Legal and archaeological territories of the second millennium BC in northern Mesopotamia

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Defining territories and settlement hierarchies is a primary goal of archaeological survey, involving the mapping of different-sized settlements on the ground. However it may not always work, owing to the particular land use or political strategies anciently employed. With the aid of cuneiform documents from Tell Leilan, Syria, the author shows how the settlements found by archaeological survey in northern Mesopotamia actually relate to a number of intersecting authorities, with a hold on major tracts of pasture as well as on arable land and cities. These insights from the Near East have important implications for the interpretation of surveyed settlement patterns everywhere.

Keywords: Mesopotamia, second millennium BC, settlement ranking, survey

Introduction

Despite the enormous recent increase in archaeological and epigraphic evidence from early second-millennium BC northern Mesopotamia (Figure 1), efforts to delineate the economic and political geography of this area have foundered (Ristvet & Weiss 2005). Archaeological survey data from the complex societies of the Habur Plains of north-eastern Syria, for example, (Figure 2) do not correspond to the predictions of the two spatial analytical techniques – rank-size rule and central place theory – that archaeologists most often use to analyse settlement patterns of state-level societies (Banning 2002: 157-61). In the Eastern Habur Triangle, survey has uncovered seven sites between 20 and 100ha in extent, all located less than 15km from each other. This produces a markedly convex rank-size curve and does not result in the hexagonal lattices that central place theory would predict (Meijer 1990; Ristvet 2005). Similarly, in the Western Habur Triangle, the virtual abandonment of all but the largest sites in this region, the ancient Ida-maraş, does not correspond to the predictions of either technique, which both posit that the settlement system of any complex society contains more small sites than large ones (Lyonnet 1996; 1997; Wilkinson 2002). Such exercises indicate that we do not yet understand the basic geo-political organisational principles of ancient Mesopotamian polities during the second millennium BC.

One of the basic assumptions of archaeologists studying the political landscape is that ancient Mesopotamian kingdoms were territorial states with contiguous borders, but the cuneiform texts suggest that the ancient reality was far more complex (Eidem 2000: 257).

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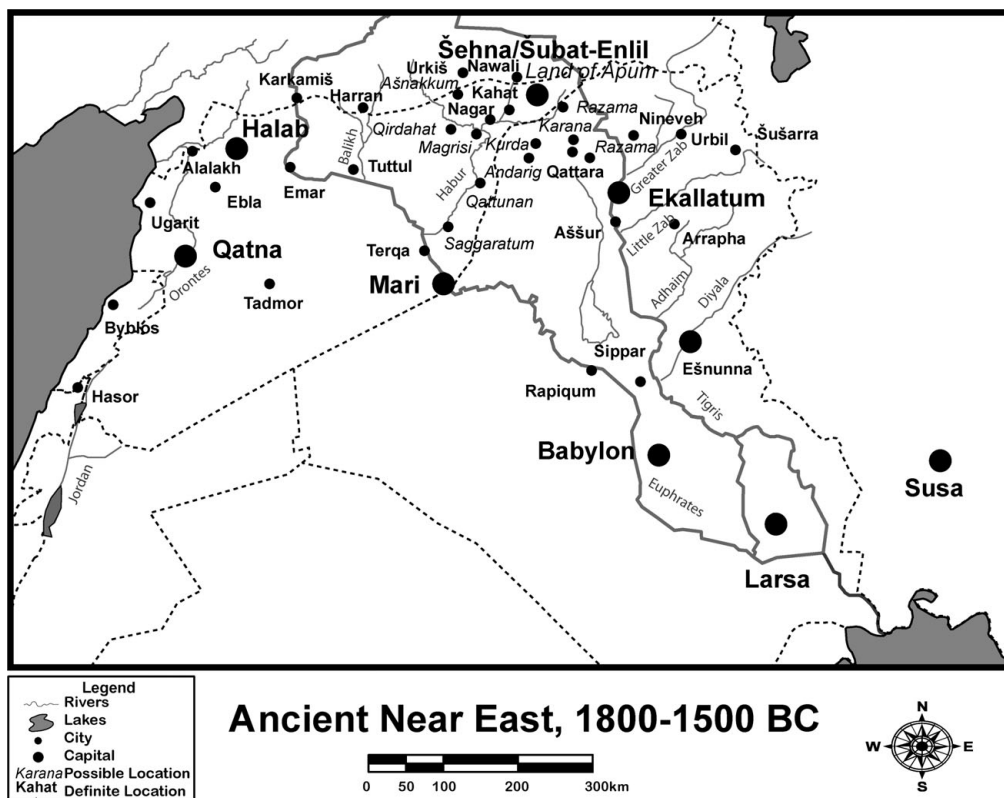
Figure 1. Cities and towns in northern Mesopotamia, c. *1800-1500 BC.*

Analysing the actual spatial configuration of these ancient city-states is fundamental to our interpretation of survey data and our wider understanding of Mesopotamian economic, social and political realities. To this end, I will explore the interplay between political, economic and religious strategies in the demarcation of two north Mesopotamian kingdoms, Kahat, centred on modern Tell Barri, Syria, and Apum, centred on modern Tell Leilan, Syria (ancient Šehna/Šubat-Enlil, Figures 1 and 2). Specifically, I will analyse both the *de jure* limits of these kingdoms as described in a mutual defence treaty, as well as their *de facto* limits as they emerge from the letters and administrative texts. I will then compare the results of this documentary study to the settlement data collected between 1984 and 2002 by the Tell Leilan Regional Survey. This will both refine our understanding of the social history and conceptual archaeology of northern Mesopotamia during the early second millennium BC, and raise questions about how documentary and archaeological territories may be matched.

Demarcating Apum and Kahat in documentary records: *the Šehna archives*

In 1987, 600 complete tablets and 400 tablet fragments and seals were discovered during the excavation of a palace in the Leilan Lower Town (Figures 3a and 3b). The 1985 and 1987 excavations of the palace revealed 25 rooms surrounding two paved courtyards,
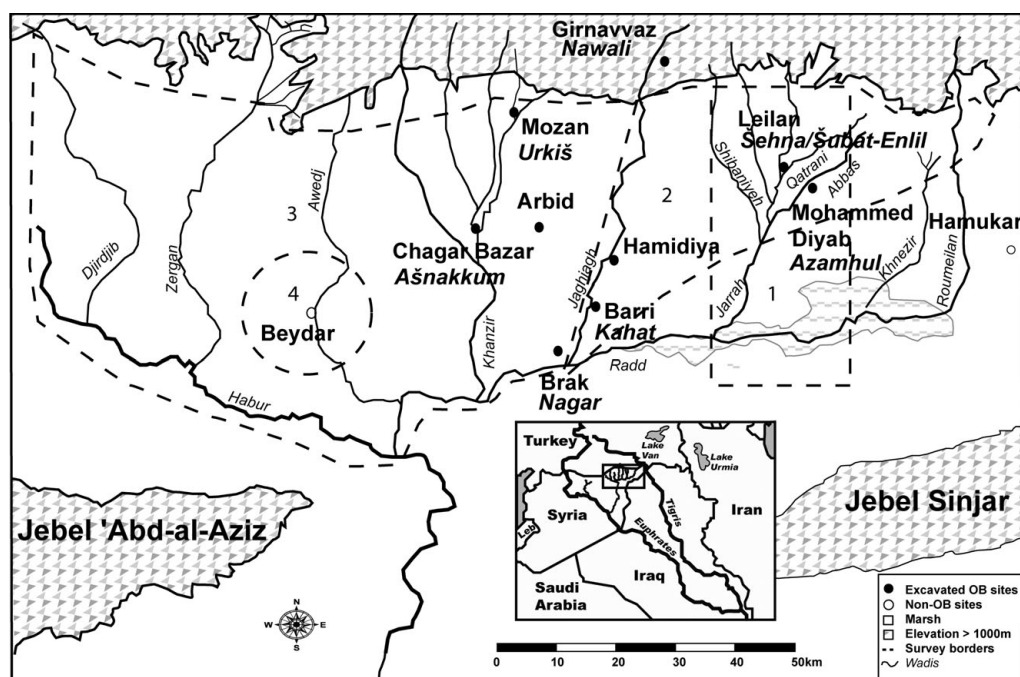
Figure 2. The Habur Plains, north-eastern Syria, sites (indicated by both modern and ancient toponyms) from 1900-1600 BC and modern surveys discussed in this paper. 1) Tell Leilan Regional Survey; 2) north-eastern Syria survey; 3) Western Habur Triangle survey; 4) Tell Beydar survey.

including a reception suite, kitchens and workspaces; probably comprising less than 10 per cent of the original palace (Akkermans & Weiss 1991). Three discrete archives were found, the first two related to internal palace affairs (including the administration of the royal wine cellars and bakery), while the third consisted of diplomatic texts, including treaties, state correspondence and administrative texts outlining expenditures made in the course of diplomacy (Eidem 1991a; 1991b; 1991c; 2008; Ismail 1991; Vincente 1992).

Tablet LT-3 (Figure 4), a treaty between King Till-abnû of Apum and King Jamşi-hatnû of Kahat, is the best preserved of the Leilan treaties. Immediately before the curse formula that warns the two parties of the dire consequences of breaking the treaty, a broken passage sums up its conditions: Till-abnû swears that his relationship with Jamşi-hatnû will be characterised by brotherhood, military assistance and loyalty (iv: 12-14, Akk. [*ah-hu*]-*tum*, *til-lu*-[*tum*. . .]/ [*a-wa-t*]*i-im dam-qa-t*[*im*. . .]/[*at*]-*wa-am ša li-i*[*b-bi-im ga-am-ri-im*], Eidem 2008).

LT-3 begins with a list of the gods who will ensure compliance with its conditions. As several of them are connected to particular localities, their position at the beginning of the treaty emphasises the politico-spatial organisation of the worlds in which these international actors meet. The first two gods connected with particular localities are Adad of Arrapha and Adad of Halab; the juxtaposition of the two storm gods may delimit the common
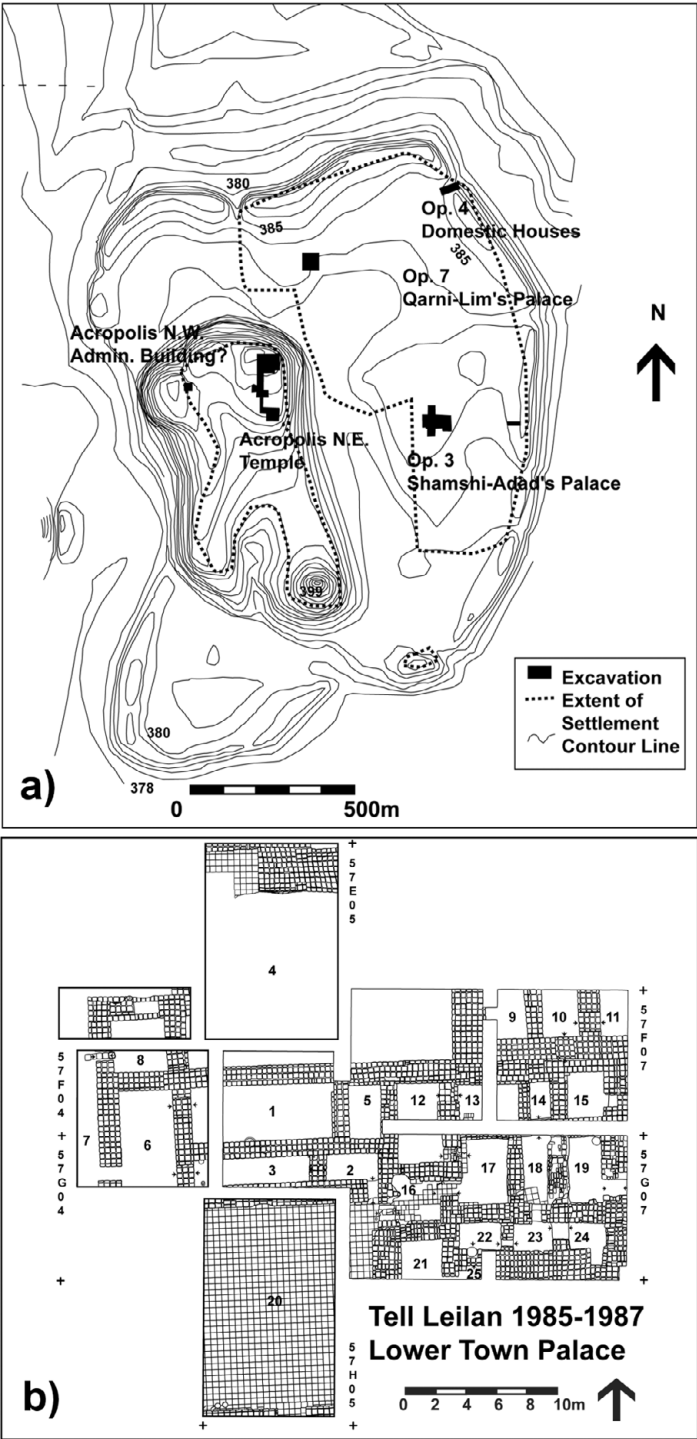
Figure 3. a) Topographic map of Tell Leilan, Syria with excavations of second-millennium BC levels marked; b) plan of the Leilan Eastern Lower Town palace.

Figure 4. LT-3, the treaty between Šhehna and Kahat (reproduced by permission of Harvey Weiss).

geographical horizon of northern Mesopotamia. The inclusion of Adad of Halab may also refer to the oversight which that city exercised over affairs in the Habur region as illustrated by this correspondence, in which the kings of Šhehna refer to Hammurabi of Halab as 'my father', a term used in the ancient Near East for an acknowledged superior, and seek his approval in various diplomatic affairs (Eidem 2008: Letters 1-4, 23). The next four gods, Adad of Nawali, Adad of Kahat, Bēlet-Nagar and Bēlet-Apim, are significant both in the wider Habur Plains and for the two polities specifically, representing as they do the four main cities of Apum and Kahat, the parties to this treaty (Figure 1).

LT-3 uses two distinct set phrases to describe the domains of the kings of Apum and Kahat who are enacting this agreement. These set descriptions, which are repeated several times in the treaty, served as legal territorial designations, and exploring their connotations can unearth perceptions of territorial organisation. The treaty describes Till-abnû and the land of Apum as *'Till-abnû/[son of Da]ri-Epuh, king of the land of Apum,/[his servants], his elders, his sons,/[and] the whole of the land of Hana'* (i: 20-22, Akk. [1]*ti-la-ab-nu-ú*/[dumu *da*]-*ri e-pu-uh* lugal *ma-a-at a-pí*/[ìr-*d*]*u*-meš-*šu* lú-šu-gi-meš-*šu* dumu-meš-*šu*/[*ù ma*]-*a-at ha-na ka-⌈lu⌉-šu.*) This designation of Till-abnû as 'king of the land of Apum and the land of Hana' parallels a phrase in a Mari treaty draft, which calls Zimri-Lim 'king of Mari and the l[and] of H[ana]' (M.6435+: 26, Akk. lugal *ma-ri*[ki]*ù ma-*[*a-at h*]*a-na*-meš (Durand 1986: 112-5, M.6435+M.8987: 25-6.). The land of Hana denotes the nomadic segment of the population that Till-abnû governs: in the Mari texts ha-na is the generic word for pastoral nomad (Durand 1992; 2004). Till-abnû is not just the king of the villagers and townspeople of Apum, then, he is also king of the nomads.

LT-3 uses a different set phrase for Kahat, which may reflect the kingdom's different history and ethnic identity. The treaty describes Kahat's king and territory as follows: *'Jamşi-hatnû/ son of Asdi-Nehim, king of Kahat/ the city of Kahat, the kings who are his brothers,/ Ea-malik, the elders, his sons/ his servants, his troops, his country, his towns,/ be they šialPIri or nuhaši, and his kingdom/ from Nawar to Nawar'* (ii: 2-8, Akk. [1]*ia-am-şi-ha-at-nu-ú*/ dumu *ás-di-né-hi-im* lugal *ka-ha-at*[ki]/ *a-na* uru *ka-ha-at* lugal-meš *ah-hi-šu*/ [id]*é-a-ma-lik* lú-šu-gi-meš-<*šu*> dumu-meš-*šu*/ ìr-di-*šu şa-bi-šu ma-ti-šu* uru-ki-há-*šu*/ *ši-a-al-*⌈PI⌉*-ri nu-ha-ši ù nam-la-*⌈*ka-ti-šu*⌉/*iš-tu na-wa-ar a-di na-wa-ar*[ki]). Till-abnû is swearing not just to Jamşi-hatnû, Kahat's king, but also to 'the kings who are his brothers', and to Ea-malik, who has no title, but is an important political and religious figure in the letters (Eidem 2008: Letters
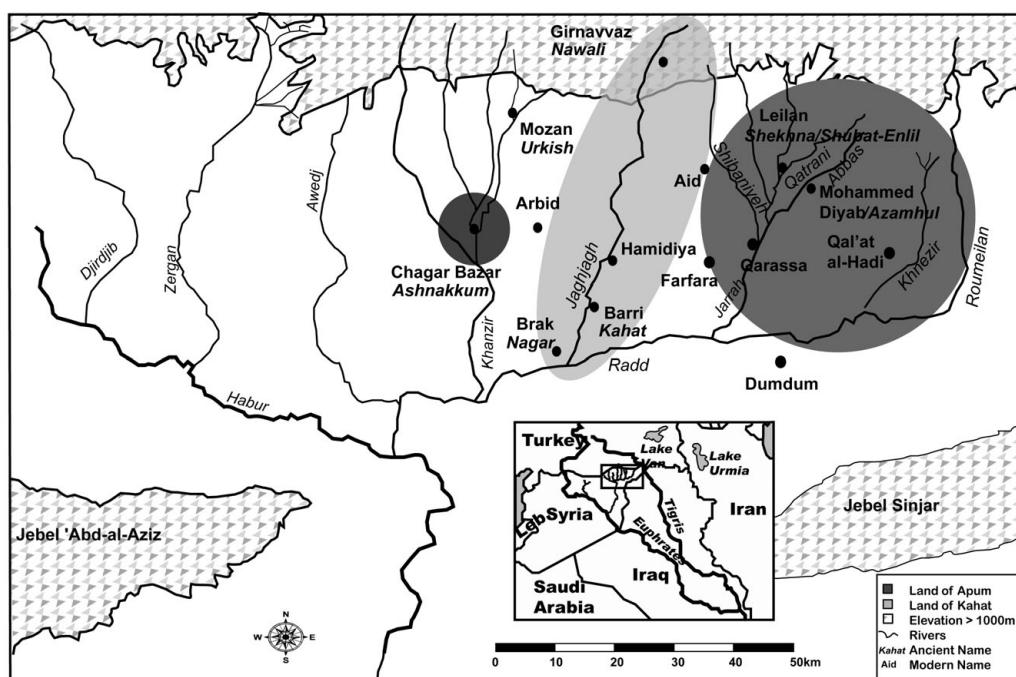
Figure 5. Hypothetical extent of the kingdoms of Kahat and Apum, c. 1750 BC.

19-20, 28-32, 99, 150, 152, 200, 207). The dichotomies associated with this kingdom are not between sown and settled but between towns described as 'šialPIiri' or 'nuhaši', neither of which can be satisfactorily translated, but which may be Hurrian ethnic terms harking back to this area's Hurrian identity in the late third millennium BC (Eidem 2008). Finally, the kingdom is delimited by a doubled toponym; it is described as being 'from Nawar to Nawar', a phrase that has complex religious and historical significance.

Nawar is the name of an important regional goddess, the Hurrian name for Bēlet-Nagar, the goddess of ancient Nagar (Guichard 1997). Simultaneously, Nawar names a divine geographical entity, the land where the goddess lives, and perhaps the land which was known as the kingdom of Urkiš and Nawar a few centuries earlier, a territory which was probably along the Jaghjagh river. 'Nawar to Nawar', therefore, may refer to the tour of the surrounding countryside that this goddess made each year (Guichard 1994; 1997). A text from Tell Leilan, an admonitory letter written by Ea-malik to prompt donations to Bēlet-Nagar from Till-abnû, provides some support for this theory by connecting the goddess' journey to the marking of boundaries: *'From this day – 15 days hence – the goddess will leave her house and the boundary markers will be rearranged'* (Eidem 1991b: 125). This sentence may imply that the Lady of Nagar, who could probably grant sovereignty over the Habur basin to kings, could also define their territories. 'From Nawar to Nawar' could also refer to two towns with similar sounding names, Nawali (modern Girnavvaz), near the mouth of the Jaghjagh river, and Nagar (modern Tell Brak), near where it joins the Radd (Donbaz 1988; Eidem & Warburton 1996). The two 'Nawars' may have delimited Kahat's territory, the towns on both sides of the Jaghjagh, for most of its length (Figures 2 and 5). The

historic and religious significance of these two cities and of the term 'Nawar' could support this theory. Both Nagar and Nawali are important cultic centres, Bēlet-Nagar and Adad of Nawali are both cited at the beginning of this treaty and Adad of Nawali is also cited in another Leilan treaty, LT-2. More support comes from the practice of 'mirror toponymy' (giving different cities identical names) which is well established for northern Mesopotamia in this period (Charpin 2003). Like the Nawars, two cities were not given identical names at random, but instead mirror each other across a mountain or a river. There are two city-states called Razâma, for instance, Razâma of Jassan and Razâma of Jamutbal, located north and south of the Sinjar mountain in northern Iraq.

The administrative texts from the year that LT-3 was enacted suggest that the city of Nawali was part of the kingdom of Kahat and participated in the treaty negotiations. This year saw a marked increase in diplomatic activity between Apum and Nawali. Three, possibly four, texts record deliveries of wine from priests in Nawali (Ismail 1991: Texts 8, 10, 12, 139). Even more intriguing is the evidence from two other administrative texts. The first text records that Till-abnû travelled to Kahat to enact this treaty and to present officials there with large quantities of silver (Ismail 1991: Text 115). The second text records that the next day the king travelled to Nawali for a religious festival (Ismail 1991: Text 128). Given the chronological connection between these two texts, and our knowledge of the religious basis for treaty making, this tablet may connect the god Adad of Nawali to this diplomatic act.

The set phrases that we have analysed here only occur in LT-3, which was probably written in Kahat. Three other Leilan treaties (LT-1, LT-2, LT-4), which were written at Tell Leilan itself over approximately 40 years, use a different stock phase for Apum and its treaty partners. Rather than formally dividing these second-millennium BC kingdoms into two lands, or stressing their religious singularity, these treaties emphasise the people of Apum. The normative descriptive terminology which is repeated twice in the text of LT-4, allowing us to reconstruct the entire title, reads: *'Till-abnû son of Dari-epuh/ [king] of the country of Apum, his sons, his servants/ his [tro]ops, his seasonal camp and his kingdom'* (ii:3-5, Akk. *ti-la-ab-nu-ú* dumu *da-ri-e-pu-uh/* [lugal] *ma-at a-pí-im* dumu-meš-*šu* ìr-*du*-meš-*šu* /[*ṣa*]-*bi-šu na-wi-šu ù nam-la-ka-ti-šu*). This phrase substitutes certain elements for those used in LT-3: 'troops' replace 'elders' and 'seasonal camp and kingdom' replaces 'the land of Hana'. This designation is less formal and more operational than the ones used in LT-3. Instead of using a phrase that establishes a dichotomy between the urban and pastoral territories of Apum, or the two ethnic identities of the towns of Kahat, the treaties written at Leilan name the people actually affected by this agreement: the princes of Apum, royal administrators, military troops and pastoral groups during their seasonal migrations.

From the elaborate descriptive terminology in LT-3 alone, Kahat appears as an equal partner of Apum. The diplomatic jargon used in the letters between Kahat and Apum supports this theory, since Jamṣi-hatnû addresses Till-abnû as his brother and hence equal. When we extend our inquiry to the content of the treaties, letters and administrative texts, however, the situation is reversed. Apum clearly controlled more territory and had more military power. It appears that the two countries drew on different forms of social capital and ruled their territories in different ways. Kahat's influence and prestige was

religious and historical, while Apum's was military and political. Kahat's importance in north Mesopotamia emerged from its probable role as the heir to the ancient kingdom of Urkiš and Nawar and the guardian of two major shrines. On the other hand, Kahat did not have the military or political clout of the land of Apum or of the other major players in the region, like Kurda, Andarig, or Razâma of Jassan. Instead, Kahat stood apart from the various military confrontations described in the letters. A stipulation in LT-3 (iii: 21-6) allows Apum to have limited control over former Kahat vassal states, indicating that Apum may have had *de facto* control over several areas that supposedly belonged to Kahat (Figure 5). Similarly, two administrative texts from Leilan, dated to the same year as the treaty, record rations issued to people of Kahat, in Kahat, thus implying that Apum had assumed some political responsibility for this kingdom (Ismail 1991: Text 97, 133). A letter about grazing rights dating to the reign of Till-abnû's predecessor shows that Apum's sheep not only regularly grazed along the Jaghjagh in areas that were probably nominally part of the kingdom of Kahat but that the kings of Apum could even extend these grazing rights to foreign kings (Eidem 2008: Letter 10). An administrative text written six months after the treaty was concluded records another journey of Till-abnû to Kahat, in order to administer the pastoral segment of Apum's economy (Ismail 1991: Text 129). During this trip, Till-abnû receives 'Amurru-sheep' from the elders or rulers of several towns in Kahat, perhaps tribute to Apum's king.

Another factor that complicates the concept of geographical borders in early second-millennium BC northern Mesopotamia is Apum's control of Ilan-ṣura. During the period in question, Till-abnû's brother and successor, Jakun-ašar, governed this city which seems to have been either the western limit of the land of Apum or a dependant city (Eidem 2008: 27-8). Yet the letters from Ilan-ṣura suggest that it was located west of the Jaghjagh, probably near Chagar Bazar (Figure 5) as Jakun-ašar writes in support of a man from Till-šannim, a toponym that occurs frequently in the Chagar Bazar texts but nowhere else. Till-šannim may have even been the ancient name of Chagar Bazar (Talon 1997: 6). Previous research in historical geography has situated Ilan-ṣura, one of the most important kingdoms in the Ida-maraṣ, both east and west of the Jaghjagh (Wäfler 1995; 2000; 2003; Guichard 1997). The evidence from Leilan may confirm a western location. This implies that Apum had political control of a non-contiguous region during this period (Figure 5). In another Leilan letter, the king of Eluhut tells Till-abnû that he will grant him a town in his kingdom west of Kahat (Eidem 2000: 258; 2008: Letter 89). Towns east and west of Kahat were thus subject to the kings of Apum and sent agricultural and manufactured goods to Leilan. The complications of this situation suggest that we should not infer that second-millennium BC kingdoms had set borders or were dependent only upon their immediate countryside.

The picture that emerges from the texts is one of an astonishingly fluid political landscape with often ambiguous borders (Lafont 1999; Eidem 2008: Letter 89). In the Mari and Leilan documentation, kingdoms are a collection of people initially, and of places secondarily. We would do well to remember the stock phrase used to describe north Mesopotamian kingdoms in LT-1, LT-2 and LT-4, which lists groups of actors, sedentary and nomadic. The ephemeral nature of political power and territorial control during the early second millennium BC may explain why the role of religion in defining places is so pronounced.

Despite the constantly shifting alliances of the kings and their contracting and expanding territories, the presence of shrines and the tour of the goddess provided stability and cultural unity.

Interpreting the archaeological settlement pattern

What are the implications of these fractured borders, non-contiguous kingdoms and migrating nomads for the analysis of Near Eastern archaeological surveys? The texts emphasise that the perspective of most excavations and surveys is too narrow. The kingdoms of this period are not closed systems but instead blend into one another. This is true politically: a town 10km from Barri/Kahat and 30km from Leilan/Apum might be part of the latter rather than the former kingdom for a decade, after which the situation could be reversed. It is also true economically: villagers who lived a few kilometres from Leilan/Apum could travel hundreds of kilometres to pasture their sheep. As a result, Near Eastern surveys are far too regionally restricted, and do not represent anything close to the true catchment areas of second-millennium BC cities, which like so many historical entities often governed non-contiguous territories.

This political understanding emphasises our need for models that are similarly contextual. We cannot apply geographical models developed in the late nineteenth or early twentieth century for the United States or Western Europe to the realities of second-millennium BC northern Mesopotamia. Rather our models must incorporate two points, the importance of which the texts emphasise: first, the dynamic political alliances that created a complex and fluid political geography and second, the dual nature of the agricultural and pastoral economy.

In order to provide an accurate insight into north Mesopotamian settlement systems, survey analyses must incorporate the dynamic political and economic systems of the early second millennium BC. The Mari letters document dramatic shifts in the basic organisation of the cities of the Habur Plains. During the reign of Samsi-Addu, this area was centrally managed and integrated into a larger economy that embraced most of northern Mesopotamia (Villard 2001). Once Zimri-Lim of Mari came to power, however, both the control and integration of this area weakened. The amount of land governed from Tell Leilan/Apum decreased as nearby cities, which had previously been under its sway, became independent. The rich agricultural land of this region, as well as the accumulated wealth from Samsi-Addu's time encouraged continuous foreign invasions. The aggressors ranged from nearby kingdoms like Andarig to the Sukkalmah of faraway Elam. In less than a century the central power in this region shifted from Ešnunna, to Šehna/Šubat-Enlil itself, to Mari, to Halab (Charpin & Ziegler 2003).

The emerging picture fits a land with several centres better than a well-integrated territorial state and correlates with long term historical evidence for northern Mesopotamia during the second millennium BC. It can also help explain cases where archaeological data do not behave as expected. Diederik Meijer's analysis of his north-eastern Syria survey resulted in an unexpectedly convex rank-size graph, a distribution which probably indicates low levels of system organisation and integration (Savage 1997). Meijer had previously assumed that this area was always strongly integrated into a territorial empire, based on the evidence of
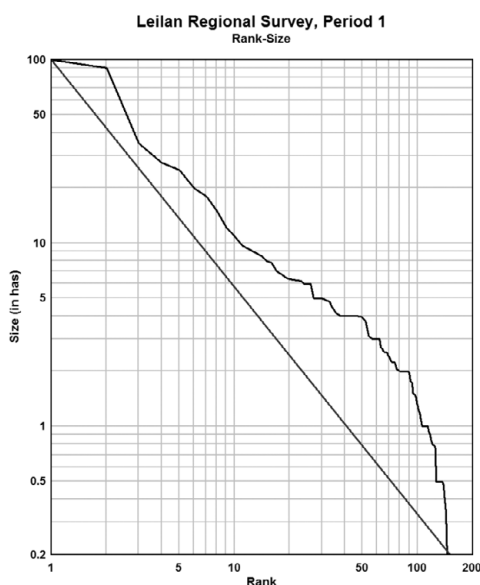
Leilan Regional Survey, Period 1
Rank-Size

Figure 6. Rank-size graph for Tell Leilan Regional Survey, Period I (1900-1700 BC).

Samsi-Addu's reign (Meijer 1990). A rank-size plot of the Leilan survey shows a similarly convex distribution (Figure 6). Such a distribution generally occurs when centres of equivalent economic function are of comparable size (Falconer & Savage 1995). This analysis suggests that the borders of these Mesopotamian surveys did not coincide with bounded and stable kingdoms centred on one city, as often assumed for small-scale surveys. Instead, the distribution may reflect the semi-independent status of most of the cities of this region and their alternating experiences of provincial integration and regional segregation.

The importance
of the pastoral element

Although the texts dichotomise the desert and the town, they also depict a culturally unified realm. This is not simply Rowton's dimorphic system, where dual enrichment and impoverishment cycles encourage the poorest and richest nomads to settle (Rowton 1974). Instead, contemporary texts emphasise that each city, town and village has a tribal identity (Charpin & Durand 1986; Fleming 2004). In the Leilan survey region, this tribal element might explain the large number and small size of villages during this period around Tell Leilan. The preceding period saw the least number of sites, while this period, Period I (corresponding to the early second millennium BC) has the largest number recorded by the Tell Leilan Regional Survey (Figures 7 and 8). This survey catalogued 157 settlements dating to Period I and identified an occupied extent of 767ha, more than 10 times that of the previous period. Most of this settlement occurred in villages. Excluding the two largest sites, the mean site size is only 2.25ha. The small size of these villages may be correlated with herding groups or nomadic lineages (Eidem & Warburton 1996; Ristvet & Weiss 2005). 79 per cent of settlements during this period were founded on previously settled mounds. This settlement pattern resembles the early twentieth-century resettlement of the Jezireh, when following centuries of nomadism, people established settlements atop or beside archaeological sites (Montagne 1932: 58; Velud 2000: 76-9).

Combining survey data with information about pasture from the Leilan texts therefore allows us to render notoriously invisible nomads visible. The letters suggest that the majority of Apum's pasture lay along the Jaghjagh, the Middle Habur and around the Sinjar; outside the traditional confines of the kingdom (Eidem 2008: 55, 84, 99). Other documents mention Apum sheep or sheep from foreign locales grazing within the land of Apum (Ristvet 2005), particularly in the east and south, suggesting that the countryside was a patchwork of land used for agriculture and pasture (Figure 9). The basaltic eastern plateau beyond Mohammed
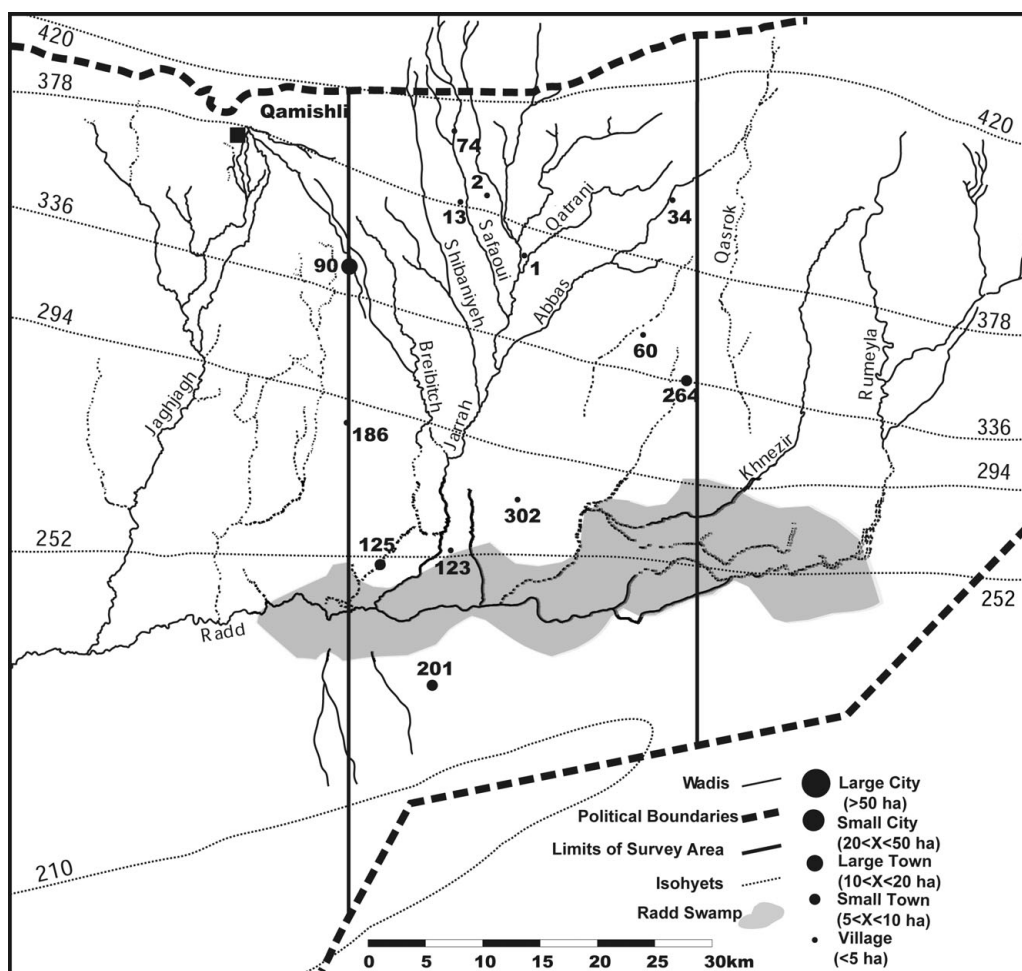
Figure 7. Tell Leilan Regional Survey (1984-2002), Period IIc (2200-1900 BC). The Tell Leilan survey covered a 30km-wide transect between the Turkish and Iraqi borders comprising 1650km². Sites were located from maps, SPOT and Landsat imagery, local informants and a walking survey along two wadis. Surface material was collected according to site topography.

Diyab (ancient Azamhul?) is better-suited to pasture than dry-farming (Weiss 1990). The area south of Leilan near the Radd swamp (ancient lake Halaba) is also marginal for dry-farming, but adequate for grazing. Several sites in these areas have sparse evidence of Habur ware, in contrast to most surveyed sites, and may represent glorified pastoralist camps that were only seasonally occupied. Similar 'pastoral camps' have also been identified elsewhere in the Habur Plains in the Western Habur Triangle survey and the Beydar survey (Lyonnet 1996; Wilkinson 2002). Indeed, the lack of lower order sites in the Western Habur Plains is probably due to a different model of dominant pastoralism (Lyonnet 1996; Wilkinson 2002). The large tells in the north must have been the famous cities of Ida-maraş, which play a prominent role in the Mari documentation, cities that were surrounded by plains empty of farmers but full of nomads. We must reconceptualise this landscape and emphasise the urban/pastoral dichotomy rather than an urban/rural dichotomy.
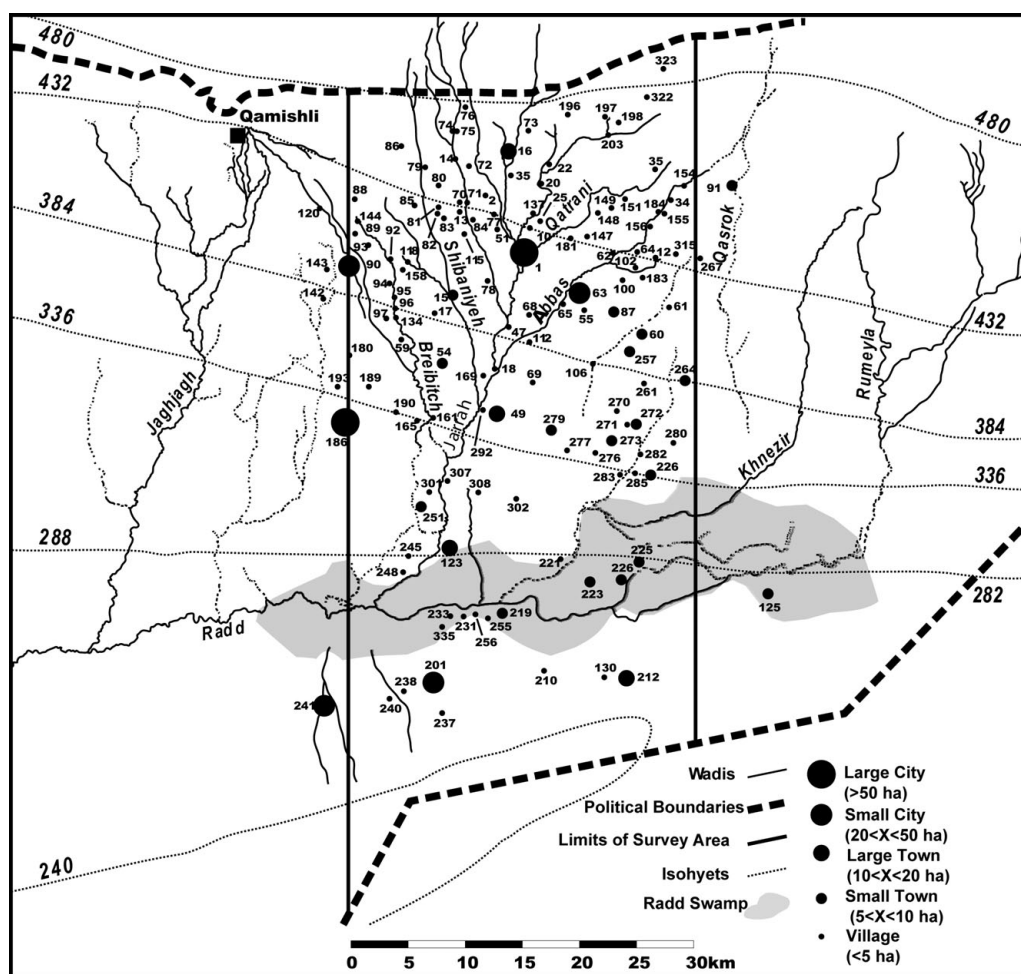
Figure 8. Tell Leilan Regional Survey, Period I (1900-1700 BC).

Conclusion

The second-millennium BC cuneiform texts from Tell Leilan provide Near Eastern archaeologists with a new framework for analysing survey data, one that can explain trends that do not fit the assumptions of modern spatial analytic techniques, like central place theory and rank-size distributions. Analysis of both the legal and functional limits of two northern Mesopotamian kingdoms reveal that pre-modern political and economic organisation does not always respond as modern geographical analysis assumes. The political instability of this area should prevent us from assuming that ancient polities had stable borders. Similarly, the importance of pastoralism in the Near East means that survey archaeologists must expand their geographic perspective and consider much larger catchment areas.

Although these specific conclusions are applicable to the Near East, they raise general concerns about survey design and analysis for all archaeologists. One of the arguments in favour of full coverage survey is that it allows archaeologists to infer spatial organisation
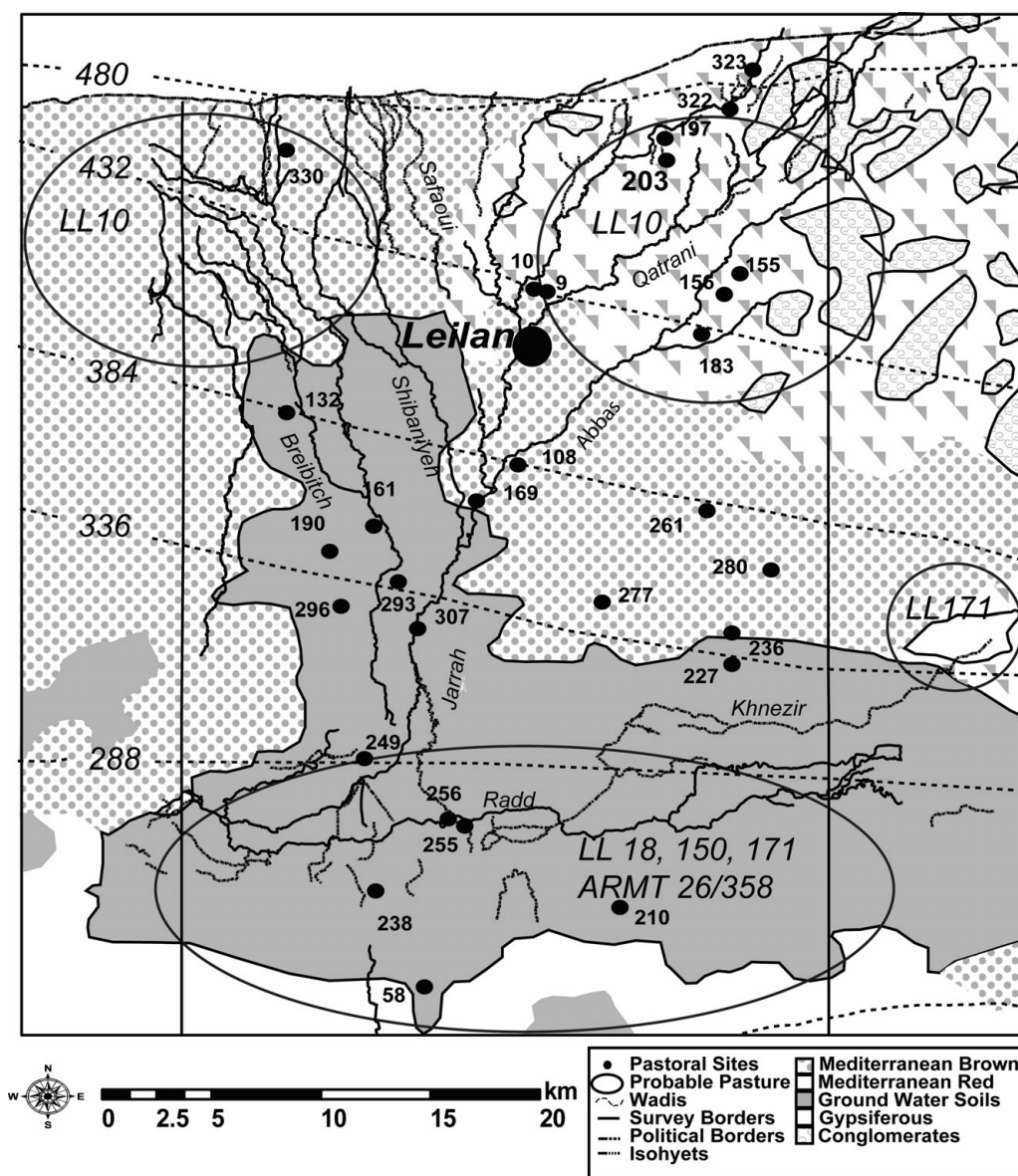
Figure 9. Probable areas of pasture in the Leilan survey area, based on evidence from texts, sherd scatters and soil resources (van Liere 1964; FAO 1966).

and hence better understand the political and economic activities thus created (Fish & Kowalewsi 1990). Yet this case study suggests that without contextualising settlement data using archaeological and historical evidence, full coverage survey alone does not enable us to identify political and economic organisation or its spatial correlates, a concern that has emerged in recent analyses of regional archaeology (Kantner 2008: 41-2). Although analysing how people understood and created their political and ritual landscapes can be difficult given the gaps in the textual and archaeological records, documentary understanding

of local land use can provide a useful starting point for modelling ancient political territories that do not conform to standard spatial analyses.

Acknowledgements

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