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Upper Daling Region
Hongshan Household and Community Dataset
An Introduction

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The Upper Daling Region Household and Community Dataset was collected as part of a multiscalar field research program in Liaoning Province, northeastern China (Figure 1). The central aim of the project was to reconstruct Hongshan period (4500–3000 BCE) local and supra-local communities so that this regional trajectory of early complex society development (Peterson and Lu 2013) could be compared with other instances in other regions (within the Hongshan area, elsewhere in eastern Asia, and elsewhere in the world). Results of regional-scale settlement study in the Upper Daling valley have already been published (Peterson et al. 2010, 2014a, 2014b). The present dataset is another result of that same project but focused at a smaller scale of analysis—that of the household and local community. The central conclusions to household and local community analysis are presented by Drennan et al. (2017). The material presented here in the Comparative Archaeology Database includes the detailed data collected in the field at the household and community scale, a description of the field methods used, and an account of the initial

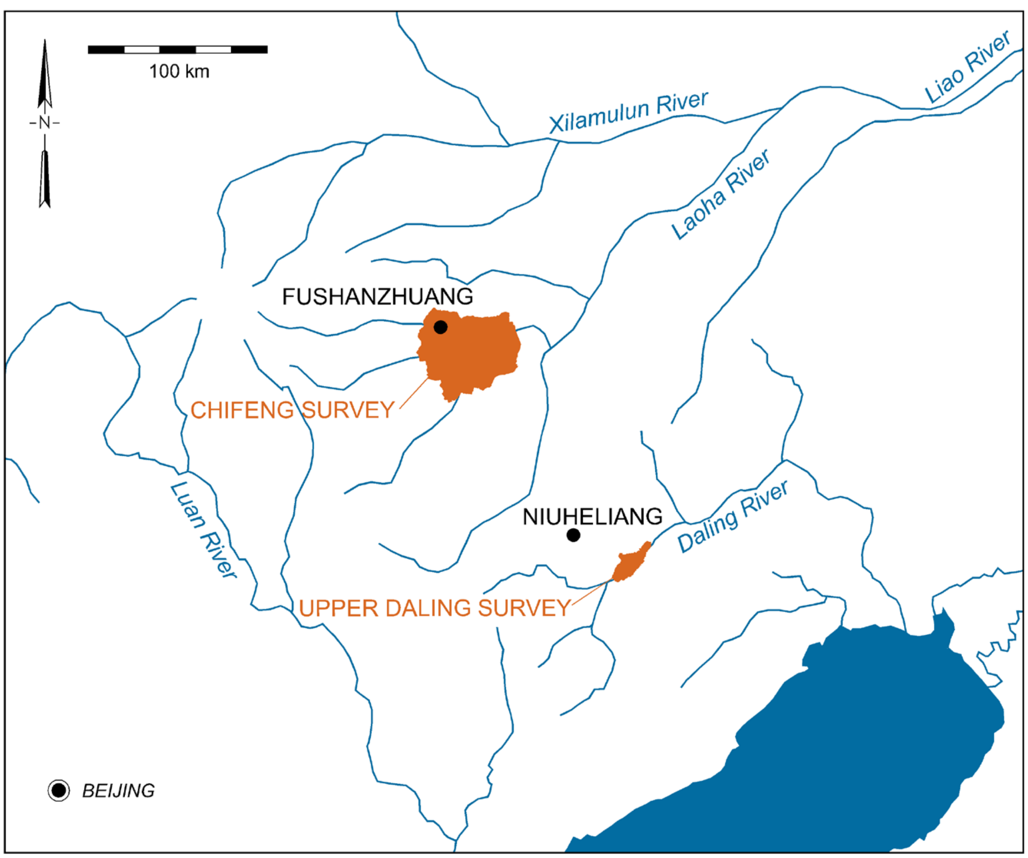

Figure 1. Locations of sites and survey regions mentioned in northeastern China.

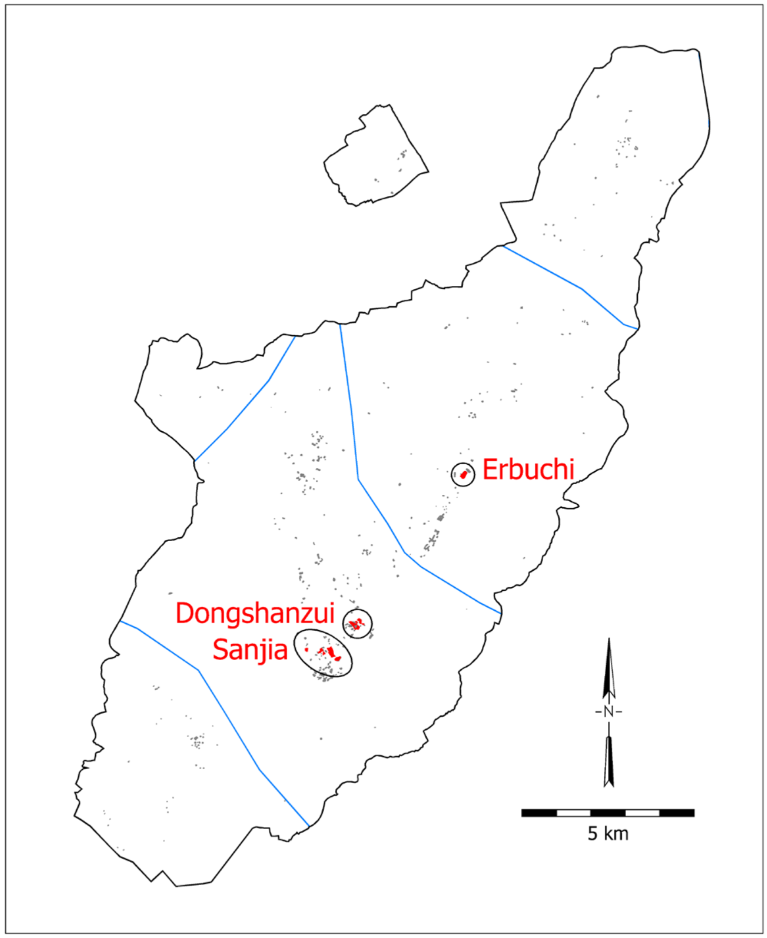

Figure 2. Locations of the Sanjia, Dongshanzui, and Erbuchi Hongshan residential zones within the Upper Daling regional survey area.

processing of the data and of the initial stages of the analysis that supports the conclusions discussed elsewhere (Drennan et al. 2017).

Regional-scale settlement analysis delineated residential zones throughout the Upper Daling valley (Peterson et al. 2014a:7–11). Three of these zones (denominated Dongshanzui, Sanjia, and Erbuchi) were selected for more intensive study at a smaller scale (Figure 2). The Dongshanzui residential zone lies around the excavated ceremonial structures of the Dongshanzui site falling within about 250 m of it; the Sanjia residential zone is 1–1.5 km to the southwest of Dongshanzui; and the Erbuchi residential zone is about 5 km northeast of the Dongshanzui site. All three residential zones had substantial Hongshan period occupation in generally good conditions for surface collecting with little material of other periods on the surface. The main objective of the fieldwork was to collect samples of artifact assemblages at the scale of households within local communities so as to reconstruct the nature and extent of wealth, prestige, productive, and ritual differentiation (Drennan and Peterson 2012:76–79) within these Hongshan "core zone" (Drennan et al. 2017) local communities. Magnetometer survey and stratigraphic test excavations were also carried out in all three residential zones in order to provide a more complete foundation for the interpretation of surface remains. Since these results were of considerable importance to regional-scale settlement analysis, they have been presented as part of that regional-scale work (Peterson et al. 2014a, 2014b).

Figure 3. Placing pin flags at artifact locations.

Field Methods

Several separate patches of land surface in each of the three residential zones were examined intensively by archaeologists walking systematically back and forth across them at intervals of 5 m or less inserting a pin flag into the ground at the location of each sherd observed

Figure 4. A high-density area of flagged surface sherds in Sector A141 Central in the Sanjia residential zone.

Figure 5. A moderate-density area of flagged surface sherds in Sector A077 in the Dongshanzui residential zone.

Figure 6. A higher-density surface sherd hot spot (toward the right) against a lower-density background (toward the left) in Sector A077 in the Dongshanzui residential zone.

Figure 7. A higher-density surface sherd hot spot (toward the rear and especially the right rear) contrasting with a much lower-density area (foreground) in Sector in the Erbuchi residential zone.

(Figure 3). This made it easy to stand back and observe the density of surface ceramics as it varied across each patch (Figure 3). Hot spots of higher density artifacts stood out clearly against a lower density background in this visual inspection. Variation in surface sherd density was robust in the face of quite different surface conditions, with high-density areas of flagged surface sherds readily noticeable in moderate (Figure 4) and dense vegetation (Figure 7) in contrast to lower-density areas in conditions of excellent surface visibility (Figures 5 and 6).

The same technique had been employed before by Peterson (2006) at Fushanzhuang in the Chifeng region, where such artifact concentrations convincingly indicated individual household locations. Five separate patches of open farmland totaling 5 ha were flagged in this way in the Dongshanzui residential zone (Figure 8). In the Sanjia area, 8 ha of mixed open farmland and well-established orchards were also flagged as five separate patches (Figure 9). And a single patch of 3 ha was flagged at Erbuchi in fallow fields with a moderate growth of weeds (Figure 10). The boundaries of the areas where individual artifact locations were flagged are included in the spatial dataset. Magnetometer survey and stratigraphic tests carried out within these patches are discussed by Peterson et al. (2014a:31–45) and complete data are online (Peterson et al. 2014b). The boundaries of the areas subjected to magnetometer survey are also included in the spatial data provided in this dataset.

The fieldwork that produced the data presented here consisted of intensive surface collection in areas of high-density artifacts identified by observing density patterns in the pin flags. Grids of 5-m squares were laid out in these high-density areas (Figures 8–10). Within each 5-m square the surface was examined completely and carefully by archaeologists working shoulder to shoulder, and all visible artifacts were collected. Then the uppermost layer of soil (approximately 5 cm) was raked or hoed up and passed through 6 mm wire mesh to recover additional artifacts (Figures 11 and 12). All sherds of whatever size were collected from the screens, along with all lithic artifacts (including debitage). Ceramics and lithics comprised the vast majority of the material recovered; other categories, including daub fragments from structure walls, were considerably less abundant. All material was bagged by 5-m square and returned to the laboratory for cleaning and analysis. Artifacts from the initial careful examination of the surface were bagged and classified separately from those

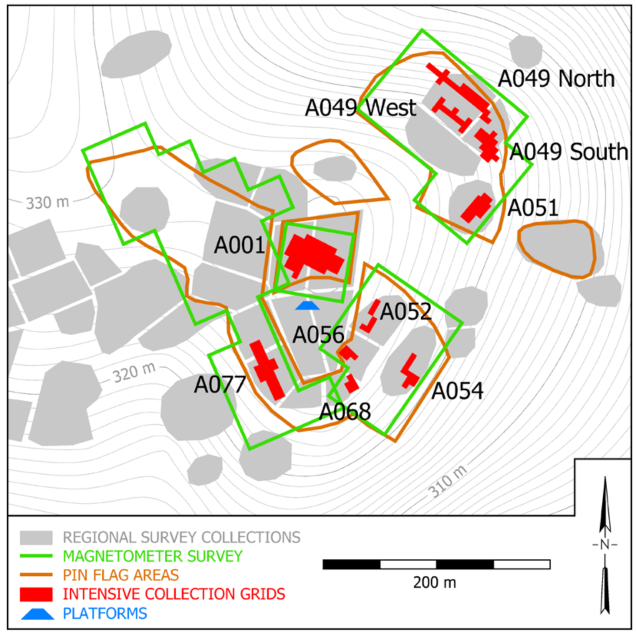

Figure 8. The Dongshanzui residential zone.

recovered by raking up the top 5 cm of soil and screening it. Data on the two phases of surface collection are provided separately here, although the two parts were combined for the household assemblage analyses.

When Peterson (2006) first used pin flags to make artifact distribution patterns visible at Fushanzhuang, the surface artifact hot spots noted in the pin-flag patterns were of a size consistent with a single Hongshan house structure

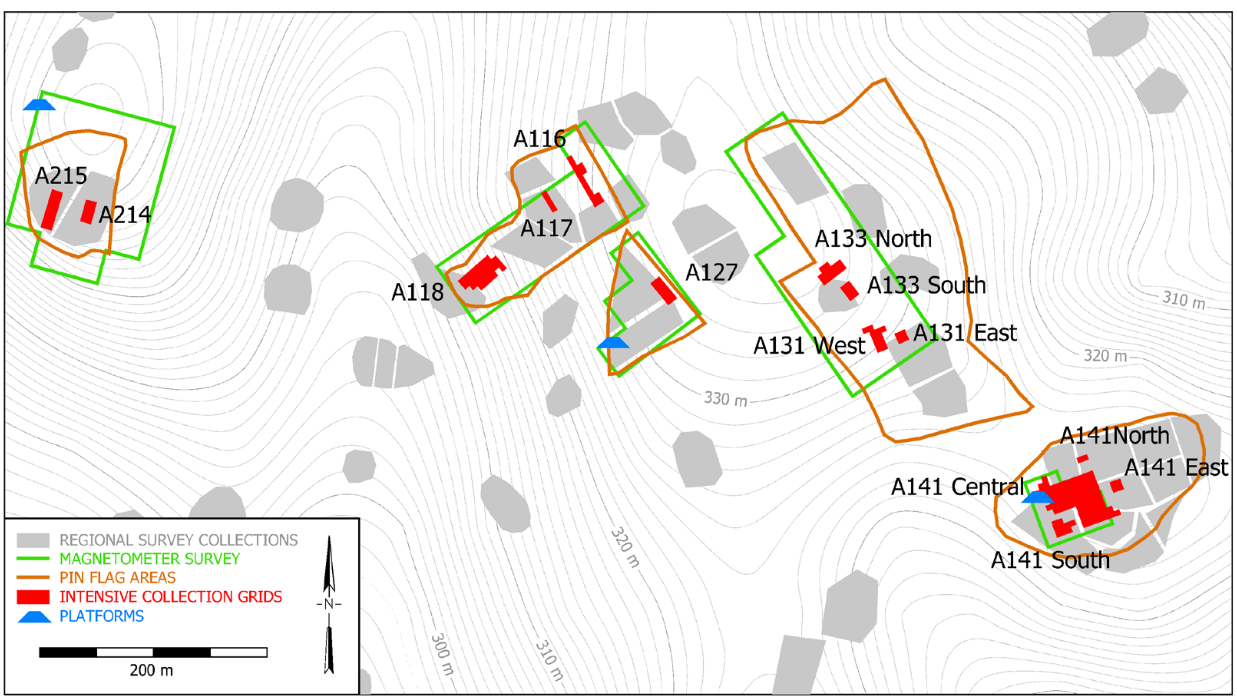

Figure 9. The Sanjia residential zone.

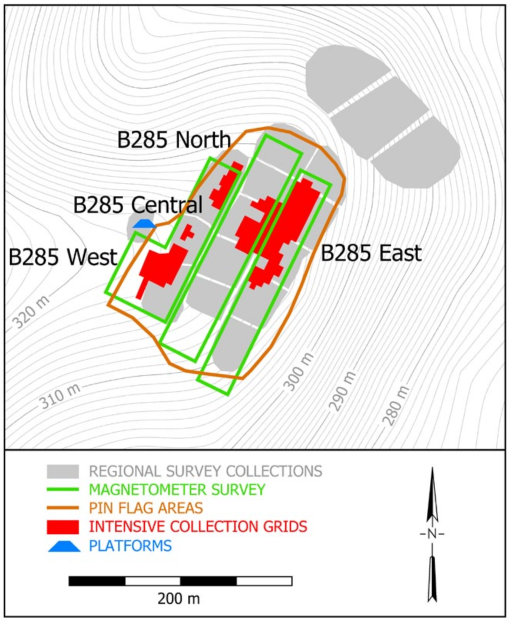

Figure 10. The Erbuchi residential zone.

with surrounding features and garbage middens as known from excavated sites (roughly 20 m across). Some of the hot spots identified at Dongshanzui, Sanjia, and Erbuchi were of approximately this size as well, but others were so large that they clearly represented more than just a single household. Within such larger high-density areas variation in artifact density by 5-m square consistently revealed smaller hot spots which, although not easily definable by looking at the pin flags placed initially, were nonetheless clearly separable. This subdivision of some intensively collected areas became part of subsequent explicit analysis based on isopleth maps of Hongshan sherds (see below). The overall correspondence between areas of high-density surface artifacts, the smaller hot spots within the larger of these areas, clusters of magnetic anomalies, and cultural features revealed in stratigraphic tests shows that the household units defined in this way can be used to investigate the variation in household artifact assemblages across Hongshan residential zones. The defined household units probably represent either single Hongshan households or occasionally two closely-spaced ones. Such approximate correspondence between archaeologically defined household units and actual households is more than sufficient to study the variation in artifact assemblages across households.

In fact even less correspondence between archaeological spatial units within sites and ancient households within local communities would provide a fully adequate basis for studying the variability in artifact assemblages across households. In small villages, especially relatively dispersed ones like these Hongshan villages, it is unusual for garbage to be moved very far from the household area where it was produced. If artifact assemblages vary much from household to household, then the proportions of different artifacts will vary to a similar extent from garbage

Figure 11. Intensive collection of 5-m squares in progress: first stage collection of visible artifacts (foreground square); second stage collection beginning by raking/hoeing up the uppermost soil (background squares).

Figure 12. Intensive collection of 5-m squares in progress: screening the uppermost layer of soil that had been raked/hoed up.

midden to garbage midden across the village. Samples of artifacts from locations spread through this space will reflect this same variability and provide a basis for studying it whether there is any particularly good one-for-one correspondence between archaeological artifact samples and households or not. In the case of the Upper Daling residential zones there does seem to be a fair degree of correspondence between artifact hot spots and households. We have thus aggregated the artifact samples from intensive surface collection in the 5-m squares into analytical units that reflect this correspondence. We refer to them as "household units" since they do seem to correspond approximately to human households, and this correspondence does facilitate further interpretation than would be possible if such correspondence did not seem to exist.

The intensive surface collection was carried out in 28 separate grids of 5-m squares (10 at Dongshanzui, 14 at Sanjia, and 4 at Erbuchi). These were not north-oriented grids; orientation varied from one to the next, each being determined in accordance with the general alignment of high-density artifact areas and the orientation of cultivated fields, terraces, and other features of the landscape. Each separate grid was given a "sector" designation based on the the number of the regional survey collection unit it fell within (e.g. A117 or A133 East and A133 West). Some sectors actually consisted of two grids separated by landscape features (terrace edges, modern graves, etc.). In these instances, both grids were given a single sector designation because together they covered a single high-density area of surface artifacts separable from other high-density areas by buffers where surface artifacts were less dense. Said another way, sometimes the grids of 5-m squares laid out to cover single areas of high-density surface artifacts were interrupted by modern landscape features across which the high density of surface artifacts continued. Grids given separate sector designations, in contrast, were separated by discernible areas of lower surface artifact density. Intensive surface collection grids were not placed in all high-density surface sherd areas so as to spread the sample out more spatially. Areas with larger amounts of non-Hongshan material on the surface were also avoided.

The grids varied considerably in overall extent, ranging from as few as four 5-m squares to as many as 121. Not all the 5-m squares in the grids were collected; only those from which artifacts were recovered were assigned grid square numbers. Four-digit grid square numbers were sequential for each residential zone: 0001–0222 for Sanjia (not all numbers in this range were used; 184 squares were intensively collected); 1001–1146 for Dongshanzui (so 146 5-m squares were collected); and 2001–2077 for Erbuchi (one number was skipped, so 76 5-m squares were collected, although only the first stage of collection was carried out in some squares—see below). Numbers were assigned to 5-m squares as they were collected, so the number sequence sometimes jumps from one grid to another and then back again.

Delineating Household Units

Once the intensive surface collections were complete and the artifacts recovered had been analyzed in the lab, attention turned to delineating the household units that would become the principal units of analysis. If a single grid (a high-density area of surface artifacts separated from others by a lower-density buffer) was 20 m or less (that is, four 5-m squares) in its longest dimension, it was considered a single household unit. All grids greater than 20 m in their longest dimension were considered candidates for possible subdivision into multiple household units. Isopleth maps of sherd densities by 5-m square were produced for each of these larger grids to see whether multiple hot spots of high sherd density could be distinguished within the sector. If multiple hot spots were visible, then the 5-m squares of the grid were assigned to different household units delineated around those hot spots. Each household unit defined in this way was assigned a three-digit number in a sequence that indicates which residential zone it belonged to: household units 001–023 for Sanjia, 101–117 for Dongshanzui, and 201–210 for Erbuchi. The analysis for all three residential zones together thus consists of a sample of 50 household units—not all the households that comprised these three residential zones in Hongshan times but still quite a substantial number.

Household unit delineation worked its way through all the sectors, from west to east, beginning with sectors A214 and A215 at the western extreme of the Sanjia residential zone (Figure 9). Although these two sectors are numbered first, they were actually collected in the field last. Pin flags were placed and the locations of grids were determined, but actual collection of those grids was delayed until the following year.

Sector A215 extended 10 by 35 m over a high-density hot spot observed in pin flags in a cultivated field (Figure 13). All 14 of its 5-m squares were intensively collected. Two 1-by-2-m stratigraphic tests (XZ and YA) were located within this grid, and another (XY) was about 25 m to the north. Test XZ revealed a midden-like deposit and Test YA, a small pit feature (see Peterson et al. 2014b for profiles and description). Surface densities of Hongshan sherds formed a single peak and tapered down from this peak in all directions. There was thus no indication that this area should be divided into more than one household unit, and the materials from all 14 squares were aggregated and be-

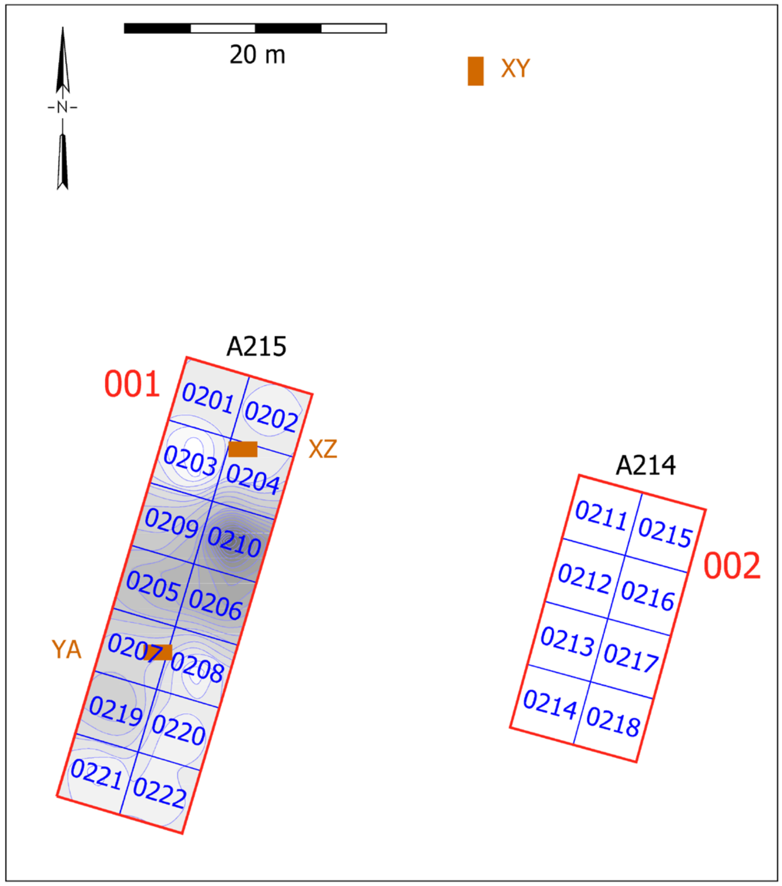

Figure 13. Aggregation of intensive collection squares in sectors A214 and A215 into household units 001 and 002. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

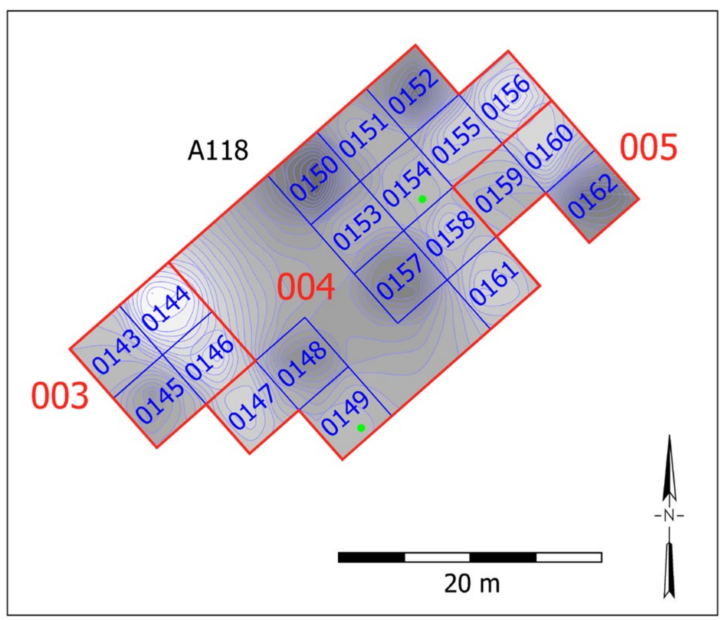

Figure 14. Aggregation of intensive collection squares in Sector A118 into household units 003–005. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

came the sample representing Household Unit 001.

The Sector A214 grid was 10 by 20 m—8 5-m squares, all of which were intensively collected (Figure 13). It lay in the same sloping cultivated field that contained Sector A215. As the longest dimension of Sector A215 was only 20 m, it was automatically considered a single household unit: 002.

Sector A118 contained 27 5-m squares (Figure 14). Pin flag densities seemed somewhat lower in the center of this grid so several 5-m squares there were not intensively collected. Altogether 7 5-m squares were collected at the southwestern end of this grid and 13 at the northeastern end. Two of the intensively collected 5-m squares yielded daub fragments from structure walls. Once the sherds from the intensive collections were classified and counted and isopleth maps of sherd densities were produced, four especially high-density squares in the central part of the sector were seen to form a cluster separated by groups of especially low-density squares from higher densities at the two ends of the grid. On the basis of this pattern, Sector A118 was divided into three household units: 003 consisting of 4 5-m squares toward the southwest; 004 consisting of 13 5-m squares that were collected in the central part of the grid; and 005 consisting of 3 5-m squares toward the northeast.

Sector A117 consisted of four 5-m squares in a line covering a hot spot visible in the pin-flag patterns (Figure 15). Two of the four squares yielded daub fragments from structure walls. Since the total length of the grid was 20 m it was not subdivided, and all four squares were grouped into Household Unit 006.

Sector A116 was also a linear arrangement extending for 50 m across a hot spot noted in pin-flag patterns (Figure 15). Altogether 14 5-m squares were intensively collected. Three of them yielded daub fragments from structure walls. Two 1-by-2-m stratigraphic tests (XW and XX) lay only a few meters away from this grid. Both revealed shallow pit features excavated into bedrock (see Peterson et al. 2014b for profiles and description). The isopleth map of sherd density showed two peaks about 20 m apart, separated from each other by a lower density area. Thus this

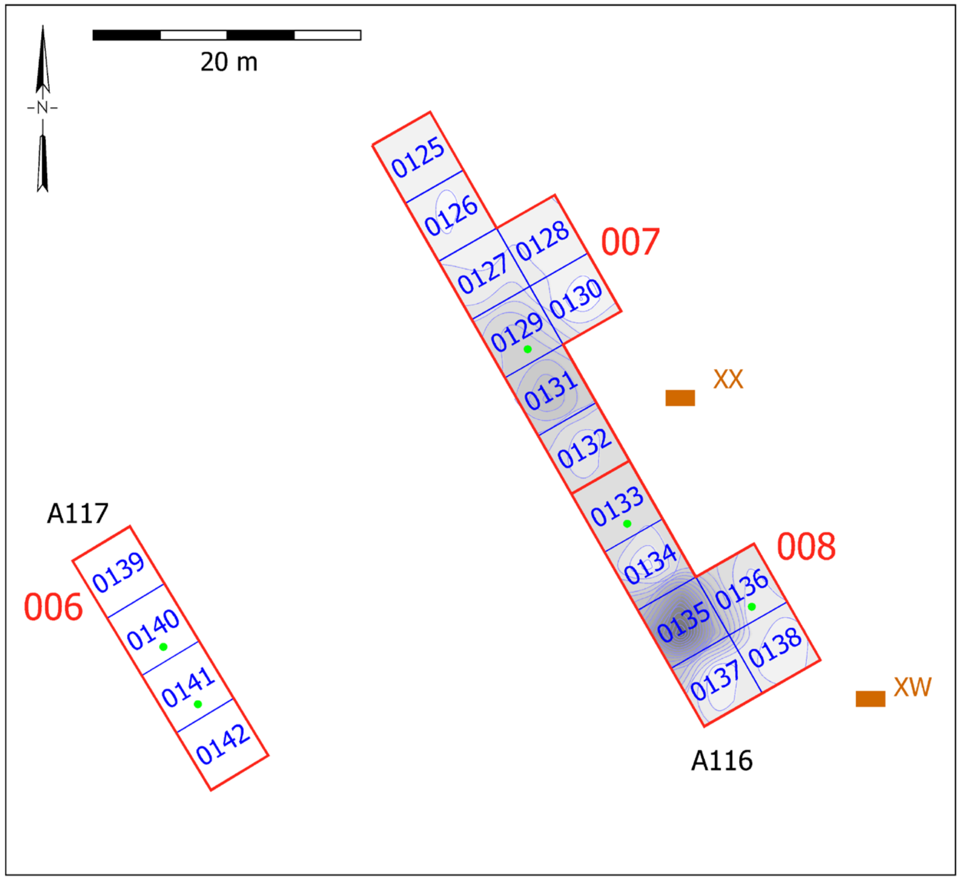

Figure 15. Aggregation of intensive collection squares in sectors A116 and A117 into household units 006–008. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

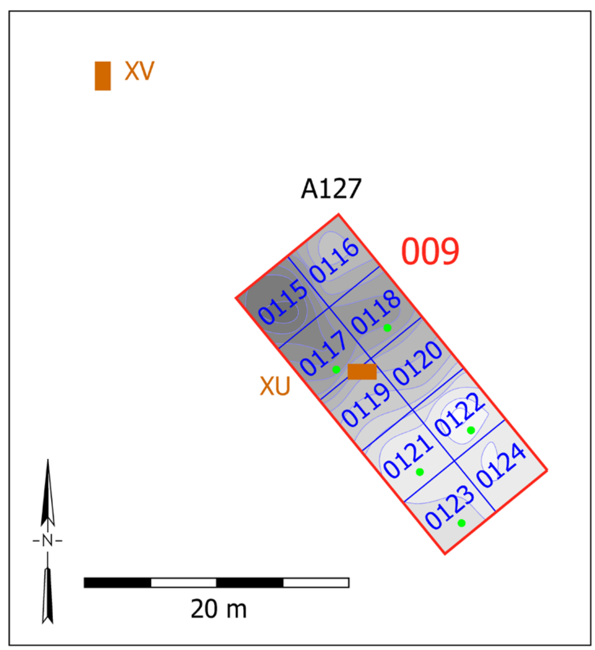

Figure 16. Aggregation of intensive collection squares in Sector A127 into Household Unit 009. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

sector was divided in two: eight collection squares toward the northwest comprised Household Unit 007, and six toward the southeast comprised Household Unit 008.

Sector A127 consisted of 10 5-m squares that were intensively collected (Figure 16). Fully 5 of the 10 squares yielded daub fragments from structure walls. One 1-by-2-m stratigraphic test (XU) was within the grid, and another (XV) was about 18 m to the northwest. Test XU revealed a possible pit feature dug into sterile yellow clay (see Peterson et al. 2014b for profiles and description). Since the grid was 25 m long, an isopleth map of sherd density was examined, but it revealed a single density peak at the northwestern extreme and densities diminishing toward the southeast. There was thus no reason to subdivide this sector and its 10 intensively collected squares became Household Unit 009.

Sector A133 North was a grid of 12 5-m squares over a pin flag hot spot (Figure 17). All were intensively collected, and four yielded daub fragments from structure walls. One 1-by-2-m stratigraphic test (XT) was located within the grid, and another (XS) was 12 m to the south. Test XT contained a small Hongshan pit feature, and Test XS revealed a larger pit feature dating to Upper Xiajiadian times (see Peterson et al. 2014b for profiles and description). An isopleth map of sherd densities revealed a single peak with densities diminishing in all directions, so all 12 squares were aggregated as Household Unit 010.

Nearby Sector A133 South consisted of six 5-m squares (Figure 17). A 1-by-2-m stratigraphic test (XR) was 8 m to

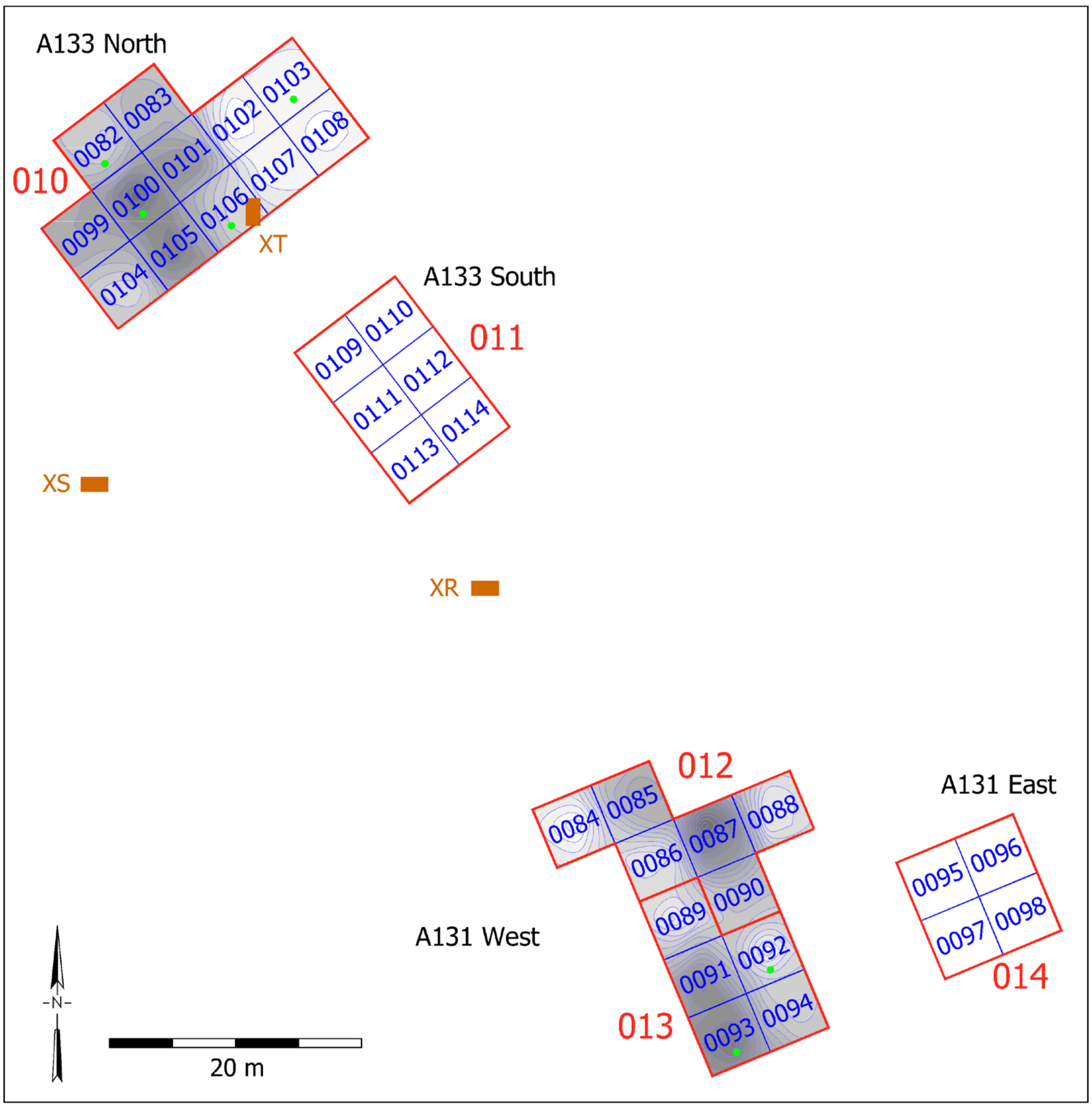

Figure 17. Aggregation of intensive collection squares in sectors A131 West, A131 East, A133 North, and A133 South into household units 010–014. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

the south of it, although it revealed no unequivocal cultural features (see Peterson et al. 2014b for profiles and description). The six squares were spread across only 15 m so they were all aggregated to become Household Unit 011.

Sector A131 West comprised 11 5-m squares in a grid over a pin-flag hot spot (Figure 17). Two of its squares yielded daub fragments from structure walls. An isopleth map of sherd densities revealed that this grid actually contained two hot spots separated by a lower-density area. On this basis, the northernmost six squares were aggregated into Household Unit 012 and the southernmost five into Household Unit 013.

Sector A131 East was a grid of four 5-m squares over a pin-flag hot spot (Figure 17). The four together became Household Unit 014.

Sector A141 North consisted of only two 5-m squares over a pin-flag hot spot (Figure 18). These two became Household Unit 015.

Sector A141 Central was a large grid measuring about 80 m across its longest dimension (Figure 18). In its entirety it consisted of 76 5-m squares. This grid, with its four separate sectors, was the closest part of the Sanjia residential zone to the excavated ceremonial architecture at Dongshanzui, just over 1 km away to the northeast. In the intervening territory lay several small patches of low-density Hongshan occupational remains. Overall surface sherd densities in Sector A141 Central were unusually high, despite the fact that it was located in a well developed orchard which limited artifact visibility to some degree. Variations in density across the area of the grid were visible in the distribution of pin flags, and low-density squares were not collected. Thus the collections were already split somewhat, and the area was further subdivided on the basis of the results of intensive collections. The extremely high artifact densities suggested houses at close spacing, so delineation of household units around hot spots in the

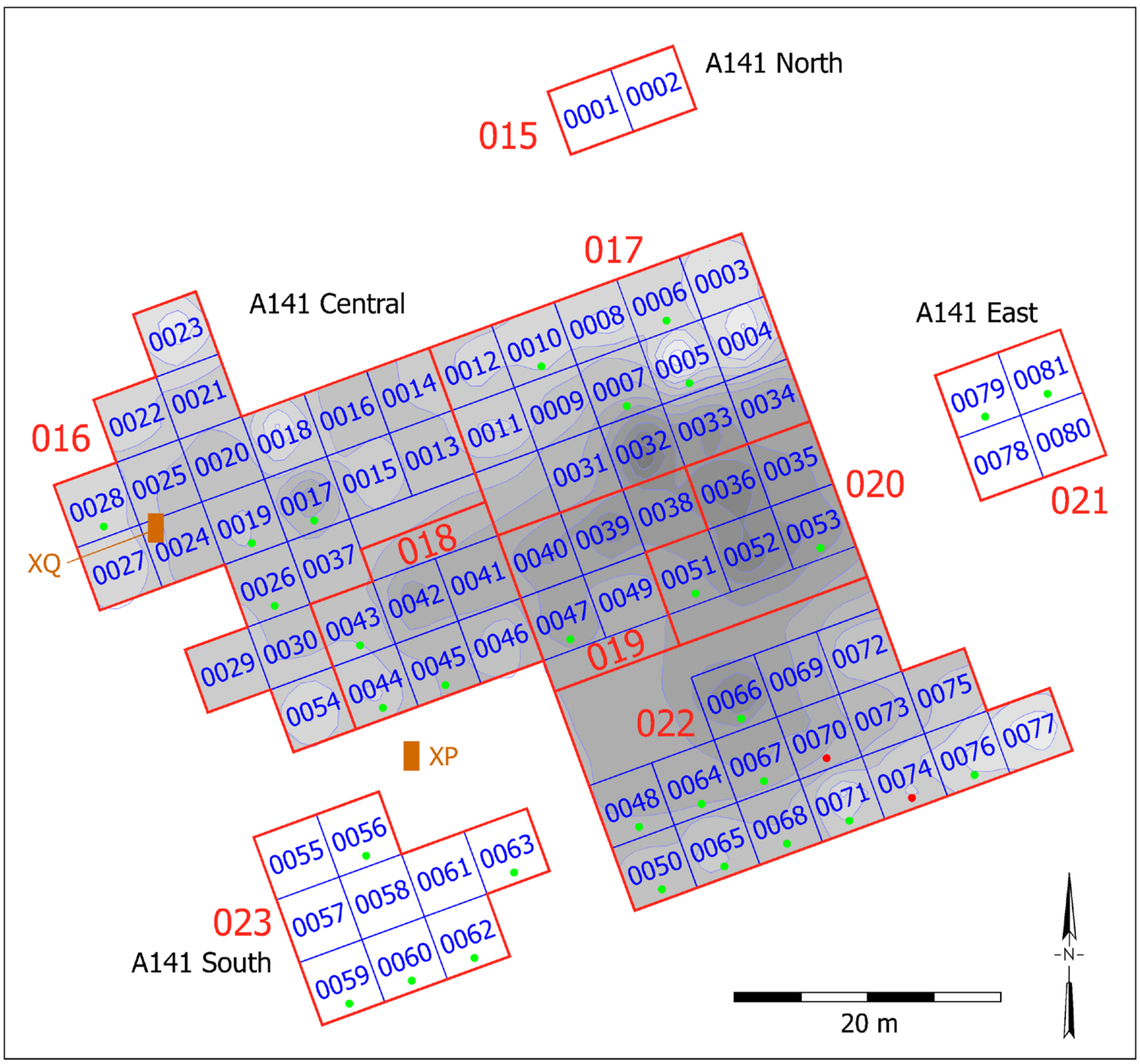

Figure 18. Aggregation of intensive collection squares in sectors A141 North, A141 Central, A141 East, and A141 South into household units 015–023. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

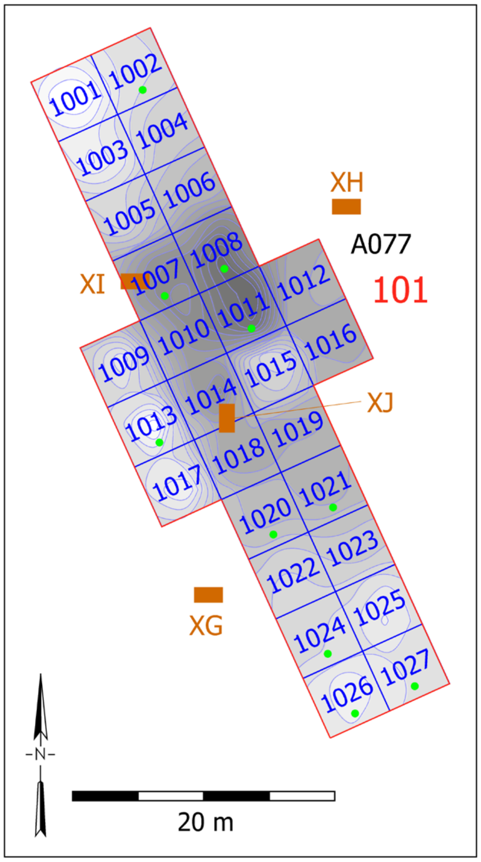

Figure 19. Aggregation of intensive collection squares in Sector A077 into Household Unit 101. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

isopleth map of surface sherd densities tended more toward "splitting" than "lumping." Altogether 66 5-m squares were intensively collected, of which 30 yielded daub fragments from structure walls. Two of these 30 were in the top quartile for daub density in squares that yielded daub. One 1-by-2-m stratigraphic test (XQ) was within the grid, and another (XP) was just 2 m outside it. Test XP revealed no unequivocal cultural features, but Test XQ intersected the edge of a stone- and clay-faced platform about 60 cm high (see Peterson et al. 2014b for profiles and description). Sherd density variations in an isopleth map provided the basis for the division of Sector A141 Central into six household units: 016 with 20 5-m squares (and including the platform revealed in Test XQ at one side); 017 with 14 squares; 018 with six squares; 019 with five squares; 020 with five squares; and 022 with 16 squares.

Sector A141 East was a grid of only four 5-m squares over a pin-flag hot spot only slightly separated from the large and complex Sector A141 Central (Figure 18). Two of the four squares yielded daub fragments from structure walls. These four squares became Household Unit 021.

Sector A141 South was a grid of nine 5-m squares over another pin-flag hot spot only slightly separated from A141 Central (Figure 18). Five of the nine squares yielded daub fragments from structure walls. The squares in this sector were aggregated into Household Unit 023, completing the delineation of analytical units for the Sanjia residential zone.

Household unit delineation also worked its way from west to east across the Dongshanzui residential zone (Figure 8). Sector A077 covered 55 m in its longest dimension and totaled 27 intensively collected 5-m squares (Figure 19). It was located about 50 m southwest and just below the excavated ceremonial architecture of Dongshanzui on the hill crest. Ten of the squares yielded daub fragments from structure walls. Two 1-by-2-m stratigraphic tests (XI and XJ) were within the grid, and two more (XG and XH) were only about 2 m outside it in different directions. All four of these tests were located over magnetic anomalies, but no clear cultural features were encountered, and densities of artifacts diminished considerably below the plow zone (see Peterson et al. 2014b for profiles and description). An isopleth map of sherd densities showed a major peak in the center of the grid with densities tapering down in all directions so all 27 squares were aggregated as Household Unit 101.

Sectors A052, A054, A056, and A068 were relatively close together beginning about 40 m southeast of the excavated ceremonial architecture at Dongshanzui. Sector A068 consisted of five 5-m squares over a pin-flag hot spot (Figure 20). Four of the five squares yielded daub fragments from structure walls, and one of these four was in the upper density quartile for squares that yielded daub. The five squares of this small grid were aggregated as Household Unit 102.

Sector A056 consisted of five more 5-m squares over a pin-flag hot spot (Figure 20). Two of these squares yielded daub fragments from structure walls. The five squares became Household Unit 103.

Sector A054 consisted of nine 5-m squares, six of which yielded daub fragments from structure walls (Figure 20). One of these six was in the upper density quartile for squares that yielded daub. Although this grid was relatively small, there were two higher-density hot spots within it, separated by an area of distinctly lower-density sherds. It was thus divided into two household units: 104 with five squares (whose highest-density area was right at the southern margin of the grid) and 105 with four squares.

Sector A052 contained seven 5-m squares, four of which yielded daub fragments from structure walls (Figure 20). Two of these four were in the top density quartile for squares that yielded daub. Again, although the grid was small, there were two high-density areas separated by a zone of lower sherd density. In the southern part of the grid, five squares became Household Unit 106; at the northern end densities rose again, and two squares became Household Unit 107.

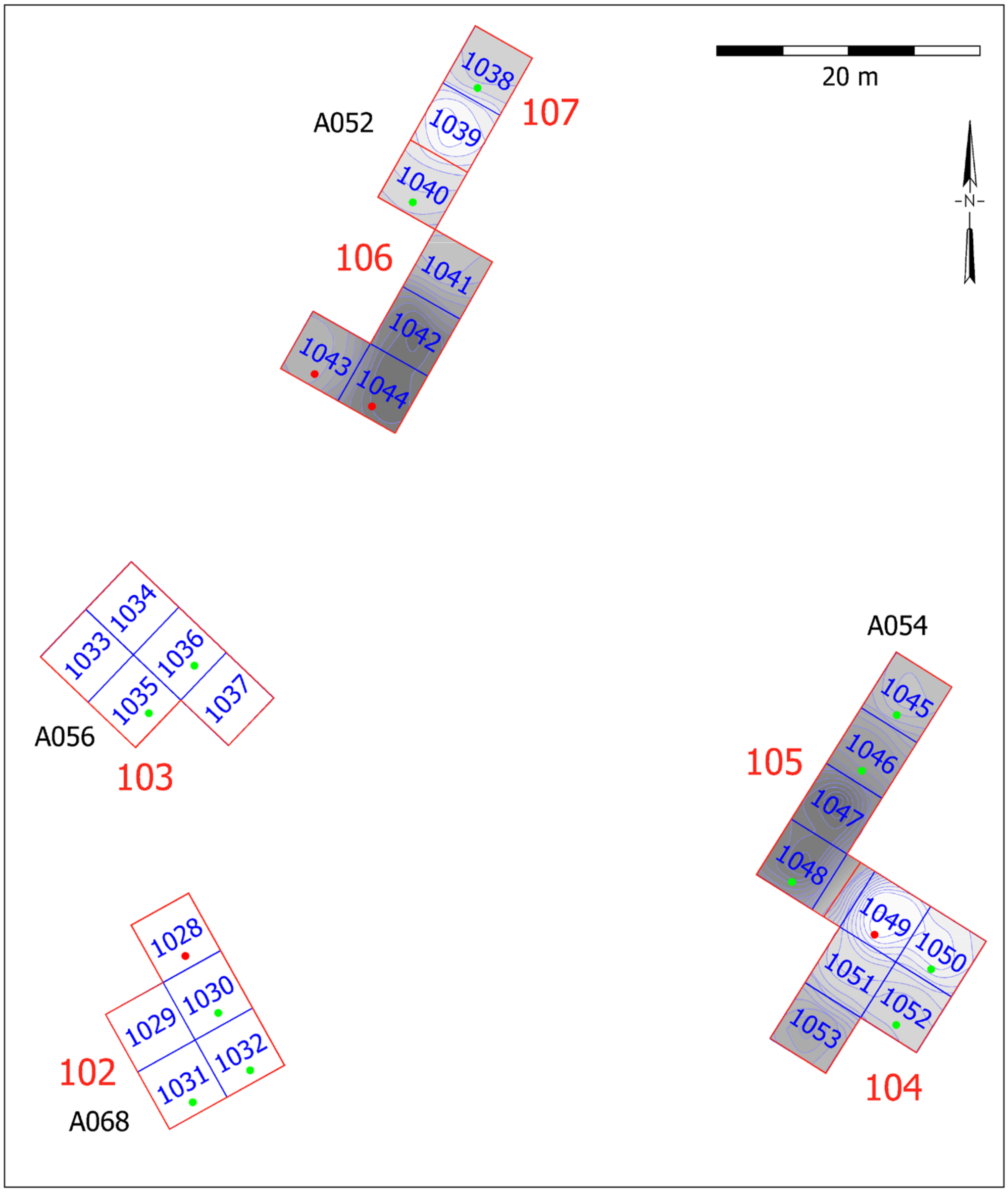

Figure 20. Aggregation of intensive collection squares in sectors A052, A054, A056, and A068 into household units 102–107. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

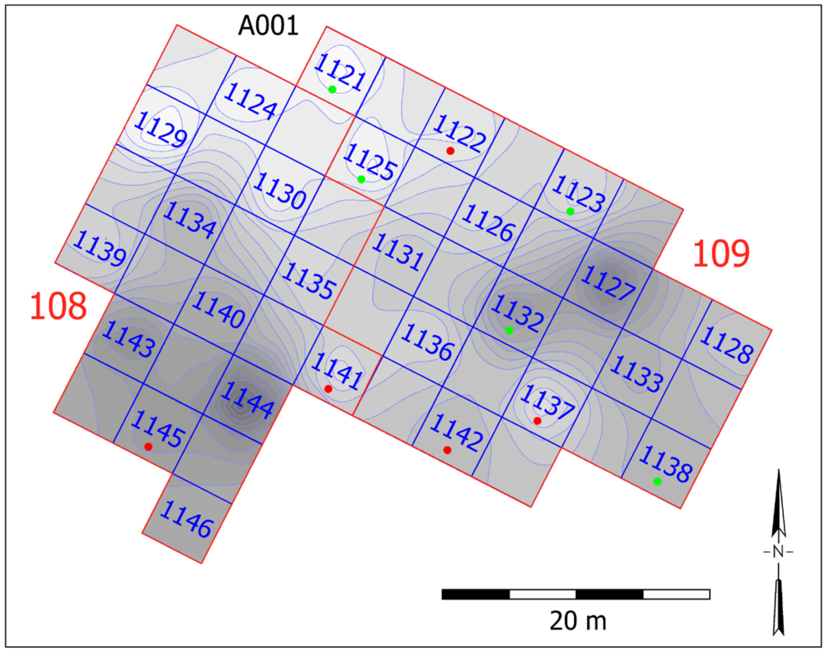

Figure 21. Aggregation of intensive collection squares in Sector A001 into household units 108 and 109. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

Sector A001, immediately adjacent to the excavated ceremonial architecture at Dongshanzui, contained 51 5-m squares (Figure 21). Only alternate squares were collected since this would give a good picture of density trends across the grid, for a total of 26 collections. Of the 26, ten squares yielded daub fragments from structure walls, and five of the ten were in the upper density quartile for squares that yielded daub. This large grid showed two clearly delineated high-density artifact hot spots, and the grid squares were split between them. Toward the west 12 collected squares were aggregated into Household Unit 108; toward the east 14 were grouped together as Household Unit 109. The uncollected alternate squares were left uncollected, since the samples of artifacts for each household unit obtained from the squares that were collected were abundant.

Sector A051 was located about 130 m down-slope to the northeast of the excavated ceremonial architecture of Dongshanzui. It comprised 15 5-m squares, all but two of which yielded daub fragments from structure walls (Figure 22). Three of these squares were in the upper density quartile among squares that yielded daub. As in other sectors this grid was placed over a pin-flag hot spot that turned out to encompass two especially high-density hot spots visible in an isopleth map based on the results of intensive collection. Their positions, though, and that of the lower-density band that separated them led to an unusual longitudinal division of this elongated grid into eight squares along the southeast side that were aggregated to become Household Unit 110 and seven others along the northwest side that became Household Unit 111.

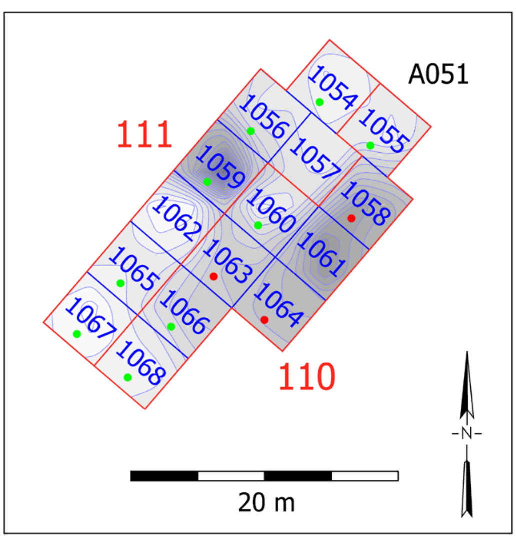

Figure 22. Aggregation of intensive collection squares in Sector A051 into household units 110 and 111. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

Sectors A049 South, A049 West, and A049 North lay just to the north of Sector A051, slightly farther away and down-slope from the excavated ceremonial architecture at Dongshanzui. Its three parts were separated from each other by only a few meters. Sector A049 South consisted of 16 5-m squares, all but one of which yielded daub fragments from structure walls (Figure 23). Eight of the 15 squares that yielded daub were in the top density quartile for squares that yielded daub. Two 1-by-2-m stratigraphic tests (XD, later expanded with the addition of XL) lay within the grid, and another (XF) was just outside it. Tests XD and XL revealed a Hongshan period pit feature filled with ash, carbon, and a high density of artifacts, including very large sherds that fit together into substantial portions of vessels (see Peterson et al. 2014b for profiles and description). Four radiocarbon dates on samples recovered from this pit fall at the very beginning of the Hongshan period (Peterson et al 2014a:21, 2014b). Test XF did not reveal unequivocal cultural features. An isopleth map revealed a high-density sherd hot spot on the east side of this grid, with another toward the west and tending to wrap partly around the eastern one. Sector A049 South was thus divided into two household units: 112 (ten squares at the southwest and northwest) and 113 (six squares at the east).

Sector A049 West consisted of 12 5-m squares in an elongated arrangement, all but two of which yielded daub fragments from structure walls (Figure 23). Seven of the ten squares with daub had especially large amounts, and

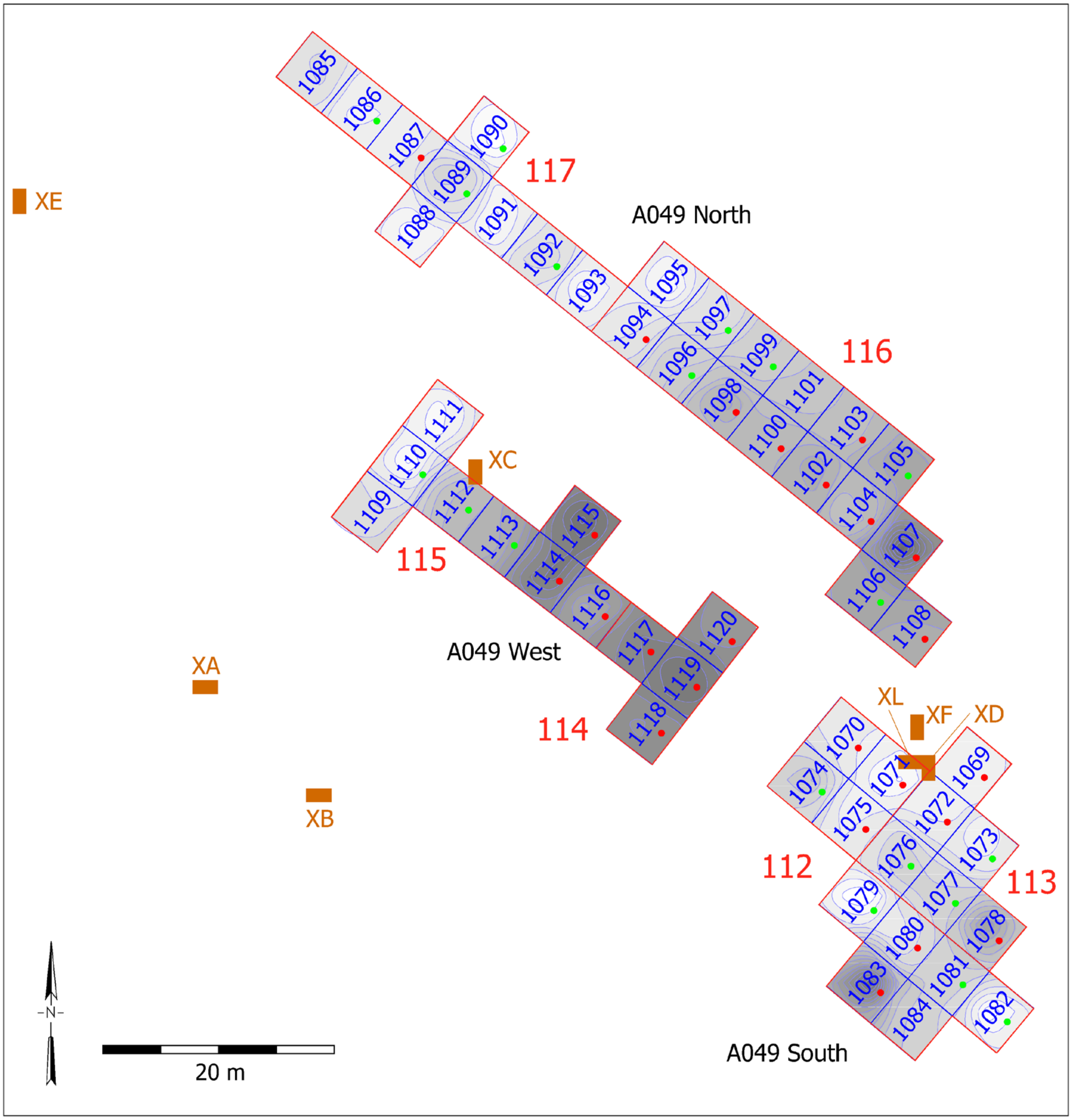

Figure 23. Aggregation of intensive collection squares in sectors A049 North, A049 West, and A049 South into household units 112–117. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

were in the top quartile for daub density among squares that yielded daub. One 1-by-2-m stratigraphic test (XC) lay within the grid, and two more (XA and XB) were about 15 m to the southwest. Altogether these tests contained three possible pit features. An isopleth map showed an especially high-density hot spot in the central part of the grid and another at its southeastern extreme. Consequently, Sector A049 West was divided into two household units: 114 toward the southeast (four squares) and 115 toward the center and northwest (eight squares).

Sector A049 North was an elongated grid of 24 5-m squares (Figure 23). Daub fragments from structure walls were again particularly abundant, being found in 18 of the 24 squares. Fully half the 18 had daub densities in the upper quartile for squares that yielded daub. One 1-by-2-m stratigraphic test (XE) was about 20 m from this grid but revealed no unequivocal cultural feature (see Peterson et al. 2014b for profiles and description). Not surprisingly for a grid spanning 75 m in one direction, an isopleth map showed two especially high-density hot spots, one at the southeastern extreme and one toward the northwest. Accordingly, 15 5-m squares were aggregated into Household Unit 116 and the remaining nine, into Household Unit 117, completing the delineation of analytical units for the Dongshanzui residential zone.

The Erbuchi residential zone was more compact, representing fewer households altogether and with closer spacing between the ones that were there. Household unit delineation again worked its way from west to east (Figure 10). Sector B285 West really consisted of two grids (of 14 and 15 5-m squares, respectively) separated by a terrace edge and a plot with modern graves (Figure 24). Time in the field was growing short so procedures were modified for this grid in order to obtain the best possible sample in the time available. First, alternate 5-m squares were eliminated from the collection plan (those with no numbers in Figure 24). Six squares (2029, 2030, 2031, 2036, 2037, and 2038) were collected by the usual methods except that the size of each square was reduced to 4 by 5 m by eliminating a strip 1 m wide along one side of each of these six squares. Finally, time constraints limited work even further in the remaining nine numbered squares in this grid (2032, 2033, 2034, 2035, 2039, 2040, 2041, 2042, and 2043). In these squares only the initial collection by careful inspection for visible artifacts was carried out (across the entire 5-by-5-m square); the uppermost soil layer was not raked and screened at all. One square yielded daub fragments from structure walls. An isopleth map of Hongshan sherd density was produced for Sector B285 West based on only the initial collection stage so that the data would be comparable for all squares, regardless of whether the raking and screening stage of work had been reached or not. The isopleth map showed one especially high-density area at the northwestern extreme of the grid with sherd densities tapering down in all directions from this. Toward the southeast, the proportions of sherds classifiable as Hongshan also decreased, dropping to less than 50%. The artifact samples recovered from the six squares in Sector B285 West in which more than 50% of the sherds recovered were Hongshan (2029, 2030, 2031, 2036, 2037, and 2038) were aggregated to become Household Unit 201. The artifacts from the other squares in this sector were not included in the counts for any household.

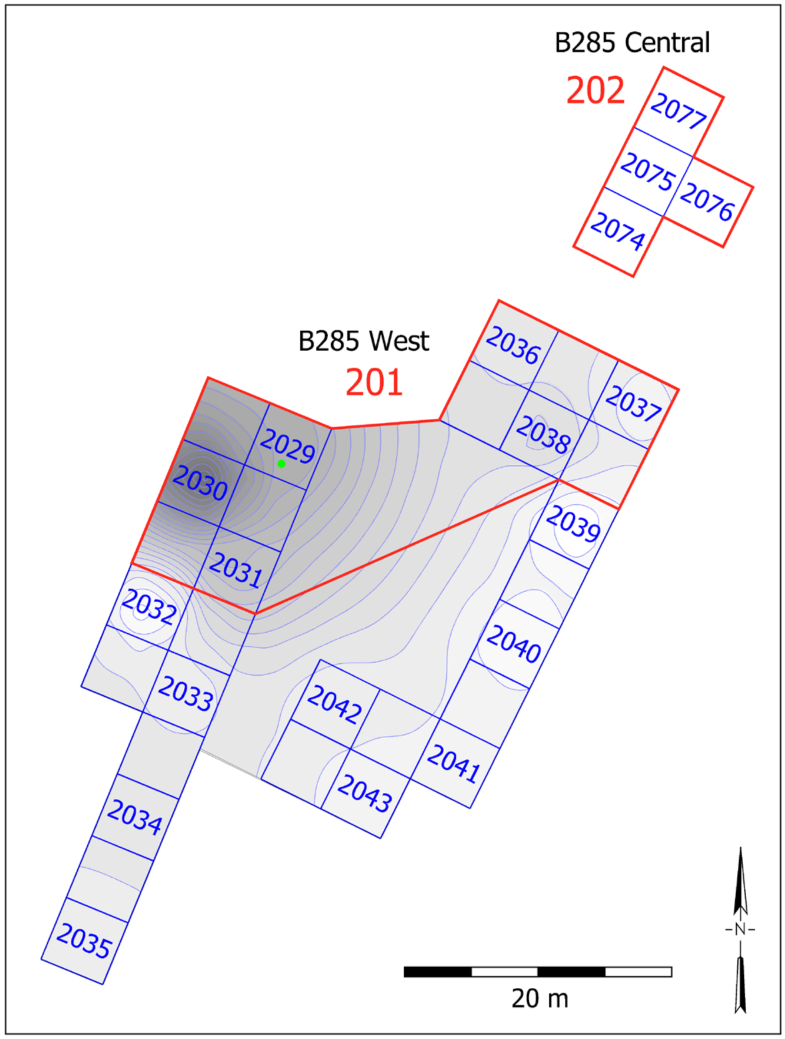

Figure 24. Aggregation of intensive collection squares in sectors B285 West and B285 Central into household units 201 and 202. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

Sector B285 Central was a small grid of four 5-m squares very close to Sector B285 West (Figure 24). Time constraints limited artifact recovery in these four squares to the first stage of careful collection of all visible artifacts. The area was too small to consider subdividing so no isopleth map was made, and the artifact sample that came to represent Household Unit 202 was thus recovered from only the first collection stage without raking and screening.

Sector B285 North was an elongated grid of 20 complete 5-m squares plus two half-squares squeezed in where whole ones would not fit because of an agricultural terrace edge (Figure 25). Because of time pressure only alternate squares (ten and a half) were collected, and the size of these was reduced to 4 by 5 m for the raking and screening stage of collection by removing 1 m from one side. The half-square 2021 was collected in its entirety. Three of the collected squares yielded daub fragments from structure walls. One 1-by-2-m stratigraphic test (XO) lay 5 m to the west of this grid, but it was very shallow and revealed no unequivocal cultural feature. An isopleth map revealed one Hongshan sherd hot spot with densities tapering down in all directions, so all artifacts recovered from this grid were aggregated together as a sample from Household Unit 203.

Sector B285 East included the majority of the occupation sampled in the Erbuchi residential zone (Figure 26). Initial flagging of surface sherds revealed high densities

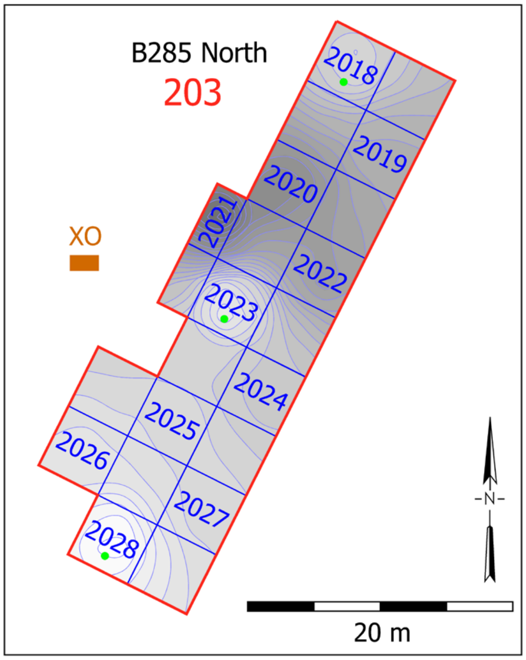

Figure 25. Aggregation of intensive collection squares in Sectors B285 North into Household Unit 203. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

along a considerable stretch of two broad modern agricultural terraces at the edge of a bluff overlooking the flat floor of the Daling River valley. This grid extended for 110 m southwest to northeast and was up to 55 m wide, separated into two parts by the division between the two terraces. Observation of pin flags placed by surface sherds indicated variation in densities within this area, but overall densities were so high that particular hot spots could not easily be identified by these observations. Since the area was large and time was limited, squares for collection were selected in a staggered pattern representing about one-third of the total number of squares. In addition, also because of time pressure, 1 m was removed from one side of most squares collected in this sector, reducing their size to 4 by 5 m. The 12 squares to which this treatment was not applied and which were thus intensively collected across their entire 5-by-5-m area were numbers 2001–2012. Finally, of the 121 5-m squares in the two parts of this grid, 46 were intensively collected in whole or in part (the ones that are numbered in Figure 26). A total of 23 squares of these 46 yielded daub fragments from structure walls, and 4 of the 23 were in the upper daub density quartile for squares that yielded daub. Two 1-by-2-m stratigraphic tests (XK and XN) were within the Sector B285 East grid, and another (XM) was less than 3 m outside it. These revealed two pit features, one of them especially deep and well preserved (see Peterson et al. 2014b for profiles and description). An isopleth map revealed especially high-density artifact hot spots within this overall high-density area better than observation of pin flags had. In this broad area it was also possible to observe a clear correspondence between concentrations of daub fragments and artifact hot spots (Figure 26). On the basis of these hot spots, Sector B285 East was divided into seven household units: 204 with seven collected squares, 205 with four collected squares, 206 with six collected squares, 207 with eight collected squares, 208 with 11 collected squares, 209 with four collected squares, and 210 with six collected squares. This completed the delineation of household units in the Erbuchi residential zone.

A Note on the Xiaoheyan Period

The Xiaoheyan period is conventionally assigned to the millennium after the end of the Hongshan period (3000–2000 BCE), but it is represented by very few known sites, and the quantity of identifiable Xiaoheyan ceramics found in systematic regional surveys is extremely small (Chifeng 2011; Peterson et al. 2014a). The Sanjia and Dongshanzui residential zones are fairly typical in this regard; having substantial quantities of Hongshan ceramics and almost nothing in the way of Xiaoheyan ceramics. At Sanjia there are nearly 5,000 Hongshan sherds from intensive collection for every one classified as Xiaoheyan; at Dongshanzui the figure is almost 10,000. The evidence increasingly suggests that at least some of the ceramics presently classified as Hongshan actually date to the third millennium BCE, along with sherds more readily recognizable as Xiaoheyan (Peterson et al. 2014a:23, 63–65). The Erbuchi residential zone presents itself as an extremely unusual site with substantial quantities of both Hongshan and identifiable Xiaoheyan ceramics. Of the 6,595 Hongshan and Xiaoheyan sherds classified from intensive surface collection at Erbuchi, 71% are Hongshan, and 29% Xiaoheyan. Unfortunately, Erbuchi does not have the stratigraphic depth that would be necessary to resolve the issue of just how and when ceramic assemblages change through this time. For overall consistency of analysis including all three residential zones and regional settlement analysis as well, all household assemblage analysis has been based on the sherds classified as Hongshan, and those classified as Xiaoheyan have been omitted. Even though it may eventually turn out to be the case that there is substantial chronological overlap between what are now labeled Hongshan and Xiaoheyan ceramics, that cannot yet be established. It would be premature to combine these two sets of material for analysis until there is more clarity in the picture that can be drawn of ceramic change during this period. When 5-m squares were aggregated into household units for analysis of household artifact assemblages, the ceramic data are the sums for all sherds classified as Hongshan in all the squares assigned to each household unit in turn. Likewise lithics data are the sums, except that lithics from squares where fewer than 50% of the sherds were classified as Hongshan were omitted from these sums. The squares whose lithics were omitted for this reason are indicated in the data files.

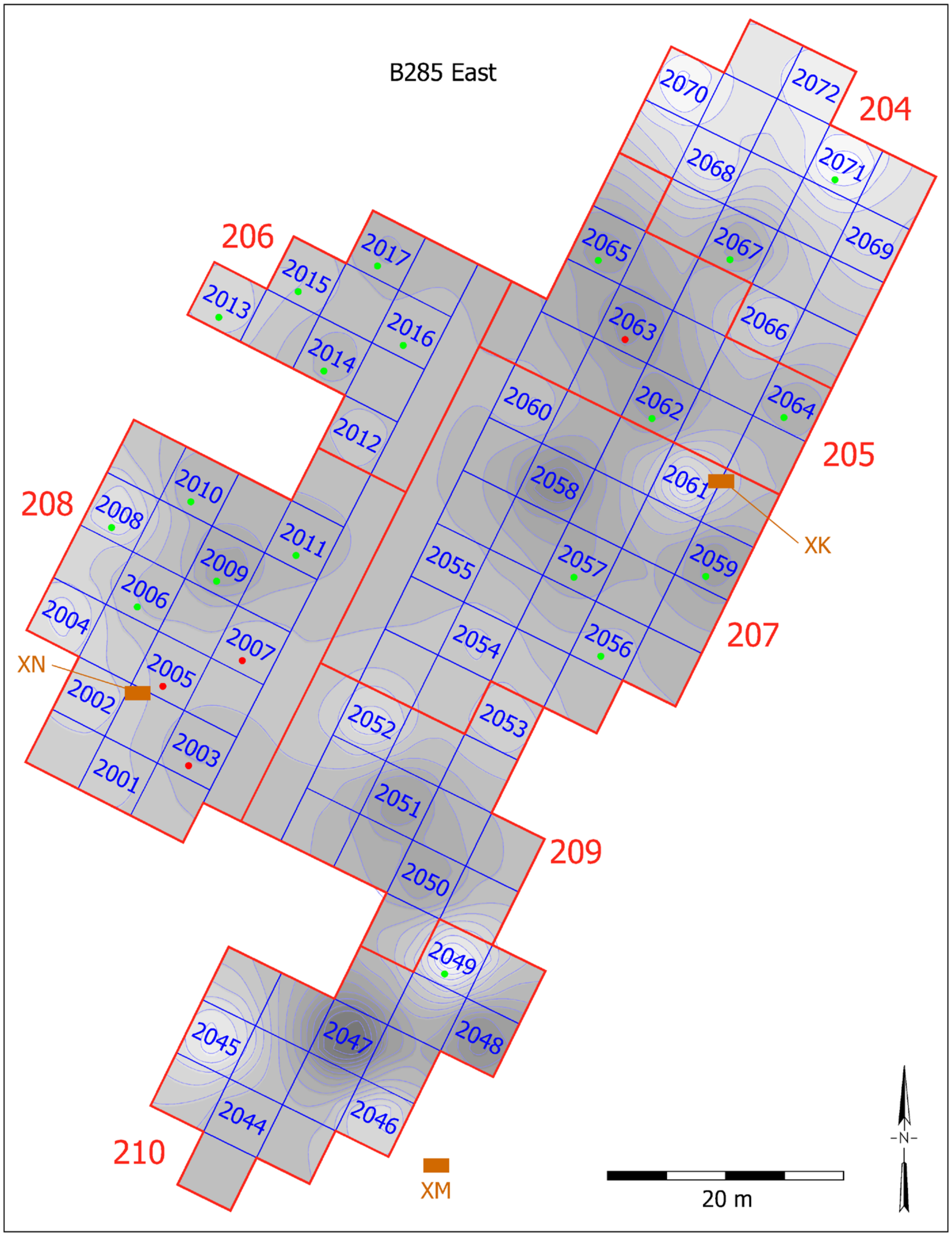

Figure 26. Aggregation of intensive collection squares in Sectors B285 East into household units 204–210. Green dots indicate squares where daub fragments were present; red dots, squares in the upper quartile for daub density.

Data Files

The full results of intensive surface collection in the Sanjia, Dongshanzui, and Erbuchi residential zones provided in this dataset include artifact counts, methodological data about collections, and locational information in downloadable form.

Data on ceramics include counts of sherds for all periods and additional detail on vessel form, paste, surface finish, color, and decoration for Hongshan and Xiaoheyan sherds. Data on lithic artifacts include both flaked and ground stone tools as well as debitage, with counts by category and additional attribute data. These ceramic and lithic data are both presented twice. One set of data files contains counts for each collection stage (careful collection of all visible artifacts followed by raking and screening the uppermost layer of soil) in each individual 5 m square. A second set of data files contains counts for all the same variables aggregated for each of the household units whose delineation is discussed above. An additional data file provides more detail about each lithic tool as an individual artifact. Data on daub fragments from structure walls are included in the ceramic data files.

Methodological data about collections are provided in a data file separate from the artifact data. This includes specification of the idiosyncrasies of collection discussed above. It also includes an estimate of the volume of soil screened in the second collection stage. Usually artifact comparisons across squares or household units were based on proportions, but for some purposes densities per cubic meter of soil screened were needed. Because of the unevenness of the surface this volume could not be measured very precisely, although it varied substantially from one collection square to another depending largely on present land use, which included fallow fields in grass or scrub vegetation, orchards of small fruit trees, and cultivation of maize, millet, peanuts, beans, and occasionally other crops. The starting point for volume estimates was the theoretical volume of soil in the uppermost 5 cm of a square 5 by 5 m: 1.250 m^3 (5 m × 5 m × .05 m = 1.250 m^3). This is an accurate assessment of the volume of soil screened where the vegetation consisted of grass and scrub in fallow fields. On average collection squares located in orchards produced about 60% as much soil for the screens, so these squares were assigned a volume of 0.750 m^3 (1.250 m^3 × 0.60 = 0.750 m^3). Intensive collecting in maize fields (while attempting to minimize damage to growing crops) reduced the volume of soil screened to about 50%, so squares where maize (or peanuts or beans) were cultivated were assigned a volume of 0.625 m^3 (1.250 m^3 × 0.50 = 0.625 m^3). Squares where millet was cultivated reduced the soil volume to about 40%, so they were assigned a volume of 0.5000 m^3 (1.250 m^3 × 0.40 = 0.500 m^3). These base volumes were further adjusted individually for each square to allow for the reduction in area occasioned by removing 1 m from the sides of some squares under time pressure (see above), larger or smaller numbers of trees in the square in orchards, more thinly planted crops, piles of stone, and other idiosyncrasies.

Locational information is provided as multiple layers in a GIS dataset that is fully compatible with the Upper Daling regional GIS dataset (Peterson et al. 2014b). Different GIS layers give the boundaries of the areas where pin flags were placed by artifacts visible on the surface, the boundaries of the tracts of magnetometer survey, the individual 5-m squares that were collected (with their numbers), the boundaries of the groups of 5-m squares that were aggregated into household units (also with their numbers), and the locations of platforms in the vicinity of the Sanjia, Dongshanzui, and Erbuchi residential zones.

Exploratory Multivariate Analysis

Once household units had been delineated on the basis of surface distributions of sherds, the counts of artifacts from individual 5-m squares were summed by household unit, and varying approaches to multivariate analysis were explored in pursuit of patterns of variation in household artifact assemblages. The variables used for multivariate analysis consisted of proportions, ratios, and averages to compensate for the wide variation in sample sizes for different household units (Table 1). Initial analytical approaches employed included nonmetric multidimensional scaling, principal components analysis, and hierarchical clustering. All showed fairly clear patterning, but the patterns were most comprehensive and clearest in the multidimensional scaling analysis. This was perhaps to be expected since multidimensional scaling, unlike principal components or hierarchical clustering, does not display the patterning in a multivariate dataset as single monolithic structure but can simultaneously present clusters, overlapping or cross-cutting clusters, axes of variation that correspond to each other well or poorly, outlier cases, and other forms of structure. The nature of relationships between household units as reflected in their artifact assemblages might well be expected to have the degree of complexity that would require such flexibility to present well.

In any event, initial scalings produced the clearest, most complete, and most interpretable results, so further exploration was pursued with multidimensional scaling. This exploration involved different combinations of variables. Separate analyses for ceramics and lithics were more enlightening than analyses combining both categories of artifacts. Answering the project's research questions focused on comparing household assemblage patterns at Dongshanzui, Sanjia, and Erbuchi in the Hongshan "core zone" with those at Fushanzhuang in the "periphery" (Drennan et al. 2017) so household assemblage data from Fushanzhuang (Peterson 2006, 2012) were subjected to the same analyses. It turned out to be most enlightening not to combine Fushanzhuang into the same analyses as the Upper Daling communities but to analyze them separately so as to compare the patterns.

Eventually the large set of variables was winnowed down to the four ceramic variables and the 20 lithic variables indicated with asterisks in Table 1 for the final analyses upon which interpretation relied. (The final lithic variables actually numbered 19 since unidirectional and multidirectional flake cores were combined into a single proportion for both kinds of flake cores.) The variables that were omitted simply did not show meaningful patterning in any of the multivariate explorations. In the case of a good many of the omitted variables the likely reason for this was categories that occurred quite rarely, paving the way for random noise to be the main component of variation in extremely low percentage values. In the end four multidimensional scaling configurations showed clear and interpretable patterning. The four were a scaling of household ceramic assemblages for Sanjia, Dongshanzui, and Erbuchi, a scaling of household ceramic assemblages for Fushanzhuang, a scaling of household lithic assemblages for Sanjia, Dongshanzui, and Erbuchi, and a scaling of household lithic assemblages for Fushanzhuang. These are the scalings presented and interpreted by Drennan et al. (2017).

TABLE 1. VARIABLES USED IN EXPLORATORY MULTIVARIATE ANALYSES.

Ceramic Variables

*% Decorated Sherds. Number of Hongshan sherds with incised Z motifs, other incising, finger nail impressions, appliqué bands, or painted designs / total Hongshan sherds.

% Incised Horizontal Z Motifs. Number of Hongshan sherds with incised horizontal Z motifs / total Hongshan decorated sherds.

% Incised Vertical Z Motifs. Number of Hongshan sherds with incised vertical Z motifs / total Hongshan decorated sherds.

% Incised Other Motifs. Number of Hongshan sherds with incised motifs other than horizontal or vertical Z motifs / total Hongshan decorated sherds.

% Incised. Number of Hongshan sherds with any kind of incising / total Hongshan decorated sherds.

% Painted. Number of Hongshan sherds with painted designs / total Hongshan decorated sherds.

% Appliqué Band. Number of Hongshan sherds with appliqué bands / total Hongshan decorated sherds.

% Finger Nail Impressions. Number of Hongshan sherds with finger nail impressions / total Hongshan decorated sherds.

*% Slipped Sherds. Number of Hongshan clay slipped sherds / total fine paste Hongshan sherds. Coarse paste Hongshan sherds are not slipped.

% Burnished Sherds. Number of Hongshan sherds with burnished surfaces / total Hongshan sherds.

% Orange Sherds. Number of Hongshan sherds with orange surfaces / total Hongshan sherds.

% Brown Sherds. Number of Hongshan sherds with brown surfaces / total Hongshan sherds.

% Gray Sherds. Number of Hongshan sherds with gray surfaces / total Hongshan sherds.

% Black Sherds. Number of Hongshan sherds with black surfaces / total Hongshan sherds.

% Yellow-Brown Sherds. Number of Hongshan sherds with yellow-brown surfaces / total Hongshan sherds.

% Coarse Paste Sherds. Number of Hongshan coarse paste sherds / total Hongshan sherds.

*% Fine Paste Sherds. Number of Hongshan fine paste sherds / total Hongshan sherds.

*% Serving Vessels. Number of Hongshan sherds from serving vessels (bowls, basins, and cups) / total Hongshan sherds from identifiable utilitarian vessel forms (bowls, basins, cups, cooking pots/jars, jugs, and urns).

% Tongxingqi. Number of Hongshan sherds from *tongxingqi* (hollow bottomless cylinders) / total Hongshan sherds.

Lithic Artifact Variables

Lithics:Sherds Ratio. Number of lithic artifacts (tools and debitage) / total Hongshan sherds.

% Lithic Tools. Number of flaked and ground stone tools / total lithic artifacts.

*% Good Raw Materials. Number of flaked and ground stone tools of high quality raw materials / total flaked and ground stone tools.

% Flaked Stone Tools. Number of flaked stone tools / total flaked and ground stone tools.

*% Ground Stone Tools. Number of ground stone tools / total flaked and ground stone tools.

% Pecked Stone Tools. Number of pecked stone tools / total flaked and ground stone tools.

*% Abraders. Number of grooved abraders (for making ground stone tools) / total flaked and ground stone tools.

*% Awls and Drills. Number of flaked stone awls and drills / total flaked and ground stone tools.

*% Axes and Adzes. Number of ground stone axes and adzes / total flaked and ground stone tools.

% Unretouched Blades. Number of unretouched blades / total flaked and ground stone tools.

*% Retouched Blades. Number of retouched blades / total flaked and ground stone tools.

*% Retouched Flakes. Number of retouched flakes / total flaked and ground stone tools.

*% Unifacial Scrapers. Number of flaked unifacial scrapers / total flaked and ground stone tools.

% Bifacial Scrapers. Number of flaked bifacial scrapers / total flaked and ground stone tools.

*% Chopping Tools. Number of large flaked chopping tools / total flaked and ground stone tools.

*% Blade Cores. Number of blade cores / total flaked and ground stone tools.

*% Unidirectional Flake Cores. Number of unidirectional flake cores / total flaked and ground stone tools.

*% Multidirectional Flake Cores. Number of multidirectional flake cores / total flaked and ground stone tools.

*% Projectile Points. Number of flaked projectile points / total flaked and ground stone tools.

*% Tool Blanks and Preforms. Number of unfinished tools (blanks or preforms) / total flaked and ground stone tools.

% Very Acute Edge Angles. Number of flaked scrapers, retouched blades, and flakes with very acute edge angles (<25°) / total flaked and ground stone tools.

*% Acute Edge Angles. Number of flaked scrapers, retouched blades, and flakes with acute edge angles (25–44°) / total flaked and ground stone tools.

*% Obtuse Edge Angles. Number of flaked scrapers, retouched blades, and flakes with obtuse edge angles (45–65°) / total flaked and ground stone tools.

% Very Obtuse Edge Angles. Number of flaked scrapers, retouched blades, and flakes with very obtuse edge angles (>65°) / total flaked and ground stone tools.

*% Debitage. Number of pieces of debitage (complete and broken flakes, flake fragments, and shatter) / total lithic artifacts.

% Debitage of Good Raw Materials. Number of pieces of debitage of high-quality raw materials / total debitage.

% Tool Manufacturing. Number of complete and broken flakes of "tool" manufacturing type / total debitage.

*% Complete Unretouched Flakes. Number of complete unretouched flakes / total debitage.

*% Broken Unretouched Flakes. Number of broken unretouched flakes / total debitage.

% Flake Fragments. Number of flake fragments / total debitage.

*% Shatter. Number of pieces of lithic shatter (i.e. debris) / total debitage.

% Cortex. Number of pieces of debitage with cortex / total debitage.

*Average Debitage Weight. Total weight of debitage in grams / total count of debitage.

Notes: The lithic artifact category "tools" does not include shatter or unretouched flakes and blades. Debitage categories used (complete and broken flakes, flake fragments, and shatter) conform to Sullivan and Rozen's (1985) typology. The "tool" manufacturing type corresponds to Bradbury and Carr's (1999) distinction between "tool" and "core" manufacturing types.

The data as prepared for multivariate analysis (variables as ratios, proportions, and averages) are provided as four files corresponding to the four final scalings presented by Drennan et al. (2017): ceramic variables for Sanjia, Dongshanzui, and Erbuchi; ceramic variables for Fushanzhuang; lithic variables for Sanjia, Dongshanzui, and Erbuchi; and lithic variables for Fushanzhuang.

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