Settlement and Economic Landscapes of Tell Beydar and its Hinterland

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1. Introduction

The present report summarizes some of the more noteworthy results of archaeological surveys conducted in the Tell Beydar area during 1997 and 1998. Following a summary of long-term trends in settlement, we examine in greater depth the settlement pattern and economic landscapes of the third millennium, a period when Tell Beydar attained its greatest size and regional significance. The results presented here complement those already published in Subarta for the 1997 field season (Wilkinson 2000a) as well as a general perspective on settlement trends in the second millennium BC (Wilkinson 2002).

The Tell Beydar Survey’s investigations into settlement and landscape in the central Upper Khabur basin represent the most systematic approach to a region that has witnessed a great deal of archaeological investigation over the last century. Aside from brief early visits by Layard, Sarre and Herzfeld, and von Oppenheim, the first in-depth study was that of the Jesuit priest and pioneering aerial archaeologist Anton Poidebard, who flew over the region as part of his study of the Roman landscapes of the eastern frontier (Poidebard 1934). Although his interests were foremost in the Roman period, he often photographed the more impressive prehistoric mounds, including Tell Beydar (Poidebard 1934: Plate CXXXV; see also Brossé 1929). The region was part of a brief reconnaissance by Max Malloian (1936), who used his results to choose sites for excavation. Truly systematic survey began with the aerial survey of Willem van Liere and Jean Lauffray (1954-55). Their study revealed the patterning of sites and routes of communication of the Early Bronze Age (EJ III-V). In more recent times, the central basin has witnessed low intensity surveys of the Jebel Abd al-Aziz (Hole 2002-2003; Kouchoukos 1998), the immediate hinterland of Tell Brak (Eidem – Warburton 1996, now being systematically expanded and intensified by Henry Wright), and especially the basin west of the Jaghjagh (Lyonnet 1996a; 1998; 2000). Most recently, Paul-Louis Van Berg has been documenting settlement and rock art on the edges of the basaltic plateau west of Tell Beydar (Van Berg – Picalause 2003; Van Berg et al. 2004).

One of the exciting features of the landscape of the Upper Khabur basin is that it is possible not only to map the pattern of the third millennium sites, partly from the distinctive distribution of tells, but also one can estimate their economic landscapes from the pattern of hollow ways that radiate from the main sites. The Tell Beydar area successfully lends itself to this type of landscape study, with the bonus that economic texts from the excavations provide evidence on the organization of the local economy. The Tell Beydar survey team, together with colleagues from the Oriental Institute Chicago, have therefore been using the Tell Beydar area as one of several examples of economic landscapes that can be simulated using agent based models to suggest how such communities developed, were sustained by their local agricultural and pastoral economies and, in turn, responded to various forms of environmental, economic and social stresses. Particularly useful is the location of Tell Beydar in a climatically marginal zone of the rain-fed farming steppe of the Khabur where rainfall, at approximately 250-300 mm per annum, results in a precarious agricultural economy subject to crop occasional crop failures.

2. Geomorphology and Taphonomic Processes

A preliminary statement has already been made on the geomorphology of Beydar area together with some representative soil descriptions (Wilkinson 2000a:3-5 and Appendix A). The area can be subdivided into three main geographical zones:

a) The valley floors, and floodplains of the Wadis Aweidj and Zerqan. These broad lowlands represent the areas of primary and long term settlement, and are the areas where tells and lower small sites predominate. Because these also represent the areas where settlement was of longest duration (the oldest discovered site being Hassuna/ceramic Neolithic in date), one can assume that the landscape has been heavily disturbed by ploughing and under almost continuous cultivation for a period of some 8000 years. As a result, many smaller archaeological features must have been ploughed away, some sites might have been reduced to little more than artefact scatters and negative features such as mud brick extraction pits infilled by plough wash or otherwise obscured. Nevertheless, despite the operation of these processes, this area has a considerable amount of archaeological sites, and it can reasonably be assumed as having been the area with most long term sedentary settlement.
The valley floor area was also particularly subject to environmental changes, first as a result of shifting channels, second, due to changes in climate and hydrology and third as a result of changes in vegetation. CORONA satellite images demonstrate that the narrow sinuous channel of the Wadi Aweidj has been subject to a number of channel shifts which are evident in the form of faint, narrow sinuous palaeochannels to the east and west of the present channel to the north east of Tell Beydar (Fig. 1).

In terms of climate change, Courty (1994) has argued that the wadis of the Jazira, including the Wadi Aweidj, had experienced significantly increased flow during the mid-Holocene. There is now increased evidence in support of this from the Beydar area (Wilkinson 2000a:4-5) as well as from the River Jaghjagh to the east near Tell Brak. In the latter area, dated sedimentary profiles indicate that the flow of the Jaghjagh was more vigorous during much of the 4th and early 3rd millennium BC, and that there would have been an alignment of gallery woodland along much of the valley (Deckers and Riehl 2007). Although the evidence in the Wadi Aweidj for increased water flow is less clear (after all the Jaghjagh had a significant flow until the second half of the twentieth century BC), the field evidence argues that the prehistoric environment was considerably more verdant than it is today.

b) In between the valleys the gentle valley side slopes rise up to low interfluves, and to the east of the Wadi Aweidj parallel tributaries of the Khabur, and the Aweidj itself flow towards the SSE and S. Although tells are rare in this area smaller sites are frequent and it appears that these areas were colonized rather late in the history of settlement of this area (see below). During much of the Bronze Age, when settlement on tells was concentrated on the valley floors of Zone a), this zone may have formed an area of pasture, as well as a source of scrub and perhaps woodland for fuel.

c) Finally, extending over some 500 sq km in much of the western half of the survey area is the broad basalt plateau of the Hemma. The Hemma extends between Wadis Zerqan to the west and the Aweidj, in the centre of the area, and is surmounted by the high volcanic hill of Jebel Gudj. Within this area, mounded sites are rare, and it appears that the Hemma represents a classic landscape of survival. In other words, because intensive, long term sedentary settlement is rare in this region, if settlement did take place, it has a much higher chance of survival than would have been the case in the intensively farmed and settled area of valley floors. Only a few smaller sites were recorded during the 1997 and 1998 seasons, but this modest recovery has been increased in recent years by the surveys of P-L Van Berg (Van Berg/Picalause 2003).

Compared to the situation of the late 1950s when the soils of the Khabur Basin were mapped by Van Liere and the area was very sparsely settled by sedentary communities, but instead was host to large numbers of nomads in tents, the region today is almost totally under cultivation. Even the basalt plateau of the Hemma, which appears to represent a long term pastoral resource, has been largely ploughed. However, parts of this area, especially the surrounding scarp slopes remain un-ploughed, and because of this there remain considerable areas of rock art and related fragile archaeological features (http://dev.ulb.ac.be/crea/AccueilFrancais.php?page=Kisham).

3. Patterns of Settlement

In two brief field seasons (1997 and 1998), the TBS recorded eighty-three sites covering 269.7 hectares of settlement within the 450 km² survey region. At 0.18 sites per kilometer, overall settlement density was much lower than more intensively surveyed regions of the eastern Mediterranean, but also lower than other areas in northern Mesopotamia (Wilkinson et al. 2004). This low density is almost certainly a result of the presence of the Hemma plateau within the survey region, the thin soils of which are poor for agriculture and therefore do not attract permanent settlement. If the 136 km² of basalt plateau are discounted, site density is 0.26 per square kilometer.

3.1. Prehistoric Periods

The surveys of 1997 and 1998 provided no evidence for occupation during the aceramic Neolithic, but there was a significant number of small settlements during what is now termed the Pre-Proto-Hassuna (Nieuwenhuyse and Wilkinson, this volume). Throughout most of the Late Neolithic settlement continued as small, dispersed settlements, but there is a suggestion that the several of the tells that became such a prominent feature of the Bronze Age landscape had already started to form by the Late Halaf period. Moreover, the presence of a single Halaf sherd from Tell Beydar suggests that Tell Beydar might also have been occupied at this time, but this can only be supported by additional deep sounding at the site.

Sites of the Ubaid period, of which there were five significant and four trace occupations, were only slightly more frequent than those of the Late Halaf (Nieuwenhuyse and Wilkinson, this volume). This may simply be because these occupations represent the earlier phases of tell formation, and are therefore obscured by the mass overburden of mainly Bronze Age date.
3.2. Late Chalcolithic (LC1-5)

Following the Ubaid, when settlements were primarily limited to tells and sites along wadis, there was a dramatic expansion of sites across the landscape. Although the detailed phasing of sites has not yet been completed, it is evident that earlier Chalcolithic sites (equivalent to Late Chalcolithic 2-3) are very widespread with 27 sites of this period being recorded. These sites occupy the main river valleys, the watershed area to the east of the Wadi Aweidj as well as the edges of the basalt plateau to the north of Tell Beydar (TBS 64). The reason behind this extensive spread of settlement is not immediately clear, but that it did not occur in isolation is evident from the fact that during this period Tell Brak to the east also experienced a massive increase in sites in both its immediate periphery (Ur/Karsgaard 2006), as well as in the greater region of Tell Brak.

In contrast, the evidence for sites with southern Uruk or LC 4-5 ceramics is much more sparse, and only two sites (TBS 34 and 38) were found, both of which were on the great bend of the Wadi Aweidj northeast of Tell Beydar (Wilkinson 2000a:10).

3.3. Early Third Millennium (EJ I-II, Ninevite 5)

Early third millennium settlement is difficult to identify because the distinctive range of decorated finewares which serve as the primary type fossils for the Ninevite 5 period appear to be rare or absent in the western part of the basin. Lyonnet’s survey found very few Ninevite 5 sherds along the Khabur River and the Wadis Zerqan and Jirjib, although they were to be found in the northeastern part of her survey, toward the Jaghjagh (Lyonnet 1996a:368-369). Her intensive collection methodology was more likely to recognize rare types than that of the TBS, so we have included several sites where she recognized early third millennium settlement but the TBS did not (Fig. 2). The TBS recognized eight sites (four with Ninevite 5 decorated types) while Lyonnet recognized an additional four (although none with decorated sherds). In the immediate hinterland of the TBS, Lyonnet also found decorated Ninevite 5 sherds at Tell al-Shur and Tell Aswad Tahtani. Such sherds have also been recovered from salvage excavations at Abu Hujayra (Martin 1998).

The twelve sites occupied at this time represents a reduction in the total number of settlements from the fourth millennium; the total settled area, however, remained almost the same. The latter is entirely the result of the new settlement at Tell Beydar. The total area of the EJ Kranzhügel is 22.5 ha, composed of a 9.6 ha central mound, a 7.4 ha outer wall, and a 5.5 ha circular depression between them (see plan in Lebeau 1997), for a total of 17.0 ha of settlement. The TBS did not collect Beydar itself, but incised Ninevite 5 sherds were recovered from the Area G step trench (Suleiman 2003).

The early third millennium landscape thus appears to have been one of small villages or hamlets around a single center at Tell Beydar. Given the close association between sites of this period and linear tracks (see below), it is probable that the communication network which is so strongly marked in the later third millennium had begun to form during this time. Although faunal and paleobotanical studies are lacking, some have suggested that the economy of the early third millennium was heavily pastoral, especially the Kranzhügel (Kouchoukos 1998; Lyonnet 1998; Danti 2000). This raises the possibility that the relatively light sherd assemblages might be the result of ephemeral or non-sedentary occupations. The true nature of early third millennium settlement in the TBS area remains uncertain.

3.4. Mid-Late Third Millenium BC (EJ III-V, ED-Akkadian and Post-Akkadian)

The excavations at Tell Beydar have produced a large assemblage of EJ IIIb ceramics, and to a lesser extent, EJ I-IIa and IV. This sequence (Lebeau 2000; Rova 2003) allows the excavators to make rather precise relative dating assessments for their excavated assemblages, often based on subtle differences in type frequencies. Such is not possible for archaeological survey, where the surface assemblage is a blurred amalgamation of multiple periods of occupation on any given site (Sallaberger/Ur 2004:59-60). To complicate matters further, third millennium ceramic chronology is still contentious due to regional differences in styles across the basin (especially between the western basin around Beydar and the central and eastern parts of the basin around Brak, Leilan and Hamoukar). There are substantial disagreements about absolute and historical chronologies, especially between the sequences from Beydar and Brak; for example, several “Akkadian” (EJ IV) types at Beydar are considered as “Post-Akkadian” (Phase N) at Brak. Ultimately, the relative sequences for the second half of the third millennium are in agreement (compare Oates 2001; Rova 2003). In light of the high degree of ceramic continuity and the ambiguities of the absolute chronology, the TBS used a set of types which certainly cover the EJ III-V (late ED and Akkadian) and probably include some EJ V (post-Akkadian) types as well (as did the Hamoukar Survey; Ur 2002:70).

The TBS recognized mid-late third millennium ceramics on twenty sites (Fig. 3); of these, fifteen were heavily occupied, while five had very light assemblages of the period, within more abundant assemblages of earlier periods. The latter are all small (around 1 ha) and three of them are in the western part of the survey area, near the Wadi Fekka. These minor occupations might represent the traces of non-permanent
settlement, perhaps by seasonally resident pastoral groups. In all cases, settlement occurred on mounds that already had substantial histories of occupation. Indeed, occupation of high mounds is the morphological hallmark of third millennium settlement across northern Mesopotamia (Wilkinson et al. 2004), a pattern that the Beydar data does not contradict.

Settlement at this time falls roughly into a four-tier hierarchy, with 17 ha Tell Beydar at the top. Three sites (Tells Effendi, Hassek, and Farfarara) are between 7 and 10 ha. Five small villages cluster between 4-2.5 ha, and the other six sites are all less than 2 ha. Almost all of the sites with major occupation lay very close to large drainages. This pattern is especially strong along the Wadi Aweidj, where most sites are spaced between 2.5 and 3 km apart. The exceptions are the small settlements at Tell Kaferu (TBS 10, 1.2 ha) and Bergui al-Buz (TBS 22, 1.1 ha), both of which are positioned on the watershed between the Aweidj and the drainages to the east.

As noted for the third millennium landscapes of the Iraqi North Jazira (Wilkinson 1993; Wilkinson/Tucker 1995), the Hamoukar area (Ur 2002; 2003), and throughout the Upper Khabur basin (Ur 2003; Van Liere/Laufray 1954-55), settlements in the TBS area were connected by shallow linear features variously called hollow ways, linear hollows, or routes rayonnantes. These features represent the traces of former trackways stretching between settlements and also leading from settlements to their fields and to the pasturelands beyond them. Alongside the pattern of settlement, these networks of ancient roadways offer clues to the ancient economies of the region (see below).

Emerging tablet finds at Beydar, Ebla and Brak are pushing the later third millennium into the historical era (Archi 1998; Eidem et al. 2001; Ismail et al. 1996). The ability to combine both archaeological and textual data makes for especially powerful interpretations, such as has now been attempted for the “province” of Nabada within the larger kingdom of Nagar (Sallaberger/Ur 2004; Widell 2004). The integration of administrative texts and landscape archaeological data suggests that agricultural and pastoral elements of the economy of the Beydar region were to a large extent controlled by the elite household at Nabada, which produced these tablets. Although the possibility that they are non-representative for the entire economy remains, it appears that this household oversaw almost all plowing activity, or at least maintained oversight of the plow animals (Widell 2004). Furthermore, the population estimates derived from the results of the survey and the record of the personnel lists (Sallaberger 1996) are in remarkable agreement (see Sallaberger/Ur 2004:58-59). Thus it could be argued that the central institutional household maintained some form of control over the entire population of Nabada, although the nature and extent of this control is unclear.

3.5. Early Second Millennium (Khabur, Old Babylonian)

Despite the fact that it was much less urbanized than the Leilan, Hamoukar or North Jazira regions, the collapse of the nucleated third millennium settlement pattern was even more dramatic in the TBS area (Wilkinson 2002). Only a single site (Tell Sekar Foqani, TBS 39) retained a substantial occupation, a reduction from 62.1 ha in the later third millennium to only 3.9 ha in the early second millennium (Fig. 4). Five other sites had very small assemblages of Khabur ware or related chaff tempered sherds, four of which had previously been occupied in the later third millennium. Lyonnet (2000) indicates a minor occupation at TBS 63 that was not recognized by the TBS. In the immediate hinterland of the TBS, she found major occupations at Tell Hanou (confirmed by an informal visit by the TBS) and Tell Dibak, and further ephemeral scatters at Tell Ain al-'Abd and Tell Aswad Tahtani.

The settlement pattern results of the intensive Tell Beydar Survey offer solid confirmation of the general pattern revealed by the extensive western basin survey of Lyonnet. Her survey found Khabur ware to be present to the west of the Jaghjagh but increasingly uncommon as one moves toward the Khabur River (see especially Lyonnet 1996a:371-372 and Fig. 5). Along the river itself, most sites with Khabur ware produced a dozen or less sherds, compared to a site with major occupation like Tell Dibak, from which over 500 sherds were recovered (Lyonnet 1996a:371 fn 18). The western Khabur basin was the zone of pastoralists during the Mari period (see most recently Fleming 2004), and the scattered traces of their non-sedentary presence can be detected archaeologically.

3.6. Iron Age-Neo Assyrian Period

Following on from the development of a significant number of lower settlements below tells and other small settlements during the Late Bronze Age, in the first millennium BC the Beydar area witnessed a significant growth in settlement. In addition to the growth of lower towns below tells, there appeared numerous small settlements that occupied virtually every part of the landscape. Settlement even occurred on the basalt plateau to the west where the small site of TBS 23 yielded a good assemblage of Iron Age pottery. This site has been already interpreted as a possible site of nomadic pastoralists (Wilkinson/Barbanes 2000). Since the original TBS survey, several Iron Age occupations have been recorded, specifically the site of Khisham which is dated to the later phases of the Neo-Assyrian occupation, or perhaps even slightly later (VanSweevelt 2005).
To the east of the Wadi Aweidj, settlement was shown to have infilled the interfleuve areas between the wadis, where a number of small settlements grew up during the Iron Age (Wilkinson et al. 2005: Fig. 12). These sites appear to have developed upon land that was probably open land during the Early Bronze Age. In other words, the landscape was much more fully settled during the Iron Age, although this appears to have taken the form of an even spread of relatively small settlements (except for the extensive lower town to the west of Tell Beydar) in contrast to the more nucleated and concentrated pattern of settlement aligned mainly along wadis during the Early Bronze Age. This pattern of settlement, which is very characteristic of other parts of the Jazirah during the period of the Neo-Assyrian empire (Wilkinson et al. 2005), appears to have taken place primarily during the 8th and 7th centuries BC under the strong administrative presence of the Neo-Assyrian kings. Whether such settlements all took place under the direct administrative oversight of the Neo-Assyrian kings is less certain, and it is likely that these settlements consist of a combination of deliberate foundations, as well as a number of spontaneous settlements by Aramaean and other mobile groups.

3.7. Later Periods

Following the collapse of the Assyrian Empire in 612 BC, the Beydar area witnessed a significant decline in settlement. This persisted throughout the next two thousand five hundred years, with settlement never attaining more than 75% of the settlement peak of the Iron Age. Settlements continued to be small and dispersed, but now most were found in close proximity to the Wadi Aweidj. This thinning of settlement, which is comparable to that recorded by Bertille Lyonnet in her more general tell-based survey (Lyonnet 1996b), is not surprising given that for much of the Roman –Byzantine period the Khabur basin fell within the mutual border between the Roman/Byzantine and Partho/Roman empires.

However, equally it must not be assumed that the pattern characteristic of the Beydar area was typical of the entire upper Khabur basin because further east, near Tell Barri, the Brak survey has recorded a significant amount of settlement for the Hellenistic –Byzantine/Sasanian period. Recent wadi surveys and satellite remote sensing confirm that some of this settlement was probably nourished by a developed system of canal irrigation. In contrast, there is no such evidence for investment in canal systems in the area of Tell Beydar.

4. General Patterns in Settlement Morphology in the TBS Area

As was noted in the interim report (Wilkinson 2000a: Figs. 7 and 8) the settlement pattern of the Beydar area went through marked morphological stages as follows:

- During the Late Neolithic (i.e. Pre Proto-Hassuna through Halaf) settlements were primarily small and dispersed (Nieuwenhuyse and Wilkinson, this volume).
- The Late Halaf and Ubaid (Nieuwenhuyse and Wilkinson, this volume) ushered in a phase of settlement nucleation which occurred primarily along wadis and streams.
- Following the Ubaid, during much of the fourth millennium BC settlement then spread across much of the survey area.
- During the third millennium settlement nucleated dramatically, tells grew in area and height, and there was relatively little settlement in the outlying countryside.
- Following the above-mentioned decline in settlement numbers in the late third and early second millennium, the area was virtually deserted but one or two tells were occupied.
- Resettlement during the last centuries of the 2nd millennium then took the form of a sporadic resettlement of lower towns and occasional small-dispersed settlements, which anticipated the much more vigorous spread of lower towns and rural settlement of the Iron Age. This pattern of rural, dispersed settlement then continued, with varying settlement density for the Iron Age and later periods.

Finally the area seems to have been more thinly settled during much of the Ottoman period. However, as has been shown by the records of the Ottoman tax records (Göyünç/Hütteroth 1997), at least the northern parts of the Khabur basin continued to be settled by agricultural villages.

5. Patterns of Movement and Communication in the TBS Area

The landscape archaeology approach stresses that human activity was never limited to the areas of concentrated activity that we label as “sites.” Although these points on the landscape stand out to the archaeologist, other “offsite” activities were very important in the past and remain archaeologically visible to various degrees, if appropriate methods are developed for documenting them. In the TBS area, the most striking offsite phenomena are the broad and shallow linear depressions which represent the transformed remains of ancient tracks. These were not constructed but rather formed from the continuous passage of humans, animals, and wheeled vehicles over centuries. These hollow way features have been particularly well studied in the Upper Khabur basin, starting in the 1950’s (Van Liere/Lauffray 1954-55; Wilkinson 1993: 2000a; Ur 2003; in press; McClellan et al. 2000).
Route patterning can be generally divided into intersite features, which ran directly between two sites, and radial systems running outward from a central site in a spokelike pattern. The former obviously conducted human and animal traffic between settlements, whereas the latter moved farmers, shepherds and their animals between the settlement and its associated fields and pastures (Wilkinson 1993; 2003:111-117; Ur 2003). The features themselves can be morphologically subdivided into two classes. The majority are broad, on the order of 60-100 m wide and up to 2 m deep. A second set are much narrower (ca. 40-60 m) with a much sharper profile. The broad features are primarily associated with third millennium tells and the narrower features with sites of the Byzantine/Sasanian and Islamic periods. This dichotomy was already noted by Van Liere and Lauffray (1954-55). It should be noted, however, that there is a continuum in width and depth.

The recent availability of declassified intelligence satellite imagery of the CORONA program (Fowler 2004) has enabled us to confirm and expand on the mapping work of Van Liere and Lauffray (Ur 2003; see also Altaweel 2004). On these images (Fig. 5), hollow ways appear as dark lines because their depressed morphology collects moisture and promotes vegetation growth. Hollow ways can be easily distinguished from modern tracks, which are recently disturbed and therefore highly reflective. Wadis and other forms of natural drainage also appear as dark lines, but lack the straightness of hollow ways. Armed with these interpretive keys, it has been possible to map hollow ways across a large portion of the basin (see Ur 2003: Figs 9-10; Sallaberger/Ur 2004: Fig. 2). The general picture that results is a very busy landscape of movement, and a spectacular degree of landscape preservation up to the time that the CORONA images were taken in the 1960’s.

The interpretation of hollow ways presented here and elsewhere is not without its critics, however; both the dating and the function has been questioned. We consider these issues in greater length here.

5.1. Dating of Hollow Ways

Based on observations around Tell Leilan, Harvey Weiss has stated that hollow ways “are probably 20th-century cart and herd tracks” (Weiss 1997:128). While some features may be more recent than the third millennium BC, these are certainly not modern features. The Upper Khabur basin had been given over for centuries to pastoral nomad control prior to French “pacification” in the 1920’s, after which agricultural settlement began to spread south from the fringes of the Tur Abdin (Montagne 1932; Lewis 1987). Prior to this time, and continuing up to the second World War, the basin did not support a population large enough to create such traffic-intensive features. The signature of pastoralist movement can be seen on the aerial photographs of Poidebard (1934). For example, a low-level aerial view of Tell Bati from October 1927 shows dozens of parallel white lines resulting from the undisciplined movement of sheep and goat herds (Poidebard 1934: Pl. CXXXIX). In this uncultivated landscape, human and animal movement was not constrained by fields; the resulting dispersed disturbance failed to produce linear features of the type seen on CORONA photographs.

Other photographs from Poidebard’s 1920’s aerial reconnaissance show that hollow ways existed prior to the recolonization of the basin for agriculture. A visitor in June 1926 noted that the rich agricultural potential of the region around Tell Beydar was completely unexploited (Brossé 1929), and the nearly contemporary photograph of Poidebard (1934: Pl. CXXXV) confirms its abandonment by cultivators. Visible in the upper left of this photograph are the traces of the forking hollow way leading from Beydar to Tell Effendi (this same feature is visible in CORONA photographs; see Fig. 5). Clearly this hollow way pre-dates the twentieth century, and is most likely to date to the mid to late third millennium BC (see below). Similarly, Van Liere (1963: Fig. 3b) identified five hollow ways which articulated with Tell Leilan’s outer wall, all of which are also visible on CORONA images; Poidebard’s photo (1934: Pl. CLX) shows several, especially the hollow way which leaves Leilan’s southeastern gate to the east (see Ur 2003: Fig. 10).

These examples demonstrate the antiquity of hollow ways, but they do not demonstrate their ages. Previous studies have relied on qualitative assessments of the strong association between radial hollow way patterns and sites of the later third millennium BC (e.g., Wilkinson 1993; Ur 2003). Given the abundance of hollow ways in the Beydar region, and the high degree of chronological control on settlement, we have quantified the associations between sites of known dates and linear features. In undertaking this analysis, we associated a hollow way with a given site if a) its terminal end was within 1000 m of the edge of the site and b) the alignment of the hollow way was with the site. The 1000 m buffer is necessary because hollow ways rarely articulate precisely with the edge of a site (the close connection with the southeastern gate at Beydar in Fig. 5 is an uncommon exception). This situation probably results from the erosion of tell edges, the presence of obscuring masks of colluvium and pits for the extraction of soil for mud bricks, which then obscure the surface around the tell periphery. In some cases, it may be that there was an uncultivated zone around settlements that was used for other activities (industrial activities, animal penning, threshing, or even for markets). A close alignment is also important because there have been cases where settlements have been located along hollow ways for reasons other than communication. In the region around Hamoukar, several sites (two Middle Assyrian, one Parthian) were placed next to hollow ways because their depressed

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morphology made them good borrow pits for mudbrick manufacture; CORONA imagery shows that the hollow ways had been widened and deepened adjacent to these later settlements (Ur 2003:113). Therefore in our analysis, sites were only associated with hollow ways if they were closely aligned. Only sites with a major (i.e., full time sedentary) occupation were considered. If a hollow way points to two sites, or two separate components of a multi-component site, it was considered to be associated with both of them.

Over 255 km of hollow ways have been identified within the TBS area, and 168 associations could be made between sites and hollow ways (Fig. 6). Five periods appear to be closely associated with these features: the Late Chalcolithic, the mid to late third millennium (EJ III-V), the Late Bronze Age, the Iron Age, and the late Sasanian-Early Islamic periods. For each period, there were ten or more sites in the TBS with one or more associated hollow ways. Hollow ways are not equally ubiquitous in all of these periods, however. Of the 19 Late Chalcolithic sites, ten (53%) were associated with a hollow way; the Sasanian-Early Islamic sites have a similar rate of association (50%). Higher rates obtain for the Iron Age (61%) and the LBA (86%). Only for the EJ I-V are all permanent sites associated with hollow ways. Hollow way associations are far less pervasive for other periods, when smaller percentages of total settlements had associated features.

In terms of the number of hollow ways associated with sites of the various periods, the three spikes correspond to the mid to late third millennium (114 features), the Late Bronze Age (85 features), the Iron Age (101 features), and the late Sasanian-Early Islamic periods (57 features). For the last named period, most of the hollow ways are of the narrow variety, an association already noted by Van Liere and Lauffray (1954:55). The high associations for the Late Bronze and Iron Ages may be more closely related to the manner in which settlements developed than to actual use of the features. In the Beydar region, when settlement resumed following the collapse of the third millennium urban system, it no longer occupied the tops of tells but rather clustered in “lower towns” around the base of the former tell (Wilkinson 2000b; Wilkinson/Barbanes 2000; Wilkinson et al. 2004). This phenomenon is especially strong in the TBS, where the most important third millennium settlements (Beydar, Effendi, Hassek, and Jamilo) all have substantial Late Bronze and/or Iron Age lower towns. As a result, it is difficult to determine whether hollow ways associated with such sites should be associated with the third millennium settlement or the subsequent LBA or Iron Age reoccupation. For example, eleven out of twelve LBA sites with associated hollow ways were also settled in the EJ III-V. It is of course possible that they were in use in both time periods, but this would imply a rather striking continuity in land tenure that is unlikely, based on dramatic differences in overall settlement pattern (Wilkinson/Barbanes 2000; Wilkinson et al. 2004). When one looks closer, it is clear that the majority of the hollow ways at these sites appear to be focused on the third millennium high mounds.

However, it is clear in at least one case that tracks were associated exclusively with an Iron Age site. TBS 23 is a small isolated site on the basalt plateau west of Tell Beydar. Several fragmentary trackways stretch to its northeast, seemingly headed toward the contemporary large lower town sites at Beydar (Beydar II) and Tell Hassek. No other periods of occupation were recognized at this site. In northern Iraq, a case has also been made for Iron Age hollow ways (Altaweel 2004:32-37; Wilkinson et al. 2005). While hollow way association is only somewhat pervasive for the Iron Age (61% of sites), it is notable that only 36% of these were also settled in the EJ III-V.

In conclusion, hollow ways have site associations that suggest that they may have been in use during many periods, but especially during the phases of maximum nucleation or expansion of site numbers. The closest associations are with permanently occupied third millennium sites, all of which are associated with hollow ways in large numbers. LBA, Iron Age, and late Sasanian-Early Islamic sites are also associated with these features to a lesser degree. In the case of the former two periods, the fact that a large proportion of these sites also were occupied in the third millennium makes a definitive assessment difficult.

5.2. Function of Hollow Ways

A challenge to the interpretation of depressed linear features as trackways has been presented by Thomas McClellan and colleagues (McClellan/Porter 1995; McClellan et al. 2000). They argue that these features are not roads because their radial pattern is atypical for hollow ways as they are known from Europe, and that only a small percentage of the features mapped by Van Liere and Lauffray actually connect with other sites. Their alternative hypothesis is that hollow ways were deliberately constructed water harvesting channels, designed to collect runoff and bring it toward sites where it could be used for drinking and irrigation (McClellan et al. 2000:143-51).

It is true that the radial patterning in northern Mesopotamian hollow ways are not seen in Europe, but this situation is the result of cultural taphonomic processes in Europe which have removed most features; the surviving traces are too fragmentary to display the radial patterning. Nevertheless, hollow ways as individual features are common throughout northwestern Europe and have been dated back to the 2nd millennium BC. On the other hand, northern Mesopotamia has been blessed with remarkable landscape preservation. It is likely that if it were not for nearly continuous occupation and a high degree of agricultural
development in temperate parts of Europe, its landscape would also preserve radial systems of tracks as well. Certainly radial road patterns are the norm for non-planned agricultural settlements in the Near East today (e.g., Qaraqosh in northern Iraq: Wilkinson 2003: Fig. 6.13), and such an arrangement appears to be economically ideal for the organization of premodern agriculture and pastoralism (Chisholm 1962).

McClellan et al.'s arguments regarding features that "lead nowhere" result from an overreliance on the dataset of Van Liere and Lauffray and an overly site-centric understanding of ancient human movement. The basinwide map of linear features published in the *Annales Archéologiques de Syrie* (Van Liere/Lauffray 1954-55) is a simplified representation of the far more complex situation on the ground; it should be used as a general guide to the extent of hollow way formation but not as a literal map of these features. That Van Liere and Lauffray were able to document these features accurately is clear from the large-scale maps of major tell sites published subsequently (Van Liere 1963). The CORONA-based remapping shows far more intersite connections than the Van Liere and Lauffray dataset. Nonetheless, the "roads to nowhere" did have destinations: they led farmers, shepherds and flocks to their fields and pasture. Without such basic economic activities, the third millennium settlements would not have been able to reproduce themselves.

The hypothesis that hollow ways were water harvesting constructions is an unlikely one but it does recognize one function of these features, albeit an unintentional one. Because of their depressed morphology, they do channel runoff, and in fact have been known to "capture" natural runoff to reroute wadi flow (see especially Tsor/Yekutieli 1992). This is, however, an entirely unintentional consequence of their depressed morphology, which resulted from repeated disturbance by human and animal movement.

Ultimately, the patterning of the surviving traces of ancient roads is far more in keeping with communication and movement than with water harvesting. The features as mapped run up and over watersheds in ways that would be impossible for flowing water, as was observed in the Iraqi North Jazira (Wilkinson 1995: Fig. 6) and can also be demonstrated in the TBS region (Fig. 7).

6. Economic Landscapes of the Beydar Region

The organization of the economic systems underlying these settlement patterns had much to do with their relative fragility or resilience, and has therefore been a focus of studies of the historical development of settlement and society in the basin (see especially Weiss 1986; Wilkinson 1994). The Beydar region is particularly well-suited for analyses of the staple and political economies, given the availability of high-resolution full coverage survey data, excavations, and cuneiform texts.

6.1. Agriculture and Pastoralism in the Mid to Late Third Millennium (Early Jazira III-IV)

The primary focus of households throughout the Bronze Age, both small-scale and institutional, was on cereal production and animal husbandry, although undoubtedly in varying proportions and modes of organization. Most studies have approached the cereal staple economy from the vantage of the modern agricultural productivity of the region (e.g., Weiss 1986), but the landscape record of the Beydar area provides proxy indicators of ancient cultivation through the surviving traces of tracks to field and pasture. These proxies enable the reconstruction of the actual former zones of cultivation, rather than hypothetical sustaining areas based on population estimates. When measured, it is possible to estimate ancient cereal production around some sites. The unsuspected complexity of the agricultural economy emerges when one compares these sites' cultivated lands with their proposed cereal consumption and their available labor.

The delineation of settlements' cultivated zones stems from the fadeout points of its associated hollow ways. These tracks form because movement is constrained onto them by surrounding fields (see discussion above). The terminus of the hollow way marks the outer boundary of cultivation, the point beyond which no fields existed to constrain movement. This boundary between cultivation and pasture was not fixed but fluctuated as the cultivated zone expanded or contracted. Therefore, hollow ways do not end abruptly but rather fade out in the general area of the long-term average boundary between cultivation and pasture. On this basis, an approximation of the cultivated zone can be made by connecting the terminal ends of a site's associated hollow ways (Fig. 8; Wilkinson 2005; Wilkinson et al. 2007).

Although the preservation is impressive in the TBS area, for a variety of taphonomic reasons we are still faced with an incomplete record of the landscape of movement. Although all sites of the mid to late third millennium were associated with one or more hollow ways (see above), it was not possible to estimate the cultivated area for all mid-late third millennium sites in the TBS area, but rather only for those whose preserved pattern of hollow ways are radial. These represent eight of the fifteen permanently settled sites. Cultivated zones were reconstructed by connecting the terminal ends of non-intersite tracks; those that directly connected to other sites were disregarded.

The size of a site's hollow way catchment is generally related to its settled area, and by extension, its ancient population (Fig. 9). We will consider these cultivated sustaining areas from the perspectives of the...
agricultural labor and consumption needs. We assume that fifty percent of the population of a settlement was involved in the harvest, and that the average worker could harvest 3 ha per season (Wilkinson 1994). Based on these assumptions, the lines on Fig. 9 show the predicted cultivated area assuming 100 persons per ha (solid line) and 200 persons per ha (dashed line). These lines represent the maximum cultivated area based on locally available labor, independent of the food requirements of the inhabitants. At a 100 persons/ha settlement density, the eight sites in our calculations would have all been cultivating more than their own populations would have allowed, with the exception of Tell Beydar itself, which would have cultivated 41% less than predicted. Even assuming densities of 200 persons/ha, the five smallest sites would have still produced above the potential of their locally available labor, as was Tell Effendi. Tell Beydar would still have cultivated less land than its population could have harvested.

Several scenarios might explain this situation. Beydar’s underproduction could be related to an over-estimation of its population. It supported large non-residential areas, including cemeteries on its outer wall and of course the palatial structures on the central high mound (Lebeau 2003). Therefore its population might have been less than the 1,700-3,400 persons that its 17 ha of settled area would suggest. On the other hand, its under-cultivation might have resulted from a considerable population of non-agriculturalists. The personnel lists from the site (Sallaberger 1996) detail many craftworkers such as potters, cartwrights, and basket weavers, in addition to agro-pastoral occupations. The apparent overproduction at the smaller settlements might result from an underestimation of their populations or of the percentage involved in the harvest. A third intriguing possibility is that the area received a seasonal influx of surplus labor during plowing and harvest times. The most likely source would be pastoral nomads, later known to be an important economic and political force in the area, and whose role in the third millennium has been underestimated (Kouchoukos 1998; Lyonnet 1998; Danti 2000; see below).

The next issue is whether this apparently high level of cultivation represented an agricultural surplus, and here we approach the landscape data from the perspective of cereal consumption. Again, we start with several assumptions: average annual consumption per person of 250 kg, an average cereal yield of 500 kg/ha, and the practice of biennial fallowing. With these variables, we have compared the agricultural requirements for sites (derived from population estimates) with the archaeologically documented cultivated zones (Fig. 10). Again, we have limited this analysis to the eight settlements with well preserved radial hollow way patterns, and we have attempted to consider different values for the population density variable (100, 150, and 200 persons/ha). In Fig. 10, the diagonal line represents perfect agricultural self-sufficiency (i.e., the hollow way-derived cultivated zone is exactly the size of the population-derived sustaining area); sites to the left of this line would have been producing more than their needs (net surplus producers), and sites to the right would have needed to consume more than their cultivated fields would have produced (net surplus consumers).

It is immediately apparent that the eight settlements were more than meeting their own consumptive needs within their cultivated zones, again with the exception of Beydar itself (and also Tell Hassek [TBS 43], if one assumes 200 persons/ha). Even Beydar would have been very close to sustaining itself at a settlement density of 100 persons/ha. The other settlements were all more than sustained by their cultivated areas and in fact would have produced substantial surpluses (Table 1). The seven sites not included in this analysis were all small sites and probably also would have fallen among these surplus producers. At a settlement density of 100 persons/ha, the cultivators at Beydar would have needed to farm an additional 214 ha to be self-sufficient. This deficit, however, would have been more than compensated by the 5,684 surplus hectares cultivated by the other seven settlements included in this analysis. The net surplus production of 5,470 ha could have supported an additional 10,939 persons. This is an incredible degree of surplus production when one considers that the TBS area probably only hosted a permanently settled population of between 6,000-13,000 persons (Sallaberger/Ur 2004:66).

The agricultural situation thus appears to be one where an urban center (Beydar) was sustained by importing agricultural products from smaller settlements in its hinterland, a situation supposed for other areas of the basin at the time (e.g., the Leilan area: Stein/Wattenmaker 2003). What is striking about the TBS area is both the excessive degree of surplus production, and the fact that it required the importation of labor to attain.

A possible explanation for this situation may lie with the other, less well studied aspect of the staple economy: pastoral production. The importance of animals in the staple and political economy has been affirmed through multiple lines of recent evidence. Several scholars have proposed connections between the Kranzhugel phenomenon, exemplified by Beydar and Tell Chuera, and the formation of pastorally-based polities (Kouchoukos 1998; Lyonnet 1998), and now impressions of hooves demonstrate that animals were kept near the monumental structures on the Beydar high mound (Sténuit/Van der Stede 2003). The more elaborated economic models for northern Mesopotamian urban economies in the third millennium have all assumed a significant pastoral component, based on zooarchaeological studies which show the importance of sheep and goat (e.g., Weber 2001; Zeder 2003), and also due to the long history of pastoral-sedentary interaction in this area in later periods. The formation of hollow ways is probably more the result...
of animal feet causing disturbance than of human feet (see calculations in Wilkinson/Tucker 1995:27). In fact, observations of the movement of domesticated animals suggests that different species move through the landscape in very different ways. For example, in Italy the classic transhumance routes up the Apennine mountains are over 100 m in width because of the propensity of the sheep to walk side-by-side rather than in line (http://www.fallascoso.com/sheep%20tracks.htm). The presence of large flocks of sheep walking to the outlying pastures would therefore result in the characteristically broad tracks recorded around Tell Beydar, which at 50-70 m wide or even more are significantly wider than would be expected for pedestrian paths (Wilkinson 2000a: Fig. 6).

Because of the light impact of pastoralism on the landscape, these models have tended to insert it into the spaces between the settlements by default, especially where the delineation of cultivated zones via hollow ways (described above) shows no sign of long-term cultivation. Throughout most of the basin, these spaces were the elevated interfluvial areas between the wadi floodplains, along which most of the larger third millennium settlements were located (see Ur 2003: Figs. 9-10). The TBS region, however, includes a broad basaltic plateau, which is now covered with thin soils and few water sources; it would have been marginal agricultural land but provided extensive grazing and hunting lands as well as serving as a source for basalt and building stone (Wilkinson 2000a:3).

New evidence for the use of the plateau comes from rock art along its eroded scarp and the traces of “desert kites,” large roughly contracted enclosures that were used for hunting wild game or penning domestic animals, and possibly both (Van Berg/Picalause 2003; Van Berg et al. 2004). The structures are very difficult to date, but based on their depictions in the associated rock art, Van Berg and colleagues date them to the third and possibly fourth millennia BC, with some of the rock art as early as the mid-fifth millennium (Van Berg et al. 2004).

The use of desert kites in the third millennium for penning domestic animals is an attractive idea, given their economic importance and the location of the kites along the edge of a large area of pasture. However, many of the rock art scenes clearly depict the kites in the context of hunting (Van Berg et al. 2004:94-95; cf. Helms/Betts 1987). Some of the depicted animals have been interpreted as gazelle, but wild animals comprise a minor element in zooarchaeological assemblages.

An alternative possibility is that these structures were used for hunting and/or penning wild equids, and perhaps also for breeding purposes. Although difficult to quantify, equids were more important in the staple economies of the basin than their faunal remains might suggest. From an agricultural perspective, equids were used for plowing and the movement of cereals from the fields to the settlement; the main institutional household at Beydar/Nabada kept close track of them (Van Lørberghe 1996). Donkeys were also a significant part of elite movement in the basin. On cylinder sealings, they are frequently depicted pulling carts (Jans/Bretschneider 1998), and the entourage of the en of Nagar included large teams of equids (Sallaberger 1996:103-106; Widell 2004).

Equids played an important role in the political economy as well. At Tell Brak, six donkeys were ritually interred in a temple complex; their well-preserved remains showed signs of a life of riding and cart-pulling (Clutton-Brock 2001). Trade in high-value donkey-onager hybrids (written kùnga or anê-BAR.AN) is now well documented between Nagar and Ebla: Nagar sent gifts of these luxury animals, and Ebla in turn sent silver (Archi 1998; Eidem et al. 2000).

Given the emerging signs of the economic importance of animals, in particular equids, it is tempting to see the agricultural overproduction discussed above as intended for animal consumption, as much as for human consumption. The exportation of cereal surpluses to neighboring regions of the basin is a possibility but an unlikely one, given the high costs of overland movement of bulk items and the complete absence of such transactions in the Beydar tablets, which otherwise suggest a staple economy independent of Nagar (Sallaberger/Ur 2004). A combination of data now emphasizes the importance of animals: zooarchaeological studies showing the dominance of sheep and goat, landscape evidence for the more intensive exploitation of pastoral zones, and textual evidence for wool production, animals for traction, and trade in hybrids. The large surpluses produced by the smaller settlements of the Beydar region would have gone far toward sustaining both the human and the animal populations, and buffering them both against climatic fluctuations. This more animal-focused economic reconstruction remains speculative, but it appears increasingly likely that the agricultural and pastoral economies of the third millennium Upper Khabur basin in general and the Beydar region in particular were tightly intertwined.

Although the inclusion of animal husbandry introduces an additional factor into the archaeological landscape, the landscape as discussed can be made more dynamic by the introduction of local household-farmers as agents, who farm within an economic landscape stressed by droughts, lack of plough teams, disease or other setbacks. Such studies, currently underway by the Chicago-based MASS group demonstrate under what circumstances populations are sustainable, and alternatively when they are likely to succumb to a crisis (Wilkinson et al. 2007). That such studies are important is made clear by the bald
statistics presented in this short report, where over the time span of some ten millennia we see high amplitude cycles of settlement expansion, concentration, desertion, and re-settlement following each other in a kaleidoscopic succession. Although undoubtedly climatic conditions play a role in such dynamics, it is now becoming evident that the inclusion of the animal husbandry not only injects a key component into the local economies, it also contributes to the long term cycles of population growth and decline.

Bibliography


Subartu XXI


Table 1: Estimated surplus and deficit agricultural production at settlements in the TBS region (assuming biennial fallow), based on various population density estimates. Sites without surplus/deficit estimations are those without a fully preserved radial route pattern. PPH = persons per hectare.
### Table J: Estimated surplus and deficit agricultural production at settlements in the TBS region (assuming biennial fallow), based on various population density estimates. Sites without surplus/deficit estimations are those without a fully preserved radial route pattern. PPH = persons per hectare.

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**Surplus Cult. (ha)**

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**Fig. 1:** CORONA satellite image (1105-1025DF57, 5 November 1968) showing the flood plain of the Wadi Aweidj north east of Tell Beydar with a narrow, sinuous palaeochannel of the Aweidj to west (left). Note that the linear feature along the present course of the Aweidj may represent a former hollow way, along which the present course of the Aweidj was diverted. (Image courtesy of the US Geological Survey).
- Fig. 2: Early third millennium (EJ I-II, Ninevite 5) settlement in the TBS area. Occupied sites (black) and abandoned settlement (gray). Decorated Ninevite 5 reported at sites marked with an asterisk (*). Early third millennium occupation reported by Lyonnet but not the TBS at sites with labels in parentheses.
- Fig. 3: Mid to late third millennium (EJ III-V, ED-Akkadian, Post-Akkadian) settlement in the TBS area. Occupied sites (black) and abandoned settlement (gray). Sites with minor or non-permanent occupation are labelled in parentheses.
Fig. 4: Early second millennium (Old Babylonian, Khabur) settlement in the TBS area. Occupied sites (black) and abandoned settlement (gray). Sites with minor or non-permanent settlement are labelled in parentheses. Note: early second millennium occupation at TBS 63 (= Ly51) was observed by Lyonnnet but not by the TBS.
- Fig. 5: CORONA image (1102-1025DF006, 11 December 1967) of Tell Beydar and the terrain to its east (Image courtesy of the US Geological Survey).
- Fig. 6: Histogram of sites associated with hollow ways. Left axis represents the number of sites, shown as stacked bars; right axis represents number of associated hollow ways, shown as a line. Dark gray bars are sites with hollow ways and also with EJ III-V occupation; light gray bars are sites with hollow ways but without EJ III-V occupation; white bars are sites without associated hollow ways.

- Fig. 7: Profiles along major intersite HWs in the Beydar region. Terrain derived from Shuttle Radar Topography Mission (SRTM) 90 m digital elevation model (January 2000). For the geographic location of these routes, see Fig. 3.
Fig. 8: Cultivated zones in the TBS Area in the El II-V periods. Sites with minor or non-permanent occupation are labelled in parentheses. Hollow way-defined agricultural territories in tight hatching.
Fig. 9: Relationship between site size and hollow way-derived catchment in the TBS area. Lines represent predicted catchments assuming 3 ha harvested per person and 50% agricultural employment. Solid line assumes 100 persons/ha. Dashed line assumes 200 persons/ha.

Fig. 10: Comparison of population-based required sustaining areas and hollow way-derived catchments. X-axis error bars show sustaining area range assuming 100 to 200 persons/ha settlement density; diamonds mark 150 person/ha sustaining area. Solid 45° line represents agricultural self-sufficiency; sites above produced surplus and sites below were net consumers.