1 Introduction to the Themes of Sedentarisation, Urbanisation and State Formation in the Ancient Sahara and Beyond

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Introduction

This volume explores a series of linked themes that have wide relevance in world archaeology: sedentarisation, urbanisation and state formation. In this opening chapter we review some of the key background to recent debate on these themes and identify some of the Saharan particularities which complicate the application of models developed elsewhere.

A dominant discourse on the Sahara throughout history has been the idea of a 'nomad menace', coupled with a persistent emphasis on the Sahara as largely uninhabited and uninhabitable.[1] It is true that pastoralism has at all times been a key mode of life and mobile populations have underpinned the development of networks variously used for trade and raiding.[2] Yet the lifestyle and inter-relations of mobile peoples of the historic Sahara, such as the Tuareg, have always been contingent to a greater or lesser extent on the existence of sedentary communities, both within the Sahara and at its fringes. A second dominant discourse of the modern era has been the assumption of dependence of African societies on exogenous contact and colonisation in order to achieve social evolution.[3] Both of these discourses need to be challenged and re-evaluated in the light of recent advances in archaeological knowledge.

A third key issue concerns the chronology of key developments within the historic Saharan world – the emergence of trade and networks of

[1] Rachet 1970 for an extreme example of the tendency.
[2] Cf. *inter alia*, Nicolaisen and Nicolaisen 1997; Shaw 1983.
[3] Gsell 1972a; 1972b, 1–11 for a classic characterisation of North Africa and the impact of Phoenician colonisation. Even in more recent appraisals, there remains a reluctance among modern scholars to recognise the degree of sedentarism present in Maghrib and Sahara prior to the coming of Carthage and Rome, Desanges 1980. See also Mattingly 2011a; 2016, for a fuller analysis.

connectivity, the movements of people and the cultural connections between them (including shared elements of a common Saharan cultural *koine*), the technological inventions and transfers within the zone and the emergence of sedentary oasis communities. These have commonly been viewed as only really taking off after the Islamic conquest of northern Africa. A prime contention of the Trans-SAHARA project is that the ultimate origins must be sought much earlier in the Protohistoric period. This volume follows already published monographs dealing with early trade in the Sahara[4] and burials, migration and identity.[5] The trade volume highlighted a much greater level of Saharan connectivity and inter-regional contacts in the pre-Islamic era. While incontrovertible evidence for commerce remains elusive (and impossible to quantify), this is not least because so much Saharan trade has involved organic items or high value commodities like gold and ivory that are under-represented in the archaeological record. However, archaeometrical analyses now provide us with a 'smoking gun' effect, connecting, for example, some Sub-Saharan metal artefacts with Mediterranean metal sources. Similarly, the review of burial practices and the isotopic signatures obtained from human remains highlighted a high degree of mobility and motion in the pre-Islamic Sahara. The final Trans-Saharan Archaeology volume covers questions relating to mobile technologies and likewise supports the conclusion of the other volumes that the Sahara was a much more populated and developed space in the Protohistoric period.[6] This volume completes the thematic review, by focusing on settlements and what they contribute to our understanding of Saharan societies. Each volume stands on its own, of course, but they are also part of an interlocking meta-analysis and frequent reference will be made in the following pages to contributions to the other volumes in the series.

The first part of this book focuses on the evidence for the early development of oases in different parts of the Sahara, as well as considering to what extent the largest or most complex oasis settlements merit identification as 'urban'. In this volume we talk of a Protohistoric period of Saharan history and archaeology with proposed dates of *c.*1000 BC–650 AD.[7]

[4] Mattingly *et al.* 2017a. [5] Gatto *et al.* 2019. [6] Duckworth *et al.* Forthcoming.

[7] We prefer a more defined Protohistoric period which sits between the Pastoral/Late Neolithic periods and the Medieval period. It is characterised by a range of societal and technological changes (e.g. metalworking, cereal agriculture and sedentary settlements). We generally avoid pre-Islamic as the uncritical use of this term ignores the varied and important processes by which different communities chose to convert (or not) to Islam during the Medieval period. We acknowledge, however, the longstanding use of the terms 'pre-Islamic' and 'Islamic' which many of our authors choose to keep. These can be helpful for distinguishing specific practices that are

In a concluding discussion at the end of the first section (Chapter 8), we draw together some ideas about what sort of models of urbanism are applicable to the ancient Saharan context.

The second section of the book then turns to a series of regional case studies from lands bordering the Sahara to look at the urban development of neighbouring societies and evidence of early state formation. The evidence of early Islamic urbanisation and oasis formation is also reviewed in detail, not least because much previous work on Saharan oases has focused on sites of this period.[8] A final concluding chapter returns to the nature of political and social complexity in desert environments and the vexed question of whether it is justifiable to identify states in the Sahara itself in antiquity. As a result of our detailed work on their heartlands in southern Libya, the Garamantes are a prime subject of interest, but the contributors to this volume also consider evidence from other times or places for complex levels of social organisation.

Sedentarisation and the Creation of Oases

In the Sahara proper, sedentarisation is synonymous with the emergence of oases (Fig. 1.1). The oasis is a fundamental aspect of the Sahara, engrained in public perceptions of the desert.[9] One of the most enduring popular perceptions of the oasis is the perennial lake in the midst of sand dunes ringed by a thin band of vegetation – the equivalent of small uninhabited islands for ship-wrecked mariners. Though such extraordinary locations do exist outside mirages (Fig. 1.2), they are rare and exotic exceptions. Oases are more commonly well frequented places with more vegetation and accessible water, if often less available as surface lakes and streams than the archetypal image.[10] The derivation of the term 'oasis' (*ouhat*) is very ancient, going back to Pharaonic times and seeming to denote the specific location of the closest oases to the Nile. The term in ancient Egyptian also meant a 'large open cauldron', which correlates with the typical physical setting of those

antithetical to Muslim practices such as the construction of burial cairns (although even here the division is perhaps not as binary as is often suggested).

[8] See in particular, Capel, Chapter 16; MacDonald, Chapter 13; McIntosh, Chapter 14; Nixon, Chapter 17, this volume. Also recent publications by Aillet *et al.* 2017 (Sedrata); Messier and Miller 2015 (Sijilmasa).

[9] For conventional accounts of the Sahara and its oases, see *inter alia*, Gautier 1970; Laureano 1991; Sèbe 1989; Sèbe and Sèbe 2003; Villiers and Hirtle 2002.

[10] On the definition of oases, see now Purdue *et al.* 2018b, especially 12–13.

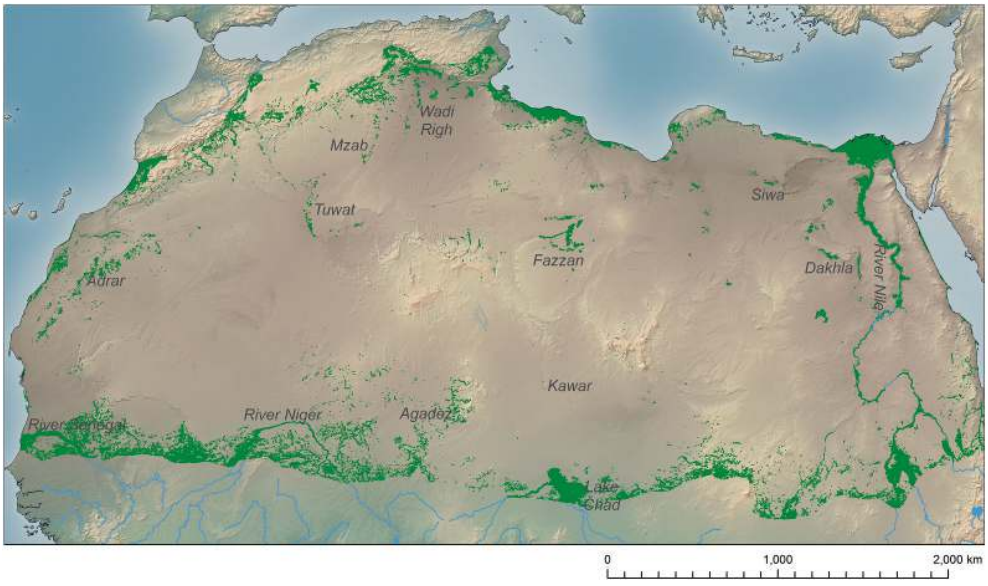

Figure 1.1. Map of the principal oasis groups and areas of modern vegetation (as identified from a MODIS NDVI) in hyper-arid and arid areas of the Sahara.

oases within depressions.[11] Despite, or perhaps because of, the early origin of the term, oases have no universal agreed definition. This is not normally a problem, they are so distinct from surrounding desert that a 'know it when you see it' attitude works for almost all case studies. However, when encompassing a view across the whole of the Sahara and ranging into areas of pre-desert, Sahel and river valleys we require something more robust if we are to achieve consistency. Published definitions include 'a fertile green spot in a desert waste, especially a sandy desert',[12] 'an area in the midst of a desert which is made fertile by the presence of water',[13] and 'an area within a desert region where there is sufficient water to sustain animal and plant life throughout the year'.[14] Although fairly vague, these definitions share in common an interest in the potential for fertile plant growth and a corresponding availability of water, but there is no attempt to distinguish between naturally occurring and man-made phenomena. The definition of desert is also problematic as this is a botanical term suggesting therefore that oases are defined by pockets of non-desert plants (of which the most recognisable is undoubtedly the date palm). Biomes combining similar plants, animals and climates provide one route to distinguishing desert and oasis, so, for example, we can identify Saharan montane xeric

[11] Vallogia 2004, 25. [12] Stone 1967, 211–68. [13] Perrin and Mitchell 1967.
[14] Goudie *et al.* 1994.

Figure 1.2. The 'archetypal' oasis? Lake Umm al-Ma in the Ubari Sand Sea, Libya.

woodlands, but it is hard to gather a satisfactory level of data for the entirety of the Sahara and this broad brush approach passes over many of the locally specific oasis environments that may be a square kilometre or less in area. Nor does this approach encompass the subtleties and connections that make up an oasis. Instead we prefer a multi-dimensional approach that identifies different types of oases through a number of factors.

Oasis Vegetation

In keeping with botanical definitions the first factor in an oasis is fertile vegetation. In the classic form, oases have dense groves of date palms which

provide the shade for fruit trees, cereals and other crops. These palmeries have such a dramatic effect that a climatic 'oasis effect' has been noted wherein the overall temperature of the oasis is lower during the day and higher at night and there is a higher humidity around the palms.[15] While palms can naturally wind pollinate and propagate there are distinct advantages to human cultivation: higher numbers of fruit bearing female plants and faster growing cuttings instead of seedlings. Oases in which date palms form the keystone species are therefore almost all anthropic to greater or lesser degree. Other vegetation forms are possible, particularly in the mountains where pools of standing water (*guelta*) or seasonal streams and rivers can form. These can have quite different combinations of tamarisk, shrubs and grasses to palm oasis and are far more reliant on the slightly higher, but less predictable rainfall that affects Saharan highlands – a wadi that turns green with vegetation for one month in an exceptional year may be dry for several years after. Recently, the development of centre pivot ('crop circle') irrigation wherein vegetation is watered with sprinklers on a rotating boom has created a new form of oasis based on monoculture or a limited range of crops.

Moreover, vegetation cannot be the only determinant as examples exist of oases with little or no cultivation such as modern al-Khalil on the Malian-Algerian frontier or the salt mines of Tawdenni and Taghaza also in Mali.[16] In these cases food and sometimes fresh water were imported to feed the inhabitants. While this is extreme, even for the Sahara, the movement of food to support oasis populations is common and probably has a long history.[17] This is a theme to which we return below.

Saharan Climate

The lack of water is a key determinant of deserts. The 200 mm isohyet has long been used as a crude indicator between desert and non-desert (Fig. 1.3), but this is a highly mobile boundary and the vegetation it supports can expand or shrink hundreds of kilometres in a few years, for instance encompassing or excluding the major oases of Mauritania and Mali. The northern border is less mobile due to the rain shadow caused by the Atlas mountains that distinguishes well the start of oases in the Maghrib. The United Nations Environment Programme definition of desert relies on aridity rather than just precipitation. The centre

[15] For example, Potchter *et al.* 2008.
[16] Scheele 2012; see Sterry and Mattingly, Chapter 7, this volume.
[17] Scheele 2012; Wilson 2012.

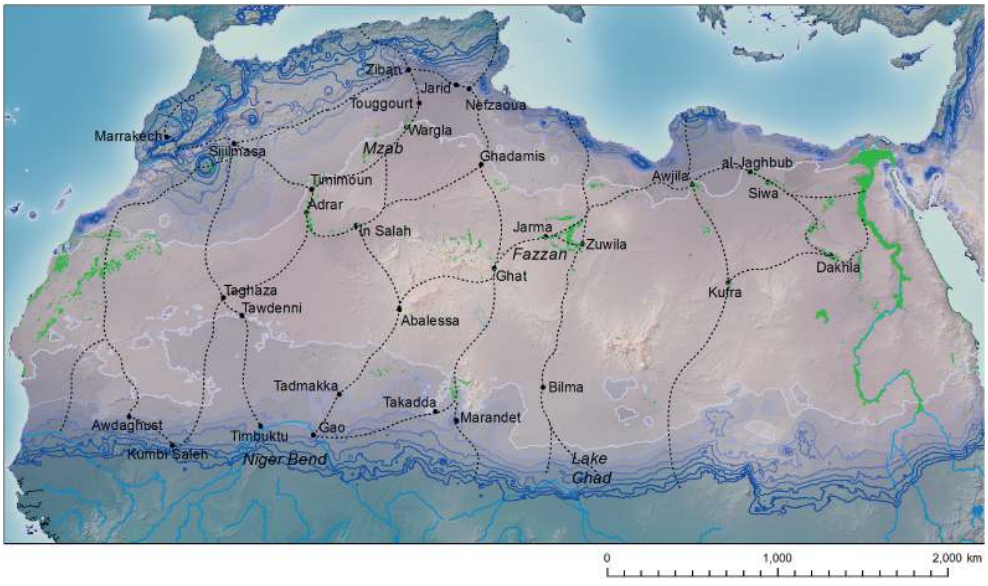

Figure 1.3. Major routes across the Sahara in relation to rainfall data.

of the Sahara can be classified as hyperarid and the northern and southern borders as arid. While the hyperarid zone is a good descriptor for the location of oases in the south, the northern oases sit fully within the arid zone which stretches into and over the Atlas and Aures mountains. The difference between the measures of precipitation and aridity is partly a reflection of the much higher winter temperatures that are experienced closer to the equator and the nature of the very different weather patterns between the southern fringe of the Mediterranean and the northern fringe of the tropics.

While it remains difficult to find a suitable climatic description for the present, the problems are even greater in the past. Localised studies in Fazzan, the Niger Bend and Ennedi have allowed the construction of detailed climate histories showing that the changing nature of these biomes with types and extent of vegetation directly linked to the water histories of these places.[18]

A few words are necessary at the outset concerning changes to the climate and environment of the Sahara in the past.[19] At various times in prehistory the Sahara has oscillated between wet and arid phases. The concept of a green Sahara is now well appreciated in relation to the pluvial

[18] Cremaschi 1998; Lutz and Lutz 1995.

[19] For some of the most recent syntheses on the subject, see: Brooks *et al.* 2005; Cremaschi and Zerboni 2011; Kuper and Kröpelin 2006; Leveau 2018, especially 19–43; Mattingly 2003, 37–74, 327–46 with reviews of earlier literature.

phases, which created substantial river systems and vast lakes.[20] The last significant wet phase was in the Early-Middle Holocene period, broadly 10,000–3500 BC. During this period, the wide availability of water in the form of seasonal rivers, small lakes and a high water table supported Saharan connectivity and mobility.[21] As a general trend, mobile human communities of hunter-gatherers adapted to herding of domesticated animals – primarily cattle.[22] Although there is evidence for periodic climatic oscillations already within the Early-Mid Holocene phase, with a major abrupt arid spell recorded at around 6200 BC, it is apparent that with the Late Holocene, at *c.*3500 BC, there was a significant step in climatic change, which marked the start of the modern hyper-arid phase in the Sahara. Minor climatic oscillations are still recorded in some parts of the Sahara, such as certain of the mountain massifs, which received somewhat higher rainfall than the region as a whole, but the human experience of, and interaction with, the Sahara over the last 5,000 years has concerned a harsh desert environment that imposes limitations on settlement, movement and lifestyles. That is not to say, of course, that the desert denies long-range movements and contacts, but that these have necessarily become more focused along axes where water is more readily available in the form of springs and a high water table. There has been progressive decline in water availability in the Sahara as non-renewable sub-surface water sources have been diminished by natural and anthropogenic action and this has had implications for both Saharan populations and the ease of movement.[23]

Interpolating the climatic data is not straightforward. In the north, the climate of the Neolithic humid phase or the 'Green Sahara' became progressively drier from 7000 BP/5000 BC with areas of desert expanding from the north-east. Palaeolakes in the Nubian Sahara appear to have dried up by around 3500 BP/2000 BC, marking the end of transhumant cattle herding in the Wadi Howar.[24] The palaeo-oasis of the Wadi Tanzzuft gradually contracted from 5000 BP/3000 BC until reaching something close to its current form around 2000 BP (first century AD), before contracting again in the last 25 years as a result of demographic pressure.[25] The drying of the Sahara has been heterogeneous, and in the case of West Africa may have occurred through two abrupt phases of desiccation at

[20] deMenocal and Tierney 2012; Larrasoaña *et al.* 2013; see also www.greensahara-leverhulme.com/ [last accessed 2 September 2019].
[21] Drake *et al.* 2011; Manning and Timpson 2014. [22] di Lernia 2013.
[23] Cremaschi and Zerboni 2009; Drake *et al.* 2004. [24] Kuper and Kröpelin 2006.
[25] Cremaschi 2006.

*c.*4000–3500 BP/2000–1500 BC and *c.*2500 BP/500 BC.[26] While the limits of the Sahara may have been more stable over the last 2,000 years there have been oscillations that affected all or parts of the region. In the Middle Niger, precipitation has oscillated between dry and wet phases with numerous severe droughts interspersed with floods.[27] The Middle Niger dry phase of 300 BC–AD 300 coincides with a slight increase in rainfall in Fazzan between 400 BC and AD 250.[28] But it must be emphasised that after 3000 BC, the minor fluctuations in rainfall have not changed the fundamental reality of the Sahara as a desert environment in which cultivation has generally been dependent on subterranean water sources or by stream flow from (sometimes distant) rainfall zones.[29]

The oases of the Sahara must be recognised as an artificial phenomenon, created in the context of this Holocene aridification phase that extends down to present times. After the climate changed decisively around 5,000 years ago, we should first consider the significance of refugia, select environments within the desert that offered enhanced possibilities of supporting human or animal life and vegetation.[30] Examples of refugia in a drying out Sahara include the relict lakes of once larger bodies of water (gradually declining in size) or mountain massifs that received slightly higher rainfall, feeding water holes and providing seasonal vegetation. It is perfectly logical that people and animals will have congregated around such locations as the climate became more hostile. But as Purdue *et al.* recognise there are important distinctions between refugia and oases:

> In anthropology, refugia are commonly regarded as isolated ecological niches where past populations retracted (allopatry) during hyperarid periods, while oases are commonly regarded as water-rich spaces in arid landscapes modified by humans (typically through cultivation and irrigation) in the form of artificial niches.[31]

The importance of human actions in transforming refugia into oases is important, while, equally, it must be stressed that many refugia did not become oases. For example, most of the relict lakes of the third millennium BC eventually dried up and people were obliged to move on.[32] In recent years

[26] Kuhlmann *et al.* 2004; Shanahan *et al.* 2006. [27] Nicholson 1979.
[28] Compare McIntosh, S. 1995, 9–11 with Cremaschi 2003, 11–12.
[29] Leveau 2018, demonstrates that even minor fluctuations for the desert margins and the Maghrib proper during Classical antiquity had potentially more profound implications for those zones.
[30] Purdue *et al.* 2018b, 9–12. [31] Purdue *et al.* 2018b, 9.
[32] See Gauthier and Gauthier Forthcoming for an important study that tracks human activity following shrinking lake margins in Chad.

some scholars have used Niche Construction Theory (NCT) as a conceptual framework that bridges between deterministic environmental and anthropocentric explanations.[33] It is also very obviously suited to the fact that oases are essentially constructed niches within constrained environmental settings and this closely correlates with our approach in this volume.

Oasis Water-Sources

Just as the form of vegetation is variable, so too is the water that makes up the other component of an oasis. Several principal forms of hydraulic regime can be identified (Fig. 1.4):[34]

Perennial Rivers

Active rivers with year-round flow are extremely rare in the Sahara. The exceptional instances are the two great rivers, the Nile and the Niger, with the Nile running right across the Sahara, while the Niger penetrates and runs along its southern margin before turning south again. Less celebrated is the Wadi Draa in Morocco, which is the only perennial river to flow into the Sahara from the north. It runs south-east for 200 km out of the High Atlas ranges, before turning abruptly westwards towards the Atlantic, though only in years of exceptional flood does water penetrate all the way to the Ocean. The Senegal is also worth noting as it currently delimitates the southern extent of the Sahara on the Atlantic coast. The exploitation of rivers for irrigation relies on the ability to divert or lift water from the main channel onto adjacent land (Fig. 1.4a). This may take the form of casual exploitation of periodic flood events or to engineered systems of barrages and diversion canals, linked to networks of channels (Fig. 1.4b) to distribute water in a controlled manner.

Seasonal Wadis

There are a number of important rivers that flow only seasonally or on an exceptional basis dependent on sporadic rainfall, sometimes resulting in spectacular flash floods. Some of the most important of these are wadi systems that flow from the Atlas ranges of Morocco and western Algeria, fed by seasonal rains and snow melt. The most celebrated examples are the Wadi Ziz (Sis) and the Wadi Rheris (Gheris) that feed the south-eastern

[33] Purdue *et al.* 2018a, various papers and Purdue *et al.* 2018b, 17–19.
[34] For an overview, see also Wilson *et al.* Forthcoming. The analysis here builds on classic geographical studies of Saharan hydrology, Capot-Rey 1953; Gautier 1970.