
w	K5,6 sf-1	u	30	43	14		x	x					x		
w	K5,6 sf-1	u	110	70	21			x				x			
w	K5,6 sf-1	u	25	40	12				x						x
w	K5,6 sf-1	u	25	40	13				x			x			
w	K5,6 sf-1	u	65	55	16					x					x
f	K5 sf-1	u	45	61	13			x				x			
f	K5 sf-1	u	75	67	14					x					x
w	K5 sf-1	u	50	60	11				x				x		
f	K5 1-2		30	55	10				x			x			
w	K5 1-2		20	39	8				x			x			
f	K5 1-2		25	54	9			x				x			
w	K5 3	c	80	54	17				x						x
w	K5 3	c	70	60	15				x						x
w	K5,6 2-1	c	40	50	11			x				x			
w	K5 4	c	30	49	9				x			x			
w	K5,9 4-5	g	95	62	11				x	x					x
w	K6 3	c	55	61	11			x					x		
f	K6 3	c	75	70	22				x						x
w	K6 3	c	35	44	11			x					x		
f	K6 4-5		95	63	23		x	x					x		
f	K6 4-5		75	78	14			x				x			
w	K6 4-5		25	41	12				x			x			
w	K6 4-5		26	47	12					x		x			
f	K6 4-5		40	?	11					x					x
w	K6 4-5		130	85	11				x			x			
f	K6 4-5		70	75	15			x					x		
f	K6 4-5		90	73	15			x				x			
f	K8 1-2		75	65	10			x				x			
w	K8 1-2		70	62	15		x			x					x
w	K8 1-2		45	58	12			x					x		
f	K8 1-2		45	63	9					x		x			
f	K8 1-2		70	87	10			x					x		
w	K8 1-2		50	61	8				x			x			
f	K8 1-2*		30	54	9				x			x			
w	K8 1-2		170	86	15			x					x		
w	K8 1-2*		125	70	17			x					x		
w	K8 1-2		70	58	17		x		x			x			
w	K8 1-2		65	58	17			x				x			
w	K8 1-2		30	44	12					x			x		
w	K8 1-2*		35	47	8				x						x
w	K8 1-2		60	57	16		x		x			x			
w	K8 3	c	38	48	10					x					x
w	K8 3	c	30	55	10					x			x		
w	K8 4	c	30	54	8				x				x		
w	K8 4	c	160	75	22					x		x			
f	K8 4-5		75	61	20				x						x
w	K8,9 sf-1	u	50	53	12			x				x			
w	K8,9 sf-1	u	40	46	14		x	x					x		
w	K8,9 1-3*	c	30	50	16		x	x				x			
w	K9 3	c	60	68	22		x		x				x		
w	K9 3	c	160	77	20				x				x		
w	K9 4-5		35	50	13					x			x		
w	K9 4-5		65	55	13					x					x
f	K9T 4-5		75	56	14					x					x
w	K11-3		15	43	10						x				x
w	LB4 3		15	65	11						x				x
w	P2-9	u	75	65	13		?		x			x	x		
w	P2-9	u	26	48	7					x		x	x		
w	P2-18	u	85	67	17			x				x	x		
f	P2-18	u		43				x				x			
w	P2-18	u	18	38	8			x					x	x	
w	P5-18	c	43	47	15			x				x	x		
w	EF 8-3	g	33	55	7		x	x				x	x		
w	R 4-3	c	81	65	15				x			x	x		
w	R20-2	e	20	41	9			x				x	x		
w	R 8-61	c	36	54	10					x				x	
w	R 5-1	c	75	62	18			x				x			
w	S 4-0	c	28	50	8		x		x			x			
f	SA 1-1*	u	105	68	25			x					x		
w	SA 1-2	u	270	80	30		x		x					x	
w	SA 1-2	u	45	59	12			x				x			
w	SA 4-2	u	115	85	14				x			x			
f	SA 5-0	u		45	9		x	x				x	x		
w	SA 7-2	u	58	51	16			x					x	x	
f	SA 7-2	u		68	12			x					x		
w	SA 7-10/1	u	30	50	10			x				x			
w	SB 1	u	50	56	13			x					x		
w	SE 1-10	u	95	65	20		?	x	x				x		
w	SE 2-1	u	62	60	12		x	x					x		
w	SE 3-10	u	101	73	15			x				x	x		
w	SE 4-10	u	88	68	13		x		x				x		
w	SE 4-10	u	92	72	14		x		x			x	x		
w	SE 5-0*	u	61	58	16		x	x				x			
w	SE 5-0	u	48	60	16		x		x			x	x		
w	SE 5-0*	u	102	70	16		?		x				x		
w	SE 5-10	u	130	69	20		x			x			x		
w	SE 6-0	u	164	80	22			x					x		

20 CHIPPED LIMESTONE DISCS, (cont.)

con	artifact	s-p	wt	dia	th	ill	bk edge	bit a	bit b	bit c	bit d	edge a	edge b	edge c	edge d
f	SE 6-0	u	80	73	13		x	x				x			
w	SE 6-0	u	70	67	11	13:13		x				x			
f	SE 6-0	u		68±	7		?			x			x		
w	SE 6-0	u	71	60	14		x			x			x		
w	SE 6-0*	u	72	60	18		x		x	x		x	x		
w	SE 6-0*	u	21	50	11		x		x			x			
f	SE 6-0	u		49	8			x					x		
f	SE 6-0	u		45	8			x	x			x	x		
f	SE 7-0	u		95±	13			x				x	x		
f	SE 8-0*	u		70±	12				x			x	x		
w	SE 9-0	c	68	60	15		x		x				x	x	
f	SE 9-0*	c		53	11			x					x		
w	SE 13-0	c	75	56	18				x				x	x	
w	SK 3-2/2	c	148	95	10						x				x
w	T 4-5	u	155	76	22			x					x	x	
w	T 5-0	c	99	63	21		?		x			x			
w	U3-55	u	118	66	20		x		x				x		
w	U3-55/13	u	49	54	14		x		x			x	x		
w	U4-55	u	36	50	10			x				x	x		
w	U4-55	u	21	43	8			x				x	x		
w	U6-55	u	140	77	27		x		x			x			
w	U6-55*	u	150	70	21				x					x	
w	U8-0	c	115	63	21				x				x		
w	U8-61*	c	36	54	10				x			x			
w	U9-5/2	c	165	72	26		?		x				x		
w	U9-2/10	c	170	75	24		x		x					x	
w	U9-4	c	53	58	12					x	x				x
w	U17-1/1	g	138	75	18		x			x				x	
f	U18-1*	g	14	53	5					x		x			
w	Z 0-3	c	121	67	21		?		x				x	.	
w	Z 3-0*	c	105	75	16	13:12			x			x			
w	Z 4-0	c	80	66	14				x			x	x		
w	Z 15-1	g	124	75	20		x			x			x		
w	19M2 4//	c	140	77	18		x			x			x		
w	19M2-8 9//	c	95	68	21		x			x			x		
w	19M2-8 9//	c	130	66	21		x			x					x
w	19M2-8 9//	c	140	72	21		x			x				x	
w	20M2-9 8//	c	360	106	28		x			x			x		
w	20L2 39//	c	110	70	19				x				x		
w	20L2-10 14//	c	65	56	16		x		x				x		
w	20L3/10	c	30	53	9				x			x			
w	20L3 8//	c	30	54	8					x				x	
w	20L3 8//	c	90	61	20				x				x		
w	20L3 8//	c	65	61	16		x			x			x		
w	21Msf 1//	c	40	58	16					x			x		
w	270sf 1//*		120	75	16		x				x		x		
w	270sf 1//		60	57	14		x			x			x		
w	270sf 1//		30	37	19		x				x		x		
w	270-3 10//		75	59	16					x			x		
1/2	270-3 10//		370	122	27					x			x		

In the foregoing ground stone tabulations, the find-spots which include the collecting unit symbol "//" (used during the 1980 season) are interpreted as follows:

19Msf 1// = 19Msurface
19M1 2// = 19M1
19M2 4// = 19M2
19M2-8 9// = 19M2-8
19M2-9 8// = 19M2-9
19M2-11 12// = 19M2-13
19M2-23 10// = 19M2-2
19M3 2// = 19M1
19M3 7// = 19M3
19M4 11// = 19M4
19N1 11// = 19N2
19N2 4// = 19N2-4
19N2 11// = 19N2
19N2-2 1// = 19N surface and 1
19N2-4 4// = 19N2-4
19N2-7 2// = 19N2-7
19N3 6// = 19N3
19N3 7// = 19N3
19N3 11// = 19N2
19N3-9 8// = 19N3
19N3-17 10// = 19N3-17
20L 3// = 20L1
20L 16// = 20L2-12
20L 40// = 20L cleaning
20L 41// = 20L2-22
20L 45// = 20L2-8
20L 50// = 20L
20Lsf 2// = 20L surface-1
20Lsf-1 2// = 20L surface-1
20L1 3// = 20L1
20L1 5// = 20L2
20L2 10// = 20L2-3,4
20L2 16// = 20L2-12
20L2 36// = 20L3-7
20L2 37// = 20L2-33
20L2 39// = 20L2-8
20L2-8 25// = 20L2-8
20L2-8 39// = 20L2-8
20L2-9 37// = 20L2-33
20L2-10 14// = 20L2-10
20L2-10 22// = 20L2-10
20L2-10 35// = 20L2-10
20L2-11 24// = 20L2-11
20L2-13 27// = 20L2-13
20L2-15 20// = 20L3-15
20L3 6// = 20L2
20L3 8// = 20L3
20L3 46// = 20L2-10
20L3-14 31// = 20L4-14
20L-8 45// = 20L2-8
20L9 13// = 20L2-9
20L-10 14// = 20L2-10
20L11 13// = 20L2-9
20L13 27// = 20L2-13
20Msf 1// = 20Msurface
20M1 3// = 20M1
20M2 4// = 20M2
20M2 5// = 20M2
20M2 16// = 20M2-20
20M2 18// = 20M2-16
20M2 20// = 20M2
20M2 21// = 20M2
20M2-7 7// = 20M2-7
20M2-9 8// = 20M2-9
20N 8// = 20N2-9
20Nsf 1// = 20N cleaning
20Nsf-1 1// = 20N cleaning
20Nsf-3 1// = 20N cleaning
20N2 20// = 20N2
21Msf 5// = 21Msurface
21Msf 6// = 21Msurface
21M1 2// = 21M1-2
21M1-1 4// = 21M1-1
21M1-3 3// = 21M1-3
21M2 9// = 21M2
21M2-2 8// = 21M2-2
21M5 6// = 21Msurface
21Nsf 1// = 21Ncleaning
27N1 2// = 27N1
27N2 3// = 27N2
27N2 4// = 27N3
27N3 4// = 27N3
27N4 5// = 27N4
27N5 6// = 27N5
27N5 9// = 27N5
27 0 5// = 27 0 cleaning
27 0 6// = 27 0 1
27 0sf 1// = 27 0surface
27 0 1 2// = 27 0 1
27 0 1 3// = 27 0 1-2
27 0 2 4// = 27 0 2
27 0 2 5// = 27 0
27 0 2 7// = 27 0 2-8
27 0 3 10// = 27 0 3
27 0 4 11// = 27 0 4
28M5-14 3// = 28M5
28N/2-cl = 28N2cleaning
29M 5// = 29M
29M1 6// = 29M1
29M3 1// = 29M3-1
29M3 11// = 29M3
29N 8// = 29N2
29Nsf 1// = 29Nsurface
29N1 2// = 29N1
29N2-8 9// = 29N2-8
29 0 0// = 29 0 1
29 0 1 1// = 29 0 1

CHAPTER IV

PRINCIPAL FOOD ANIMALS AT ÇAYÖNÜ

by Barbara Lawrence

INTRODUCTION

Five species of artiodactyls predominate in the faunal remains at Çayönü. Of these, all but Cervus are potential domesticates. All were utilized in significantly varying quantities at different times in the site's occupation and clear-cut evidence exists for the domestication of Ovis and Capra, though not of Bos and Sus.

While the extent and origin of domestication locally have been the main focus of the faunal studies to date, the shifting utilization of wild species has also been considered. Much study remains to be done. Equus, Gazella, Ursus, and Lepus were all important parts of the fauna used, and domestic dog, though not common, was present and has been reported elsewhere (Lawrence 1967). In addition, a significant number of bones of small mammals remain to be analyzed.

The report on the faunal remains from the first (1964) season at Çayönü (Lawrence 1980) explores in detail the question of the presence or absence of domestication. The bones recovered at that time were treated as a single sample and it was found that Ovis surely and possibly Capra were domestic. On the basis of size, Hans Stampfli (in Lawrence, op.cit.: 299) reported that some Sus were also domestic.

Excavations from the following seasons (through that of 1978) on which the present report is based, have shown that several sub-phases of the main prehistoric phase existed (see Chapter 1) and that abundant domesticates only occurred in the uppermost levels of the central area* of the mound. Since most of the Ovis and Capra from the first season were recovered from these levels, 932 identified fragments, the small scattering of caprine bones coming from levels of the earlier sub-phases does not alter the conclusions reached. These conclusions have been reinforced and expanded by subsequent studies. What can be said now is that during the earlier* occupation levels, those presently referred to as the "earliest available levels sub-phase", the "grill plan sub-phase", and the

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*For Lawrence's usages, "uppermost levels of the central area" and "earlier", see the explanatory note for the figures, p.192. Eds.

"cell plan sub-phase" (see Chapter 1), and at a time when domesticated grain was already in use, the inhabitants of Çayönü depended on wild game. Sus, Bos, and Cervus were far and away the dominant animals; some Capra and a few Ovis were found, and there is no evidence that any of these were domesticated.

In the central area of the mound, this situation of plentiful wild game ends with levels in which all bone is very scarce. Above these levels, caprines appear in large numbers, with Ovis about twice as common as Capra and a sharp reduction in actual and relative amounts of the other three forms.

While the faunal composition of the uppermost occupation levels (in the central area, see below) differs markedly from that of the earlier levels, no such distinction is found between the cell and grill plan sub-phases. This is partly related to sample size. Typical cell plan buildings have much bone associated with them, the same is not true of grill plan buildings. Where bone has been found in the absence of architecture, it has not usually been possible to attribute it to either the cell or grill sub-phases. As a result, we do not presently have large enough samples from either the cell or the grill sub-phase to establish any pattern of change between the two and both agree in having a high proportion of Sus, Bos, and Cervus. Consequently, all of the early material (from contexts considered to be of the earliest available, the grill and the cell plan sub-phases) is treated in this section as constituting a single unit which I shall call the earlier levels. In the center of the mound, this includes the levels preceding certain bone-scarce levels; elsewhere on the mound, where the first building remains encountered are of the cell or grill plan, my earlier levels designation includes all the bone except that from a few near surface levels. Contrasted with this are the uppermost levels in the central part of the mound where some, at least, of the animals are domestic. In the central area, my term "uppermost levels" includes the bones from SA1 2 and 3, SB1 2 and 3, SA 4 through 8, SE 1 through 8, U 2 through 6, T 4 and 5, and P 2. Preceding these particular contexts are levels where all bone is very scarce.

In the following discussion, "caprine" refers to the combined Ovis, Capra, and Ovis/Capra material, which is sometimes referred to in the literature as "ovine".

MATERIALS AND METHODS

The following skeletons were kindly loaned for comparative purposes by the Field Museum of Natural History, Chicago:

Ovis orientalis, 26 male and 14 female from Iran;

Capra hircus aegagrus, 9 male and 5 female from Iran, 1 male and 1 female from Iraq.

In dealing with faunal material, many sorts of analysis are possible and what is undertaken depends, of course, on the archeologist's aims and priorities as well as on the resources available for the project. It is also influenced by the physical aspects of the site. At Çayönü, the condition of the soil was such that extensive screening was not practical and, while some flotation was tried, only small quantities of mostly unidentifiable fragments were found. Essentially, the mass of material recovered was the result of routine digging. The hardness of the soil meant that some pick-damage was inevitable. To the extent possible, this was minimized by keeping a specialist at the excavation to extract important pieces. The repair of broken material as soon as it was dug also contributed to enlarging the sample of diagnostic bone.

The recovered bone was solid, easy to clean after soaking, and all fragments were saved. Only the identifiable pieces were given lot numbers. The rest were bagged and kept for later study. During three of the seasons, this unidentifiable material was quantified, twice by weight and once by bulk combined with size of fragment. While no complete scrap analysis was undertaken, the usefulness of such a study was tested during the '68 season and has been reported on elsewhere (Lawrence 1978). After lot-numbering, identifiable fragments were sorted into two categories. Material which was identifiable but not needed for the present study was bagged according to locus. Material to be used in this study was sorted according to element, identified as far as possible, given an individual specimen number, and measured; the information about each piece being recorded on needle-sort cards. A necessary ingredient in zooarcheology is the capability of organizing data from particular specimens by categories of information. Methods of recording which can be used in computer analysis are efficient but such technology is neither universally available nor within the financial reach of many. Needle-sort cards are a good, easy-to-use compromise. It is not the data which varies, merely the method of handling it.

As with the selection of elements to be used, only those measurements useful for the present study were taken and only some of those are included here. Unless otherwise stated, measurements were taken between the points specified by von den Driesch (1976) but not necessarily with the calipers oriented as described by her. This is important because such differences in orientation, together with the often imprecise contours of worn bone do, in fact, lead to variations in the results obtained by different workers. As a result, while internal consistency is achievable in the measurements of faunal material from a given site, the intersite comparison of raw data is less useful. Given a similar methodology, comparison

of the results obtained is more valuable.

In addition to measurements, an important part of zooarcheological evidence is the relative abundance of the different species found. The many factors which affect the deposition and recovery of bone (see Meadow 1980) are such that an accurate estimate of the actual numbers of animals used is seldom possible. Nevertheless, useful estimates of abundance can be made and how they are arrived at is important. Influencing the choice of method is the composition and distribution of the bone sample in the mound. At Çayönü, with the exception of the astragali, calcanei, and phalanges, almost no whole bone was found; fragments tended to be small and even epiphyses were often broken. Cranial fragments were rare as were remains of fragile bone. No dumps were found and few floors and hearths. The scattering of fragments, for the most part appeared to be similar to the random accumulation of trash in abandoned houses and open areas which one finds in villages of the region today. Consequently, associated skeletal parts were almost non-existent and the possibility that identifiable pieces belonged to different animals is rather high.

In other words, while it might be expected that a total fragment count could give a reasonable picture of numbers of individuals, there are difficulties. The interspecific variation in survivability and identifiability of the skeletal parts of the five major food animals, as well as the selection of only certain parts of the carcasses of large animals to bring to the site, makes such a total fragment count only useful in comparing forms of similar size and skeletal composition, as Ovis with Capra, or Bos with Cervus. For Sus, the greater identifiability of its more numerous bones produces a misleading abundance of identifiable pieces.

There are difficulties, also, in using the standard minimum number of individuals count - abbreviated MNI. Differences (possibly culturally imposed) which have resulted in unusually high numbers of some elements of some species, limit the accuracy of such a count for some of the most abundant samples of Ovis and Capra. The same is true of the very small samples of Cervus and Bos in which percent of occurrence is more affected by chance. Neither the total fragment count nor the MNI approach gave comparable results when applied to both large and very small samples of a given species, as well as to samples which were biased by unexplained abundance of certain elements. More consistent results were obtained by counting the most frequently occurring elements for each species and dividing the sum by the number of those elements in a single entire skeleton. For Ovis and Capra, the elements used were the scapula (when it included the glenoid), the distal humerus, the proximal and distal radius, the pelvis (when it included the acetabulum), the astragulus, the calcaneus, the distal metacarpal and the distal metarsal,

and the sum total of these was divided by eighteen. For Bos and Cervus, the tibia also was included and the total divided by twenty. For Sus, the total included the tibia but not the metapodials and was divided by sixteen. The resulting number is a frequency and is here called the relative frequency - abbreviated RF. The system is based on that first used in their Suberde report by Perkins and Daly (1968:98-99). Since then Perkins and his associates have modified it somewhat, and a good evaluation of the accuracy of the relative frequency method as compared with the other two methods of estimating relative abundance is in press (Gilbert, Singer, and Perkins in press). Given the characteristics of the Çayönü fauna it is the most useful basis for calculations of relative abundance.

DESCRIPTION

Ovis and Capra

The identification of the sheep and goat remains used here was undertaken in the same manner as described for the 1964 season (Lawrence 1980:287-299). Material from the uppermost levels of the central area (see p.176) and that from the earlier levels was analyzed separately and the results compared in terms of relative abundance of species, range of size, and estimated age distribution. As stated earlier, only those skeletal elements directly related to this particular study were measured. Only a part of the identifiable material was measurable, sizes of the remaining elements were checked by comparison to make sure that no significant variations were overlooked. Comparable measurements of modern, wild Ovis orientalis and Capra hircus aegagrus were also made.

The apparent difference in size between wild Ovis and those from Çayönü reported for the 1964 season (Lawrence 1980) is not confirmed by this further study. The larger series of Ovis orientalis from Iran used in this study tends to be intermediate in size between Ovis from the uppermost and from the earlier levels at Çayönü. Geographically, and in time, the Iranian and Çayönü populations are widely separated and such differences as do occur could easily be attributable to regional variation. When comparisons of size are made between the two Çayönü populations some important distinctions can be found (see Table 1).

Statistical comparisons of measurements of both sheep and goats are hampered by the small numbers of some elements, especially from the earlier levels. Further, since the bones are of unknown sex, the effect of sexual dimorphism, which is rather large in caprines, cannot be determined. Nevertheless, certain differences are pronounced enough to strongly suggest domestication. Comparison of Ovis from the earlier and the aforementioned uppermost levels shows a decrease in size in the latter (Table 1). The differ-

ences in the means for the lateromedial width of the distal articular surface of the humerus and the anter-posterior width of the verticellus of the metacarpus are significant. This is not true of the proximodistal length of the astragalus, and samples of the other elements are not adequate for such comparison. The difference in size, though not sufficient by itself to prove domestication, strongly reinforces the possibility of its occurrence. For Capra, size comparisons are less conclusive. There is a tendency for the measured elements from the earlier levels to be larger but the differences are not statistically significant. Of more importance is the high coefficient of variation, V, in the lateromedial width of the distal articular surface of the metapodials from the earlier levels (see Table 2) and the large size of the largest of these. The measurable samples are small but the fact that animals with very wide metapodials did occur both in cell and in the grill levels is confirmed by additional, unmeasurable, similarly large specimens: two metatarsals and four metacarpals. The coefficient of variation for this width in the comparative wild series is also high, though the mean for this population shows it to be smaller sized. The fact that the wild comparative series agrees with the Çayönü material from the earlier levels in having this large variation, suggests sexual dimorphism rather than a mixed wild and domestic population. The smaller coefficient of variation in the uppermost levels probably reflects a decrease in the number of large males occurring. Such a shift in population structure, combined with the tendency towards smaller size, would suggest domestication. The presence of one very large metacarpal also suggests that some hunting continued in the aforementioned uppermost levels.

The age structure of a population is most commonly studied by making survivorship curves based on time of epiphysial union in different elements. The results are only useful in showing the abundance of animals in generalized age groups (cf. Watson 1978). The precise application of these results is further limited by the lack of studies correlating known ages in wild or early domestic caprines with time of epiphysial union. Tables of fusion, largely based on domestic breeds, have been published by various authors (especially Halbermehl 1961:119-129; Todd and Todd 1938; Silver 1963; and Sisson 1917). There is considerable variation in the ages given. An additional source of confusion in relating the tables, lies in the fact that it is not always clear whether epiphysial union is interpreted as meaning the disappearance of the epiphysial line or when the epiphysis can no longer be detached from the diaphysis. In the present paper, elements in which the epiphysial line persists are included in the unfused category. For purposes of comparison, the survivorship curves (Fig. 4.1) follow Flannery (in Hole et al. 1969:285) who derives his figures from Silver.

Sequence of tooth eruption has also been used in

estimating age, but similar problems exist. There is a lack of information on animals of known age. In addition, what constitutes eruption in terms of height of tooth above alveolar margin is not well defined. Sebastian Payne (1973) has addressed the latter problem by describing stages of wear - called Stages A-I - in the four, posterior, lower molariform teeth. The ages which he attributes to these "Stages" are again estimates, with the exceptions that those for 9-12 and 21-24 months are fixed by relating them to wear patterns in modern Turkish animals slaughtered at these ages. The suggested ages for his Stages C-H are: C, 6-12 months; D, 1-2 years; E, 2-3 years; F, 3-5 years; G, 4-6 years; H, 6-8 years. Figures showing in detail the variation at each of his Stages, make it possible to apply his criteria to other populations. When a sufficient number of jaw fragments are available, it is then possible to determine to what extent animals of similar ages were being selected for slaughter.

In the Çayönü material, because of the limited number of jaw fragments found, estimates of mortality for Ovis and Capra were based on the combined data from epiphysial union and patterns of toothwear. In order to judge how closely ages estimated from tooth wear coincide with those estimated from epiphysial union, Payne's tooth wear Stages together with epiphysial union were tabulated for the 32 skeletons of the comparative modern wild series, whose teeth were in Stages C-E. This tabulation showed that by Stage C, fusion of the distal end of the humerus was approaching completion, that fusion of the distal metapodials begins early in Stage E, and that by late Stage E a few distal radii are already fused. The difference in age at fusion between the distal radius and the metapodials appears to be less than is usually stated, and in two individuals it seems to be proceeding simultaneously. At some point in Stage F, fusion of the distal radius is completed.

When the thirty jaw fragments from the aforementioned uppermost levels at Çayönü are sorted according to Payne's Stages, the most conspicuous result is that 24% fall in Stage C at an interval which matches well the 9-12 month group (Payne 1973:298), and 38% in Stage E. The survivorship curve for the total number of caprines (Fig. 4.2) when compared with the percent of Stage C dentitions suggests a lower mortality, 17%, for this age group. That this is not necessarily so is shown by the comparative series. Here it is seen that of the four early to mid Stage C dentitions, one belongs to an animal with unfused distal humerus, the other three have reached the epiphysial line stage. The only late Stage C dentition belongs to an animal with fused distal humerus. This means that survivorship curves based on epiphysial union may fail to count some animals of about one year of age. If the three next oldest dentitions in the Çayönü mandibles, which are early D, are added to these, the mortality at the end of the first year is about a third of the population, with

most of the animals probably killed in the early winter and spring. The similarity between Ovis and Capra in the ratios of unfused to fused humeri implies the same treatment at this age.

The second group with a high mortality is in Stage E. Of these eleven specimens, five, which are similar in wear, are probably mid to late Stage E, the rest are variously younger. In the comparative series, ten out of fourteen animals with Stage E dentition had fused metapodials and fusion is found in three of the youngest. No late Stage E examples had unfused metapodials, suggesting that fusion is probably completed by about 2 1/2 years of age, as has been estimated for the survivorship curves. The mortality for caprines at this age as shown by both dentition and survivorship curves is in good agreement.

Fusion of the distal radius follows closely after metapodial fusion and, according to the four specimens in the comparative series, probably occurs from mid Stage E to early F. Survivorship curves show a high mortality during this period with only 34% of the Capra and 46% of the Ovis surviving past the time of fusion of the distal radius. That this high mortality rate continues past the time of fusion of the distal radius is shown by the small number of jaws with Stage F tooth wear. Admittedly, the series on which this is based is small but the indication is that there is a peak in mortality at age three or a little over, as represented by late Stage E and early Stage F dentitions. Kill-off patterns for older animals are difficult to estimate since late fusing elements are too scarce to be used in survivorship curves, and in addition because tooth wear in older animals is more variable. Nevertheless, based on tooth wear, it seems that few individuals, only about 17% of the population, survived beyond the fourth year.

It must be reiterated, however, that until epiphysial union and tooth wear are correlated with known age in populations comparable to those being studied, the best that can be done now is to consider sequence and to a certain extent spacing of growth changes. The sequence of tooth wear discussed here is primarily useful because of the continuity of change it describes. Epiphysial union alone, being episodic, is not so useful, and since mortality peaks do not necessarily coincide with fusion of a particular element, estimates of survivorship based only on fusion may be skewed. The combined data of tooth wear and epiphysial union from the aforementioned uppermost levels at Çayönü give a reasonably good picture of a caprine population with a high mortality in the fall and winter of the first year, and then a gradual decrease in numbers until the summer and fall of the third year, when there is a steep decline in numbers of goat but not sheep.

From the earlier levels, data on kill-off patterns is inconclusive: only six useable caprine jaw fragments are preserved and these span all of Payne's Stages from C to G.

More information is available from survivorship curves (Figs. 4.1 and 4.2) based on epiphysial union. These show that no caprines were killed during the first year, and the high percent of fused phalanges suggests that most animals survived until their second fall. For the older group, the survival rate of Ovis and Capra differs, with the mortality rate - as shown by fusion of the metapodials and radii - consistently higher for Capra than Ovis. For Capra, the abrupt decline in numbers surviving at the above mentioned times closely resembles the situation found in the aforementioned uppermost levels. For Ovis, the decrease in numbers is much less (Fig. 4.2). These apparent differences must be viewed with caution because of the small size of the Ovis sample and because, relatively, Capra radii are unexpectedly few.

Relative Abundance of Species in the Specified Uppermost and in the Earlier Levels

Two aspects of abundance will be considered. One is the relative abundance of Ovis, Capra, Bos, Cervus, and Sus in the aforementioned uppermost and the earlier levels (Figs. 4.3-4.8), and the other is the localized distribution of species or elements in either of these contexts. Fundamental to an understanding of any such quantification of faunal data from archeological sites is the fact that only a small piece of the original evidence will survive and find its way into the zooarcheologist's hands. Statements of abundance are at best approximations, and their value lies not in any precision of numbers but in their use as a basis for computing percentage differences of various sorts. No single, best method for making such species counts exists. The procedure used must depend on such things as the amount of bone, the comparability of different segments of the collection, its documentation and in the ways in which the sample is biased. For reasons discussed earlier, relative frequency, RF, figures have been used here. The comparisons and conclusions drawn are based on percentages derived from these.

Relative abundance of the five major food animals in the earlier and in the aforementioned uppermost levels is very different. Caprines, which account for only 23% of the sample from the earlier levels, have increased to 80% in the aforementioned uppermost levels, with a corresponding decrease in the other three forms. There is also a change in the relative importance of Ovis to Capra. In the uppermost levels, as defined earlier, (p.176) Ovis is about twice as numerous as Capra, with a Capra to Ovis relative frequency ratio of .47. The most abundant element of each is the left astragulus (see Figs. 4.3 and 4.4). Neither the abundance nor the preference for the left side is correlated with any particular area or find spot. In addition to the astragali, the distal humeri of Ovis, but not of Capra, are more numerous than chance alone would

account for, and their random distribution parallels that of the astragali. Although the proximal radius fuses at about the same time as does the distal humerus, it is much less numerous. In the case of Ovis, there are about a third as many proximal radii as there are distal humeri, while for the total caprine sample the proportion is about half. This is in contrast to the situation in the wild caprines from Yafteh Cave (Flannery pers. comm.) where proximal radii were about twice as numerous as were distal humeri.

In the earlier levels, which had a much smaller caprine population, Capra was about twice as abundant as Ovis, with an Ovis to Capra ratio of .55. As in the uppermost levels I have specified, the numbers of distal humeri and astragali were disproportionately great for both species, with the number of proximal radii few in comparison to the distal humeri. There is, however, no significant difference in the number of left and right elements, and whole carcasses were apparently also being used.

Relative abundance of the other three artiodactyls also differs in the earlier and in the specified uppermost levels. Based on relative frequency, Bos and Cervus together account for 32% of the sample in the earlier levels, in contrast to 4% in the uppermost levels. The sharp decline in numbers of Bos at the time when domestic sheep and goat appear is good evidence that cattle were not already domesticated. If they had been domesticated, it would be expected that they would have continued as important components of the fauna used. Additional evidence that the cattle were wild is provided by a comparison of the percentages of the different elements of the skeleton found in the earlier and the above mentioned uppermost levels.

In their discussion of possible domestication at Suberde, Perkins and Daly (1968:104), by analogy with accounts of the bison-hunting Indians of the American West, have shown that high percentages of foot bones indicate that animals were not killed adjacent to a site. When hunting was done at a distance, large animals were butchered where they were killed. Most of the leg bones, which are heavy, were abandoned and the meat and hides, with some of the foot bones attached, were dragged back to the settlement. It is interesting that, in the specified uppermost levels at Çayönü, 88% of the cattle bones recovered were foot bones. This is very close to the percent reported at Suberde - a site only a little more recent than Çayönü - for the wild cattle found there.

A slightly different comparison of numbers of elements of Bos in the earlier and in the aforementioned uppermost levels at Çayönü shows that phalanges especially - as distinct from all of the foot bones - are relatively more numerous in these uppermost levels where they comprise 72% of the sample, as compared with 55% in the earlier levels.

This concentration of toe bones, together with the decrease in total numbers of Bos found, suggests that in the late stages of the prehistoric occupation of Çayönü, cattle became scarcer locally and hunters had to go farther afield to find them. The percentages from the earlier Çayönü levels, when it seems reasonable to assume that Bos were closer at hand, show a higher proportion of leg bones, exactly as would be expected when hunters were not constrained by weight and distance in transporting a kill. Domestic cattle slaughtered at Çan Hasan show very similar percentages of leg and foot bones (Perkins and Daly, ibid. to those of the Çayönü Bos from the earlier levels. This suggests that in the prehistoric Near East a large number of leg bones, as compared with foot bones, can be as much a reflection of closeness to the place of utilization as it is of domestication.

For Cervus, also, the percent of phalanges in the specified uppermost levels, 45%, is greater than in the earlier levels, 32%, though the difference is less than in Bos. The figure for these uppermost levels must be viewed with caution because the total number of Cervus bones recovered was so few.

Throughout the occupation, Sus was an important food animal. In the earlier levels, it is by far the most abundant species recovered (see Fig. 4.6) and accounts for 45% of the total. The decrease to 15% in the aforementioned uppermost levels suggests that Sus had not been domesticated. As already mentioned, Stampfli, in analyzing the 1964 material (Lawrence 1980:299) believed that some of the Sus were too small to have been wild. This was on the basis of comparison with European material. Whether or not Turkish and European wild pigs were the same size is uncertain. Nor do we know whether present populations of Turkish wild pig, available for comparison, are descended in part from pre-Mohammedan domestic animals gone feral. Because of a projected comprehensive study of Sus from the Near East by C.A. Reed, no detailed study of the Çayönü Sus material has been undertaken here.

Species abundance, as seen in an excavation, though a useful indicator of animal population shifts, does not by itself provide information on what kinds of meat were most important in the diet of an ancient settlement. Total meat consumption as shown by Guilday (1970) is not accurately determinable from the faunal remains of an archeological site. Percentages of major protein sources and changes in these are, however, important and possible to estimate. For this, the weight of meat per carcass, not the number of individuals utilized, has to be estimated. Such estimates, in the absence of precise information for animals of known age and sex, are at best approximations. As such, the weights used by Perkins and Daly (1968:100) are a good basis for comparison. Multiplying these weights by the relative frequencies for each species gives the results shown in Table 4. The figures in this table

emphasize the fact that, although nearly a quarter of the remains from the earlier levels were caprine, they provided only 6% of the protein consumed, whereas 61% of the protein came from Bos and Cervus. In the aforementioned uppermost levels, by which time the caprines accounted for 50% of the protein used, Bos still accounted for 18%. Evidently, Bos was important and available enough to make hunting at a distance worthwhile. The relatively greater decrease in Cervus, which may have been more forest dependent, suggests that areas near the site may have been increasingly heavily cultivated. The combination of cultivation and a need for wood may have decimated nearby forested areas.

A clearing and drying-out of the countryside may also account for the decrease in Sus in the uppermost levels. Pigs are adaptable feeders, but they need forest litter or soft ground in which to root. Dry, sun-baked fields and a reduced stream without marshy edges - as seen at Çayönü today - is not a favorable habitat for pigs. Earlier, the landscape must have been wetter; a beaver jaw from the earlier levels is evidence of a deeper river, or ponds and marshes at that time.

Fauna from Building Remains of the Typical Cell Type Plan

As stated above, while much of the combined sample of bones from the earlier levels is not attributable to either the cell or the grill sub-phases, a rather large complex in the westerly area of the mound deserves further comment. This consisted - as of the end of the 1978 season - of a group of four typical cell building remains, each with several occupation levels variously superimposed. Three of these surrounded a well-defined, apparent courtyard.

The western area's interest, as regards the faunal remains, lies in the fact that the abundant bone found there was not randomly distributed but tended to be concentrated in particular areas, either according to species or to particular parts of the skeleton. In addition, much of the worked bone was recovered from the western area. In 1978, three sets of house remains, HB, HC, and HD, and the open space between them were excavated. This open space, which will be referred to in the following as a courtyard, had a pebbly pavement and two hearths, and it was in the courtyard that the major part of the bone from this complex was found. Sixty percent of the identified fragments and 17.18 kgs of the scrap came from the courtyard as compared with forty percent of the identified fragments and 5.34 kgs of scrap from the three houses. Worked bones were also abundant in the courtyard. These were predominantly flat pieces, which might have been made from ribs, and piercing tools, which might have been needles or awls made from shaft fragments of various sized animals.

The faunal accumulation found within the HB and the HC house remains differed in interesting ways. In the third level of the HB house, most of the bone was concentrated in HB 3-11, with half of the scrap by weight occurring there. Of the identifiable fragments, all of the Ovis, Ovis/Capra and Sus as well as three of the five Bos phalanges were found in HB 3-11. No worked bone was found in any of the cells of this third level HB house.

In the second level HB house, the total weight of scrap was about the same as that from HB 3, with the fragments more evenly distributed. Only two identified pieces were found, each in a different cell.

The situation in the case of the HC house was quite different. The total amount of bone, in the nine cells of the HC level 4 house, was more than twice as much as in either of the second or third level HB houses, and nearly a third of this amount was found in one cell, HC 4-5/14. Identified fragments were also concentrated there and were found in two closely associated groups. The most interesting of these consisted of five unworked scapulae (two left and two right of Cervus and one left of Sus). Given the fact that there are no worked scapulae, except for a single counting bone, presently identified from the site, one wonders what the purpose of such a concentration would be. As compared with HB, the HC building remains also differed in the species represented. The most numerous bones were those of Sus which occurred in five of the cells and, in at least one cell, two individuals were represented. The only two Ovis bones found were in one cell and no Capra or Ovis/Capra were found. As in HB, the most numerous bones were Bos phalanges, which were found in four different cells. Worked bone was also wide spread and was found in all except one cell. Of particular interest was the occurrence in HC 4-5/14 of eighteen pieces of worked antler, as well as two other bone tools.

These differences in the faunal contents of the two houses suggest that the total bone sample, including scrap, needs further detailed study, and that all the bone could profitably be fitted into the larger context of other finds from each house.

HD, an incomplete structure of which only two cells had been excavated, as of 1978, contributed no additional information on the variation of bone material in the houses.

For purposes of comparing the identified bone found in the courtyard with what was found inside these buildings, all material from inside the HB, HC, and HD cell houses, whether or not assignable to particular cells, was used. As has already been remarked, there was a much greater quantity of bone found in the courtyard than in the houses. In addition, distribution by species and elements differed. Ovis, which is in general about half as abundant as Capra in the earlier levels, is here only a

quarter as abundant, with most of the bones found in a single cell. In the courtyard, only one first phalanx and one pelvic fragment of Ovis were found. Capra, on the other hand, though scarce inside the houses, is as numerous as Bos and Cervus outside. A concentration in the courtyard of fore-limb elements of Capra, which included six fused, proximal radius and ulna pieces, suggests that there was some special use intended for these bones.

Distribution of skeletal parts inside the cell houses and outside in the courtyard was also different in the case of Bos and of Cervus. Leg bones of Cervus were about equally numerous inside the houses and outside in the courtyard. However, of a total of ten Bos bones, only one came from within a cell. Foot bones, on the other hand, were about equally numerous for Bos inside and outside of the houses whereas Cervus bones were scarce inside the houses.

The cluster of houses around an apparent courtyard where much activity went on is not yet duplicated in other areas. The single sequence of cell plan remains in the AD exposure, with various different occupation levels, includes an external pavement which is not entirely comparable with the courtyard in the H area. Furthermore, large amounts of burnt kerpiç in and around the sequence of AD building remains, make it difficult to relate the bone in these contexts directly to the architecture. Nevertheless, here as in the H complex, most of the bone, at least two thirds of the scrap and three quarters of the identified fragments, come from outside of the building remains. A significant difference between the AD and the H areas is the preponderance of Bos and Cervus found in AD, and the relatively large number of Capra found in H (see Table 3). Apparently the utilization of species in different parts of the typical cell sub-phase occupation levels differed, although the sample from AD is too small for positive conclusions.

DISCUSSION

In considering the age structure of an animal population, a high percentage of animals that were killed before one year of age has been used by many authors as an important criterion for domestication. While it is true that wild populations (cf. Buechner 1960:82-85, and Flannery, in Hole et al. 1969:281-286) do not show such a high mortality for this pre-one year age group, a low mortality for this age group does not necessarily prove that the population was not domestic. For instance, Wheeler's survivorship curves for domestic caprines from Tepe Tula'i resemble Flannery's for the wild, hunted population from Yafteh Cave in Luristan much more closely than they do the curves for domestic caprines from pre-pottery Bus Mordeh, Khuzistan (see Fig. 4.1). More important in separating wild from domestic is the high mortality in early domestic populations after age three. Equally

important is evidence, such as that from the tooth studies at Çayönü, that animals of particular ages were being selected for slaughter. Such a non-random pattern would not occur in a hunted population.

Scrutiny of Flannery's "survivorship curves" for both wild and domestic forms (in Hole et al. 1969:285) and Wheeler's (1975:279) as well as those from Çayönü shows a wide range of variation in survival at different ages during the first three years. Since these curves are based on epiphysial union not tooth wear, they do not show kill-off patterns in detail: what they do imply, as discussed by Wheeler (loc.cit.) are differences in herding practices and in the utilization of animals.

At Çayönü, by considering Ovis and Capra separately, it has been possible to determine that treatment of the two must have been much the same until two and a half years of age. After that age the high mortality of Capra is typical of early domestic caprine populations, while Ovis shows no such trend. Admittedly the sample for Capra is small, but that for Ovis is by no means negligible. Coupled with the rather sudden appearance of Ovis, and no evidence of earlier attempts to domesticate it locally, suggests that domestic sheep may have been introduced together with new uses for their products. This resulted in the animals being kept until an older age.

SUMMARY

As of the end of the 1978 season, we find that clear evidence for the domestication of animals occurs only in the uppermost levels of the available exposure on the more northerly portions of the central area of the mound. The recovered sample of bone is large, uniform in species composition, and rather evenly distributed over the area in question with no particular relationship to architectural remains.

In contrast, the combined sample of wild fauna from the earlier levels shows no such homogeneity. It comes from widely scattered areas all over the mound and was recovered from at least two sub-phases, the grill plan and the cell plan. Within these sub-phases, there are well-defined differences in the deposits of bone found in particular places. These differences may be in localized species abundance, as in the H area, or in the relation of amounts of bone to architectural features.

In considering the antecedents of domestication at Çayönü, it is important to consider what followed the earlier levels in which the fauna was wild. As of the end of the 1978 season the evidence was scanty. In the central area of the mound, the exposed levels between the earlier and the uppermost levels have very little bone of any kind. In other parts of the mound, with one possible exception,

- AD 2 - the first levels encountered had the faunal assemblage typical of the earlier levels. The exception, AD 2, had a small collection of thirty-five fragments consisting of nine Ovis, four Capra, seven Ovis/Capra, seven Bos, six Cervus and two Sus bones. While the high percent of caprines is worth noting, no conclusions can be drawn from this small collection until more excavating is done in adjacent areas. Underlying AD 2 are levels in which caprines are few and Bos and Cervus predominate.

From the evidence presently at hand, there is no indication that the inhabitants of Çayönü were gradually developing herding skills. Domestication seems to have appeared relatively suddenly (given the presently available evidence in the central area of the mound) and goats, the most commonly used of the two caprines in the wild fauna, declined in importance with the appearance of domestic sheep. That the practice of herding was introduced together with flocks of domestic sheep is further suggested by significant skeletal differences in Ovis from the central area's uppermost levels as against those from the earlier levels. The Capra population, on the other hand, showed no such pronounced differences.

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EXPLANATIONS FOR THE FIGURES

Fig. 4.1 Survivorship curves for early caprines based on ages for epiphysial union used by Flannery (Hole et al. 1969), showing the Çayönü caprine samples compared with Flannery's samples from Yafteh Cave, from the Bus Mordeh and Mohammed Jaffar phases at Ali Kosh, and with Wheeler's sample from Tepe Tula'i
A - distal humerus; B - first phalanx; C - distal tibia; D - distal metapodial; E - distal radius

Fig. 4.2 Survivorship curves for Çayönü caprines: Ovis and Capra compared with each other and with the combined caprine sample (A,B,C,D, and E, as in Fig. 4.1, above)

Fig. 4.3 Comparison of the abundance of Ovis elements from the *earlier** and the uppermost* levels at Çayönü.

Fig. 4.4 Comparison of the abundance of Capra elements from the *earlier** and the uppermost* levels at Çayönü

Fig. 4.5 Comparison of the abundance of the total of all Ovis, Capra, and combined Ovis/Capra elements from the *earlier** and the uppermost* levels at Çayönü

Fig. 4.6 Comparison of the abundance of Sus elements from the *earlier** and the uppermost* levels at Çayönü

Fig. 4.7 Comparison of the abundance of Bos elements from the *earlier** and the uppermost* levels at Çayönü

Fig. 4.8 Comparison of the abundance of Cervus elements from the *earlier** and the uppermost* levels at Çayönü

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* In Lawrence's usage, the word "*earlier*" includes materials from all three of the earlier Çayönü sub-phases, as known through 1978, and is set in italics to distinguish it from the more restrictive term "earliest available levels sub-phase" (see p.7). Also, since she restricts her use of the term "uppermost" to materials coming from the particular contexts she notes on p.176 we have tended in the text to use such qualifying words as "aforementioned" or "specified" before her "uppermost" to emphasize her more restrictive use of the term "uppermost". Eds.

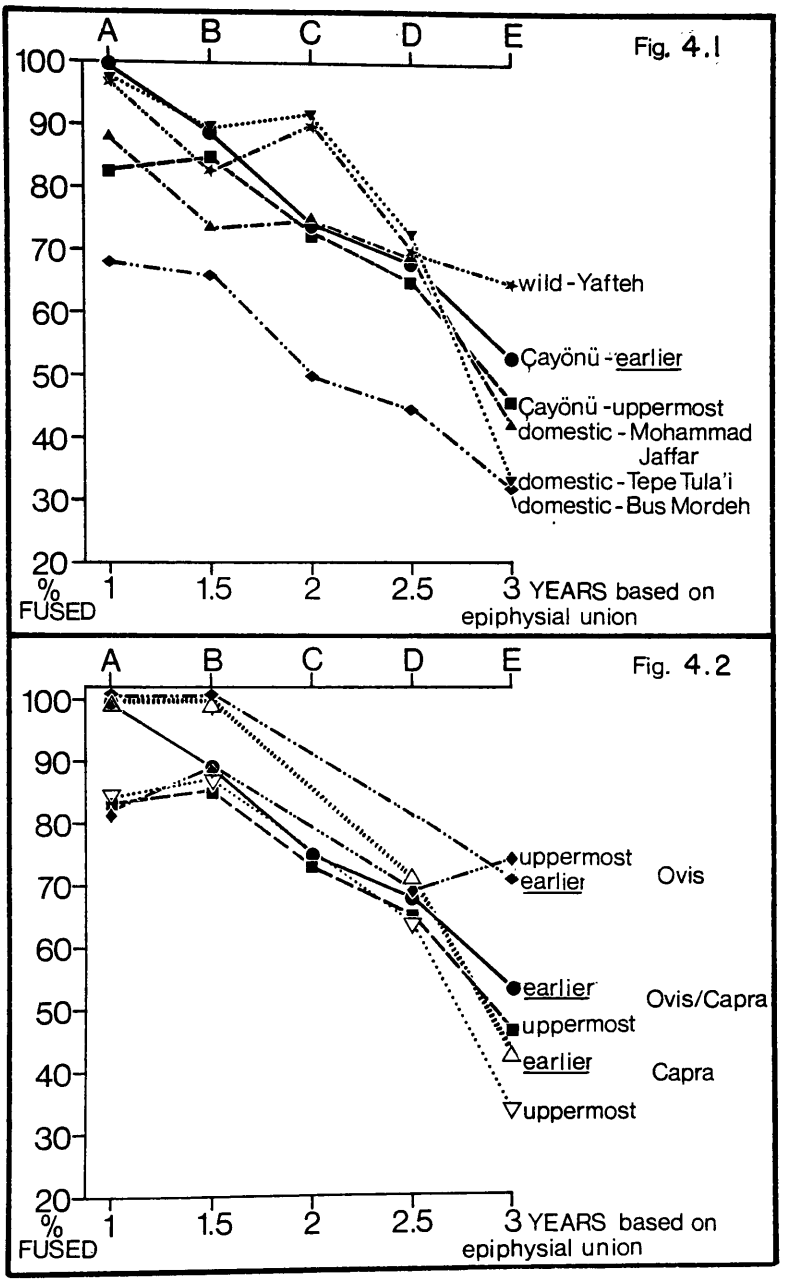

Fig. 4.1 Survivorship curves; early caprines from various sites

Fig. 4.2 Survivorship curves; caprines from Çayönü

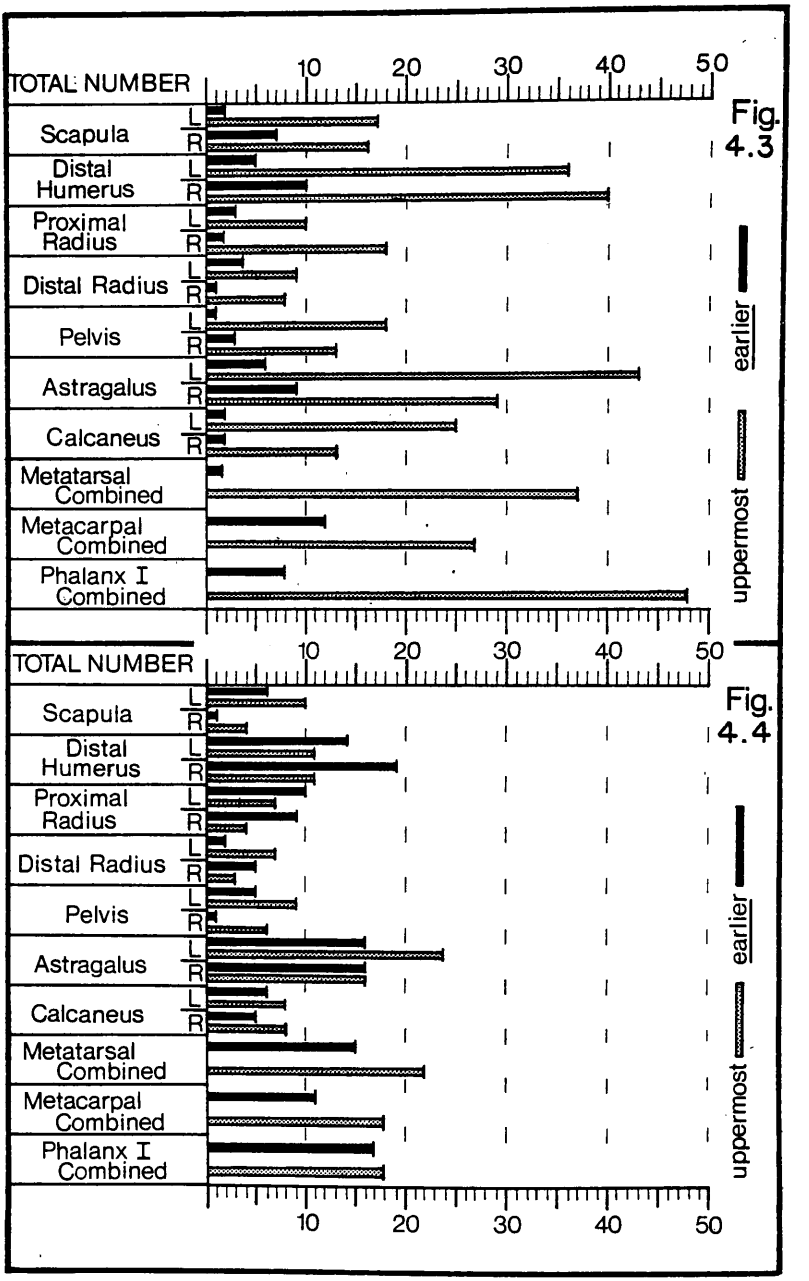

Fig. 4.3 Comparison of abundance of Ovis elements

Fig. 4.4 Comparison of abundance of Capra elements

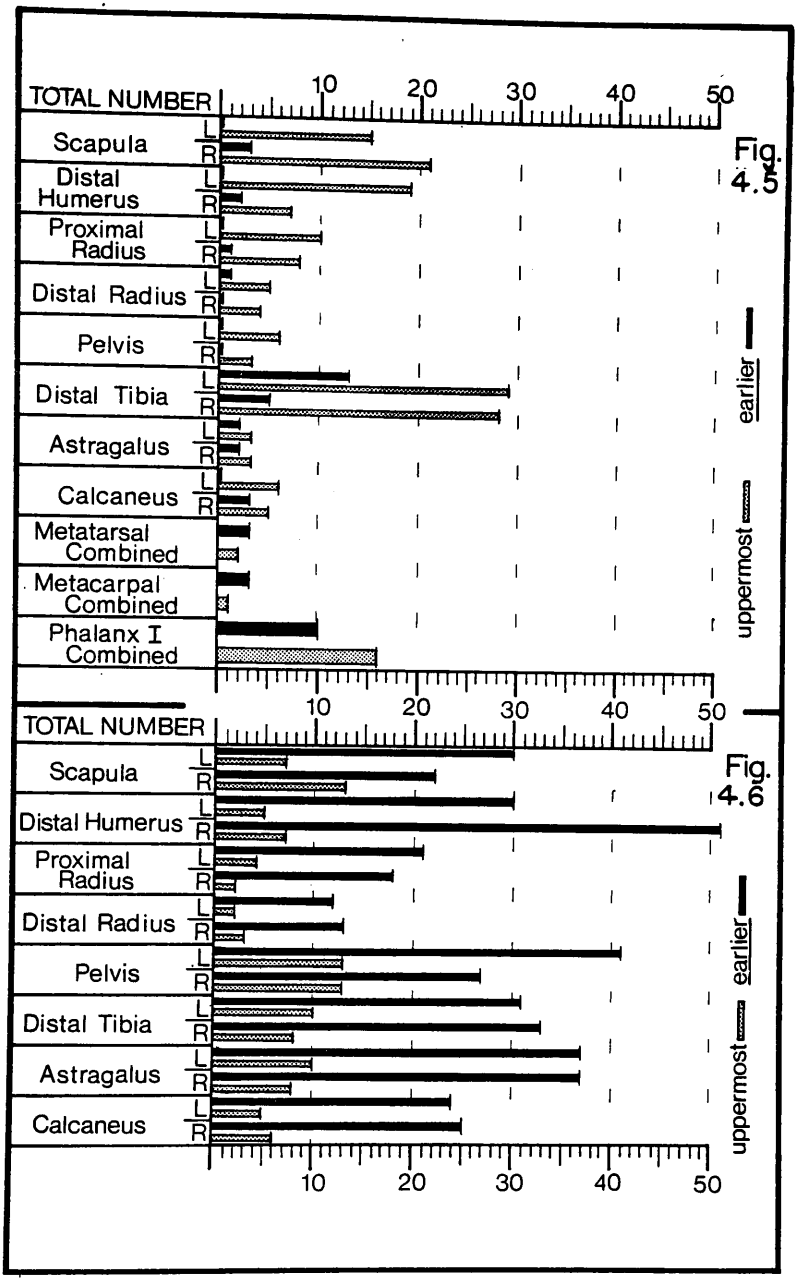

Fig. 4.5 Comparison of abundance of elements; Ovis, Capra, and combined Ovis/Capra

Fig. 4.6 Comparison of abundance of Sus elements

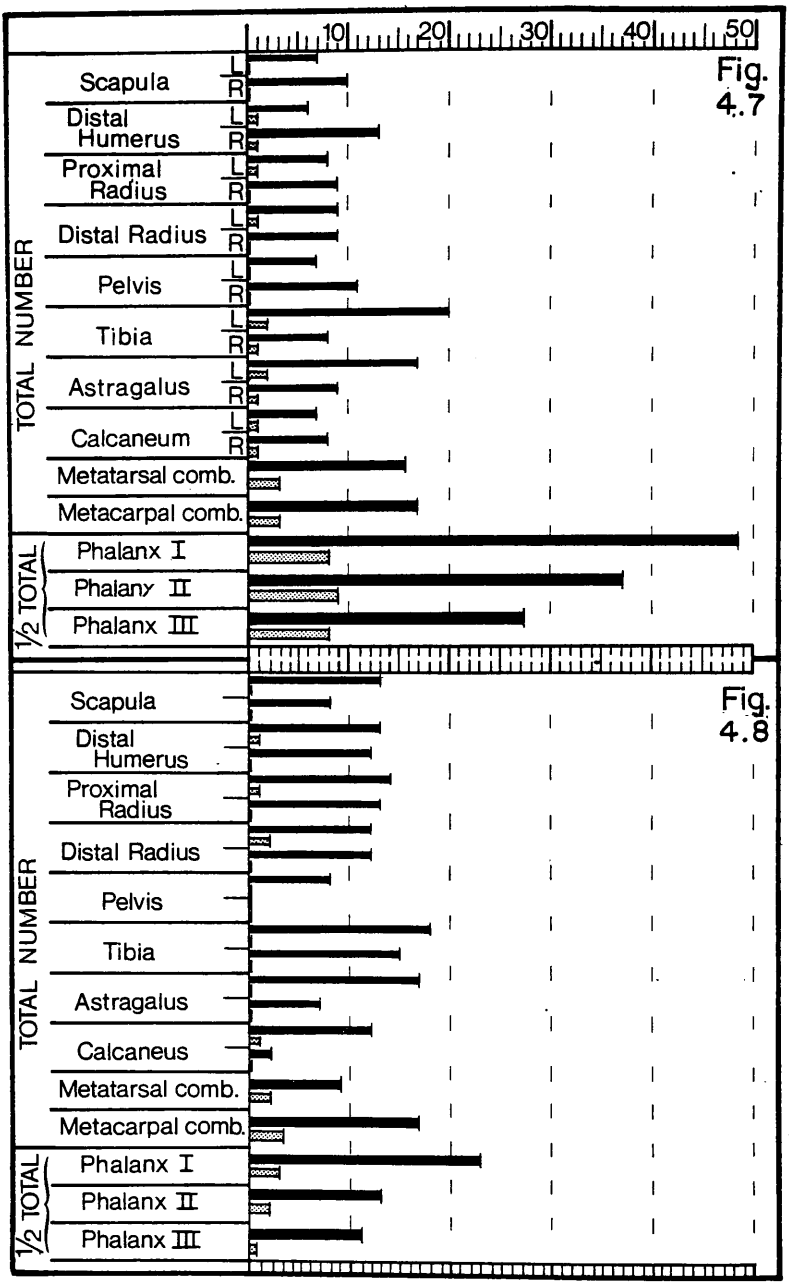

Fig. 4.7 Comparison of abundance of Bos elements

Fig. 4.8 Comparison of abundance of Cervus elements

Table 1 Measurements of Ovis (in mm)

Elements	Der	N	OR	M	SD	V
Humerus, dist	U	64	24.4-33.2	29.16± .22	1.73	5.93
	E	14	28.6-36.7	32.69± .64	2.40	7.34
	W	40	26.1-35.1	31.09± .37	2.31	7.43
Radius, prox	U	20	26.4-32.8	29.58± .43	1.94	6.56
	E	5	28.4-35.2	30.70±1.07	2.40	7.78
	W	40	24.6-34.6	30.89± .34	2.15	6.96
Radius, dist	U	14	22.5-27.1	24.94± .41	1.54	6.18
	E	5	29.2-35.3	30.90±1.01	2.27	7.35
	W	40	21.4-28.9	26.00± .31	1.93	7.42
Astragalus, lateral	U	67	26.8-33.7	29.40±1.80	1.50	5.10
	E	8	28.0-35.0	30.22± .80	2.25	7.44
	W	40	26.2-34.9	31.08± .30	1.90	6.11
Metacarpal, dist artic surface	U	5	25.0-27.9	26.14± .48	1.07	4.09
	E	3	27.5-31.6			
	W	26	24.9-29.9	27.23± .29	1.47	5.40
Metacarpal, verticellus	U	19	15.0-17.4	16.40± .16	.71	4.33
	E	10	17.4-20.0	18.30± .31	.99	5.40
	W	40	15.2-20.1	17.84± .19	1.23	6.89
Metatarsal, dist artic surface	U	15	23.4-27.2	25.35± .31	1.20	4.73
	E	1	2.57			
	W	26	24.5-29.3	26.95± .28	1.45	5.38
Metatarsal, verticellus	U	32	14.7-18.3	16.67± .17	.93	5.58
	E	2	16.2,16.9			
	W	40	15.1-20.4	17.78± .22	1.37	7.71

Abbreviations for Tables 1 and 2:
Der= derivation; N=number; OR= range of variation; M= mean ± the standard error of the mean; SD= standard deviation; V= coefficient of variation; U= specified uppermost* levels; E= earlier* levels; W= comparative modern wild series, combined male and female; dist- distal; max= maximal; artic= articular

All measurements for Tables 1 and 2 were taken as follows:
Humerus, distal= maximum lateromedial width of distal articular surface not including hordeolum;
Radius, proximal= lateromedial width of articular surface taken at midline;
Radius, distal= maximum lateromedial width of distal articular surface;
Astragalus, lateral= maximum proximodistal length laterally and parallel to main axis of bone;
Metacarpal and metatarsal, distal articular surface= maximum lateromedial width;
Metacarpal and metatarsal, verticellus= maximum anteroposterior width of verticellus taken with calipers parallel to main axis of bone

* See note on p.192

Table 2 Measurements of Capra (in mm)

Elements	Der	N	OR	M	SD	V
Humerus, dist	U	21	29.9-38.0	33.12± .68	3.10	9.35
	E	32	30.4-40.3	35.39± .62	3.48	9.83
	W	14	26.7-37.9	32.28± .92	3.44	10.66
Radius, prox	U	4	29.3-35.5	31.40±1.22	2.43	7.74
	E	18	28.6-41.1	33.38± .88	3.72	11.14
	W	13	26.6-37.1	31.90± .88	3.18	9.97
Radius, dist	U	8	24.7-31.6	28.80± .66	1.87	6.50
	E	5	27.9-30.0	28.18± .35	.79	2.61
	W	11	25.0-33.0	28.96± .83	2.74	9.46
Astragalus, lateral	U	35	27.3-34.4	30.22± .30	1.77	5.86
	E	31	26.9-35.8	31.70± .37	2.08	6.56
	W	13	26.1-32.1	29.85± .49	1.78	5.96
Metacarpal, dist artic surface	U	6	27.5-34.0	29.80± .87	2.12	7.11
	E	5	29.0-38.8	32.30±1.77	3.97	12.30
	W	12	24.1-33.8	28.68± .95	3.27	11.40
Metacarpal, verticellus	U	13	16.7-21.0	18.20± .33	1.19	6.53
	E	9	16.0-26.3	19.30±1.59	1.89	9.79
	W	14	15.4-19.6	17.73± .38	1.41	7.95
Metatarsal, dist artic surface	U	15	23.4-27.2	25.35± .31	1.20	4.73
	E	20	14.7-17.9	16.60± .21	.93	5.58
	W	13	22.8-31.0	26.80± .81	2.91	10.86
Metatarsal, verticellus	U	15	16.5-20.2	18.52± .39	1.50	8.10
	E	11	16.6-21.0	18.48± .55	1.81	9.79
	W	13	14.5-19.0	16.94± .42	1.50	8.85

Table 3 Relative frequency of animals in the AD and H areas

	H area		AD area	
	R.F.	o/o of sample	R.F.	o/o of sample
Bos	3.0	14.7	1.85	32.0
Cervus	4.3	21.0	1.80	31.0
Ovis	1.1	5.4	.22	3.8
Capra	4.2	20.7	.33	5.7
Sus	7.8	38.2	1.56	27.0

Table 4 Relative Importance of Major Food Animals

	Uppermost Levels*			Earlier Levels*		
	R.F.	o/o of Sample	o/o of Protein	R.F.	o/o of Sample	o/o of Protein
Bos	1.05	2.8	20.8	9.3	15.4	49.5
Cervus	.60	1.6	2.6	10.7	17.7	12.5
Ovis	19.90	52.0	30.5	4.3	7.0	1.8
Capra	9.30	24.0	14.2	7.7	12.8	3.2
Sus	7.25	19.0	31.7	28.2	46.8	33.0
(using only differentiable Ovis and Capra)						
Bos	1.05	2.2	18.2	9.3	14.8	49.0
Cervus	.60	1.3	2.3	10.7	17.0	12.4
Caprine	38.80	81.3	51.8	14.8	23.4	6.0
Sus	7.25	15.2	27.7	28.2	44.7	32.6
(including undifferentiable Ovis/Capra for total Caprine)						

Explanations for Tables 3 and 4

Relative frequency (R.F.):

For Ovis and Capra = total number of identified fragments of scapula, distal humerus, proximal and distal radius, pelvis, astragalus, calcaneus, distal metacarpals, and distal metatarsals, divided by 18

For Bos, Cervus, and caprines = as above, but including tibia and divided by 20

For Sus = as for Bos, but not including metapodials, and divided by 16

Percentage of sample = occurrence based on relative frequency

Percentage of protein = protein available from major food animals. These approximations are based on the following estimated pounds per species: Bos, 1000; Cervus and Sus, 220; Ovis and Capra, 77 - these numbers are then multiplied by the relative frequency value for each

* See note on p. 192