ARCHAEOLOGICAL RECONNAISSANCE IN THE REGION OF DIA, MALI

by

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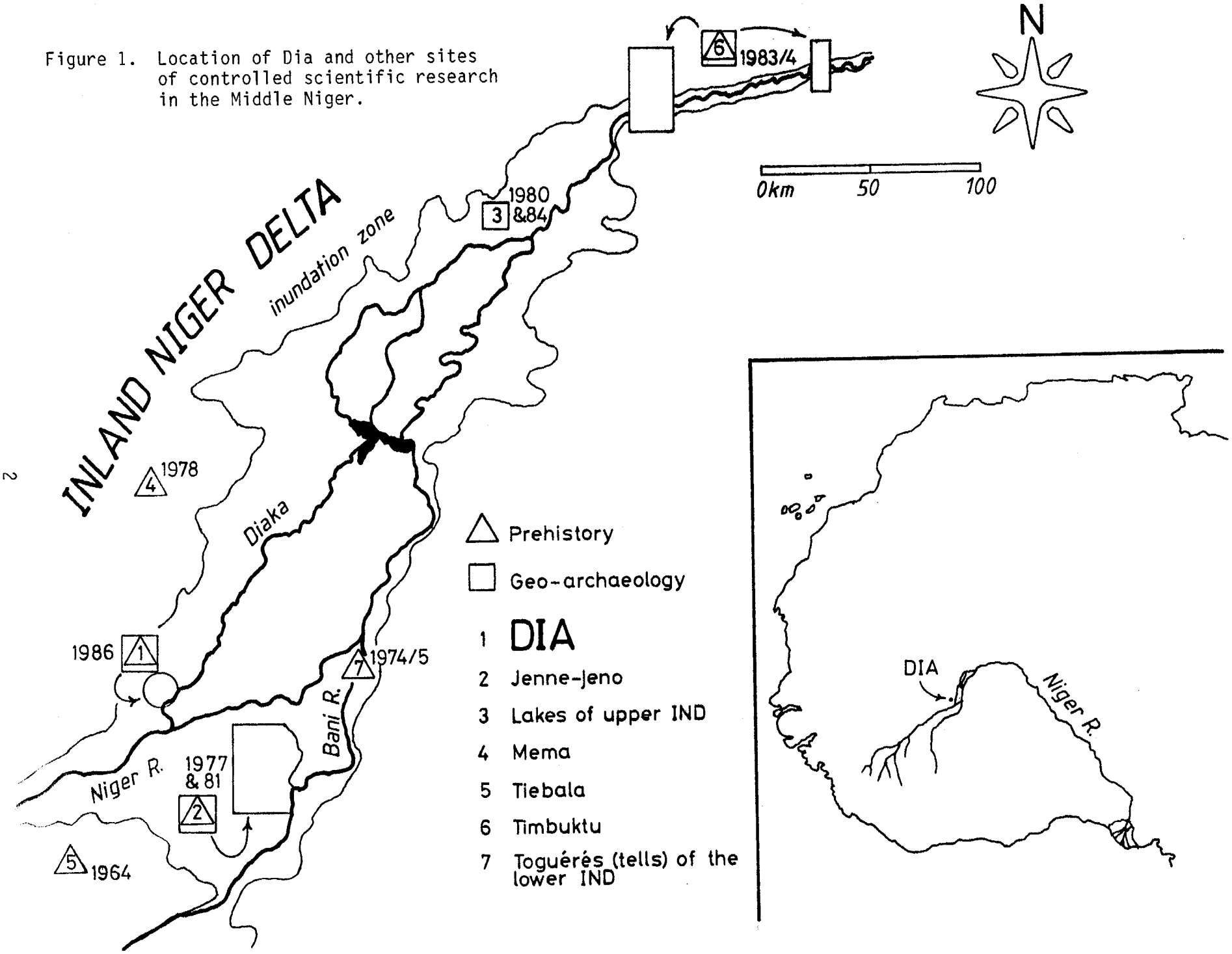
INTRODUCTION AND BACKGROUND

INTRODUCTION

Many of the oral traditions of West Africa recognize Dia as the center from which the Soninke merchants dispersed throughout the Western Sudan. These Soninke are reputed then to have founded many Inland Niger Delta towns critical to long-distance commerce, such as Sansanding and Jenne. The chronology of these movement of Soninke merchants is uncertain. However, we know from archaeological research undertaken at its ancestral site of Jenne-jeno that settlement in the Jenne region began at least by 250 B.C. By the birth of the Empire of Ghana (before A.D. 700), other sources confirm that the Soninke controlled trade within the Inland Delta and beyond. Dia was selected for survey and excavation because of its position at the western frontier of the Inland Delta. This site promised to yield information both about the relationship of long-term settlement change in the floodplain with changing climate and flood regime and about the impact of the Empire of Ghana on this region.

The Dia research is an integral part of our long-term investigation into the origins of commerce and urbanism along the Middle Niger (**Figure1**). Our 1977 and 1981 excavations at Jenne-jeno have furnished a chronology of these phenomena in the upper (southwestern) Inland Delta. However, changes in settlement pattern (size of sites and their distribution over the landscape) can only be understood with confidence if we can document the development of commercial and cultural contacts at the supra-regional scale. Thus, many seasons of excavation and survey employing parallel methods to obtain comparable data must be planned for several Middle Niger locations. We have already undertaken regional survey (funded in 1983/1984 by the National Geographic Society; see *National Geographic Research* 2(3):302-319) at the Niger Bend around Timbuktu and Gourma-Rharous. The Niger Bend research reinforced our belief that

Figure 1. Location of Dia and other sites of controlled scientific research in the Middle Niger.



throughout the first millennium A.D. the whole of the Middle Niger represented one of West Africa's most important spheres of interaction. The Dia research was designed to provide data that could be compared with information from Jenne and the Niger Bend. Specifically, we were interested to document how settlement patterns around Dia changed through time, as well as the affinities of ceramics and other aspects of material culture with those of the Jenne and Timbuktu regions.

Even without the perspective of our own Middle Niger research, however, Dia offered a compelling case for archaeological investigation, since its hinterland contained one of the highest densities of ancient sites visible on aerial photographs anywhere along the Middle Niger. The archaeological attraction of the region is complemented by its rich, and largely untapped, historical and ethnographic potential, as we shall see below.

BACKGROUND: DIA IN ORAL TRADITION AND MYTH

Foundation myth: The foundation myth of Dia occupies a privileged position in the ranks of West African traditions of autochthones emerging from or living in holes. Its numerous variants all affirm the joint claim of the Marka (Nono) Tomata and Bozo Koanta families to founding status (Oumar Dienta: pers. comm.; Dieterlen 1959:125; Solvaing 1983:121-24). The myth's variations are parallel in structure: Dagoma Tomota, the rice cultivator or hunter/farmer ferrets out an elusive race existing only on fish and wild plants and led by Mama Koanta (Kwanta, Konda). In one version, rice farmers live in holes and emerge only during the day, while the fishermen come out only at night. In another, Tomata the hunter lays a trap for elusive persons eating his catches. When Bozo and Marka join together, the (temporary) subterranean dwellings are abandoned, Dia is founded, and the Marka/Bozo alliance is sealed.

Various claims are made for the location of early Dia. Monteil (1932:30-32) and Solvaing (1983:122) record Dia-Kolo ("Ancient Dia"; west of present-day Dia) as the first permanent settlement of the Macina,

heartland ("domaine primitif") of the northern, oldest Mande (Delafosse 1972, I:252-53). Is Dia-Kolo the same as Dia-Kara, recorded by Dieterlen (1959: 125, note 1) as the oldest Bozo village in the area, or might it be an alternative name for the mound of Shoma west of Dia (Oumar Dienta: pers. comm.)? Other settlements inhabited prior to Dia, according to these traditions, are Mara, Shoma and the presently occupied quarter across the Dia pond (east and adjacent to Mara) from Dia proper (**Figure 3**). Solvaing (1983:122) interprets the successive occupation of these sites as record of alternating agglomeration, then dispersal due to war, famines and epidemics although the chronology for these events is far from trustworthy. Traditional chronologies for such events are prone to temporal warping, in which historical events are projected into a more prestigious mythological past. In interpreting these chronologies, West African historians have tended to link the origins of important places or peoples to dated historical events (a prejudice discussed with reference to foundation of towns in S.K. & R.J.McIntosh 1984). In both cases, the chronologies provided for important events are suspect.

In addition to its foundation myth, Dia's claim to status as one of West Africa's most venerable towns rests on its role in the dispersal of Soninke merchants throughout the western Sudan, an expansion of population and commerce known as the Soninke diaspora. We believe that the chronology of these movements and their implications for the rise of complex society in West Africa merit serious attention from archaeologists.

Soninke Diaspora: In a preliminary effort to reconsider the history of the Inland Delta (especially Jenne) and Dia in the context of the Soninke (Wangara) trading history, one of us has examined historical interpretations of the earliest movements of these people (S.K.McIntosh 1981: 154-57) (**Figure 2**). It appears that the southward dispersal of the Soninke recorded in the oral traditions is the continuation of a trend established by the first millennium B.C. in response to Saharan desiccation and possible difficulties with Saharan nomads. The traditions identify three centers for this later dispersal: Dioura, Wagadu and Dia. The dispersal from Dia is recorded in the oral traditions as preeminantly a

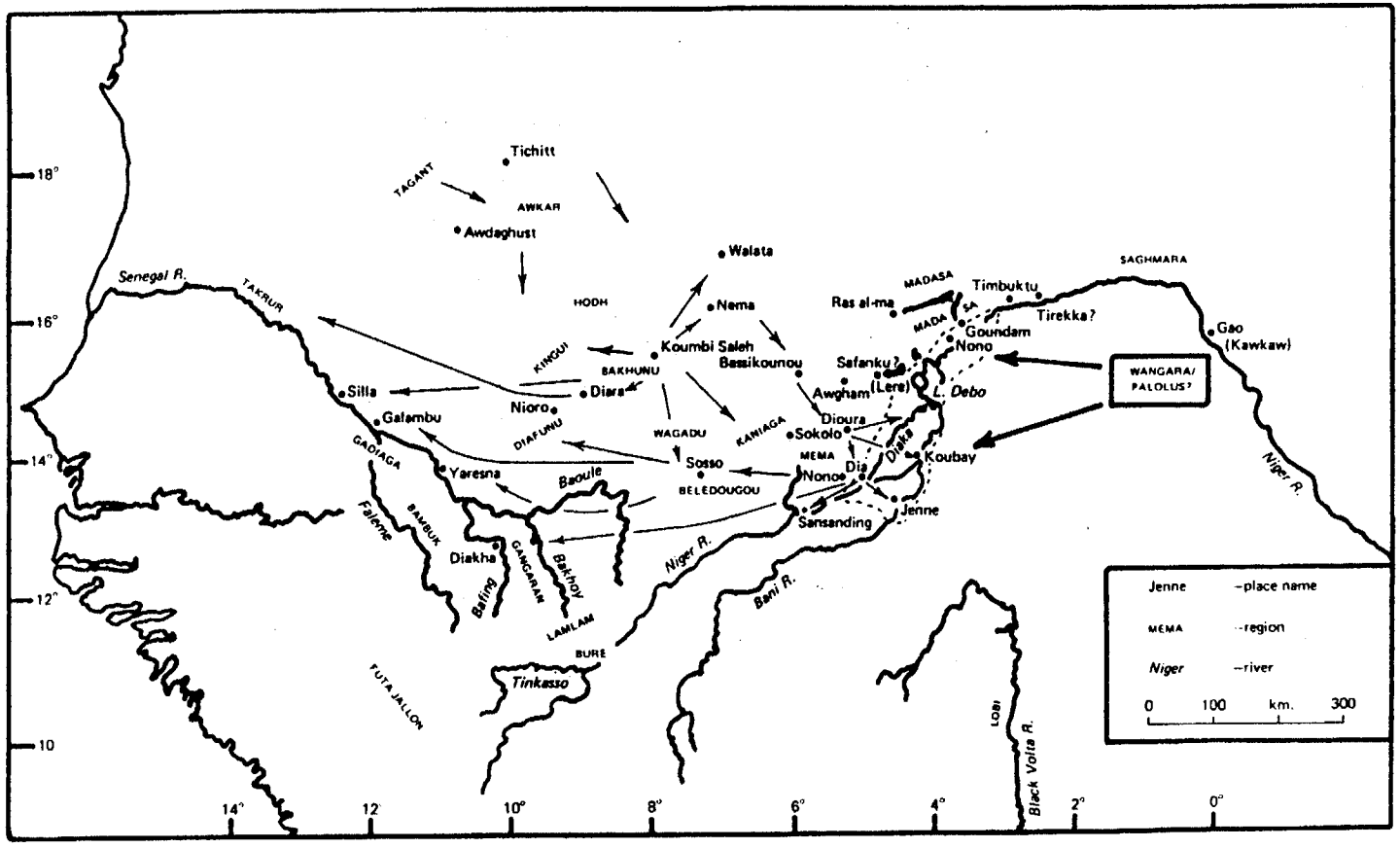


Figure 2 - SONINKE MOVEMENTS RECONSTRUCTED FROM ORAL TRADITIONS (from S.K.McIntosh 1981, p.155)

trading diaspora. Dia colonists (i.e., Nono/Marka) are reputed to have settled throughout the Inland Niger Delta, founding the important commercial centers of Sansanding and Jenne (according to one interpretation, the original Marka name for Jenne was Diane, meaning "little Dia" - Delafosse 1972, I:270, note 1; Monteil 1932:36). Dia merchants also spread south to Bobo-Dioulasso, Kong, Bonduku and the Akan gold fields as the "malinkized" Dyula or Juula (see below; Curtin 1975:68-9). Contemporaneously, Dia colonists spread far west to found Diakha-sur-Bafing and towns of the Diafunu, where they also became "malinkized" and became known as Jahaanke (Curtin 1975:68-9,74-5,283; Monteil 1929:45). These traders of the Senegambia frequently traded eastward with Middle Niger centers such as Dia.

The chronology and extent of this east-west southern Saharan-Sahel commerce will be critical for our understanding of why commercial centers such as Jenne-jeno became fully urban by the mid-first millennium, well before significant trans-Saharan commerce is thought to have been under way (S.K. & R.J. McIntosh 1988:114-119,122-25). Needless to say, such information is needed to understand the rise of the Ghana empire, purportedly in the Soninke Bakhunu region (and perhaps the Takrur state along the middle Senegal). Some insights into the processes by which commerce and population dispersals encouraged these complex society transformation may, in the lamentable absence of more archaeological attention, be obtained by extrapolating from the second millennium experience of the Wangara and Dyula.

Wangara-Dyula Connection: Dia again provides the historical link between these two trading entities, both of whom (in large part) claim this city as their ancestral source. Wangara are Soninke long distance traders, particularly associated with the gold trade. Through time, many abandoned the Soninke language, accepting various Manding languages and the name Dyula in an acculturation process studied by Curtin (1971, 1975) and Perinbam (1974), among others. Along with Islam, literacy in Arabic, and retention of Soninke patronyms, the veneration of Dia was a device employed by Dyula merchant clans to differentiate themselves from both

elite and commoners in southern and western lands.

Perinbam (1974:679-89) argues that the distinctive trade and social organization of the Dyula existed as early as the Soninke empire of Ghana and that the Wangara (Wankoré, Gangara) of early second millennium sources were the true proto-Dyula. That is, Dyula trade connections once thought to have come into existence in or after the fourteenth century may be far older. The process of "malinkization" may be far more protracted than previously believed. But also, the central role of these traders in the development of pan-West African resources (Bambuk-Bure, Akan and Lobi gold, textiles and kola) and in fostering interaction among newly-emerging elites and technical specialists (Perinbam 1974:689), may also have been far earlier than imagined. This reconsideration of economic developments would be consistent with the implications of recent Iron Age research in the West African Sahel and even the forest.

Although discussion thus far has concentrated upon the commercial and long-distance importance of Dia, we must not ignore its equally central place in the spiritual system of the Mande. Curtin (1975:67) describes how Jahaanke (Diakhanke) in the Senegambia reinforce their trade monopoly by invoking the special protective power due to their origin from Dia, "...a town famous for its outstanding place in the supernatural order of things on Muslim and pagan grounds alike". Indeed, Dia like Jenne is today revered as a holy spot of Islamic learning and authority. Its Koranic schools draw from far beyond Mali. But it is likewise a known and respected (sometimes feared) center of synchretistic beliefs. Dieterlen (1959:124-33) indicates the enormous potential in a brief inquiry into Dia's cardinal position in Mande origin myth (the town marks the northern end of the rainbow marking the chief north-south axis of the world at the beginning of time) and its sanctity as one of the chief sitings of *dya*, the spiritual principle of fish, fishing and the Bozo generally. Specifically, the pond of Dia (between present Dia and Mara) retains spiritual importance for the interaction of fish, cereal and humans. As such it is called the "mare de famille" (Dieterlen 1959:120) - perhaps yet another hint at the antiquity of this region for the processes of domestication, ethnic accommodation,

population growth, etc., critical for the emergence of the first West African cities.

RESEARCH OBJECTIVES

As we have indicated above, the rich historical, oral and ethnographic potential of Dia has as yet been inadequately explored. Mauny summarized the even less developed state of prehistoric research in the region:

"L'archeologie est pratiquement desarmee, manquant de "fossiles directeurs". Aussi, l'examen des poteries, des rares statuettes, des perles, la presence de pipes (indiquant des sites posterieures a 1600) recoupe utilement le peu que l'on connait par la tradition oral ou la tarikh. Nous sommes en terrain mouvant et avons le sentiment d'en etre encore au debut de l'aire pionniere au point de vue archeologique." (Mauny 1961:95)

Mauny's statement remained equally valid in 1986, preceding our investigation of Dia. There had been no published or unpublished systematic, scientific excavation or survey at Dia or in the Macina prior to the 1986-87 research. Hence we began those investigations with the most general of historical and archaeological questions, many of which flowed logically from our prior research in the Niger Bend and Jenne regions:

HISTORICAL

1. How early was Dia founded and what was the nature of settlement in its earliest years?

2. What are the affinities in the material culture throughout the Dia occupation sequence to that of the upper Inland Delta (Jenne and Jenne-jeno) and the Niger Bend (Timbuktu vicinity)? What inferences can we make about cultural and political ties between the Macina and the rest of the Middle Niger during this period? Is there any evidence of

trade contacts with other areas of the Middle Niger that might suggest Soninke commerce? If so, what can we glean of the role of the Macina and Dia in the rise of the empire of Ghana and its commercial base?

3. To what extent does the archaeological evidence support the tradition of a population dispersal from Dia?

ARCHAEOLOGICAL

1. Is there evidence at Dia that interactions along the Middle Niger pre-date the historic period?

2. Is there evidence at Dia of Late Stone Age occupation?

3. For the sites in the Dia hinterland, what can be ascertained from survey and surface collecting about the range of sites (size, function, chronology of abandonment and length and intensity of occupation) and their location in relation to geomorphological landforms, availability of water, other sites, etc? How reliable are aerial photographs for survey with regard to relative detectability and recognizability of sites on various landforms, and on floodplain vs. highland features?

4. Why do many rural and urban (Dia itself) sites appear clustered on aerial photos? Is this clustering comparable to that discovered in the Jenne and Timbuktu hinterlands? What is the chronology of occupation of these clustered settlements: were they occupied sequentially or simultaneously? Do the surface artifacts and features suggest any functional differentiation among the sites of the same cluster or between neighboring clusters? Why are some hinterland sites isolated and (most) others clustered? Was "implosion" to a settlement pattern of a few larger, isolated settlements a relatively recent phenomenon as in the Niger Bend and Jenne regions?

5. How comparable is the "archaeogeomorphology" of the Macina to that of the superficially similar Inland Delta? Can settlement and landform

changes here be sequenced, dated (if even relatively) and tied to the larger West African palaeoclimatic sequence? Is there a trend of eastward migration of the Macina distributaries? Would late first millennium conditions in the Macina have been conducive to the domestication of indigenous rice (*Oryza glaberrima*)? What does the geomorphology have to tell us about the first penetration of LSA peoples into the Middle Niger? Finally, can a pattern of causality be established between climatic or fluvial changes and shifts in settlement, emergence of urbanism and/or population movement? Conversely, can environmental change be attributed to human activities?

The objective of the 1986-87 research was to gather information, at least of a preliminary nature, on as many of the questions on this rather daunting list as possible. Considering that historical and archaeological knowledge of this important region is virtually non-existent, this kind of preliminary inquiry is necessary to lay the foundation for later, more intensive fieldwork.

Chapter 2

EXCAVATION AND STRATIGRAPHY

Exploratory excavations in the 1986-87 season at Dia consisted of three test units excavated in the complex of mounds immediately surrounding the modern town. The first, unit D6, was located near the high point of Mara, the easternmost mound and the area considered the "original" village by modern inhabitants. Unit Sh7 was excavated at the northern end of Shoma, the westernmost and largest of the three major mounds and the only one still exhibiting extensive foundation remains on its surface. Unit SCW, also on the site of Shoma, was a cross-section of the massive city wall whose remains bounded the northwestern periphery of that site (**Figure 3**).

The intent of the *sondages* was twofold: to establish a reliable artifact sequence which could be compared with existing sequences for the Jenne and Timbuktu regions (S.K. and R.J. McIntosh 1980, 1986), and to determine, if possible, the date and duration of settlement in different parts of the Dia complex. Both these aims were aided immensely by the remarkable similarity of artifacts from Dia with those of Jenne-jeno. Excavation sites D6 and Sh7 were accordingly chosen by examining the distribution of surface artifacts, particularly pottery, and placing excavation units in areas with artifacts presumed to represent a broad chronological range. The Shoma city wall was excavated in order to provide comparative dates and architectural information on that most imposing of all the site's surface features, which we thought likely, as at Jenne-jeno, to have been constructed during a period of growth and urban centralization. A small section of the city wall was excavated at a spot where washing and wind erosion had exposed a well-preserved area of the wall foundation (**Figures 16 and 17**).

Excavation methodology

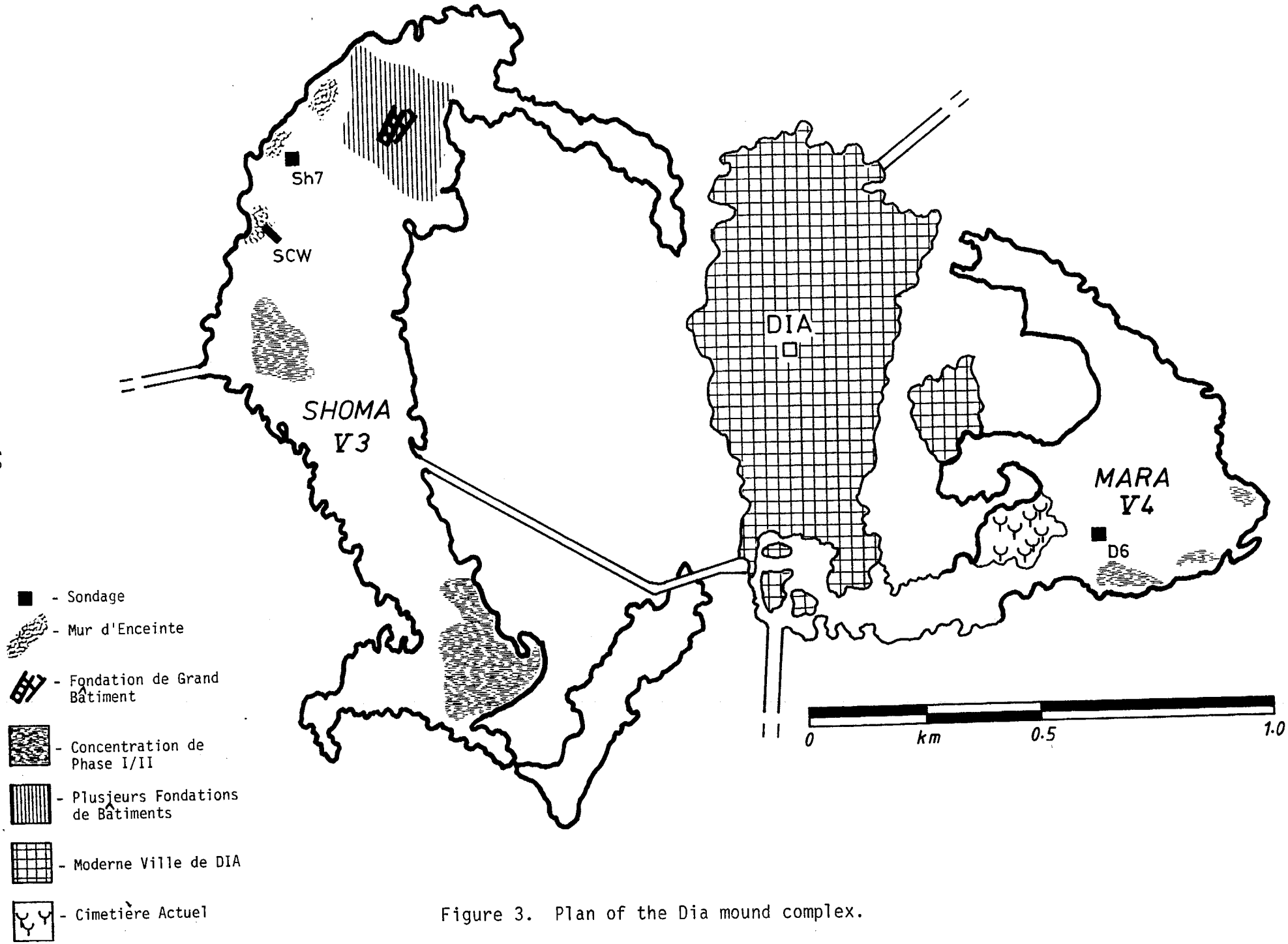


Figure 3. Plan of the Dia mound complex.

Because of the preliminary nature of the research at Dia, we attempted to sample as large an area as possible within the brief (three-week) time period allotted for excavation. For this reason, excavation units were kept to the smallest workable size, the largest being the 2x2 m test unit on Mara. All three were excavated to sterile or near sterile soil, with the size of the excavated area reduced in the lowest levels to facilitate access. Excavation followed natural stratigraphic levels as closely as possible, with such archaeological features as were encountered being given separate level record forms and removed as levels in their own right (Appendix 1). All levels were excavated either with trowels or with the traditional short-handled agricultural hoes, or *dabas*, favored by the Malian workmen.

Because of previously encountered difficulty in screening the compact clays of Niger floodplain sites, we did not attempt to screen excavated material for artifacts but carefully sorted it by trowel, both within the excavation unit and on a tarpaulin placed over the backdirt pile. All artifacts that were recovered were bagged and transported to Dia for analysis, with three separate bags (bone, pottery, and other small finds) kept for each level. Recording and preliminary analysis of ceramics and small finds were accomplished on the spot in Dia, and the artifacts subsequently taken to the Institut des Sciences Humaines in Bamako for storage. Faunal remains were brought to Rice University in Houston for analysis. Preliminary results are reported in Appendix 4.

Soil samples were taken periodically (eight in all) in order to study the nature and origin of specific deposits. Two flotation samples, both from unit D6, were not analyzed because of the paucity of floral remains in the completed sample. Six samples of charcoal and bone were collected for radiocarbon analysis, using tweezers and placing the sample in a double envelope of aluminum foil inside a sealed plastic bag. Of these samples, only two--one from unit D6 and one from Sh7-- contained enough material for reliable dating (Appendix 2).

Discussion of the excavation units

Unit D6 (Mara): The first test unit opened was unit D6, on the site of Mara, just southeast of the present town. Immediately upon arriving at Dia, we were accompanied by an elder, Oumar Dienta, to the mound of Mara, which is considered in the town to be the site of the earliest settlement at Dia. Unfortunately, the highest part of Mara now serves as the town cemetery, but we carefully surveyed the remainder of the site, looking for a location that would yield an artifact sequence of long duration, at least part of which could be tied to the Jenne-jeno ceramic sequence. The spot chosen for unit D6 was on relatively high ground near the cemetery, and exhibited abundant surface finds of pottery similar to Jenne-jeno Phase IV and V (second millenium A.D.), with classic Phase I/II ceramics (late first millenium B.C. / early second millenium A.D.) exposed nearby (**Figure 3**).

Unit D6 was 2x2 m square at the surface, oriented north-south, with its northeastern corner 10.360 m at 255^{o} from a government benchmark set in a cement piling, labeled "6606" (**Figure 4**). The Point of Origin, datum for all measurements in this unit, was precisely the elevation of the top of the metal pin which serves as the benchmark. The unit was excavated through 14 levels to a depth of 4.05 m. Its original 2x2 m size was reduced to 1x2 m (oriented east-west) in levels 12 and 13, and to 1x1.25 m in level 14.

Figures 5-10 show the excavated levels and natural strata of unit D6, while Appendix 1 gives detailed stratigraphic data for individual levels. Chronological relations between strata and the probable depositional occurrences reflected in this sequence are reconstructed in **Table 1**. Overall, stratigraphy for unit D6 was straightforward, with two major occupational periods separated by a clear stratigraphic break. The first 1.54 m (levels 1-8) was made up of successive layers of clay, deposited primarily by mud wall collapse and wall melt. These horizontal strata were interrupted only by a large disposal pit (levels 3, 4, and part of level 1), and by a trench, undetected during excavation, which extended from the

Figure 4. Unit D6 during excavation, showing location of government benchmark on Mara.

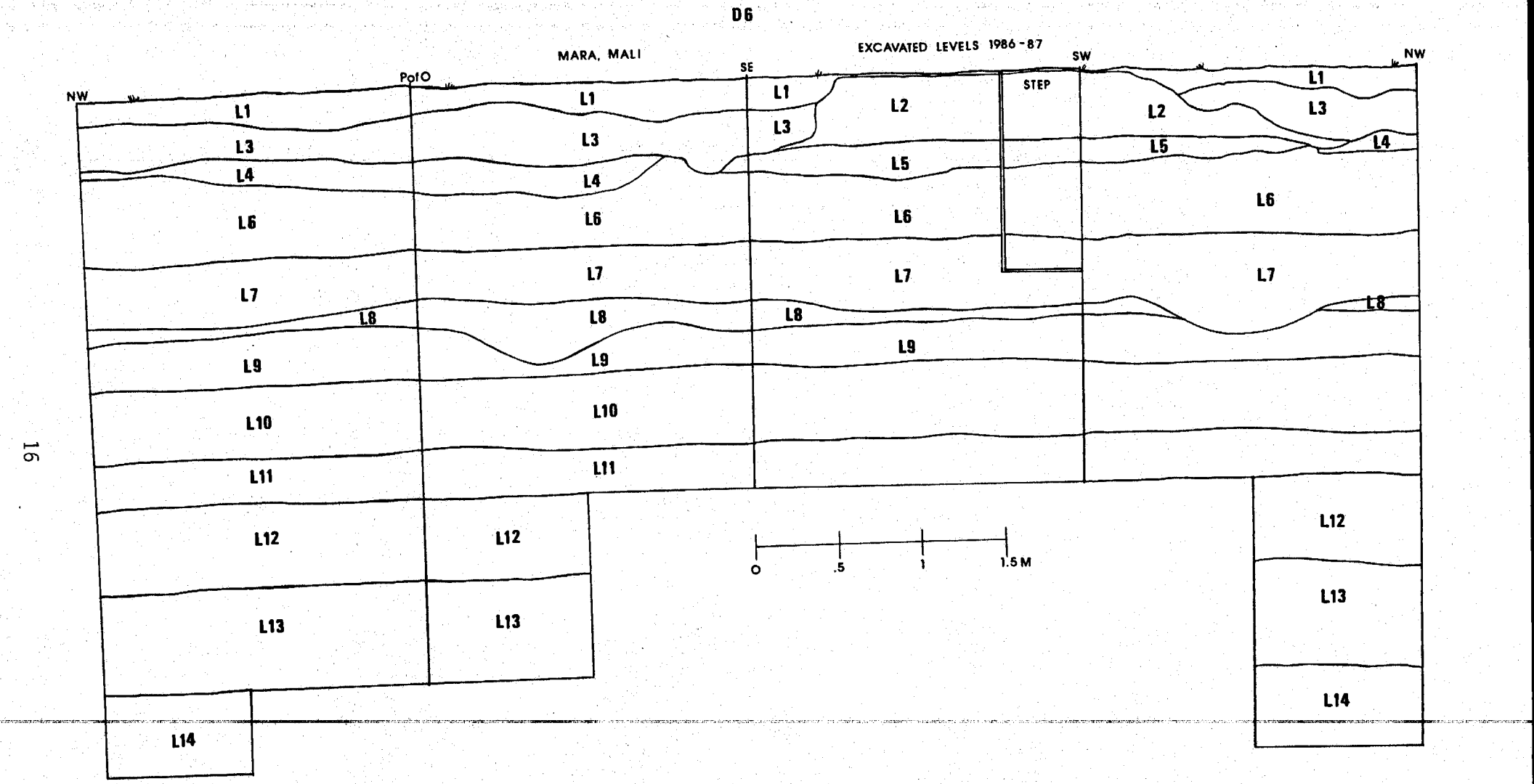


Figure 5. Excavated levels in unit D6.

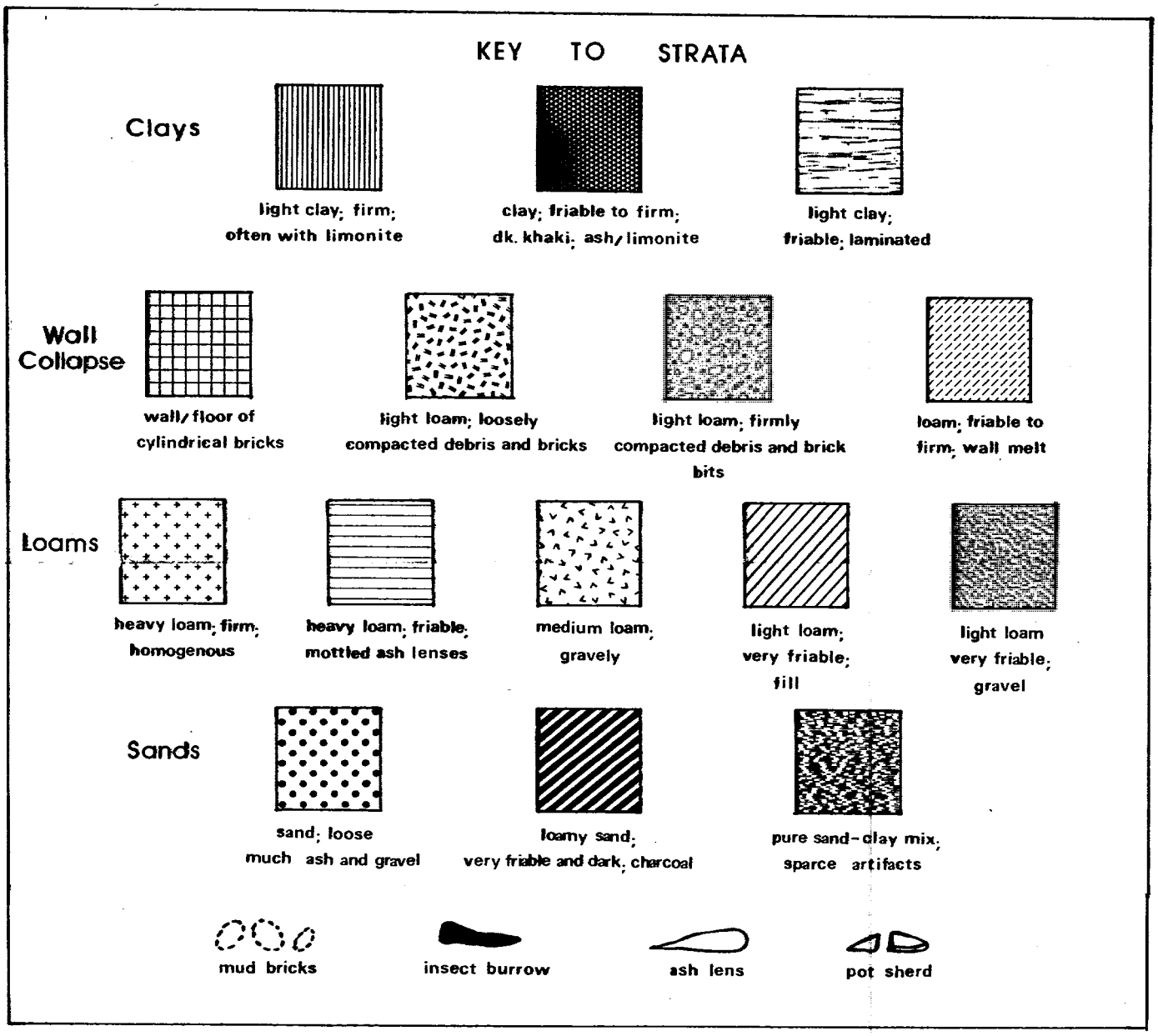


Figure 6. Key to stratigraphic notation for excavated levels.

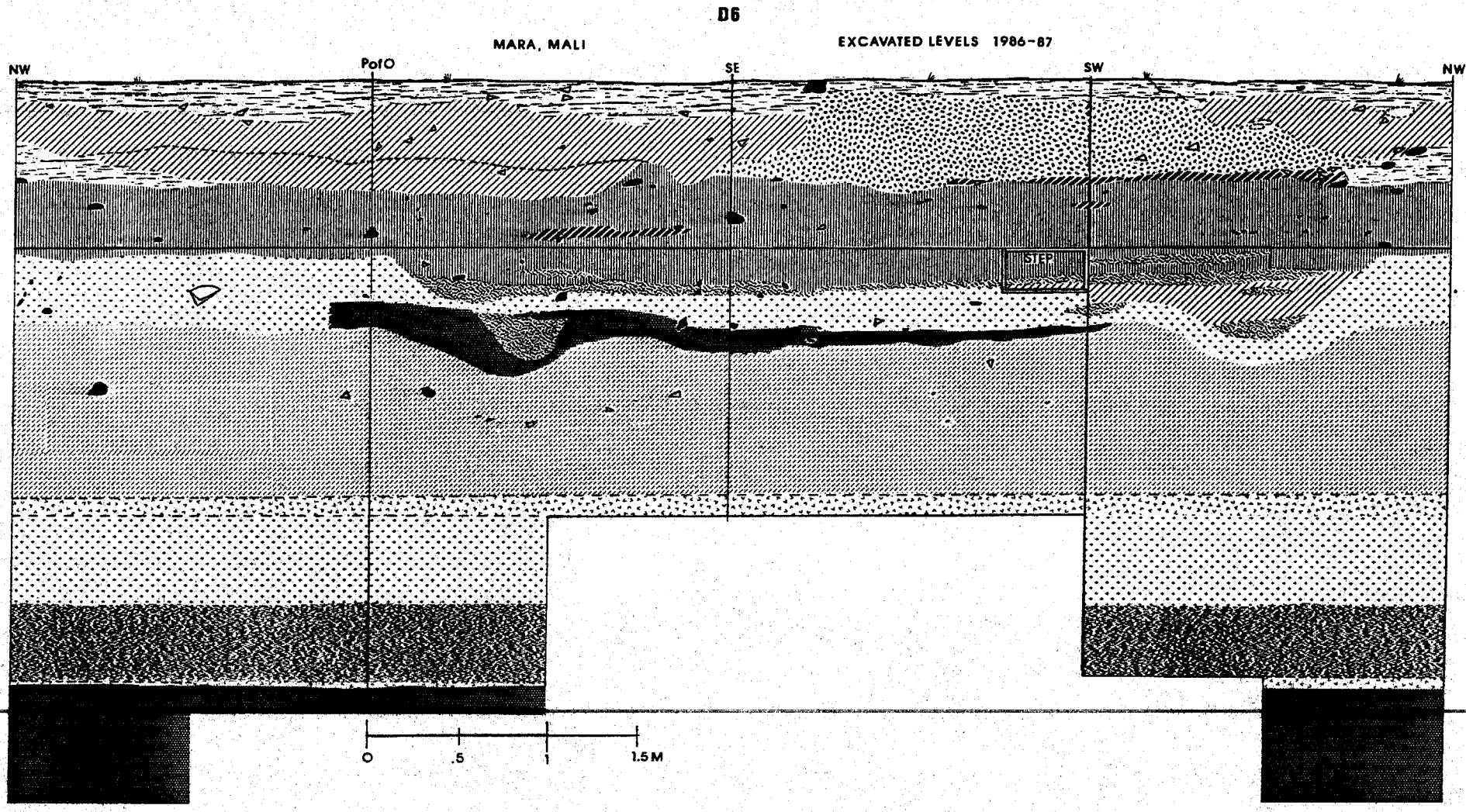


Figure 7. Stratigraphy of unit D6.

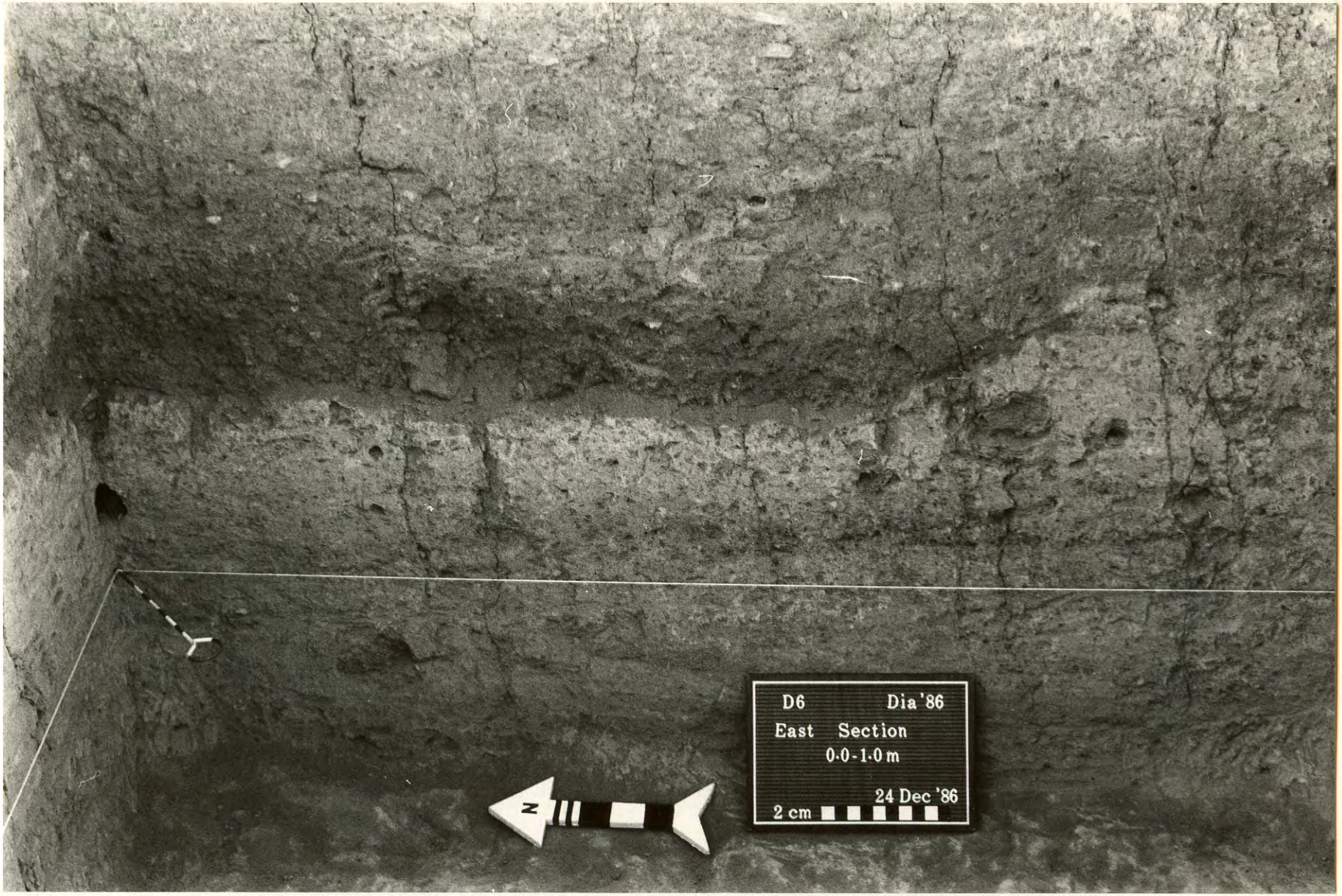


Figure 8. Unit D6, east wall, showing stratigraphy of levels 1-6.

Figure 9. Unit D6, north half of east wall, showing stratigraphy of levels 7-10.

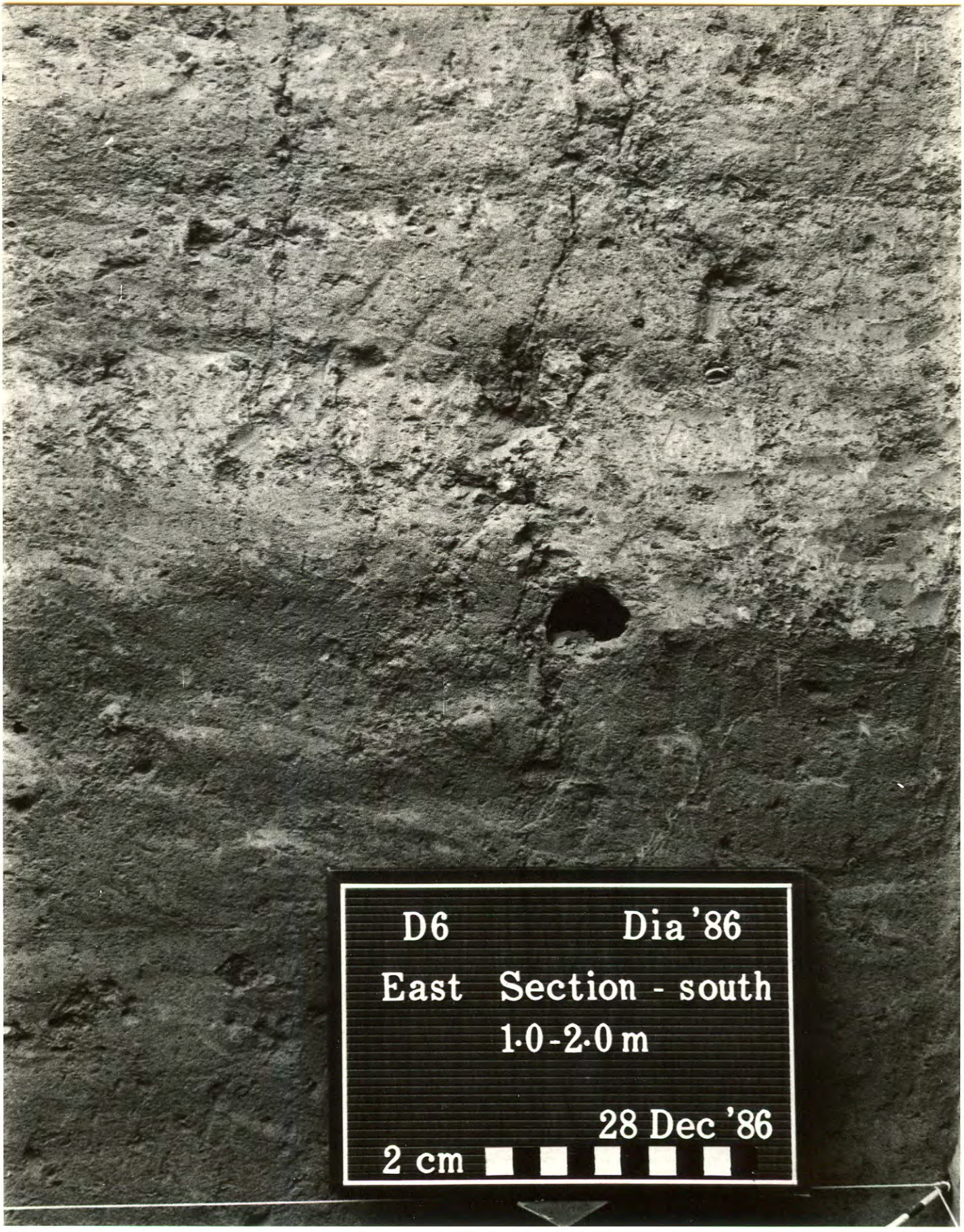


Figure 10. Unit D6, south half of east wall, showing stratigraphy of levels 7-10.

Table 1: Reconstruction of depositional sequence in unit D6

Excavated level*	Depositional event
1	Surface deposits, microlayered and moderately disturbed.
3	Upper level of refuse pit dug into level 2.
4	Lower level of refuse pit dug into level 2.
2	Rapid wall collapse with scattered whole bricks.
5	Same as level 2, but with fewer bricks.
6	Moderate to slow wall melt with some domestic debris.
7	Long exposure/abandonment of this area of site.
8	Same as level 7, but greater ash content.
9	High sand, disturbed by trench from level 8.
10	High sand with occupation deposits; end of regular but temporary occupation of levee.
11	High sand; largely sterile.
12	Loamy sand with temporary occupation underlain by sterile sand layer.
13	Levee sand with temporary occupation on original low levee.
14	Levee erection on floodplain.

* related events enclosed by brackets

bottom of level 6 through level 9. While levels 1-6 appeared to reflect active occupation of the D6 area, microlayering and sand lenses suggested a period of exposure during the deposition of levels 7 and 8. Pottery from all eight levels resembled that from the second millenium Phases IV and V in the Jenne area (S.K. and R.J. McIntosh 1980: 191-192), with ceramics from the pit deposits and wall collapse of levels 1-5 clearly recognizable as Phase V (**Table 4**). Non-ceramic artifacts were sparse in all levels, though much more varied in the Phase V pit deposits than in succeeding strata (Appendix 3).

With level 9, soil changed abruptly to the friable loam/loamy sand which characterized the remaining 2.51 m of the unit. Archaeological materials from level 9 were mixed with material from the intrusive trench originating in level 6, and included Phase IV ceramics similar to those in previous levels. A radiocarbon sample taken from charcoal at the bottom of the trench yielded a date of 410 ± 90 B.P. (Beta-20711) for the trench fill (Appendix 2). At the recommended limit of two standard errors, this calibrates to A.D. 1310-1650 using the high precision calibration curve of Stuiver and Pearson (1986).

Archaeological material in all subsequent levels consisted almost exclusively of small thin ceramic sherds scattered through an otherwise featureless loamy sand. Along with the stratigraphic break evidenced by this soil type came a sharp chronological break, for pottery in levels 10-13 was classic Phase I/II, dating at least six centuries earlier (c. 250 B.C. to A.D. 300 at Jenne-jeno) than the Phase IV/V ceramics of overlying levels. Material from these early levels appeared to reflect at least three distinct periods of (temporary?) occupation, with heavy concentrations of pottery separated by sterile or nearly sterile layers of loamy sand (Appendix 1). The earliest evidence of occupation at D6 was a concentration of thin-walled, finely prepared Phase I/II ceramics in the upper part of level 13 (Chapter 4). These artifacts were deposited in a matrix of nearly pure sand, apparently the surface of a low levee, which in turn bottomed out on sterile floodplain clay in level 14.

Unit Sh7 (Shoma): Test unit Sh7 was placed on one of the high points of the mound of Shoma, some 1.5 km west of Mara on the western side of Dia. This unit was opened in the hope of finding material that would shed light on occupation at Dia during the 600-year hiatus at unit D6. This period, the second half of the first millenium A.D., encompassed the documented historical existence of the Empire of Ghana and has been shown to be a crucial period of urban growth at Jenne-jeno (R.J. and S.K. McIntosh 1981: 16-19; 1982: 30). Unit Sh7 was located just west of the continuous exposure of foundations which covered much of the northern end of Shoma (**Figure 3**). The excavation site was characterized by a heavy surface exposure of Jenne-jeno Phase IV ceramics, with smaller amounts of Phase III and I/II material (**Figure 11**). The excavation unit was 2.0x1.5 m, oriented north-south, and was excavated through 15 natural levels to a depth of 4.50 m. In levels 10-15 the excavated area was reduced from the surface size of 2.0x1.5 m to 2.0x0.85 m (**Figure 12**).

Although occupational remains were more abundant at unit Sh7 than at unit D6, stratigraphy was not markedly more complex than that of D6. Excavated levels closely paralleled the natural stratigraphy of the unit (**Figures 13 and 14**). As in unit D6, stratigraphy consisted of straightforward horizontal layers interrupted by only two features: a possible pit excavated as level 2, and a sequence of living "floors", not separately excavated, in level 8 (**Figure 15**). Stratigraphic data for these and all excavated levels are given in Appendix 1.

Occupational deposits could be divided into four major periods, separated by three comparatively unproductive clay levels which appeared to represent intervals of reduced cultural activity (**Table 2**). A stratum of hard clay wall collapse and wall melt in levels 1-5 (0.115 to 0.85 m) was underlain in level 6 by a 50 cm "transitional" level of light clay. This level resembled the overlying wall melt of level 5 in many respects, but it had fewer artifacts, no bricks, and a homogeneous structure which appeared to be a product of incremental deposition over an extended period of time. Beneath this, in levels 7-9 (1.35 to 2.23 m), was a series of heavy

Figure 11. Unit Sh7 from the northwest, overlooking the mound of Shoma.

Figure 12. Unit Sh7: excavation of the lower levels.

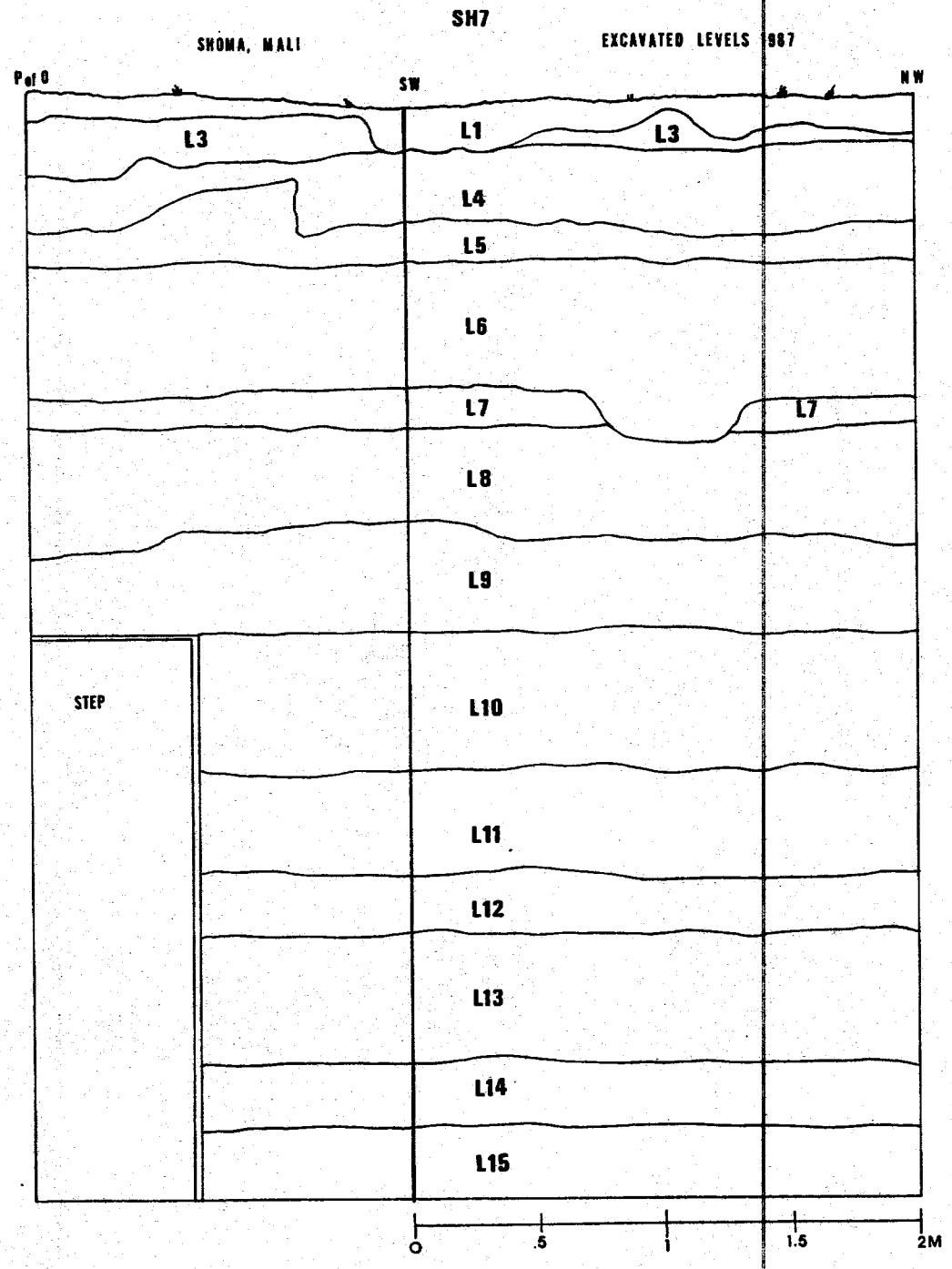


Figure 13. Excavated levels in unit Sh7.

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SH 7

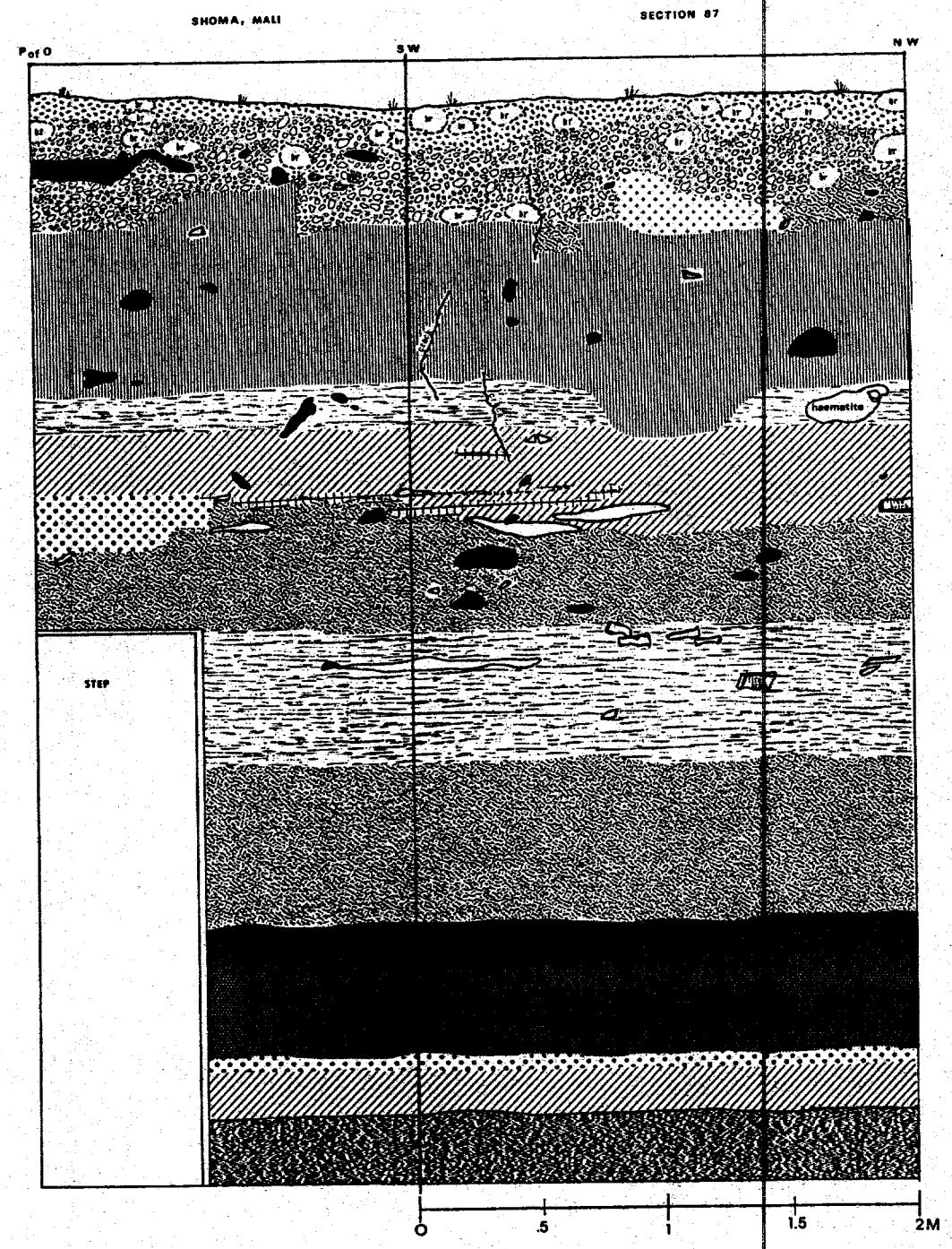


Figure 14. Stratigraphy of unit Sh7.

Figure 15. South wall of unit Sh7, showing stratigraphy of levels 1-8.

Table 2: Reconstruction of depositional sequence in unit Sh7

Excavated level*	Depositional event
2	Rapid pit fill; dug into levels 1 and 3.
1	Rapid wall collapse with possible surface disturbance.
3	Rapid wall collapse.
4	Moderately slow wall collapse.
5	Slow wall melt.
6	Very slow deposition; original surface for building wall
7	Activity area.
8	Occupation level with possible sequential "floors".
9	Occupation level without "floors".
10	Moderately slow accumulation of cultural debris.
11	Moderately rapid domestic accumulation--possible living area.
12	Same as level 11 but with more early "chinaware" pottery; levels 11 and 12 combined may be the earliest permanent occupation.
13	Slow accumulation at some remove from living areas.
14	Possible sequential temporary occupation on levee surface.
15	Sterile levee.

* related events enclosed by brackets

occupation levels and activity areas marked by a heterogeneous loam containing ash, large pottery sherds, and lenses of sand and charcoal. These levels, which appeared to reflect the most intensive cultural disturbance of the Sh7 area, contained three extended lenses of hard-packed burnt clay approximately at their midpoint, in the lower part of level 8. A charcoal sample from level 9, taken just beneath these terracotta "floors", gave a radiocarbon date of 980 ± 80 B.P. (Beta-20712). This calibrates to A.D. 880-1240 using Stuiver and Pearson's calibration curves at two standard errors (Stuiver and Pearson 1986).

Level 10, a second "transitional" level consisting of 60 cm of homogeneous light clay, was followed in levels 11-12 by another increase in cultural deposits. These levels, extending from 2.82 to 3.50 m, were characterized by a heterogeneous light loam yielding much bone and a profusion of thin-walled Phase I/II sherds. In level 13 (3.50-3.98 m), this loam graded again into a light clay, characterized by the yellowish brown color and abundant limonite nodules typical of deposits at floodplain level. Like levels 11 and 12, the top part of level 13 contained large amounts of characteristic Phase I/II pottery, but artifact yield diminished to near sterility by the end of the level.

The earliest occupation level in unit Sh7 was level 14 (3.98-4.23 m), a friable sandy loam which resembled the sandy lower levels of unit D6. Archaeological deposits in this level were relatively heterogeneous, with scattered ash, much Phase I/II pottery, and a slight horizontal structure suggesting the possibility of successive temporary occupation. This sand level, which appeared to be the surface of a levee, was underlain in level 15 by a sterile clayey loam which appeared to represent the erection of the levee on the floodplain surface.

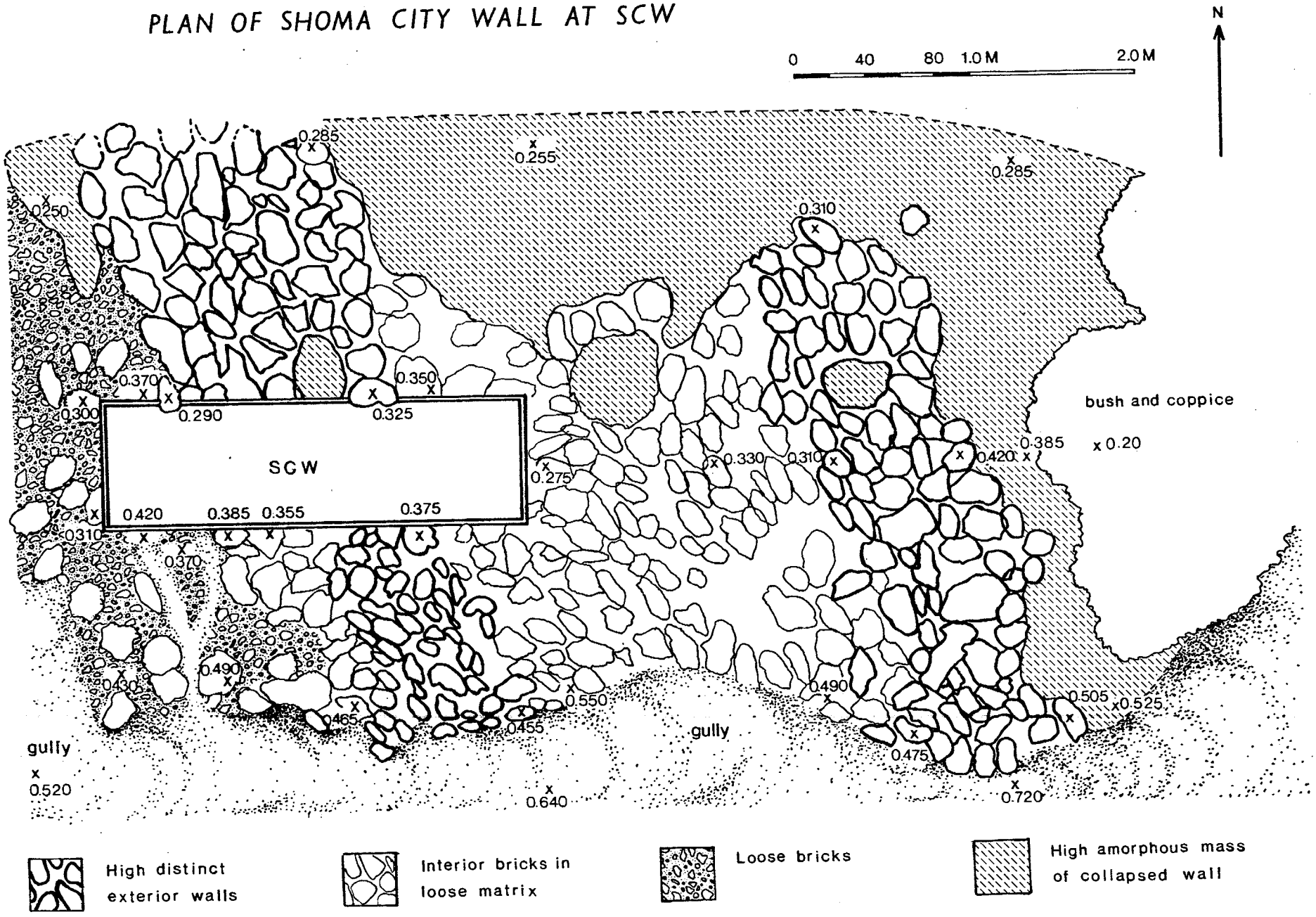
Various occupational levels in unit Sh7 contained a mix of ceramics from early periods, apparently due to their inclusion in the clay used as building material. Nevertheless, pottery from this unit showed a complete sequence from Jenne-jeno Phase I/II through Jenne-jeno Phase IV, with changes in ceramic phases approximately corresponding to the natural

stratigraphic breaks in deposition (**Table 4**). The wall collapse in levels 1-5 included sherds characterized by decorative attributes similar to those of Jenne-jeno Phase IV. Levels 6-10 contained carinated and painted pottery typical of Jenne-jeno Phase III, datable at that site to the mid/late first millenium A.D. (Chapter 4). Pottery from the lowest occupied levels, 11-14, consisted almost entirely of the thin, finely prepared, twine-decorated wares characteristic of Jenne-jeno Phase I/II. As in other units at Dia, non-ceramic artifacts were rare, and proved of little use in interpretation or dating of excavated levels.

Unit SCW (Shoma): Unit SCW was a cross-section of the massive city wall whose visible remains ran some 0.5 km along the northern and western edge of Shoma (**Figure 3**). This test trench was located on the northwestern periphery of Shoma, southwest of both unit Sh7 and the mass of building foundations which occupied the interior of this part of the site. The excavation site was adjacent to a narrow gully which had exposed, *in situ*, a section of the entire width of the wall foundation and adjacent wall collapse (**Figures 16 and 17**). Unit SCW measured 2.50x0.75 m, with its main axis oriented 136°. It was excavated through nine levels to a depth of 1.98 m, some 95 cm below the base of the wall foundation (Appendix 1). In the two lowest levels, excavated area was reduced from the surface dimensions of 2.50x0.75 m to 1.40x0.75 m.

Like the Phase III city wall at Jenne-jeno, the Shoma city wall was visible on the surface as a mass of irregularly circular sun-dried bricks, which at Shoma averaged c. 20 cm in diameter and 9 cm in thickness. Both on the surface and at its foundation, the Shoma city wall measured about 5.0 m across, more than half again the width of the c. 3.0-3.6 m Jenne-jeno wall (S.K. and R.J. McIntosh 1982: 402). Unlike the Jenne-jeno wall, which was a unitary structure of mortared brick, excavation revealed the Shoma city wall to have been built by revetment, with two mortared brick casing walls, each approximately 1.30 m wide, enclosing a 2.40 m core of loose brick fill (**Figure 18**).

PLAN OF SHOMA CITY WALL AT SCW



High distinct exterior walls

Interior bricks in loose matrix

Loose bricks

High amorphous mass of collapsed wall

Figure 17. Section of Shoma city wall as exposed by gullywash.

Figure 18. Surface exposure of the Shoma city wall in the area of unit SCW, showing wall collapse (foreground), city wall, and gully. Pins mark the inner boundaries of the revetment wall.

Unit SCW bisected the eastern 1.90-2.00 m of this structure, encompassing approximately the eastern one third of the brick fill and all of the eastern revetment wall. To the east it extended an additional 50-60 cm into the cultural deposits within the wall's perimeter. Stratigraphic deposits were of four types: the wall foundation, composed of the revetment wall in the east and brick fill in the west; wall collapse and wall melt just east of the revetment wall; an underlying light clay occupation level into which the wall foundation was dug; and an apparent levee sand underlying these cultural deposits. This sequence is reconstructed in **Table 3**. Stratigraphy was extremely clear, with, in most instances, an unmistakable delineation of boundaries between revetment wall, brick fill, and the different levels of external deposits. Excavated levels, shown in **Figure 19**, corresponded closely with the natural strata (**Figures 20-22**).

Levels 1 and 3 (0.15-0.75 m) comprised the main body of the wall excavated in unit SCW. These levels consisted of combined revetment wall and brick fill, with the eastern revetment wall composed of entire bricks in hard clay mortar, and the fill deposits to the west made up of loose bricks in a softer heavy loam matrix. The revetment wall terminated at the base of level 4, where it bottomed out at a depth of 1.03 m. The slightly shallower brick rubble fill ended in the upper part of level 5, at a depth of 0.85 m.

The mass of erosional debris lying east of the revetment wall was excavated as level 2 (0.16-0.53 m). This level was made up of 17 cm of loose wall collapse overlying a 20 cm stratum of compact wall melt containing occasional, severely eroded bricks. Beneath level 2 and the architectural remains of levels 1, 3,4, and 5 was a continuous stratum of iron-stained light clay, similar to floodplain deposits, which appeared to be undisturbed occupational deposits antedating the construction of the city wall. This stratum, composed of levels 6-8 and the lower part of level 5, continued without change to a depth of 1.70 m. It was underlain in level 9, the lowest level of the unit, by a nearly sterile loamy sand, apparently levee material similar to that found in the lower levels of

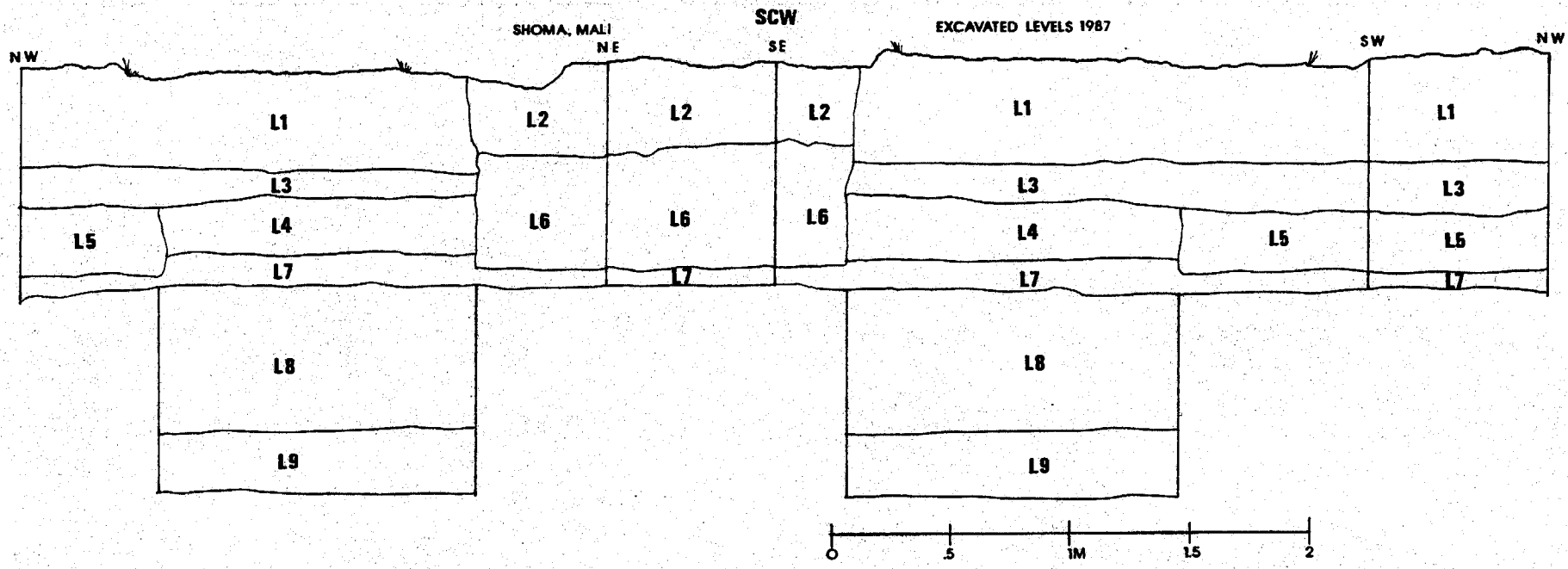


Figure 19. Excavated levels in unit SCW.

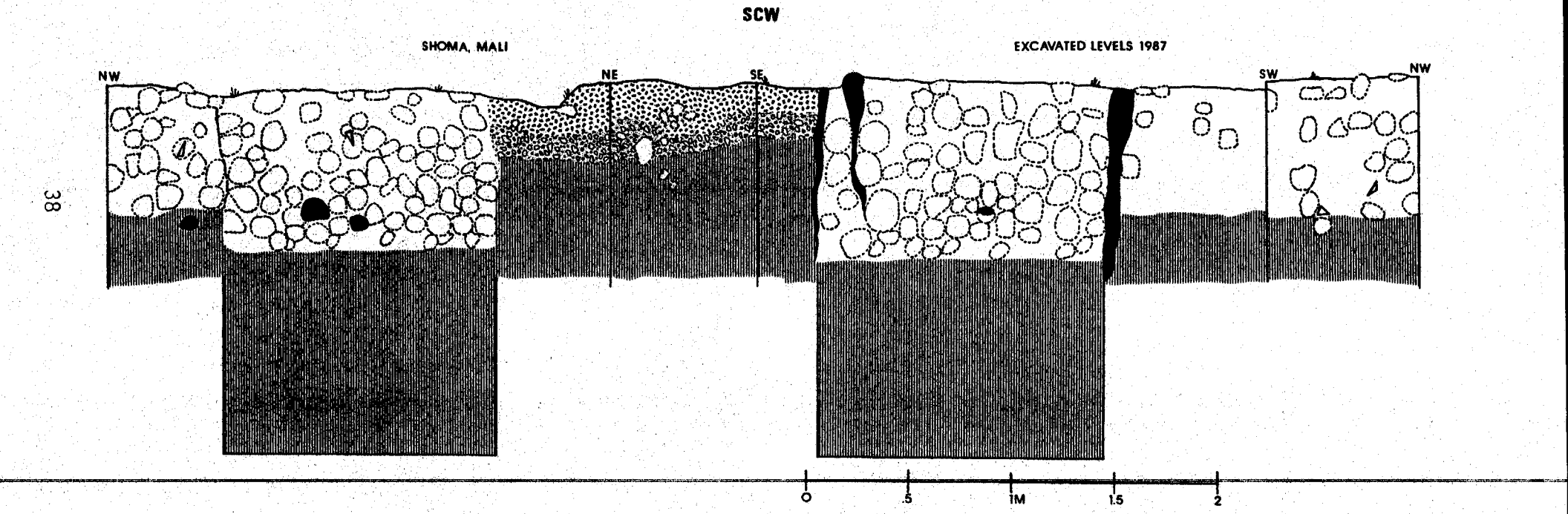


Figure 20. Stratigraphy of unit SCW.

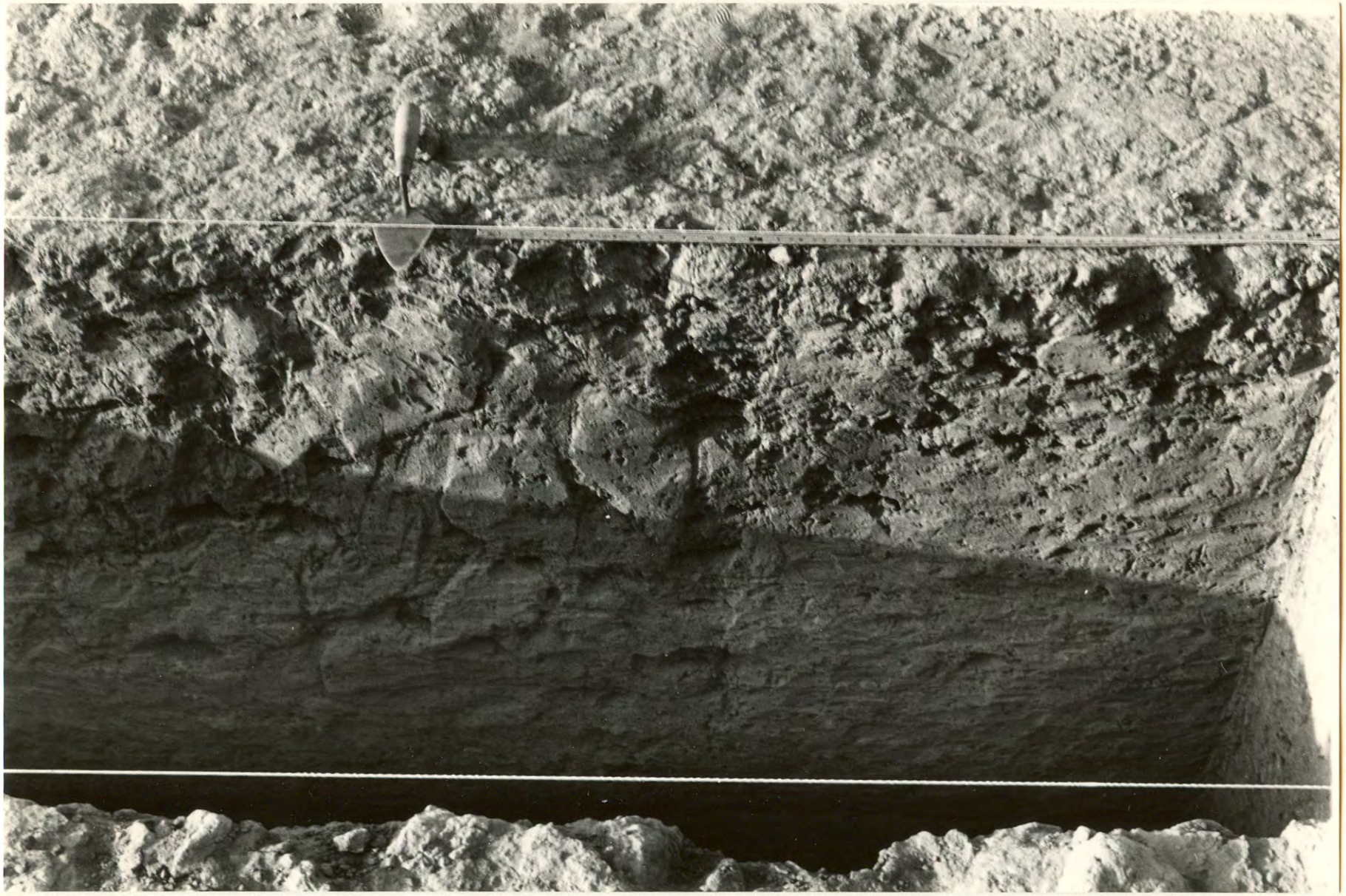


Figure 21. Unit SCW, west half of south section, showing delineation between revetment wall and brick fill.

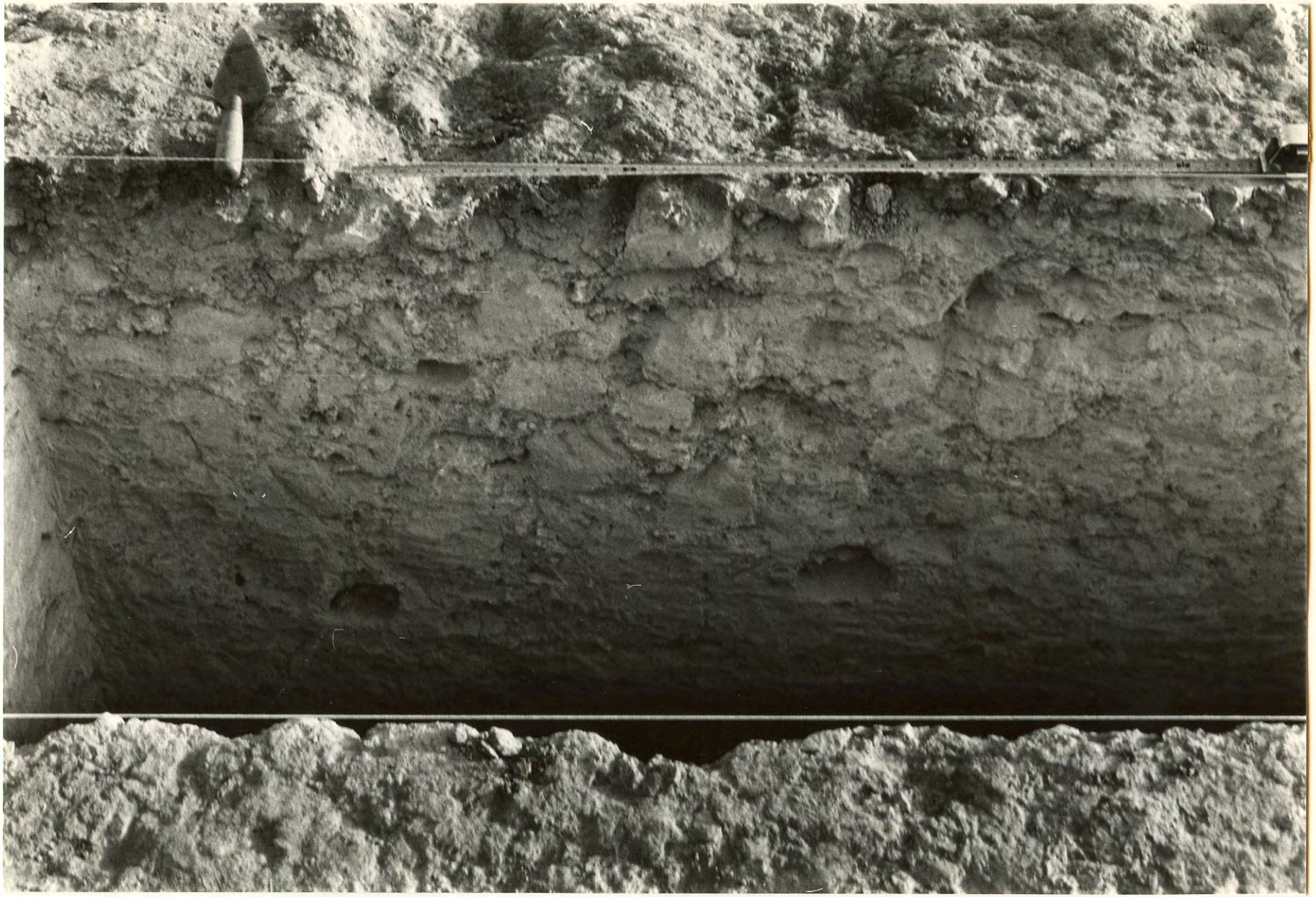


Figure 22. Unit SCW, west half of north section. Tape measure extends to approximate edge of revetment wall.

Table 3: Reconstruction of depositional sequence in unit SCW

Excavated level*	Depositional event
2	Top of level: loose wall collapse with whole bricks. Bottom of level: slow wall melt with small brick nodules only.
1	City wall, made up of eastern revetment wall with loose brick fill to west.
3	Same as level 1.
4	Lowest part of revetment wall.
5	Top of level: lowest part of brick fill. Bottom of level: same as levels 6 and 7.
6	Regular permanent occupation preceding construction of city wall.
7	Same as level 6.
8	Sparse occupational remains.
9	Levee; sparse occupational remains, diminishing with depth.

* related events enclosed by brackets

Table 4: Attribution of excavated levels by occupational phase

	Unit D6 levels	Unit Sh7 levels	Unit SCW levels
Phase V *	1		
	2		
(c. A.D. 1400	3		
- present)	4		
	5		
Phase IV		1	
	6	2	
(c. A.D. 800	7	3	?
- A.D.1400)	8	4	
	9	5	
Phase III		6	
		7	6?
(c. A.D. 300		8	7?
- A.D. 800)		9	8?
		10	9?
Phase I/II	10	11	
	11	12	
(c. 250 B.C.	12	13	
- A.D. 300)	13	14	

* Phase dates are based on radiocarbon and ceramic chronologies from Jenne-jeno (S.K. and R.J. McIntosh 1980; R.J. and S.K. McIntosh 1982).

units Sh7 and D6. Level 9 was closed at 1.98 m with no change in soil and with occasional artifacts still occurring.

Dating of the Shoma city wall was problematic, due to the peculiar distribution of artifacts within this unit. No artifacts other than pottery and occasional pieces of iron slag were recovered in any level (Appendix 3). In levels 1, 3, and 4, which were composed entirely of *in situ* city wall, ceramic yield was high, and consisted predominantly of characteristic Phase I/II pottery sherds, incorporated into both the bricks and mortar. All other levels had fewer than 40 sherds, and most had considerably fewer. Phase I/II material continued to dominate the small ceramic assemblage recovered from the wall collapse of level 2, as it did in the brick rubble fill from the upper part of level 5. In all levels antedating the wall, however, these ceramics, while present, were extremely rare, suggesting that their presence in the architectural levels may have derived from preferential inclusion as a tempering material for bricks (Chapter 4). The recovery from levels 7 and 8, immediately below the wall foundation, of several rim sherds of a type known only from Phase III or later at Jenne-jeno provided a mid first millenium A.D. *terminus post quem* for the construction of the wall. We suggest that its construction dates to approximately the same period as the late Phase III Jenne-jeno city wall (R.J. and S.K. McIntosh 1982: 30).

Conclusions: Occupation chronology and nature of deposits

Not surprisingly for a site of this size, excavation revealed markedly diverse patterns and dates of occupation in different parts of the Dia complex. Units Sh7 and D6, located on the high ground of their respective mounds, appear to have been "residential" sites, each with over 3.5 m of primarily domestic remains including ceramics, bone, ash, and house collapse. But these two units had very different occupational histories, with each recording its most archaeologically productive levels during a period not represented at the other--i.e., Phase III at Sh7 and Phase V at D6. Only during Phase IV and Phase I/II did there appear to be

contemporary settlement in the two areas.

The long Phase I/II sequences in the lower levels of these units were remarkably dissimilar. In units D6 (levels 10-13) and Sh7 (levels 11-14), Phase I/II deposits were extremely thick, comprising, at 1.7 and 1.4 m, approximately one third to one half of all occupational strata. At D6 the entire phase appears to have consisted of a series of temporary settlements, possibly fishing camps, with artifacts distributed through a uniform sandy matrix which suggested the possibility of periodic fluvial reworking. At unit Sh7, however, Phase I/II appears to have been largely characterized by continuous occupation. Although there was no direct evidence of permanent architecture, the majority of Phase I/II deposits in this unit were composed of relatively heterogeneous material with ash, bone, and somewhat larger pottery sherds than were found at D6. Aside from one possible hiatus in the lower part of level 13, just above the levee surface, there were no sterile lenses indicating periods of abandonment as at D6. Only in the levee sand of level 14, a thickness of some 25 cm, did soil structure and artifact distribution suggest limited temporary occupation preceding the first permanent settlement at Sh7. At both Mara and Shoma, slag from ironsmithing or smelting were found in the lower levels of Phase I/II (in unit Sh7 smelting slag was found actually on the levee surface, in level 14), demonstrating that the earliest inhabitants were fully conversant with metallurgy.

Phase III was represented at Dia only on the mound of Shoma. On Mara, the area of unit D6 appeared to have been totally abandoned during this period, although surface artifacts indicated some Phase III occupation on other parts of the mound. In Sh7, Phase III pottery was present in levels 6-10, which, at a total thickness of nearly 2 m, comprised the longest of the three occupational phases in this unit. Though no architectural remains were encountered, the series of apparent living surfaces and "floors" in these levels gave evidence that this was the period of most intensive occupation at Sh7. As in all levels in this unit, pottery included a significant admixture of Phase I/II material. Non-ceramic artifacts included none of the decorative objects or copper and iron artifacts found

during this phase at Jenne-jeno.

Unit SCW, located on the edge of the mound of Shoma, appeared to consist primarily, if not entirely, of deposits dating to Phase III or later. The city wall foundation excavated in this unit gave evidence that Shoma during its later years was a well-organized urban community, capable of banding together to construct a city wall comparable to that of Jenne-jeno at its peak. Judging from the scantiness of artifacts outside and beneath the wall, however, SCW was not otherwise a locus of significant occupation. Given the relatively low-lying position of the unit, in an area subject to erosion and perhaps flooding, the possibility cannot be excluded that artifacts found in the non-architectural levels of SCW had been redeposited by washing from other parts of the site. As this unit was not excavated to entirely sterile soil, the possibility exists that level 9 was underlain by other, unexcavated levels containing Phase I/II material. Available data suggests, however, that as at Jenne-jeno, Phase I/II occupation may not have extended to include this site near the edge of the mound (S.K. and R.J. McIntosh 1980: 441).
During Phase IV (early second millenium A.D.), settlement at Dia may have once again extended to Mara. In unit D6, abandoned sometime during Phase I/II, levels 5-9 yielded pottery similar to that of Jenne-jeno Phase IV. This material, encountered immediately above the sandy levels of Phase I/II, was anchored by a fourteenth/fifteenth century radiocarbon date from level 9 (Appendix 2). On Shoma, Phase IV pottery was present in levels 1-5 of unit Sh7, where there appears to have been a smooth transition from Phase III to Phase IV, with little change other than pottery types and quantity between level 6 and level 5. In both units D6 and Sh7, Phase IV deposits consisted primarily of brick wall collapse and wall melt, the only domestic architectural remains encountered in the Dia excavations. Phase IV levels in both units were characterized by large amounts of pottery but scant non-ceramic artifacts and were, to all appearances, part of a single extended community.

This expanded settlement area may have in fact involved a gradual transfer of population to the mound of Mara, for at some point during

Phase IV, Shoma, like Jenne-jeno, was abandoned and not reoccupied. On Mara, however, plentiful surface artifacts attest to continued occupation through Phase V, a period encompassing the late second millenium and characterized by essentially modern pottery and artifacts. Phase V was represented in unit D6 by level 2 and the associated refuse pit excavated in levels 1, 3, and 4. In level 2, hard clay and heavy brick rubble signified rapid wall collapse, presumably from the same structure that had begun to decay in the Phase IV levels 5 and 6. The disposal pit was filled with ash, copious amounts of bone, and large fragments of broken pots, clearly the remains of an active domestic occupation. In these levels non-ceramic artifacts, though still rare, began to show a diversity that stood in marked contrast to all earlier periods at Dia. For the first time, grindstones and slag were supplemented by a range of specialized objects: fishing net weights, decorative items, iron "wire", and spindle whorls, this last the only excavated artifact class which suggested Islamic North African influence. Notably absent -- though present elsewhere on Mara as surface artifacts -- were terracotta tobacco pipe fragments, the usual hallmark of post sixteenth century occupation (Mauny 1961: 59). Phase V deposits from unit D6 (0.41 m excluding the pit deposits) were, however, the shallowest of any occupation phase on the site, and may have encompassed only a portion of the time that Mara was occupied during this period. Phase V terminated on Mara when, within the historical memory of modern inhabitants, settlement shifted westward to present-day Dia.

Chapter 3

ARTIFACTS AND FEATURES

ARTIFACTS

This section describes the artifacts, other than pottery, recovered from the excavation units on the mounds of Shoma and Mara. Surface artifacts from the survey of the Dia hinterland were recorded, but not analyzed. These artifacts are discussed in the summary of the survey results in Chapter 5. Pottery from the Dia excavations is evaluated in Chapter 4.

Only 109 small finds other than pottery were recovered in the 1986-1987 excavations. Although other factors may have contributed, this remarkably low yield can quite probably be attributed to the chance placement of excavation units in areas with comparatively little immedite occupational activity (Chapter 2). Of the artifacts recovered, well over two thirds (77) consisted of small pieces of iron slag, an artifact which, like broken pottery, has little inherent value, is easily scattered, and appears to have frequently found its way into the dried clay bricks used for building walls. Iron slag was regularly recovered from excavated levels of all depths, including the Shoma city wall.

A distant second in artifact quantity were grindstones and grindstone fragments, of which eleven were recovered. Like slag, grinders were found scattered throughout all levels of D6 and Sh7, the two "residential" excavation units. With the exception of one glass bead from Phase I/II unit D6, virtually all other artifacts came either from the Phase V trash pit and wall collapse of unit D6, or from the Phase III and later Phase I/II occupational levels of unit Sh7. No artifact class other than slag and grindstones contained more than five items. Within this small sample, however, decorative objects and objects indicative of economic specialization (i.e., spindle whorls and net weights) tended to be concentrated in the Phase V levels. No metals other than iron were

recovered.

The following descriptions are organized into three categories: ceramic artifacts, including spindle whorls, net weights, terracotta animal fragments, and fired brick; stone artifacts, including stone and glass beads, grindstones, potter's ochre, and decorative items; and metal artifacts, made up of iron wire and smithing and smelting slag. A catalogue of all artifacts by provenance is found in Appendix 3.

Ceramic artifacts

Spindle whorls: Spindle whorls, assumed to be associated with the introduction of cotton, are generally considered an indirect sign of trans-Saharan contact in West Africa (Mauny 1961: 59, 245-46). At Jenne-jeno, spindle whorls first appear in Phase IV (c. A.D. 800-1400), along with other possible evidence of Arab influence such as rectilinear house plans and glass trade beads (S.K. and R.J. McIntosh 1980: 191-92). Five ceramic spindle whorls were recovered from the 1986-87 excavations at Dia, all from the Phase V levels of unit D6. This was the only indication of North African influence found in either Phase IV or Phase V at Dia.

TABLE 5: SPINDLE WHORLS: MEASUREMENTS & DESCRIPTION

Unit/ Level	Description	Height	Diameter	Bore Diam.	Weight
D6/1	Sub-spherical, gray, undec.	24 mm	30 mm	3.0 mm	19.81 g
D6/2	Sub-spherical, black, dec. w/ longitudinal grooves filled w/ white paint.	18 mm	24 mm	2.5 mm	10.49 g
D6/3	Hemispherical, black; sides	15.5 mm	22 mm	2.5 mm	11.31 g

incised w/ 6 double circles over 2 latitudinal grooves; all incising filled w/ white paint.

TABLE 5: SPINDLE WHORLS CONT.

Unit/ Level	Description	Height	Diameter	Bore Diam.	Weight
D6/3	Hemispherical, black, undec.	17 mm	24 mm	1.5 mm	10.30 g
D6/4	(fragment) Hemispherical, black; flat end painted red & incised w/ diag. grooves filled w/ white paint.	21 mm	24 mm	3.0 mm	(5.9 g)

Net weights: Two fired clay fishing net weights were recovered, from levels 3 and 4 of the Phase V trash pit in unit D6. Both weights were red/light red in color and were broken off above the center point of their original length. The length of the fragment from level 3 was 29 mm and that from level 4 was 65 mm. Bore diameter on each was 6.5 mm and maximum thickness, at the midpoint, was 18 mm. Several other net weights recorded on the surface of Mara (Chapter 5) were the only other incidence of this artifact type noted in either excavation or survey.

Terracotta animal fragments: Small zoomorphic and anthropomorphic figurines c. 3 to 7 cm in length occurred at Jenne-jeno in levels ranging from late Phase I/II through Phase IV (S.K. and R.J. McIntosh 1980: 159). These figures have also been found in Late Stone Age contexts (Smith 1974: 48; Connah 1981: 134-36), and closely resemble small clay figurines still made as toys by Fulani children. At Dia, one fired clay fragment which appeared to be the hindquarters of a quadruped was found in the Phase I/II level 13 of unit Sh7. This fragment was of black clay and measured 46.5 mm in length by 27 mm width and 47 mm maximum height.

Level 8 (Phase III) of the same unit yielded several pieces of a dark buff clay object which may also have been part of a figurine, although its extremely fragmentary nature made its exact shape impossible to determine.

Fired brick: Five pieces of fired brick were recovered at Dia, all from unit Sh7. Two of these were from the largest of the Phase III occupational "floors" in level 8, and two more came from the accompanying domestic debris of levels 8 and 9. The fifth fragment was from level 11, a possible Phase I/II living area.

TABLE 6: FIRED BRICKS: MEASUREMENTS & DESCRIPTION

Unit/Level	Color	Slip	Thickness
Sh7/8		red-slipped surface w/ 1.5-mm border of white paint just inside edge of brick	50 mm
Sh7/8	mottled	none	38 mm
Sh7/8	gray	none	48 mm
Sh7/9		dark red	60 mm
Sh7/11		dark red	50 mm

Stone artifacts

Grindstones: Three complete grindstones and eight grindstone fragments were recovered from excavation units Sh7 and D6. These artifacts were

distributed more or less evenly through various levels and showed no clustering in any one area or time period. The grindstones were made from a variety of sandstones whose original provenance is not known, but which were clearly imported to the Dia area since there is no naturally occurring stone in the Niger floodplain. The closest potential sources of sandstone are on the outskirts of the Inland Niger Delta, c. 90-100 km to the east and west of Dia.

TABLE 7: GRINDSTONES: DESCRIPTIONS AND MEASUREMENTS

Unit/ Level	Description	Composition	Height	Width
D6/3	Indeterminate shape; red staining over all working surfaces	Fine buff-colored sandstone	29.5 mm	
D6/3	Sub-triangular shape; broken at small end	Coarse gray sandstone	33.0 mm	72.0 mm
D6/7	Fragment one corner	Fine light tan sandstone		
D6/11	Fragment two sides and edge	Mottled black/white medium-grain sandstone		
Sh7/3	Very fragmented	Med/fine homogeneous gray sandstone		
Sh7/4	Fragment	Same		
Sh7/8	Ovoid base 125x78mm w/ 27mm dimple in ctr	Coarse friable gray sandstone	56.0 mm	

Sh7/12	Three fragments of one grinder; shape indeterminate	Fine-grained gray sandstone	30.5 mm
Sh7/13	Fragment one side w/ 7.5 mm groove down center	Gray sandstone	

Stone and glass beads: Only two beads were recovered from the Dia excavations, one from the lower level (level 4) of the Phase V disposal pit in unit D6 and one from level 10 of the same unit. The Phase V bead, slightly sub-spherical in form, was 6 mm in height, 8 mm in diameter, and had a perforation diameter of less than1 mm. Weight was 0.08 g. This bead was carved from soft white "marl," a material clearly foreign to the Inland Niger Delta, although its place of origin is not known.

The second bead consisted of two tiny fragments of a translucent light blue glass bead, whose only measurable dimension was from the edge of the center perforation to the outside of the bead (2.5 mm). This artifact, found in the uppermost Phase I/II level of unit D6, is something of a mystery. Glass beads of presumed European manufacture are thought to have been introduced to West Africa in the second millenium A.D. (Mauny 1961: 59, 245-46). In color, craftmanship, and size, however, this bead resembles a blue glass bead found in late Phase I/II deposits at Jenne-jeno (S.K. and R.J. McIntosh 1980: 164). Both beads date, at the latest, to the early first centuries A.D., implying the existence of some sort of long-distance contact by that period. They bear little resemblance to the heavy opaque glass beads usually found in second millenium contexts.

Other decorative objects: This artifact class included two unidentified stone objects, both from the Phase V levels of unit D6. From level 1 came a small gray and red quartzite ellipse, perhaps a gaming piece or decorative object of some sort, but also possibly a natural river pebble. This item measured 9 mm long by 7.5 mm wide and 3.5 mm thick. The second item, from level 3, was a small flat fragment of white "marl"

(weight 10.9 g) incised with what appeared to be a diamond-shaped outline filled in with horizontal cross-hatching.

Stone "cone": This object, found in level 12 of unit Sh7 (Phase I/II), was made from a coarse-grained mottled red and black metamorphic stone. Its function is unknown. The shape was that of a truncated cone, slightly oval in cross-section, 23.5 mm in height, and measuring 6.5x5.0 mm at the base and 4.5x3.5 mm at the top. Weight was 1.0 g.

Potter's ochre: A c. 20x20 cm clump of dark purple hematite nodules, possibly potter's ochre, was found among the ash and Phase III domestic refuse of level 7, unit Sh7.

Metal artifacts

Iron wire: In spite of the regular occurrence of slag throughout the excavations, only one object made of metal was found at Dia. This was a small strand of rusted iron "wire" recovered from level 1 of unit D6. This level, the topmost stratum of Phase V in unit D6, was the most recent excavated on the site. The iron strand was 19.5 mm in length and had a round cross-section 4.5 mm in diameter.

Iron slag: Iron slag was by far the most common artifact included in the small finds category at Dia. In all, 77 pieces of slag were recovered, mostly in small isolated occurrences throughout the deposits of all three excavation units. All slag recovered was classified as either smithing slag -- lightweight, porous, and cinderlike in appearance -- or smelting slag, denser, heavier, and sometimes glassy in appearance. More than two thirds of the slag recovered was smelting slag, evidence that local smiths were not only working iron on site, but were also importing raw ore and reducing it to bloomery iron.

Smelting or smithing slag was found in slightly more than half of all occupational levels, including the lowest levels of Phase I/II, an

indication that, as at Jenne-jeno, knowledge of iron-working was brought into the region by the earliest settlers. Although there were no large concentrations, the largest amounts of slag came from the heavy Phase I/II and Phase III occupational deposits of unit Sh7. In levels 8 and 9 of this unit (Phase III), several pieces of smelting slag still had clay furnace parts attached. Comparative slag weights across the site are shown in **Figure 23**; exact weights and counts by level are given in Appendix 3.

FEATURES

No features such as house walls, hearths, etc., were found during the excavations at Shoma and Mara. All features described in this section are surface features, recorded during the surface survey of Shoma, Mara, and outlying sites. The only surface feature subjected to excavation, the Shoma city wall, was sectioned perpendicularly by the unit labeled SCW. The description of the city wall is found in the introduction to the stratigraphy of that unit in Chapter 2.

Surface Features: Mara

There were no surface features on the high, central section of Mara, where test unit D6 was located. There were perhaps a dozen house foundations at the extreme northwest of the mound, closest to the presently inhabited link between Mara and Dia proper (**Figure 3**). These foundations were rectilinear and of round bricks. Our informant, Oumar Dienta, claimed they were of recent date.

Surface features: Shoma

Figure 3 illustrates the surface features of this mound as recorded

Occurrence of Slag by Excavated Level

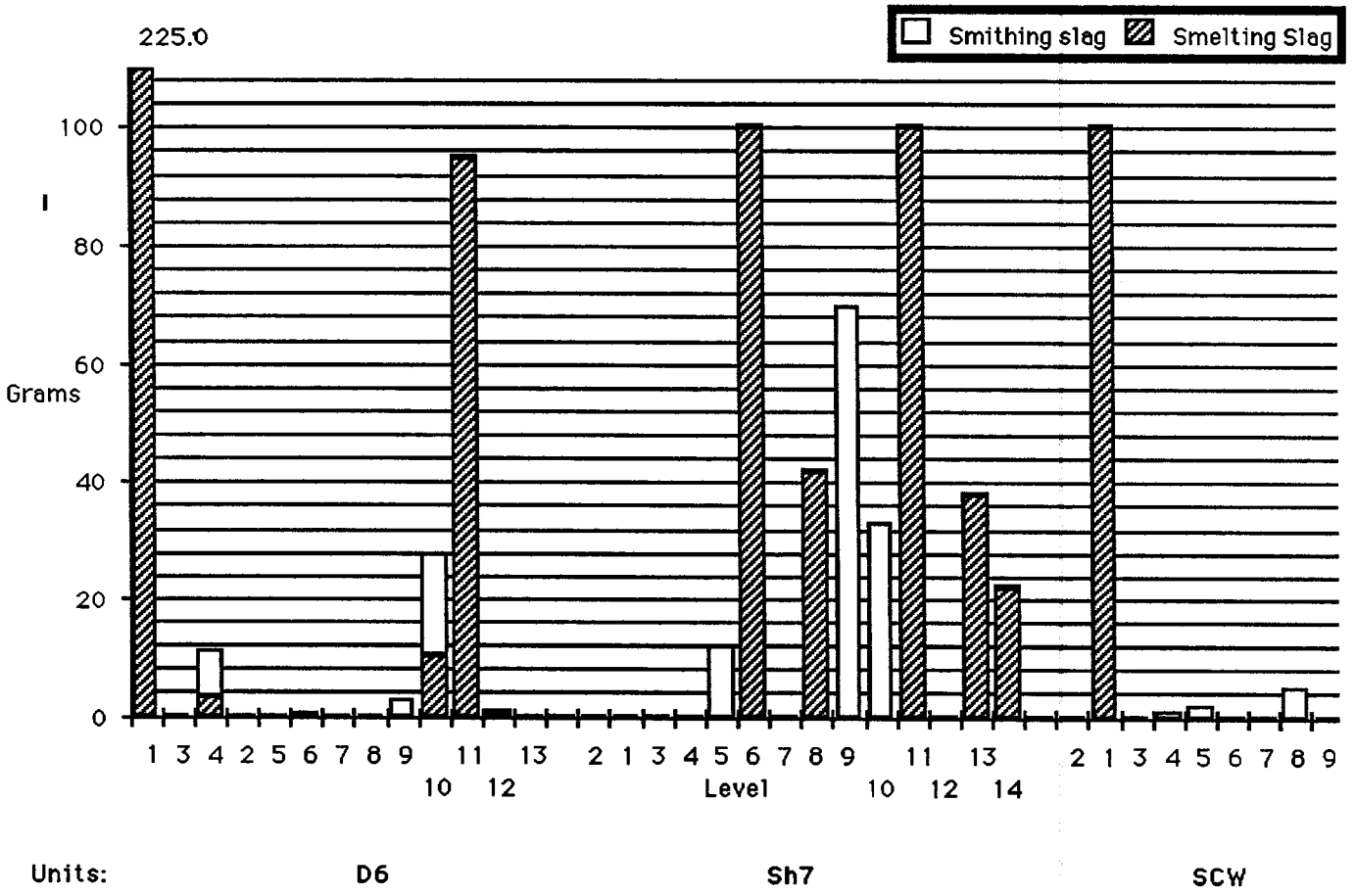


Figure 23

during two days of field walking. The massive architectural exposure covering most of the northern half of the site rarely revealed house shape. All bricks found were round and, where individual houses could be discerned, they were round. A major exception to the lack of structure shape was the massive rectilinear feature in the northeast quadrant, illustrated in **Figure 24**. This feature attracted our attention by the clarity of the brick and wall definition (perhaps indicating construction at the end of Shoma's occupation, or even well after the mound was abandoned) and by the regular cell-like alignment of the rooms. This feature is quite unlike any other we have found in archaeological survey or excavation throughout the Middle Niger.

The central part of Shoma, to the south and west of these foundation remains, is dominated by a dunelike high sand eminence topped with a stand of palms. There is a possibility, quite unlikely in our opinion, that this feature is a tumulus. Its shape is slightly conical, like a tumulus, and builders of tumuli are known to have preferred sandy soil. However, the Shoma feature lacks the protective and distinctive capping of burnt earth so often documented at the Inland Delta further downstream (Mauny 1961). It seems more likely that this is either a recent, localized accumulation of sand caught by the palms and high vegetation of the farm on this part of the site, or that it represents a high vestige of the original levee upon which the settlement was placed.

Finally, the vast exposures of Phase I/II ceramics in low-lying parts of the mound, particularly to the south and west, and the respectible "noise" of this material everywhere on the surface raise questions about the first occupation of this site. Was the first settlement localized towards the southwest? Or was the entire mound occupied and a reduced population during Phase III and particularly Phase IV progressively restricted to the northern half of Shoma?

Surface features: satellite mounds

Figure 24. Shoma "acropolis": view of the western portion of the extended rectilinear structure which dominates the surface remains of northern Shoma. In the background, topped with palms, can be seen the high dunelike feature bounding the western edge of the mound.

Surface features recorded from mounds in the Dia hinterland consisted of pre-Islamic burial sites and brick architectural foundations. The numerous funerary features, found on seven mounds in the immediate vicinity of Dia (**Figure 53**), were visible on the surface as circles or ellipses of hard clay outlined by a single course of round sun-dried bricks (**Figures 25 and 26**). These structures were often covered by or associated with a "lid" or pavement composed of rounded potsherds. In some cases funerary urns similar to those found in the Jenne-jeno "jarfields" could be seen eroding out of the mound (S.K. and R.J. McIntosh 1980: 97-104). Rarely, circular features also had an interior or exterior feature made up of an additional rectangular or square outline of sun-dried bricks. On sites IV6, IV10, 22i, and 23i, which appear to have served as cemeteries, funerary features were found in great density, often overlapping one another. These features are described in **Table 8**.

Architectural remains, described in **Table 9**, consisted of round and, very occasionally, rectangular house foundations made of circular sun-dried bricks. These were found in varying abundance on approximately half the mounds surveyed outside Mara and Shoma. It should be noted that architectural remains on the surface of any mound are badly disturbed and more often than not quite indistinct in shape and, sometimes, even in the form of the bricks. On the satellite mounds as well as on Mara and Shoma it proved impossible to count house foundations accurately, in sharp contrast to the Jenne-jeno vicinity where it was the exception to find merged agglomerations of foundations. In the terminology to follow, "large" architectural exposure means an extensive (>10m x10m) expanse of merged wall and floor, and "scattered" means several far smaller expanses, each perhaps representing a single house. It will be impossible to achieve greater accuracy of reporting architectural remains of the surface of these sites without excavation.

Figure 25. Site 23i: circular funerary structure and potsherd pavement.

Figure 26. Site 23i: circular funerary structures as exposed by erosion.

Table 8: Satellite mounds: circular funerary features

Site	Approx #	Location	Other (esp. potsherd pavement assoc.)
IV1	several	NW	
IV3	several		3 large potsherd pavements (Cnt & SE) and 1 large ceramic urn
IV6	c. 5 doz.	E, NE & S	brick lined; range of diam.47-180 cm, c. 2/3 of which are >100 cm; used as cemetery after occupation
IV8			1 large potsherd pavement, lined in bricks as at site23i (funerary use uncertain)
IV10	c. 3 doz.	SE	one inhumation also
22i	several doz.	all	linear arrangement to S, 1-1.5 m spacing
23i	several doz.	East half	1 large potsherd pavement and several circular pavements over clay funerary features

Table 9: Satellite mounds: architectural features

Site	Exposure	Brick Shape	Structure Shape	Comments
V2	large	round	round	
V6-7	large	round	round (occasional rect.)	diameter c. 3 m
IV1	large	round	round	
IV6	large	round	round (occasional rect.)	
18i	large	round	round	burned extensively
19i	small	round	?	
22i	small	round	round	
LIa	scattered	round	round	
LIc	scattered	round	round	
LIe	scattered	round	round	

Chapter 4

POTTERY

METHODS OF DATA COLLECTION AND RECORDING

Body Sherds

Despite the small size of the excavation units, most levels produced substantial amounts of pottery. Sherds recovered from a careful search of excavated soil were placed in cloth bags labelled with excavation unit, stratigraphic level, and date and transported to our base in Dia. There, all the sherds from each morning's excavation were washed during the afternoon of the same day and left out to dry. In this way, each day's excavated pottery was clean, dry and ready for sorting and recording the following afternoon.

Recording began with the sorting of each bag of sherds into "feature" sherds (rims, bases and handles) and body sherds. The feature sherds were rebagged for later study by S.K. McIntosh. Body sherds were immediately sorted into descriptive groups based on decorative variables and then recorded. The Dia assemblage proved to be so similar to the Jenne-jeno assemblage that the decorative variable categories defined for the Jenne-jeno material could be applied without significant modification to the Dia ceramics. The recorded variables were as follows:

SLIP. As at Jenne-jeno, some or all surfaces of some pots were covered with a suspension of clay, water and hematite colorant, resulting after firing in colors ranging from light orange (Munsell value 2.5 YR 6/6, 6/8; 5 YR 6/6, 6/8) to dark reddish-purple (Munsell value 5YR 5/6, 5/8). Only presence or absence of slip, not color of slip, was recorded for body sherds.

TWINE IMPRESSION. At Dia, as at Jenne-jeno, the impression of a twine pattern onto a leather-hard pot surface was the most common technique for decorating pot bodies. Twelve of the 17 different twine

patterns recognized at Jenne-jeno were present at Dia. One twine pattern not known from Jenne-jeno was also encountered. The 13 patterns recorded comprise several groups of related twines, such as the various plaited or braided roulettes (twines 1,2,3, and 10) , twisted twine roulettes (twines 4 and 5, 6 and 7), and twine- or cord-wrapped stick roulettes (twines 14, 15, 17). In the table below, we describe these twine patterns, using the classification developed for the Jenne-jeno pottery (S.K. and R.J. McIntosh, in prep.)

TABLE 10. Classification of Twine Patterns

BRAIDED OR PLAITED TWINES - **Figure 27** (see Hurley 1979:84-6)

- Twine 1: regular 2-cord plaited roulette
- Twine 2: herringbone 2-cord plaited roulette
- Twine 3: doubled 2-cord plaited roulette
- Twine 10: very small, fine 2-cord plaited roulette (i.e., a tiny version of Twine 1)

TWISTED TWINE ROULETTES - **Figure 28** (cp. Hurley 1979 cords 23, 29, 30, 57, 147, 154)

- Twine 4: twisted cord roulette producing vertical beaded pattern
- Twine 5: twisted cord roulette producing diagonal beaded pattern
- Twine 6: twisted twine roulette producing diagonal indented pattern
- Twine 7: twisted twine roulette producing large "maize cob" diagonal indented pattern

KNOTTED TWINE ROULETTES - **Figure 29**

- Twine 8: the appearance of the twine pattern is knotted, but the exact method of roulette manufacture is unknown

TWINE- OR CORD-WRAPPED STICK ROULETTES - **Figure 29**

- Twine 14: stick wrapped with untwisted fibers (Hurley 1979, cord 215
- Twine 15: stick tightly wrapped with cord (Hurley 1979, cord 221)

Twine 17: multiple stick roulette wound with spaced cord
(Hurley 1979, cord 262)

OTHER TWINE - **Figure 29**

Twine 20: unknown technique

PLASTIC. Following Shepard (1954:70, 194-5), we define plastic decoration as any decorative technique that exploits the plastic properties of clay. At Dia, plastic techniques other than twine impression (so common that we placed it in a descriptive category of its own) included channelling, comb-impression, stamping, incision, fingernail impression, and comb-dragging. The different plastic motifs encountered on the Dia pottery are illustrated in **Figures 30 and 31**.

PAINT. Three colors of paint - red, white and black/magenta - were encountered on the Dia pottery (**Figure 32**).

Recording procedures for body sherds began with the sorting of each bag of body sherds into the following groups: 1. undecorated; 2 slipped only; 3. twine-decorated only, (only one twine pattern present); 4. channelled and slipped only; 5.channelled only, no slip; 6. painted only (only one paint color present); 7.single plastic motif (other than twine impression or channelling); 8. unidentifiable (usually due to weathering); 9. multiple-attribute sherds not falling into any of the first 8 groups. During the sorting process, we discarded small sherds measuring less than approximately 2 cm on a side. With the initial sort completed, we set the sherds in group 9 aside for the moment, since they required more elaborate recording techniques. We proceeded to subdivide the sherds in groups 3, 6 and 7 into piles representing the different twine patterns, paint colors and plastic motifs. Having now divided all the body sherds from the bag into groups of similarly-decorated sherds, we carefully searched each group for pieces that clearly came from the same original pot. Multiple sherds from the same pot were set aside, leaving only one sherd representing that pot in the pile for recording. In this way, we sought to minimize the

Figure 27. Patterns of braided twine roulette impression on pottery from Dia. Top row: twine 1. Bottom row, left to right: twines 2, 3, 10.

Figure 28. Patterns of twisted twine roulette impression. Clockwise from upper left: twine 4 (two variants on same sherd), twine 5, twine 6, twine 7.

Figure 29. Knotted roulette, cord-wrapped stick roulette, and unidentified twine impression. Clockwise from upper left: tightly wound cord-wrapped stick roulette; small variant of same; knotted roulette; unidentified roulette; small variant of unidentified roulette; multiple cord-wrapped stick.

Figure 30. Plastic decoration on pottery from Dia. Top row: stamp and channeling. Bottom row, left to right: comb drag; incision; fingernail impression on carination.

Figure 31. Combinations of twine and other plastic decoratiion. Top row, left to right: twine 6 and twine 4; channeling over twine 1; pattern comb-dragging over twine 4. Bottom row: shallow comb-dragging over twine 4.

Figure 32. Paint decoration. Top row, left to right: cross-hatched red paint (Phase I/II); white over channeling with black geometric design (Phase III); white over twine 3 with black in single channel (Phase III); white over channeling with black stripes (Phase III). Bottom row, left to right: white over shallow comb-dragging (Phase III); red on cream-colored pottery (Phase V); red splashed on cream-colored pottery (Phase V).

danger of artificially inflating attribute frequencies by counting numerous fragments of the same pot. At this point, the number of sherds in each attribute pile (save group 9) was recorded, and those sherds not requiring further treatment such as drawing or photographing were discarded. Only the group 9, multiple-attribute body sherds remained to be recorded at this point in the procedure. As there were always relatively few of these, it was possible to describe each individual sherd in terms of a number of its formal and non-formal properties, including provenience (excavation unit, level), slip, and other decorative variables, as the format below illustrates:

unit	level	slip	burnish	twine	paint	plastic	other/details
Sh7	8	no	no	4	-	channels	channelling adj. to Tw 4
Sh7	8	DO	yes	-	wh+bl		deep chan.+blk pt. above carination, shallow chan + wh pt. below

In cases of complex, or relatively rare decorative motifs, a sketch of the sherd was made in the far right column. After recording, these multiple-attribute sherds were also discarded. Each day, then, we recorded and discarded all body sherds excavated the previous day, with the exception of illustrative sherds retained for a study collection. Rims and feature sherds were analysed and recorded separately after excavation was completed. In the next section, we describe the methods used.

Rim and Other Feature Sherds

As was the case for body sherds, all rim and feature sherds larger than 2 cm on a side were studied. The procedure began with the emptying of all bags of feature sherds from a single excavation level onto the table and their sorting into piles of handles, bases, spouts and rims. Handles, bases and spouts were drawn and described individually in terms of color, shape, size and decoration. Rim sherds were further sorted into various rim types (using a basic classification derived from the Jenne-jeno pottery

analysis) within two broad groups, unrestricted and restricted rims. Following Shepard (1954:230-1) unrestricted rims belong to vessels for which a tangent drawn to the rim in profile is vertical or inclined outward, and for which there is no point on the vessel contour marked by constriction; on restricted rims, a tangent drawn to the rim in profile inclines inward, or there is a point in the vessel contour marked by a constriction. Vessel shape for most of the rims from Dia is conjectural, of course, since no complete vessels were recovered from excavation. It has been reconstructed on the basis of rim angle whenever possible. The following rim classes were used in the analysis:

UNRESTRICTED	RESTRICTED
Simple	Simple
Beaded	Beaded
Non-vessels (potlids)	Carinated forms
Everted	Everted
Thickened (includes plates)	Flanged
	Bottles
	Thickened
	Short-neck globular

For each level in each excavation unit, all rim sherds in each rim class were drawn and/or described in terms of a number of variables, as follows: rim profile, rim angle, rim diameter (where determinable), slip (presence/absence, color, position on sherd), and decoration (details of twine, paint, plastic decoration and their position on the sherd.

RESULTS

Unit Sh7

Body sherds: Among the body sherds from Sh7, twine decoration

dominates in all levels, comprising 80-90% of the sherds in levels 11-14, and 60-70 % of all sherds in other, higher levels (**Figure 33**). Sherds decorated with slip only are rare (<5%) in levels 14-12, but are more common (10-20%) in higher levels. Undecorated (plain) sherds never exceed 10% 0f the body sherd assemblage at any time.

If we look in detail at the largest decorative category - twine-impressed sherds - we find that twisted twine roulettes of type 4 and 5 predominate at all levels, ranging from 90-99% in the lowest four levels, to 70-85% higher up in the sequence (**Figure 34**). Braided and twisted twine roulettes of types 1,2,3,4,5,6,7, and 10 account for all but ten of the twine decorated body sherds from Sh7. While braided twine motifs increase in popularity through time at Sh7, neither braided nor twisted twine roulettes of types 6 and 7 ever achieves real popularity.

In considering those body sherds that were not plain or decorated with slip only or twine impression only, some interesting patterns appear. Below, a breakdown of the decorative motifs constituting the "other" category in **Figure 33** illustrates these patterns (**Table 11**).

TABLE 11. OTHER DECORATIVE MOTIFS ON Sh7 BODY SHERDS

LEVEL	CHANNEL ONLY	CHANNEL + TWINE	LT DRAG OVER TW4	TWINE4 + TWINE 6	PATTERN COMB DRAG OVER TW4	CHAN + FING IMP	CHAN + PAINT	PT OVER TWINE 3
1	9	3				4		
2	3	2					1	
3	2							
4	17	8	1			3		
5	17	7			1			
6	8	6					5	
7	13	9			1	1	1	
8	15	10					8	
9	26	6					8	1
10	4	6			1		11	5
11	8	9		1				
12		2	2	6				
13	2	3	32	5				
14			12					

Figure 33. Unit Sh7: Body sherd decoration by excavated level

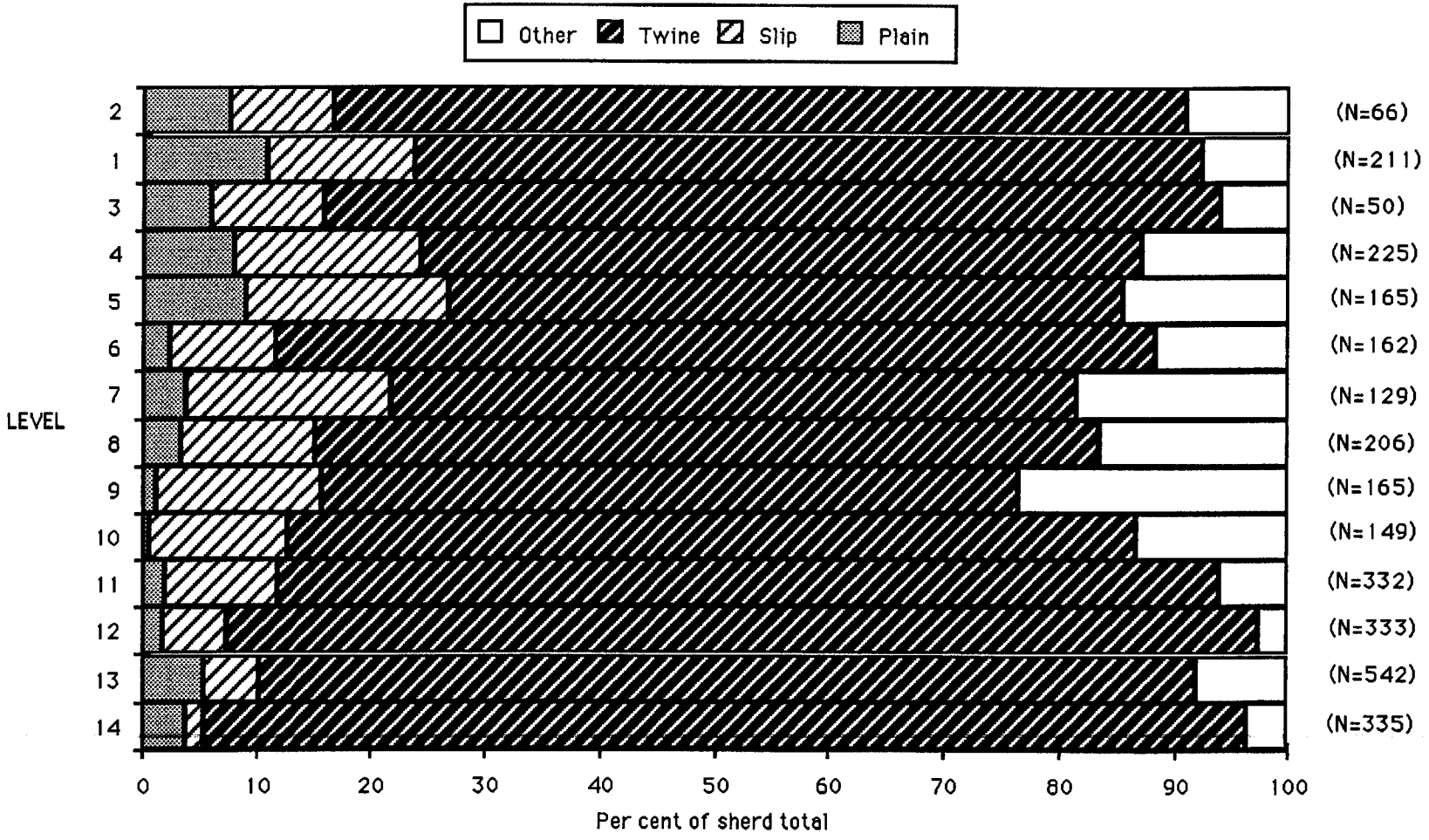
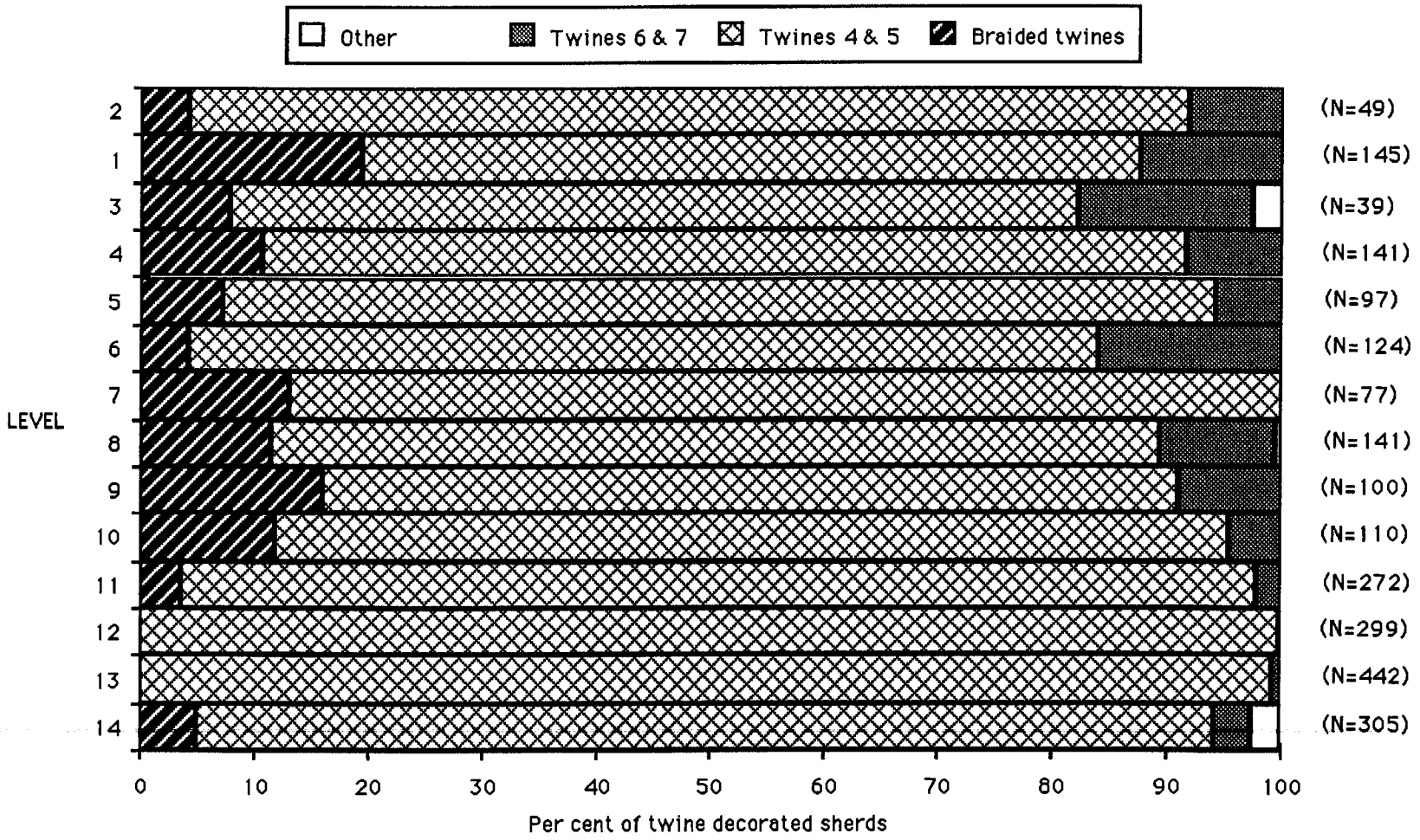


Figure 34. Unit Sh7: Twine Decorated Body Sherds



Although <10% of the body sherds in levels 14-12 fall in the "other" category, two decorative motifs account for nearly all these sherds: twine 4 covered by light, linear comb dragging (**Figure 31**), and twines 6 and 4 adjacent to each other on the same sherd. These two motifs virtually disappear after level 11. In levels 10-5, 10-15% of body sherds are included on the "other" category, comprising the following decorative motifs: channelling, channelling + twine, painted decoration, either over channelling or, less frequently, over twine 3. In levels 4-1, the "other" category declines to <10%, and paint decoration disappears. Channelling, either alone or in combination with twine or fingernail impression, remains the dominant motif within this category.

Information on paste was not recorded for body sherds, with the exception that occurrences were counted of the thin-walled, finely-prepared, pottery that we nicknamed "chinaware" (because of the high-pitched clinking, reminiscent of fine china, made when two sherds were knocked together) after first encountering it in early levels at Jenne-jeno. The fine fabric of chinaware is responsible for its characteristic appearance and high-pitched sound when hit: the paste comprises clay, some naturally occurring hematite-stined quartz sand, and a small quatity of finely ground grog. The coarser fabric of later pottery results from the addition of larger amounts of coarse grog. As the table below illustrates, increasingly high proportions of chinaware characterized the lowest levels of Sh7. In other levels, chinaware occurred sporadically in frequencies not exceeding 10%.

TABLE 12. PERCENTAGE OF CHINAWARE AMONG Sh7 BODY SHERDS

LEVEL	%	LEVEL	%
1	4.8%	8	5.8%
2	0	9	0
3	8%	10	4%
4	0	11	24.4%
5	0	12	65.2%
6	2.9%	13	78.6%
7	5.4%	14	84.2%

Feature sherds: Aside from rims, feature sherds recovered from Sh7 include several ring bases, three "steamer" fragments (flat pottery fragments perforated with holes), one curved handle fragment, and three bottle necks. The provenience of these sherds is listed in **Table 13**.

TABLE 13. NON-RIM FEATURE SHERDS FROM Sh7

Level 6 - 1 bottle neck with multiple flanges (**Figure 44**)

Level 8 - 1 steamer fragment
1 fragment curved pot handle, 2 cm. diameter
1 chinaware ringbase, 6 cm diameter

Level 9 - 1 steamer fragment
1 flat base, 6.5 cm diameter
2 bottle necks (**Figure 44**)
1 ring base fragment, 13 cm. diameter

Level 10 - 1 ring base fragment, 18 cm. diameter

Level 11 - 3 ring bases

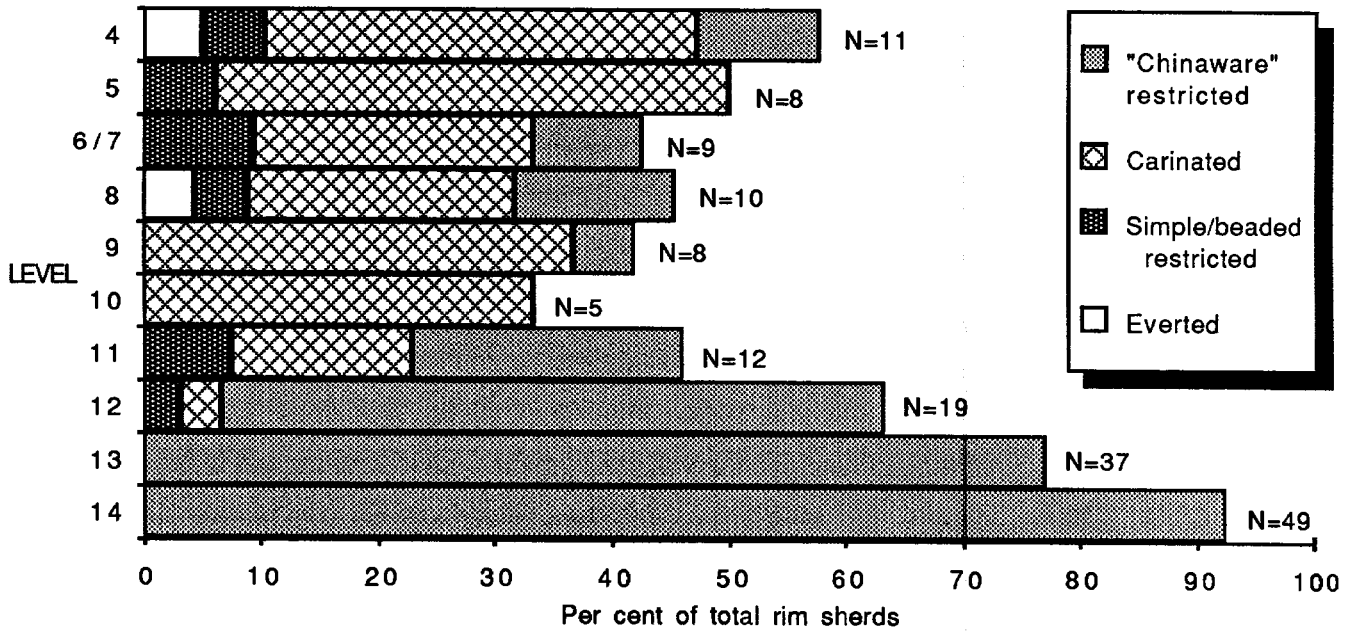
Level 12 - 2 chinaware ring bases
1 chinaware bottle neck (**Figure 41**)

Level 13 - 7 chinaware ring bases
1 steamer fragment
1 thick, curved pot support from a brazier, Tw 4 decoration

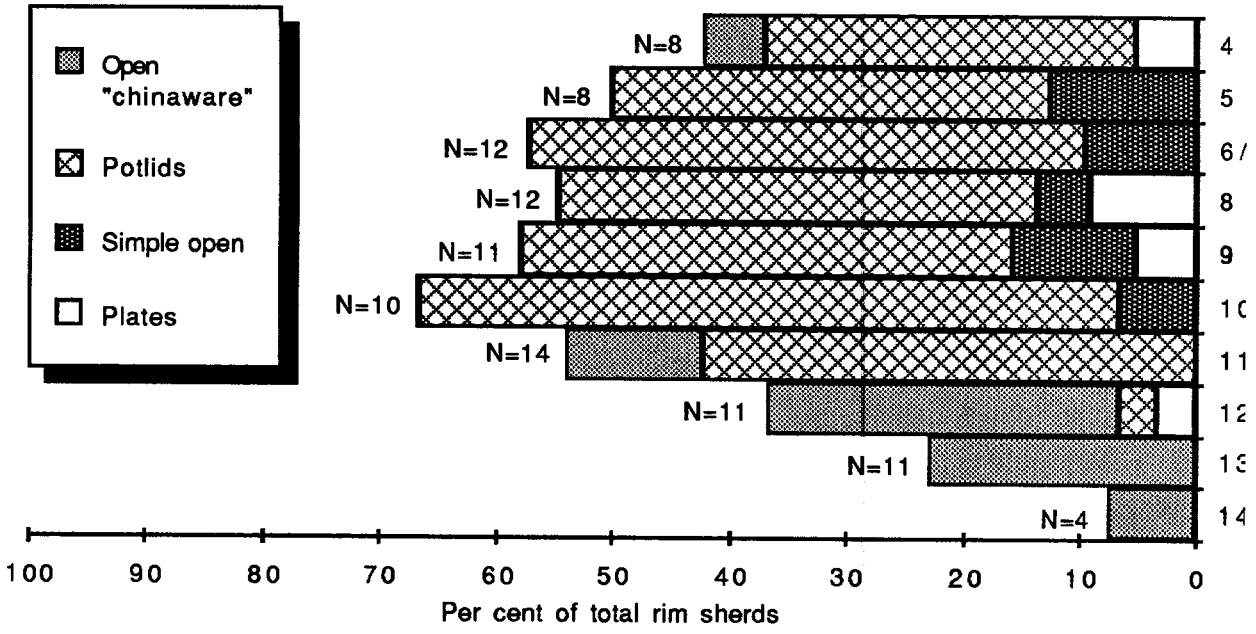
A sufficient number of rim sherds were recovered from Sh7 levels 4-14 to permit analysis. The composition of the rim sherd assemblage through time is summarized in **Figure 35**. In levels 14-12, restricted rims, nearly all of them chinaware, dominate. The rim forms involved are rolled, everted rims and the slightly outcurved rim of a short-necked, globular vessel (**Figure 41:** IE, IF). A lesser number of unrestricted simple chinaware rims are also present. The character of the assemblage changes markedly after level 11, as carinated forms and potlids come to dominate the assemblage.

Interpreting the Sh7 assemblage

The changing character of the pottery assemblage at Sh7 suggests that several different time periods are represented. Most clear-cut is the distinctive early assemblage found in levels 14-11, characterized by a very high percentage of the thin-walled, finely-prepared pottery we have called "chinaware". The range of rim types is relatively limited: simple open bowls (**Figure 41:** IA-ID), simple bottle necks, globular vessels with either slightly out-turned rims (**Figure 41:** IE) or simple rims, and restricted rolled rims (**Figure 41:** IF). Commonly, the rim is slipped, while the body of the vessel is almost invariably impressed with twine 4 or 5 (**Figures 42 and 43**). Slip and twine overlie one another only rarely.



A. Unit Sh7: Restricted rim sherds



B. Unit Sh7: Unrestricted rim sherds

Figure 35. Unit Sh7: Rim sherd classes by excavated level

Twine 4 sometimes occurs adjacent to Twine 6, or is covered with very light comb dragging. Since most of the elements of this early assemblage at Sh7 are identical to aspects of the Phase I/II assemblage from Jenne-jeno, we have no hesitation in assigning the Sh7 material to the same Early Iron Age timeslot: c.250 B.C. - A.D.300.

The radically different nature of the assemblage from Level 10 on suggests that a considerable amount of time elapsed between the deposition of levels 11 and 10, or, alternatively, that level 10 was deposited over a long period of time, with little pottery incorporated during most of it. A radiocarbon date (Beta-20712) from level 9 of 980 ± 80 B.P. (calibrated to A.D. 880-1240 at 2 s.e., using Stuiver and Pearson 1986) indicates that the time gap may exceed six centuries. The common occurrence in levels 10-6 of carinated vessels (**Figure 44:** IIIR, IIIT) and potlids, plus the presence of polychrome painted decoration evokes the Phase III assemblage from Jenne-jeno, dated c. A.D. 300-800 . Again, the range of rim forms is smaller at Dia , as is the variety of painted decoration, but overall, this middle assemblage from Sh7 is extremely similar to the pottery of Jenne-jeno Phase III (**Figure 45**). We suggest that levels 10-7 were laid down within a short space of time at the very end of Phase III. The sporadic presence of chinaware in these levels at Sh7 can be attributed to the practice of incorporating early pottery into wall material. As we shall see in the excavation of the Shoma city wall (unit SCW), early pottery may have been preferentially sought for this purpose.

In Sh7 level 5, a new kind of carinated rim, with a small rolled lip, appears(**Figure 46:** IVB). Typically, this form has slip and channelling above the carination, and twine impression below. Other carinated forms, with simple unrolled rims, continue, but painted decoration disappears. Two kinds of flanged rim are new, as is fingenail impression on carinated edges (**Figure 47**). All of these changes are paralleled in Phase IV (A.D. 800-1400) at Jenne-jeno. However, in this late assemblage at Sh7 braided twines do not enjoy the tremendous popularity that they do in the Phase IV Jenne-jeno assemblage (60-85% of all twine-impressed body sherds). At

Sh7, twines 4 and 5 remain the dominant twine patterns throughout the sequence.

Unit SCW

Body sherds: The levels containing brick fill from the city wall (levels 1,3,4) produced a substantial amount of pottery, due to the practice of incorporating potsherds into the bricks themselves. Other levels contained too little pottery for meaningful discussions of relative frequencies of various attributes. In levels 1,3 and 4, twine impression was the sole decorative variable on 80-90% of body sherds (**Figure 36**). The range of other decoration was limited: slip only, channelling only, channelling + twine 4, and light comb dragging over twine 4. Among twine-decorated body sherds, twisted roulette 4 or 5 is present on over 90% of the sherds. (**Figure 37**). The percentage of chinaware is interesting because, although variable, it is much higher for the wall construction levels than for the levels antedating the wall (**Table 14**).

TABLE 14. PERCENTAGE OF CHINAWARE AMONG SCW BODY SHERDS

LEVEL	%	LEVEL	%
1	55%	5	73%
2	86%	6+7	7%
3	76%	8+9	12%
4	39%		

As we excavated the city wall, these high proportions of chinaware initially led us to believe that the wall's construction dated to the earliest phase of Iron Age occupation in the area. The rim sherds from levels 1,3 and 4 were overwhelmingly characteristic of the early assemblage from Phase I/II at Jenne-jeno and from the lowest levels at excavation unit Sh7. Restricted chinaware rims of type IF (**Figure 41**)

Figure 36. Unit SCW: Body sherd decoration by excavated level

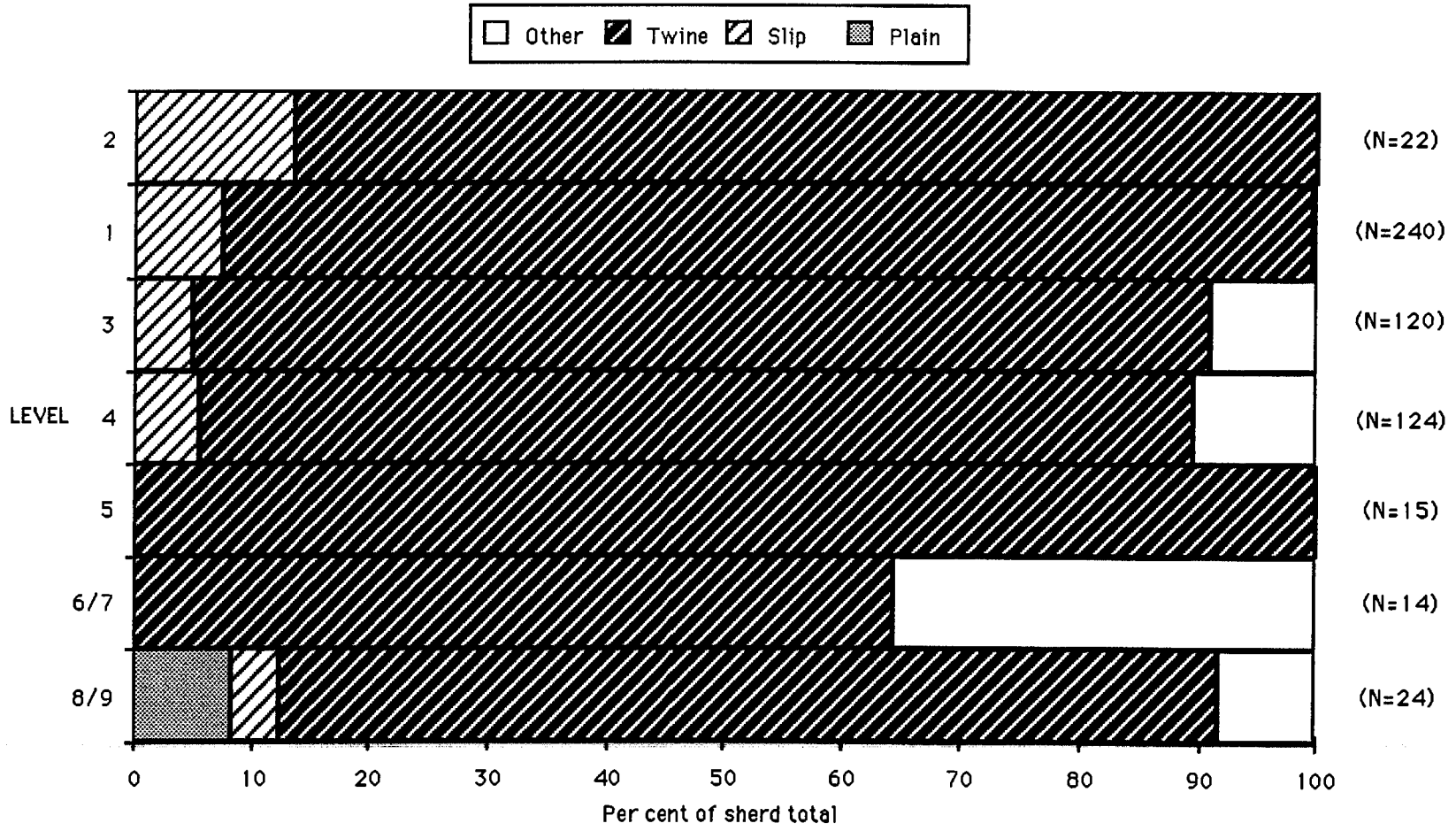
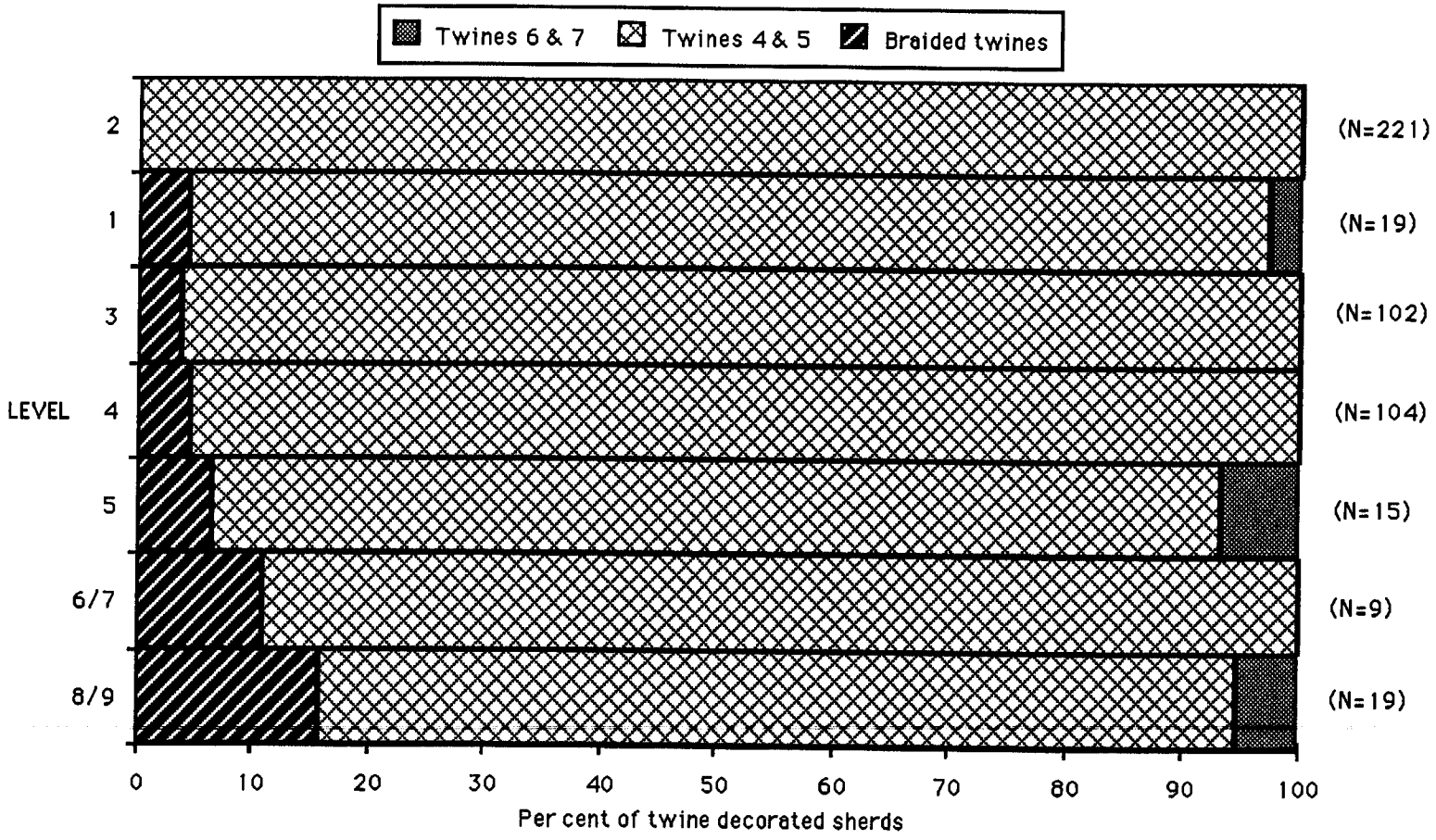


Figure 37. Unit SCW: Twine Decorated Body Sherds



comprised 71% of the rimsherds from level 1(total n= 39), 78% of those from Level 3 (total n=9), and 50% of level 4 rims (total n=10). Unrestricted chinaware rims accounted for 18%, 22% and 40% of the rim sherds from these respective levels. The low proportion of chinaware from levels 6,7,8, and 9 underlying the city wall was not consistent with the hypothesis of early wall construction, however. The recovery from levels 7 and 8 of four carinated sherds of a type known only from middle and late assemblages at Sh7 and Phase III and IV assemblages at Jenne-jeno suggested another possibility. It now appears likely that the wall was constructed in the last half of the first millennium A.D., at the earliest, and the builders of the wall utilized, perhaps preferentially, sherds from earlier deposits or an earlier site nearby in making the bricks.

Unit D6

Body sherds: The body sherd assemblage from D6 shows a great deal of variation through time with respect to several attributes. Twine-decorated pottery, for example, constitutes 80% or more of the assemblage in levels 12 and 13, and this percentage decreases to around 50% in levels 5-1 (**Figure 38**). In the lowest levels, slipped and plain sherds are rare (<8%), while higher up, they reach relative frequencies as high as 30%. Among the twine-decorated body sherds, twines 4 and 5 are most popular in levels 12 and 13, where they comprise >90% of all such sherds. (**Figure 39**). Their frequency declines to 20-35% in levels 8-1. Braided twines, on the other hand, increase in popularity through time at D6. They constitute less than 5% of the twine motifs in levels 13-11, then jump to 35-45% of twine-decorated sherds in levels 7-1. Twisted twines 6 and 7 are variable, but well-represented in levels 9-1. While braided and twisted twine roulettes 1,2,3,4,5,6,7, and 10 comprise at least 4/5 of the twine motifs in every level, a number of sherds in levels 11-1 are decorated with cord-wrapped stick roulette, knotted twine roulette and a twine pattern whose method of manufacture has not yet been determined (**Figure 29**).

Figure 38. Unit D6: Body sherd decoration by excavated level

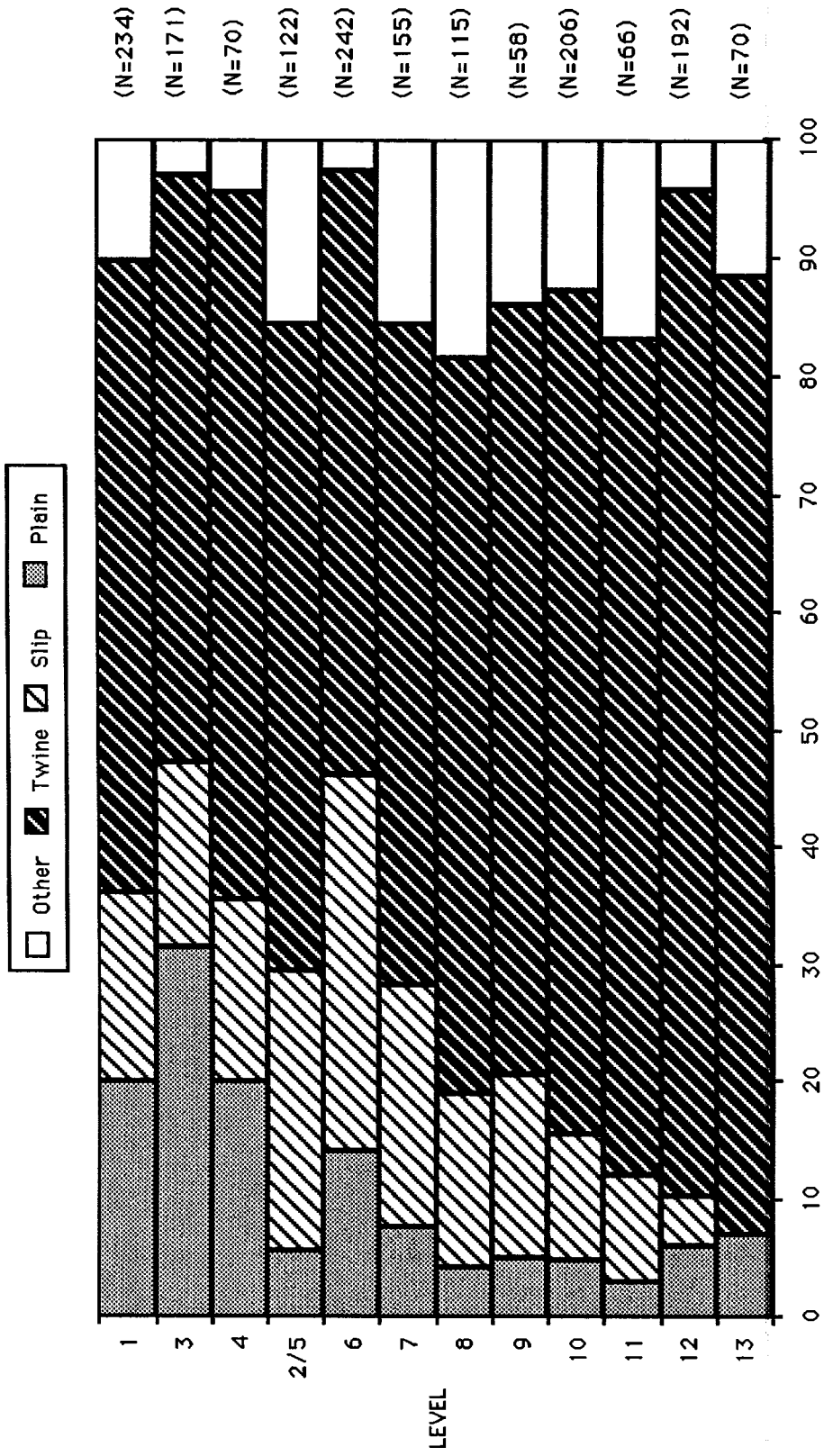
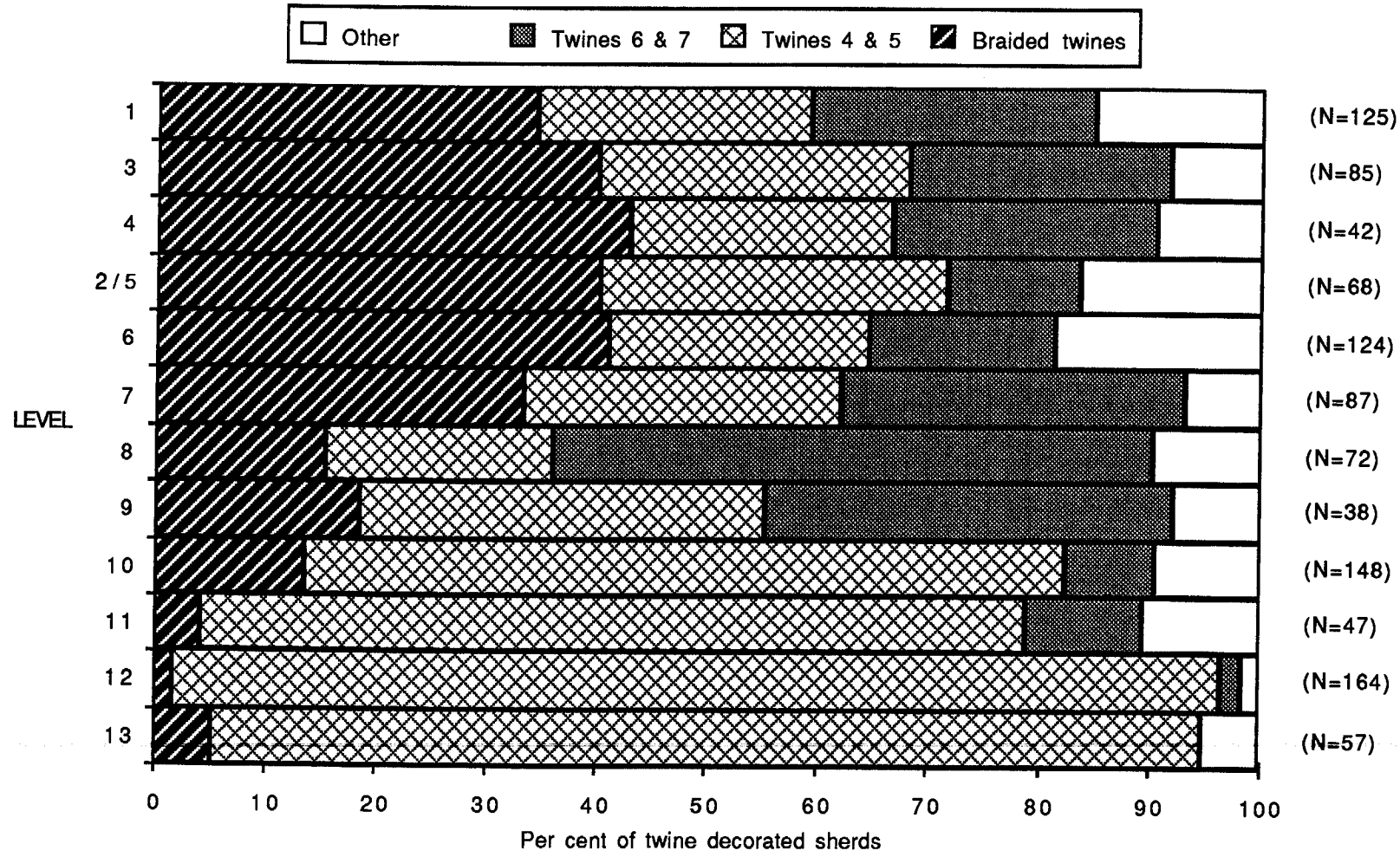


Figure 39. Unit D6: Twine Decorated Body Sherds



Between 5 and 20% of the body sherds in any given level are decorated with something other than twine roulette or slip. The other decorative attributes recorded for D6 sherds are summarized in **Table 15** below.

TABLE 15. OTHER DECORATIVE MOTIFS ON D6 BODY SHERDS

LEVEL	CHANNEL ONLY	CHANNEL + TWINE	LT DRAG OVER TW4	TWINE4+ TWINE6	PATTERN COMB DRAG OVER TW4	CHAN + FING IMP	CHAN + COMB IM	CHAN + STAMP
1	7	6			3		1	7
2	3	7					1	5
3	5							
4		1					1	2
6	2	3						
7	15	3			1	3		2
8	13	3			2	2	1	
9	4	3			1			
10	19	7	1	1				
11	6	3	1	2				
12		5		2	1			
13			1					

Clearly, several of these decorative motifs have a restricted occurrence in time. Light comb dragging over Twine 4, and adjacent twines 6 and 4 occur only in the lowest levels; channelling plus fingernail impression, comb impression, or stamping are found only in levels 8-1. Paint decoration was not found on any of the D6 body sherds. We did not record information on numbers of chinaware sherds for the D6 assemblage.

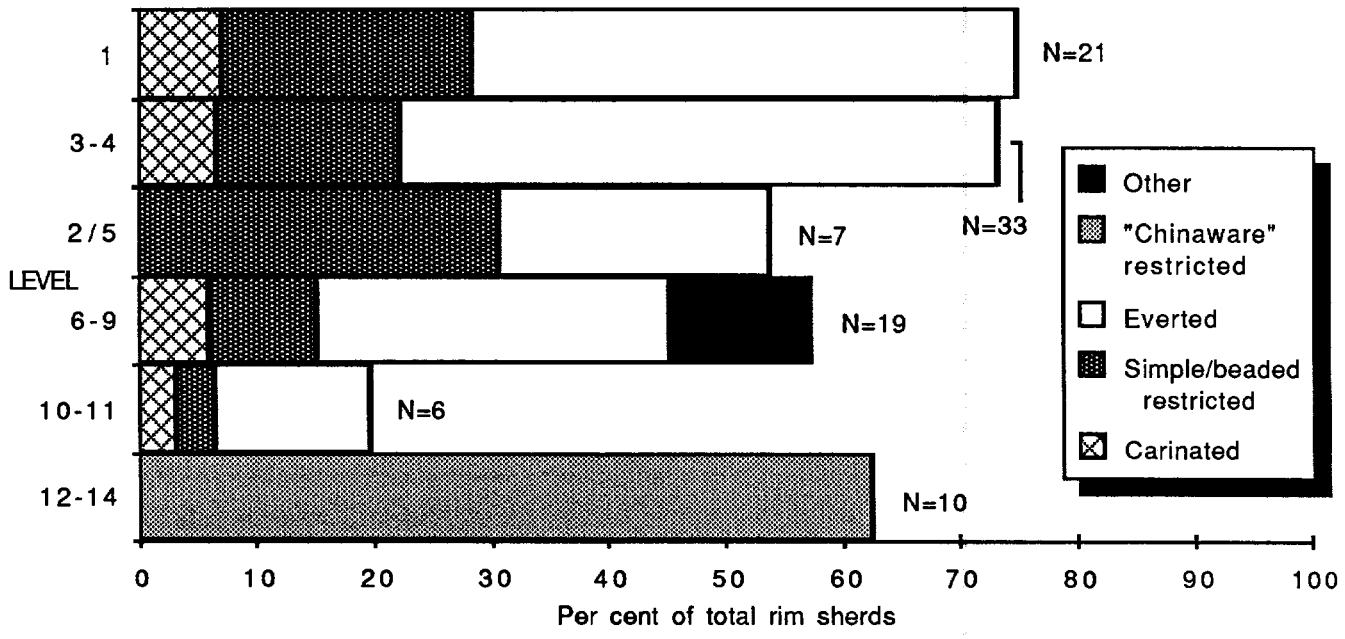
Feature sherds: Only eight feature sherds other than rims were recovered from D6. Three of these were conical potlegs c. 5 cm long and 4-5 cm maximum diameter, one each from levels 1,3, and 4. Four others were ring bases, two each from levels 7 and 12. The eighth feature sherd was a double-flanged bottle neck decorated with dark red slip(**Figure 48**).

The composition of the rim sherd assemblage through time is summarized in **Figure 40**. Chinaware rims constitute 100% of the assemblage in the lowest levels; restricted rim classes predominate. We again encounter the short-necked, globular chinaware vessel that was noted earlier in units Sh7 and SCW, as well as simple open and closed bowls. Levels 10 and 11 are unusual for their high proportion of simple unrestricted forms; some chinaware persists, and carinated vessels appear. Description of level 10 pottery was hampered by the heavy, white carbonate crust covering most of the sherds. The nature of the rim sherd assemblage changes markedly above level 10. Everted rims and potlids become much more important components, and the pottery is generally thicker and less finely-made. In the uppermost levels, everted rims constitute approximately 50% of the rim assemblage.

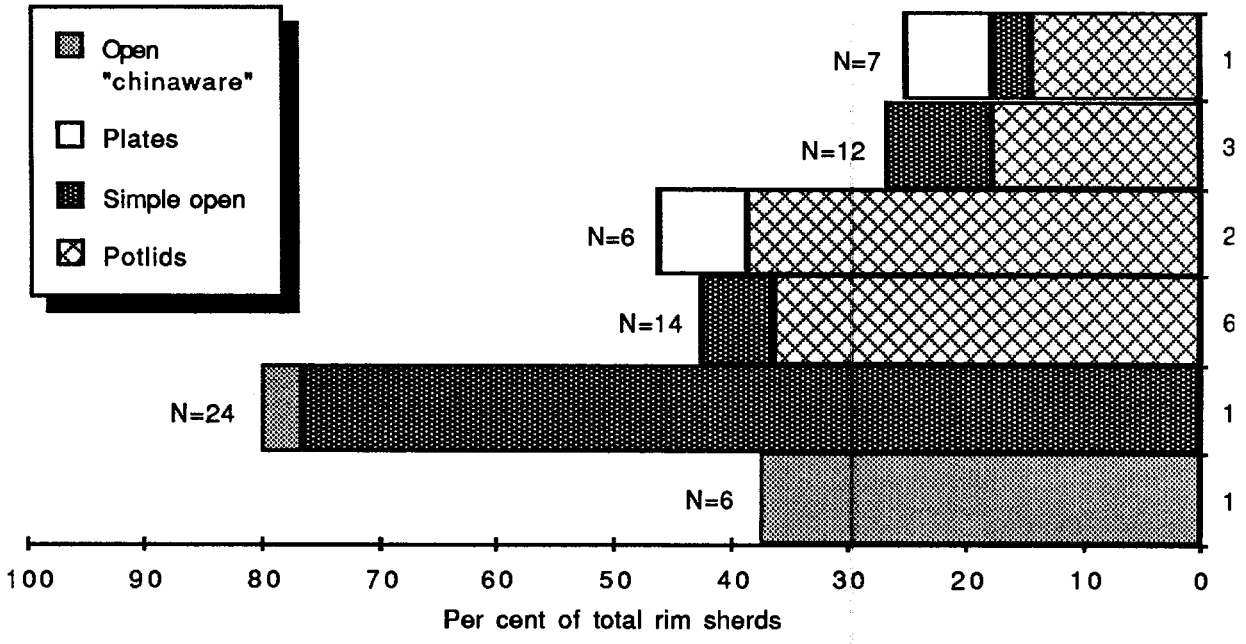
Interpreting the D6 assemblage

The earliest occupation levels (14-12) at D6 are characterised by the same "chinaware" assemblage that we have already seen and described in the lowest levels of Sh7. By extrapolation from Jenne-jeno, where this kind of pottery has also been recovered, the date of this earliest occupation would fall at the end of the first millennium B.C. or the beginning of the first millennium A.D. After this early occupation, it appears that the area of D6, and perhaps all of Mara, was not inhabited for a long time. Not only is there no painted pottery, characteristic of the middle to late first millennium A.D., at D6, but charcoal from level 9 has been dated to 410 $\pm$ 90 B.P., which calibrates to A.D. 1310-1650 at a two standard error limit, using the Stuiver and Pearson (1986) high-precision calibration tables. The plastic decorative motifs on the pottery, especially the stamping and comb impression, are paralleled in Phase IV and V (covering the second millennium A.D. up to 1900) around Jenne-jeno.

While levels 14-12 can be related in a straightforward and unambiguous manner to a particular phase of the well-dated Jenne-jeno sequence,



A. Unit D6: Restricted rim sherds



B. Unit D6: Unrestricted rim sherds

Figure 40. Unit D6: Rim sherd classes by excavated level

levels 11-1 are more problematic. We have tentativeley assigned levels 11 and 10 to the earliest phase; not only is there some chinaware present in level 10, but the simple open bowls that predominate are virtually identical, except for paste, to the chinaware bowls of levels 12-14. The carbonite crust on the surface of the level 10 sherds is probably the result of long exposure on the surface of D6 before occupation deposits again began to accumulate centuries later. Whether this occurred at the end of Phase IV (A.D. 1300-1400) or somewhat later is difficult to determine. While we feel confident that levels 5-1 must be assigned to a recent period (Phase V, post-1500 A.D.), characterized by a predominance of everted rim forms, an appreciable percentage of undecorated body sherds, a notable popularity of braided twine motifs, and relatively gross plastic decoration (**Figures 48 and 49**), levels 6-9 are not so easily placed in time. These levels produced two rim forms that we have described as characteristic of Phase IV at Jenne-jeno: a carinated rim with a small rolled lip (**Figure 46:** IVB), and flanged rims (**Figure 46:** IVF; **Figure 47**). The difficulty is that, since the Jenne-jeno sequence ends c. A.D. 1400, we do not know how long after 1400 these forms persisted. We have no comparative excavated sequence from the Jenne-jeno area covering Phase IV and Phase V, so the nature of the changes occurring in the pottery assemblage between these two phases is known only sketchily. While the pottery from levels 5-1 in D6 is different enough from anything excavated at Jenne-jeno to warrant its assignment to a period postdating the abandonment of that site (happily confirmed by the radiocarbon date from level 9), levels 6-9 contain pottery similar enough to the late Phase IV material from Jenne-jeno to raise the question of whether the D6 and Jenne-jeno sequence overlap in time at this point. The issue cannot be resolved without more excavated material, but for the time being, we have tentatively assigned levels 6-9 to late Phase IV (c. 1300-1400 A.D.).

SUMMARY AND CONCLUSIONS

The close similarity of the pottery from the sites of Shoma (Sh7 and SCW)

and Mara at Dia to the well-studied pottery sequence from Jenne-jeno has allowed us to use the Jenne-jeno sequence to interpret the chronology of the Dia deposits and also to evaluate the intensity of contact between the two areas through time. We have characterized the Dia pottery in terms of four time-succesive assemblages, Early, Middle, Late and Recent (Figs. 4.14-4.17), which correspond to Phases I/II, III, IV, and V at Jenne-jeno. Within each of these assemblages, we identify one or more pottery types whose occurrence, as far as we can tell from the excavated material from Dia and Jenne-jeno, is restricted to a particular phase and can be considered a diagnostic type for that phase. The identification of these diagnostic types, plus the evaluation of time-sensitive attributes such as chinaware fabric, channel and paint decoration, and coarse stamping formed the basis of our chronological placement of the surface material from sites surveyed around Dia. A description of the types identified for each phase follows:

PHASE I/II (c. 250 B.C. - A.D. 300) - **Figure 41**

IA - unrestricted bowl with simple rim, chinaware fabric, twine impressed decoration (usually twine 4/5, sometimes with a thin band of twine 6 above the twine 4/5) over the entire outer surface of the vessel, except for a zone <1.5 cm wide at the rim, which either was left plain or was slipped.

Variant - same as IA, except rim profile on outer surface is inflected slightly at the point where the undecorated or slipped zone begins.

IC - same as IA, but the undecorated or slipped zone is > 1.5 cm.

Variant -same as IC, except rim profile on outer surface is inflected at the point where the undecorated or slipped zone begins. A twine impression on the body of the vessel either begins at the point of inflection or is separated from the point of inflection by an undecorated zone.

ID - a closed vessel with simple rim, chinaware fabric, twine-impressed decoration (usually twine 4/5) beginning at the shoulder

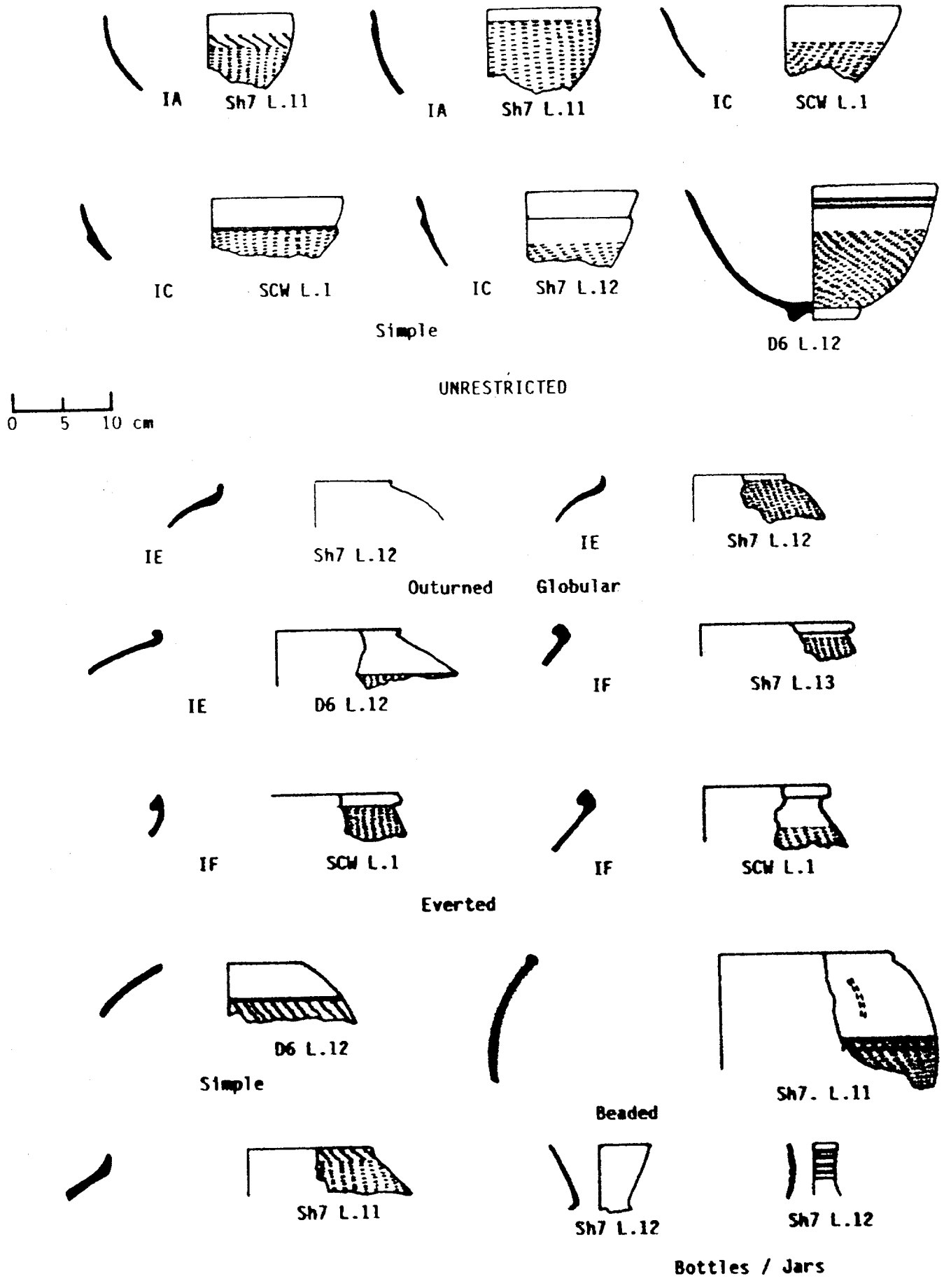


Figure 41: Rim and vessel profiles of Dia Early (Phase I/II) pottery assembalege

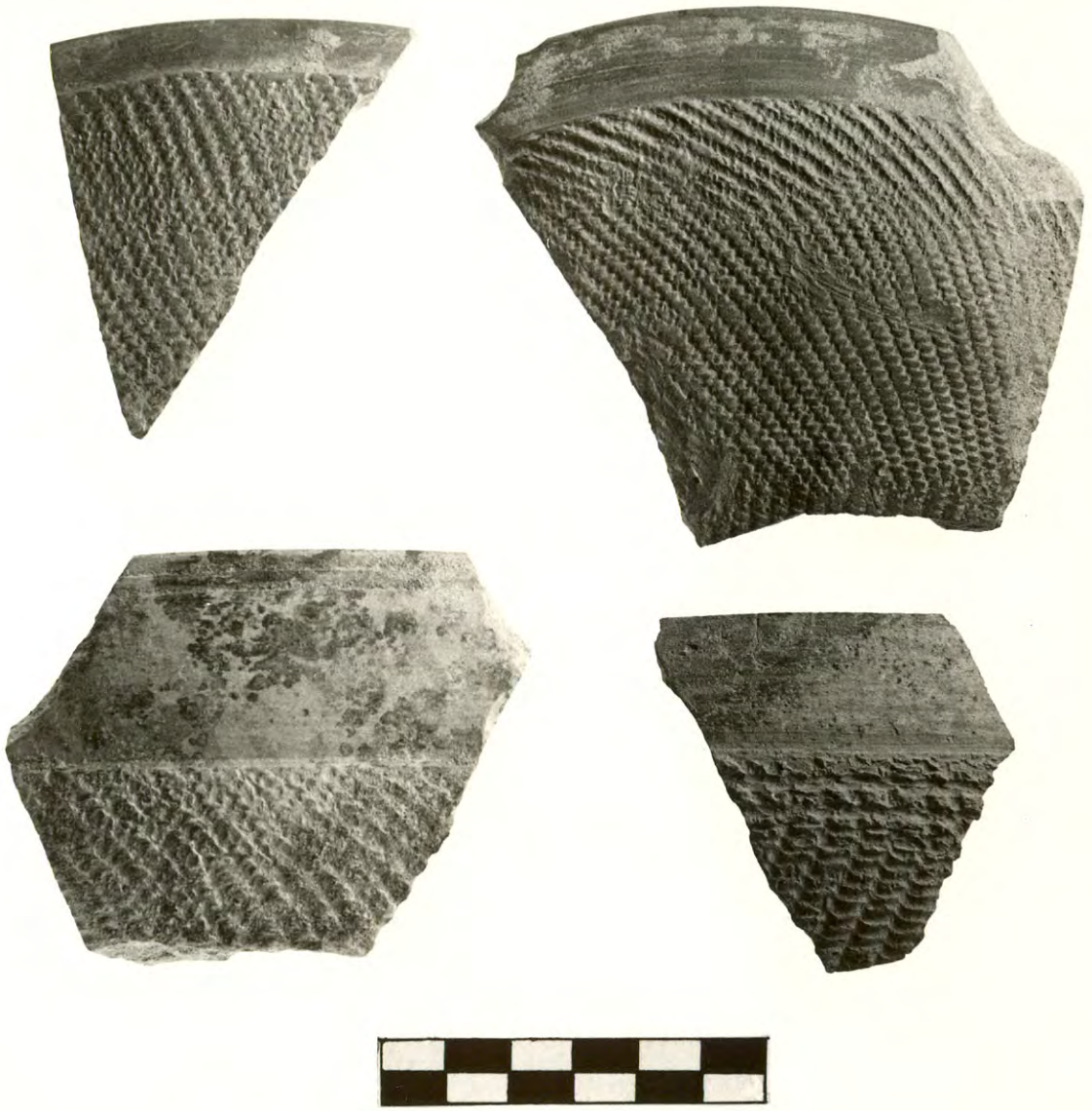


Figure 42. Phase I/II simple rim types. Top row: Type IA. Bottom row: Type IC.

Figure 43. Phase I/II rolled rim, globular vessel types. Type IF (top left and middle); Type IE.

and covering the outer surface of the body of the vessel, slip above the twine-impression to the lip. For types IC and ID, cross-hatching in red paint is sometimes found on the zone between the twine impression and the lip.

IE - restricted globular vessel with small, rolled, slightly out-turned rim, chinaware fabric, twine impression (twine 4/5, sometimes with thin band of twine 6 adjacent) beginning either at the neck, at the shoulder, or at the widest point on the body, commonly with slip overall.

IF - Rolled, everted rim, chinaware fabric, with twine impression (twine 4/5) beginning at either the neck or shoulder, with either no slip or slip overall.

PHASE III (c. A.D. 300-800) - **Figure 44**

IIIR - unrestricted, shallow dish or plate with thickened rim, in medium coarse grog-tempered fabric. Decoration includes slip on the rim, a zone of shallow channelling below rim, twine impression (usually twine 4/5) covers the remainder of the outer surface. Frequently, the inner surface has shallow channelling as well.

IIIT - restricted vessel with carinated rim that may be undercut below the carination. Fabric as in IIIR. Above the carination, the rim is slipped and cut by several deep channels, which are frequently painted over with white and/or black paint. Beneath the carination is a zone of shallow channelling, sometimes overpainted with white. Below this zone, twine impression (usually twine 4/5) covers the rest of the body of the vessel.

PHASE IV (c. A.D. 800-1400) - **Figure 46**

IVB - restricted, carinated rim with small rolled lip, in medium

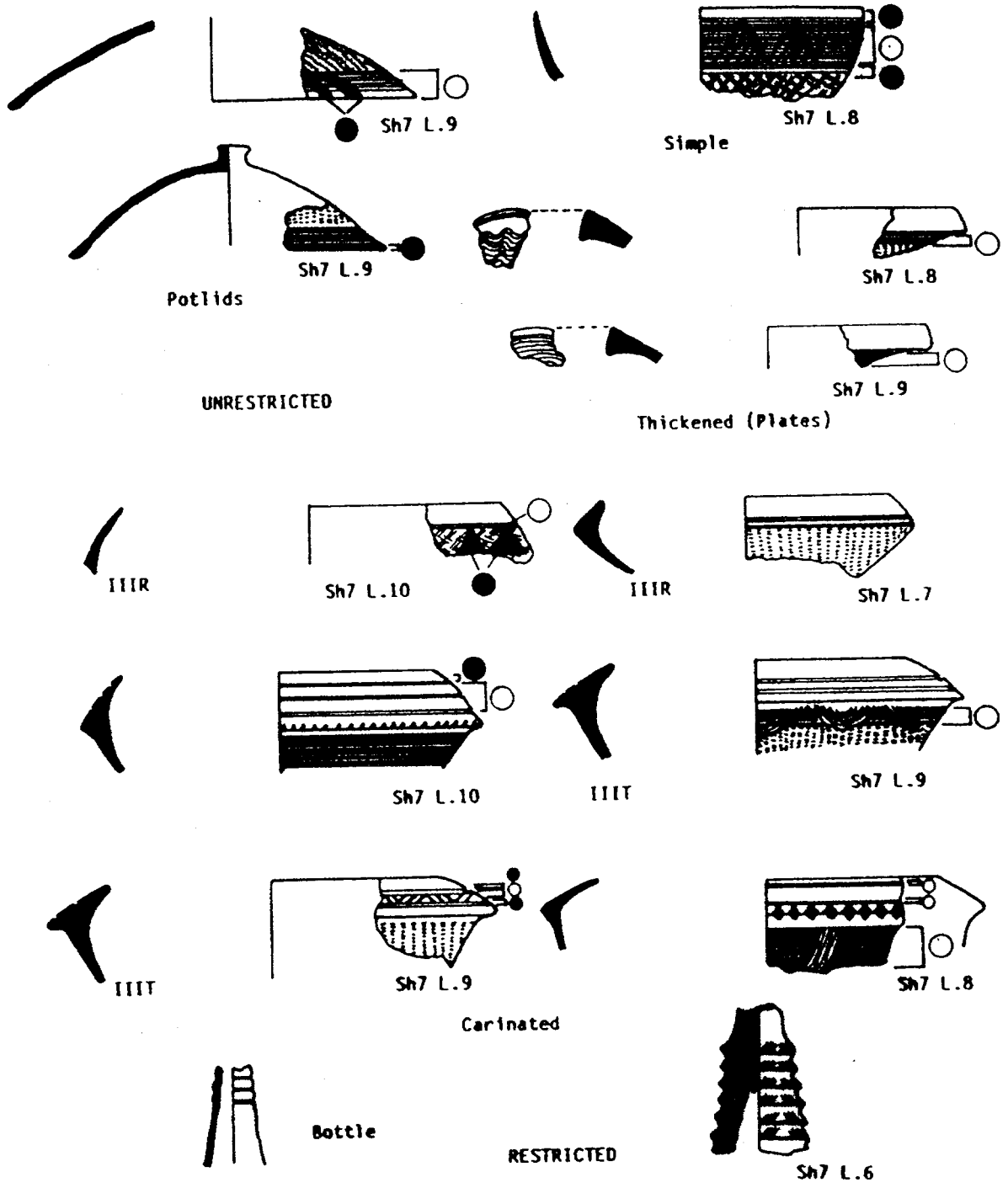


Figure 44: Rim and vessel profiles of Dia Middle (Phase III) pottery assemblage

Figure 45. Phase III carinated pottery types with channeling and paint.

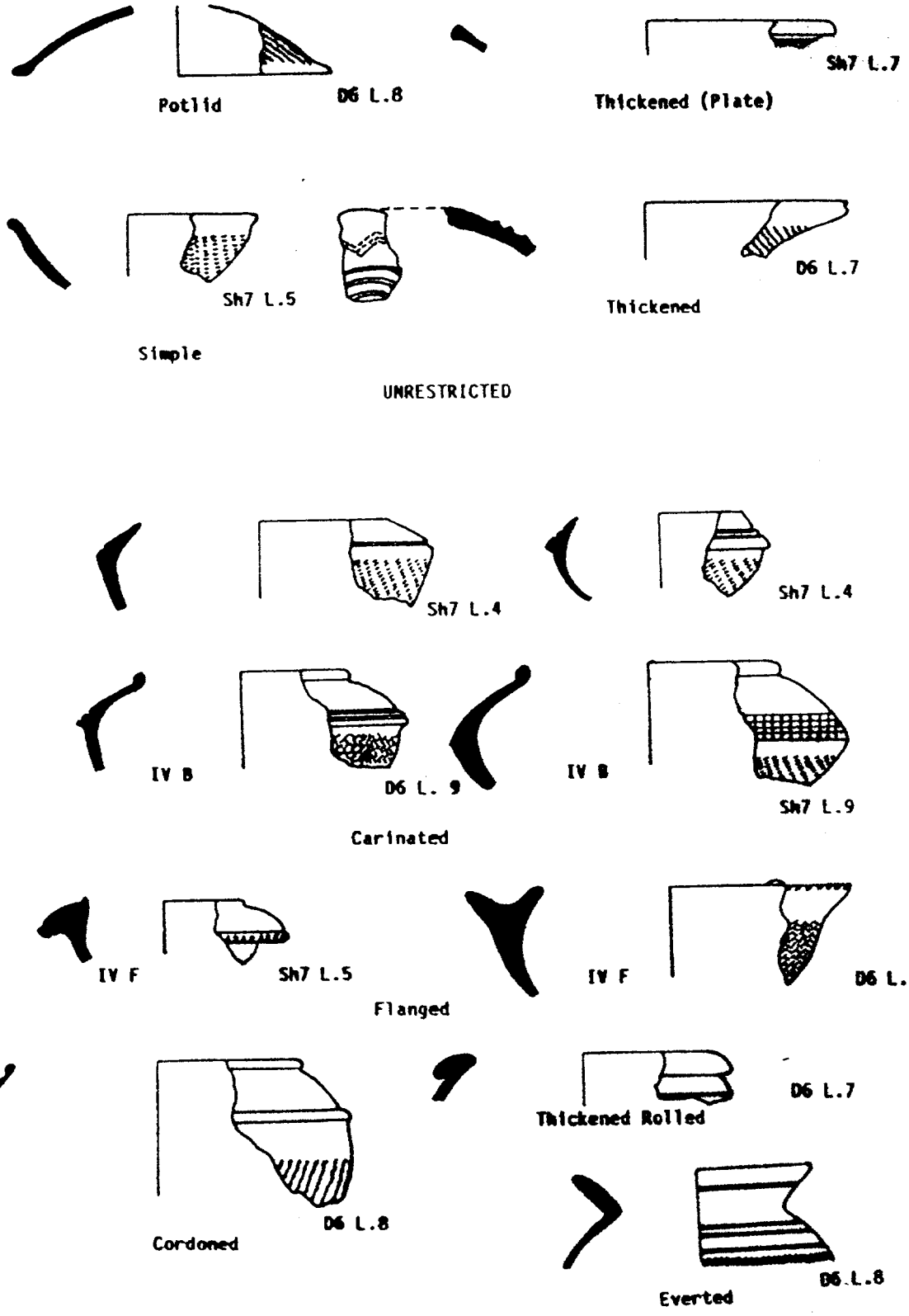


Figure 46: Rim and vessel profiles of Dia Late (Phase IV) pottery assemblage

Figure 47. Phase IV plastic decorated sherds from Dia survey.

coarse, grog-tempered fabric. Above the carination, the rim is slipped and cut with several deep channels. There may be other plastic motifs overlying or above the channelling, such as incision at right angles to the channels or comb impression between the channels and the lip. The angle of the carination may have fingernail impressions. Below the carination, twine impression (twine 1, 4/5, or 6) covers the rest of the outer surface of the vessel.

IVF - restricted, shallow vessel with flanged rim, fabric as in IVB. The rim is slipped and the angle of the flange is frequently fingernail impressed. Twine impression (twine 1, 4/5, or 6) covers the rest of the outer surface of the vessel.

PHASE V (c. A.D. 1500-1900) - **Figure 48**

VA - restricted, everted rim of coarse, grog-tempered fabric. Slipped inside and out on rim to neck only. Outer surface below neck is roughened by twine impression (twine 1 or 6) or comb dragging. Carelessly applied broad strokes of red paint are occasionally occur between the shoulder of the vessel and the widest point on the body.

The similarities between the pottery assemblages from Dia and Jenne-jeno are the most compelling in Phases I/II and III, because these phases are well-represented in the excavated material from both sites. By contrast, Phase IV is sketchily represented in the excavated sequence at Dia, and Phase V around Jenne-jeno is known from survey only, not from excavation. The Phase I/II pottery assemblages from Dia and Jenne-jeno are virtually identical. Types 1A-1F overwhelmingly dominate at both sites. This close identity of the pottery suggests particularly close interactions between the two sites at this early phase, lending support to the oral traditions that Jenne-jeno was founded by settlers from Dia. The one cautionary tale from the Phase I/II pottery at Dia is the clear evidence of its secondary use in building material during a much later time period

Figure 49. Examples of Phase V pottery.

at Shoma. Using the quantity and distribution of Phase I/II pottery on the surface of sites around Dia as a guide to the extent of Phase I/II occupation deposits is clearly untenable. Nevertheless, the sheer volume of chinaware on most of the sites surveyed suggests that early Iron Age occupation was, in fact, considerable. This is supported by the fact that Phase I/II was the only phase represented abundantly and unambiguously in the excavated material from both Mara and Shoma. Secondary use of very early pottery in Phase III or IV buildings has not been documented at Jenne-jeno.

Phase III material from Jenne-jeno and Dia is also very similar, with carinated rims with channelling and painted decoration comprising a significant portion of the rim assemblage. The Jenne-jeno assemblage becomes much more varied in Phase III, with a broader range of rim forms than in Phase I/II and the appearance of elaborately painted "luxury" wares, especially the deep-red burnished ware with white geometric designs that has also been found in tumuli in the Lakes region. The Dia material is much less varied, and only one sherd of white on red ware was recovered. It is not possible to say whether this reflects a population that was less heterogeneous, wealthy or cosmopolitan than the Jenne-jeno population, or whether it is merely an artifact of the much more limited sample of material available from Dia.

The situation for Phases IV and V is even less clear, since comparable excavated material from both sites is not available. The lack of Phase IV finely channelled, comb-impressed or stamped dark-red burnished wares among the Dia pottery may again be a sampling artifact. It is harder to explain the lack of popularity of braided twines at Dia during Phase IV in this manner. At Jenne-jeno, braided twines account for 50-80% of the twine impressed pottery during Phase IV. Possibly, only a small slice of Phase IV -- very early or very late -- is represented in the excavated sequence at Dia, and the bulk of the phase, when braided twines were most popular, is missing. Possibly, braided twines for some reason never caught the fancy of the folks on the northern margin of the Inland Delta. We cannot know without much more excavation. It remains to be seen

whether the impression of decreasing interaction through time between Jenne-jeno and Dia (insofar as it is reflected in the pottery assemblages) is sustained when a larger sample from more extensive excavations is available.

Chapter 5

SETTLEMENT PATTERNS IN THE DIA HINTERLAND

Towns such as Shoma and Mara do not emerge in isolation, but grow and change in continuing interaction with their surroundings. To understand the process of urbanism, therefore, one must first reach some understanding of the larger processes of environmental change, population movement, and information exchange which give rise to a city and support its growth. Recent research suggests that throughout much of the period under study, the entire Middle Niger region comprised a vast interaction sphere, closely bound by ties of trade and culture (Bedaux et. al. 1978; S.K. and R.J. McIntosh 1984; R.J. and S.K. McIntosh 1988: 150-153). The 1986-87 survey was designed to document the changing nature of population distribution in the environs of ancient Dia, and to help determine what role that settlement system might have played in the larger cultural scheme of the Middle Niger as a whole. In particular, we hoped that investigation into the nature and chronology of occupation around Dia might shed some light on the area's early associations with Jenne-jeno, which play so large a part in Soninke oral tradition.

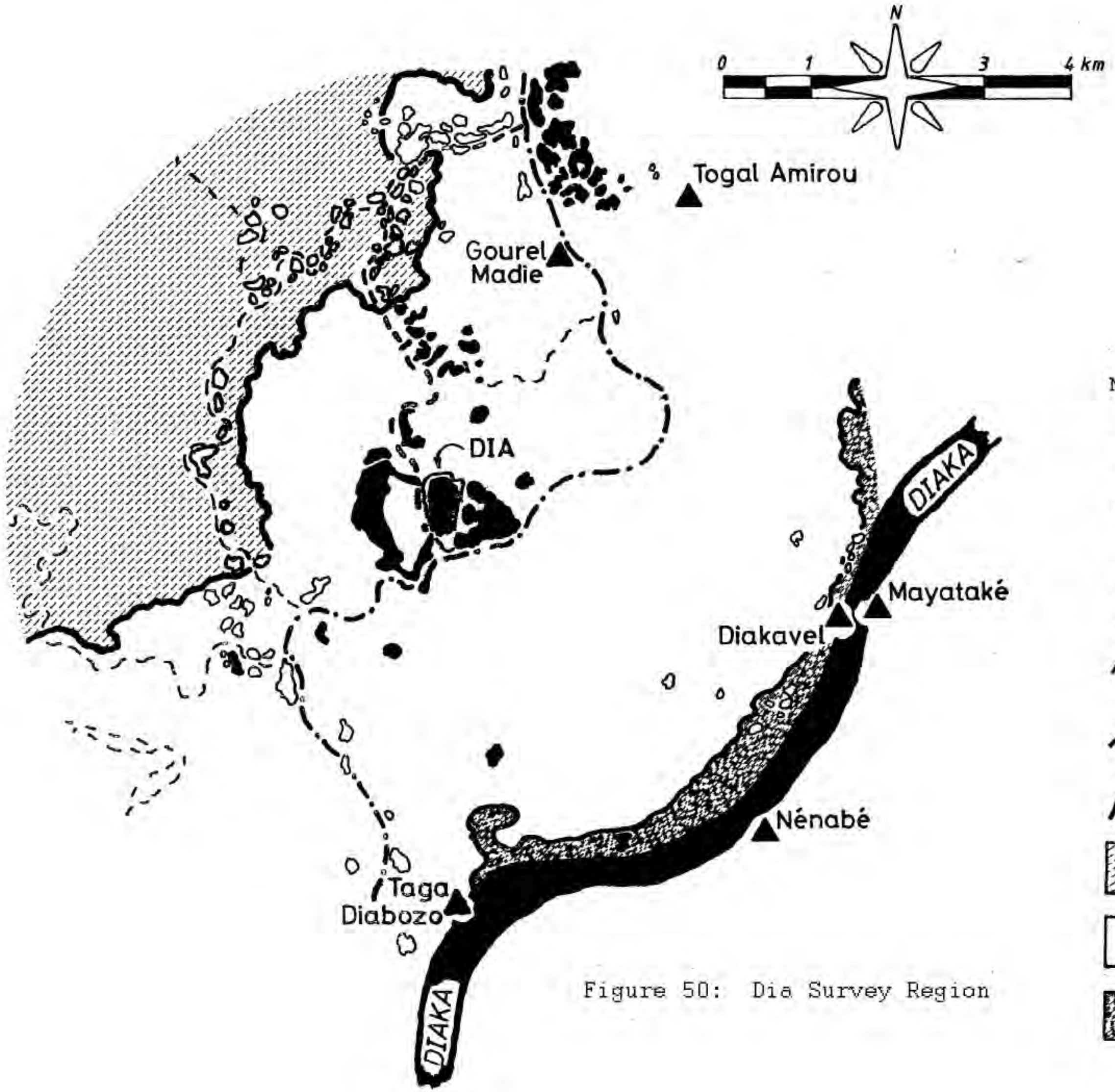
Central to our research strategy was the investigation of Dia's development as an urban center within an extended hinterland. We were eager, also, to collect settlement data in a manner that would make them compatible with data previously collected in the regional surveys around Jenne and Timbuctu, and to contribute to the inventory of archaeological sites now being compiled by the Institut des Sciences Humaines of the Malian Ministry of Culture. To this end, our research design emphasized the same methodology and regional perspective that had proved so useful at Jenne-jeno and Timbuctu, enabling us to chart the changing relationship of those towns to their surrounding landscapes of hamlets and villages (S.K. and R.J McIntosh 1980, 1986).

In both the Jenne and Timbuctu regions, changing climatic conditions and

landform preferences provided a key to ancient population dynamics, as settlement shifted through time between the floodplain and the higher ground of dunes and levees. Against this theoretical/methodological backdrop, the prehistoric climate, geomorphology, and usage of different landforms and soil groups were considered critical to an understanding of the forces at work in the changing settlement of ancient Dia. Of particular importance were changes in the availability of water, a factor of vital consequence in a marginal climatological zone like the Middle Niger. We therefore introduce our discussion of the Dia survey with an extended overview of the geomorphology, climatology, and hydrology of the Middle Niger, and the setting they provided for human occupation in the environs of Dia.

Geomorphology and setting

Dia is one of the major population centers of the Macina, the seasonally inundated floodplain which comprises the the southwest section of the Inland Niger Delta north of the Niger. The town is located some 30 km from the eastern edge of the Mema, or dead delta, a waterless region now inhospitable to permanent occupation, but characterized by active watercourses and thriving human settlement during much of lifetime of ancient Dia (Szumowski 1957; Mauny 1961; Haaland 1980). Like Jenne and Jenne-jeno, Dia and its surrounding sites are situated near the juncture of the hard clays of the deep floodplain basin and the sandier, more easily worked middle elevation soils, which are extensively cultivated in rice during the annual Niger flood. The survey area is presently watered by the Diaka, the Niger's major distributary and the only permanent watercourse in the region, and by a network of three lesser distributaries, or *marigots*, the two largest of which pass in immediate proximity to Dia, Shoma, and Mara. North and west of Dia these marigots are lined with dense clusters of *tells* which have now, without exception, been abandoned (**Figure 50**). Though this archaeological evidence strongly suggests that they once accommodated a more permanent flow, all three streams are now seasonal, flowing only during the months of the Niger and



MAP 3

- site (surveyed or verified)
- putative site
- modern village
- 4th order marigot
- 3rd order marigot
- 2nd order marigot
- Floodplain, deep clay
- Floodplain, middle sand
- Levee

Figure 50: Dia Survey Region

Diaka flood.

Most of the existing geomorphological features of the Middle Niger can be traced to the early Holocene, when a period of cool, humid conditions from c. 12500 to 5000 B.P. led to vigorous fluvial remodeling of the Pleistocene landscape (R.J. and S.K. McIntosh 1988: 142-146). The deep clays of the Mema and Macina were laid down during this period by a series of large rivers, possibly successive courses of the Niger, whose apparent southeastward migration is documented by a series of abandoned channels ranging from the Diguéni near Segou to the Diaka itself (**Figure 51**). In the generally accepted reconstruction of events, this migration was the end result of a long hyperarid spell in the late Pleistocene, during which the Niger ceased to flow east of Segou and massive dunefields were erected across much of what is now northern Mali (e.g., Furon 1929; Urvoy 1942; Tricart 1965; Grove and Warren 1968). These dunes have traditionally been thought (although cf. Beaudet et.al. 1977; Petit-Maire and Riser 1983: 413) to have blocked the river's previous courses to the south Saharan depressions of Hodh, Aklé, and Azaouad, forcing it to seek new channels to the south when it again began to flow in the early Holocene. The relict channels still remain, marked by remnant tree-lined ponds and subterranean aquifers. Like the Tilemsi Valley further east, they may have served as natural corridors for Stone Age peoples moving south out of the Sahara when drier conditions again prevailed in the late Holocene (Petit-Maire 1986; Smith 1979).

The apparent continuing southeastward trend of the Niger and its distributaries during the Holocene has been documented by many authorities, among them Furon (1929: 268-73), Grove and Warren (1968: 199), Urvoy (1942: 60-83), and Voute (1962: 196-98). Because the phenomenon appears to be widespread throughout the Inland Delta (and particularly notable in the obviously recent desiccation of the Mema), it has generally been attributed to a tectonically inspired subsidence affecting the courses of rivers and distributaries through the entire Middle Niger basin (e.g., Gallais 1967: 47-58, Tricart 1965, Urvoy 1942: 63-80). If such a gradual west-east tilt is indeed the moving force behind

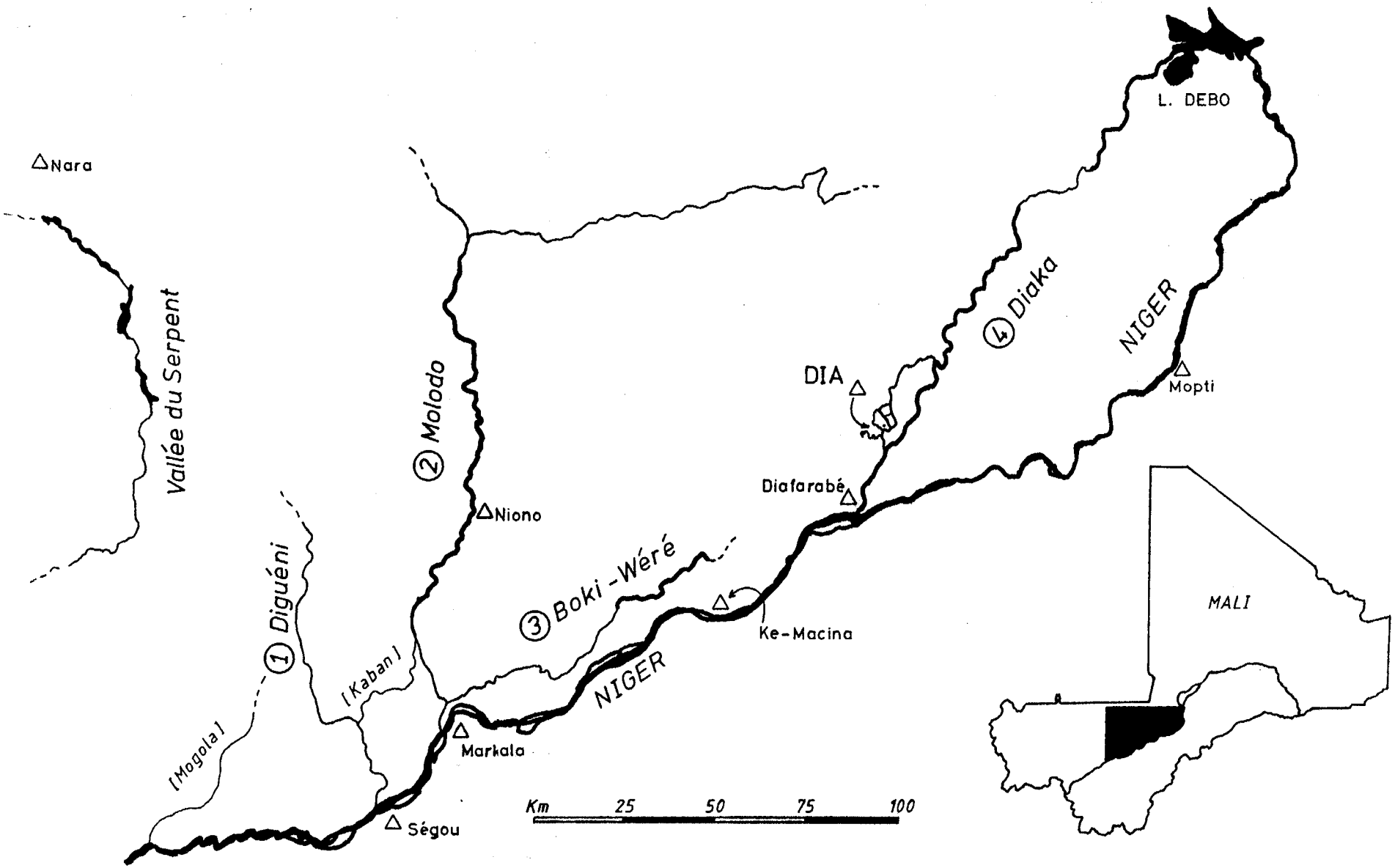


Figure. 51. Abandoned channels in the Mema and Macina, showing possible eastward migration of the Niger in the early Holocene.

the continual abandonment of river and distributary channels in the Niger floodplain, then this fact is of some relevance in interpreting the hydrology of the Macina, just east of the Mema, and the Dia region itself, where there are indications of a similarly recent, primarily west-east, fluvial evolution. But while the phenomenon of west-east fluvial evolution is indisputably widespread in the Middle Niger, it is not universal, and we have argued elsewhere that the migration of watercourses in that region might as satisfactorily be attributed to the natural processes of aggradation and channel strangulation in a floodplain of extremely low gradient (R.J. McIntosh 1983: 189; S.K. and R.J. McIntosh 1980: 314-31). Field observation in the upper Inland Niger Delta has suggested that before assuming its present channel, the Niger meandered extensively both east and west, a phenomenon which runs counter to the theory of migration due entirely to subsidence. Although some features in the upper Inland Delta suggest the possibility of localized subsidence on the eastern edge of the floodplain, there is no clear evidence that this affected the course of waterways as distant as the Mema and Macina (R.J. McIntosh 1983: 189).

The Niger during the climatic optimum of the early Holocene (c. 10000-8000 B.P.) had a much higher transport capacity than at present, and carried a heavy load of silts and aeolian sands from the Pleistocene dunes and sand sheets in its upper reaches. These sediments, deposited in a mosaic of low levees and meander scars still clearly visible on aerial photographs, often resulted in congestion and successive strangulation of distributary channels. Though less extensive, this process of channel aggradation and migration continued in subsequent humid periods occurring as late as the sixteenth century A.D. These humid episodes were interspersed with periods of varying desiccation which were marked by minor episodes of dune-building, aeolian accumulation in distributary channels, and concentration of drainage in fewer channels (Brooks 1986; Nicholson 1980; R.J. McIntosh 1983). From c. 4500 B.P. to the present, the overall picture was one of oscillatory but continuing climatic decline, as rainfall decreased, lake levels fell throughout West Africa, and the great lakes and streams of the early Holocene Sahara disappeared entirely (S.K.

and R.J. McIntosh 1983).

The onset of this extended decline, c. 2500 B.C., saw gradual and erratic movement east, north, and south by Late Stone Age peoples migrating out of the increasingly arid southern Sahara. In the Middle Niger itself, remains of Late Stone Age occupation are rare, confined to the northern and northwestern peripheries of the region: the sites of Kobadi and Boulel in the Mema, occasional surface scatters in the Lakes Region west of Timbuctu, and abundant remains in the Azawad north of the Niger Bend (Guitat 1972; Petit-Maire and Riser 1983; Raimbault 1986). Within the more central and well-watered parts of the region, no Late Stone Age material has been found to date (e.g., Mauny 1961; Bedaux et. al. 1978; S.K. and R.J. McIntosh 1980; S.K. and R.J. McIntosh 1986). This puzzling absence of neolithic remains has been attributed by Urvoy (1942), Tricart (1965), and others to the existence of a vast prehistoric lake, Lake Paleo-Debo, occupying what is now the southern Middle Niger floodplain before the Niger breached the Tosaye Sill near Timbuctu. The existence of this lake has recently been brought into question, particularly by Beaudet et.al. (1977) and Jacobberger (1987), who question the concept of a recent breach of the Tosaye Sill and suggest that temporary Late Stone Age camps might have been erased by channel migration or rapid alluviation. We have proposed elsewhere that the absence of Late Stone Age material in a floodplain of essentially the same configuration as today could be a result of swampy and pestilential conditions brought on by the high rainfall of the second and early first millenia B.C., which might well have rendered the region inhospitable to potential settlers (R.J. McIntosh 1983:191-92; R.J. and S.K. McIntosh 1988).

The earliest Iron Age occupation yet recorded in the Middle Niger floodplain (c. 250 B.C. at Jenne-jeno) coincides with the onset of an extended dry period, with conditions more arid than today. Decreased rainfall and reduced flooding during this period may have opened the floodplain to human occupation and facilitated settlement directly on the floodplain bed, rather than on the high exundated features which are preferred today. With the onset of more humid conditions, c. A.D. 500, this

early settlement blossomed into an extended urban network reaching throughout the Middle Niger, with mature urbanism and region-wide prosperity in the region of Jenne, large settlements lining the banks of the now defunct Wadi el-Ahmar outside Timbuctu, and increasingly elaborate tumuli and megaliths in the Lakes Region (S.K. and R.J. McIntosh 1980; S.K. and R.J. McIntosh 1986; Saliege et. al. 1980).

In the Mema, the large relict channels of the Fala de Molodo and Boki Wéré appear to have held some sort of permanent water as late as the twelfth century A.D., with apparent industrial-scale iron production, requiring large amounts of wood fuel, along the Fala de Molodo (Haaland 1980: 39-43). The abandonment of these channels in the early second millenium A.D. may coincide with a period of high flooding, c. A.D. 900-1300, which led to channel aggradation and strangulation of several major distributaries in the vicinity of Jenne (R.J. McIntosh 1983: 196). This unpredictable and often destructive flood regime marked the onset, c. A.D. 1100, of a period of climatic decline which brought to an end the long heyday of densely crowded settlement and far-flung cultural interaction which had characterized the Middle Niger during preceding centuries. Beginning about this time, settlers began to retreat from floodplain sites around Jenne and Timbuctu and to localize in large isolated settlements on higher ground. This relocation was accompanied by a drastic decline in the population as a whole, a process aggravated by the political turmoil attendant upon the weakening of the empires of Mali and Songhai, penetration of the region by militant Fulani and Bambara populations, and the Morroccan conquest of 1591. As the climate declined to present semi-arid conditions, many distributaries were occluded by aeolian deposits or otherwise reduced in flow as drainage began to concentrate in fewer channels. Major distributaries and rivers, now carrying a much reduced load, began to fix their positions by deep incision, thereby locally decreasing the depth and area of the annual flood in some parts of the floodplain (R.J. McIntosh 1983: 196-7).

Within the Dia survey region, the density of abandoned sites along the banks of lesser waterways suggests the possibility of a similar process of

desiccation within occupied times. The system of interconnected marigots that feeds the region is part of a greater loop which in turn connects to the Diaka both northeast and southeast of Dia (**Figure 51**). The configuration of the three major marigots within this loop suggests that they may have been meanders, progressively cut off as the main water flow of the region sought new channels. The possibility exists that during the early Holocene "pluvial" one or all of these streambeds may have carried the main flow of what is now the Diaka and that they were, sequentially or severally, reduced in status as that watercourse gradually shifted its channel southeastward toward the Niger. From the distribution of archaeological sites along their banks, however, none of the streams appears to have been comparable in size to the present Diaka during the two to two and a half millenia since they first supported human occupation. Pottery dates from the survey region suggest a somewhat earlier time of human abandonment than we have posited for the Niger Bend and the upper Inland Delta. The significance of this chronology within the context of the climatological events outlined above will be explored in the section dealing with survey results; for the moment we will confine our discussion to the later Holocene evolution of the Dia marigot system without reference to its implications for human settlement in the area.

In their present state, the three marigots decline in size and flow from west to east, in order of their distance from the Diaka (**Figure 52**). The possibility that this may not always have been the case is suggested by the far greater density of sites along the two westernmost marigots (M2 and M3) than on the lower banks of the easternmost M1. That the system as a whole relatively recently sustained a greater flow than at present is evident not only from the density of sites but also from excavated evidence of a broad system of levees upon which the mounds of Shoma and Mara appear to be based (Chapter 2). On Mara, continued accumulation of apparent water-borne sand, to a height of 1.8 m above floodplain level, suggests that the process of levee-building may have continued well after the site's initial occupation (Appendix 1). Although discontinuous low levees also line the banks of Marigot 1 further north, there is no clear

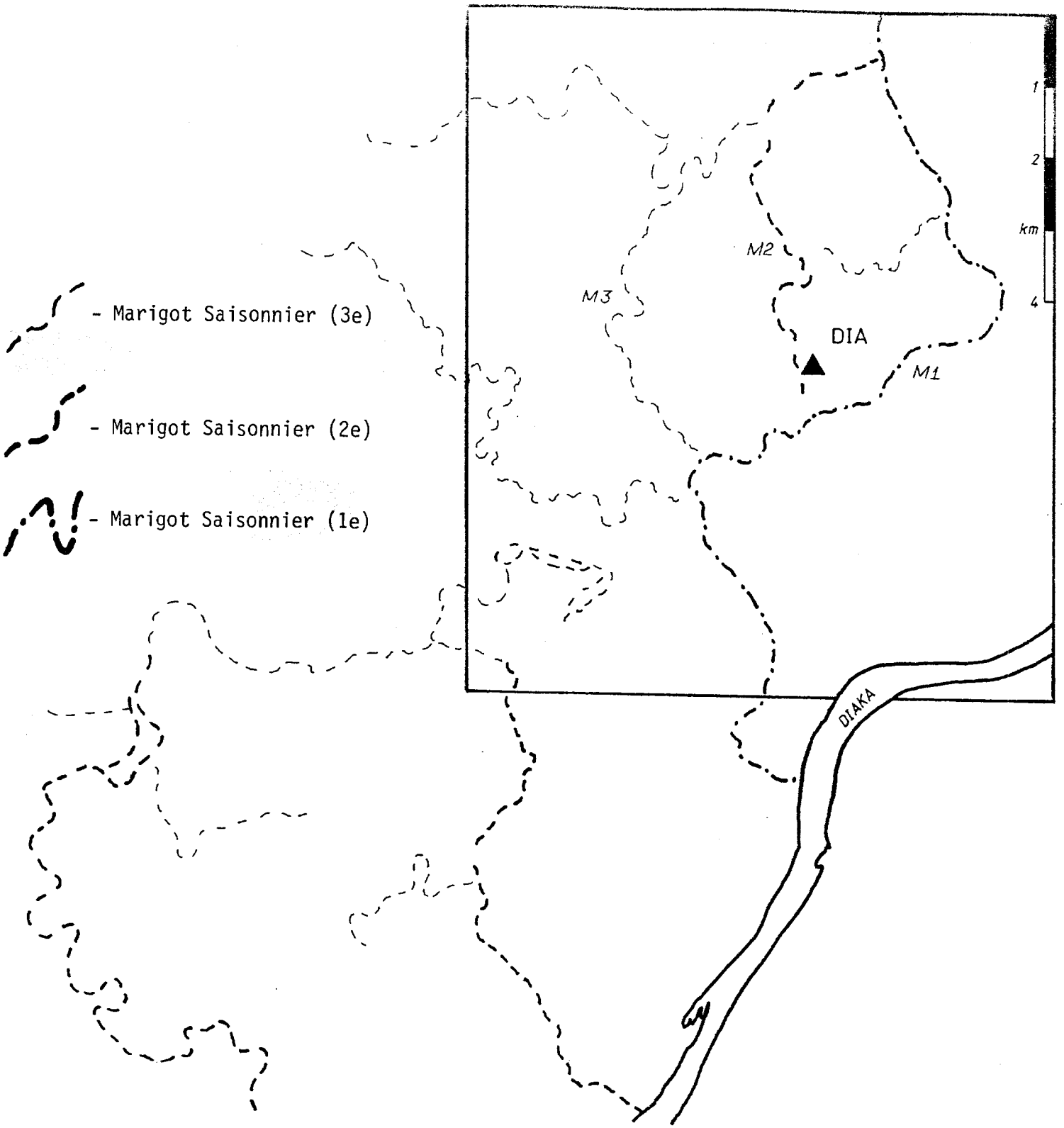


Figure 52. Present hydrography of the survey region.

evidence of such large-scale levee erection elsewhere in the survey region, with the exception of the high sand-clay levee bordering the west Diaka bank on either side of its confluence with Marigot 1 (**Figure 50**).

The archaeological evidence does not reveal human factors (invasions, forced relocations, religious conversions entailing abandonment of "pagan" sites) which might have altered patterns of occupation at Dia. But if the streams feeding the survey region were in fact more active in the recent past, their decline can in all probability be attributed to one of two main causes: an overall deterioration of climate, reducing waterflow within the Middle Niger as a whole; or disruption of the flow from the marigots' immediate source, the Diaka. The first of these hypotheses is rendered unlikely by the settlement chronology of the region, which indicates abandonment during the climatic improvement of the late first and early second millenia A.D. The second, which presumes decreased drainage along the primary marigot channel leading from the Diaka, could have occurred either during an arid episode, as a result of aeolian blockage or of diminished flood from the Diaka; or during a humid period, in which increased fluvial activity could have resulted in channel aggradation and strangulation; or from a combination of these circumstances over an extended period of time.

Until such time as we have a detailed geomorphological study of the Macina and the Dia area, the events molding the hydrology of the region will remain hypothetical. One possible reconstruction, however, is that the Diaka's elevation to its present status as major distributary of the Niger may postdate the period of greatest activity of the three marigots of the survey region. In this scenario, all four channels might originally have functioned as part of a system of distributaries feeding off another, larger distributary of the Niger, such as the Tinana, a recently active but now seasonal waterway which passes just west of Dia (Gallais 1967: 57-58). The subsequent "capture" of the Diaka and its marigots by the the present Niger would have led to increased waterflow and increased bed-load along the Diaka, resulting in deposition of sediment in the form of the extensive levee system which now lines the upper Diaka. Marigot 1, the major

marigot of the survey region, would have been reduced more and more to the status of a flood-season distributary only (*bras de crue)* as the levees increasingly encroached upon its convergence with the Diaka. This process could have occurred, and in all likelihood did occur, even if no "capture" of the Diaka is postulated, with the end result of diminished water for the marigot system as a whole.

Within the marigot system, the geomorphological sequence becomes more complex. A glance at Figures 50 and 52 shows that the heaviest concentration of ancient sites is along the second- and third-order marigots (M2 and M3) in the west of the survey region. What is now the largest marigot, the first-order M1, has almost no sites between its divergence from Marigot 2 at Dia and its reconvergence with that same waterway some five kilometers downstream. While modern settlements are largely concentrated along the exundated banks of the Diaka, the three existing floodplain villages (Dia, Goural Madie, and Togal Amirou) are all located along M1 or a smaller distributary (not shown) which branches off it to the northeast.

This distribution of sites makes it clear that the now-dominant M1 was, for whatever reason, considered undesirable as a locus of occupation at the time the adjoining marigots were settled. Following the abandonment of these early settlements, however, M1 appears to have become the only watercourse capable of supporting the limited remaining floodplain occupation. Either of two opposed hypotheses might account for this shift. The first is that during the early occupation of the survey area, under the extremely dry conditions of the late first millenium B.C., Marigots 2 and 3 carried the main flow of the marigot system, with M1 an insignificant seasonal distributary incapable of supporting human occupation. As waterflow increased from the Diaka under the humid conditions of the late first millenium A.D., Marigots 2 and 3 were successively choked off by the deposit of riverine sediments at their divergence with Marigot 1. Marigot 1, by default, became the region's primary watercourse. This argument gains some support from the obvious strangulation of a previous embouchure of Marigot 3, now carrying no water at all but clearly framed

by a line of sites just west of the present M1-M3 convergence (**Figure 50**). Further east, around Mara and Shoma, even slight amounts of accumulation would have sufficed to severely diminish the flow in Marigot 2, already confined by its position between two large mounds.

The second hypothesis proposes that the relative status of the three marigots has remained unchanged and that early settlers avoided the lower and middle reaches of Marigot 1 not because of dearth of water, but because of high flooding resulting from its proximity to the Diaka. In this case settlement would have been largely confined to the less treacherous but still well-watered minor distributaries. In support of this hypothesis is the extreme rarity of ancient sites along Marigot 1 except in areas which may have been slightly above floodplain level. These are the Dia complex, with its underlying low levees, and a second mound group in the northeast (Cluster LI) that, from its odd configuration, seems likely to be based on a continuation of an uninhabited low levee which adjoins it from the south (**Figure 50**). Even so, as noted above, high floods appear to have continued to disrupt occupation on Mara (and possibly southern Shoma as well) until long after their initial settlement.

Under this reconstruction, all three marigots would have been reduced to seasonal distributaries with the strangulation of Marigot 1 by the Diaka following the first millenium A.D. improvement in climate. In the case of the smaller Marigots 2 and 3, this diminution of flow alone could well have been enough to ensure abandonment. The documented strangulation of Marigot 3 would thus have been an independent event, possibly caused by subsequent aeolian accumulation along a waterway which now had insufficient flow to clear its channel. As the Diaka began to deeply incise its bed, a process which continues today, available water would have been further decreased both by diminution of flow entering the marigot channels and by seasonal reduction of the field of inundation, as a smaller fraction of the annual flood surmounted the high river banks to reach the floodplain.

Survey of the Dia hinterland

The Dia survey was designed to address both geomorphological and archaeological considerations through the systematic collection of basic data from sites in the immediate environs of Dia, and through the documentation of variation in site size, surface features, artifacts, and location on various landforms and soil groups. One significant aim was to determine similarities and differences with the chronologies and settlement patterns around Jenne-jeno and Timbuctu, especially in regard to the wholesale abandonment of hinterland sites which appeared to be common to all three regions. We were particularly interested in comparing the Dia survey region with the geologically similar Jenne-jeno hinterland, which like Dia was characterized by a dominant urban site orbited by numerous smaller settlements within a seasonally inundated floodplain.

At Jenne-jeno, a pronounced settlement characteristic had been the tendency of sites to cluster, usually in combinations of large and small mounds marked by apparent functional differentiation within the cluster. Aerial photographs showed a similar pattern of clustering in the sites around Dia. We were interested in investigating whether sites within these clusters tended, as at Jenne-jeno, to be simultaneously occupied and simultaneously abandoned; and if so, whether they showed a similar pattern of internal functional differentiation. We also hoped to be able to discern a reason (chronological? functional? environmental?) why some sites were clustered and some appeared to have developed in isolation.

A central goal was the correlation of settlement chronology with changing landform preferences and climatological events which may have affected the Dia region. In the Jenne-jeno hinterland, early occupation tended to be directly on the floodplain bed, generally on well-sorted clayey soils suitable for rice production, with later expansion consisting primarily of an intensification of population within the same soil groups. As these sites were abandoned, low-lying heavy clays tended to be depopulated first, followed by the lighter, higher floodplain soils and, finally, by sites

in the immediate area of modern Jenne. At the same time, high landforms such as dunes and levees were colonized by the newly arrived Bambara and Fulani populations, who sought out light, well-drained soils suitable for millet and sorghum cultivation (S.K. and R.J. McIntosh 1980: 366-388 ; R.J. McIntosh 1983: 195).

We were interested to discover whether habitation in the Dia region followed a similar geomorphological/geographical sequence. Were initial settlements on the floodplain bed progressively abandoned in order of their distance from the urban center? Did sites on the edge of the deep clay floodplain in the west of the survey region have a different chronology from the middle elevation soils to the east? Were high levees here, as at Jenne, avoided as a locus of settlement until late in the region's history? Finally and most importantly, given the distribution of settlement in most of the survey region, were there chronological or other differences in occupation along the three marigots in the survey region? How did the archaeological chronology of occupation and abandonment tie in with postulated changes in the hydrology of these streambeds? And did these correlate archaeologically with documented geomorphological and climatological events in the Middle Niger region as a whole?

Underlying all these research questions was our investigation of the urban character of ancient Dia and its position as an urban center in the expanded "national region" of the Middle Niger. One tool for determining the nature of the urban landscape was the charting of regional settlements in a rank-size hierarchy, which had shown fully integrated "mature urban" development of both the Jenne-jeno and Timbuctu hinterlands at their most populous (R.J. and S.K. McIntosh 1984; 1988). Another was analysis of functional integration and specialization of the hinterland sites. Both these analyses would give us insights into the nature of the Dia hinterland as a discrete community and into its role -- cultural, commercial, symbolic -- within the extended community of the Middle Niger floodplain.

Survey methodology

Survey procedures in the Dia region were essentially those used for floodplain sites in the surveys around Jenne and Timbuctu: i.e., the systematic recording of surface artifacts and features from a geomorphologically stratified sample of sites. Because of the relatively short field season, of which a substantial portion was devoted to excavation at Shoma and Mara, the Dia survey covered a far smaller geographical area than did the previous surveys in the upper Inland Delta and the Niger Bend. Since our overriding interest was the growth and organization of Dia, we chose to concentrate our time on an intensive survey of sites in the immediate area of Dia, similar to that conducted in 1977 on sites within a four km radius of Jenne (S.K. and R.J. McIntosh 1980: 349).

Our primary focus of research was the area within a two km radius of the Dia mosque, where we conducted an intensive survey of clustered and isolated floodplain sites. For the purpose of including a variety of landforms and sites, however, we expanded the survey region to a radius of five km in the southwest and northeast, in order to encompass a sample of levee sites and floodplain sites located at a distance from Dia. These consisted of one levee site and one isolated floodplain mound near the west bank of the Diaka, and an elongated cluster of mounds (originally misidentified as a levee) along the upper banks of Marigot 1 in the northeast of the survey region.

Experience in the floodplain around Jenne had shown us that we could expect to find exposed archaeological remains only on ground permanently above flood level. This phenomenon (confirmed at Dia by a search of some five km of floodplain deposits south of the modern town) permitted us to concentrate our research on exundated features such as floodplain mounds and levees, all of which were clearly visible on aerial photographs of the region. Before entering the field, therefore, all major landforms and soil groups were mapped and all putative sites were identified and numbered using 1: 50,000 scale aerial photographs (Series 75-MAL 32/500 [Mali]: Institut Géographique National, Paris). On the basis of this information,

the survey region was stratified into three geomorphological domains (**Figure 50**). These consisted of levees (in this case the ancient sand-clay levee along the west bank of the Diaka); the deep clay floodplain, made up of the heavy, uncultivated clays of the deep floodplain basin; and the sandy clay rice-producing soils of the middle floodplain elevations. Within these domains, sites were further stratified into those tightly clustered (usually along a marigot) and those isolated in the floodplain or along a levee.

Of the three geomorphological domains, two were examined in the field. These were the middle elevation floodplain, which comprised the vast majority of the survey area, and the largely sterile (one site) high Diaka levee. The deep clay floodplain, situated at a greater distance from Dia, was not investigated, although two clusters of sites on its southeastern edge (Clusters VIII and X) were considered to have possible chronological implications for this soil group. Within the middle floodplain, investigation focused on clustered sites along the three marigots running through the survey region (five clusters totaling 33 sites), and on isolated sites (four) on the floodplain bed (**Figure 53**). Inside the two km radius, all isolated sites and all sites in the Dia cluster were examined in detail and surface ceramics recorded. All sites in all other clusters within two km of Dia were visited to verify that they were constructed of cultural deposits. Using simple random selection, half the sites in each cluster were then designated for more thorough examination. (The one exception was Cluster VIII, from which only one site was surface recorded.) Outside the two km radius, on the linear arrangement of sites to the northeast (Cluster LI), all sites within five km of Dia were verified, and one fourth of those randomly selected for surface recording and dating.

One goal of the Dia survey was methodological: a test of the reliability of aerial photographs, a basic tool in the formulation of our research design, as a means of identifying true sites on the various landforms of the region. The value of aerial photography as an unbiased means of determining the number, kind, and location of archaeological sites has been demonstrated repeatedly in semi-arid regions, where visibility is often such that sites

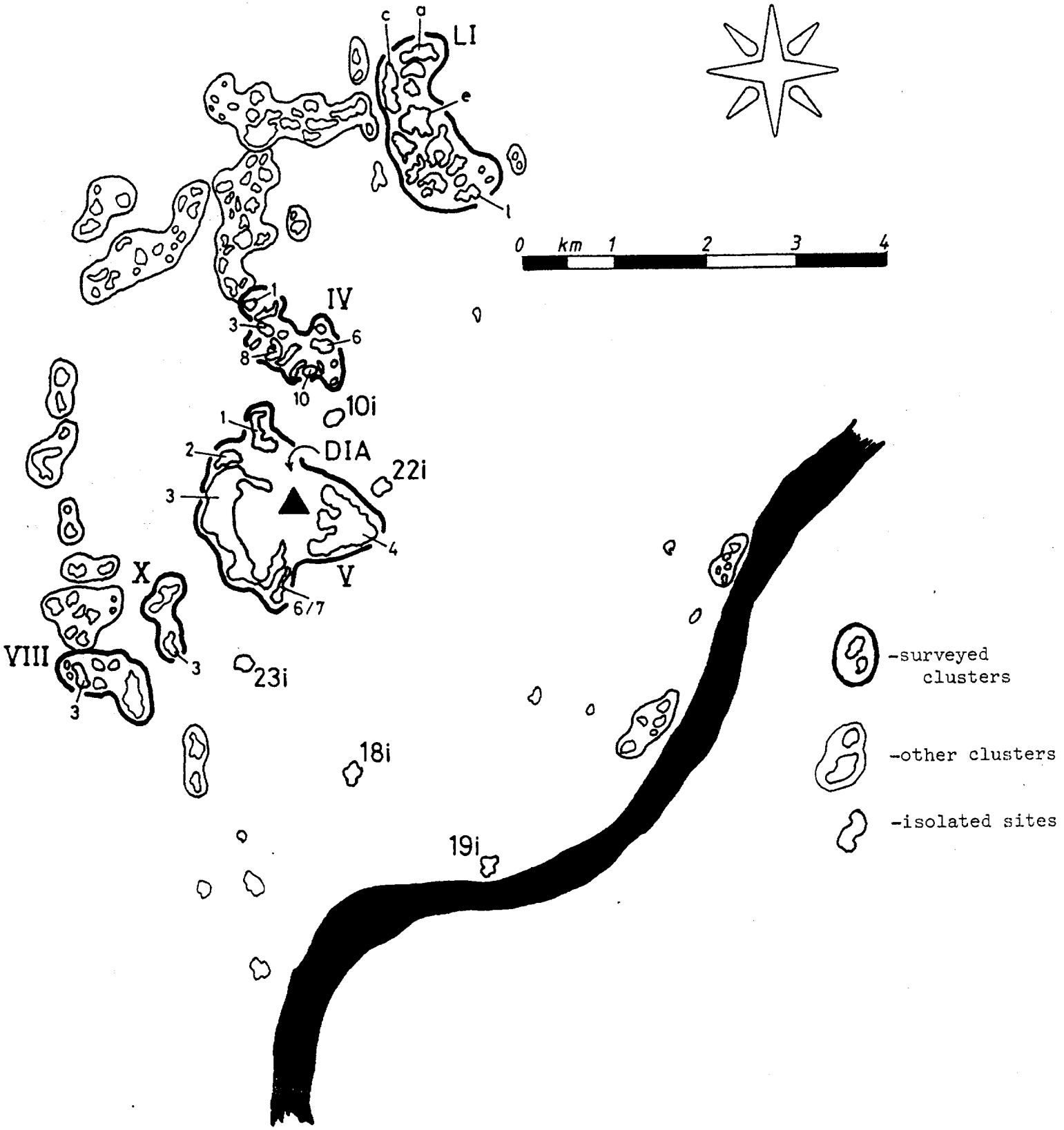


Figure 53. Archaeological sites recorded in the survey region.

and geomorphological features can be mapped directly from the photograph (e.g., Adams and Nissen 1972). In our own surveys in the upper Inland Delta and the Niger Bend, we had found that aerial photographs provided complete visibility of floodplain sites and excellent differentiation of landforms and soil groups (R.J. and S.K. McIntosh 1984: 23-24; S.K. and R.J. McIntosh 1980: 348-349).

The test of aerial photograph reliabilty consists of an evaluation of both visibility (whether all existing sites can be seen on the photograph) and identification (verification by ground survey that all observed sites are in fact true sites). In the Dia area, as at Timbuctu and Jenne, aerial photographs showed 100 per cent visibility for floodplain sites; that is, no sites were observed in the field which were not also visible on the air photos. Identification of sites in the Dia hinterland, however, proved to be much less consistent: of the 37 floodplain sites verified as true sites, only 22 had been classified as such on the basis of aerial photographs. This large error factor was due entirely to the misidentification as a levee of the large feature (Cluster LI) in the northeast of the survey region, which ground survey showed in fact to be a dense elongated cluster of 15 archaeological sites. In addition, two other putative floodplain sites were revealed in the field to be geomorphological features containing no cultural deposits, thus giving an overall identification rate of 56 per cent (22 of 39 sites and putative sites correctly identified). This compares poorly with the Jenne area, where 100 per cent of floodplain sites were both visible and identifiable, and with the Timbuctu region, where 93 per cent of putative sites were correctly identified (R.J. and S.K. McIntosh 1984: 23; S.K. and R.J. McIntosh 1980: 349). On the Diaka levee, the one putative site which was visited turned out to be a true site, and a fieldwalk of roughly two km along the levee surface turned up no sites which had not been visible on the air photo. While this small sample cannot be generalized to all levee sites in the Dia area, it does compare favorably with the Jenne-jeno rate of 90 per cent visibility and identification of sites located on levees (S.K. and R.J. McIntosh 1984: 82).

Summaries of pertinent data recorded in the Dia survey are listed by site

in Appendix 5. For all sites, we recorded size, location, and distance from water, and the type of landform on which they are situated. On all sites which were examined, the sites were systematically walked and any surface features were noted. These features are described in Chapter 3. Miscellaneous surface artifacts were likewise recorded (but not collected) from all parts of the site, and classified into various functional categories (metallurgical, elite, agricultural, fishing, and funerary) intended to provide some insight into activities which might have been carried out there. Sites were dated by noting characteristics of surface ceramics throughout the site. A control for this procedure was provided by collecting all ceramics from one or more arbitrarily selected areas of one meter square, which contained pottery deemed representative of the assemblage as a whole. The number of collections taken was governed by a rule of thumb of one collection for sites of less than one hectare, and two or more (depending on the site size) for larger sites. Within these one-meter squares decorative characteristics of 100 per cent of sherds were recorded in detail, using the same descriptive categories as were used in the Shoma and Mara excavations (Chapter 4).

Survey results

In all, surface artifacts and features were recorded from 21 sites in the Dia hinterland. For purposes of analysis, these sites were considered as six clusters or broadly geographical groups of sites, whose interrelationship was examined from the perspectives of chronology, site function, and geophysical status (size, location, and relation to other sites) (**Figure 53**). Site groupings consisted of

1) the Dia complex (Cluster V), the dominant group of the survey region, composed of Shoma, Mara, and three smaller mounds lying at the juncture of marigots 1 and 2;

2) Cluster IV, a group of ten small mounds (five surface collected) lining the east bank of Marigot 2, just north of the Dia complex;

3) isolated sites near Dia. These three floodplain mounds (sites 10i, 22i, and 23i) comprised a 100 per cent sample of isolated sites within the

two km survey region;

4) Clusters VIII (seven mounds/one surface collected) and X (two mounds/one surface collected), lying near the mouth of Marigot 3, the western margin of settlement in the Dia region and the only one of the three marigots to pass largely through the deep clay floodplain;

5) Cluster LI, an elongated, densely packed group of 15 sites (four surface collected) located on a possible levee at the convergence of Marigots 1 and 2 in the northeast of the survey region; and

6) isolated sites more than two km south of Dia, where a much sparser pattern of ancient settlement consisted generally of widely separated isolated sites. The sample from this area consisted of one site (19i) on the Diaka levee and one floodplain site (18i) located four km south of Dia on a vestigial marigot leading from the Diaka to Marigot 1.

The overwhelming first impression conveyed by these sites was their notable similarity to sites in the Jenne area, in terms of settlement patterns, surface artifacts, and surface features. Within the survey area, however, several trends were immediately apparent which were at striking variance with findings around Jenne. Most evident was the nature of the clustered site pattern which was the dominant mode of settlement in both regions. In the Jenne survey region, clusters usually consisted of one or more large sites orbited by a constellation of smaller sites. These were located in almost equal numbers along the channels of watercourses and on the floodplain bed. At Dia, however, clusters tended to be in long lines of densely packed sites, with no evident dominant mound. All floodplain clusters, and nearly all settlement, followed the banks of the larger marigots, possibly an indication that prehistorically less permanent water was available in the Dia floodplain than around Jenne-jeno (**Figure 50**).

Isolated sites, also, generally appeared to be located along existing or vestigial marigots. These sites, nearly nonexistent around the densely settled marigots north of Dia, were largely confined to the floodplain and levees south of Dia, where the two sites examined suggested a somewhat later chronology than the northern clustered sites. The three isolated

sites around Dia, all located on the traces of otherwise uninhabited small streambeds, were all in fairly close proximity to other, clustered, sites, whose chronology they generally followed. Two of the three (sites 22i and 23i) appeared to have been closely tied to Dia or other clusters as funerary sites, at least in later periods.

As at Jenne and Timbuctu, the Dia survey produced no evidence of Late Stone Age occupation. Throughout the survey region, pottery closely resembled that of the Inland Niger Delta sites around Jenne, with all four Jenne-jeno occupational periods, from Phase I/II to Phase V, represented on at least several sites. The overall chronology revealed by these ceramics was, however, markedly different from that of either Jenne or Timbuctu. In those regions, the greatest density of hinterland sites appeared to correspond with Phases III and IV (c. A.D. 300 to 1400), with abandonment generally occurring in late Phase IV or Phase V, and relatively little Phase I/II material evident on the surface. At Dia, however, 76 per cent (16) of the 21 sites examined had some Phase I/II surface material, often of considerable density and extent (**Figure 54**). Phase III material was found on 18 of 21 sites (86 per cent). The Phase III abandonment of these sites, some three centuries or more before the same process occurred around Jenne, was particularly striking. By the end of Phase III, well over half the occupied sites had been abandoned, with Phase IV ceramics found on only 38%, or eight, of all examined sites. On almost all of these occupation was greatly reduced from preceding periods. Phase V occupation, like that of Jenne and Timbuctu, was found on only a handful of large, widely separated sites, none from the previous hinterland clusters (**Figure 55**).

The interpretive leap from chronology of surface remains to chronology of site occupation is problematic for the Dia hinterland sites because of the evidence from the SCW excavations of abundant secondary use of Phase I/II potsherds in later mud brick building material. The sheer abundance and density of Phase I/II pottery on so many of the Dia survey sites certainly indicates an extensive occupation at that early date. We therefore, in the remarks that follow, make the interpretive leap that

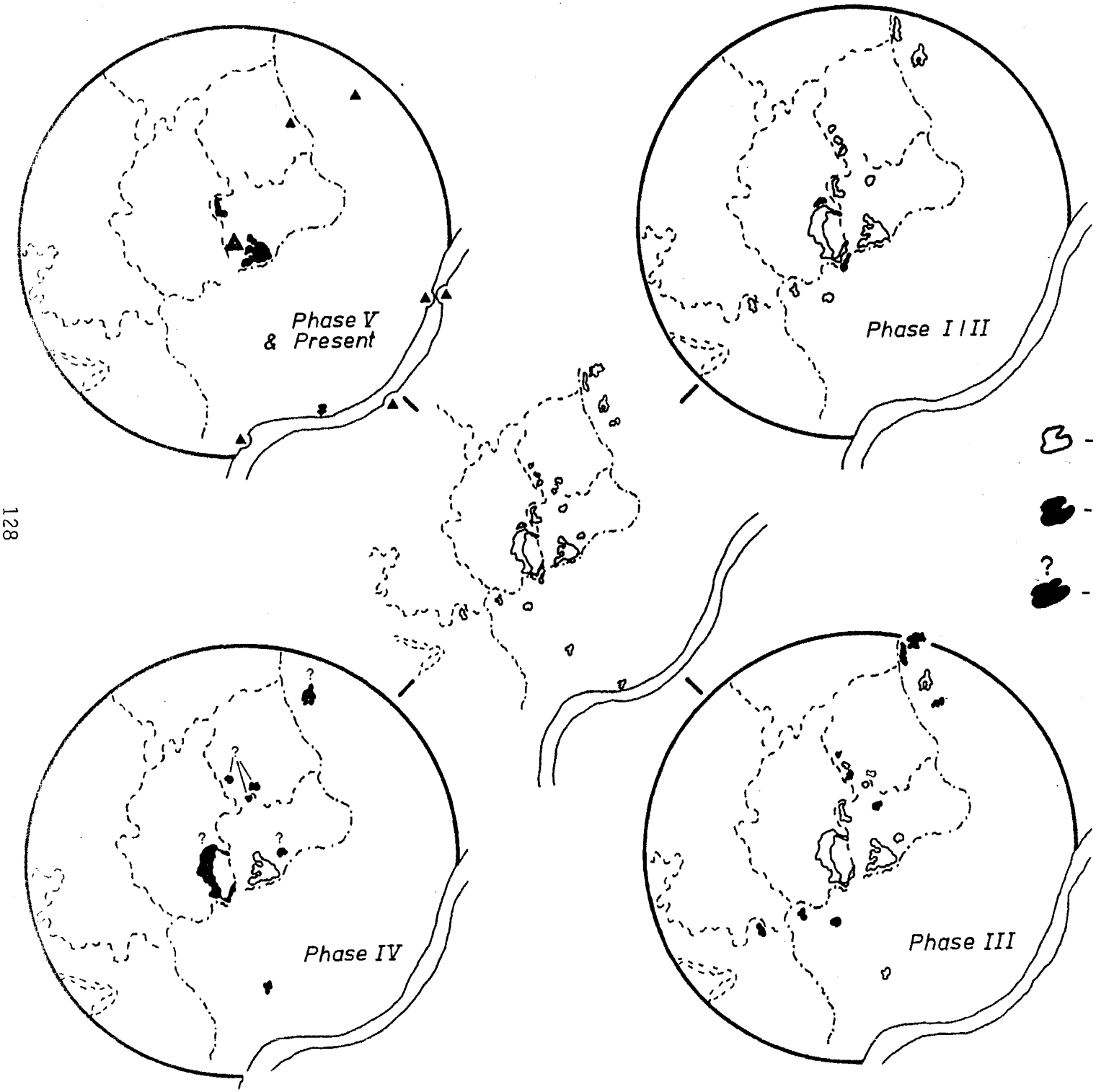
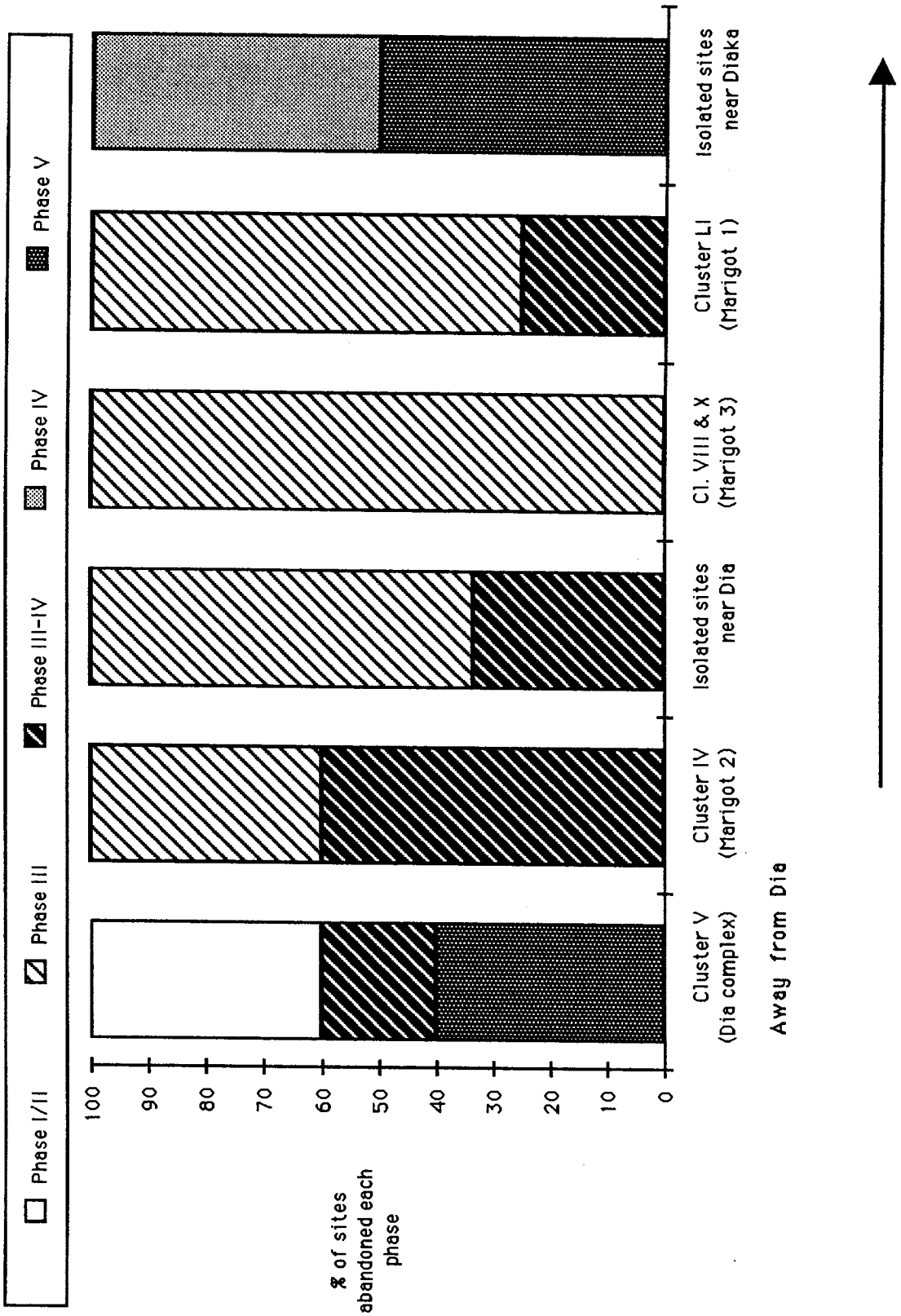


Figure 54. Summary of occupation in the survey region during different occupational phases.

Figure 55. Abandonment of sites by occupational phase



surface chronology reflects occupation chronology. But it should be kept in mind that since the distribution of at least some Phase I/II material on the Dia survey sites may be the result of secondary use, the occupation chronology cannot be safely inferred without excavation.

Occupation of sites within clusters appeared to be largely contemporaneous; in all clusters most sites were occupied during both Phase I/II and Phase III. Abandonment appears to have been largely but not entirely simultaneous: although the majority of sites were abandoned during Phase III, within each cluster (with the exception of the two-site sample from Clusters VIII and X) a much reduced population appears to have retreated to the larger and more central mounds before abandoning the hinterland entirely in Phase IV. This chronology applied both to clustered sites near Dia and to the more distant Cluster LI, at the northern edge of the survey region.

The notable exception to these patterns was the Dia cluster, which had widely varying occupation ranging from Phase I/II to Phase V. This cluster was the only one in which Phase I/II remains, present in significant and geographically extensive amounts on all mounds, were more widespread than Phase III, restricted to vestigial remains on the high ground of Mara, one outlying mound to the north of Shoma, and the apparently densely inhabited walled settlement on northern Shoma itself. Later occupation in this cluster may bear testimony to a population "implosion" accommodating the exodus of settlers from the hinterland: Phase V, present on Mara and one outlying mound north of Shoma, was found nowhere else in the floodplain.

Chronologically, there appeared to be little difference in occupation along the three marigots, with the possible exception of the two sites examined on the westernmost Marigot 3, both of which lacked the Phase IV occupation found in clusters along the larger and more easterly Marigots 1 and 2. While this may be a hint of early abandonment of the deep clay soils along Marigot 3, or possibly early strangulation of that channel, it cannot be substantiated without verification from a larger sample of sites.

Isolated sites around Dia, similarly, followed the general chronology of that area, with sites 10i and 23i datable to Phases I/II and III, and site 22i occupied consistently from Phase I/II through IV. Only in the far south, on the two isolated sites near the Diaka, did artifacts indicate a substantially later chronology. Here, the floodplain site 18i, which yielded no Phase I/II ceramics, was the only hinterland site in which Phase IV occupation appeared to be comparable to that of the underlying Phase III. Site 19i, the one true levee site examined in the survey, was datable entirely to Phase V. As the only settlement in the survey region to have been founded after Phase III, this site suggested a similar pattern to that of Phase V Jenne, with new occupation on high levees and dunes replacing the old floodplain sites.

In the Jenne survey region, surface artifacts and features had suggested that sites within clusters were functionally distinct, with moderate-sized and larger sites serving as centers for smelting and metallurgy, and larger sites generally showing a more integrated functional complexity (R.J. and S.K. McIntosh 1983: 42-44; S.K. and R.J. McIntosh 1984: 89). We have suggested that this differentiation may be an artifact of the ethnic heterogeneity of the region -- where still today members of different ethnic groups live in separate communities and pursue different occupations -- and that the clustered settlement pattern of that area may have been a means of resolving conflicting needs for functional integration and ethnic identity (R.J. and S.K. McIntosh 1988). Around Dia, unfortunately, any such broad comparisons were precluded by the extreme sparsity of surface artifacts, a condition these sites shared with those near Timbuctu (R.J. and S.K. McIntosh 1984: 22-23). We can, however, note several possible trends which may have a bearing on the function and settlement of different sites and clusters of sites.

Occurrence of all artifact types was erratic (Appendix 5), possibly due to widespread scavenging by modern inhabitants, although, as at Timbuctu, finds were equally infrequent on mounds both accessible and inaccessible to present population. While there was no discernible correlation between absolute site size and functional complexity, larger sites within clusters

tended, as might be expected, to have a more diverse artifact yield than smaller sites (**Figure 56**). Fishing net weights, artifact of a presumably widespread activity, were found only on the surface of Mara. Evidence of metallurgical activity (smelting and smithing slag) was found only on the two later, isolated sites near the Diaka and in the centrally located Clusters V (Dia cluster) and IV. Within each of those clusters slag occurred on four out of five sites, with no distinction as to site size. By far the largest concentration of slag, and the only recorded instance of a furnace, was on the isolated site 18i in the lower floodplain, conceivably an indication of specialization in that area. Agricultural artifacts (grindstones and spindle whorls) had a similarly spotty distribution, but tended to be located on the larger sites within a cluster. Personal "elite" artifacts (beads, stone bracelets, and clay tobacco pipes), an indication of disposable wealth and, possibly, social stratification, were again found only in Clusters IV and V, and again with no apparent differentiation by site size. Tobacco pipes, introduced in the late second millenium A.D., occurred only on sites which otherwise showed evidence of Phase V or more recent activity (**Figure 57**).

The one significant functional distribution was not of artifacts but of pre-Islamic burial features, which were strongly clustered at sites near the dominant Dia cluster (**Figures 25 and 26**). These circular brick structures, with associated potsherd pavements and funerary wares, were found on the floodplain sites 22i and 23i, south and east of the Dia complex, and on every site which we examined in the nearby Cluster IV (**Figure 57**). On the two isolated sites, and sites 6 and 10 in Cluster IV, they occupied most of the mounds, which clearly had been converted to cemeteries after they no longer were inhabited. Phase III ceramics were associated with at least some of these features on all sites at which they occurred. At site 23i, south of Shoma, some funerary structures appeared to date as early as Phase I/II, while in Cluster IV and site 22i, the sites nearest Mara, they were datable primarily, if not exclusively, to late Phase III and Phase IV. On these latter sites, they appeared to account for all Phase IV pottery found, suggesting that abandonment of these sites, as at all other sites within the two km survey radius, may have actually

Figure 56. Number of artifact categories represented within site groupings

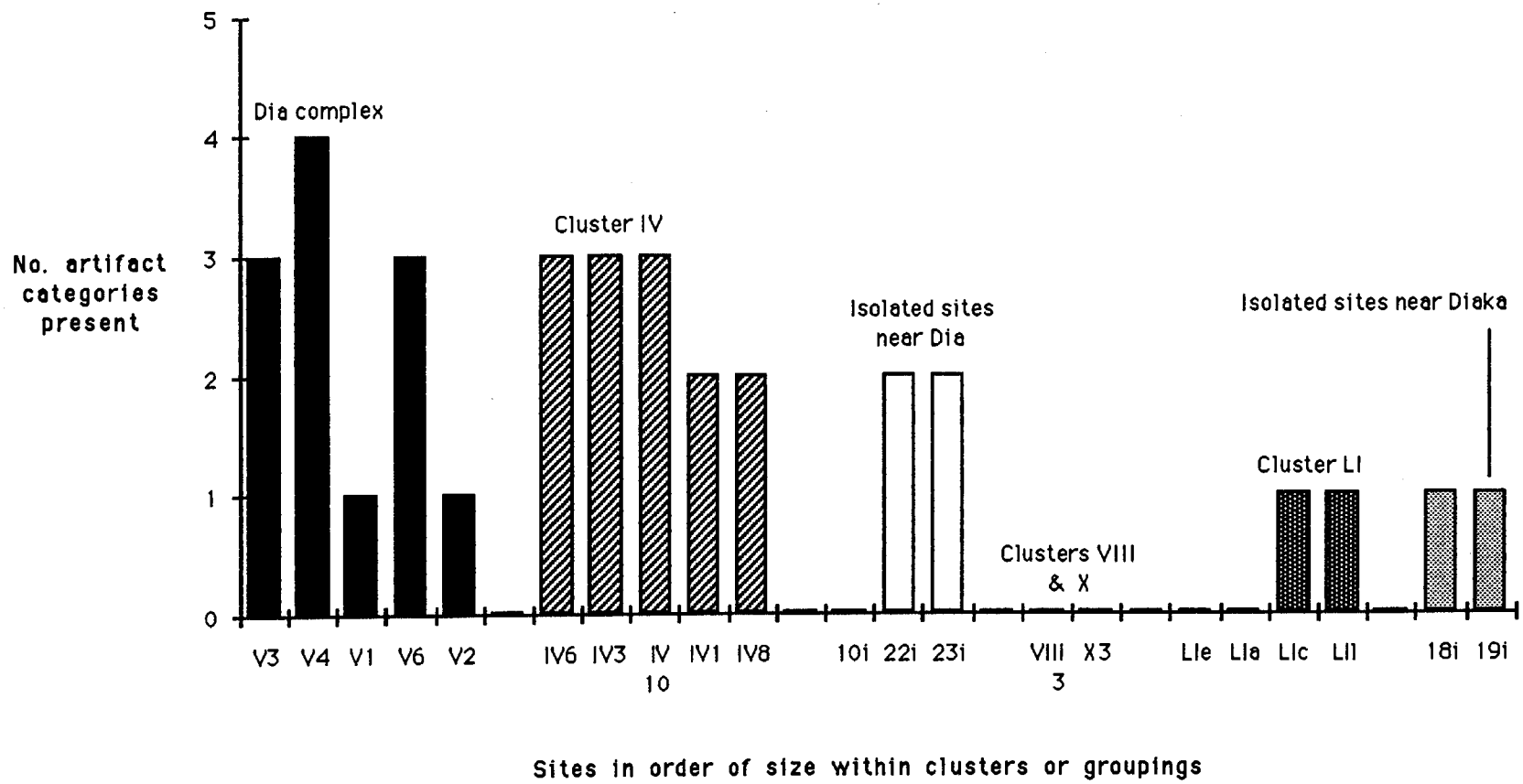
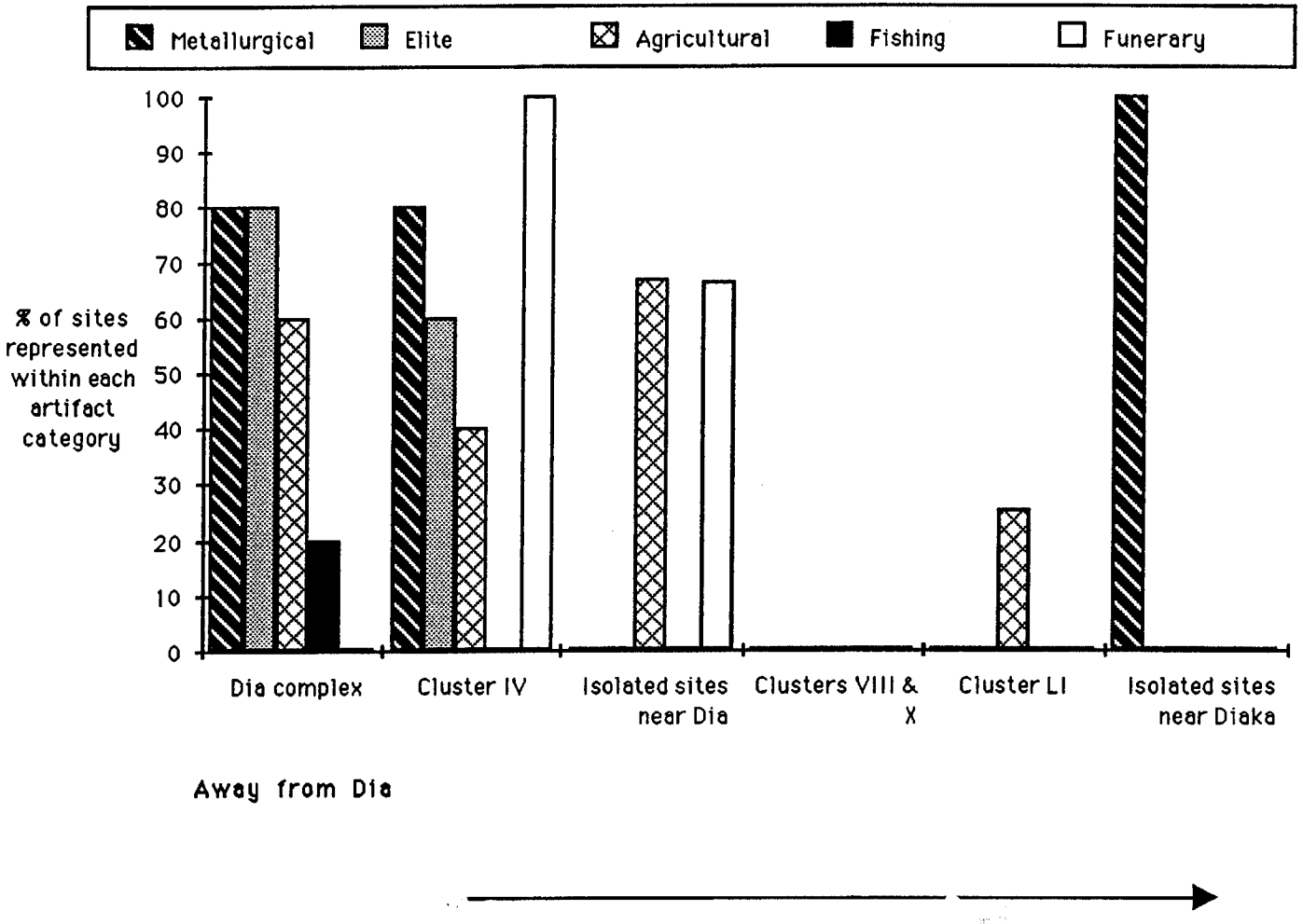


Figure 57. Distribution of surface artifacts by functional category



occurred some time before the end of Phase III. This would leave actual Phase IV habitation restricted to the Dia complex, site 18i near the Diaka, and the equally distant Cluster LI, and strongly suggests that the later funerary sites served as cemeteries for the Phase IV population of Mara and northern Shoma.

Conclusions

Overall, the pattern of occupation and material culture in the Dia hinterland was one of remarkable similarity to the hinterland of Jenne-jeno. Throughout the survey region, artifacts and surface features gave strong testimony to the existence of close ties between the Macina and the upper Inland Delta from the time of their earliest occupation. Abundant architectural remains on nearly half the surveyed sites -- usually round houses made from the sun-dried circular "djennefré" bricks now considered a hallmark of Jenne masons -- were identical to structures found at Phase III and IV Jenne-jeno (**Table 9**). The massive brick city wall surrounding the site of Shoma corresponded in both scale and chronology to the Phase III wall of Jenne-jeno (S.K. and R.J. McIntosh 1982: 402), while the circular funerary structures on sites surrounding Dia were accompanied by identical funerary wares to those of urn burials at Jenne-jeno (S.K. and R.J. McIntosh 1980: 97-104; S.K. and R.J. McIntosh, in prep.). Iron, sandstone, and stone beads and jewelry gave evidence that, as at Jenne-jeno, goods and raw materials were imported from outside the Inland Delta during all phases of occupation. Copper, found on two sites in Cluster IV, appeared to affirm the inclusion of Dia, however peripherally, in the Phase III/IV commercial networks which stretched northward from the Middle Niger to the southern Sahara. Above all, the similarity of domestic pottery types demonstrated participation in a common cultural tradition which extended into the everyday life of both regions and which, by Phases III and IV, had expanded to include the Niger Bend area as well (S.K. and R.J. McIntosh 1986: 310-313).

Perhaps the strongest indication of this common tradition was the

distinctive pattern of densely and simultaneously occupied clustered settlement which characterized the majority of sites in both survey regions. Geographically, settlement around Dia divided into two broad areas: clustered and occasional isolated settlement on the three marigots to the north, west, and east of Dia; and isolated settlement south of Dia on the floodplain and the Diaka levee. Sites from the first of these regions, overwhelmingly dated to Phases I/II and III, constituted the vast majority of hinterland settlement and occupied an area which still (although dry at the time of the 1987 survey) shows evidence of recent extensive cultivation of rice fields. Like Jenne-jeno, the mounds of the Dia complex grew up at a location admirably suited to commerce and agriculture: in their position at the juncture of the major and minor marigots of the region, they commanded entry to the sheltered agricultural hinterland while at the same time providing it access to the broader distributary systems of the Diaka and the Niger.

The extent to which Dia and its hinterland were integrated into commercial networks along the Middle Niger is not illuminated by by the excavation and survey results thus far. The paucity of small finds at the Dia sites was notable in both survey and excavation. In the excavations, the quantity and form of these artifacts remained remarkably constant throughout the occupational levels, consisting from Phase I/II through Phase IV of little more than grindstone fragments and small pieces of smelting and smithing slag. This poverty of artifacts contrasts with even the lowest levels of Jenne-jeno, where iron slag and grindstones were found in abundance. It was particularly notable in Phases III and IV, which at Jenne-jeno were characterized by a variety of ornamental and utilitarian items made from imported stone and metal (S.K. and R.J.McIntosh 1980:188-193). While it is altgether probable that the paucity of artifacts was a result of the extremely small sample -- three units totaling 8.88 m^2 out of a total site area of roughly 1.5 km^2 -- the fact is striking that at Dia there was little sign of the trade for which the Soninke descendants of ancient Dia were known and which formed the basis of the prosperity at Jenne-jeno and Jenne.

In summary, the chronology of settlement in the Dia hinterland would appear to be thus: occupation at clustered hinterland settlements was densest during Phase I/II and early Phase III. From the extremely small sample available, the isolated sites south of Dia appear to date during or after the Phase III/IV abandonment of the northern clustered sites and may possibly have been founded in locations suitable to specialized tasks or agriculture: Phase III/IV iron smelting at a time when fuel may have been more abundant along the largely unsettled small waterways near the Diaka, and highland agriculture on the Diaka levee following the Phase V penetration of the Macina by millet-growing Bambara and Fulani. On the Dia cluster itself, hinterland events were reflected in a widespread Phase I/II occupation which gave way to an extremely concentrated and urbanized Phase III settlement, followed by shallower but more extensive Phase IV habitation as the hinterland sites were abandoned. With Phase V, occupation in this cluster was again reduced to settlement primarily on the mound of Mara before relocating to the now densely inhabited central mound of Dia.

This pattern of rapid growth, abrupt abandonment, and apparent concomitant changes in landform preference generally mirrors events in Timbuctu and Jenne which took place some three to five centuries later. We have discussed above the apparent correlation of demographic events in the Middle Niger as a whole with region-wide climatological trends: initial settlement at Jenne-jeno, possibly facilitated by reduced flooding, during the semi-arid conditions of the late first millenium B.C.; the far-flung cultural and demographic "explosion" which accompanied the improved climate of Phases III and IV; and the progressive retreat of hinterland populations following the onset of the present climatic decline c. A.D. 1100. Of this sequence, the Dia region can be said to have participated in only the final stages. Its dense Phase I/II settlement corresponded to the earliest stages of growth at Jenne-jeno and to ephemeral, probably temporary occupation along the wadis near Timbuctu (S.K. and R.J. McIntosh 1986: 316), while a limited Phase III expansion appears to have been checked almost as soon as it began by the dramatic Phase III/early IV depopulation of the hinterland. Only in Phase V, when an

already greatly reduced population retreated even further to the centralized mounds of the Dia complex and, possibly, to the highland sites preferred by the now dominant Fulani and Bambara, does it reflect events in other parts of the Middle Niger.

We have suggested in the section on geomorphology that this deviation may have been a result of local geomorphological events which set Dia apart from the mainstream of occurrences elsewhere in the Middle Niger. There are hints -- in the possible location of major sites on pre-existing low levees, and in the evidence of repeated Phase I/II flooding on the high ground of Mara -- that, despite the dry conditions which presumably prevailed, Phase I/II settlement may have taken place at a time when the Dia marigot system carried a far greater water supply than did watercourses around Jenne-jeno. This in turn may suggest that the Dia marigots occupied a more significant role than presently in the hydrology of the Middle Niger, possibly approaching the status of a then much smaller Diaka. Under these conditions, the Phase III onset of a more active fluvial regime, with an accompanying increase in destructive high floods, may have encouraged the otherwise puzzling early abandonment of Mara, southern Shoma, and the lower-lying southern mounds of the Dia complex, all of which would have been vulnerable to high water flowing from the Diaka along the lower course of Marigot 1. At the same time the increased availability of permanent water supplies and arable land may have led to the intensification and expansion of Phase III settlement on northern Shoma and other sheltered areas along the lesser marigots to the north.

As this fluvial activity reached its peak in late Phase III and early Phase IV, c. A.D. 700-1100, deposition of the high bed loads of both major and minor marigots may have resulted in far-reaching hydrographic changes, as minor watercourses migrated from congested beds and the encroachment of levees on its confluence with the Diaka resulted in a significant loss of water for the marigot system as a whole. Shoma and other northern sites in the increasingly desiccated hinterland were abandoned as population fled to Mara, where a now reduced Marigot 1 was, then as now, still capable of insuring a permanent water supply, held over

in large ponds in the center of the mound. By Phase V, the region was faced not only with a further loss of water from the now deeply incised Diaka, but also with social and political upheaval as the Macina became a frequent battlefield in the great population movements and shifts in political alignment which accompanied the continuing climatic decline of the late second millenium A.D. As immigrant Fulani and Bambara populations established new settlements on sites suited to their specific agricultural needs, the beleaguered Phase V inhabitants of Mara withdrew to the protected, centrally located mound of Dia, whose continuation as the dominant population center of the region was assured by its permanent water supply, access to aquatic and agricultural resources, and advantageous location for seasonal water transport.

This hypothetical reconstruction may well be rewritten in the light of future investigations. From the scanty geomorphological and archaeological evidence available, however, it seems likely that some such geomorphologically inspired sequence was responsible for both the early *floruit* and early demise of the remarkably homogeneous settlement of the Dia hinterland. If the Dia region was in fact the beneficiary of superior geographical and hydrological conditions during the semi-arid climatic conditions under which the Inland Delta was settled, this fact alone could account for its early rise to urban status and consequent dominant role in early Soninke myth and history. Similarly, its dramatic and premature depopulation, which lends some basis to the legendary role of Dia as an early center in the Soninke diaspora, can only be accounted for by events which were comparatively sudden but permanent in effect. That these events were at least partially hydrological is suggested by the clear evidence of Phase III or later strangulation of the originally densely occupied Marigot 3, and by the overall evidence of desiccation in a region which once supported a thriving population. Whatever the causes, they were dramatic enough to bring to a halt an urban system which had endured with remarkably little change for well over a thousand years, and effectively to reduce it to the role of bystander in the great cultural and demographic events of the late first millenium Middle Niger.

APPENDIX 1: DESCRIPTION OF EXCAVATED LEVELS

Description of excavated levels in D6 (descriptions of soil texture after Ahn 1970: 19-21)

Level 1: Level 1 consisted of surface deposits and the indurated upper part of level 3, hardened by leaching and exposure into a microlayered platey structure. The soil was a very compact light brownish gray light clay, becoming more friable with depth. Artifact content was similar to that of level 3, with many fish bones and large ceramic fragments.

Level 2: Level 2 was a hard-packed, homogeneous heavy loam/light clay which appeared just beneath the surface in the southwestern one-third of the excavation unit. This level appeared to be rapid wall collapse, apparently from a single structure. The soil was very pale brown in color, with flecks of charcoal and slight termite disturbance. Level 2 contained a large number of scattered round sun-dried bricks, but no sign of *in situ* foundations.

Level 3: This was the upper level of a shallow deposition pit which had been dug into levels 2 and 5. The soil consisted of a soft, ashy pale brown light loam which contained many large pottery sherds, charcoal fragments, and fish bones, and a scattering of eroded cylindrical bricks. As in all deposits from this pit, non-ceramic artifacts consisted of a variety of objects including spindle whorls, net weights, and decorative stone items.

Level 4: Level 4 was the lower part of the same shallow pit as level 3. Like level 3, this level contained much bone, pottery, and charcoal. The soil was gray and extremely fine-textured, with a higher ash content than level 3. There were very few bricks, and pottery fragments tended to be larger than those found in level 3.

Level 5: Level 5 was a continuation of the accumulated wall collapse found in level 2. Artifacts were sparse, and the soil was a hard-packed heavy loam/light clay, very pale brown in color. Wall sections showed no difference between levels 2 and 5, though level 5, unlike level 2, had few

entire bricks.

Level 6: Level 6 underlay level 5 and formed the floor of the rubbish pit excavated in levels 3 and 4. It was separated from level 5 by a thin layer of sand and charcoal containing many large sherds. Soil texture overall was a very compact, homogeneous light gray light clay marked by numerous termite burrows and occasional charcoal lenses. Structure was moderately platey, with visible horizontal definition. Especially in the upper northern section of the level, some areas showed a distinct microstratigraphy of clay interspersed with medium-coarse sub-angular wind-borne sand. Level 6 yielded numerous ceramic sherds but no obvious bricks. It appeared to be an accumulation from slow wall melt, preceding the more rapid collapse represented by levels 2 and 5.

Level 7: Soil in this level consisted of a pale brown to yellow clay, very compact, with some termite activity and a pronounced platey structure suggesting a period of prolonged exposure. Throughout the clay there were lenses of orange sand, some made up of fine rounded sand particles indicating water deposition, and some composed of coarse, sub-angular, wind-deposited particles. Much of this sand appeared to have been deposited within the confines of a broad east-west trench, undetected during excavation, which extended from the bottom of level 6 to the middle of level 9.

Level 8: Level 8 was very similar to level 7, with soil composed of a hard, microlayered, very pale brown to yellow clay interrupted by numerous sand lenses. In the south and east of the unit, this clay contained a concentration of iron inclusions similar to those usually found in floodplain deposits. Soil in the lower part of the level, just above the opening of level 9, was noticeably less compact and contained significant quantities of scattered ash and charcoal. Like the sand in level 7, the ash appears to have been at least partially associated with the intrusive trench originating in level 6.

Level 9: This level marked a transition from the clay matrix of levels 1 through 8 to the sandier soils of levels 10 through 14. Overall, the soil was a homogeneous, loosely compacted very pale brown loam made up of

clay and medium-fine subrounded/subangular sand. This loam contained very little cultural material. Material from this matrix was, however, badly contaminated by the intrusive trench of levels 7 and 8, which extended approximately to the midpoint of level 9. A radiocarbon sample taken from charcoal from the bottom of the trench yielded a date of 410 ± 90 B.P. (Beta-20711), which calibrates to A.D. 1310-1650 at the recommended two standard error limit.

Level 10: The soil in this level was a lightly compacted brownish yellow loam nearly indistinguishable from that of level 9. Soil texture was uniform throughout the level, with occasional iron staining, a few termite burrows, and a high content of rounded to subrounded sand particles. Level 10 yielded numerous small fragments of pottery. As in succeeding levels, these were encrusted with a heavy buildup of calcium carbonate suggesting prolonged exposure to water.

Level 11: Level 11 was very similar to level 10. Soil consisted of a very pale brown loamy sand, slightly more compact than in level 10 and more heavily mottled with iron staining. With depth, the soil became more compact and staining changed to limonite nodules, which became more numerous just above the bottom of the level. Level 11 contained almost no artifacts below the first few cm.

Level 12: Level 12 began as fine loosely compacted light yellowish brown loamy sand with many limonite inclusions. Pottery content was high in the upper half of the level, then tapered off to almost nothing as the soil became sandier, lighter in color, and more loosely compacted, with fewer iron inclusions. Like levels 10 and 11, level 12 appeared to contain material from temporary, perhaps seasonal, occupation of the levee.

Level 13: In this level, for the first time, the soil was a true levee sand, composed of uniform light gray/very pale brown medium sub-rounded water-borne particles with very slight clay admixture. Iron inclusions were abundant compared to the lower part of level 12, and both iron inclusions and clay content increased significantly in the last few cm of the level. The relatively abundant thin carbonate-encrusted pottery in the upper part of this level may represent the earliest occupation at Mara, on

the surface of the original levee. Very little cultural material was recovered from the lower half of level 13.

Level 14: Level 14 was below the dry season water level and appeared to represent the formation of the levee on the floodplain surface. Soil was a yellowish brown loamy sand composed of clay and coarse sand, and contained a profusion of large iron nodules. Except for one pottery sherd from the top of the level, this stratum was completely sterile, and it bottomed out on apparent floodplain alluvium.

Description of excavated levels in Sh7.

Level 1: Soil in this level was a compact homogeneous light yellowish brown clay. Texture was hard and platey from surface exposure and leaching, but otherwise level 1 appeared to be classic rapid wall collapse containing many scattered round bricks. Artifacts consisted entirely of ceramics.

Level 2: Level 2, covering about the northeastern one-third of the excavation unit, was excavated as a possible pit in the wall collapse of levels 1 and 3. Soil was a brown to yellowish brown loam, darker and more friable than the soil of levels 1 and 3. Level 2 contained a number of large ceramic sherds and many scattered cylindrical bricks.

Level 3: Level 3 consisted of a very compact light gray light clay surrounding the area of level 2. This level also contained many whole round bricks and appeared to be a continuation of the wall collapse of level 1. A line of bricks visible along the southern edge of the excavation unit appeared to be fallen and leaning toward the west, as if the wall had tumbled from the east.

Level 4: This level was composed of a light gray heavy loam, less compact than level 3. It was characterized by pronounced termite activity and contained many patches of sand. Level 4 yielded numerous ceramic sherds but fewer entire bricks than preceding levels, and appeared to have been formed by a moderate to slow process of wall collapse and melt.

Level 5: Like level 4, level 5 was made up of a light gray heavy loam honeycombed by termite burrows. Soil texture was much more homogeneous than in level 4, and artifact yield was lower. Level 5 contained few if any entire bricks, and appeared to be a product of slow wall melt rather than wall collapse.

Level 6: Soil in level 6 was a compact homogeneous light gray light clay very similar in color and texture to level 5. Artifact yield was lower than that of level 5, but included a number of large pottery sherds concentrated in the center and northwest of the unit. This level contained no entire bricks and appeared to have been formed by a process of slow deposition over a long period of time.

Level 7: Level 7 was a thin band of crumbly pale brown heavy loam which marked a clear stratigraphic break from the clay of preceding levels. Soil was sandier and less compact than that of level 6, and contained many patches of black ash and charcoal. Consistency ranged from lightly to moderately compact in patches all over the unit. Charcoal was present in large chunks in the southeastern part of the unit and a 20x20 cm clump of hematite nodules was found in the northwest corner. Ceramic yield was high.

Level 8: Level 8 continued the high artifact yield of level 7, but was much less compact and showed distinct horizontal definition. Soil was an extremely heterogeneous and crumbly light gray light loam, interrupted by many termite holes, areas of hard-packed earth, and clods and patches of burnt clay. About 25 cm into the level was an apparent series of living surfaces made up of sequential terracotta "floors" with associated horizons of ash and charcoal. These were underlain by several extended lenses of ash and sand. At the same level as the uppermost terracotta "floor" were a deposit of pure sand, c. 25 cm deep, in the southeast of the unit and two fired bricks in the northwestern corner.

Level 9: Level 9 consisted of the occupational deposits beneath the "floors" of level 8. This level continued to exhibit the heterogeneity of deposition and wealth of artifacts which characterized level 8, but the

soil was much ashier and lacked the distinctive burnt clay inclusions of level 8. Soil was a light brownish gray light loam, darker, softer, and more humid than that of level 8. It contained patches of sand, significant amounts of ash, and many large potsherds. Like level 8, level 9 had extensive termite disturbance. Samples taken from a pocket of charcoal and ash near the top of the level yielded a radiocarbon date of 980 ± 80 B.P. (Beta-20712), calibrated to A.D. 880-1240 at two standard errors.

Level 10: Level 10 was a fairly homogeneous light gray light clay, far less compact than level 9 and becoming more loamy with depth. It contained less ash and sand and fewer and smaller ceramic sherds than preceding levels, and appeared to represent a much slower accumulation of domestic debris.

Level 11: Level 11 began as a brown light clay slightly softer than that of level 10. This graded gradually into a loosely compacted heterogeneous brown light loam with significant termite activity. Artifacts consisted of numerous ceramic sherds, made up primarily of the fine thin twine-decorated pottery typical of the earliest occupation at Jenne-jeno. By the end of the level ceramic finds consisted almost exclusively of these early wares. A large concentration of bovid bone found at the base of the level suggested that this was an area of active occupation.

Level 12: Level 12 was nearly identical to level 11, a heterogeneous brown light loam with much termite disturbance. Phase I/II ceramics were recovered in the same profusion as in level 11. Clay content increased with depth, and by the end of the level brownish yellow iron stains had begun to appear.

Level 13: Level 13 showed a clear change in color and texture from levels 11 and 12. Soil consisted of a light yellowish brown to brown light clay, similar to deposits usually found just above the floodplain level. Iron staining changed to limonite inclusions, which became more numerous as excavation continued. Thin twine-decorated pottery was recovered in large quantities from the top of the level but dwindled with depth. Soil color steadily darkened with depth.

Level 14: With level 14, the soil changed abruptly from clay to a moderately compact dark yellowish brown light loam, similar to the sandy lower levels of unit D6. As in unit D6, this sandy soil appeared to be the surface of a levee. Artifact yield was dramatically higher than that of the lower part of level 13, and again consisted primarily of early pottery types. Soil consistency was extremely heterogeneous, with ash, termite disturbance, and some horizontal structure. With depth, the soil became less compact and lighter in color, grading into a friable light gray sandy loam in the lower part of the level. The cultural deposits in this level appeared to represent the earliest occupation in unit Sh7.

Level 15: Level 15 marked another sharp transition, from the sandy soil of level 14 to a lightly compacted homogeneous brownish yellow heavy loam. This sand/clay mixture contained no iron inclusions and no artifacts, and appeared to be sterile levee material underlying the early cultural deposits of level 14. It terminated at the base of the level in sterile floodplain clay.

Description of excavated levels in SCW

Level 1: This level began excavation of the east-west section of the city wall which bounded the western periphery of Shoma. Level 1 consisted entirely of *in situ* city wall, with the eastern two-thirds of the level encompassing the eastern revetment wall and the western third made up of rubble fill from the center of the wall. Excavated material throughout the level consisted of well-defined cylindrical sun-dried bricks in a gray/light gray hard clay matrix. There was no obvious horizontal distinction at this level between the loose brick of the fill material and the mortared bricks of the revetment wall. As in all subsequent levels of the city wall, both bricks and mortar contained large quantities of thin twine-decorated Phase I/II pottery, to the near exclusion of other ceramic types.

Level 2: Level 2, to the east of and at the same depth as level 1, was made up of wall collapse and erosion debris adjacent to the city wall. The upper part of this level was classic wall collapse, composed of a comparatively

loose light yellowish brown heavy loam containing many whole bricks. Beneath this was a layer of apparent wall melt consisting of a compact clay containing isolated eroded brick nubbins and some iron inclusions. Artifact yield was low, and consisted almost exclusively of thin-walled Phase I/II pottery.

Level 3: Level 3, which underlay level 1, also consisted entirely of *in situ* city wall. In this level the distinction between revetment wall and loose brick fill became obvious. The revetment wall, excavated in its entirety in the eastern part of the level, consisted of bricks in a compact gray/light gray matrix of hard clay mortar. The rubble fill to the west was made up of loosely packed bricks in a softer, iron-stained yellowish brown heavy loam.

Level 4: This level, directly beneath the eastern part of level 3, was the lowest level of the revetment wall. As in level 3, soil consisted of a hard-packed gray/light gray clay matrix containing many large bricks and early ceramic wares.

Level 5: Level 5 marked the end of the rubble fill in the center of the city wall. The upper part of the level, which underlay the western part of level 3, contained a single row of bricks in an iron-stained light yellowish brown loam matrix. This soil continued, with no more bricks and few other artifacts, to the bottom of the level.

Level 6: Level 6, underlying level 2, continued the excavation of deposits just outside the city wall. Soil was typical floodplain material consisting of very pale brown light clay with iron inclusions and very few artifacts. This level appeared to be the original surface into which the city wall foundation was excavated.

Level 7: Level 7 extended across the entire excavation unit just below the level of the revetment wall. Soil was a hard-packed brownish yellow light clay, with iron inclusions, which in section was indistinguishable from level 6 and the lower part of level 5. Like those levels, level 7 yielded few artifacts and also clearly antedated construction of the city wall.

Level 8: This level was similar to level 7, with soil a yellowish brown light clay containing iron inclusions and only occasional artifacts. Like level 7, level 8 yielded several ceramic sherds which appeared to be datable to Jenne-jeno Phase III or later.

Level 9: Level 9 marked a sharp discontinuity from the clayey soils of previous levels. Soil was a very pale brown friable loamy sand similar to that found in lower levels of units D6 and Sh7. Artifacts were rare and decreased with depth. This level appeared to be the same as the levee deposits found in other excavation units, with sparse cultural deposits coming down on sterile soil.

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REPORT OF RADIOCARBON DATING ANALYSES

FOR: Roderick J. McIntosh
Rice University

DATE RECEIVED: April 14, 1987
DATE REPORTED: May 8, 1987
BILLED TO SUBMITTER'S INVOICE NUMBER

OUR LAB NUMBER	YOUR SAMPLE NUMBER	C-14 AGE YEARS B.P. ± 1σ
Beta-20711	DIA-3	410 +/- 90 BP
Beta-20712	DIA-5A & DIA-5B	980 +/- 80 BP

APPENDIX 2: RADIOCARBON DATES

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

APPENDIX 3: ARTIFACT CATALOGUE

UNIT/ LEVEL	Ceramics	Spindle whorls	Iron wire	Net weights	Stone beads	Glass beads	Unid. stone artifacts	Grind-stones
D6/surface	90							
D6/1	297	1	1				1	
D6/3	210	2		1			1	2
D6/4	83	1		1	1			
D6/2	109	1						
D6/5	40							
D6/6	299							
D6/7	183							
D6/8	142							
D6/9	71							
D6/10	289					1		
D6/11	75							
D6/12	224							
D6/13	93							
D6/14	1							
Sh7/2	82							
Sh7/1	246							
Sh7/3	86							
Sh7/4	301							
Sh7/5	194							
Sh7/6	179							
Sh7/7	168							
Sh7/8	248							1
Sh7/9	211							
Sh7/10	178							
Sh7/11	374							
Sh7/12	348						1	
Sh7/13	580							
Sh7/14	380							
Sh7/15	-							
SCW/2	38							
SCW/1	279							
SCW/3	139							
SCW/4	140							
SCW/5	23							
SCW/6	8							
SCW/7	19							
SCW/8	35							
SCW/9	15							
TOTAL	**6477**	**5**	**1**	**2**	**1**	**1**	**3**	**3**

APPENDIX 3: ARTIFACT CATALOGUE

UNIT/ LEVEL	Grind-stone fragments	Hematite/ potter's ochre	Fired brick	Terracotta animal fragments	Smithing slag (gm)	Smelting slag (gm)	ARTIFACT TOTAL
D6/surface							90
D6/1						5(225)	305
D6/3							216
D6/4					1(7.7)	1(3.5)	88
D6/2							110
D6/5							40
D6/6					2(0.8)		301
D6/7	1						184
D6/8							142
D6/9					1(2.7)		72
D6/10					5	3(27.84)	298
D6/11	1					5(95.0)	81
D6/12						1(0.72)	225
D6/13							93
D6/14							1
Sh7/2							82
Sh7/1							246
Sh7/3	1						87
Sh7/4	1						302
Sh7/5					4(12.0)		198
Sh7/6						9(100.0)	188
Sh7/7		1					169
Sh7/8			3	1?		6(41.8)	259
Sh7/9			1		5(69.8)		217
Sh7/10					2(33.0)		180
Sh7/11			1			16(100.0)	391
Sh7/12	3						352
Sh7/13	1			1		2(38.0)	584
Sh7/14						1(22.0)	381
Sh7/15							-
SCW/2							38
SCW/1						5(100.0)	284
SCW/3							139
SCW/4					1(1.0)		141
SCW/5					1(1.98)		24
SCW/6							8
SCW/7							19
SCW/8					1(5.0)		36
SCW/9							15
TOTAL	**8**	**1**	**5**	**2**	**23(134)**	**54(754)**	**6586**

APPENDIX 4

Preliminary Faunal Analysis for the December 1986 Survey at Dia, Mali

by

Kevin C. MacDonald

Introduction-

For this analysis I had available for comparison a large type collection of U.S. Gulf Coast animals, and two previously analized collections of West African faunal material (Klein 1980, Howes 1980).[1] The previously identified Bovid material from the 1981 season at Jenne-Jeno was further utilized to ensure conformity to Klein's scale of small, small medium, large medium and large bovids (Klein 1980, Klein and Cruz-Uribe 1984).

Most identifiable faunal material came from unit D6, which appears to at least at one stage to have served as a trash pit. In D6 bones displaying butchery marks and charring are numerous. The Shoma City Wall (SCW) and pit Sh7 yielded very little faunal material. The bulk of this paper will address material from D6.

After carefully washing the material, I initially sorted the remains into four easily recognizable categories: mammal, fish, reptile/amphibian and bird. Completely worn down and tiny fragments were set aside as unidentifiable. After my sorting into the four major categories was double-checked and complete, I individually identified bones (as will be noted in the individual faunal group sections) and weighed all material by Level Record Form (LRF) number and category (i.e. Mammal, Fish, Reptile/ Amphibian, Bird and unidentified).[2] I also weighed charred bones seperately within each category, added their number back into the category amount and established a percentage of charring for each LRF number category. The weight measurements were taken to supplement my analysis of minimum identifiable individuals. Tables (1 and 2) containing both the weight percentage of bones by LRF and category and charring by LRF and category (both for unit D6 only) may be found in the conclusions.

A table of minimum number of individuals (MNI) by category, size range, and, in some cases, taxonomic family may be found following the conclusions encompassing all excavation sites. MNI was determined by dividing the faunal remains into discrete skeletal elements and then dividing the quantity of each element by the maximum number of the particular part possessable by an individual, rounding the result up. The highest MNI result for each faunal type within an LRF# type was utilized.

1-This study would not have been possible without the generous instruction of Mr. Bill McClure founder and curator of the Houston Archaeological Society Faunal Type Collection at Rice University. Also, I would like to thank Dr. Tab Rasmussen for providing me with a list of West African bird families with and without parallels in North America, and for a rudimentary knowledge of diagnostic avian skeletal anatomy.

2- Note that not all of that which is classified 'mammal,' for instance, has been identified by body part and to size. Much material in each category is unrecognizable except for texture, thickness , etc., which identify it to taxanomic class- but not any further. It is only the bone that is still questionable, even to class, which is termed 'unidentifiable.'

Mammalian Material-

With the exception of a large rodent femur (from D6, LRF#3), all mammalian bones in the Dia assemblage are Bovid. These are listed in tables 3 and 4 according to size: small (i.e. oribi), small medium (i.e. goats, sheep, and smaller reedbuck), large medium (i.e. larger reedbuck and hartebeest), and large (i.e. Bos and Eland).

In the Dia assemblage, dental material, one of the most diagnostic elements for bovids especially, is relatively scarce; and when present is often in worse condition than accompanying cranial and post cranial material. In the few cases in which dental material is more or less intact, that material is insufficient to say much about the plethora of Bovidae genus in West Africa (Dekeyser 1955). Pictorial reference works proved to be too vague or incomplete (Hillson 1986). Clearly a larger type collection is needed before dental remains can be more finely sorted. A few specimens, however, did prove to be somewhat distinctive. Particularly the incisors and cheek teeth fragments from D6 LRF #1, the upper molar portion from SCW LRF #18 and cheek milk teeth from Sh7 LRF#36. The adult material from LRF#1 can almost certainly be sorted to either the genus Ovis (sheep) or the genus Capra (goat) due to the cheek teeth's distinctive root ridge and the size, general morphology, and slope-like wear pattern of the incisors. The molar from the SCW unit is nearly a perfect match for *Bos* (as to if this corresponds to domesticated cow or to *Syncerus* is yet to be determined). Also, a lucky find indeed, is the perfectly intact milk molar of a large Bovid from Sh7- this can undoubtedly be traced to its source with a better comparitive collection.

Also worth note are the portions of a Bovid occipital present in D6 LRF#1(one condyle and most of the eminence). These also proved to be a close match to goat, but again, as with all of the post-cranial material, I can say nothing with any confidence until I can observe the range of variation present in a West African Bovid collection

Of some interest are the butchery marks and patterns found on many of the bovid bones as well as charring patterns (charred and butchered bones are indicated in tables 4a-d.). A particularly strange butchery element involves the finding of three distal tibial anterior, articular portions (each primarily featuring the medial malleolus). Interestingly, they are all from the left side and are each from a different Bovid size category (small medium D6 LRF #6, large medium D6 LRF#1, and large D6 LRF#3).Two are charred, but all three are cut in an identical manner (diagonally upward, from the center of the articular surface, towards the anterior side) (see III.1). The only obvious reason for this would be to remove the hoof, but it seems an inconvienient way to do so. More ethnographic information on butchery practice is needed. Also interesting are two vertebrae (a large Bovid cervical from LRF #5 and a large medium cervical from LRF#7 [D6]) both of which are cut down the middle, as if to split a carcass into two sides of meat (modern butchery practice inference)(see III.2).

More than a few immature individuals (in one case perhaps fetal-unfused half of atlas vertebra, large size D6 LRF #5) are present. Many vertebrae and long bones epiphysis are not yet fused and in one case an inferior epiphysis is present with its corresponding vertebral body (large medium Bovid cervical vertebrate from LRF#7 [D6]). Also worthy of note is the presence of the epiphysis of a distal radius unfused to its diaphysis (large Bovid size LRF#7 [D6]) (see III.2).

Fish Material-

I lacked a West African comparitive fish collection, so very little quantitative taxonomic analysis was performed on the numerous fish remains of unit D6. Preliminary comparison with previously analized fish material from the 1981 season at Jenne-Jeno shows a similarly high Silurid (catfish) content (especially *Clarias* and *Syndontis*), but a noticably smaller proportion of *Lates* (the nile perch). Those *Lates* present in the faunal material excavated at Dia tend to be smaller (less mature perhaps) than those found at Jenne-Jeno. Whethet this is an environmental or a deposistional product is not known.

Fish remains are grossly quantified both by weight (including percentage charred) and by MNI (see tables 1, 2, and 5). MNI was generated through the use of three robust and numerously occuring facial bones: the cleithrum, the operculum and the articular portion of the mandible. Casteel's suggestion that fish MNI should be determined by the use of proatlas, atlas, penultimate and ultimate vertebrae was not followed as the Dia material lacked significant numbers of these vertebral elements (i.e. in LRF#1 there are no more than one of each of these vertebrae types MNI=1, there are however eight mandibular articular portions MNI=4) (Casteel 1976). For cleithra and opercula, which easily become fragmented, only one portion of each was counted (in this case the artcular portion of the operculum and the posterior portion of the cleithrum). To obtain results from these facial bones results were divided by two, as each type of bone is paired, and as with other faunal types the result was rounded upwards. Obviously, this is only a gross estimation. If these parts were broken into species, MNI totals for fish overall would inevitably expand.

Reptile and Amphibian Material-

Reptiles and Amphibians are present only in unit D6, and there in small numbers. Their presence, however, further attests to a broad exploitation of a moist environment. The most common reptile is the turtle, mostly represented by disarticulated pieces of upper and under shell (plastron and carapace) which are sometimes charred, and in some cases by long bone or innominate material. Most material is tracable to the Family Tryonichidae- the softshell turtles (LRF#'s 1 and 3)(Olsen 1964). Other material is definitely turtle but indeterminate as of yet to family (LRF#'s 5 and 7). Both of these could be brought much closer to their source

(at least genus) with comparative material. Snake (Serpentes), of an indeterminate family, is present in LRF#1, but is only attested to by two vertebrae.

There is evidence of frog remains in more LRF's than is indicated by its singular appearance (astragalus in LRF#5), but as the bloated tube-like frog bones closely resemble some of the ribs of the catfish, it is difficult to definitely differentiate them. However, even if every catfish rib of this sort were converted to a frog, it would still not amount to a significant amphibian presence at the site.

Avian Material-

Remarkably intact and present in their most diagnostic forms, bird remains from Dia have been suprising. As with Reptiles and Amphibians, they only occur in D6, where their small weight percentage belies their diversity and MNI. Bird bones tend to be very unique in regard to size and morphology and therefore easy to identify quickly to family and ultimately to species. Thus it is easy to track down many remains to family in just the identifying of the bone itself (many bird remains are so distinctive the same bone may have a greatly different appearance in another Family).

The two predominant bird families present in unit D6 are the Family Phalacrocoracidae (cormorants) and the Family Numididae (guinea fowl and other galliformes). The aquatic cormorants are a further confirmation, in addition to reptile, amphibian, and abundant fish remains of ancient proximity and utilization of a nearby body of water (the Niger River and its floodplain). Members of the Family Phalacrocoracidae are present in LRF#'s 3-7 in relative abundance (see tables 3 and X). Their are two species of cormorant present in the Niger Delta region, *Phalacrocorax lucidus* (the White-breasted Cormorant, roughly equivilant in size to American Double-crested Cormorant) and *Phalacrocorax africanus africanus* (the Long-tailed Shag, roughly two-thirds smaller in wingspan than the white breasted cormorant and far more common along the Niger) (Bannerman 1953). As the remains from D6 attributable to Family Phalacrocoracidae were from two-thirds to one-half the size of the double crested cormorant and as the long-tailed shag is presently more common in the region in question, I would strongly speculate that the remains from D6 are of the latter species (see Ill. 3). As this cannot be verified without a more complete type collection than the one I have on hand, all Family Phalocrocoracidae remains are identified only by that family in tables 3 and 7.

The nature of human relationship to the cormorant in prehistory is enigmatic. Cormorants generally are highly greasy diving birds, relying on catching fish through underwater swimming- not general eating fare. Bannerman notes in The Birds of West and Equatorial Africa,

> ...the Long tailed Shag is one of the most familiar birds of both coastal and inland waters, frequenting equally fresh and salt water. The adult appears black glossed with green; the bare skin of the face is red, as are also the eyes.... A short crest ornaments the crown.... This is one of the commonest fish eating birds of the large West African rivers such as the Niger and Benue, and in the dry season when the sandbanks are exposed large numbers may be seen on the banks..... When the large rivers are in flood and the sandbanks submerged the Long-tailed cormorants leave their usual haunts, and between April and September the majority depart for an unknown destination. (Bannerman 1953, pp.134-135)

Their number and the fact that a few of their bones are charred would indicate that they are not chance inclusions. What they were utilized for? Perhaps modern ethnographic information would shed some light on this.

Another well represented family is that of the Numididae- Guinea Fowl and other galliformes. There appear to be two species- one larger than a domestic chicken and another roughly the same size. While many bones that I have not positively identified appear very galliforme, Numididae's only certain appearance is in LRF#3 where at least two are present.

Other birds present include the sandpiper (Family Scolopacidae), the crane (Family Gruidae), ducks and geese (Family Anatidae), and the heron (Family Ardeidae), Many other remains are identifiable, but require a West African type collection for taxonomic assignment. For a complete listing of bird findings by unit and LRF number see table 7.

Conclusions-

Included in this final section are two tables (1 and 2)- one a weight percentage analysis of fauna by LRF and faunal class, and the other a percentage figure for charred bone also by LRF and class. They are useful in appreciating both the rough presence of different wildlife in the unit and which ones were likely being exploited for some purpose (charring). As modern Middle Niger inhabitants commonly eat their meat in a sauce (a cooking method that does not result in charring of bone), it is hard to say exactly what charring means. The tables:

Table 1
D6 Excavation- Faunal Wt. Percentage By Type

LRF #'s	1	2	3	4	5	6	7	8	9	10	11	12
Mammalian	36	60	40	44	29	91	77	89	81	98	0	100
Fish	25	19	30	19	51	2	2	1	3	2	100	0
Rept/Amph	2	0	2	0	1	0	1	0	0	0	0	0
Bird	4	2	2	14	2	4	2	0	0	0	0	0
Un-i.d.ed	33	19	26	23	17	3	18	10	16	0	0	0
% of Dia Total Weight	20	2	38	.5	17	9	12	.5	.25	.25	.25	.25

Table 2
D6 Excavation- Percent of Type Charred

LRF #'s	1	2	3	4	5	6	7	8	9	10	11	12
Mammalian	25	0	23	0	13	0	1	0	0	100	-	0
Fish	12	5	19	13	13	12	49	100	0	100	0	-
Rept/Amph	0	-	64	-	100	-	0	-	-	-	-	-
Bird	5	0	11	0	33	0	27	-	-	-	-	-

Note: In table 1, I would not attribute the drop off in fish to a climatic change, for reasons not only of a lack of sample resolution after LRF #7 (as is evidenced by the bottom row sample size decreasing sharply deeper in the unit), but also because a change in site utilization explains it much more reasonably. In table 2, note also that at some point all classes were charred. Dashes represent no presence of that particular class in that particular LRF#. I do not attach any caloritic correspondence to these measurements (especially as bone density varies by amount of meat in different animal groups and exactly what these animals were or *were not* being utilized for cannot always be ascertained). Still, it should be noted that out of 3,089g of bone analyzed, 1173g were mammalian in origin and 814g were of fish remains.

The large amount of bone which is charred and/or butchered, may attest that the location D6 was at some time being used as a trash pit. Additionally, in LRF#3 the perfectly articulating proximal ends of a small Bovid left radius and ulna are present (see III.4). This is hardly what one would would expect from an exposed surface. Furthermore it may be speculated from the presence of cormorant remains (probably of the species *Phalacrocorax africanus africanus*) that this trash pit was utilized during the dry season, as these birds would have only been in the

region at that time (Bannerman 1953).

All post-cranial material from Sh7 and SCW is very fragmentary and only identifiable to class (if that). Suprisingly, however, some of the most intact Bovid dental remains do come from these units, the most notable of which were mentioned in the Mammalian section. No fish, reptile , amphibian, or bird remains occur in either of these units.

It should also be noted that in D6 LRF#5 there is a piece of bone which may have been utilized as a tool (see Ill. 5). The bone itself looks to be from the shaft of a small medium to large medium bovid long bone. It is only complete 'all the way around' in a narrow but strong central portion, one end sloping off to an ever thinner, sharp single blade of bone, the other remaining blunt. All in all it is a very thick sturdy piece. The break may have been fortuitous judging from the margins, although they also could have been abraded down as well. It is entirely possible that it was a chance break which was deliberately honed and utilized. Hypothesis for its possible uses range from a fish lure, to a spear straightener, to a scraper; further determination would require microscopic investigation.

In summary, it appears that the faunal record at Dia in many ways conforms to that of Jenne-Jeno, especially in regards to plentiful fish of a similar variety (catfish and nile perch), if not of a similar ratio to each other. The Bovid make-up at Dia also looks to be much the same. There appears to be goat/sheep, a large cattle bovid, an unknown small Bovid (Oribi?) and one or more other large medium/small medium types (probably reedbuck). In others areas, however, faunal remains may indicate a broader spectrum of environmental utilization (i.e. abundant bird remains and reptiles).

Table 3
All Units - Minimum Number of Individuals (MNI)

LRF#s	D6											SCW				Sh7			
	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Mammalia / Bovidae -	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
indet. rodent			1																
small			1																
small med	1	1	1	1	1	1	1												
large med	1		1	1	1		1	1							1				
large	1		1		1	1	1						1						1
ovis/capra	X						X												
Fish -	4	1	8	1	7	1	1	1	1	1	1								
Reptilia -	X		X		X		X												
indet. turtle					1		1												
F.Trionychidae	1		1																
indet. snake	1																		
Amphibia -					X														
indet frog/toad					1														
Aves -	X	X	X	X	X	X	X												
F.Gruidae	1																		
F.Ardeidae			1																
F.Anatidae	1																		
F.Numididae			2																
F.Phalacrocor.			1	1	1	2	1												
F.Scolopacidae	1																		

Note: x indicates subject is definitely present

Table 4a. Small Bovid Skeletal Element Representation

Unit	D6											SCW				Sh7			
Layer	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Skull																			
Frontlet or other																			
Occipital condyles																			
Maxilla																			
Mandible																			
Vertebrae																			
Atlas																			
Axis																			
Cervical																			
Thoracic																			
Lumbar																			
Sacral																			
Anterior																			
Scapula																			
Humerus-proximal																			
Humerus-distal																			
Radius-proximal			1																
Radius-distal																			
Ulna-proximal			1																
Posterior limbs																			
Posterior																			
Innominate																			
Femur-proximal																			
Femur-distal																			
Tibia-proximal																			
Tibia-distal																			
Bones of feet, etc																			
Metacarpal-proximal																			
Metacarpal-distal																			
Other carpals																			
Calcaneum																			
Astragalus																			
Navicular-cuboid																			
Metatarsal-proximal																			
Metatarsal-distal																			
Other tarsals																			
Sesamoids-proximal																			
Sesamoids-distal																			
Patella																			
Phalanges-1st			1																
Phalanges-2nd																			
Phalanges-3rd																			
Teeth																			
Indet. Incisor																			
Indet. Molar																			

Italics signify charring or butchery marks

Table 4b. Small Medium Bovid Skeletal Element Representation

Shelf	D6											SCW					Sh7		
Loci	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Skull																			
Frontlet or other		1																	
Occipital condyles	1																		
Maxilla																			
Mandible	1																		
Vertebrae																			
Atlas			1																
Axis																			
Cervical						/													
Thoracic	1						1												
Lumbar																			
Sacral																			
Anterior																			
Scapula			1																
Humerus-proximal			/																
Humerus-distal																			
Radius-proximal					/														
Radius-distal																			
Ulna-proximal																			
Posterior limbs																			
Posterior																			
Innominate	1		/																
Femur-proximal																			
Femur-distal																			
Tibia-proximal																			
Tibia-distal						/													
Bones of feet, etc																			
Metacarpal-proximal							1												
Metacarpal-distal				1															
Other carpals	1		1		1														
Calcaneum																			
Astragalus																			
Navicular-cuboid																			
Metatarsal-proximal																			
Metatarsal-distal																			
Other tarsals	1																		
Sesamoids-proximal																			
Sesamoids-distal																			
Patella																			
Phalanges-1st	1	1					/												
Phalanges-2nd	/		1																
Phalanges-3rd																			
Teeth																			
indet. Incisor	4																		
indet. Molar	2						1												

Italics signify charring or butchery marks

Table 4o. Large Medium Bovid Skeletal Element Representation

Unit	D6												SCW				Sh7			
Levels	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Skull																			
Frontlet or other																			
Occipital condyles																			
Maxilla																			
Mandible																			
Vertebrae																			
Atlas																			
Axis	1																		
Cervical							*1*												
Thoracic			2																
Lumbar																			
Sacral																			
Anterior																			
Scapula								1								1			
Humerus-proximal																			
Humerus-distal																			
Radius-proximal																			
Radius-distal																			
Ulna-proximal																			
Posterior limbs																			
Posterior																			
Innominate			*1*																
Femur-proximal							1												
Femur-distal																			
Tibia-proximal			1																
Tibia-distal	*1*																		
Bones of feet, etc																			
Metacarpal-proximal																			
Metacarpal -distal																			
Other carpals																			
Calcaneum																			
Astragalus																			
Navicular-cuboid																			
Metatarsal-proximal																			
Metatarsal-distal																			
Other tarsals																			
Sesamoids-proximal																			
Sesamoids-distal																			
Patella																			
Phalanges-1st					1														
Phalanges-2nd																			
Phalanges-3rd																			
Teeth																			
indet. Incisor				1															
indet. Molar																			

Italics signify charring or butchery marks

Table 4d. Large Bovid Skeletal Element Representation

Unit	D6												SCW				Sh7		
Quarter	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Skull																			
Frontlet or other																			
Occipital condyles																			
Maxilla																			
Mandible																			
Vertebrae																			
Atlas					1														
Axis																			
Cervical					*1*														
Thoracic																			
Lumbar	*1*																		
Sacral																			
Anterior																			
Scapula			1																
Humerus-proximal																			
Humerus-distal																			
Radius-proximal																			
Radius-distal							1												
Ulna-proximal																			
Posterior limbs																			
Posterior																			
Innominate																			
Femur-proximal			*1*																
Femur-distal	*1*																		
Tibia-proximal					*1*														
Tibia-distal			*1*																
Bones of feet, etc																			
Metacarpal-proximal						1													
Metacarpal -distal																			
Other carpals																			
Calcaneum							1												
Astragalus																			
Navicular-cuboid																			
Metatarsal-proximal						1													
Metatarsal-distal																			
Other tarsals																			
Sesamoids-proximal																			
Sesamoids-distal																			
Patella																			
Phalanges-1st							1												
Phalanges-2nd							1												
Phalanges-3rd			*1*																
Teeth																			
Indet. Incisor																			
Indet. Molar													1						3

Italics signify charring or butchery marks

Table 5. Selected Fish Skeletal Elements for Determination of MNI

Unit	D6											SCW				Sh7			
Layer	1	2	3	4	5	6	7	8	9	10	11	12	18	20	26	27	32	35	36
Selected Skel. El.																			
Opercula	6	0	15	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cleithra	5	1	6	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Articular of Mandible	8	1	7	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Diviser	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Other Skel. Elem.	X	X	X	X	X	X	X	X	X	X	X	0	0	0	0	0	0	0	0
MNI	4	1	8	1	7	1	1	1	1	1	1	0	0	0	0	0	0	0	0

Table 6. Reptile/Amphibian Skeletal Element Representation

Reptilia-

F.Trionychidae
- LRF#1- portion of illium (innominate)
  - femur (proximal portion)
  - numerous fragments of plastron (upper shell)
  - numerous fragments of carapace (under shell)
- LRF#3- numerous fragments of plastron (upper shell)*

indet. turtle
- LRF#5- femur (complete)*
  - fragments of carapace (under shell)*
- LRF#7- fragments of plastron (upper shell)

indet. snake
- LRF#1- 2 vertebrae

Amphibia-

indet. frog/toad
- LRF#5- astragalus*

Table 7. Avian Skeletal Element Representation

Aves

F. Gruidae
- LRF#1- humerus (proximal and distal portions)

F. Ardeidae
- LRF#3- humerus (proximal portion)

F. Anatidae
- LRF#1- coracoid (distal portion- indet. goose)

F. Numididae
- LRF#3- sternum (keel)
  - sternum (keel and manubrium)
  - coracoid (distal 3/4)*
  - coracoid (proximal 3/4)
  - ulna (proximal portion)

F. Phalacrocoracidae
- LRF#3- coracoid (complete except for sterno-coracoidal process)
- LRF#4- carpometacarpus (distal portion)
- LRF#5- tibiotarsus (distal portion)*
- LRF#6- humerus (proximal portion)
  - coracoid (complete except for sternocoracoidal process and head)
  - coracoid (complete except for sternocoracoidal process)
  - carpometacarpus (proximal portion)
- LRF#7- tarsometatarsus (complete except for internal cotyla)*

F. Scolopacidae
- LRF#1- humerus (proximal portion)

indet. bird
- LRF#1- beak (distal portion)
  - 3rd phalanx (anterior)
  - tarsometetarsus (proximal portion)
  - sternum (keel)
  - coracoid (distal portion)
- LRF#3- three fused thoracic vetebrae and two additional vertebrae (from a crain sized bird)
  - cranium (portion)
  - 1st phalanx (posterior)*
  - coracoid (complete except for sternocoracoidal process)
  - radius (proximal portion)
- LRF#4- tibiotarsus (distal portion)
- LRF#5- tibiotarsus (shaft)
  - 1st phalanx (anterior, 'wing finger')

Table 7. (continued)

indet. bird (contd.)	
LRF#5-	scapula (medial portion)
	mandibula (posterior portion of one half)
LRF#6-	radius (proximal portion)
	scapula (medial 4/5)
LRF#7-	2nd phalanx (posterior)
	3rd phalanx (anterior)
	radius (proximal portion)
	tibiotarsus (proximal portion)

* signifies charring or butchery marks

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Dia cluster

Site V1 (examined)

Lat/Long:	14°21' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.25 km	
Occupation:	Light Phase I/II; III; V	
Size:	6.50 ha	
Function:	Elite (two terracotta pipe fragments)	
Features:	0	

Site V2 (examined)

Lat/Long:	14°21' N	4°58' W
Landform:	Floodplain	
Nearest water:	0.50 km	
Occupation:	Phase I/II	
Size:	2.31 ha	
Function:	Furnace waste (v. light scatter smelting slag)	
Features:	Lg. exposure round house foundations, round bricks	

Site V3: SHOMA (examined)

Lat/Long:	14°21' N	4°58' W
Landform:	Floodplain	
Nearest water:	0.75 km	
Occupation:	Dense Ph. I/II to III; IV on highest point of mound	
Size:	49.50 ha	
Function:	Furnace waste (smelting slag; iron nodule) Agriculture (many grindstones) Elite (stone bracelet)	
Features:	Large exposure of architecture; city wall exposure	

Site V4: MARA (examined)

Lat/Long:	14°20'5" N	4°57'5" W
Landform:	Floodplain	
Nearest water:	0.25 km	
Occupation:	Phase I/II; light III; IV; V	
Size:	28.26 ha	
Function:	Furnace waste (light smelting and smithing slag) Agriculture (four grindstones; two spindle whorls) Fishing (four net weights) Elite (one quartz bead; one Hombori marble bead; terracotta pipe fragments) Miscellaneous (fired brick)	
Features:	Rectangular house foundations, round bricks	

Site V5 (examined)
Lat/Long: 14°21' N 4°58' W
Landform: Floodplain
Nearest water: 0.5 km
Occupation: Site covered by gardens; no artifacts visible
Size: 0.50 ha
Function: 0
Features: 0

Site V6/7 (examined)
Lat/Long: 14°20' N 4°58' W
Landform: Floodplain
Nearest water: 0.35 km
Occupation: Phase I/II
Size: 3.02 ha
Function: Furnace waste (several pieces slag)
Agriculture (grindstones)
Elite (stone bead)
Miscellaneous (fired brick)
Features: House foundations

Isolated sites

Site 10i (examined)
Lat/Long: 14°21'3" N 4°57' W
Landform: Floodplain
Nearest water: 0.50 km
Occupation: Phase I/II; dense III
Size: 2.00 ha
Function: 0
Features: 0

Site 18i (examined)
Lat/Long: 14°19'3" N 4°57' W
Landform: Floodplain
Nearest water: 1.80 km
Occupation: Phase III and IV
Size: 5.90 ha
Function: Furnace waste (extensive smelting slag; possible furnace to the southwest)
Features: House foundations w/ round bricks

Site 19i (examined)
Lat/Long: 14°19' N 4°56'3" W
Landform: Levee
Nearest water: 0.25 km
Occupation: Phase V (recent)
Size: 2.95 ha
Function: Furnace waste (sparse slag)
Features: Several small house foundations, round bricks

Site 22i (examined)
Lat/Long: 14°21' N 4°57' W
Landform: Floodplain
Nearest water: 0.30 km
Occupation: Sparse Phase I/II; majority III; light IV
Size: 2.00 ha
Function: Agriculture (sandstone)
Funerary (circular funerary structures in all but NE quadrant of mound)
Features: A few brick foundations to south

Site 23i (examined)
Lat/Long: 14°20' N 4°58' W
Landform: Floodplain
Nearest water: 1.50 km
Occupation: Dense Phase I/II to III
Size: 1.01 ha
Function: Agriculture (sandstone)
Funerary (many circular funerary features & potsherd pavements)
Features: Several round & rect. foundations, round bricks

Cluster IV

Site IV1 (examined)
Lat/Long: 14°22'3" N 4°58'5" W
Landform: Floodplain
Nearest water: 0.10 km
Occupation: Phase I/II; majority III; recent (camp?) in one corner of site
Size: 0.66 ha
Function: Agriculture (grindstone)
Elite (large ceramic bead; two terracotta pipe fragments)
Funerary (several circ. funerary features in NW)
Miscellaneous (fired brick)
Features: Many round house foundations w/ round bricks

Site IV2 (verified only)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.10 km
Size: 1.50 ha

Site IV3 (examined)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.10 km
Occupation: Sparse Phase I/II; majority III; IV
Size: 0.90 ha
Function: Furnace waste (rare smithing and smelting slag)
Agriculture (grindstone)
Elite (blue glass bead)
Funerary (circ. funerary features & potsherd pavements)
Miscellaneous (copper)
Features: 0

Site IV4 (verified only)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.10 km
Size: 1.60 ha

Site IV5 (verified only)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.30 km
Size: 1.20 ha

Site IV6 (examined)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.25 km
Occupation: Majority Phase III; some IV
Size: 2.08 ha
Function: Furnace waste (sparse slag scatter)
Agriculture (two grindstones)
Funerary (circ. funerary features over entire site)
Miscellaneous (ceramic bottle necks; fired brick)
Features: Extensive exposure well-defined brick foundations: round houses (some square), round bricks

Site IV7 (examined)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.25 km
Occupation: Fragmented pottery, no datation
Size: 0.28 ha
Function: No artifacts
Features: 0

Site IV8 (examined)

Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.25 km
Occupation: Some Phase I/II; majority III
Size: 0.63 ha
Function: Furnace waste (sparse slag scatter)
Funerary (potsherd pavement at center of site)
Features: Round houses w/ round bricks on eminence at SW

Site IV9 (examined)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.10 km
Occupation: Sparse pottery, badly water rolled, no datation
Size: 0.60 ha
Function: No artifacts
Features: 0

Site IV10 (examined)
Lat/Long: 14°22' N 4°58' W
Landform: Floodplain
Nearest water: 0.30 km
Occupation: Majority Phase III; some IV
Size: 0.78 ha
Function: Furnace waste (iron; lots of slag)
Elite (quartz bead "blank")
Funerary (many circular funerary features & inhumations)
Miscellaneous (two copper)
Features: 0

Site IV11

Not a site: low levee

Cluster X

Site X1 (verified only)
Lat/Long: 14°20' N 4°58' W
Landform: Floodplain
Nearest water: 0.10 km
Size: 3.50 ha

Site X2

Not a site: low levee

Site X3 (examined)
Lat/Long: 14°20' N 4°59' W
Landform: Floodplain
Nearest water: 0.25 km
Occupation: Some Phase I/II; majority III
Size: 1.00 ha

Function: 0
Features: 0

Cluster LI

Site LIa (examined)
Lat/Long: 14°24'3" N 4°57' W
Landform: Floodplain
Nearest water: 0.30 km
Occupation: Some Phase I/II; majority III
Size: 4.10 ha
Function: 0
Features: Scattered foundations

Site LIb (verified)
Lat/Long: 14°24' N 4°57' W
Landform: Floodplain
Nearest water: 0.20 km
Size: 6.40 ha

Site LIc (examined)
Lat/Long: 14°24' N 4°57' W
Landform: Floodplain
Nearest water: 0.30 km
Occupation: Phase I/II and III
Size: 2.70 ha
Function: Furnace waste (low to moderate slag scatter overall; many large smelting slag)
Agriculture (two grindstones, spindle whorl)
Miscellaneous (ceramic bottle tops, fired brick)
Features: Many round house foundations, round bricks

Site LId (verified)
Lat/Long: 14°24' N 4°57' W
Landform: Floodplain
Nearest water: 0.40 km
Size: 5.90 ha

Site LIe (examined)
Lat/Long: 14°23'3" N 4°57' W
Landform: Floodplain
Nearest water: 0.25 km
Occupation: Light Phase I/II; majority III; light IV
Size: 7.00 ha
Function: Furnace waste (negligible slag)
Features: Scattered foundations

Site LIf (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.50 km	
Size:	2.70 ha	

Site LIg (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.60 km	
Size:	0.80 ha	

Site LIh (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.40 km	
Size:	2.70 ha	

Site LIi (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.60 km	
Size:	0.80 ha	

Site LIj (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.25 km	
Size:	0.80 ha	

Site LIk (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.25 km	
Size:	0.40 ha	

Site LIl (examined)

Lat/Long:	14°23'3" N	4°57' W
Landform:	Floodplain	
Nearest water:	0.50 km	
Occupation:	Phase III	
Size:	2.70 ha	
Function:	0	
Features:	Modern cemetery; 1-2 possible round funerary features	

Site LIm (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.50 km	
Size:	0.20 ha	

Site LIn (verified)

Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	

Nearest water:	0.50 km ,	
Size:	1.40 ha	
Site LIo (verified)		
Lat/Long:	14°24' N	4°57' W
Landform:	Floodplain	
Nearest water:	0.50 km	
Size:	1.20 ha	

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