RUBINA RAJA AND EIVIND HELDAAS SELAND

The Paradox of Palmyra

An Ancient anomalopolis *in the Desert*

ABSTRACT Palmyra, the UNESCO world heritage site that tragically made headlines following ISIS's destruction of several of its key monuments in 2015, was once a thriving city in the heart of the Syrian Desert. Settled from Neolithic through modern times, the documented urban history of the site spans a millennium, from the late centuries BC until the late first millennium AD. Palmyra has often been cast as 'the bride of the desert', and the apparent paradox of a sizeable city 150–200 km from major areas of cultivation has spurred considerable scholarly interest. In this article, we discuss the roles of climate change, geopolitical changes, and nomad–settled interaction in the urban biography of Palmyra, drawing on published palaeoclimatological evidence and general evidence offered by urban development, epigraphy (inscriptions), and settlement size.

KEYWORDS Palmyra; oasis city; climate change; arid Near East; urban development; settlement size

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The City in the Desert — An *anomalopolis*

Palmyra was the Greek and Latin name of an oasis and a city in the northern Syrian Desert (Fig. 9.1). To the north and east, the distance to the agricultural corridor of the Euphrates Valley is 150–200 km. To the west, the closest major centres are Homs (140 km), Apamea (200 km), and Damascus (220 km). The settlement is arguably more properly referred to by its Semitic name of Tadmor, as the latter toponym is attested throughout the recorded history of the place. Palmyra, however, is a well-known and established name that has the advantage of distinguishing the urban history, even if this also outlives Roman rule in Syria.

The claims of Palmyra as constituting a different sort of settlement compared to other urban sites, an *anomalocivitas*, are many and include the unique architectural, artistic, and epigraphic records of the city, and its key role in Old World long-distance exchange. While these aspects of Palmyra's urban history have been noted by a large body of modern scholarship, the anomaly of the city was recognized already by ancient observers. The Roman naturalist Pliny the Elder described Palmyra as 'a city famous for its situation, for the richness of its soil and for its agreeable springs; its fields are surrounded on every side by a vast circuit of sand' (Plin., *HN* v. 88, trans. by H. Rackham) (Figs 9.2–9.3). Writing a few decades later, Josephus, who incorrectly thought Palmyra was founded by Solomon, also, with more precision, described the region of Palmyra as having springs and wells in an otherwise arid landscape (Jos., *Ant. Iud*. VIII. 153–54), thus taking note of the

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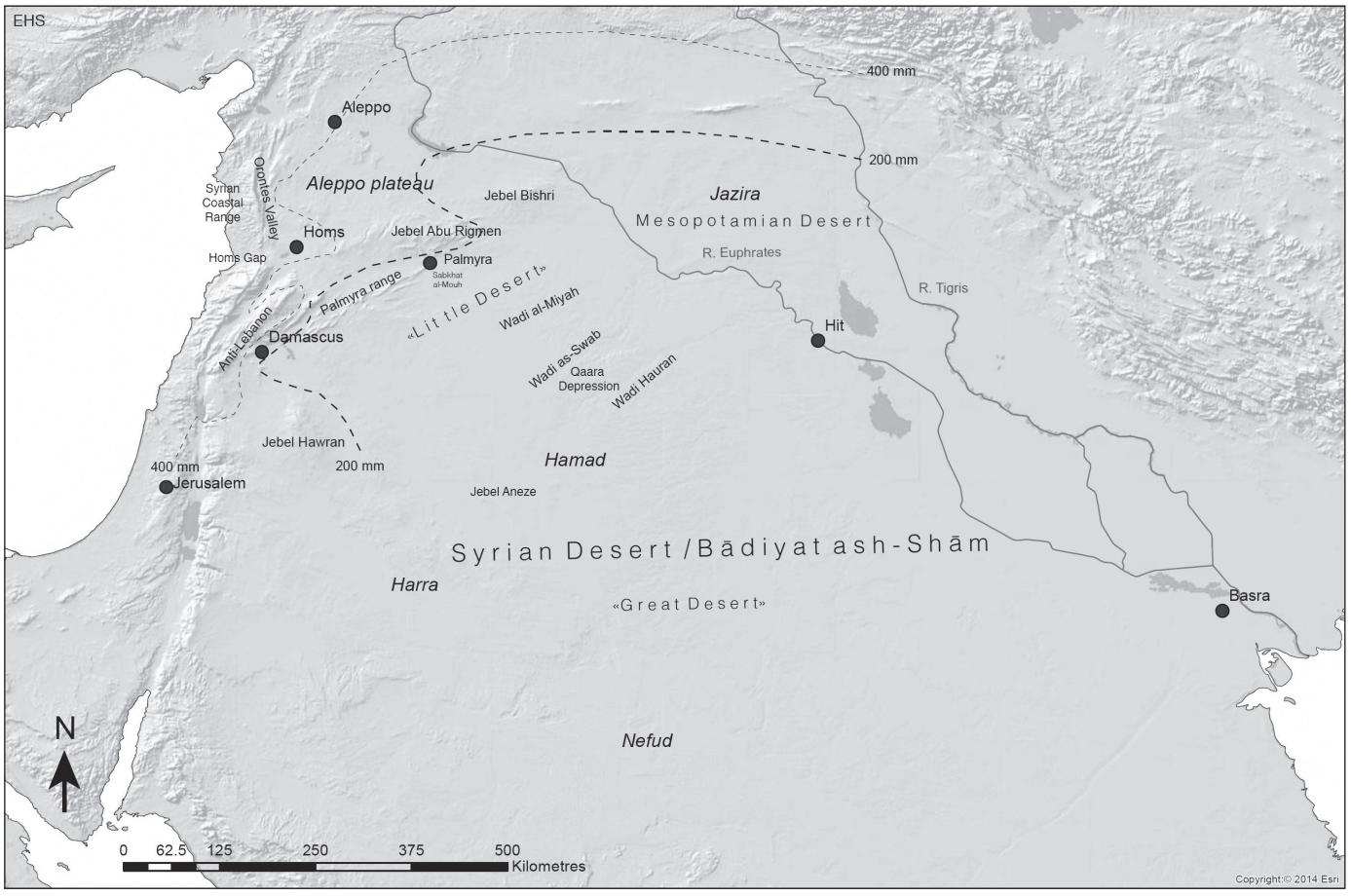

Figure 9.1. Regional map of the Syrian Desert. Map by Eivind H. Seland. Basemap © ESRI 2014.

Figure 9.2. View of the oasis at the Temple of Bel, looking south-east. Courtesy of Jørgen Christian Meyer.

Figure 9.3. Aerial view of Palmyra from the 1920s/30s. Palmyra Portrait Project and Rubina Raja, courtesy of Mary Ebba Underdown.

conditions that made agriculture and pastoralism possible in the hinterland of the city. While these classical authors both lacked first-hand knowledge,[1] and the Syrian Desert is better described as gravel than as sand, their main point about water still stands, and the emergence and prosperity of an urban centre in a marginal environment does merit attention. Arguably, this ecological anomaly also provides the background for the economic and cultural distinctiveness that has made Palmyra famous in modern times (i.e. Hoffman-Salz 2011; 2015). Subsistence and demography in ancient Palmyra have received limited attention in past scholarship (but see Crouch 1975; Hauser 2012; Meyer 2017; Romanowska, Bobou, and Raja 2021; Raja, Bobou, and Romanowska 2021). With one remarkable, but by all standards outdated exception (Partsch 1922), the relationship between the climate- and urban histories of the site has only been addressed in passing (e.g. Issar and Zohar 2007, 234–35). While local palaeoclimatological series from the Syrian Desert are still lacking, the urban biography of Palmyra might well be studied in light of regional climate as reflected in archaeological and historical evidence as well as in light of regional palaeoclimatological evidence.

Archaeological evidence of human activity in the region of Palmyra reaches back to the Epipalaeolithic. With the gradually drier regional climate in the early Neolithic, activities contracted towards the oasis, and over time the mode of subsistence changed towards food production (Cremaschi and Zerboni 2016) with the surrounding region being exploited by groups relying on pastoralism and cooperative hunting of gazelle and other animals (Morandi Bonacossi and Iamoni 2012). Evidence of habitation dating to the third millennium BC has been identified beneath the Roman-period Sanctuary of Bel (Al-Maqdissi 2000), and the toponym of Tadmor is attested in early second-millennium texts from Kanesh in Anatolia and Mari on the Euphrates (Klengel 1996; Schou 2015, 92–94). While controversial references to Tadmor appear in Old Testament/Hebrew Bible texts (Klengel 1996, 162; Sommer 2018, 156), the urban archaeological record only commences in the late Hellenistic period (Plattner and Schmidt-Colinet 2011; Schmidt-Colinet and al-As'ad 2013). Given the attractiveness of the oasis (see below) and the scattered Bronze Age and Iron Age references, it is likely that a permanent settlement existed at the oasis, but that it was of limited size and that most of its vestiges were eliminated by Roman-period development or remain hidden below the presently visible ruins and gardens (Gawlikowski 2021, 17). Several commentators have reasonably hypothesized a gradual urbanization of semi-nomadic pastoralists in the Hellenistic period on a site already established as a seasonal and cultic focal point (Yon 2002, 140–44; Gawlikowski

1 For Pliny, see Will 1985. For Josephus, see Klengel 1996, 162; Sommer 2018, 156.

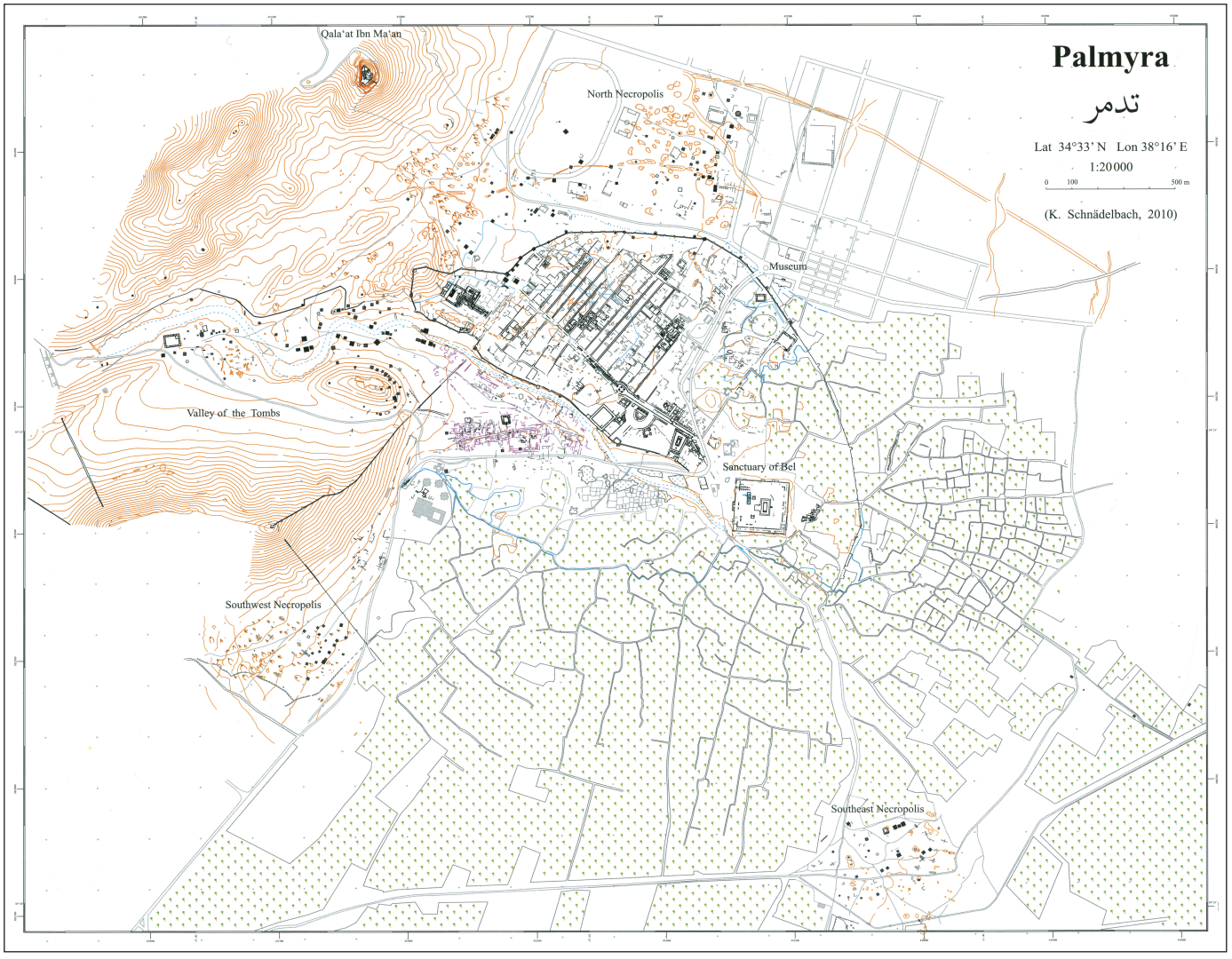

Figure 9.4. Map of Palmyra (from Schnädelbach 2010). Courtesy of Klaus Schnädelbach.

2003; Kaizer 2017; Sommer 2018, 156–57). However, this process is currently not overtly traceable in the archaeological record.

Although Pliny and Josephus never visited Palmyra, their short descriptions of the city offer crucial insights into what was deemed important about the city to contemporary observers. Both authors focus not only on urban Palmyra but also on its hinterland — an important inclusion since these two elements are so closely entwined that it is virtually impossible to study either in isolation (Meyer 2017). Pliny's mention of the fields surrounding Palmyra reminds us that the city was encircled by arable land or land that could be made arable. The farming of the hinterland could only be achieved through intense management of water resources throughout the year (Meyer 2017, 17–27). Palmyra, with its fields and gardens, was nonetheless essentially an oasis surrounded by an arid steppe. This landscape, often referred to as the *badiya*, with a term used for the deserts inhabited by the Bedouins, was utilized as pastureland as well as for agriculture (Meyer 2017, 17). Permanent settlements were located in the hinterland. Works of art and remains of buildings found there underline that some of these had a permanent character and were not only seasonally occupied (Schlumberger 1951; Meyer 2017, 28–57; Raja and Seland 2020).

The first three centuries AD, what we today term the Roman period in the Near East, are the time from which by far most of our archaeological evidence stems (Fig. 9.4). In these centuries, Palmyra was under Roman rule, and the stability which Roman domination brought with it had an immediate economic effect on the region. The stable political and military climate allowed for economic growth and not least for investments into long-term projects that would have needed societal trust in order to

be realized, among them the city's celebrated role in long-distance trade between the Mediterranean and the Indian Ocean (Seland 2016). In Palmyra the effects of stability and prosperity are evident in the urban structural expansion (Hammad 2010; Gawlikowski 2019; Raja 2022) as well as in the development of the artistic and architectural traditions of the city, in particular its portrait habit (Ingholt 1928; Raja 2019; 2020; Bobou and others 2021). The urban trajectory of Palmyra, however, abruptly changed course when the city was sacked by Roman troops under the command of Emperor Aurelian in AD 272 and again in AD 273 following the uprising led by Zenobia, on behalf of her underage son Vallabath. The settlement continued but on a much smaller scale well into medieval times (Intagliata 2018). Until the 1920s the entire *temenos* (sanctuary enclosure) of the Temple of Bel held a village, which only was dismantled during the early years of the French Mandate, when archaeological projects mainly focusing on the Roman-period monuments led to the forced relocation of the population to a new settlement adjacent to the ruins (Raja 2022, 124–26).

Water, Climate, and Agriculture in Palmyra and the Palmyrene

The oasis of Tadmor/Palmyra is a fertile area watered by underground aquifers in the otherwise semi-arid environment of the Syrian Desert. Palmyra is situated near the lowest elevation of the Tadmor basin with a catchment of 4860 km² (Wirth 1971, 63–64; Brunel and others 2006). With an average annual precipitation of *c.* 120–40 mm in the catchment area, almost all of it between October and April, significant quantities of water are available, much of which, however, evaporates, drains towards the seasonal salt lake of Sabkah al Mouh south of the oasis, ends up in underground reservoirs, or is dispersed through the numerous minor springs in the region. Due to topography and geology, the availability of groundwater is better in and along the limestone mountains north of Palmyra than in the flat gravel plain to the south-east, which drains towards the Euphrates by way of three major wadi systems (Meyer and Seland 2016; Seland 2019).

The Syrian Desert is classified partly as cold, partly as hot desert climate (Köppen-Geiger BWk and BWh) (Beck and others 2018). Although there have been fluctuations over time, archaeological surveys of the hinterland (Morandi Bonacossi and Iamoni 2012; Schou 2015; Meyer 2017), along with historical sources and travellers' reports, confirm that the region of Palmyra has been semi-desert or dry steppe since the mid-Holocene desiccation. The anthropogenic impact on landscapes might, however, have been significant even in pre-industrial times. While the region today appears mostly as desert and wasteland, early twentieth-century visitors described it more in terms of parklands with lush pastures and terebinth and pistachio trees (von Oppenheim 1899–1900; Musil 1928, passim; Betts 1998, 2–4; Wilkinson 2003, 18–19; Meyer 2017, 17–22). A major and still unresolved question is the impact of human activities on the landscape during the Roman-period peak of Palmyrene urbanism.

Local and microregional climate series are still lacking. Recent reviews of regional evidence, however, indicate wetter conditions than those currently prevailing in the region during the so-called Roman Climate Optimum, *c.* 300 BC–AD 200, followed by less stable climate, *c.* AD 200–350, and a dry period described as the Late Roman Megadrought, *c.* AD 350–470. This was followed by a historically wet period, *c.* AD 470–670, which was interrupted briefly by the decadal 536-climate crisis. From the late seventh century until the ninth century AD the region experienced gradually desiccating conditions.[2]

Before the Syrian civil war, which broke out in 2011, the gardens of the Palmyrene oasis covered *c.* 1000 ha. This, however, was possible only with the aid of mechanized pumping. Around 20 per cent of this area, close to the Sanctuary of Bel, was known as the 'Old Oasis' (Brunel and others 2006). Until the introduction of drilled wells, the regional groundwater level was higher (Baba, Karem, and Yazdani 2021), and the oasis was served by two springs, the sulphurous Efqa, just west of the gardens of the ancient city, and the Abu al Fawares, *c.* 7 km to the west, as well as a smaller spring at the foot of the hills north of the archaeological site (Musil 1928, 136, 145; Crouch 1975; Żuchowska and Juchniewicz 2012). These springs were also active in Antiquity as evidenced in archaeological remains of hydraulic infrastructure as well as in epigraphic sources (Crouch 1975; Piacentini 2002; Yon 2009). According to the preserved municipal tax law dating to the second century AD, water for irrigation and livestock was city property and taxed at a considerable rate (*PAT* 0259; commentary Matthews 1984). Before the Syrian civil war, the main crops of the gardens were dates and olives (Brunel and others 2006). When Alois Musil visited in 1912, barley was still an important crop, cultivated between the trees, but the

2 Izdebski and others 2016; Labuhn and others 2018; Harper and McCormick 2018. For a case study, also see Lichtenberger and others 2021.

Figure 9.5. View of tower tombs. Photo by Rubina Raja.

Figure 9.6. Several sarcophagi from the Hypogeum of the Three Brothers, AD 200–220. Palmyra Portrait Project, Ingholt Archive (PS 1066), courtesy of Ny Carlsberg Glyptotek.

yield was insufficient to supply even the 350 households that the village consisted of at that time (Musil 1928, 145). We may take for granted, however, that the combined water of these sources, together with wells and cisterns, was sufficient to cater for the daily needs of its inhabitants even when Palmyra was at its urban peak in the third century AD, a time at which Palmyra has been estimated to have held a population of between *c.* 50,000 and 150,000 (Crouch 1975). This raises the question whether Palmyra had more ample access to water in the Roman period than it had in the early twentieth century.

This is not the place to discuss the food supply of ancient Palmyra, which must have been a major undertaking, but which is addressed in several recent studies (Hauser 2012; Hoffman-Salz 2015; Meyer 2017). In summary, however, the agricultural potential of the region was significant. Palmyra was part

of a regional agricultural tradition combining the extensive cultivation of cereals with horticulture of dates, olives, and vines (Wilkinson 2003; Decker 2009; Kamash 2013). In this arid subregion, emphasis on barley, which is hardier than wheat; and dates, which have very modest requirements of water after the first two years, is likely. Julia Hoffman-Salz (2015) suggests that tribal institutions were instrumental in regulating agricultural production in the city, and notwithstanding the continuing debate on the nature and role of Palmyrene tribes vs civic institutions (Sartre 1996; Smith 2013; Sommer 2017), her point that food production must have been a matter of communal interest and responsibility in the special environment of the Syrian Desert remains vital to our understanding. In addition to the oasis in Palmyra, substantial fields were located west of the city, the antiquity of which is attested by altars dedicated to the Palmyrene deity of fertility and storms, Baal Shamin, depicting ears of grain. These were irrigated with surface water flowing from Wadi Abyad, north of Palmyra (Meyer 2017, 41–46). Seventy kilometres south-west of Palmyra, the impressive Umayyad-period Harbaqa Dam provided possibilities for large-scale irrigation. Whether the dam has a Palmyrene/Roman precursor is debated (Meyer 2017, 46–51), but the water flowing through the wadi in which the dam was constructed would in any case be suitable for run-off irrigation similar to the fields west of Palmyra. Throughout the northern territory of Palmyra, such opportunities existed on a smaller scale and are well documented in more recent historical periods (Meyer 2017, 36–41).

Proxies for Urban Development

The transition from what is assumed to have been an overall nomadic subsistence basis of the desert tribes to a sedentary community had to bring a different sort and variety of labour specializations with it, since several parts of the population would not have been involved in sustaining food accessibility for the group. The Hellenistic city occupied about 20 ha to the south of the Roman-period city, which also included the areas of sanctuaries such of Nabû and Arṣû, and the area where later the theatre and the agora would be built. For the most part pre-Roman settlement has not been traced in the later Roman city (Schmidt-Colinet and al-As'ad 2013, 75).

In the first century AD, the construction of sanctuaries such as that of Bel, the city's main sanctuary, to the east and of Allat to the west, expanded the settlement into the area to the north and east of the earlier Hellenistic settlement. Infrastructural developments most likely also were implemented in this period, such as the layout of the road connecting the city's east and west parts (Gawlikowski 2019). Furthermore, it was in this period that the monumental tower tombs, large elite family tombs, which are icons of Palmyra, were introduced (Henning 2013) (Fig. 9.5).

Figure 9.7. Sarcophagus box relief depicting an unmounted camel with a riding saddle and two standing males. Palmyra, Palmyra Museum, inv. no. 2093/7431. AD 240–273. Courtesy of Jørgen Christian Meyer.

A detailed and complete overview of the city's expansion between the first and the third centuries AD does not exist, but the construction of public and religious buildings continued well into the second, and even into the third century AD (Hammad 2010). Most likely construction of domestic housing also continued — but this has not been studied in any detail, since most archaeology undertaken at Palmyra has focused on its public monuments (Gawlikowski 2019). Vast necropoleis consisting of monumental tower tombs and underground tombs, as well as house or temple tombs, were established around the city, and more than five hundred funerary monuments have been documented around the city (Schnädelbach 2010; Henning 2019). While no workshops have been excavated and published from Roman Palmyra, other sources of archaeological data give insight into craft specialization, such as the architecture and architectural and sculptural decorations (Fig. 9.6) (Raja 2022; Raja and Steding 2021a; 2021b). Numerous quarries around the city also bear witness to craft specialization (Schmidt-Colinet 1990; 1995).

The evidence for trade is another proxy for Palmyra's urban development (Fig. 9.7). Among

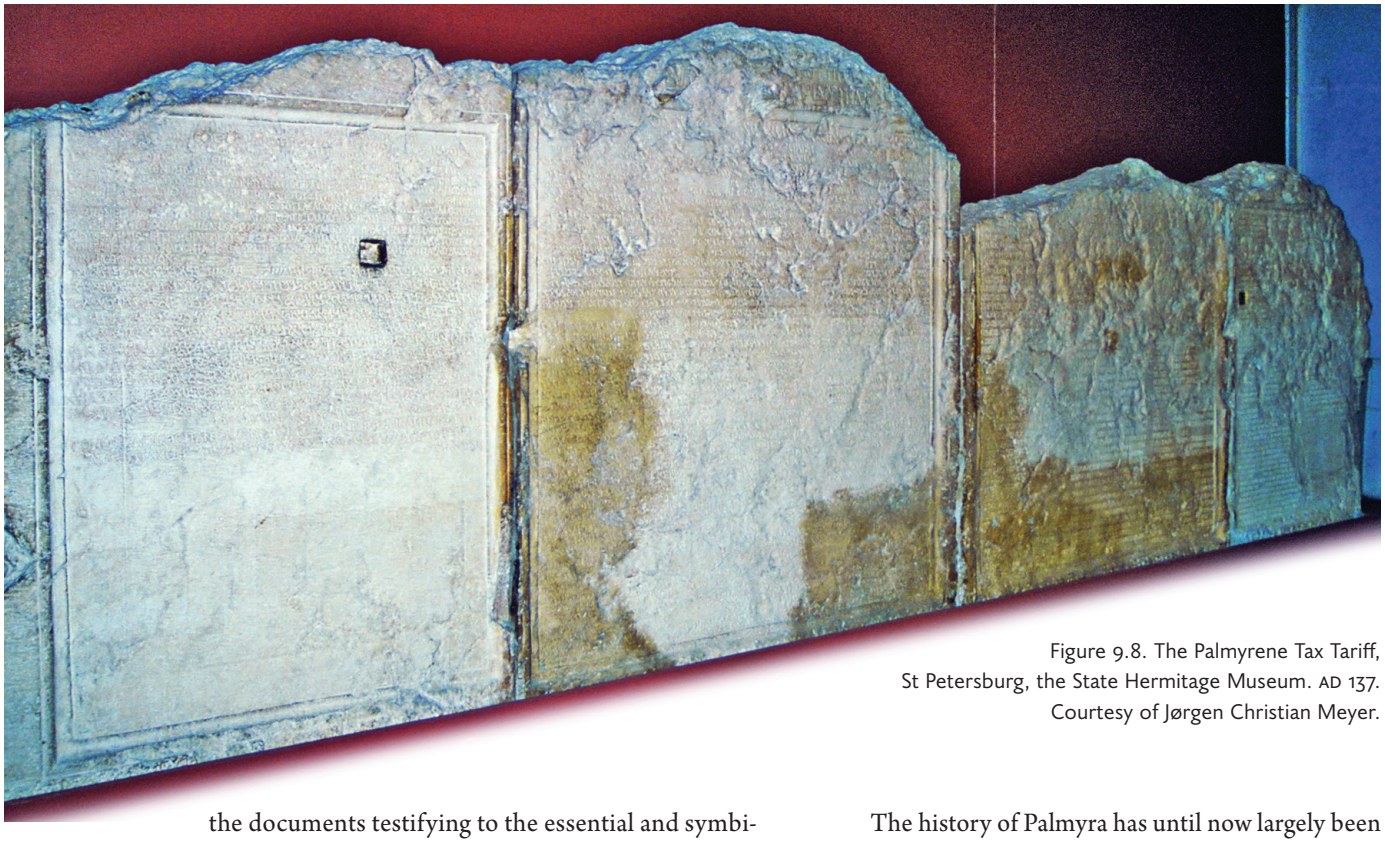

Figure 9.8. The Palmyrene Tax Tariff, St Petersburg, the State Hermitage Museum. AD 137. Courtesy of Jørgen Christian Meyer.

the documents testifying to the essential and symbiotic relationship between the city and its surroundings is the famous Tax Tariff of AD 137 (*PAT* 0259), a monumental limestone block onto which a bilingual record of the local tax law was inscribed. The tariff regulates grazing rights (Greek, lines 233–37; Aramaic, lines 145–49), as well as foodstuffs brought in from the surrounding countryside (Greek, lines 181–91; Aramaic, lines 102–13), and the use of water from the springs, presumably for irrigation in the gardens (Greek, lines 88–91; Aramaic, line 58) (Fig. 9.8). The tariff does not deal with long-distance trade but focused on the local handling of taxation matters (Matthews 1984; Shifman 2014). Imports found in the archaeological record of the city also bear witness to the products which were produced in other places. Ceramics from both Antioch and Athens, as well as produce transported in Rhodian amphorae, were imported to Palmyra already in the Hellenistic period (225–175 BC) (Römer-Strehl 2013, 8–10). Parthian imports are also found from about 175 BC. The dominating type of imported pottery after the mid-second century BC was Parthian ceramics, but *terra sigillata*, the red-glazed fine ware, from Asia Minor and eggshell ware from Mesopotamia also occur (Römer-Strehl 2013, 11–80). The funerary sculpture gives further indications of imports, since they depict Palmyrene women with rich jewellery with parallels found both in central Roman and eastern contexts (Raja and Steding 2021b; Krag 2018).

The history of Palmyra has until now largely been written as accounts of the development of the monumental architecture of the city, its rich corpus of art, as well as the inscriptional material and other written sources (Yon 2002; Smith 2013; Sommer 2017). Domestic architecture has rarely been investigated, until recently. Furthermore, the publication of small finds from various contexts has only begun to occur in the last decades (i.e. Higuchi and Izumi 1994; Higuchi and Saito 2001; Saito 2005; Schmidt-Colinet and al-As'ad 2013). If we want to study individual wealth, which in turn had an impact on the overall development of the city, we have to turn to the inscriptions from the public and religious spheres of Palmyra, which number several thousand, giving us information about individual sponsorship.

Members of the Palmyrene elite financed the construction of the monumental sanctuaries in Palmyra (Kaizer 2002). They also invested in the financing of other major monuments (Yon 2012; 2019). But another sphere presents good information about individual wealth, and this is the funerary domain, where we can study the commissioning of monuments, tombs, their decoration, and the often lavish funerary sculpture (Raja 2019; Romanowska, Bobou, and Raja 2021). A comprehensive study of all known graves and funerary sculpture has recently shown that these monuments and their developments over time give insight into drops and increases, fluctuations that connect closely to the development of the

city overall (Raja, Bobou, and Romanowska 2021; Raja 2022; Romanowska, Bobou, and Raja 2021). Measuring public wealth in Palmyra is difficult. If we look for example at the investment of the society in military activities, we do not get many hard facts, despite our knowledge that Palmyrenes were good soldiers as evidenced through inscriptions and art (Seland 2016, 68–70). It is often presumed that Palmyra under Odainath and Zenobia had a large army. Some sources estimate its size to 70,000 men, but these estimates are not reliable (*contra* Crouch 1972), and the question remains from where these men would have been sourced, since they most likely would not all have come from Palmyra.

So Palmyra's size, population size, growth, and overall wealth have only been estimated roughly based on urban density and the size of the urban landscape.[3] It is certain that the city grew intensely in the first centuries AD, after which its size stabilized until the unrest in the third century AD. After the sacks in AD 272 and 273, there seems to have been a sharp decline in population settled in the city (Intagliata 2018). The sixth and early seventh centuries saw a resurgence of activity in the city. New walls and several churches were constructed. In the early Islamic period at least one mosque and a new *suq* (market) were added (Gawlikowski 2005; Intagliata 2018). In the territory, extensive projects were undertaken, first in the form of the establishment of monasteries, later with the construction of luxurious Umayyad castles with accompanying hydraulic and agricultural infrastructure (Genequand 2012). This parallels agricultural expansion in other arid parts of the region in the Byzantine and early Islamic periods (Decker 2009, 174–203). Towards the end of the early Islamic period, these are abandoned. This also happened with the city centre of ancient Palmyra, and the village that survived until the early twentieth century was established behind the walls of the ancient Sanctuary of Bel.

Discussion and Conclusion

As stated in the introduction, Palmyra constitutes an anomaly on several levels. The maintenance of a distinct local cultural identity over centuries in a world otherwise dominated by imperial templates and the city's dependence on long-distance trade are two aspects that have received a fair share of scholarly attention. The foundation for the urban development itself, in terms of its agricultural basis in a region where dry agriculture has never been possible, has, however, rarely been addressed (but see Hoffman-Salz 2011; 2015). There is somewhat of a research trajectory in this observation, which can be traced back to the nature of the evidence available to us. The city and its hinterland yield ample — but often not collected or systematically studied — archaeological and written evidence (in particular from the Roman period) relating to its local culture and to its trade. However, even tracing the urban development in detail has not been done. And what is even more complicated is to trace and map the agricultural basis, since the hinterland of Palmyra is extensive and the necessary fieldwork expensive. Nonetheless, research undertaken and published over the last two decades does give possibilities for pulling together some evidence upon which to base considerations about the influence of climate on the site's development.

Even with the limited evidence available, it is clear that the periods of urban growth and prosperity in Palmyra coincide with benign climate conditions in the so-called Roman Climate Optimum, *c.* 300 BC–AD 200, and the Byzantine and early Islamic periods, *c.* AD 470–670. Urban crises and lows — including the Roman reduction and occupation of the city after AD 272/73; the near hiatus in building activities, literary sources, and epigraphic activity in the fourth and fifth centuries AD; and the abandonment of the urban core in the early–middle Islamic transition — coincides with periods of drier regional climate. Reduced activity in the city is accompanied by less evidence of settlement in the hinterland (Meyer 2017), unsurprisingly suggesting that the two are connected.

Assessing the nature of this connection, however, is less straightforward. The urban trajectory of Palmyra is also clearly associated with major geopolitical developments and events. The city emerges parallel with the establishment of the Syrian Desert as a frontier zone between the Roman and Parthian Empires. It is reduced following a serious rebellion against Roman rule. Its late Roman/early Islamic resurgence is associated with imperial interest and investment in the region and its subsequent demise with the end of Umayyad control and the shift of the political centre to Mesopotamia. Moreover, the late Roman and medieval to modern urban and hinterland lows coincide with periods of nomad strength in the region. The complex interplay between these factors currently cannot and probably should not be disentangled, but some general observations may be made.

3 Hanson (2016, 769–70) argues that Palmyra covered 120 ha. Also see Hanson 2016, 769–70 for further references. But now also see Romanowska and others 2021.

Palmyra's urban existence was always precarious. It depended on stable political conditions, investment in hydrological infrastructure, and a measure of economic prosperity, secured by caravan trade in the Roman imperial period and by strategic importance and regional imperial interest in the Byzantine and early Islamic periods. The expansion and prosperity of the urban centre only in periods of benign climate, however, lead us to conclude that climate change did play an important role in the rise and demise of the Syrian desert city. The oasis itself, while reliable as source of drinking water, was never able to provide agricultural support for a major settlement. Less rain would dramatically influence the agricultural potential of the hinterland and increase competition for resources with nomadic groups, making settlement and agriculture in the hinterland more difficult.

Climate change also affected imperial interest and capacity in the region. Dry climate would harm the tax and population base of the region and make it less attractive for imperial investment in control and infrastructure. Dry periods would also greatly harm the nomadic population, as the example of the catastrophic 1958–1961 Syrian drought may illustrate, which reduced herd sizes of sheep, goats, and camels by 34, 73, and 79 per cent respectively (Wirth 1971, 454). This would surely lead to increased competition for the scarce well-watered tracts of land that would be available for agriculture in more benign periods.

While Palmyra is a site that has attracted immense scholarly attention for more than a century and been the object of large-scale archaeological projects, as well as numerous smaller investigations, the results have until now not been pulled together in a way which addresses the site in a true longue durée perspective, disentangling the site's shifting character and the underlying reasons for these changes. We have here begun to outline and discuss the evidence and the way in which it must be tackled in the future in order to push borders for new directions in research into the *anomalopolis* that Palmyra was. In our opinion, climate change did have a role to play. It not only directly affected the amount of water available for food production in Palmyra, but also in a less direct manner the geopolitical conditions and the dynamics between nomads and settled in the Syrian Desert. It is hardly a coincidence that the urban centre at Palmyra emerged and flourished in a historically benign climate and contracted and was abandoned in periods with less rainfall.

Abbreviations

Jos., *Ant. Iud.*	Josephus, *Antiquitates Iudaicae*
PAT	Hillers, D. R. and E. Cussini. 1996. *Palmyrene Aramaic Texts* (Baltimore: Johns Hopkins University Press).
Plin., *HN*	Plinius maior, *Naturalis historia*

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