Settlement and Landscape in Northern Mesopotamia: The Tell Hamoukar Survey 2000-2001.

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I. Introduction

Since its inception in 1999, the Syrian-American Hamoukar Expedition has attempted to place on-site excavations into a larger context both on the site itself and within its region. The Tell Hamoukar Survey (THS) has conducted site-based surface collection and documentation of off-site traces of land use such as ancient roads and field scatters. Our ultimate goal is to understand the history of human settlement and land use in the eastern Upper Khabur basin through the synthesis of intensive problem-oriented excavation and extensive site survey and landscape studies.

The Tell Hamoukar Survey must acknowledge the kind support of the former and current Directors General of Antiquities and Museums in Damascus, Drs. Sultan Muhesen and Abd al-Razzak Moaz, as well as the Director of Excavations Dr. Michel Maqdisi and the Director of Antiquities for Hassake Province, Abd al-Massieh Baghdo. I am grateful to the Hamoukar Expedition directors, Drs. McGuire Gibson and Amr al-Azm, for giving me the responsibility for the survey. The September-October 2000 field season was carried out by Carlo Colantoni and Lamya Khalidi, both of the Cambridge University, and myself; in September 2001 I was assisted by Tariq Ahmed of the Damascus DGAM. This fieldwork was made possible by support from the Ryerson Fund of the University of Chicago and the ASOR Mesopotamian Fellowship, which also partially funded the excavation of Area H (Gibson *et al.*, this volume).

Hamoukar is located in the Upper Khabur basin, at the northeastern corner of Syria (Fig. 1). It sits at the eastern edge of the basin, eight kilometers west of the modern town of Yarubiya. This places it almost precisely on the watershed between the Tigris River and the Khabur Basin, and, by extension, the watershed between the Tigris and Euphrates.[1] Although the Hamoukar area has never been subjected to systematic archaeological survey, other surrounding areas have been investigated at varying levels of intensity (Wilkinson 2000a). In the eastern basin, D. Meijer (1986, 1990) conducted an early low intensity extensive survey; Stein and Wattenmaker undertook a more intensive survey in a 15 km radius area around Tell Leilan (1990, in press). Immediately east of the Upper Khabur basin in northern Iraq, T.J. Wilkinson's North Jazira survey documented 184 sites over 475 km^2 (Wilkinson and Tucker 1995). The results of these surveys provide valuable hypotheses to be tested in the THS area.

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1 For the geomorphology of the Upper Khabur basin, see Courty 1994 and Wilkinson, this volume.

II. THS 2000-2001 Regional Survey Methodology

In 1999, we conducted a systematic surface collection of Hamoukar itself, in order to identify all periods of occupation and the locations and movement of settlement on the site through time (Ur 2002). In the 2000 season the Tell Hamoukar Survey aimed to conduct a similar systematic surface investigation of all sites in Hamoukar's immediate hinterland. The survey area consisted of a five kilometer radius (125 km^2) from the edge of the excavation concession. In that area, we were able to supplement our intensive on-site surface collection with extensive off-site investigations of archaeological landscape features as well.

A. Preliminary Site Identification

Possible sites were identified initially from high resolution CORONA satellite photographs. CORONA was the first program of American intelligence satellites, run from 1959 to 1972; in 1995 these images were declassified and are now available online for previewing and ordering. Because of their ease of interpretation, high resolution, and low cost, archaeologists are beginning to exploit them (Kennedy 1998, Phillip *et al.* 2002, Ur forthcoming).

These images were produced by photography rather than by digital sensors and thus are fairly easy to interpret (Fig. 2). The angle of the sun illuminates the southern slopes of tells, while the northern slopes are shaded (a). Lower mounds, which do not cast shadows, appear as light spots (b); their silty anthropogenic soils are well drained in most seasons, so their surfaces are drier and thus more reflective than the natural reddish brown soils of the surrounding plain. Because sites are constructed of mud brick in this region, almost all are associated with one or more brick extraction pits; these depressed features accumulate moisture and appear as dark spots. The more recent sites (c), particularly Parthian through Islamic, preserve these features better than older sites, which allows a tentative general dating from the image signature alone.

The CORONA images have proven to be an extremely powerful tool for site identification. They preserve a landscape that is over 30 years old, prior to the expansion of towns, the intensification and mechanization of agriculture, and the introduction of diesel pumps and irrigated cotton fields. As a result, we were able to locate sites that since have been buried beneath villages, flattened by bulldozing, and covered by irrigated cotton fields. Our field scatter sampling program involved walking transects across large portions of the survey area, yet it located no sites which had not already been identified from the CORONA imagery. Indeed, in alluvial environments of northern Mesopotamia, CORONA-informed survey can produce site recovery rates comparable to the fieldwalking-intensive Mediterranean surveys (Wilkinson, Ur, and Casana forthcoming).

We relied primarily on CORONA missions from late fall of 1967 and 1969 and spring of 1972.[2] The photographic positives were scanned at a resolution of 1200 dpi, registered by reference to ortho-rectified SPOT imagery, re-projected into the UTM coordinate system, and

[2] These were DS1102-1025D (11 December 1967), DS1108-1025D (6 December 1969), and DS1117-1025D (27 May 1972).

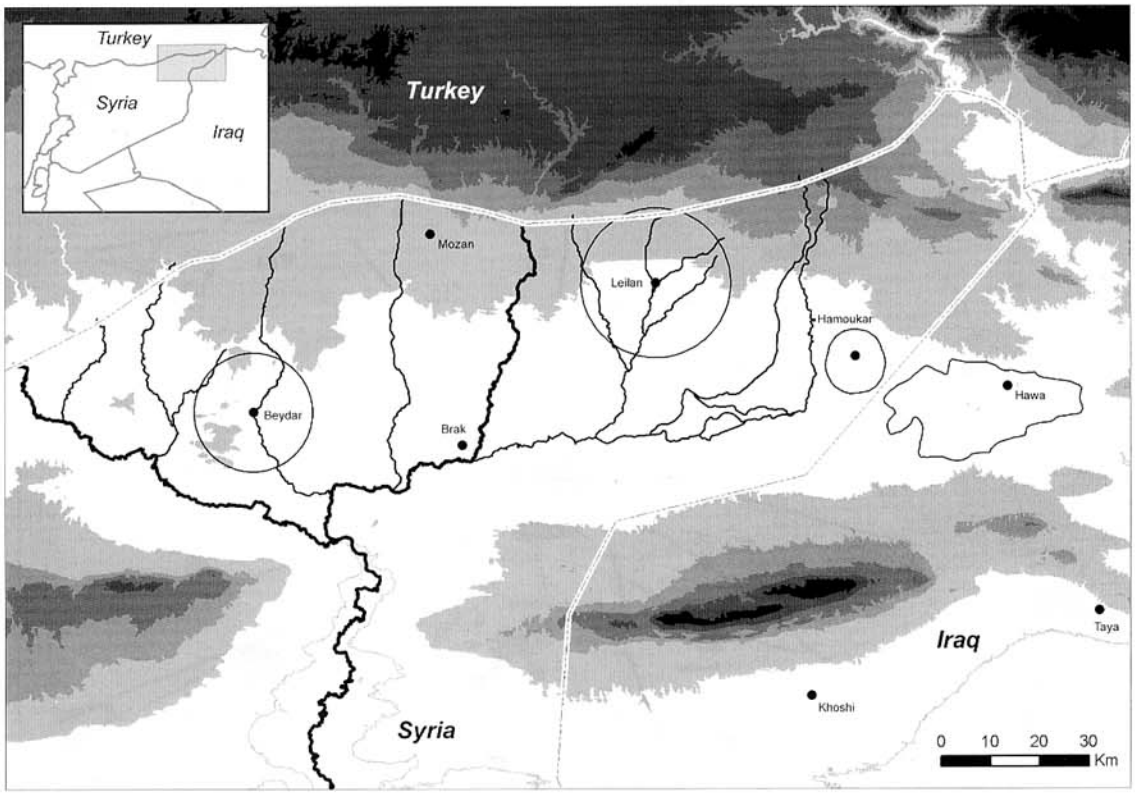

Fig. 1. The Upper Khabur basin, with major 3rd Millennium sites and intensive survey areas indicated.

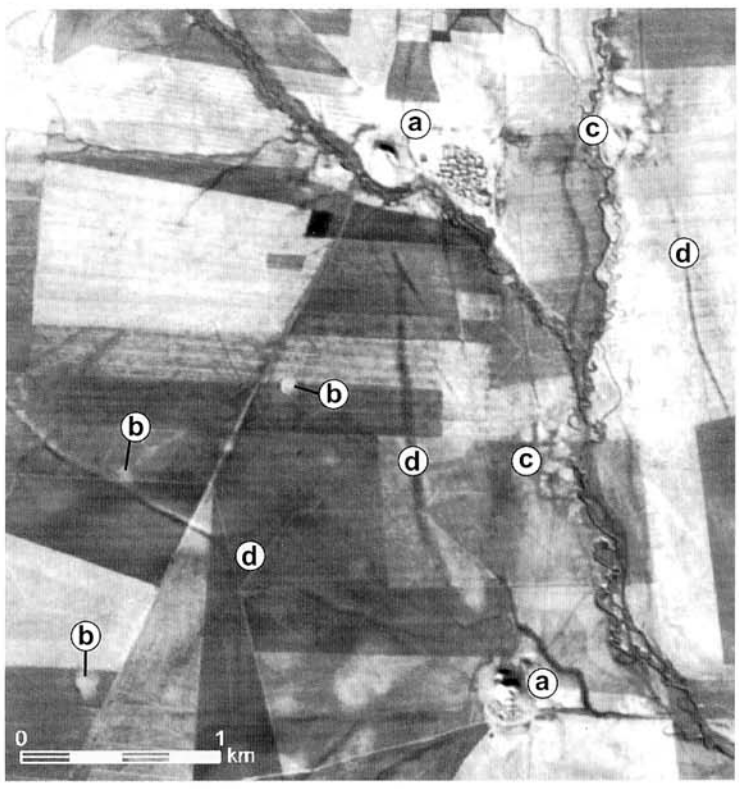

Fig. 2. December 1967 CORONA photograph (DS1102-1025DA012). a. High mounded tell sites ; b. lower (<2m) mounds ; c. complex sites of multiple mounds and brick extraction pits ; d. hollow ways.

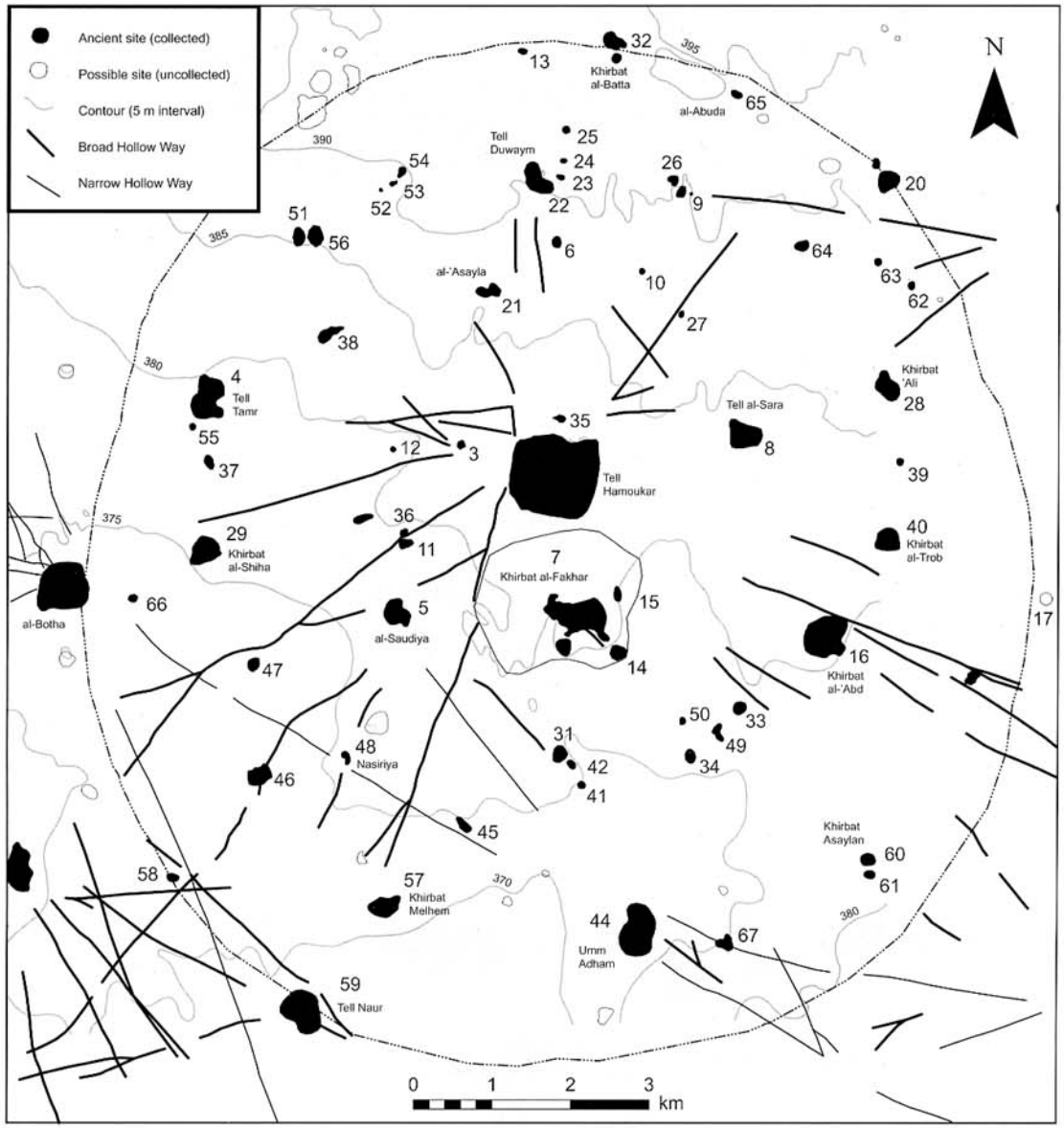

Fig. 3. Sites and hollow ways in the Tell Hamoukar Survey area.

imported into a GIS program, where potential sites were vectorized off the CORONA image onto a separate layer.[3] This site layer was integrated with data from print maps, such as topography, watercourses, and modern roads and villages, to produce a GIS database which acted as a base map (Fig. 3).

[3] Image registration and projection conversion was performed in the ENVI 3.5 software package ; vectorization of CORONA features and in-field GPS point plotting was done using ArcView 3.2.

B. Collection Methodology

The sites were then visited on the ground and collected. Because of its great size and overall flatness, Hamoukar was well suited for a sampling strategy ; for the regional survey, we chose to collect in areas that could be adapted for the variable topography of each site. Our collection methodology was based on the approach used by T.J. Wilkinson in the North Jazira project (Wilkinson and Tucker 1995 : 17-18) and the Tell Beydar Survey (Wilkinson 2000b), but modified in order to take advantage of Geographic Positioning System (GPS) handheld receivers, GIS computer technology, and new remote sensing data sources, particularly the CORONA photographs discussed above.

Site edges were mapped by GPS points taken at roughly 50 m intervals around the site.[4] This edge was defined by a combination of three criteria : surface sherd density, topography, and soil color. Assessment of sherd density was qualitative, although controlled field scatter collection has demonstrated that on-site density is generally greater than 200 sherds per 100 m^2, while off-site field scatter ranges from 20-100 per 100 m^2 (Wilkinson and Tucker 1995 : 20). The topographic expression of sites in the THS region ranges from prominent high mounds such as Tell Naur (THS 59, 19 m high) to sherd scatters without any visible mounding. In several cases, sites had been flattened mechanically to expand cotton fields ; in these cases, site boundaries were defined by reference to their original shape on CORONA photographs. Site soil color tended to be a light gray, which stood out from the reddish brown calcic xerosols of the surrounding fields. In an ideal situation, a change in all three variables (sudden decline in sherd density, edge of mounding, and abrupt shift from grayish to reddish soils) would co-occur, but we found in the course of the survey that using the edge of mounding was the most practical way to define site limits.

Once boundaries had been defined, the site was divided into collection areas based on the site's topography. We attempted to limit areas to roughly one hectare for consistency in coverage. The positions of corners and points along the boundaries of collection units were recorded using a GPS. Within each unit, all diagnostic sherds (rims, bases, handles, decorated sherds) were collected.

C. Ceramic Chronology and Analysis of Surface Collections

Sherds were dated by reference to a typology based on the one used by Wilkinson and Tucker in the North Jazira (Ball *et al.* 1989, Wilkinson and Tucker 1995) and expanded to include the results of recent excavations in the region and at Hamoukar itself. Recent publications of 3rd and 2nd millennium ceramics from Brak, Rimah, and Nineveh have proven to be especially useful (Oates *et al.* 1997 and 2001, Postgate *et al.* 1997, McMahon 1998). For the prehistoric periods, the Yale University Khabur Basin Project has produced a radiocarbon chronology with associated ceramics (Hole 2001). On Hamoukar, lower town excavations in Areas E and H have confirmed the dating by association of later 3rd Millennium types found

[4] Since the US Department of Defense ceased introducing a deliberate error (called Selective Availability) in May 2000, the estimated positioning error of handheld GPS receivers in the Upper Khabur basin can be as low as 5 m.

in the initial Hamoukar surface collection (Ur 2002, Gibson *et al.*, this volume), and surface collection in single-phase areas of the late 5th Millennium Hamoukar southern extension (THS 7, see below) produced a range of new types. In this report, ceramic periodization and terminology follows Wilkinson and Tucker (1995) except where noted.

Site limits and collection area boundaries were plotted in ArcView 3.2, which allowed for highly accurate assessments of surface areas. When sherd quantities by period then are related to this spatial data, it is possible to gauge occupation on the basis of a calculation of sherds per hectare for each ceramic period. In general, an area was considered to have been settled in a given period if at least two typed sherds of that period per hectare were recovered. However, this ratio was set higher for some periods with a high number of diagnostic types, and lower for some periods with fewer (or less robust) diagnostic types.

III. Site Survey Results

Within the 125 km^2 survey area, 67 sites totalling 708 hectares were identified and collected, spanning the time range from Hassuna to Late Islamic (Fig. 4). 3928 sherds were typed. The initial processing of our ceramic collections is reported below, but should be considered preliminary, particularly for the early prehistoric periods (Hassuna-Ubaid) and the Sassanian and Islamic periods.

Prehistoric (Hassuna, Halaf, Ubaid). The earliest settlements recognized by the THS were six sites of the Hassuna period, averaging 1 ha. All were small low mounds with little or no subsequent occupation. By the succeeding Halaf period, sites (12) and total settled area (17.5 ha) both doubled (Fig. 5). Again, all appear to have been small villages, although later settlement at THS 16 and THS 59 make the size estimation difficult. The sites themselves are evenly distributed across the survey area. This early trend toward more and larger sites stopped with the Ubaid, for which only two sites (THS 34, 2.0 ha and THS 46, 0.3 ha) were recovered. Because the Ubaid may represent the initial stage of urbanization in the region, it is possible that sherds of this date are deeply buried and inaccessible beneath large Bronze Age mounds.[5]

LC 1-2 (Post-Ubaid). In previous surveys of the Upper Khabur and North Jazira, several distinct ceramic traditions were treated as a single chronological unit, although there were doubts about their contemporaneity (Meijer 1986, Wilkinson and Tucker 1995 : 43-45, 92). Recent research has demonstrated that the ceramic assemblage known from Gawra XI-IX is earlier than the chaff-tempered Amuq F types (Tomita 1998, Schwartz 2001, Rova 1999-2000). In the useful new "LC" chronology proposed at the Santa Fe Uruk conference (papers in Rothman 2001), this phase has been designated as LC 1 and LC 2. The earlier phase is characterized by sprig ware and deep U-shaped jars, while the latter features a series of grit-tempered forms such as double-rimmed jars and stamped fineware beakers. New radiocarbon dates place LC 1-2 in the second half of the Fifth Millennium BC (Hole 2001, Wright and Rupley 2001).

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[5] One or two Halaf and Ubaid sherds have been noted in later excavated contexts at Hamoukar, although the 1999 surface collection found no sherds of these periods.

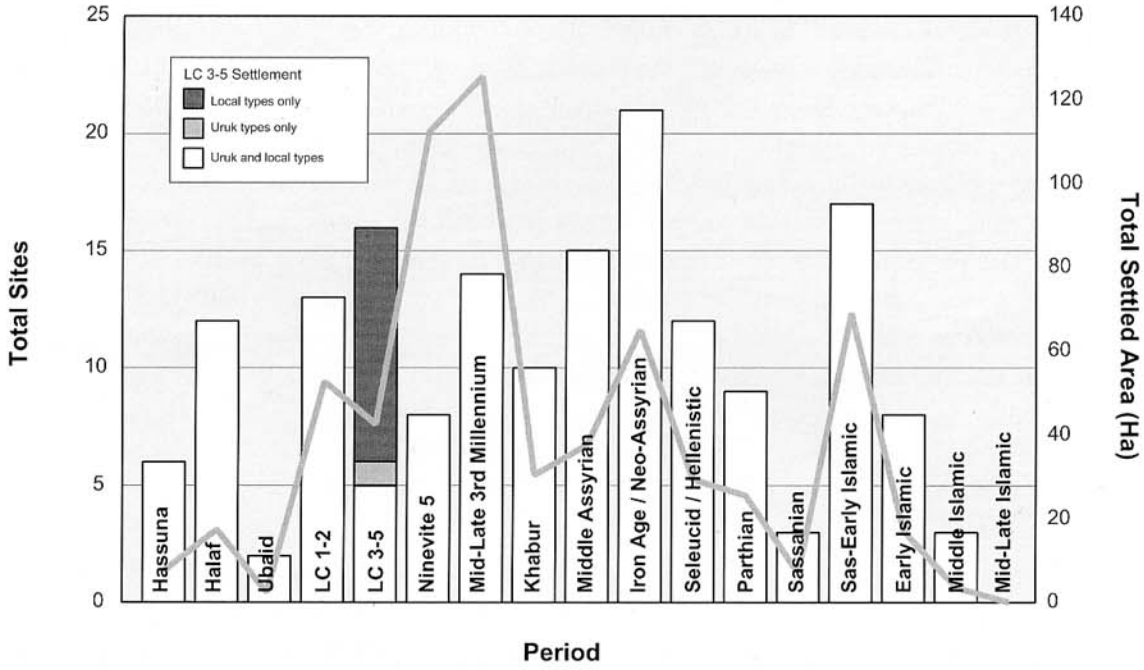

Fig. 4. Number of sites (bars) and total settled area (line) in the Tell Hamoukar Survey by period.

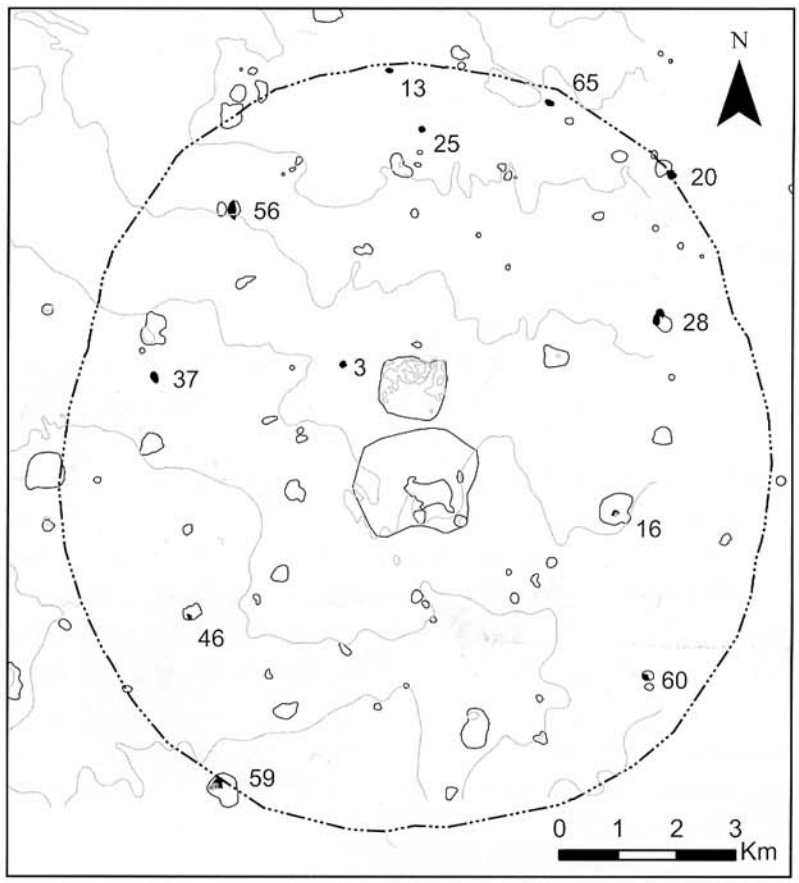

Fig. 5. Halaf settlement in the THS area.

In fields to the south of the mounded site of Hamoukar lies a vast area we have called the "Southern Extension," covered with handmade sherds and abundant obsidian debitage. This area was initially identified by a distinct mottled signature on a CORONA satellite photograph. Athough the center contains an undulating 31 ha complex of mounds of Parthian to Islamic date, the entire range of fields is covered with sherds of Post-Ubaid (LC 1-2) date, including sprig ware. In the 1999 season, a brief reconnaissance estimated the size of this area (THS 7, known locally as Khirbat al-Fakhar) at 280 ha (Ur 2002). To test this estimation of the sherd scatter limits, in the 2000 season, a series of 100 m^2 sample collection units was placed at 200 m intervals across the site to measure sherd density (Fig. 6). Within these 59 collection units, density averaged over 1500 sherds per 100 m^2, and every unit produced obsidian blades, flakes, and cores.

The systematic surface collection confirmed that the limits of the sherd scatter corresponded to the limits of the mottling on the December 1969 CORONA image and suggested a 300 ha extent. Beyond the boundary of the site, sherd densities drop down to 50-70 sherds per 100 m^2, well within the range that would be expected for such proximity to 3rd Millennium Hamoukar (see below).

The extent of the LC 1-2 Southern Extension makes it unique among prehistoric sites. Rather than applying the standard 100-200 persons per hectare figure generally used to estimate population, we must consider alternative models of settlement (Gibson *et al.* this volume, Wilkinson, this volume). The scatter might be the remains of seasonal groups who returned to different parts of the site each year, but the volume of surface sherds argues against that. Another possibility would be a lower density pattern of scattered households, analogous to the pattern seen in the villages of settled pastoralist groups in the basin today. In any case, the site certainly functioned as a major center of obsidian tool production and trade.

The late 5th Millennium settlement landscape did not consist solely of THS 7; 12 other sites were occupied at this time (Fig. 7). All were small villages of less than 3 ha. Like THS 7, all had a considerable obsidian surface component, although none featured its abundant cores and blades.

LC 3-5 (Uruk/Late Chalcolithic). Sites of the "Uruk Expansion" phenomenon (Algaze 1993, Stein 1999, Rothman 2001) are well represented within the THS area (Fig. 8).[6] Hamoukar itself was a 15 ha town at this time (Ur 2002). Roughly 300 m north of the high mound at Hamoukar was a 1.08 ha area of low mounding with predominantly Uruk grit-tempered ceramics (THS 35, Fig. 9). Although its eastern half had been removed for an irrigated cotton field, its former extent could be measured from CORONA photographs. Although the detailed history of Uruk settlement on Hamoukar itself has yet to be firmly established, the presence of drooping spouts on THS 35 suggests a LC 5 (Late Uruk in the southern chronology) date. Because southern ceramics overwhelmingly predominate over local wares on this small site, it appears to be a *karum*-like settlement, near but separate from a larger established town. The reason for this separation remains unclear, since the excavations in Area A demonstrate that a community using southern Mesopotamian wares was living on Hamoukar at the time.

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[6] In this report, "Uruk" is used as a purely cultural term, referring to the presence of Southern Mesopotamian ceramic types and the colonists themselves; it is not meant to have chronological significance except where specifically noted.

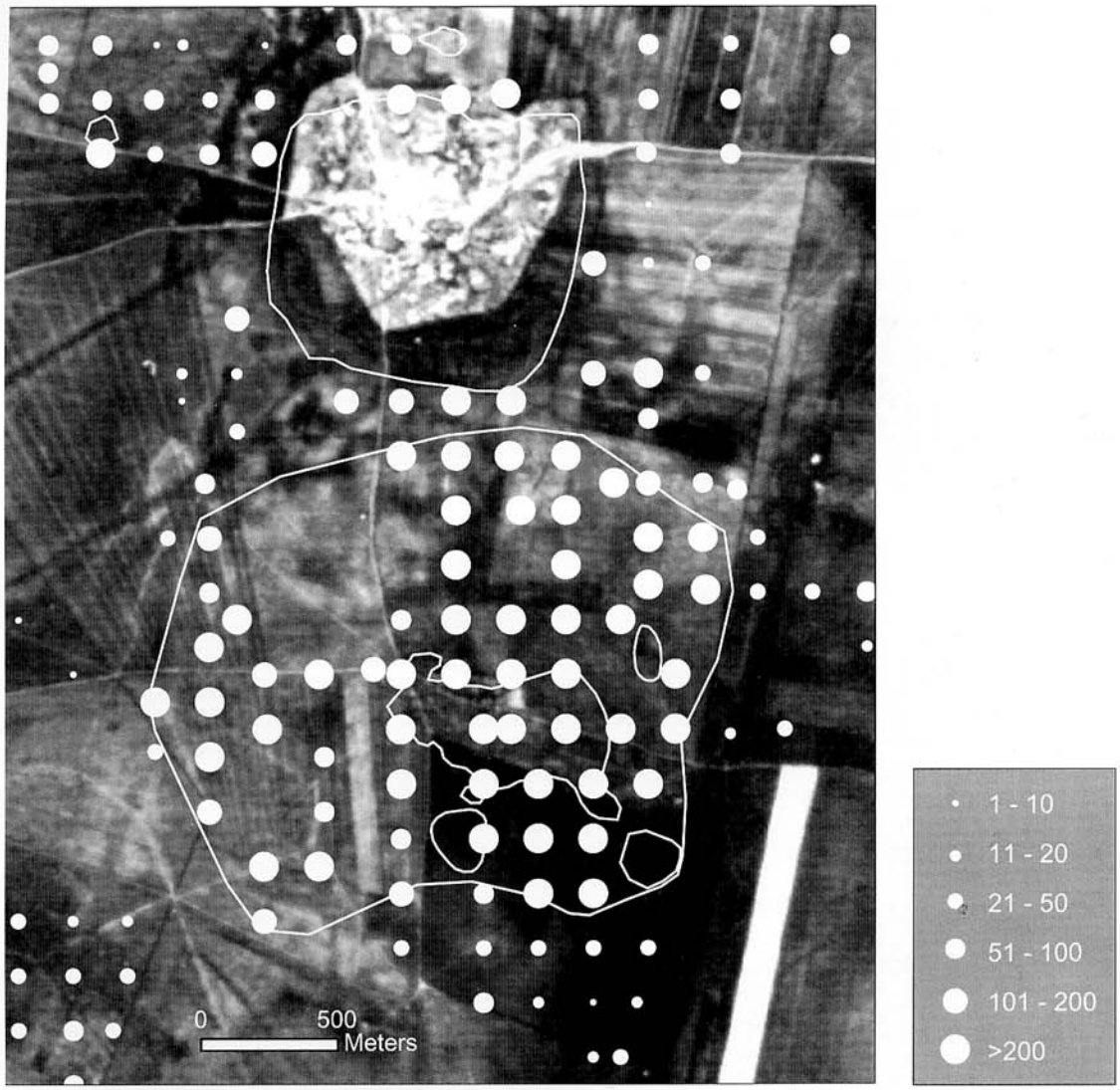

Fig. 6. Collection units on the Southern Extension (THS 7, Khirbat al-Fakhar).

Other such communities existed in the region at the same time. In the southern part of the survey area was a low 8.55 ha mound with abundant bevelled rim bowls and other southern types, including LC 5 drooping spouts (Khirbat Melhem, THS 57). In sum, southern types were recovered from five sites for a total of 26.9 ha. If we can equate the presence of southern ceramic types with the presence of southern colonists, the relatively small THS area would be one of the densest areas of colonization in northern Mesopotamia yet surveyed.

These intrusive sites did not appear in an empty landscape; at all but one very small site (al-Asayla, THS 21), the surfaces of these Uruk sites were also covered with chaff tempered reduced core local wares of the "Amuq F" or "Northern Middle Uruk" variety, as it is

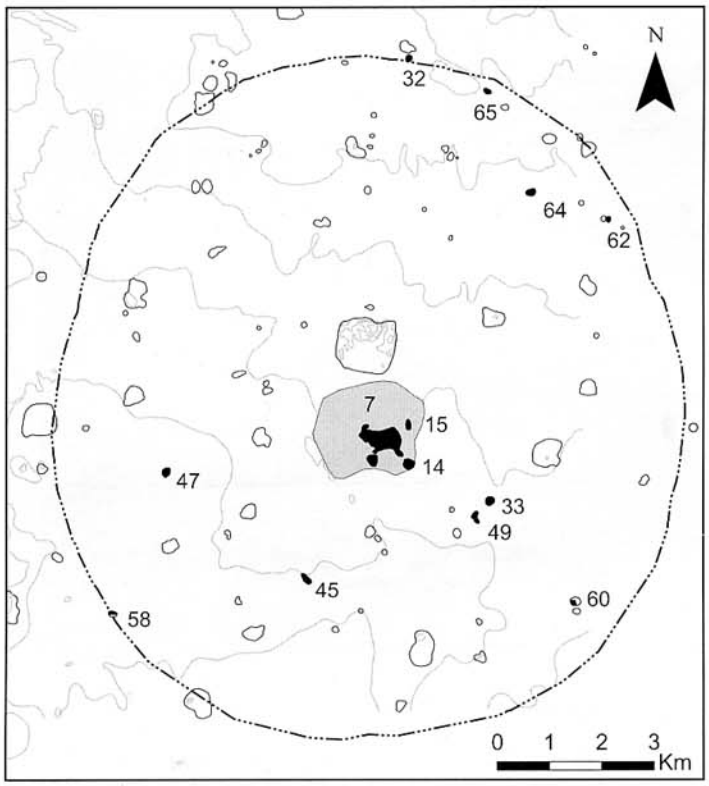

Fig. 7. LC 1-2 (post-Ubaid) settlement in the THS area. Gray area represents low density settlement.

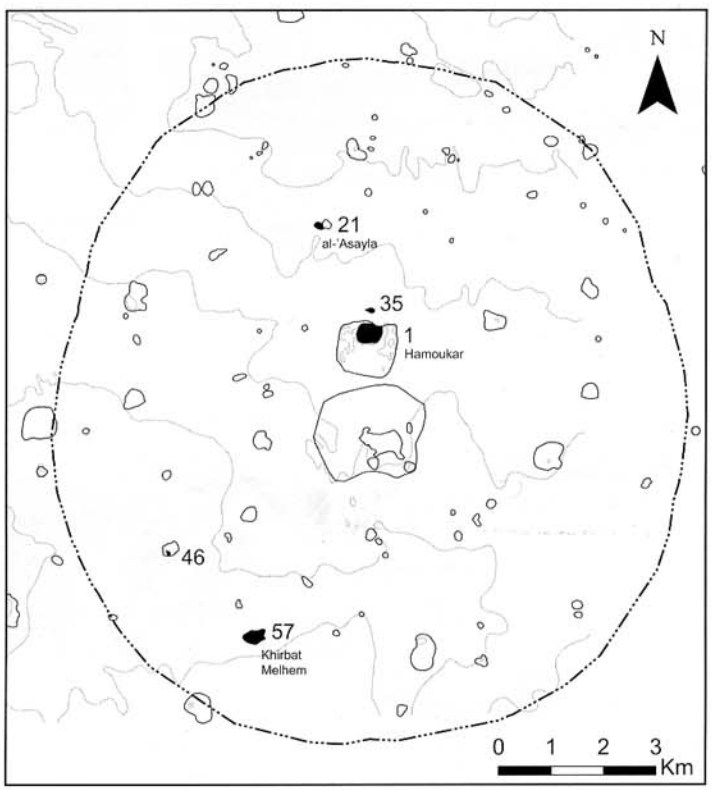

Fig. 8. Uruk settlement in the THS area.

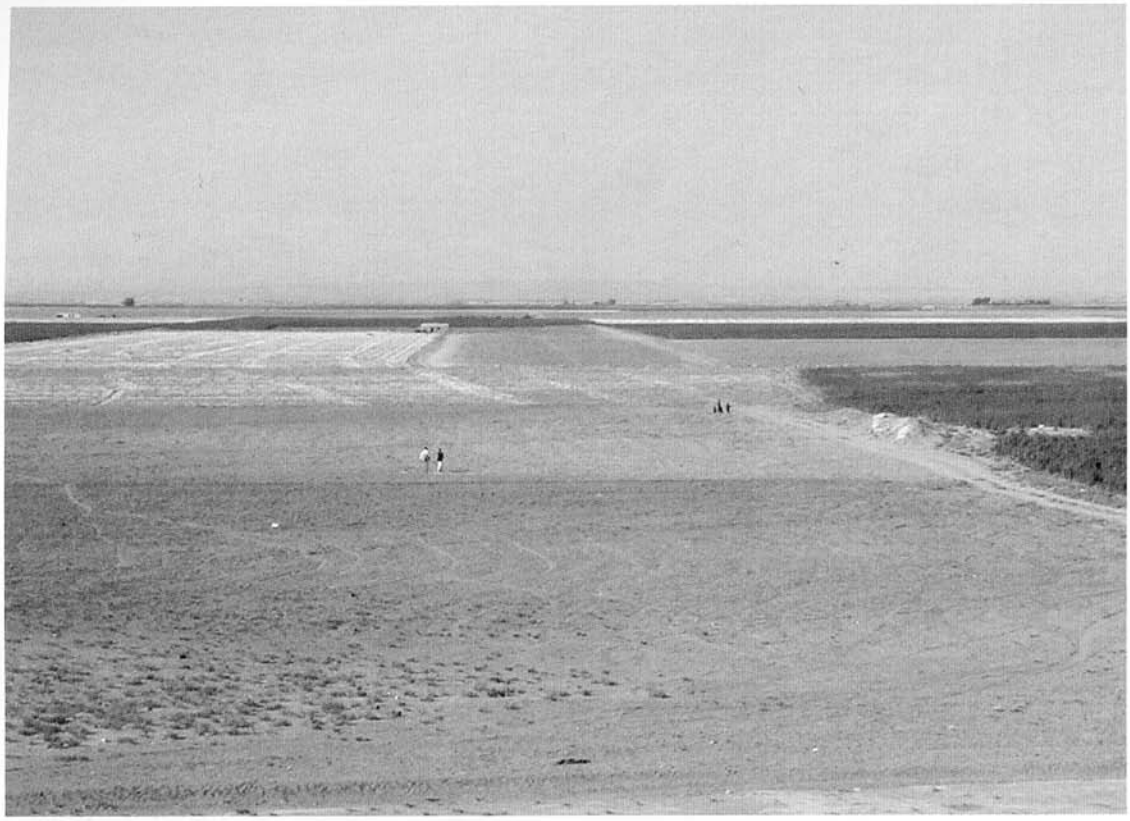

Fig. 9. THS 35. The site is visible as an area of lighter soil between the two pairs of figures. At right, the site has been bulldozed for cotton fields.

called at Brak TW and Hacinebi Tepe (Oates and Oates 1991, Pearce 2000).[7] Twelve other sites had exclusively local Late Chalcolithic ceramics for a total of 42.6 ha. Excavations in Areas A and B on Hamoukar have demonstrated that the indigenous population was already organized as a socially complex society prior to the arrival of the colonists (Gibson *et al.* 2002 and this volume). Based on survey data, it appears that the eastern Khabur basin was already well populated prior to the arrival of the Uruk colonists, unlike the Middle Euphrates area, and the southern colonists integrated themselves within preexisting communities. The distance of the Upper Khabur basin from the southern homeland and the archaeological signs of preexisting social complexity at Hamoukar itself lends support to Gil Stein's distance-parity model (1999); the eastern Khabur was a zone of interaction characterized by political and social equality between foreign and indigenous populations, rather than an exploitative one-sided relationship between a dominant core and an economically dependent periphery.

3rd Millennium BC (Ninevite 5, ED III-Akkadian, Post-Akkadian).[8] The early 3rd Millennium remains difficult to study from surface collections, due to the nature of the ceramic assem-

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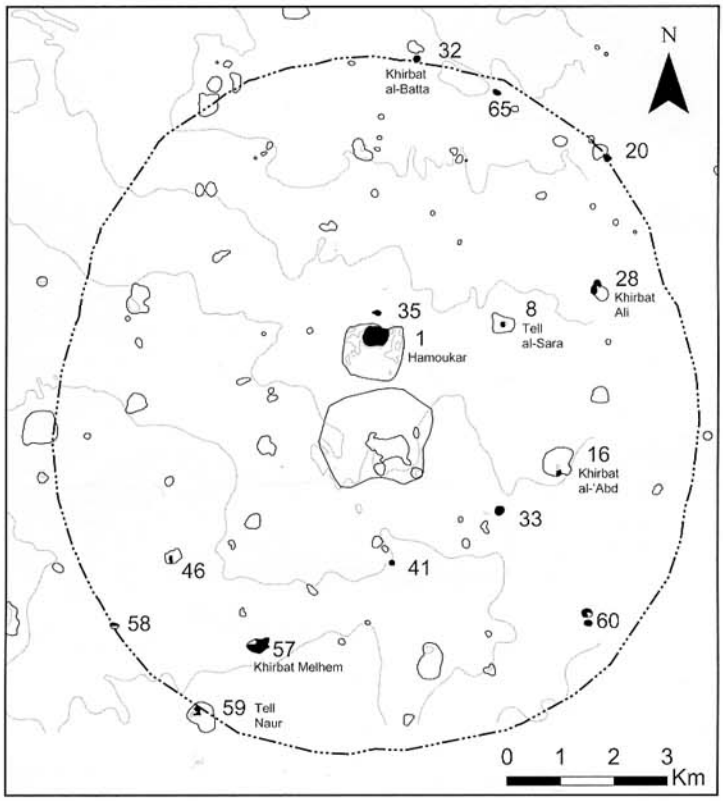
7 We generally assign a 4th Millennium date to this assemblage. It is difficult to determine a more specific chronological position within this span for purely local Late Chalcolithic sites because the LC 3-5 periods are subdivided based on the presence or absence of specific southern Uruk ceramic types (Schwartz 2001).

8 The proposed "Early Jazira" chronology for the 3rd Millennium BC (Pfälzner 1997, Lebeau 2000) will be an excellent framework for future work, but at its current stage of development it has not been associated with

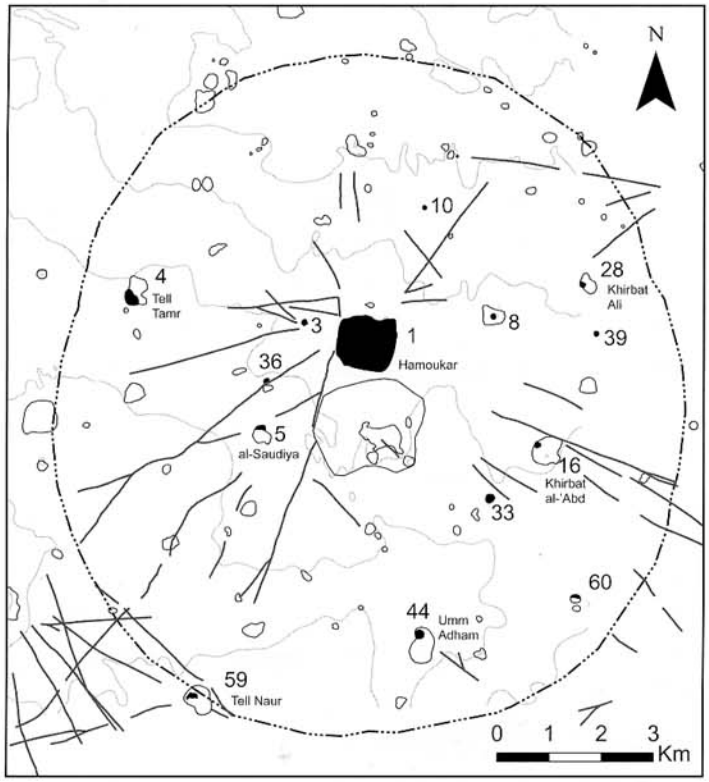


10. Late Chalcolithic (LC 3-5) settlement in the THS area.

blage. The most robust and frequently occuring types, such as pedestal and parabolic bases, crescent lug handles, and fine beaded rim cups, all remain in use for the entire Ninevite 5 period (Schwartz 1985, 1988), whereas the chronologically sensitive decorated types survive poorly on the surface of sites and are uncommon, perhaps because these are specialized fine wares (Stein and Wattenmaker 1990, in press). Painted Ninevite 5 sherds, the best indicator of early Ninevite 5 occupation, are exceedingly rare in surface assemblages (Buccellati and Kelly-Buccellati 1988 : 44-45, Wilkinson and Tucker 1995). None of the eight sites of the Ninevite 5 period in the THS area can be placed with confidence in any specific sub-phase. In all likelihood, the majority of the Ninevite 5 sites and settled area in Fig. 4 should be considered to be late in the period.

The 1999 surface collection estimated that Hamoukar grew to 105 ha in the final phase of the Ninevite 5 period, mirroring the expansion of nearby Tell Leilan in Leilan phase IIId (Ur 2002, Weiss and Courty 1993 : 35-36). Surface indications suggest that full occupation continued for the remainder of the 3rd Millennium and probably lasted into the post-Akkadian period as well. In the THS area, sherds of the middle to late 3rd Millennium BC were found on 31 sites, almost half of the total sites in the THS area ; in most cases these sherds were in

ceramic assemblages in any published form, and therefore cannot yet be used for fieldwork purposes. Therefore we continue to use the terminology of Wilkinson and Tucker (1995).



11. Mid-Late 3rd Millennium settlement in the THS area.

very low quantity and in a very battered condition. The interpretation of these sherd scatters as the remains of actual settlement must be viewed critically. Particularly in the case of small low mounds, it is very likely that the majority of these sherds arrived on these sites by the process of 3rd Millennium manuring, the deliberate application of site-derived debris onto agricultural fields in order to raise crop yields (Wilkinson 1982, 1989). The resulting continuous carpet of sherds ("field scatter") covers the plains of northern Mesopotamia at a very low density, but it also extends onto ancient sites. Abandoned sites would have been used as agricultural land in the past as they are today ; during the urban phase of the 3rd Millennium, when agricultural intensification was necessary to sustain the large population of Hamoukar, the surfaces of former settlements would have been placed under cultivation.

The challenge faced by survey archaeologists is to discern field scatter surface assemblages from settlement surface assemblages. The key to this distinction is in the condition of the sherds. The surface assemblages of plowed-out low mounds tend to contain a high percentage of large sherds with angular fresh breaks. However, the 3rd Millennium sherds on many of these low sites are smaller, with abraded surfaces and fractures. This is the morphology of field scatter, not a settlement surface assemblage.

Of these 31 sites, the surface assemblages of fourteen can be interpreted as representing occupation at this time, for a total of 125.6 ha (Fig. 11). At 105 ha, Hamoukar represents almost 85% of this settlement. Other occupied sites included small villages on nearby tells, most of them roughly 5 km from Hamoukar, near the THS survey limits (THS 4, 8, 44 and

59). If we are interpreting sherd scatters correctly as indicating settlement instead of ancient manuring, then nine other sites were occupied at this time, all very small (<1 ha). Based on the results of the intensive North Jazira Project and Tell Beydar surveys, Wilkinson has developed a morphological model which states that 3rd Millennium settlement is strongly associated with high mounded sites and generally absent from small low sites, which tend to be prehistoric or Iron Age (Wilkinson and Tucker 1995, Wilkinson 2000b). The THS results partially support this model in that all of the tell sites in the survey region were occupied in the 3rd Millennium, but the presence of 3rd Millennium sherds on some low mounds in the THS area suggests that settlement morphology may have been more varied at this time than has previously been appreciated.

Despite the important political and social changes (Steinkeller 1998) as well as climatic events (Weiss and Courty 1993) which have been proposed, it has proven difficult to subdivide this period in excavation contexts, let alone based on surface assemblages. The "sila bowl," which some consider to be an Akkadian period rationing standard (Senior and Weiss 1992), appears in both ED III and Akkadian contexts at Tell Brak (Oates 2001a: 193-94); it is better interpreted as a product of the increasing mass production and craft specialization of potters at the time of urban expansion in the mid-3rd millennim BC (Stein and Blackman 1993). Lyonnet attempted to make a ceramic differentiation between Leilan phases IIa (ED III) and IIb (Akkadian) for the Muhammad Diyab surface collection but noted that most of her types occurred in both periods; her survey of the western Upper Khabur basin lumps them into a single phase (1990:74-75, 2000, but see now Ristvet and Weiss 2000). At Tell Brak, the only site in the basin with a ceramic sequence that can be stratigraphically connected to a historical southern Mesopotamian ruler, it has been demonstrated that most types span two or more phases of the 3rd Millennium BC (Oates 2001a). This includes all of the most common THS types (Fig. 12). Pottery production was decentralized under many independent specialists, not tightly controlled by large institutions via attached specialists (Stein and Blackman 1993: 53-55), so it is perhaps not surprising that existing ceramic traditions would continue unchanged by political shifts.

The question of post-Akkadian settlement in the THS area depends to a large extent on the chronological interpretation of comb incised decoration (Fig. 13). In the final phase strata in the lower town excavations on Hamoukar (Areas C, E, and H), this type of decoration is very common (see Gibson *et al.*, this volume). At Tell Brak it occurs in Phase M (Akkadian) and Phase N (post-Akkadian) levels, although at low frequency in both. However, Joan Oates distinguishes between an elaborated Akkadian variety and a simpler post-Akkadian version which normally consists of a wavy band framed by two horizontal bands (2001a: 164-65). The latter predominates in excavated lower town contexts on Hamoukar and in surface collections from the THS area, where it is found on all of the high mounds (THS 4, 8, 44, and 59). Other distinctive Brak post-Akkadian types are found on Hamoukar and its satellites, but these types are too infrequent within the ceramic repertoire of the time to be used as survey diagnostics. On this basis, we propose tentatively that the early post-Akkadian (Ur III in the southern historical chronology) settlement landscape was essentially identical to that of the post-Ninevite 5 (ED III-Akkadian) period which preceded it, and that the settlement reorgani-

zation which is manifested by the Khabur period occurred well after the rise of the post-Akkadian late 3rd Millennium Hurrian kingdoms known from Brak and Mozan.

The Ancient Name of Hamoukar. The 1999 surface collection established the size of mid to late 3rd Millennium BC Hamoukar at 105 ha, making it the largest city in northeastern Syria, with the exception of Tell Mozan (Ur 2002). It was also wealthy : at a time when baked brick was a rare commodity, even in the public buildings at Brak (Oates *et al.* 2001) and Leilan (Senior 1998 : 254), every trench into 3rd Millennium levels at Hamoukar has produced extensive baked brick pavements, and the surface of the lower town is covered in abundant fragments. Its size, wealth, and proximity to the Tigris makes it unlikely that Hamoukar escaped the notice of ED III and Akkadian rulers to the south.

One of the year names of Naram-Sin was "the year (when) Naram-Sin won a battle against Subartu in Azuhinum (and) captured Tahish-atal" (Gelb and Kienast 1990 : 51-52 [D-13], translation after Steinkeller 1998 n. 54). Both Azuhinum and Tahish-atal are Hurrian names. Azuhinum is also mentioned in a fragmentary royal inscription of Naram-Sin, recording a campaign against cities with Hurrian names (Michalowski 1986a, 1986b). According to the reconstructions of Frayne (1993) and Steinkeller (1998), this campaign began by marching up the Euphrates to Tuttul, continued northeast across the Jazira to Urkesh (modern Tell Mozan) in the Upper Khabur, and ended by crossing to the east side of the Tigris. It is between Urkesh and the Tigris that the battle with Tahish-atal was fought at Azuhinum. In the 2nd Millennium BC, there are references to Azuhinum in texts from Rimah, Mari, and Nuzi (Finke 1993, Groneberg 1980). Some of these are probably references to a second town of this same name in the Nuzi region (Astour 1987 : 16 n. 93, Potts 1994 : 22), but some may refer to the Azuhinum in the Jazira.

The largest cities of the 3rd Millennium between Urkesh and the Tigris are Leilan (90 ha), Hamoukar (105 ha), and Tell al-Hawa (66 ha), which were connected by roads at this time (see below) ; slightly off this direct line are Tell Rumaylan (not surveyed but large) and Tell Taya. Leilan has already been identified as Shekhna in the 3rd Millennium BC (Whiting 1990). Out of these candidates, I would propose that Azuhinum is either Hamoukar or Tell al-Hawa. If the Jaziran kingdom of Azuhinum did continue into the 2nd Millennium, then it was probably Tell al-Hawa, which was as large as 66 ha at that time (Ball *et al.* 1989 : 34-35). On the other hand, if the 2nd Millennium references are to a kingdom in the eastern Tigris region,[9] then Hamoukar, on account of its size and wealth, is a better candidate for the seat of a Hurrian king important enough to be mentioned in an Akkadian year name.[10]

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[9] Mari texts record a king Shadu-sharri of Azuhinum (ARM 14 106) but Wilhelm (1989 : 15) places this Azuhinum in the eastern Tigris region.

[10] Note that Steinkeller's hypothetical position of Azuhinum (1998 : Fig. 3) places it at almost exactly the location of Hamoukar.

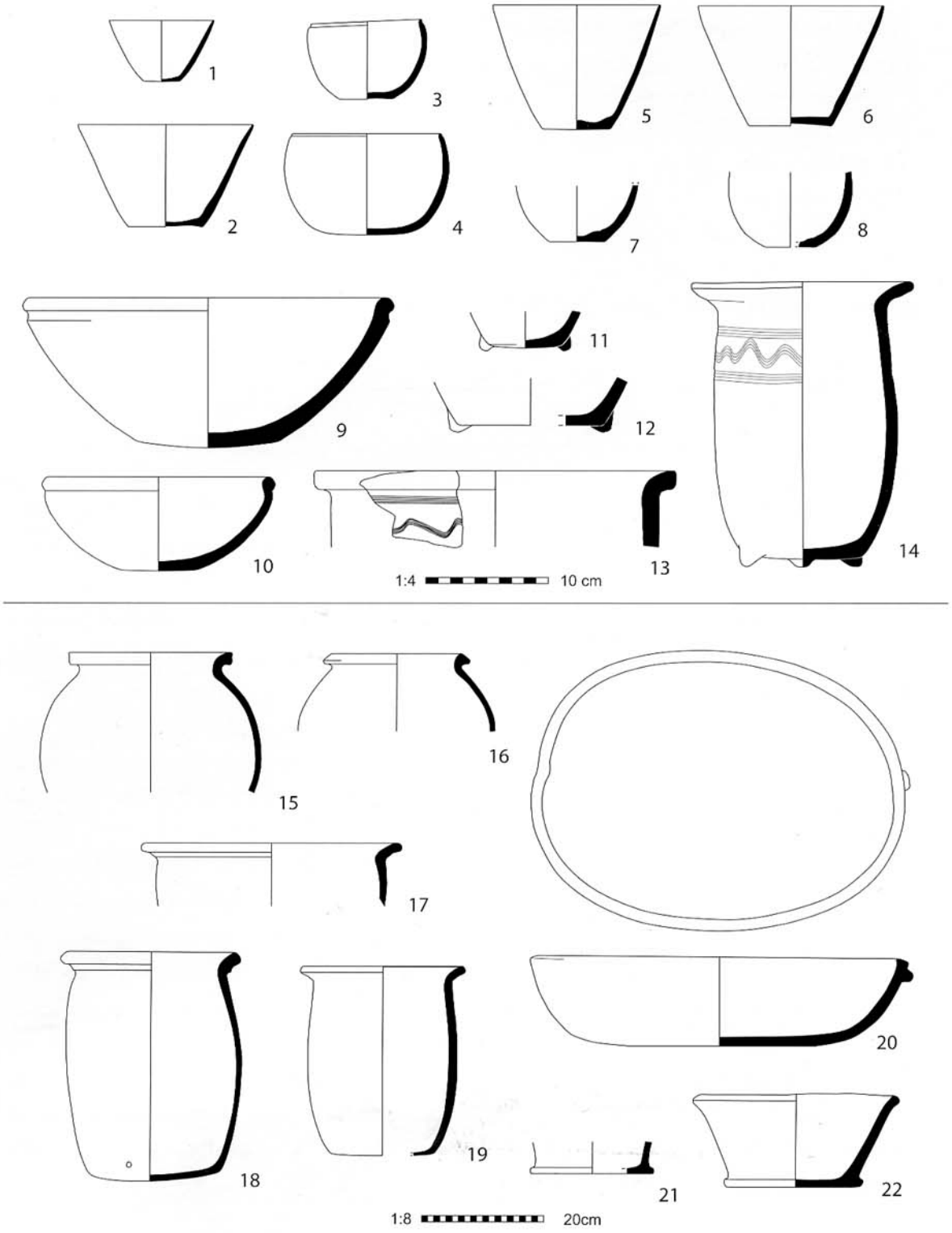


Fig. 12. THS Mid-Late 3rd Millennium diagnostic types.

Fig. 12. THS Mid-Late 3rd Millennium diagnostic types.

Type 33: Stonewares.
1. C.1431. Gray vitrified surfaces with yellow horizontal streaks, blue-gray core; No visible temper; stoneware. Rim dm. 8.5 cm. Area H Locus 6.
2. C.536. Pink surfaces with yellow patina (pink to red horizontal streaks); No visible temper; stoneware. Rim dm. 14.0 cm. Area H Locus 6.
Type 413: Beaded-Rim Cup.
3. C.535. Yellow-green surfaces; fine semi-sandy fabric; complete. Rim dm. 9.0 cm, base dm. 4.5 cm. Area H Locus 6.
4. C.2953. Pale green surfaces, green core; fine sandy fabric. Rim dm. 12.0 cm. Area H Locus 19.
Types 30 (Beaker Base) and 414 (Beaker Rim).
5. C.277.1. Yellow surfaces and core; occasional fine lime, sandy fabric. Rim dm. 13.6 cm, base dm. 5.5 cm. Area H Locus 6.
6. C.277.3. Yellow-green surfaces and core; occasional medium chaff, sandy fabric. Rim dm. 15.2 cm, base dm. 6.8 cm. Area H Locus 6.
Type 29: Flat Jar Base.
7. C.277.6. Yellow-green surfaces and core; fine sandy fabric; string cut base. Base dm. 4.6. Area H Locus 6.
8. C.277.5. Yellow-green surfaces and core; fine sandy fabric; string cut base. Base dm. 4.1 cm. Area H Locus 6.
Type 404: Gray Round Rim Bowl.
9. C.2355.1. Brown lightly burnished surfaces, black core with orange margins; Occasional medium chaff, common sand. Rim dm. 8.5 cm. Area H Locus 19.
10. C.1724. Pale gray surfaces, brown core; hard fine sandy fabric; traces of burnish on exterior. Rim dm. 18.0 cm. Area H Locus 21.
Type 403: Lug-Footed Base.
11. A.165.15. pale yellow surfaces, pale orange core; common fine chaff and occasional sand. Base dm. 8.0 cm at inflection. THS 1 Collection Unit 64.
12. A.161.6. Pale yellow-green exterior, buff interior, buff-gray core; frequent sand, occasional fine chaff. Base dm. 16 cm at inflection. THS 1 Collection Unit 60.
Type 32: Comb-Incised Decoration.
13. B.526.24. Yellow-green surfaces, pale green core; frequent fine chaff, occasional fine lime. Four-line bands of comb incision. Rim dm. 27 cm. THS 8 (Tell al-Sara) Area A.
14. C.1730. Pale yellow surfaces, pink core; common fine-medium chaff; four-line horizontal bands of comb incision framing four-line wavy band. Rim dm. 17.8 cm. Area H Locus 22. (This vessel also has a type 403 base and a type 412 rim.)
Type 103: Band- or Indented-Rim Jar.
15. A.318.1. Pale yellow surfaces, yellow-buff core; common medium chaff, rare medium lime. Rim dm. 26 cm. Area C.
Type 408: Triangular Cooking Ware Jar Rim.
16. C.277.9. Red to brown burnished exterior, brown interior, thick black core; common medium-coarse chaff and medium dark grit. Rim dm. 21 cm. Area H Locus 6.
Type 412: Folded Ridged Jar Rim.
17. A.353.4. Yellow-green surfaces and core; frequent medium chaff, frequent sand. Rim dm. 41 cm. Area D.
Type 407: Folded Straight-Sided Jar Rim.
18. C.2892. Yellow-green surfaces and core; Common medium chaff. Complete. Warped and irregular. Rim dm. 27.2 cm. Area H Locus 5 Burial 1.
19. C.3131. Green surfaces, black core with orange margins; frequent medium chaff. Incised horizontal line inside rim. Rim dm. 26 cm. Area H Locus 19.
Type 154: Lugged Large Bowl.
20. C.1959. Yellow-green surfaces and core; common fine-medium chaff, occasional fine-medium lime. Horizontal lug handle, "dent" in opposite end. Area H Locus 14.
Types 402 (Flat Extended-Foot Base) and 401 (Flaring Rim Vat).
21. A.53.1. Pink to yellow surfaces, pink-orange core; common sand and occasional fine lime. Base dm. 26 cm. THS 1 Collection Unit 3.
22. C.3149. Pale yellow surfaces, buff-orange core; common-frequent medium chaff. Complete. Rim dm. 32 cm; base dm. 22 dm. Area H Locus 19.

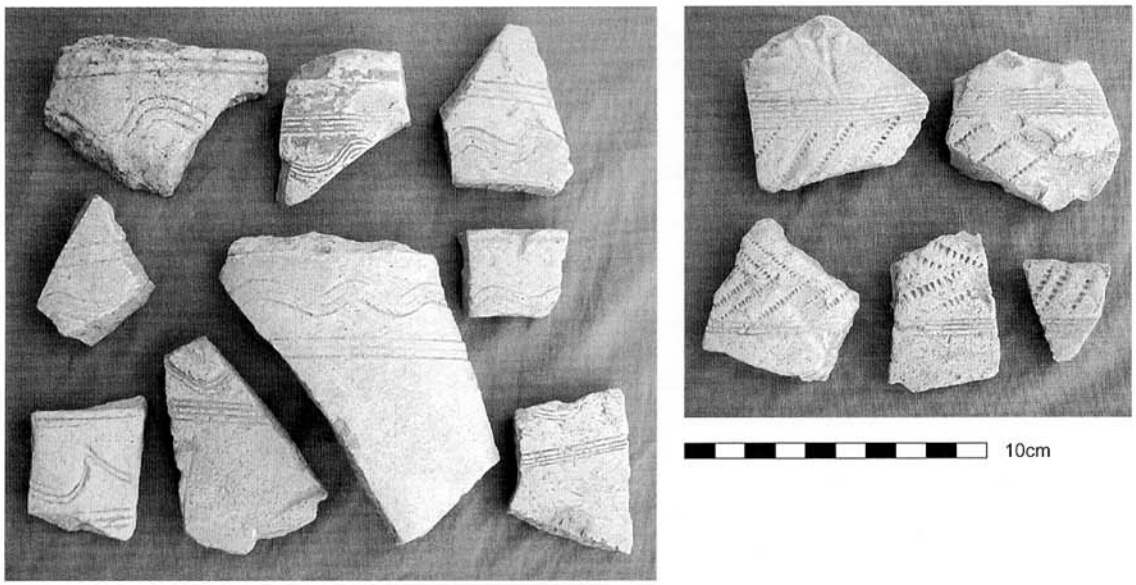


Fig. 13. Comb-incised and diagonal punctate sherds from THS sites.

2nd Millennium BC (Khabur/Old Babylonian, Mitanni, Middle Assyrian). In the 2nd Millennium, settlement underwent a radical reorganization with the abandonment of Hamoukar. The focus of settlement shifted to the 10.4 ha town of Khirbat al-Abd (THS 16); the rest of the landscape consisted of dispersed villages and hamlets totalling 30.5 ha (Fig. 14). Several major Khabur period settlements existed just outside of the THS survey permit: Tell Kotchek, Tell Antar (now called Tell Mas'ud Kabir), and Tell Hadi. The latter two may have had substantial lower town occupation in the early 2nd Millennium, meaning that the rural pattern may be to some extent an effect of the survey limits. This rural pattern continued into the Middle Assyrian period, when Khirbat al-Abd grew to 14.2 ha (Fig. 15).[11]

Iron Age/Neo-Assyrian. Settlement remained rural and dispersed into the Iron Age, although the number of sites grew to 21, the most for any period in the survey (Fig. 16). Hamoukar was reoccupied in the form of a 5 ha village or rural estate on its northeastern corner (Ur 2002); the excavations in Area C have confirmed the initial surface assessment (Gibson *et al.* this volume). Although Khirbat al-'Abd shrank to 2.0 ha, other mid-sized settlements appeared at THS 4 (7.3 ha), THS 29 (4.2 ha), THS 32 (6.4 ha), and THS 40 (4.6 ha). Only nine of these 21 sites had been occupied in the Middle Assyrian period. Without excavation and finer chronological control, it is difficult to say whether the growth of numbers of sites (15 to 21) and total settled area (37.6 to 65.0 ha) was the result of the sedentarization of the Arameans, the forced relocation and settlement of conquered populations from elsewhere, or the expansion of local populations in the context of a pacified landscape under a powerful terri-

[11] We cannot discuss Mitanni settlement at the present state of analysis. As in the North Jazira (Wilkinson and Tucker 1995), Nuzi ware was very rare. Painted "Khabur ware" should be understood to continue into the early Mitanni period (Postgate *et al.* 1997, Oates *et al.* 1997).

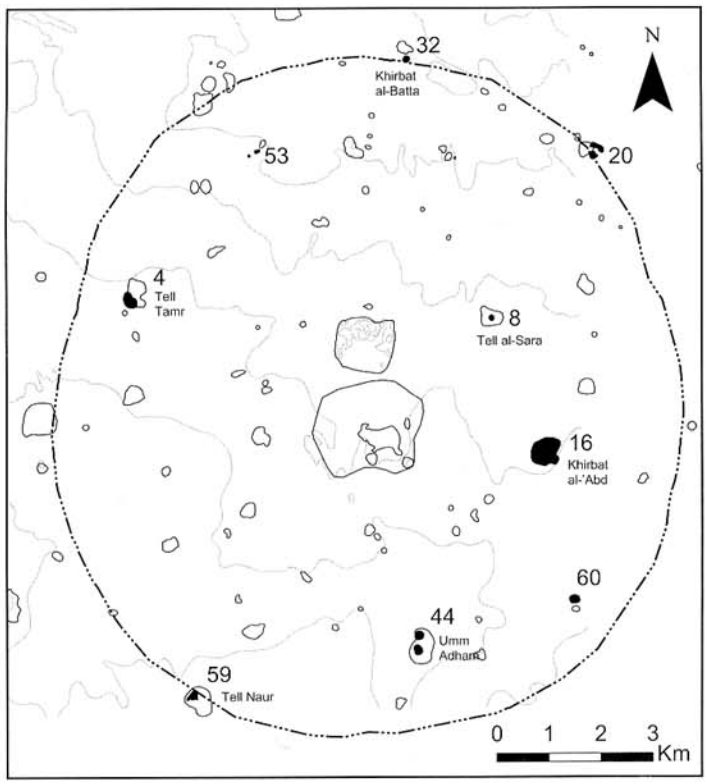


Fig. 14. Khabur settlement in the THS area.

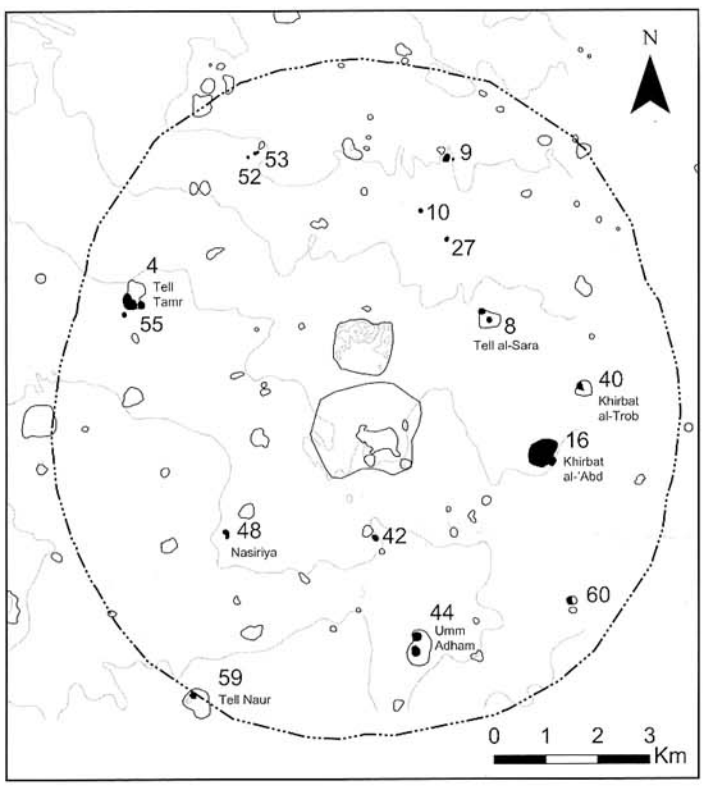


Fig. 15. Middle Assyrian settlement in the THS area.

torial empire (Wilkinson and Barbanes 2000). Within this 300-400 year long ceramic period, the documented settlement pattern probably reflects all three processes.

Hellenistic/Seleucid through Sassanian. Following the Iron Age, political centers moved further and further away from the basin. At the same time, settlement quantities and the total settled area diminished steadily (Fig. 4).[12] Only twelve sites were occupied in the the Hellenistic/Seleucid period, down from 21 Iron Age sites ; nine sites had Parthian occupation. Settlement reached a nadir in the Sassanian period, when only three sites (7.0 ha) were occupied.

Early Islamic-Present. This trend was abruptly reversed in the Sassanian-Early Islamic period, when new sites appeared and several existing villages expanded into towns (Fig. 17). This was a dramatic shift. Numbers of sites more than quintupled from 3 to 17. Settled area increased almost tenfold, although this is certainly an underestimate : al-Botha (THS 43) and Umm Adham (THS 44) have large modern villages and could not be properly collected ; they could be as large as 34.3 ha and 24.3 ha in this period, respectively. If these larger estimates are correct, this would be the most populous period in the settlement history of the THS area.

Thereafter settlement was again reduced up to the present day, but this may reflect a lack of excavated Islamic assemblages with which to date collections, more than actual patterns of settlement. Our settlement patterns for the Mid to Late Islamic periods are very preliminary and require further study. Settlement at present mostly consists of small villages of a few households. Al-Hurriya village at Hamoukar (about 800 persons) is the largest in the area. Almost all villages sit atop some form of ancient settlement, and almost every tell or low mound has attracted modern occupation, even if only a single-room structure. The same settlement inertia which produced the artificial hills dotting the landscape is still in effect today.

IV. Off-Site Studies and Ancient Landuse

Although settlement sites represent the most visible archaeological remains, ancient populations used and interacted with a much larger part of the whole landscape, and many of these activities have left recoverable traces. The small area of the Hamoukar survey permit allowed us the time to intensively investigate two types of off-site archaeological features : field scatters and hollow ways.

A. Field Scatters

Several areas of northern Mesopotamia have a nearly continuous carpet of low density sherd scatter across the landscape. These have been most convincingly interpreted as the remains of ancient manuring, the application of site-derived debris to fields in order to increase yield (Bintliff and Snodgrass 1988, Wilkinson 1982). Studies by Tony Wilkinson in the North Jazira have shown these to be strongly associated with large sites of the mid to late 3rd Mil-

[12] A distinct Achaemenid ceramic assemblage has yet to be defined for Northern Mesopotamia ; for discussion, see Green 1999.

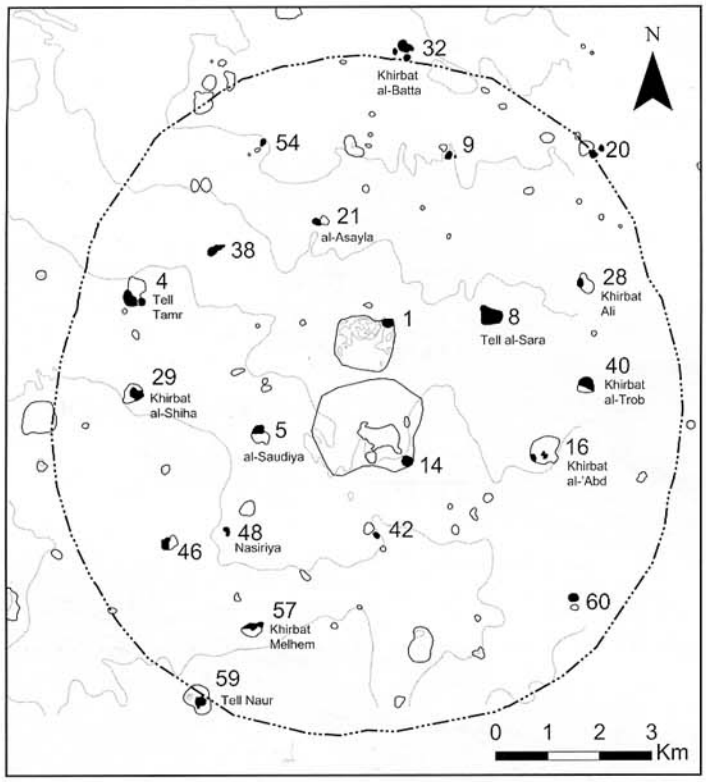
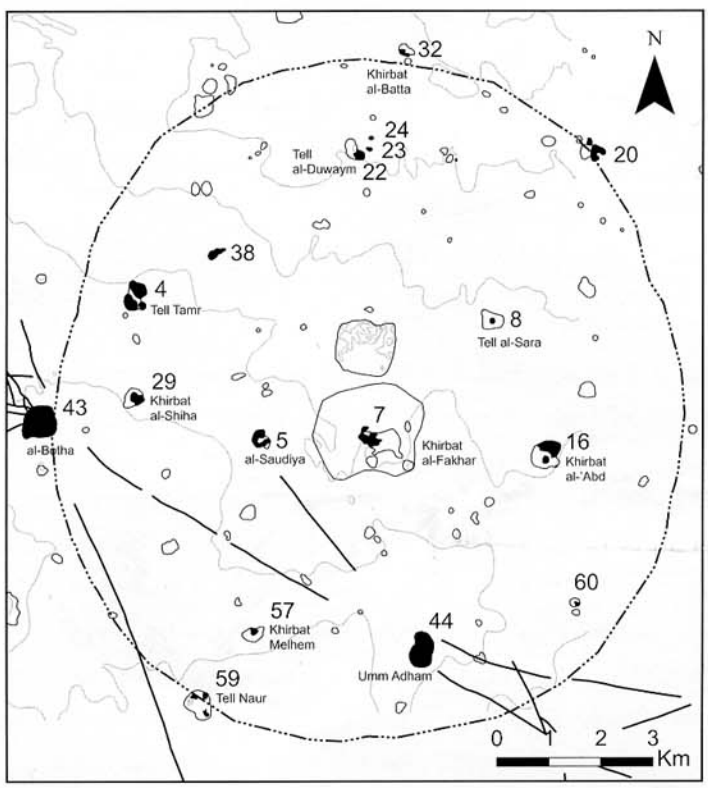


Fig. 16. Iron Age/Neo-Assyrian settlement in the THS area.



17. Sassanian-Early Islamic settlement in the THS area.

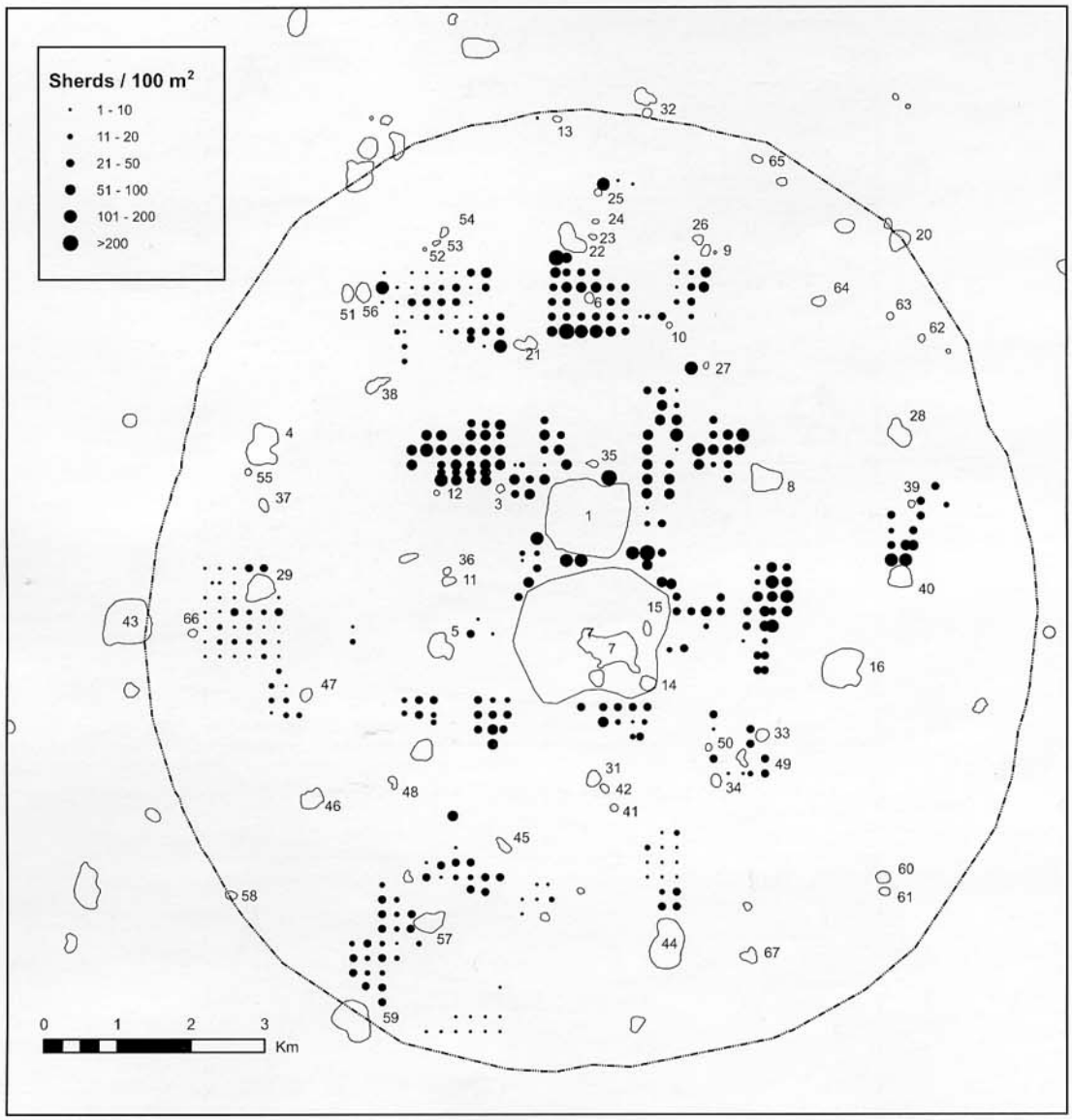


Fig 18. Field scatter collection units in the THS area.

lennium, which would have required this form of agricultural intensification to support large populations in the face of high interannual shifts in rainfall (Wilkinson 1989, Wilkinson and Tucker 1995)

To test this hypothesis, we collected all sherds from 100 m^2 collection units which were positioned by GPS at 200 m intervals (Fig. 18). To insure comparability between our units, they were restricted to fallow fields or fields which had been harvested earlier in the year and then heavily grazed. Grazing greatly improves sherd visibility by removing stubble and breaking up any remaining clods of earth. The uneven distribution of our collection units is due to the presence of early plowed fields and summer cotton crops, which prohibited the investigation of large areas. In all, four hundred and ninety units were collected.

The distribution of field scatter density matched the pattern in the north Jazira: the densest scatters were proximate to Hamoukar and its 3rd Millennium BC satellites (Fig. 19).

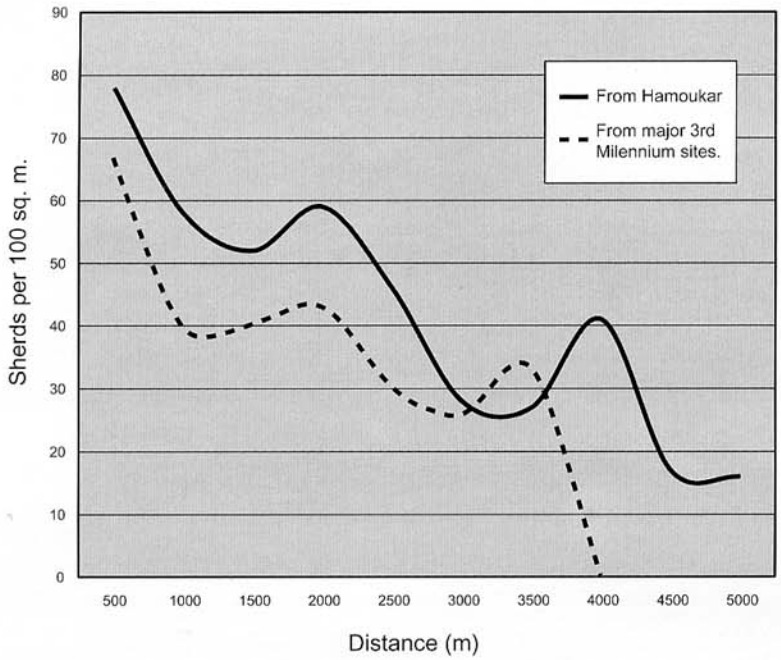


Fig. 19. Decreasing field scatter density with distance from Hamoukar (solid) and from major 3rd Millennium sites (dashed).

The fields northeast and northwest had particularly dense concentrations. In field scatter units within 500 m of Hamoukar, these units averaged 78 sherds/100 m^2; with the exception of a small spike at 2000 m, this average drops steadily with distance from the site, reaching averages just under 30 sherds/100 m^2 at 3000-3500 m before spiking up to 41 sherds/100 m^2 at 4000 m. This second spike is explained because at this distance from Hamoukar, these units were now falling within the zones of intensive manuring of Hamoukar's four main satellite sites (THS 4, 8, 44, and 59). When field scatters are plotted by distance from the five largest mid-late 3rd Millennium sites, this spike disappears. The averages for distance in this second curve are lower, although both follow otherwise identical trajectories. This difference suggests that Hamoukar's satellites also practiced manuring with diminishing frequency further from the site, but at a lower overall intensity than at Hamoukar itself. These patterns support the manuring model. The urban growth of Hamoukar was accompanied by agricultural intensification in the fields adjacent to the site and its neighbors.

Besides the mid to late 3rd Millennium, the two other periods of greatest settlement in terms of both site numbers and total population were the Iron Age and Sassanian-Early Islamic periods. However, field scatters are not as closely associated with sites of these periods. At the western edge of the THS area, a large expanse of clean fallow fields lay between the major Sassanian-Early Islamic town of al-Botha (THS 43) and the important Iron Age town of Khirbat al-Shiha (THS 29). The 44 collection units in this area averaged only 11.7 sherds/100 m^2. The farmers had either lost this technique, did not use it for cultural reasons, or simply found it unnecessary, despite the relatively large populations that the region carried at those times.

This interpretation of field scatters has been criticized on the grounds that the ancient surface is now buried (Weiss and Courty 1994, Courty 1994 : 56). It is certainly true that there has been aggradation over land surfaces, but this has been localized rather than uniform across the entire landscape, mostly in the narrow wadi floodplains (Wilkinson, this volume). For example, the effects of alluviation on field scatters is noticeable around the 3rd Millennium village at Tell Naur (THS 59), where the area immediately east of the site had very low density scatters despite optimum ground visibility at the time of survey (Fig. 20). This appeared to contradict the predicted proximity of dense field scatters to 3rd Millennium sites. A possible reason for these low field scatter densities was revealed when the collection units were plotted on a CORONA image from May 1972, which showed the dark traces of a relict wadi.[13] In all likelihood, the gradual infilling of this feature has obscured most traces of field scatters. However, field scatter collections in the fields to the north of Tell Naur produced densities in line with the 3rd Millennium manuring model.

B. Hollow Ways

The Hamoukar survey also investigated the broad linear depressions commonly called hollow ways. These features were initially studied in the basin by Van Liere and Lauffray (1954-55, Van Liere 1963) and recently by Wilkinson (1993, Wilkinson and Tucker 1995) ; both interpreted them as the traces of ancient road systems and noticed a strong association with bronze age tell sites. The availability of CORONA satellite imagery has allowed us to map these features in the Hamoukar survey area and elsewhere in the basin (Ur forthcoming). On these images their troughs appear as dark lines because they accumulate moisture ; their inwardly sloping sides appear white because they are better drained and thus more reflective (Fig. 2 d). These can be easily differentiated from modern roads and tracks, which have recently disturbed surfaces and are highly reflective.

It is important to recognize that hollow ways are not the ancient roads themselves, but rather their surviving traces, in the form of linear depressions, soil marks, and crop marks. The landscape of the Upper Khabur basin has been transformed by thousands of years of natural (Courty 1994) and cultural forces. These sunken roads have been infilled by aeolian and colluvial sediments, eroded by captured rainfall runoff, and most recently reworked by mechanized plowing and irrigation systems. The remnants, which have survived in the form of hollow ways, must be analyzed in the light of these processes.

The pattern of hollow ways in the THS area was initially studied by Van Liere and Lauffray as part of their project to map these features throughout the Upper Khabur basin (1954-55) ; their map shows typical radial networks around Hamoukar and Tell Naur (Fig. 21). In Van Liere's later discussion of Bronze Age capitals (1963), his larger scale map of Hamoukar depicts a different, more complex pattern (Fig. 22). Based on the pattern seen in CORONA photographs and discussed below, it is clear that the small scale basin-wide map of Van Liere and Lauffray (1954-55) is a simplification. It provides a general impression of the

[13] See Wilkinson (this volume) for a more detailed discussion of this feature.

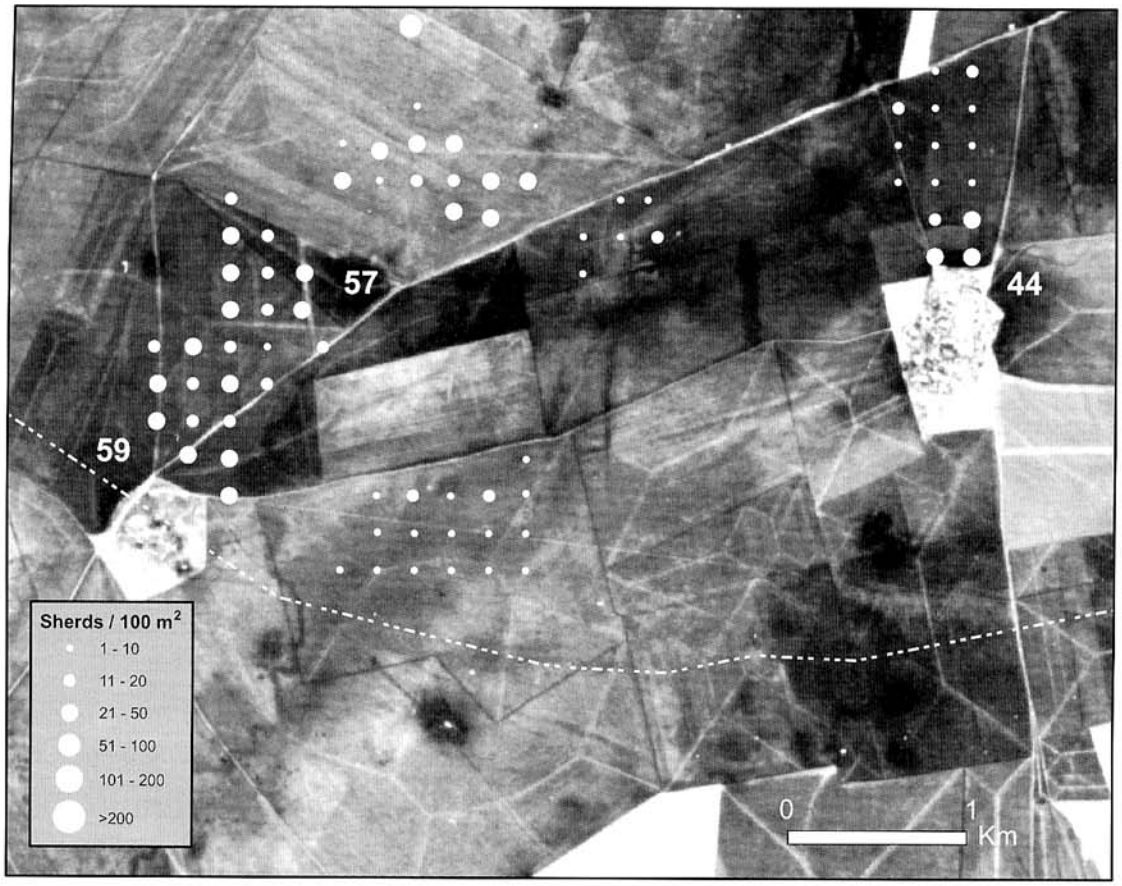


Fig. 20. Field scatters in the region between Tell Naur (THS 59) and Umm Adham (THS 44). CORONA photograph DS1117-1-25DF147 (27 May 1972).

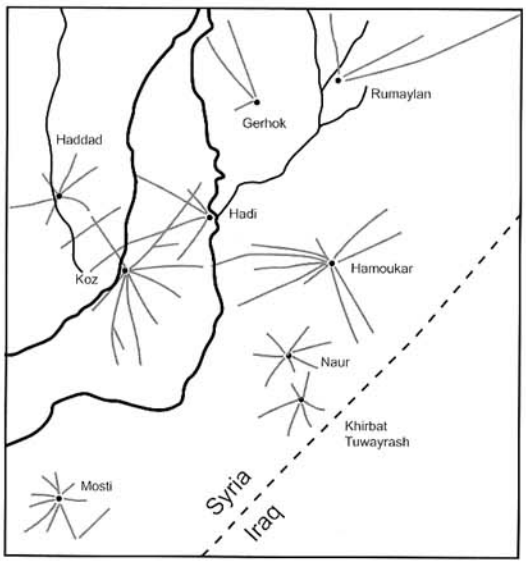


Fig. 21. Van Liere and Lauffray's distribution of hollow ways in the eastern Upper Khabur basin (based on Van Liere and Lauffray 1954-55 : map 1).

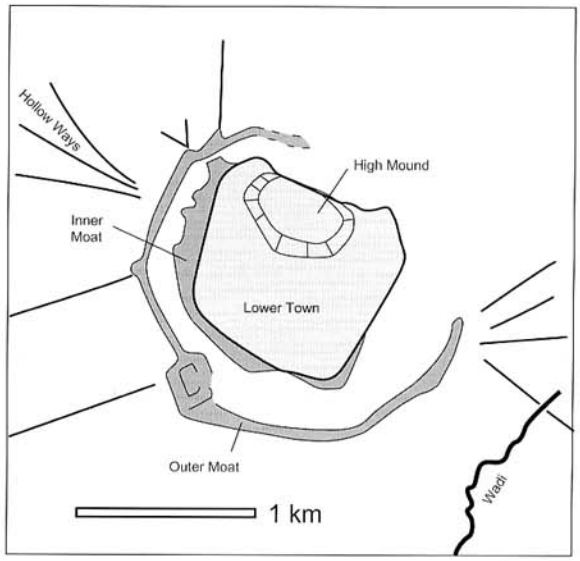


Fig. 22. Van Liere's map of Hamoukar (based on Van Liere 1963 : fig. 3b).

distribution of hollow ways in the basin but does not reflect the actual geographic position of these features and cannot be used to locate these features on the ground (e.g. Weiss 1997).

The THS project has used CORONA imagery to completely remap large sections of the basin, including the THS area, where hollow ways are most visible in the southwestern quadrant (fig. 23). Because they run parallel to the natural slope of the terrain in this area, runoff moisture has been captured, causing erosion. In other areas where hollow ways run perpendicular to the slope, they have impeded surface runoff and have been gradually filled in. These hollow ways are visible only as crop or soil marks in aerial photographs or satellite images.

In the course of the survey, seventeen hollow ways were visited on the ground and profiled. Three of these had no topographic expression, having been either filled in by surface colluvial aggradation or obscured by mechanical plowing since the late 1960's, when the CORONA photographs were taken. The other fourteen hollow ways featured a range of widths and depths, but two general groups can be distinguished (Fig. 24). The broad group averages a width of 100 m and a depth of 0.5 m ; the narrow group averages a width of 45-50 m and a depth of 0.25 m.

The broad group is primarily associated with 3rd Millennium settlements. A number of broad hollow ways can be tied to a particular point along the western edge of the Hamoukar lower town, where re-entrant contour lines suggest the location of an ancient gate or point of access into the 3rd Millennium city. A similar association between 3rd Millennium gates and hollow ways has been proposed at Tell Beydar (Lebeau 1997, Wilkinson 2000b). The narrow hollow ways are associated with one of the other times of settlement expansion, the Sassanian-Early Islamic period, particularly the towns of al-Botha (THS 43) and Umm Adham (THS 44). This confirms the original dating of narrow hollow ways to the Byzantine period, proposed by Van Liere and Lauffray (1954-55).

These ancient networks probably originated for economic reasons : the movement of people and animals to and from the agricultural fields which sustained their settlements, and the movement of settlement-based herds to and from pastures (Wilkinson 1993). The roads also served local inter-site movement of bulk goods and people, as well as the broader movement of high value raw materials and manufactured goods. We know from the Beydar texts that the king of Nagar paid periodic visits to other towns in his kingdom (Ismail *et al.* 1996, Oates *et al.* 2001), no doubt crossing the plain on these tracks. Official movement such as this was probably made in wagons, which are depicted on contemporary cylinder seals (Oates 2001b : 289-92, Jans and Bretschneider 1998).

In the western and central Upper Khabur basin, these economic roles were manifested in spokelike radial patterns (for local access to fields and pasture) and intersite routes for movement between sites (Ur forthcoming). In the Hamoukar area, such clear patterns are absent. Hamoukar's network of roads was elaborated to the southwest, perhaps due to an interregional east-west route in this direction, the exploitation of marsh resources by Hamoukar, or simply accidents of survival. Two roads joined in order to ford a wadi (now completely filled in) near THS 47 ; they then forked, with one branch heading toward the gate in the western edge of the lower town, and the other heading for the gate at the southwestern corner, which is also visible in the contours. Northeast of the site, a track from Tell Tamr (THS 4) split into two branches, one heading to the western gate and the other by-passing the site to the north.

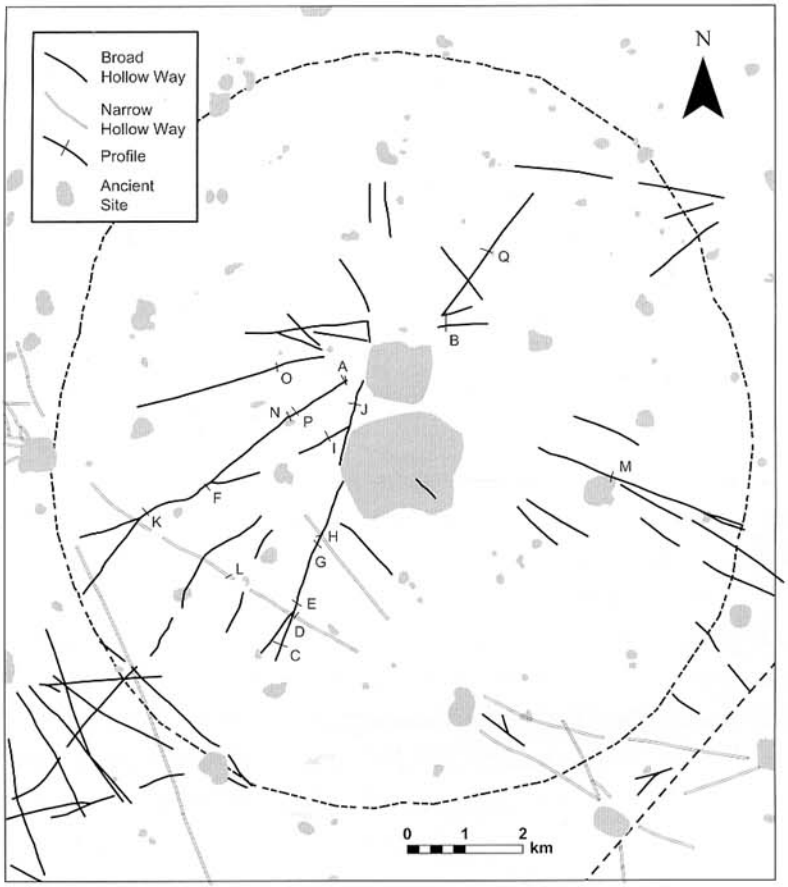


Fig. 23. Hollow ways and profiles in the THS area.

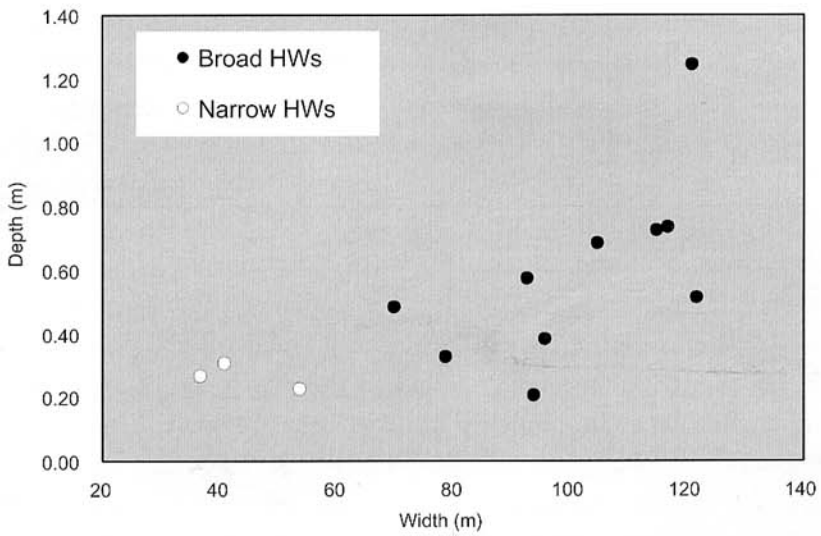


Fig. 24. Hollow way width vs. depth in the THS area.

The orientation of the set of three hollow ways to the northeast suggests that there may have been a gate at the north edge of the site as well. Elsewhere in the THS area, fragments of broad hollow ways can be found which are all generally fixed on Hamoukar.

Beyond the immediate hinterland of Hamoukar (Fig. 25), a few radial systems have survived around tells between Hamoukar and Leilan, but most important is a series of intersite hollow ways which connected these two major cities via smaller tells. To the southeast of Hamoukar, this same route continues to join with the Tell al-Samir-Tell Uwaynat route mapped by Wilkinson (Wilkinson and Tucker 1995 : Fig. 24 route E), and ultimately to Nineveh.

Hollow ways served other purposes in subsequent periods, after their communication function had ceased. Because their depressed morphology channeled moisture from surrounding areas, their damp troughs were a convenient source of mud brick material. To the northeast of Hamoukar, a small Middle Assyrian site (THS 27, 0.53 ha) was constructed from material dug out of the adjacent hollow way, which is deeper and wider where brick material was extracted (Fig. 26). To the southwest of Hamoukar, the inhabitants of another small Middle Assyrian settlement (THS 11, 1.8 ha) also widened and deepened a hollow way in the process of constructing their settlement. In this case, the borrow pit attracted Parthian period settlers over a thousand years later, who continued to mine this hollow way for their settlement (THS 36, 0.88 ha). In this manner, 3rd Millennium urbanism had an unintended impact on the choice of settlement location thousands of years after these cities had turned to ruins.

V. Conclusions and Summary

Within the THS area, we identify four major phases of settlement expansion and four phases of abandonment. In the LC 1-2, both settlement numbers and total area increased dramatically over all previous periods ; this is without considering the unique 300 ha site at THS 7. The mid-late 3rd Millennium saw unprecedented settlement nucleation, when almost 85% of the population lived at Hamoukar. This urban phase had a long lasting impact on the surrounding landscape. If the mid-late 3rd Millennium was the Age of Cities, then the Iron Age was the Age of Villages. Numbers of sites, which had been growing since the early 2nd millennium, reached a peak ; almost all were very small. The final phase of expansion was the Sassanian-Early Islamic period, which could be called the Age of Towns : no one center dominated, but four sites exceeded 10 ha.

Four periods of settlement reduction or abandonment were identified. Only one of twelve Halaf sites continued into the Ubaid period, for which we only recognized two settlements. The 3rd Millennium urban system collapsed prior to the Khabur period, which was strongly rural in the THS area. The millennium following the Iron Age saw a steady decrease in sites and settled area culminating in the Sassanian period, for which only three small sites were documented. The decline of Sassanian-Early Islamic towns also appears to be abrupt, but we must reserve final judgement until a more detailed study of the mid to late Islamic ceramics can be made.

The THS has also demonstrated the utility of GIS and remote sensing applications. The combination of CORONA-based site identification and GPS navigation greatly improved site

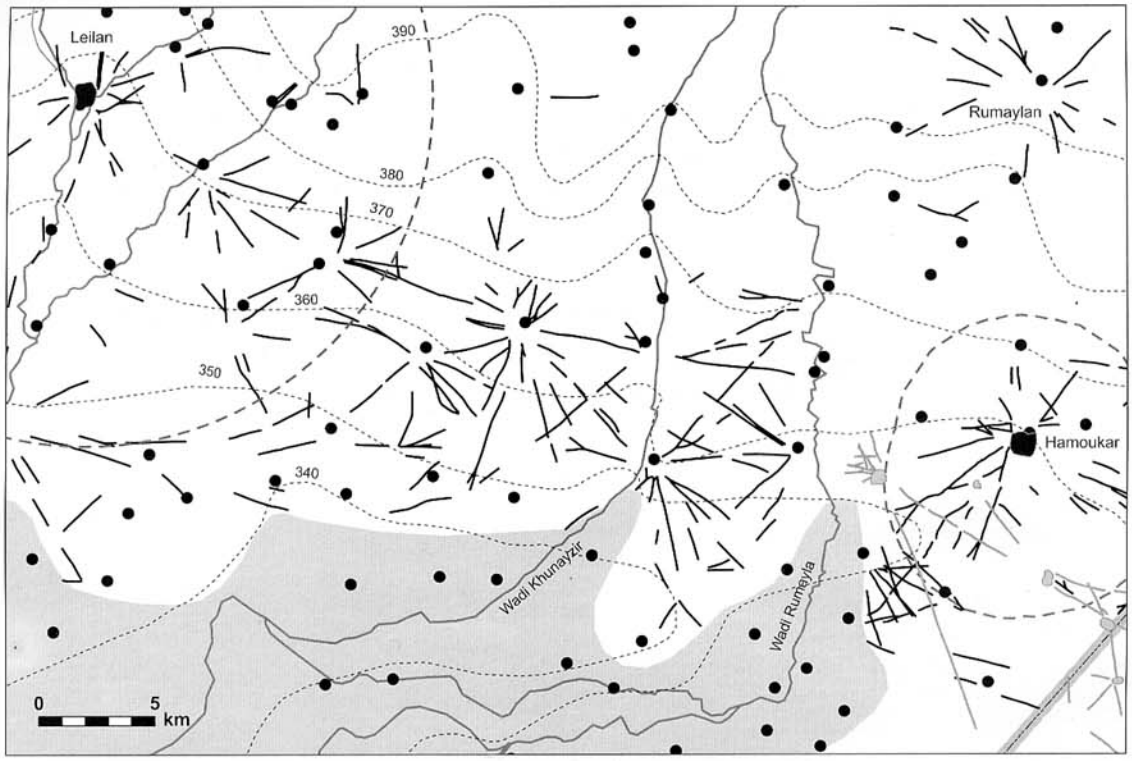


Fig. 25. Hollow ways in the eastern Upper Khabur basin. The gray area is marsh.

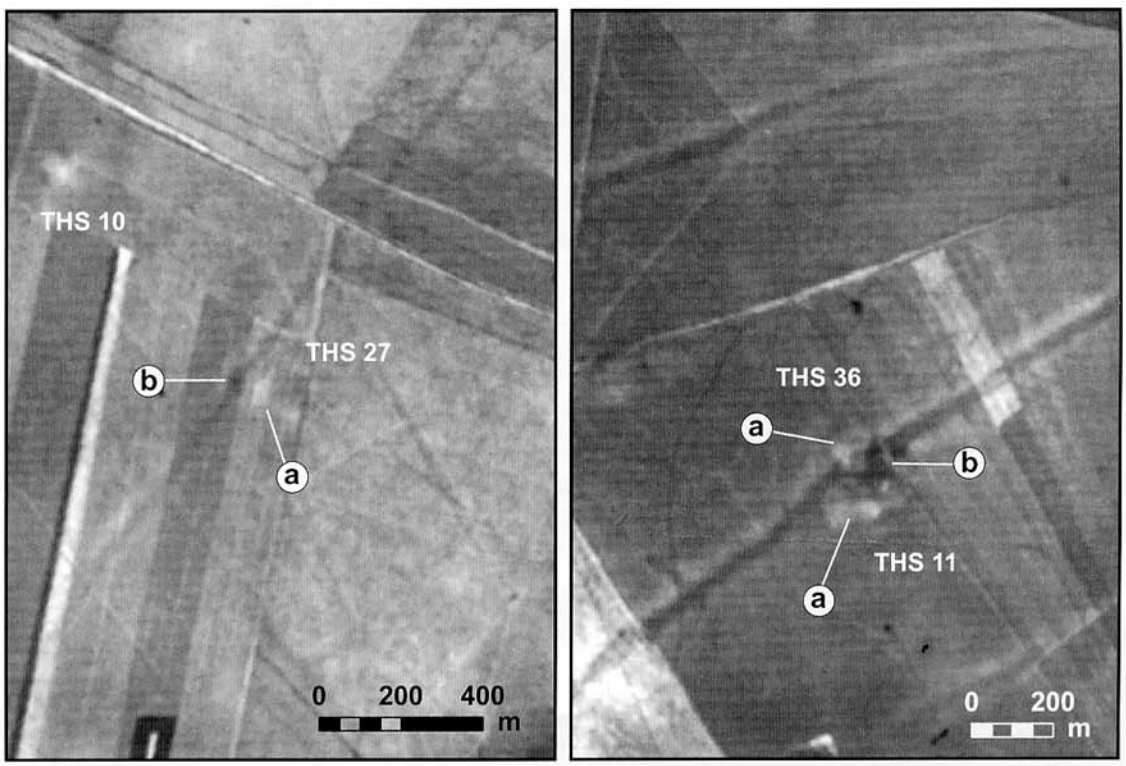


Fig. 26. Hollow ways reused as brick pits at THS 27 and THS 11/36. CORONA photograph DS1108-1025DA005 (6 December 1969)

recovery rates and collection times. Indeed, without such tools, the location of most of the small prehistoric sites would have required walking ground transects. GPS mapping and positioning of sites and collection areas permitted accurate quantification of sherd densities and overall aggregate settlement area. Overall, we were able to implement a full coverage high intensity site collection methodology but still undertake extensive documentation of off-site archaeological features.

The small area investigated by the Tell Hamoukar Survey has demonstrated the rich settlement history of the area, and its potential for intensive settlement and landscape survey. We hope to further document settlement expansion and contraction, urbanization and ruralization, and off-site land use patterns across a greater area of Northern Mesopotamia in the future.

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