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Harappa 1989: Summary of the Fourth Season

George F. Dales and J. Mark Kenoyer

Harappa has the distinction of being the site where the initial discovery of the Indus Civilization was made (Vats 1940). The potential importance of the site for extended research was dimmed by two factors: first, the devastation imposed on the architectural remains by nineteenth century brick robbers and, second, the more spectacular results of the excavations being conducted at Mohenjo Daro (Marshall 1931; Mackay 1938). But Harappa's fortunes improved in 1937 with the discovery of the first known Harappan period cemetery by K.N. Shastri. Subsequently, R.E.M. Wheeler directed excavations in the cemetery area and along the western edge of the so-called citadel, Mound AB (Wheeler 1947, 1968). Then, in 1966, Dr. Mhd. Rafique Mughal of the Department of Archaeology, conducted further excavations in the Harappan cemetery R37 (Mughal 1968).

The decision to reopen excavations at Harappa was based on our interest in learning more about the physical and cultural development and function of a major urban settlement of the Indus period. Fortunately, Harappa is located in an area where the water table is substantially lower than the surface of the ground. Thus the site does not provide the same physical barriers to new excavations as does Mohenjo Daro, and the entire material history of the city can be investigated. The presence of one of the few known Indus period cemeteries in either Pakistan or India was a second incentive. And third, the discovery of sherds of the so-called Early Harappan period by Wheeler pointed to the possibility of locating a pre-urban settlement and discovering new evidence bearing on the origins and early

development of the Indus civilization. The initial license, issued in 1986, has been extended through 1991.

For a comprehensive preliminary report on the third season's work, including a summary of the work in the Harappan cemetery conducted during the second and third seasons, see *Pakistan Archaeology* (Dales and Kenoyer 1990). What follows is a summary of the fourth season, January-April 1989, with emphasis on the excavations on Mound E and on the studies of the pottery and figurines.

We wish to thank the Department of Archaeology, Government of Pakistan, for its cooperation and assistance, especially the Director-General, Dr. Ahmed Nabi Khan, and the curators at Harappa, Mr. Mhd. Siddique and Mr. Makhin Khan. Major support for the project has been provided by the Smithsonian Foreign Currency Program, the University of California at Berkeley, the University of Wisconsin at Madison, and several private contributors.

The work during the 1989 season was assisted by Mr. Qasm ul-Qasmi (Dept. of Archaeology Representative); Mr. Tariq Masood and Mr. Shahbaz Khan (Lahore Museum); Barbara Dales (Administrative Assistant/Registrar); Ms. Harriett Beaubien (Conservator); Dr. Richard Meadow (Zooarchaeologist); Ms. Charlotte Schmid-Maybach (photographer); Ms. Dawn Morton (Illustrator); Dr. Rita Wright (Ceramicist); Dr. Massimo Vidale (Is.M.E.O., Rome); graduate students Rose Drees and James Knight of University of Wisconsin-Madison, and Chris Jenkins of University of California-Berkeley, and Pakistani students from Shah Abdul Latif University (Khairpur) and Punjab University (Lahore).

Excavations on Mound E

J.M. Kenoyer

In addition to the overall objective of obtaining new information on the cultural and structural development of Harappa, other specific questions are being investigated. For example, we are focusing on the development of civic organization and control, occupational specialization, and social stratification (Jacobson 1988; Kenoyer 1989; H.T. Wright 1986). In the absence of written documents, such questions can be addressed through horizontal excavations of areas where we can document changes through time in the patterning of architecture and specific classes of artifacts.

Here we will discuss two major categories of data: architecture and the spatial distribution of activity areas. Although the current excavations represent only a small area of the vast urban settlement, they demonstrate that it is possible to learn something concrete about cultural and structural developments at Harappa on the basis of selected excavations. Furthermore, in conjunction with new information from sites such as Mehrgarh-Nausharo (Jarrige 1986, 1988), Rojdi (Possehl and Rava 1989), Kotasi (Bisht personal communication), and Dholavira (Bisht 1991), these data will be important for developing new interpretations of the rise of urban, state-level society in the subcontinent.

General Background of the Excavations

Mound E dominates the southeastern quarter of the mounded site at Harappa. Its elevation at the northwestern corner is 172.8 meters AMSL, slightly lower than Mound AB. The eroded surfaces of the central and eastern parts of the mound appear to represent either major streets or brick robbing tunnels.

In 1986 we conducted a detailed surface survey of the entire mound prior to selecting areas for excavations. This survey revealed that, although parts of the mound are pitted by historical and modern digging, the eroding perimeter of the mound provides a wealth of information. In various areas we were able to identify craft activities such as shell working, chert processing, and copper processing, as well as chert drills and used blades that may be related to wood working and various domestic activities. Also observed were numerous traces of baked brick architecture and massive mudbrick structures that appear to be remains of platforms.

The northwestern corner and western edge of the mound were selected for excavation (Figure 1). Traces of massive mudbrick platforms, brick walls, a ceramic production area, and pottery of both the Mature and Late Harappan periods indicated the potential importance of this area. A large step-trench was excavated down the western slope of the mound, and horizontal exposures were made on both the top and the base of the mound in areas adjacent to the trench. North of the large trench, another trench was opened to expose an area of ceramic production.

This northwestern edge of Mound E provides a sequence of distinctly stratified deposits and architectural features that allow us to follow the cultural changes from the Early Harappan settlement on natural soil to the Late Harappan occupation associated with Cemetery H. The following discussion will describe first the deposits inside the perimeter of the mound and, second, the complex series of walls that form the perimeter of the mound.

Periodization

The complex structural and cultural history of the site calls for a revision of the nomenclature used to describe it. The Early Harappan deposits can be sub-divided into two groups of strata: Period I - the deposits that were accumulated on natural sediment prior to the construction of the large mud brick revetment walls; and Period II - the deposits built up inside and on top of the revetment walls. The subsequent deposits are characterized by baked brick architecture and the entire range of artifacts associated with the Mature Harappan period. These strata are designated Period III. Period IV is the transitional phase following the Mature Harappan occupation, and Period V corresponds to the Cemetery H or Late Harappan occupation of the site. In this article we will be discussing the Early Harappan (Periods I and II) and the Mature Harappan (Period III) deposits.

Natural Sediment

The natural sediment on which the earliest settlement was situated consists of a yellowish brown silty sand that appears to represent river deposits, presumably of the ancient Ravi. The height of the natural surface on which the settlement was established—at least at the northwestern corner of Mound E—is approximately 1.5 meters higher than the traces of natural sediment found in other excavations between Mounds E and AB, in the cemetery area (300 meters to the south) and in the low western mound (Figure 1). Although this higher elevation may have resulted from the removal of natural sediments in the surrounding areas by human activity or later erosion, it is also possible that it represents a natural higher elevation on the ancient plain that was considered optimal for establishing the early settlement. Sedimentological studies by Elise Pendall and Dr. R. Amundson of U.C. Berkeley have also concluded that the site was situated on an elevated natural surface (Pendall 1989; Pendall and Amundson 1990a, 1990b).

Deposits Within the Perimeter Walls Periods I and II: Early Harappan Levels

The earliest cultural levels can be attributed to the Early Harappan period as defined first by Dr. Rafique Mughal at Kot Diji (Mughal 1970) and subsequently at Sarai Khola

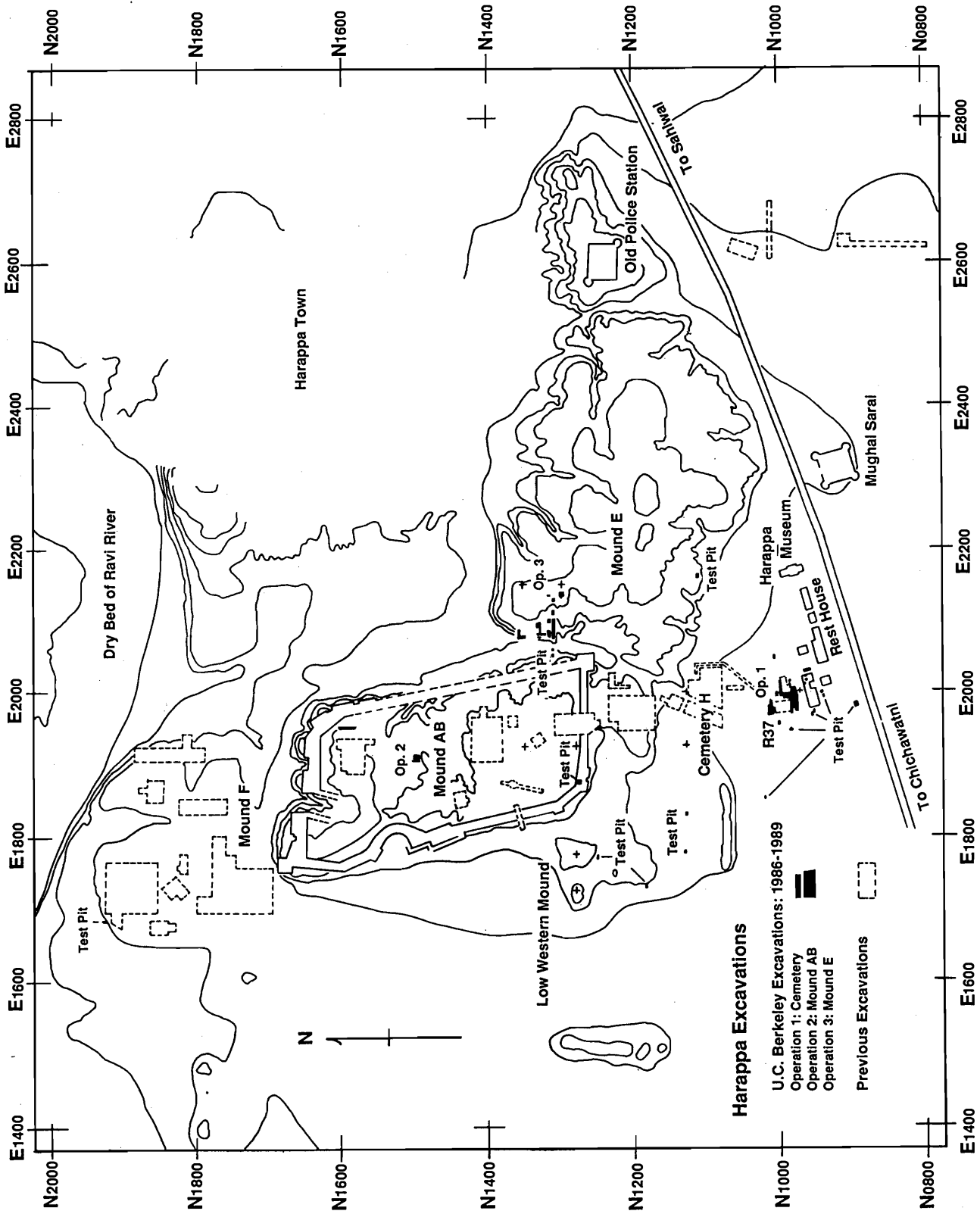


Figure 8.1. Plan of Harappa and Areas of Excavations.

(Halim 1972) and Rehman Dheri (Durrani 1988). Associated with these periods at Harappa are distinctive early ceramics, grey fired bangles, stone blades made from dark grayish chert, a stone celt, stone beads, and human figurines. Certain categories of artifacts do, however, continue into the Mature Harappan period—e.g., specific ceramic types, triangular terracotta cakes, and red fired bangles.

Undisturbed primary occupation levels of the Early Harappan period have been identified all along the north-western edge of Mound E (Figure 2) where the early mound is 2.5 to 3 meters high. The deposits include hearths, domestic debris and mudbrick walls and platforms. One of the walls associated with a small kiln is made of small mudbricks (7 x 12 x 34 cm) while a larger wall at the north-western perimeter of the mound is made of larger bricks (10 x 20 x 40 cm). The orientation of the exposed walls is northwest to southeast at an angle approximately 10 degrees west of north.

Mud brick platforms were constructed to protect the edge of the mound from erosion. This practice carries over into the Mature Harappan period where we see massive platforms and retaining walls protecting domestic areas along the crest of the mound.

A small circular kiln, 50 x 60 cm in diameter and approximately 40 cm high, was found in Period II. It has a unique firing structure made by placing the upper half of a large pot in the center of the kiln. The fuel appears to have been placed on both the outside and inside of the broken pot. The interior of the pot is vitrified and reduced while the exterior is oxidized. This suggests that the objects being fired may have been placed inside the pot for a high temperature reduction that would have resulted in a dark grey or black color. It is possible that this structure was for firing the thin grayish black bangles that are common in the Early levels, but no bangles were actually found in or around the kiln. If this can be substantiated, the presence of this technology in the Early Harappan period at Harappa may have some relationship to the highly advanced technique of stoneware bangle production documented at Mohenjo Daro by Halim and Vidale (1984).

The layers around and above the Early kiln contain many vitrified sherds and kiln wasters which appear to reflect ceramic production over long periods of time. This is confirmed by the discovery of two other kilns nearby in levels associated with Period III.

Period III: Mature Harappan Levels: Domestic Architecture and Platforms

In the step-trench, we found Mature Harappan domestic structures with baked brick walls and rubble pavings. Adjacent to the pavings were several hearths and what appear to be domestic middens filled with bone, pottery, figurines and toys. These domestic areas, situated on the crest of the mound, were protected from erosion by mud brick platforms and revetment walls. Similar arrangements

can be seen in modern houses in Harappa town that are also located on the edge of the city mound.

The construction of such platforms and retaining walls is quite evident in eroding deposits at other places around the edges of mound E and AB. It is important to distinguish the platforms, which were constructed in limited areas at different times, perhaps by individuals, from the perimeter walls which are massive structures that appear to have been built in one episode by large groups of laborers.

These Mature Harappan platforms were built above earlier platforms that extend down into the Early Harappan levels. The bricks used for the Mature Harappan platforms measure approximately 7.5 x 16 x 32 cm whereas the earliest platforms used bricks measuring ca. 10 x 20 x 40 cm. It is interesting that the size ratios of the bricks remain approximately the same but the absolute size changes over time. This pattern of decreasing brick size over time and the introduction of baked brick appears to coincide with the dominance of Mature Harappan pottery and artifacts.

Period III: Ceramic Production

Just up the slope from the Early (Period II) kiln are two Mature Harappan kilns (Figure 2). The smaller of them is structurally different from the Early kiln in that it is tear-drop shaped and has a well defined opening to the west (80 x 75 x 30 cm deep) for air and possibly fuel. Two major construction phases and several phases of replastering are evident in the kiln. Possibly it functioned as a pit-kiln that would have been plastered to form a domed covering, presumably with vent holes. After each firing the structure would have been broken open and then rebuilt.

In the mouth of this kiln was found a concentration of low fired triangular terracotta cakes and *mushtikas* (potato-shaped clay lumps with finger impressions). Their presence can be explained as a method for allowing air into the kiln while at the same time effectively sealing in the heat. Traditional potters in Pakistan still use old pots or stones at the mouth of similar kilns for this purpose. A thick layer of ash was found in the bottom of the kiln covered by a layer of sherds. Possibly these sherds served as setters to hold and cover the objects being fired and also to protect them from direct contact with the fuel. Again, this technique is still used by modern potters at Harappa. Although no complete objects were found in this kiln, it is probable that because of its size the kiln was used for firing only small vessels or figurines.

Just to the north of this kiln is a much larger updraft kiln that was used after the small one was abandoned. It measures almost two meters east-west and three meters north-south and is tear-drop shaped with an extended opening to the south for air and/or fuel. The central column probably supported a perforated floor, although no fragments were found. On at least three occasions the fire became too hot and vitrified the kiln walls along with much of the pottery. Large quantities of vitrified pottery were found around the kiln and in eroded strata on the slopes of the mound.

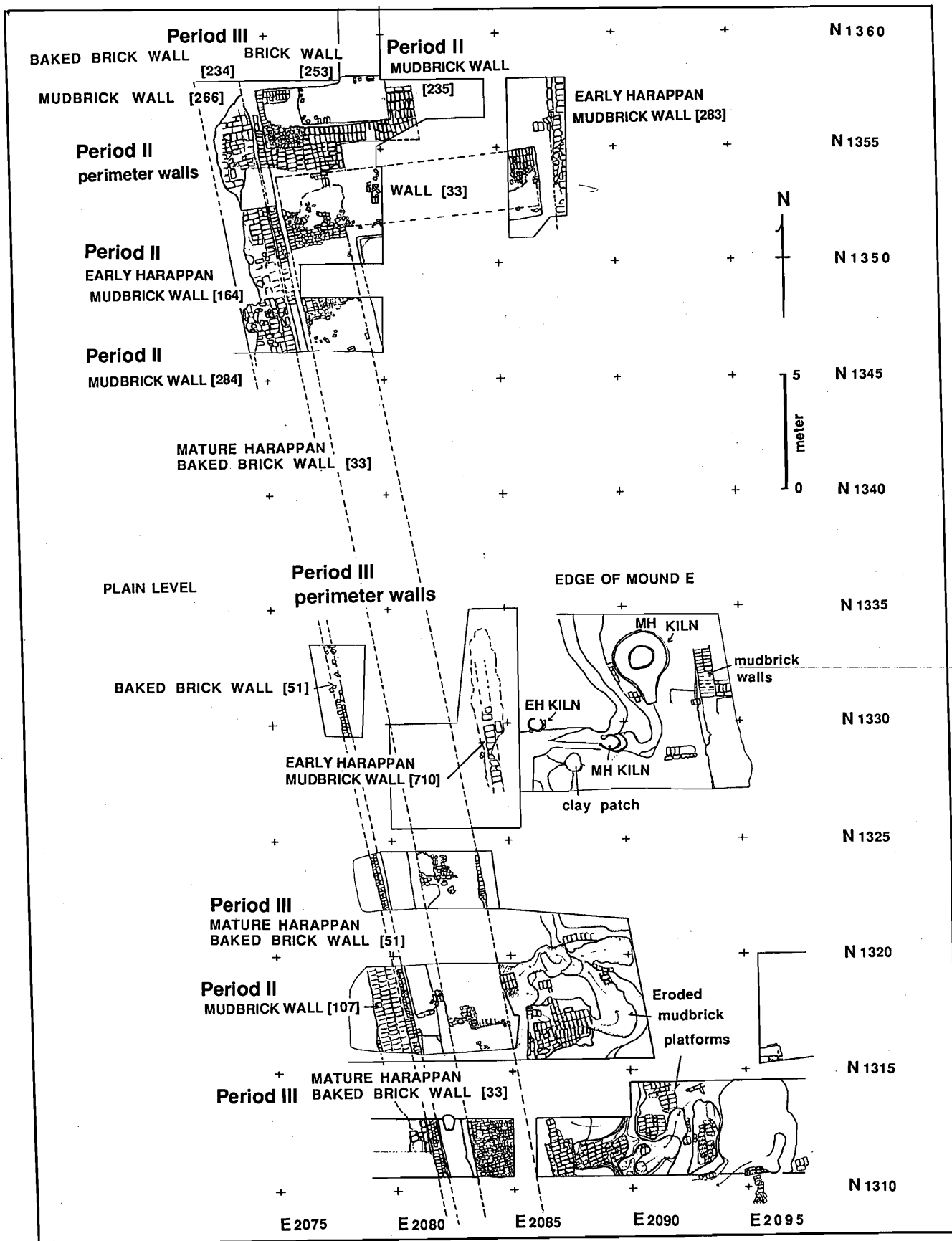


Figure 8.2. Plan of Excavation at Northwest Corner of Mound E.

A wide range of Mature Harappan pottery was found in association with the kiln as well as various indicators of pottery production. A clay chuck mould was found that would have been used for making the base of large storage jars. Also found were fragments of hematite for making pigments, bone spatulas and worn stone blades for trimming the pottery before firing, and patches of fine clay that may represent the areas where the potters prepared the clay.

In levels above this kiln is a series of floors with red burnt patches, but it is not certain if they relate to ceramic production or to other pyrotechnic activities.

Perimeter Walls

Period II: Early Harappan

We have exposed five, possibly six, different walls (Figure 2) made of large mud bricks (10 x 20 x 40 cm) and associated with Early ceramics. They are oriented approximately 10 degrees west of true north. Two of the walls are quite eroded and are sandwiched between Period I and II deposits. The other three or four were built partially on natural soil by cutting foundation trenches into Period I deposits (Figure 3). The most complete wall [164] extends north-south for over 15 meters. It is two meters wide and stands approximately two meters high. A possible corner has been identified but the eastern extension has been completely obliterated by later construction.

Wall [235] was built after [164]. It is 2.5 meters wide and has a well defined corner and eastern extension that continues for about four meters. The north-south portion of this wall was obliterated by later Period III construction and the exterior face of the corner was repaired in Period III with a baked brick facing.

Both of these walls were made from mud bricks having several different distinct colors. There does not seem to be any pattern to the use of these bricks except that often three or four bricks of one color were laid together. Their association probably reflects the manner in which bricks were brought from different stockpiles. Different source areas for the clay are also a probability.

The precise function of the walls is not clear but since the exterior faces are invariably eroded and the interior faces are not, it appears that they functioned as retaining or revetment walls. These walls represent a fairly massive scale of construction that was not likely to have been undertaken on an individual basis. They may reflect some form of Early Harappan social organization with the ability to mobilize and control the production of large quantities of bricks as well as the labor involved in the construction of the walls.

Period III: Mature Harappan Perimeter Walls

The Early Harappan mud brick walls were repaired by later Mature Harappan architects using both mud and baked bricks. Tentatively, it appears that these repairs were made

before the construction of walls [51] and [33] (Figures 2 and 3).

Baked brick wall [51] is relatively thin—approximately 45 to 50 cm wide—and extends for more than 35 meters. It was rebuilt at least three times. The exterior face is heavily eroded while the interior is intact. This suggests that it served as a retaining wall. Evidently it did not do its job well because the Harappans found it necessary to build a larger, more massive structure: wall [33]. This wall [33] was constructed after cutting through the earlier thin wall and digging an extremely large foundation trench that essentially shaved off the edge of the Early Harappan and Mature Harappan mound to a height of 3.5 to 4 meters. The foundation trench cut through Early Harappan levels and down into natural soil. Prior to building the wall, a thin layer of overfired clay nodules was laid along the entire length of the trench. An indication of the builders' skill is that the level of the bottom of the wall has only a 2 centimeter variation along its entire exposed length of over 45 meters.

Both mud and baked bricks measure generally 7.5 x 16 x 32 cm. The wall is 2.5 meters wide with brick bonding the same as used in the earlier mud brick platforms. It has the same orientation as the Early Harappan mud brick walls (10 degrees west of true north), and even has the same corner angle (83 degrees). The eastern extension is nine meters long and ends abruptly with no evidence as yet for a gateway or entrance. It is preserved to a height of only 1.3 meters but its reconstructed height at one point is 3 meters. The wall was battered and appears to have rested against the face of the mound and functioned as a revetment or retaining wall. The orientation of the wall is approximately the same as that of Wheeler's so-called defense wall on Mound AB (12 degrees west of magnetic north) (Wheeler 1947, 1968), but the Mound E walls suggest an entirely different function.

Some questions remain relating to the precise function of such massive structures along the western perimeter of Mound E, and to who organized their construction. During the 1990 season we will try to determine if similar structures continue around the entire perimeter of the mound or if they are limited to specific areas. We also need to study the source areas for the mud bricks, the changes in brick sizes through time, and the change from mud to baked brick architecture.

Figurines

G.F. Dales

This section summarizes the evidence from all of the first four seasons. Terracotta figurines of anthropoid and non-anthropoid creatures are abundant at Harappa. But without written documents of religious nature, and without the presence of recognizable religious or cultic structures, the original functions and significance of the figurines

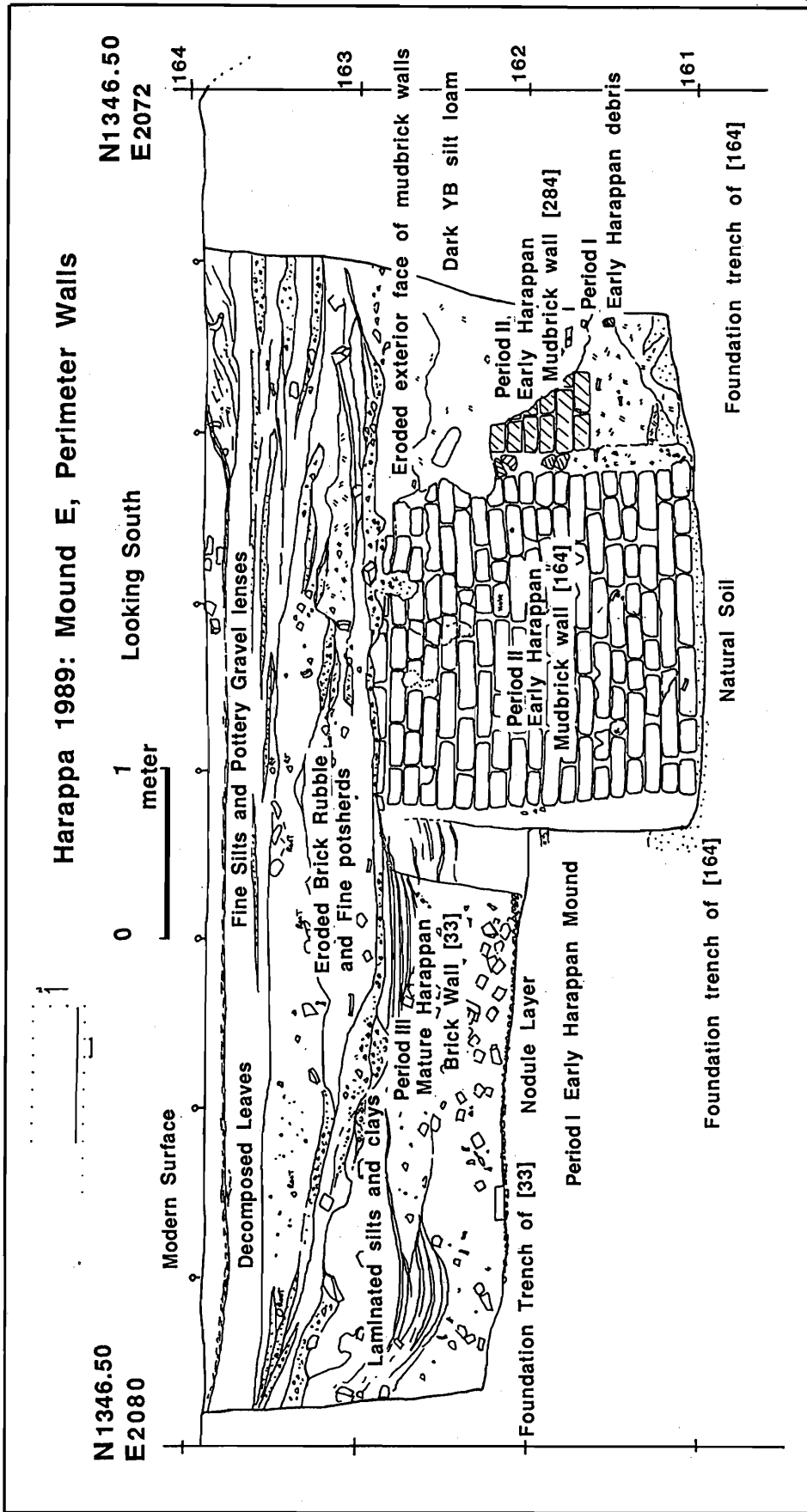


Figure 8.3. Section Showing Perimeter Walls, Mound E.

remain in doubt. At this stage of the study of the newly excavated figurines, it is essential to develop systematic criteria for the identification and description of the various types and styles of representations. From this, with the addition of contextual and distributional information, some functional understandings may be forthcoming. Both classes of figurines present distinctive sets of problems.

Non-Anthropoid Figurines

Some 550 complete or partial non-human figurines have been recorded from the first four seasons' excavations. The basic problem concerning their classification is that of identifying the species of the quadrupeds. The bodies are virtually identical except for the rhinoceros, the humped bull, and the dog; the horns, snout, and facial details serve as the main species indicators. Dr. Richard Meadow, the expedition's zooarchaeologist, has worked with Dales to develop a coding system for the recording and analysis of these features. Correlation studies are not yet complete but tentatively the study shows the following breakdown:

<u>Animal Types</u>	<u>Quantity</u>	<u>% of Total</u>
Quadruped mammals, unidentified	133	24.5%
Horned quadrupeds, unidentified	88	16.2%
Cattle	164	30.3%
Buffalo	58	10.7%
Rhinoceros	34	6.3%
Sheep/Goat	15	2.8%
Other (Dog, Cat, Primate, Bird, Turtle, Elephant, Unicorn)	50	9.2%

These tentative figures suggest that cattle outnumber sheep/goat by 10 to 1; cattle outnumber water buffalo by 3 to 1; and cattle outnumber rhinos by 5 to 1. Of the 164 identifiable cattle, *Bos indicus* outnumber other types of cattle by 2 to 1.

There is a decided difference in species ratios between the figurines and the actual faunal remains excavated at Harappa. For example, water buffalo and non-humped cattle, plentiful among the figurines, are very rare in the faunal collection. There is no compelling reason why the two sets of data should correspond but the quantitative verification of the differences is important and it is the first time that this analytical approach has been applied at a major Indus site.

Dales and Carl Lipo with the assistance of Meadow are also studying the figurines from the University of Pennsylvania Museum's 1964-65 excavations at Mohenjo Daro. There are striking differences in species ratios, style and manufacturing techniques between the two sites. Whether these reflect merely differential distribution of the species or different functions remains to be determined.

Anthropoid Figurines

Identification of sex is usually no problem. Body configurations are different as are facial features, ornamentations and headdresses. Standing male figures do have applied breasts but they are flat discs rather than the conical forms seen on the female figures. There are two examples of what appear to be hermaphrodite figures but they require further study.

To date, 497 anthropoid figurines, or parts of, have been recorded. Of these, 393 (79.1%) are females, 73 (14.7%) are males, and 31 (6.2%) are too fragmentary to determine the sex. Female representations are thus about five times more plentiful than males. The figurine distribution is also of interest. Most of them—78% of the total—came from the cemetery excavations during the second and third seasons, but not a single figurine was found in primary context in a burial. All the objects were found in the thick debris layer covering the actual cemetery. Of these figurines, 76.7% are female and 17% are male. The situation is quite different, however, with the fourth season when the excavations concentrated on the slope of Mound E. Only 58 figurines were found, 86.2% of which were female and only 3.5% were male, with 10.3% unidentified as to sex.

Attention is now being focused on the manufacturing procedures used for the figurines as well as on their types and styles. A peculiar manufacturing detail has been recognized for the female figures. Most, if not all, were made in vertical halves which were stuck together before the jewelry, other ornamentations, and hip bands were applied. Careful examination of complete figurines usually detects traces of the join on the torso. Several complete figures were x-rayed and the joint is clearly seen. Just why this peculiar technique was used is unclear. Whether there was some sort of ideological or ritual practice involved or whether there were more mundane reasons for this technique remains under study.

Another manufacturing detail is also being investigated. I refer to the actual form of the torso which is almost flat on the front side with a pinched waist and short pointed stubs projecting horizontally from the shoulders. The shoulder "skin," arms and breasts were applied as separate pieces to this basic torso. It is of interest that the basic torso is virtually identical in form to many of the earlier figurines known from Pakistan westward to the the Mediterranean going back to Neolithic and even earlier times (Dales 1960, 1963).

These distinctive manufacturing details are known to me during the Indus period only at Harappa. A detailed examination will be made of figurines at the other Indus sites—especially Mohenjo Daro—to determine whether these practices are distinctive at Harappa or are characteristic of all Indus female figurines and have just not been noticed.

In addition to the Mature Indus figurines, the 1989 excavations on Mound E yielded three fragmentary examples of earlier period figurines closely related in form and style to

figurines from Sheri Khan Tarakai in Bannu District (Khan, Knox and Thomas 1988), Gumla (Dani 1971), and Soviet Central Asia (Dales 1974). These examples, together with the Early pottery, are extremely important for our identification of the pre-urban deposits at Harappa. A major focus of the forthcoming fifth season will be on the problem of delineating and defining the nature of the transition from the Early to the Mature period at Harappa. Distinctive figurines such as these will provide crucial comparative data both within the Harappa site and with other early sites in northern Pakistan.

Pottery

G.F. Dales

Classification and Description

The classification and analyses (technological, stylistic, functional) of pottery is an especially important aspect of the research at Harappa. The need for this is vital within the Mature Indus period occupation itself but it is even more essential when dealing with the Early/pre-urban and Late (Cemetery H-related) occupations. Generally we refer to the Early ceramics as being related to the Kot Diji- Jalilpur-Sarai Khola tradition, which does provide some temporal framework, but we need more detailed information concerning the degree and nature of continuity between the periods. This requires a solid classificatory and typological framework that documents the development of technology and style through time. The same conditions prevail for the later materials at Harappa. Little is yet understood about the relationship between the Mature Indus period at Harappa and that represented by Cemetery H. The ceramics are the main source of potential information.

The only comprehensive attempt to provide an analytical classification system for Indus pottery is the work by Dales and Kenoyer on the Mohenjo Daro pottery (1986). This was used as the starting point for the development of a related system at Harappa. As anticipated, differences immediately became apparent between the pottery of the two sites and some of the groupings within the classification system have had to be modified. The differences may be the product of functional, aesthetic or other factors which are all part of our broader study of the relationships between the two sites. What is essential is that the overall system be adaptable to the ceramics of both these as well as other Indus sites.

With the assistance of Chris Jenkins, a thorough study is being made of all the recorded pottery from the first four seasons at Harappa. Certain modifications have been made in the definitions of some of the original Mohenjo Daro categories. In some instances, two or more of the original categories have been combined and at other times only some of the variant forms within a category have been moved to another category. For example, significant refinements have been made in the definition and classifica-

tion of the following Mohenjo Daro categories (see Dales and Kenoyer 1986: Table 10-A, pp.467-471, and Figure 102): Pots 10; Jar-Pots 12; Jars 17, 18, and 21; and some of the bowl categories.

Archaeometric Analysis of Ceramics

Dr. Rita Wright is currently conducting archaeometric analyses of the Harappan ceramics to try to increase our understanding of the continuities and discontinuities in ceramic technology during the Early and Mature Harappan periods. She is also comparing the technology employed at Harappa with that known at other sites of the Indus culture. The analyses involve, for example, the characterization of the raw materials used in the preparation of the clays, the slips and paints used, the firing temperatures used, as well as the manufacturing techniques employed. Reports on the progress of these analyses are in preparation.

Study of Cemetery H Pottery

Pottery that is typologically and stylistically related to the burial pottery from Cemetery H (Vats 1940) is found in great abundance on the surfaces of Mounds AB and E. Habitation levels associated with the pottery have been noted on both mounds as well, but to date no preserved structures have been discovered. The pottery, being the only surviving vestige of those peoples at Harappa, takes on a special importance. Complete examples of the burial vessels were published by both Vats and Wheeler (1947), but no systematic description or classification of the corpus has been made. During the 1989 season, a start was made in the study of this pottery by Rose Drees. New measurements, drawings and photographs were made of several of the complete vessels in the reserve store of the Harappa Museum, some of which had not been published. Dr. Rita Wright is providing information on the technological aspects of the vessels. These new studies will provide new data for a more objective comparison with the pottery industry of the Mature Indus period.

Paleoecological Studies

Faunal Studies by Richard Meadow

After the analysis of a small collection of animal bones excavated from Mound AB during the first season (1986), it was clear that wild animals including deer, blackbuck and gazelle, fish, turtles, and birds were important to at least part of the population during the Mature Indus period at Harappa. This finding required confirmation from other parts of the site since the use of different animals for food may have varied through the ancient city according to what sections of the population had access to different kinds of animal resources.

The current excavations on Mound E are providing abundant faunal remains from the Mature Indus period. And now, with the discovery of the Early Indus settlement at the north-west corner of Mound E, we can also address the question of whether the nature of the exploitation of animals changed during the transition to the Harappan urban complex.

During the 1989 season, all the previously excavated faunal materials were cleaned as a necessary preliminary to their analysis. A number of lots from Mound E were examined in detail and documented, and specific specimens were selected for study at the Zooarchaeology Laboratory, Peabody Museum, Harvard University.

There are often difficulties in differentiating some of the skeletal parts of water buffalo from cattle, and of humped from non-humped cattle. To alleviate this problem, a major effort was made during the 1989 season by Richard Meadow and his assistant James Knight to make a collection of bones of modern animals from the "bone pits" outside of Harappa town. Bones from 43 animals—including water buffalo, zebu cattle, horse, donkey, and mule—were collected and cleaned by simmering in laundry detergent. The water buffalo and cattle bones were measured and photographed. This data, when used in conjunction with observations on the morphology of the bones, will be extremely useful in helping us to distinguish between the archaeological remains of the different forms of large bovines.

A complete collection of these modern specimens is stored at Harappa in order to assist future researchers who wish to study the animal bones from other archaeological sites in Pakistan.

Palaeobotanical Studies

The palaeobotanical samples collected during the 1989 excavations on Mound E contain a large proportion of carbonized seeds. They are currently under study by Heather Miller and Seetha Reddy at the University of Wisconsin-Madison with the initial assistance of Dr. Steve Weber of the University of Pennsylvania.

The preliminary study of the samples has identified primarily winter grain crops of wheat and barley together with a fine collection of legumes. There are also seeds of various small wild grasses. A detailed report will be prepared after the 1991 season.

Conclusion

In addition to the studies described above, ongoing analyses of other classes of artifacts and materials are being conducted. Specialized studies are being made of faience, metals, and the lithics. Ethnoarchaeological and experimental archaeological work is continuing under the general supervision of J.M. Kenoyer.

The fifth season (1990) will focus primarily on expanding the exposure of the Early Harappan (Period I and II) remains at the northwestern corner of Mound E and beginning work on the south side of Mound E. Special attention will be given to documenting evidence for changes and continuities between the Early and Mature Harappan periods as represented in the architecture, ceramics, and other classes of artifacts.

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