

# Variability in the Neolithic Settlement Patterns of the Egyptian Nile Valley

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**Abstract** Egypt is considered a Neolithic without villages, yet despite this characterisation, settlement pattern remains one of the more uncertain aspects of pre-historic lifeways. Reconstruction of settlement pattern often relies on environmental factors, subsistence strategies or typo-chronological associations to dictate likely modes of human settlement. Here, we examine the period from around 6,500 cal. BP to the late Neolithic in the Egyptian Nile Valley compared to selected examples from the Western Desert. Descriptions of regional settlement patterns have largely focused on divisions between Upper and Lower Egypt and the Western Desert based on a difference in subsistence strategies. We consider the features of the archaeological record in both these regions to determine whether such a dichotomy is warranted, and what this might mean in terms of the relationship between environment and socio-economic change. We suggest an alternative approach to the archaeological record to better understand the nature of Neolithic settlement pattern.

**Résumé** L'Égypte est considéré comme un néolithique sans villages pourtant, malgré cette caractérisation, le modèle d'établissement est l'un des aspects les plus incertaines de modes de vie préhistoriques. Reconstruction du modèle d'établissement repose souvent sur les facteurs environnementaux, les stratégies de subsistance, ou les associations de typo-chronologique de dicter le

modèle d'établissement de peuplement humain. Ici, nous examinons la période d'environ 6500 cal. BP à la fin du Néolithique dans la vallée du Nil Égyptien par rapport à des exemples choisis former le Désert Occidental. Les descriptions des modèles d'établissement régionaux ont principalement porté sur les divisions entre Haute et Basse Égypte, et le Désert Occidental basé sur une différence dans les stratégies de subsistance. Nous considérons les caractéristiques de l'enregistrement archéologique dans ces deux régions afin de déterminer si une telle dichotomie est justifiée et ce que cela signifie en termes de la relation entre l'environnement et le changement socio-économique. Nous proposons une approche alternative à l'enregistrement archéologique de mieux comprendre la nature du modèle d'établissement de l'habitat néolithique.

**Keywords** Neolithic · Settlement pattern · Fayum · Egypt

## Introduction

The late advent of agriculture and pastoralism in Egypt is often explained by environmental or social barriers that prevented people moving domestic species from the Levant across the Sinai and into Egypt (e.g., Hassan 1988, 2002; Shirai 2006; Watkins 2004; Wenke 1999; cf. Bar-Yosef 2002; Close 2002; McCorriston 2006). However, it is equally possible that subsistence practices were adopted only when they became sustainable, when suitable local Egyptian environmental conditions

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developed along with the necessary social relationships to make the use of domestics attractive (e.g., Stanley and Warne 1993; cf. Lucarini et al. *in press*; Williams 2009). Because there are so few attempts to understand Egyptian Neolithic sites in relation to their local palaeoenvironmental and landscape contexts rather than in relation to external contacts, there are even fewer attempts to understand the diversity of responses within Egypt itself to shifting early-mid Holocene environments and associated changes in subsistence.

Settlement patterns in the Egyptian Neolithic are often compared with contemporary occupations in southwest Asia, where Neolithic villages are closely bound to the development of agriculture (e.g., Byrd 2005; Zeder 2009). However, in Egypt, a lack of evidence for permanent structures in some sites makes the identification of villages less certain (Wengrow 2006, p. 63). Settlement patterns in the Egyptian Neolithic therefore tend to be inferred from assumptions made about subsistence strategies related to the use of particular environments, rather than from direct evidence for sedentism and mobility. At its simplest, occupation of the desert regions is linked to higher mobility levels due to the limited availability of water, while occupation of the Nile Valley is associated with lower mobility levels due to the presence of the river. The result is a Neolithic of the Western Desert characterised by mobile pastoralists and a Neolithic of the northern Nile Valley and Delta characterised by sedentary agriculturalists. The process of “Neolithization” in Egypt, whether originating from either of these regions, is explained through diffusion and/or migration (e.g., Bar-Yosef 2002; Shirai 2006; Warfe 2003). However, such migrations or transmissions of ideas are often proposed based on only certain types of evidence, most often the presence of certain diagnostic artefact types as well as domestic species, and if these are present, they are taken to imply the arrival of a complete socio-economic package associated with a particular type of settlement pattern.

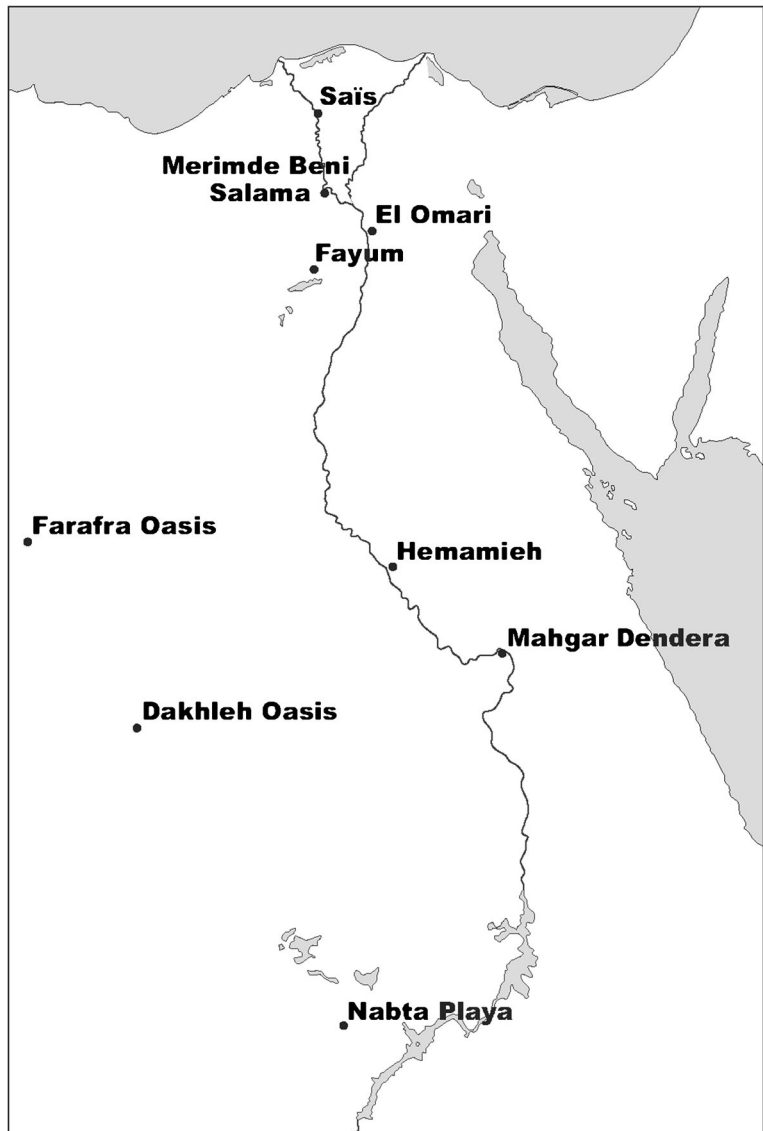
Our own work and that of others have sought to question such a basis for the origin of the Egyptian Neolithic by considering the role of regional environmental variation (Holdaway et al. 2010; Phillipps et al. 2012; Wengrow et al. 2014). In these studies, a bipartite model between the Western Desert and Nile Valley/Delta is critiqued, and here, we consider this critique further by assessing archaeological data from locations within the Nile Valley region, including the Delta, and selected locations in the Western Desert (Fig. 1). We

consider settlement pattern reconstructions for Neolithic Egypt focusing on how behaviour is inferred from the archaeological record and the influence of post-depositional processes on this record at a local scale. Firstly, we review published evidence from the Nile and the Western Desert, and secondly, we use the Fayum region as a case study to illustrate how an alternative assessment might be constructed.

## Background

During the mid-Holocene, southwest Asian plant and animal domesticates were introduced into Egypt and, therefore, into a different environment from their origin. Whatever aspects of the socio-economy accompanied these domesticates, they were likely modified in relation to local environments. The Egyptian Neolithic involved the use of foreign subsistence species during a period of rapid, punctuated and unpredictable climate change. The ecological impacts of these changes therefore should provide useful models for estimating the timing and range of human socio-economic responses to climate shifts. Egyptian datasets should also allow variability in human-environment interaction and adaptation to be assessed and compared to the results from other early agricultural studies, long dominated by results from other regions of the globe (Shirai 2006; cf. Bar-Yosef 2002; Harlan 1971). However, before this potential can be realised, issues that have confounded Neolithic settlement pattern studies need to be addressed. For example, the movement of domesticated plants and animals from southwest Asia into Egypt with accompanying aspects of material culture and settlement continues to be viewed by some as a package that arrived altogether at one time (e.g., Wilson et al. 2014) despite critiques based on studies from outside Egypt that show how separate aspects of this package developed and diffused at different times (e.g., Finlayson 2013; Hodder 2012; Lucarini 2013; Zeder 2009). As these studies from outside Egypt show, the relationship between people and objects varied in ways that are poorly dealt with by emphasising either the collective nature of the package or the arrival of a few “diagnostic” aspects. This also applies to settlement pattern reconstructions, where the use of a dichotomy involving settled agriculturalists vs. mobile hunter gatherers or pastoralists masks varying degrees of mobility, that in turn reflect differences in socio-economy. Understanding the

**Fig. 1** Locations discussed in text



significance of such variability requires that proxies for mobility are identified and studied, independent of the “chrono-cultural” labels and assumed normalised behavioural packages with which they tend to be associated.

The features used to define occupation duration are also problematic. During the Natufian period of the Epipalaeolithic, for instance, built structures, storage and heavy ground stone implements are seen by some as evidence for sedentism (e.g., Belfer-Cohen and Bar-Yosef 2000). However, Yeshurun et al. (2014, p. 592), citing the work of Edwards (Edwards 1989; Hardy-Smith and Edwards 2004), note how the assignment of “purpose, permanence, and perception” to structures

during this critical period is most often based on assessments of site size and the permanence of interior features. Portable material refuse, which is equally valuable in understanding the use life of such structures, is given much less attention. While the use of houses or built structures interpreted as houses to define settlement pattern categories has been critiqued a number of times (e.g., Boyd 2006), these continue to be used as a proxy for occupation duration in discussions of the Egyptian Neolithic (Wengrow 2006).

Salvatori (2012) comments on the ways in which sedentism can be assessed, noting problems in the archaeological identification of places occupied

continuously vs. those places that were simply returned to frequently. While it may seem self-evident to use permanence of structures to indicate permanence of settlement, when the longevity of structures outlives the longevity of human association with them, the presence of house remains is no guarantee that any associated occupation was also permanent. Elsewhere, measures of movement and, therefore, the corollary sedentism use more direct sources of evidence for human mobility in the form of portable material culture, because unlike structures, these objects could be moved with the people who moved (e.g., Close 2000; Holdaway et al. 2010; Phillipps and Holdaway 2016). Moreover, because many forms of portable material culture are numerous and highly visible, they can be used to investigate sedentism and mobility at a landscape scale even in cases where permanent structures are absent.

Another set of issues relates to post-depositional processes. While the impact on the flood sedimentation along the Nile Valley is often used to explain the absence of Neolithic archaeological remains (e.g., Ball 1939; Hassan 1980; Midant-Reynes 2000; Wengrow 2006), few if any of these studies have systematically documented other forms of post-depositional processes, nor have they been used to explore how these operated at a local scale. This in part reflects a focus on single sites rather than landscapes, a surprising decision since surface visibility in Egypt in areas not covered by sedimentation offers great potential to record extensive archaeological deposits. Despite this potential, little attention is given to the types of landscape approaches that have benefitted studies in parts of the Mediterranean (e.g., Bintliff 2000; Bintliff and Snodgrass 1988; Cherry et al. 1991). Regional syntheses exist for the Nile Valley as a whole (e.g., Butzer 1976; Hassan 1997), but few studies examine local environments and site distributions in detail.

In the following, we review the current understanding of Neolithic settlement in the Egyptian Nile valley based on the published evidence. We contrast this with selected sites from the Egyptian Western Desert. We concentrate on archaeological observations, rather than the interpretations of this evidence, since this allows us to illustrate variability in the archaeological record between locations as well as what is common among them, without reliance on interpretations of limited aspects of this record. In accordance with the discussion above, we focus on what we can glean from a series of localised

regions. We finish with the Fayum where we review the results of our recent fieldwork, undertaken with the specific goal of understanding Neolithic landscape use and an alternative view of settlement pattern.

### Settlement Reconstructions: the Archaeological Evidence

#### Saïs

The removal of material to form a 400-m<sup>2</sup> pit revealed deeply buried Neolithic deposits at Saïs with extensive faunal remains, pottery and stone artefacts. The site is located adjacent to a palaeoriver channel in the Nile Delta, and this is reflected in the nature of the material that accumulated. The extent of archaeological excavations was constrained by both contemporary activity and the depth of some of the deposits in relation to the water tables. No direct dates were obtained for the material excavated, so the dates that are available are based on pottery and stone artefact comparisons with assemblages from other sites. The earliest Neolithic phase, Saïs I, has a suggested age of 7,000–6,800 BP (layers 3015–16 and below), while the later Neolithic phase dates to 6,500–6,300 BP (layers 3008, 3009–10, 3011–12, 3013–14), suggesting a hiatus of approximately 300 years between the early and later Neolithic occupations (Wilson 2006, p. 83). The small area excavated limited the potential for understanding the wider context of the recovered material. Concentrations of material, particularly fish bone and midden, were identified, but the processes that led to the accumulation of these deposits remain unspecified.

Pig bones are the most commonly identified element in the faunal assemblage with smaller numbers of cattle, sheep and goat bones (Wilson and Gilbert 2003). A dense fish-bone filled layer is interpreted as a processing or refuse area, but as noted above, detailed geomorphic studies that assess how this deposit accumulated remain to be undertaken (Wilson et al. 2014). Portable material culture likewise lacks detailed contextual analyses, but assessment of the forms of the materials does allow some inferences to be made about mobility. Ceramics are found in a range of shapes and sizes (Wilson et al. 2014). These show typological similarities with ceramics from the earliest phases from Merimde Beni Salama based on similarities in decoration (Wilson and Gilbert 2003; Wilson et al. 2014). Stone artefact

analyses suggest intensive use of raw material and the removal of elements of the assemblage, particularly flakes, in contrast to cores or tools. This is consistent with high mobility when compared to other locations in Egypt (Phillipps 2012). The stone tools from late Neolithic layers are typologically associated with the later Neolithic layers at Merimde Beni Salama (Wilson and Gilbert 2002).

Around a third of the fish elements recovered were identifiable, and of these, the majority come from clariid catfish with smaller numbers of tilapia elements (Linseele et al. 2014). Both large and smaller specimens are present, suggesting that if fishing was related to the flood cycle of the Nile, catches occurred during both the movement of flood waters onto the flood plain and their subsequent recession. Fishing in deeper waters is easier at times of lower water levels when turbulence was reduced. Combined, fish species and sizes suggest that catches occurred at multiple times, meaning that whatever movement people were involved in, they were present at different seasons during the periods when the fish middens accumulated. In sum, Saïs provides a window into Neolithic period activities in the Delta adjacent to a river channel. People accessed fish, potentially obtained at different seasons and made stone artefacts, a number of which were moved to other locations. They had access to pottery, which shared decorative forms found in other Delta sites. Settlement pattern reconstruction is obviously limited by the area of the site excavated. Although, today, the site is obscured by modern development, it is extensive and sampled only by limited excavations. Typological comparisons suggest links with other sites, but the nature of these links remains speculative. Stone artefact analysis indicates movement of material away from the site, while the faunal remains indicate exploitation of fish in different seasons.

#### Merimde Beni Salama

The western Nile Delta occupation of Merimde Beni Salama has dates between 6,800 and 6,400 BP (Hassan 1988, p. 142). The site is spatially extensive, originally covering an area of 200,000 m<sup>2</sup>, and the settlement is thought to have moved during the course of occupation, probably due to changes in the Nile branch that flowed close to the area excavated. Midant-Reynes (2000, p. 117) suggested that the disused settlement areas at Merimde were subsequently used for human burials. However, detailed analysis of the settlement remains

and interpretation of settlement pattern is lacking. The early to middle Neolithic structural remains at Merimde include postholes and wooden posts suggesting some kind of roofed structures, while the later Neolithic settlement contains the remains of small circular huts made with the use of organic materials (Eiwanger 1979). Partially subterranean pits, lined with clay and basketry, were also discovered; however, no grain was recovered from these features, meaning that any functional ascription as granaries is based on form alone (Hassan 1988). In addition shallow, circular depressions were recovered with spiral matting attached to the sides. Hassan (1988) interprets these as related to threshing floors.

The latest phase of occupation (6,400 BP, Hassan 1985, p. 95) contained an area with semi-subterranean oval structures between 1.5 and 4.0 m in diameter. Archaeological remains suggesting foundations were built above ground from mud-bricks with the implication that some sort of roof existed, presumably made from vegetation (Hassan 1980). Because of their low frequency, these structures were not considered characteristic of the site, and Eiwanger (1982) suggested that they may have functioned as communal storage facilities. During this period, woven baskets set into the ground were used extensively for grain storage and some were found sitting in clay-lined pits (Eiwanger 1978; Midant-Reynes 2000, p. 116). These granaries were spread out as though they were assigned to individual dwellings (Midant-Reynes 2000, p. 116).

The evidence for domestic cereal cultivation comes from the presence of grinding stones and the remains of domestic emmer wheat found within a hearth (Hassan 1988). Other grain species found in storage pits included six-rowed barley, lentils and peas, wild sedges and legumes (Zohary and Hopf 2000, p. 219). Faunal remains from the site include sheep, goat, cattle, pig and fish (Hawass et al. 1988); however, there are relatively few published details that give the context for these faunal remains.

Stone artefact and ceramic analysis is limited, with typological comparisons used to propose connections between Merimde and other Neolithic occupations in North Africa, such as the Fayum and Haua Fteah (McBurney 1960). The stone assemblages of the early Neolithic phase are made using a blade-based technology. Projectile points dated to this period have typological links to the PPNB of southwest Asia (11,700–8,400 BP, Kuijt and Goring-Morris 2002, p. 362), particularly with the presence of Helwan points (Eiwanger 1979, Plate 4;



Kuijt and Goring-Morris 2002, Fig. 11 cf. Saïs). The later Neolithic phases include bifacial tools, projectile points and ground adzes very similar to those found in the Fayum (Eiwanger 1979, p. 45, Pl. 10). The ceramics exhibit a wide variety of forms and sizes, but no clear typological similarities are proposed with other Neolithic sites.

To summarise, Merimde Beni Salama has evidence for structural features, remains that probably represent houses and other structures that indicate storage. The area over which Neolithic material is found is substantial, and the excavations are inevitably limited. Changes in the river flow during occupation of the site likely led to changes in the areas occupied, and the function of some areas changed as these came to be used for burials. Faunal material contains many of the species reported from Saïs. Analyses of portable material culture are based on formal typology. Stone artefact forms are similar to those found in Saïs and the Fayum, and there are suggestions of links to sites further afield in the Levant, but we lack quantitative studies that demonstrate the movement of materials into and away from Merimde.

#### El Omari

The Neolithic occupation of El Omari, south of Cairo, is dated to 6,435–5,670 BP, which falls into the later part of the Merimde occupation (Hassan 1985, Table 1; Mortensen 1992). The site extended over an area 750 m × 500 m, which was confirmed by soundings across the area (Debono and Mortensen 1990, p. 13). The area was likely regularly flooded by Wadi Hof during the middle Holocene (Debono and Mortensen 1990, p. 13).

Excavation revealed what is interpreted as an extensive Neolithic occupation. Settlement remains include more than 100 semi-subterranean circular pit features, including basketry, and clay-lined grain storage pits (Debono and Mortensen 1990; Hassan 1980). Post holes were associated with the features, suggesting that they were fenced in or covered by an organic superstructure.

The recording at El Omari was thorough, each pit feature was numbered prior to excavation, the area around it cleared, and the contents of it sifted (Debono and Mortensen 1990, p. 15). The depth of each object found was measured relative to the surface of the pit.

Cultivated six-row barley, einkorn and emmer wheat were present (Wetterstrom 1993). Mortensen (1999)

suggested that flax was cultivated and used in textile manufacture, in addition to wild grasses, which were harvested and used for basketry. Faunal remains consist of pig, cattle, sheep, goat, fish and waterfowl (Hayes 1965; Mortensen 1999). Typological connections between El Omari and the Fayum are claimed based on bifacial tools and similarities in ceramic manufacturing techniques and forms, but there is no direct evidence of interaction.

#### Hemamieh

The North Spur of Hemamieh was excavated by Caton-Thompson during two seasons in 1924 and 1925. Neolithic material covering an area of 40 by 50 yards (36.6 m × 45.7 m) was identified and the main area excavated (Brunton and Caton-Thompson 1928, p. 69). The site is located on a spur below the cliffs near the modern town of Hemamieh. It may have extended further into the valley before being subsequently washed away by the Nile River (Brunton and Caton-Thompson 1928, p. 69).

Caton-Thompson uncovered what are described as hut circles and excavated nine with a further example uncovered by Holmes and Friedman (1994). The circles varied in diameter, and the walls of the inferred huts were made of mud with some limestone chips (Brunton and Caton-Thompson 1928, p. 82). Reed impressions on the exterior of some of the circles suggest that they were at least partly covered and some had indications of support posts placed against the walls. The structures were, in most cases, considered too small for use as dwellings. It is suggested that some circles were used for storage for fuel based on the presence of sheep and goat dung (Brunton and Caton-Thompson 1928, p. 82; Holmes and Friedman 1994). However, it is equally possible that these represent animal pens rather than structures. Hearths are scattered throughout the site away from the potential huts and display no clear patterning.

Ceramics were found in pit features together with spatha shells (Brunton and Caton-Thompson 1928, p. 44), and Emmer wheat is attested in small quantities (Brunton and Caton-Thompson 1928, p. 77). Storage is suggested by the presence of mud-lined pit features (Brunton and Caton-Thompson 1928, p. 87). Sheep, goat and pig are mentioned in the faunal assemblage. No further information is given,

but they are presumably domestic species (Brunton and Caton-Thompson 1928, p. 77).

The presence of sheep and goat is inferred from the presence of dung. Four pig mandibles were found in three of the pit features. Ox burials were found but these are likely associated with Old Kingdom deposits (Brunton and Caton-Thompson 1928, pp. 91–94). Emmer wheat was found in a pit feature and in another area not associated with a pit. Barley was found in a test pit dug by Holmes and Friedman (1994), as well as several weed species.

Settlement shifted over time and the North Spur site fell into disuse, after which it was used as a site for refuse. During the late Predynastic or Protodynastic, the location was used for burials with dating provided by the presence of diagnostic pottery forms. A number of pot burials were found (Brunton and Caton-Thompson 1928). The pattern of abandonment and then subsequent use as a burial ground are reminiscent of the sequence suggested for Merimde Beni Salama (Midant-Reynes 2000, p. 117).

#### Mahgar Dendera

The radiocarbon chronology for Mahgar Dendera suggests that the site was occupied from 6,400 to 5,700 BP (Hendrickx et al. 2001, p. 89). A number of structures are reported, although the archaeological evidence for these is limited and ephemeral. Twenty hearths are reported as partly dug into the ground, but are very shallow, and associated with a small number of post holes and stake (“wedging”) holes. Storage pits (11) are also recorded and are mostly between 40 and 80 cm in depth (Hendrickx et al. 2001, p. 24). A small number of in situ pots were excavated, and these are interpreted as storage jars. Faunal remains suggest a dominance of fish, in addition to some herd animals although the numbers of bone elements identifiable as herd animals are less than for other Predynastic sites (Linseele et al. 2009). The seasonality of resources is used to suggest intermittent occupation (Hendrickx et al. 2001, p. 102).

#### Nabta Playa

Nabta Playa and surrounding areas were occupied intermittently from the early to mid-Holocene, ca. 10,800 BP until 6,000 BP (Wendorf and Schild 1998, p. 97). Environmental reconstructions

suggest that occupation is correlated with fluctuations in precipitation that provided standing water (Banks 1989; Nicoll 2001; Wendorf and Expedition Members 1977). The archaeological record consists of both surface and stratified contexts, usually containing stone artefacts, pottery, faunal remains, ostrich eggshell, fire-cracked rocks and hearths. Additional archaeological features during the El Nabta phase include huts, storage pits and wells at site E-75-6 (Królik and Schild 2001; Wendorf et al. 2001; Wendorf and Schild 2002). Wendorf and Schild (2006) present archaeological evidence to suggest the reuse of particular locations through the repeated construction of domestic architecture in what they suggest represent villages.

Stone artefacts are typologically connected to the Epipalaeolithic, although there are differences in tool-type proportions between the early Holocene and later periods, particularly the disappearance of some geometric microlith types in the later Neolithic (Close 2001, p. 71). Early ceramic types are associated with those of the Khartoum Neolithic (Close and Wendorf 2001, p. 68) and later types with the A-group (Banks 1980, p. 301; Gatto 2006) and Badarian (Nelson et al. 2002, p. 542). Recent results of stone artefact analysis from the site of E-75-8 (Close 2001) suggest heightened levels of mobility during the middle Holocene period associated with the later Neolithic phases (Phillipps 2012).

Faunal remains include cattle (identified as either *Bos primigenius* or *Bos primigenius taurus*) dating to 9,500 BP at both Nabta Playa and Bir Kiseiba (Wendorf et al. 1989a, b, p. 63). Although tentatively identified as domestic species based on the morphology of the remains (Gautier 1980, p. 332), archaeologists have argued that the animals were domesticated since the climate would have been too dry to support wild cattle (Close 1996; Gautier 1980, 1987, 2001; Wendorf et al. 1989a; Wendorf et al. 1976; Wendorf and Schild 1980). Therefore, the presence of cattle must mean that people led them out into the Sahara (Close 1984; Gautier 2002; Smith 1992; Wendorf and Schild 1998). However, the early date for domestication and the lack of additional archaeological evidence have led to critiques of the domestic status (e.g., Fuller et al. 2011; Gatto 2011; Grigson 1991; Smith 1986; Wengrow 2003; Zeder 2008). Sheep and goat are recorded at Nabta Playa by 8,000 BP, for example at E-75-8 (Close 2001, p. 352;

Gautier 2001, p. 634, cf. 6,700 BP, Gautier 1980, p. 332; cf. 5,595 BP; Smith 1989, p. 74). Other small game is also present throughout all periods (Gautier 2001, p. 622). Botanical remains at E-75-6, for example, suggest the exploitation of wild sorghum, sedges, legumes and other wild grass seeds, tubers and fruit (Wasylikowa 2001; Wasylikowa et al. 1997; Wetterstrom 1993).

#### Dakhleh Oasis

Archaeological remains at Dakhleh are divided into three distinct cultural phases defined as Masara (Epipalaeolithic, 10,300–8,500 BP), Bashendi (A 8,400–7,650 BP, B 7,400–5,800 BP) and Sheikh Muftah with remains continuing into the Old Kingdom period (McDonald 2009, p. 8). Archaeological remains attributed to the Masara period consist of stone artefact scatters, some grinding stones and hearths (McDonald 1998, p. 129). Round- or oval- and crescent-shaped stone structures between 2 and 4 m in diameter are recorded for the Masara C subdivision (McDonald 2009, p. 11). No botanical remains of species likely exploited by people are documented, but faunal remains include hartebeest, gazelle, hare, birds and turtles (McDonald 1998, p. 131).

Bashendi A remains comprise scatters of stone artefacts, pottery, grinding stones and hearths (McDonald 2009, p. 10). Archaeological features, for example, those at the Late Bashendi A occupation, Locality 270, include slab structures, stone clusters and what McDonald (2009, p. 22) refers to as “small bin-like forms” and associated evidence of grinding. Some of these structures show evidence of repeated use, abandonment and reoccupation (McDonald 2009, p. 23). The faunal remains from a number of locations include gazelle, hartebeest, fox, hare and bird, but no domesticated species (McDonald 1998, p. 132; McDonald 2009). McDonald (2009, p. 25) tentatively suggests that some stone features may represent animal kraals and that the arrangement of some features is similar to patterns typical of those constructed by modern herders. A wide range of botanical remains are present including wild sorghum and millet suggesting summer rainfall, although as McDonald (2009) points out, winter rains may also have occurred during this period.

Bashendi B archaeological remains are more dispersed, consisting of surface scatters of artefacts, although some stone structures are attributed to this period (McDonald 2009, p. 27). Faunal remains include

abundant evidence of domestic cattle and goat (McDonald 1998, p. 134).

#### Farafra Oasis

Archaeological remains at Farafra Oasis are attributed to the mid-late Holocene. Like other oases in the Egyptian portion of the eastern Sahara, Farafra represents a permanent water source (Barich 1993, 2004, 2014a). The earliest occupation remains date to the early Holocene (10,000–8,000 BP) and consist of artefact scatters and hearths (Hassan et al. 2001, p. 39). Archaeological remains dating to between 7,200 and 6,000 BP are concentrated around ephemeral lakes such as Bahr Playa and Hidden Valley Playa and are interpreted as repeated reoccupation. The remains consist of stone-lined structured, hearths, pits and pot-holes (Barich et al. 2012; Barich and Lucarini 2008). Floral and faunal remains suggest a combination of plant harvesting and sheep/goat pastoralism (Barich and Lucarini 2008). Hearth features are distributed over large areas, sometimes forming clusters, some of which contain evidence for episodes of reuse (Barich et al. 2012; Barich and Lucarini 2008). In the Hidden Valley Playa, several circular stone huts referred to as a “village” (Barich 2014b; Barich and Hassan 2000, p. 13; Barich and Lucarini 2002) were located and are dated by charcoal from hearths to between 7,300 and 6,200 BP. These hearths yielded botanical remains suggesting the use of morphologically wild sorghum seeds and fruits (Barakat and Fahmy 1999; Fahmy 2014; Lucarini 2007). These species suggest the presence of summer rainfall (see also Hassan et al. 2001). The area of Sheikh el Obeiyid, west of the Hidden Valley, contains a number of stone-slab-lined structures clustered together dating to the mid-Holocene. These features are interpreted as having a domestic function and collectively are described as a village, and they are interpreted as indicative of increasing sedentism (Hamdan and Lucarini 2013).

#### Summary and Discussion

While the descriptions of the Nile Valley Neolithic sites in this outline obviously only summarise the published information available, the limitations on what can be synthesised from such data are only too clear. There are potentially extensive Neolithic deposits at a number of locations which, for a variety of reasons, have only been partially sampled. Structures exist in some locations, but



the detailed understanding about how these structures relate to one another is lacking, together with the similarly detailed geomorphological studies that are needed to understand the shifts in local environment that have led to their preservation. There are faunal records from a number of locations, but these also lack the contextual studies that would indicate how the faunal materials were deposited. With a small number of exceptions, studies of portable material culture are typologically based and therefore limited in their scope. These provide the basis for suggestions about the relationships among sites based on morphological similarities in artefact forms, but are not backed up by analyses that indicate what form these relationships might take. In short, we know that people used locations along the Nile Valley and Delta, sometimes creating structures, sometimes utilising domestic animals and plants and exploiting fish resources. We know that they returned to these places at different seasons over periods of time that span many centuries. We know that people moved around to some degree and stored resources at some locations, presumably with the intention of returning. Sometimes, their time at locations involved creating structures in which they probably lived.

In contrast, the approaches used to study the middle Holocene archaeological record in the Western Desert are more spatially extensive than in the Nile and immediately adjacent regions. This reflects a variety of factors relating to the distribution of archaeological remains and research agendas. The observations made by various archaeologists working outside the Nile Valley suggest a complex picture of use of the Western Desert that likely related not only to climatic fluctuations, but also to local environmental contexts including resource availability. Mobility, or lack thereof, is inferred through a variety of means including reconstructions of subsistence resources, the presence of structural features and the movement of material culture. Subsistence reconstructions suggest a reliance on domesticated animals, although this is somewhat spatially and temporally variable. Wild plants and animals were exploited, and in contrast to the Nile Valley, fish are obviously absent.

Combining the accounts from both regions provides a somewhat stark picture of past settlement. It is of course interesting to consider the significance of the diffusion of people and ideas from both the Egyptian desert and southwest Asia, but before models are created and links made between sites, it is important to consider the datasets that we have available with which to assess

these links. And, for the Nile Valley, the data are surprisingly sparse, with only a moderately richer record for the Western Desert. A degree of sedentism is assumed in the Nile Valley based on the association of agriculture and regular water, and therefore, a site-based approach to the archaeological record is used. In the Western Desert, multiple locations are assessed, however, there is an emphasis on the identification of features and studies involving the examination of evidence for settlement pattern using material culture proxies are rare (exceptions include Close 2000; McDonald 2009).

In the following section, we outline the data for the Fayum Neolithic. Aspects of the Fayum dataset are, in some ways, no more complete than the data discussed above. However, in assessing the nature of settlement in the Fayum, we have endeavoured to take account of this incompleteness and to consider multiple datasets rather than the remains from a single site. This leads us to a different understanding of Neolithic landscape use from that described in either the Nile Valley or Western Desert locations.

### **Case Study: Fayum North Shore Survey**

The Fayum north shore was made famous through the work of Caton-Thompson and Gardner early in the twentieth century. Our more recent work builds on their earlier endeavours together with those of a number of other scholars (Hassan 1986; Wendorf and Schild 1976; Wenke 2009; Wenke et al. 1988). We approached the north shore record from a landscape perspective, considering how formation processes contributed to the record observed by archaeologists today. The distribution of artefacts and features was analysed to better understand occupation intensity, in addition to an examination of artefact movement as a proxy for human mobility (e.g., Holdaway et al. 2010; Holdaway et al. 2016; Holdaway and Wendrich 2016; Phillipps and Holdaway 2016). Our methods combined the excavation of stratified sites with the examination of surface material and previously published accounts. Analyses were spatially extensive as well as locally intensive, and involved the assessment of a range of archaeological remains, artefacts, fauna and features as well as their geomorphological contexts (Koopman et al. 2016).

The methods that we employed are described in detail in Holdaway and Wendrich (2016) and are only briefly summarised here. We employed a combination

of excavation of stratified deposits and the location and analysis of material distributed as surface deposits. Results of the excavation of the stratified site of Kom K are summarised below together with the results of analysis of what remained of the Upper and Lower K pits and the excavation of a number of surface hearths. We recorded the distribution of surface assemblages of stone artefacts, ceramics and faunal material via the use of survey transects, intersecting rectangles 100 m long by 10 m wide orientated north-south and east-west (Fig. 2). These were placed in a staggered pattern across the north shore in areas relatively unaffected by modern development with additional transect units placed where material concentrations were identified. Surface sediment types were recorded on transects allowing the impact of differential visibility to be assessed.

## Results

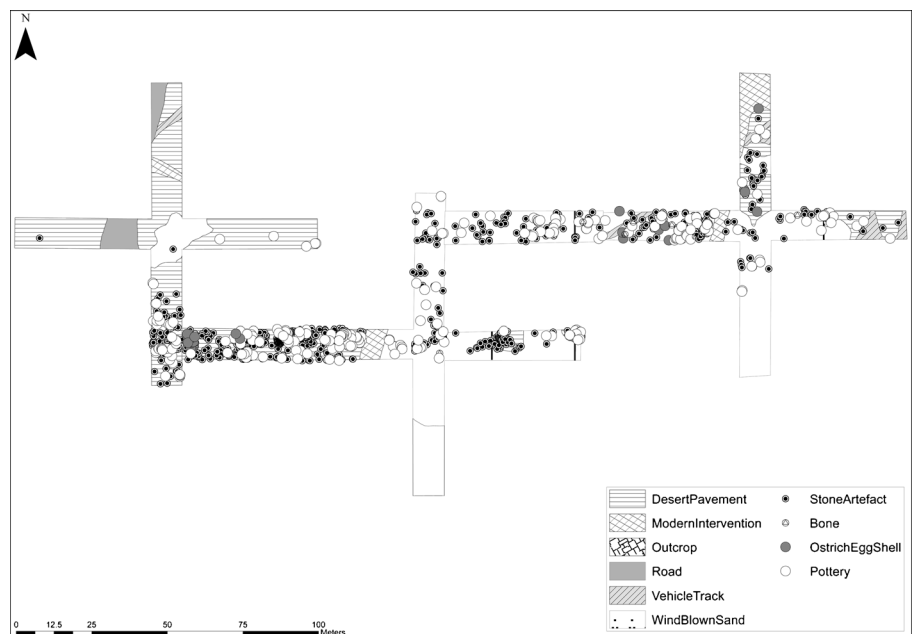
Stratified sites like Kom K were first described by Caton-Thompson and Gardner (1934) as Neolithic villages (Fig. 3). However, our reinvestigation suggests that the stratigraphic structure of this site is complex and not as easily translatable into functional categories like villages, hamlets or occupation sites as the literature in the past has suggested. The site is largely composed on windblown sand deposits that are mixed with cultural material in the form of portable artefacts, fauna and

rake-out derived from hearths. Sets of superimposed hearths are present, and it is likely that hearth reuse has removed some of the evidence for even more hearth construction events than those that we were able to identify. The site lacks additional features that might indicate the presence of other types of structures.

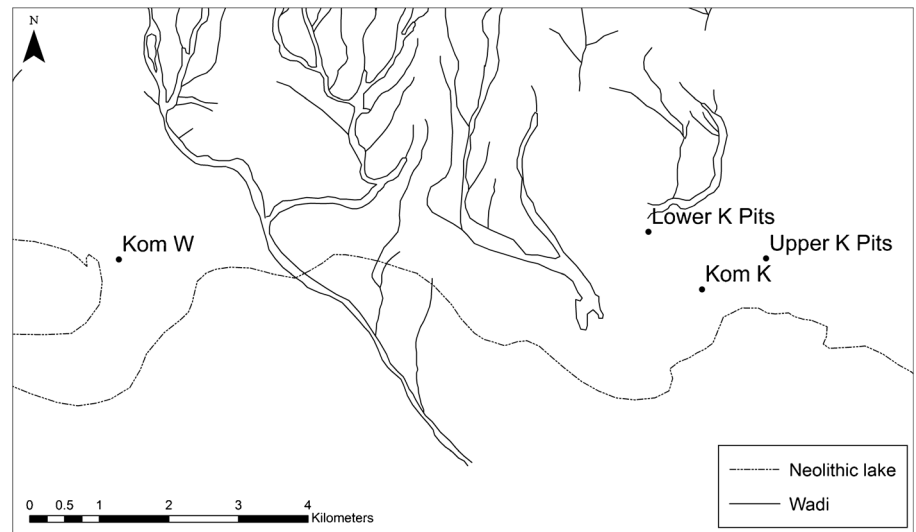
Reuse of hearths gives an indication that Kom K was occupied repeatedly, but radiocarbon determinations from hearth charcoal give only a general indication of how long a period of time this reuse might have spanned. We know that people cooked food at this location, including food types that included domestic grains, and that they abandoned stone artefacts and ceramics. Animal dung was used as fuel. The nature of the windblown sediment accumulation at Kom K means that the hearths could have been created over a very short period of time or alternatively one that spanned some centuries or, for that matter, some combination of both with periods of short-term occupation separated by longer periods of abandonment.

The Upper K Pits were recognised by Caton-Thompson and Gardner (1934) as grain storage “granaries” and represent another example of a distinct archaeological site now unfortunately destroyed by contemporary development. On the basis of the pits that were excavated, we know a great deal about their use as storage devices. Some of the large ceramic vessels found in the pits were likely used for storage, while

**Fig. 2** Transect examples with mapped surface artefact distribution and surface geomorphology



**Fig. 3** Key mid-Holocene locations in the Fayum



some of the smaller vessels could have been for grain preparation (e.g., threshing) or cooking and were stored in the pits when not needed. In some cases, the pits were lined with basketry, likely made from wheat straw. The fill contents indicate that most of the pits were abandoned, with indications of the original fill of wheat (*Triticum turgidum* ssp. *dicoccon*), barley (*Hordeum vulgare* ssp. *vulgare*) and seeds of *Polygonum* and *Linum*, mostly present as remains hidden in the fabric of the basketry lining. Several of the pits were carefully closed off with lids of a compact material forming a mortar, which were prepared in shallow depressions near to the storage pits. From the configuration of the pits, it is clear that these were re-used, probably multiple times. The Lower K Pits and several of the dilapidated ones identified by Caton-Thompson and Gardner in the Upper K Pits make it likely that, upon abandonment, the pits were actively decommissioned by removing the basketry lining. We also know, within the precision of the radiocarbon dates that we obtained, that they were constructed at approximately the same time as the hearths at Kom K.

From what can be reconstructed from the published sources, some of the Lower K-Pits were lined with basketry, while others were not. The sizes of the pits varied considerably, with the smallest not much larger than some of the intact ceramic vessels that Caton-Thompson and Gardner retrieved. It is possible that the smallest depressions from the Lower K Pits were used to hold clay vessels or fired vessels like those Caton-Thompson and Gardner retrieved intact from Kom W

(Emmitt 2011). If so, and assuming that the pits and vessels were related to storage, then placing storage facilities at different points in the landscape was part of the Fayum settlement pattern during at least some periods.

The K Pits are spatially restricted to only two localities. This may simply be a function of site preservation and modern development, but as best as we can determine, they do not exist in other locations. Ceramics, on the other hand, are more extensively distributed. The preservation of ceramics is dependent upon their context, with more intact examples found in stratified deposits, while those in surface scatters are often heavily eroded. Despite this, there is at least circumstantial evidence that some of the ceramics reflect storage activities both within and outside the stratified sites although we cannot be certain what was stored within the ceramic vessels. Nevertheless, the ceramic vessels likely held something and, given this landscape, may have seen a larger number of storage locations than the Upper and Lower K Pit evidence alone indicates.

Kom K retained stratified deposits, but the contents of these deposits do not differ substantially from the surface materials that we studied in the surrounding areas. These indicate the remains of hearth construction, the exploitation of fauna, predominantly fish and the use of pottery, as well as the abandonment of large numbers of stone artefacts. Flint is not found naturally in areas of the Fayum close to the lake, so raw material for flaking was moved into the area from elsewhere. Cobbles were worked across their shortest axis in the areas around

Kom K as well as areas immediately to the west, leading to the production of relatively short, thick flakes (Phillipps and Holdaway 2016). The stone artefact assemblages show many fewer cores than should be present given the total volume of the flaked artefacts that was found. This suggests that cores were moved from these locations leaving behind the flakes, presumably for further use elsewhere.

Grinding stones occur in the majority of areas that we studied. Their presence need not relate solely to the presence of domestic grains as indicated by the use of grinding stones in other parts of eastern North Africa (e.g., McDonald 1991; Wendorf et al. 1989b). Nevertheless, their presence indicates the use of grinding in different parts of the landscape. Grinding equipment can be large and heavy, not conducive to transport, and therefore, large grinding stones are sometimes considered a marker of sedentism, particularly in southwest Asia. In the Fayum, their distribution correlates somewhat with hearths, but there are many areas where grinding stones (sometimes large examples, Fig. 4) can be found without associated hearth features. If this is not a symptom of preservation, the grinding stone distribution may suggest an alternative, more distributed use of landscape to that proposed for southwest Asia. Surface deposits of stone artefacts are more ubiquitous than deposits that contain both stone artefacts and ceramics. This also reflects preservation to a degree, but even so, the ubiquity of the stone artefacts indicates spatially extensive activity within the band of a few hundred meters north of the lake basins that Caton-Thompson and Gardner identified, distributed along the edge of these basins for multiple kilometres.

Putting these sets of evidence together and considering the Fayum north shore from a landscape-rather than site-based perspective, we have a record that indicates a spatially extensive occupation that was characterised by movement rather than prolonged settlement in any one place. The southwest Asian domesticates are certainly present, but the nature of settlement does not look like

the village-centred occupation that some have argued for southwest Asia.

Recent examination of faunal remains from the Fayum suggests the use of fish-dominated economic practice in all periods of early- to mid-Holocene occupation (Linseele et al. 2014). Given the proximity to a Lake Qarun that was more extensive than it is today, this is perhaps not surprising. Even in the context where domesticated animals can be identified, for instance, at Kom K, their presence is not overwhelming. This reflects the minor role played by domesticated animals, which reinforces the difference in the settlement pattern in the Fayum Basin compared to that present in parts of southwest Asia mentioned above. Seasonality in fish remains is marked for the mid-Holocene occupations, particularly amongst species such as catfish, which use shallow water environments to spawn (Linseele et al. 2014, p. 11).

There is evidence that the mid-Holocene Fayum was influenced by the southward movement of the Mediterranean winter rains, particularly during the period 6,700–5,800 cal. BP associated with moister conditions than today (Arz et al. 2003; Bar-Mathews et al. 1997; Phillipps et al. 2012). Recent geological research confirms this and further confirms the annual influx of Nile floodwater into the lake, although the local environmental outcome of this is yet unknown (Marks et al. 2016). This may have provided what Williams (2009) refers to as a period of “geological opportunism” in the Fayum, meaning that the use of plants and animals (especially fish species) occurred when it was environmentally possible for this to occur. Cappers (2013) suggests that water and nutrients form ecological constraints on use of cereals. However, fluctuations in the lake level also likely had an impact on lake fauna, such as fish, and lake-edge vegetation (Phillipps et al. 2016). The date of apparent abandonment of the Fayum around 6,000 cal BP may correlate with the age estimates for an increase in the Nile floods as Williams (2009) suggests, the result of greater summer precipitation in Ethiopia at around

**Fig. 4** Large grinding stone example



6,100 cal BP and, somewhat counterintuitively, a decrease in Nile sediment loads, in addition to a decline in winter rainfall. All of these environmental variables likely played a role in landscape use in the Fayum during the mid-Holocene, although they did not necessarily determine it.

In sum, we can assess aspects of the Neolithic settlement pattern in the Fayum Basin by combining observations obtained from both stratified and surface deposits. No one location provides a clear picture of past landscape use, with this only emerging when multiple locations are compared. Detailed observations of features, non-portable and portable artefacts and faunal materials are needed at many places, and these need to be assessed in relation to what has survived. In addition, the nature of the palaeoenvironment needs to be considered in relation to the changing availability of different types of resources. We still lack a complete settlement pattern for the Fayum, but we do have a better understanding how the landscape region that we studied was used. In the following, we consider how the Fayum settlement pattern might be interpreted.

### Horizontal Tells in the Egyptian Neolithic

Villages have long held a critical place in understanding the Neolithic package (e.g., Childe 1956; Sherratt 1997; Zeder 2009), particularly given renewed understanding of the chronology of plant and animal domestication in southwest Asia (e.g., Zeder 2008). However, in Egypt, Neolithic and early Predynastic occupation is described as “complexity without villages” (Wengrow 2006). This requires a reconsideration of what constitutes a village, and how sedentism or intensity of occupation might be measured in the absence of obvious remains of house structures.

Çatal Höyük might be considered the quintessential Neolithic village. The temporal depth created by successive layers of occupation at this site is used by Hodder and Cessford (2004) to describe the creation of social memory and history of place in a domestic context. Watkins (2004) goes so far as to describe the architecture as forming “theatres of memory.” In the Egyptian Neolithic, a similar time depth of occupation is lacking, and in fact, the majority of archaeological remains suggest the opposite to the persistence evident at Çatal Höyük. In the south and central regions of Egypt, Wengrow (2006) uses this lack of evidence for

intensive occupation of place to propose a settlement pattern based around primary pastoral communities and mobility. When the funerary evidence present at some locations is included, he suggests that a culture is indicated built around a “mobile body-centred habitus.” However, in northern Egypt, while there may be little evidence for villages, there is equally little or no evidence for the large cemeteries that are characteristic of Upper Egypt.

Wengrow (2006, p. 83) suggests that in contrast to the development of Mesopotamian tells with their extensive vertical stratigraphic depth from prolonged occupation of spatially discrete locations, Predynastic occupations of the Egyptian Nile Valley “were for the most part light and ephemeral...human activity ... defined by lateral spreading of cultural material along a horizontal axis...” Such dispersed archaeological records or “horizontal tells” are seen by Wengrow as the product of a mobile primary pastoral socio-economy, one that he infers from the middle and upper Nile Valley archaeological records. Is the same true of northern Egypt, where there is equally scarce evidence for permanent occupation? And if so, what are the implications for the northern Egypt socio-economy as it relates to social structure, permanence of place, ownership of resources and resource centralisation?

Although we have emphasised the relative lack of data, it is possible that both Merimde Beni Salama and El Omari have evidence consistent with dispersed rather than concentrated village-like settlement, while the best evidence for this is seen in the Fayum. In the latter region, analyses of portable material culture as well as the evidence from storage structures provide insights into the nature of movement that lacks parallels in village-like occupation in southwest Asia (Holdaway and Wendrich 2016). While it is true that the Fayum lacks the cemeteries that Wengrow suggests were the focal points in Upper Egypt given the level of landscape change in Lower Egypt, together with the relatively few areas that have been studied intensively from a landscape perspective, it is possible that such sites either once existed and have now been destroyed or are yet to be found. In any case, except for the cemeteries, the distribution of materials, evidence for storage, a subsistence economy that showed a predominance of fish and other wild resources in addition to domesticates, and a material culture that indicates mobility may be taken to reflect regional similarities with areas to the south as much as it reflects regional differences.



Hassan (1988) noted that the nature of Neolithic remains in Egypt suggests small communities living in short-lived settlements. Explanations for this are often environmental. As Hassan (1988, p. 154), for instance, suggests, “Large individual settlements may have been unlikely to develop because of the narrowness of the floodplain in the region,” in this case referring to the Badari region of Middle Egypt. Even later in the prehistoric sequence, there is little evidence for substantial architecture aside from the continued use of organic structures and introduction of mud huts. Hassan (1988, p. 155) notes that evidence from Naqada and later phases at Hemamieh, “suggests that up to about 3600 BP, the pattern of settlements consists of small, dispersed communities with small huts or shelters associated with storage pits, animal enclosures, and refuse areas.” As Wenke (1989, p. 142) notes, “For most of the fourth millennium BC, the majority of Egyptians lived in small communities of oval huts, with a transition to communities of interlocking mudbrick rectangular buildings coming only quite late.”

In fact, there is very little evidence for substantial settlement architecture during much of the Predynastic (the Naqada I period rectangular structure at Hierakonpolis is one of the few exceptions, Hoffman 1979). While this is significant when thinking about the later Predynastic period where the key elements of state formation are the production of agricultural surplus, standardisation of production (e.g., pottery), trade and centralisation of storage, it also has implications for the relationship between the early Predynastic and the Neolithic. Comparing early Predynastic settlements with those identified in Neolithic sites, in addition to evidence for settlement pattern, the differences between the Neolithic and later times may be more in degree than in kind. Thus, it may be that storage or repeated occupations left less of a material trace in Egypt than in some places in southwest Asia because settlement in Egypt shifted spatially and more frequently through time.

In reviewing the Egyptian evidence, there are a number of factors that may have affected the ability to continuously occupy a spatially restricted location. In the case of Merimde, for example, the shifting river had an impact on the location of settlement. In the western desert sites and, to some degree, at Dakhleh and Nabta Playa, shifts in local environmental conditions may be responsible for shifts in the locations that were occupied at different times. The same may be true of the Fayum. Here, local environmental conditions, like the changing

water levels in the lake basins, necessitated the movement of settlement. This need not have involved inundation by rising lake waters but might have reflected the lack of accessible locations from which to exploit spawning fish, the inability to repeatedly cultivate the same tract of land, if rain-fed agriculture was practiced, and/or the absence of fresh sediment that required a shift in the position of “fields.” There may equally be social or other economic reasons why settlement shifted, and of course, any of these reasons may have changed over time.

One of the lessons to be drawn from the Fayum and from Neolithic settlement pattern studies in those areas with extensive surface deposits is the size of the regions that were might be used by Neolithic peoples. Despite the extent of the landscape investigations in the Fayum, it is likely at any one period that we have remains from only a part of any settlement pattern. People were able to move over remarkably large areas, so as archaeologists we must resist the tendency to see one site as central to any settlement pattern. In the Nile Valley, settlements were probably as spatially extensive as areas like the Fayum or indeed those in the Western Desert. Even acknowledging Hassan’s comments noted above about the geographic limits imposed by the Nile floodplain, people could and probably did move over significant distances. This needs to be kept in mind when interpreting sites that, today, for a variety of reasons are limited in their spatial extent.

If shifting settlement relates to changes at least partly reflective of local environments, the question is raised why people chose to engage in agriculture in the north of Egypt only during this period and not before and, in the case of the Fayum north shore, not in the period after 6,000 BP. Williams (2009) discusses the concept of geological opportunism, whereby occupants of a particular location may choose to engage with agriculture when it is geologically or environmentally appropriate to do so. This may be linked to the mid-Holocene increase in winter rainfall (Phillipps et al. 2012), but it also relates to the variable environmental and socio-economic conditions under which people chose to engage in low-level food production (Holdaway et al. 2010). If we can overcome the assumption that the use of domesticates is inevitably better than the exploitation of wild resources, the question of when domestic species began to be used can be answered by noting the particular set of historically contingent conditions that combined in different parts of Egypt in ways that, while

displaying some degree of local variability, also display similarities up and down the Nile. Southwest Asian domesticates were eventually adopted but were incorporated into a socio-economy and settlement pattern that was African, not southwest Asian. Given the difference between the regions, this should come as no great surprise.

## Conclusion

Egypt has the potential to contribute to studies examining human-environment interrelationships involving agriculture in the greater southwest Asian, North African and Mediterranean regions (Barton et al. 2004; Colledge and Conolly 2007; Finlayson 2004; Knapp 2010; Zeder 2008). Nowhere is local environmental variability better represented, with lacustrine, deltaic, riverine and desert microenvironments all occupied during the Holocene. Some shared cultural traits are indicated by artefact types, but there is also variability represented by many aspects of human behaviour during the mid-Holocene. Archaeologically, this includes artefact types, archaeological features, subsistence economies and behavioural differences that indicate various types of social organisation, mobility levels and degrees of interaction.

A more detailed understanding of human-environment interrelationships through settlement pattern studies conducted at a landscape scale is essential for modelling the earliest phases of food production in Egypt. Comparative studies are needed to understand the variability represented in the archaeological record. This requires common research goals and standards for archaeological observation and the acquisition of data. Landscape approaches to understanding human-environment interrelationships allow for a much more detailed, spatially focussed understanding of these processes, including their spatial and temporal variability, than do considerations of single sites as “typical” examples. Understanding regional variability in settlement pattern is the first step towards a more nuanced picture of the use of food production in Egypt, and a better appreciation of the changes that led to the formation of the pharaonic state.

Settlement pattern has long been connected to changes in subsistence practice in Egypt during the Holocene, particularly with the arrival of domesticated plants and animals. In contrast to previous work, the observed

variability in the early Neolithic of the Fayum suggests that the ways in which people initially adopted food production in Egypt from its original context in southwest Asia were highly variable, and this likely reflects local environmental and social variability. These results call into question the utility of generalised models that uniformly characterise socio-economy across regions. The level of variability within Egypt alone has important implications for the origins of agriculture and past and future adaptation and development within both the greater region and worldwide.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

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