11

The ancient game traps at Gharb Aswan and across Lower Nubia (north-east Africa)

Per Storemyr

Large-scale, permanent hunting structures, typically made of stone, are common in the Middle East, Arabia, Central Asia, and several other regions globally. Such features are also extremely widespread along a 400-kilometre long stretch of the river Nile in Upper Egypt and Lower Nubia (Figure 11.1) (Storemyr 2011). However, they differ from, and are far less well known, than the desert kites of the Middle East. Whereas the latter generally feature long stone drivelines that converge towards an enclosure where game was trapped and killed (Helms and Betts 1987; Betts 1998; Holzer et al. 2010), the Nubian game traps are 'open' structures that lack enclosures. Instead, their low stone lines converge towards one or several funnel-shaped openings, called 'chutes', where the animal trapping took place (Figures 11.2 and 11.3). Since the chutes are open, the actual trapping would have been undertaken with the aid of additional devices, such as snares, nets, cord, or wheel-traps – in some cases also pitfalls – or by bow-and-arrow or spear.

There can be little doubt that the stone lines were intended for game trapping on a considerable scale. As to their function, everything from barriers to protect habitation sites by the Nile, to ritual structures, to constructions used for pastoral purposes, has been taken up in discussions with colleagues. None of these purposes can explain the vital characteristics of the lines, namely that they converge into chutes, behind which there are neither corrals nor other types of enclosures.

One would have expected corrals if the constructions were intended for trapping animals for domestication. And the stone lines are far too low to have been effective as barriers for protection of habitation. If they were ritual

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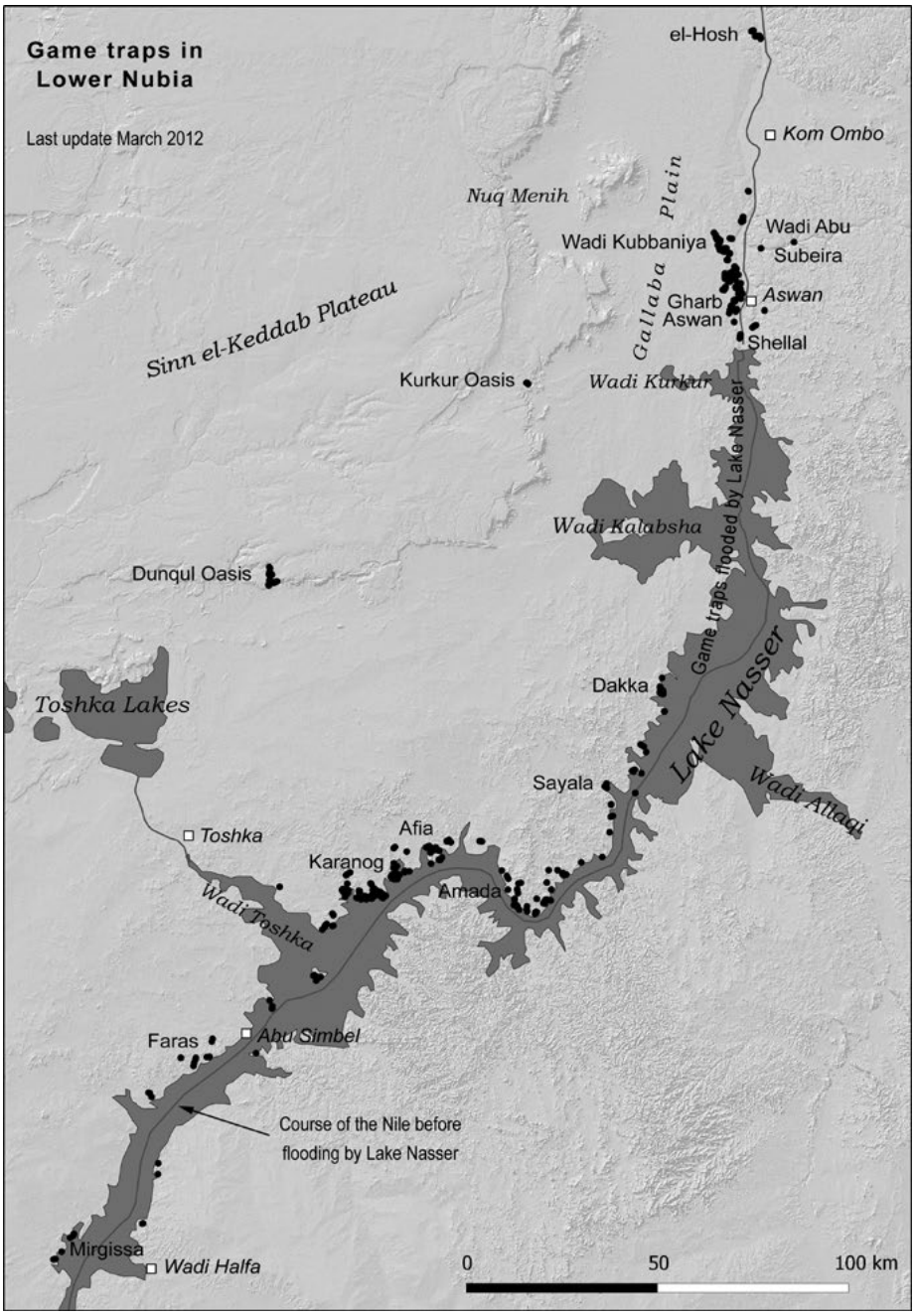

Figure 11.1. Map of Upper Egypt and Lower Nubia with game trap structures (dots). Sources: the Gharb Aswan-Kubbaniya and el-Hosh assemblages: mainly field observations by the author; the Wadi Abu Subeira stone line: Adel Kelany/the author; the traps from Sayala to Shellal: Hester and Hobler (1969); other: Google Earth™ survey by the author. (Cartography by P. Storemyr)

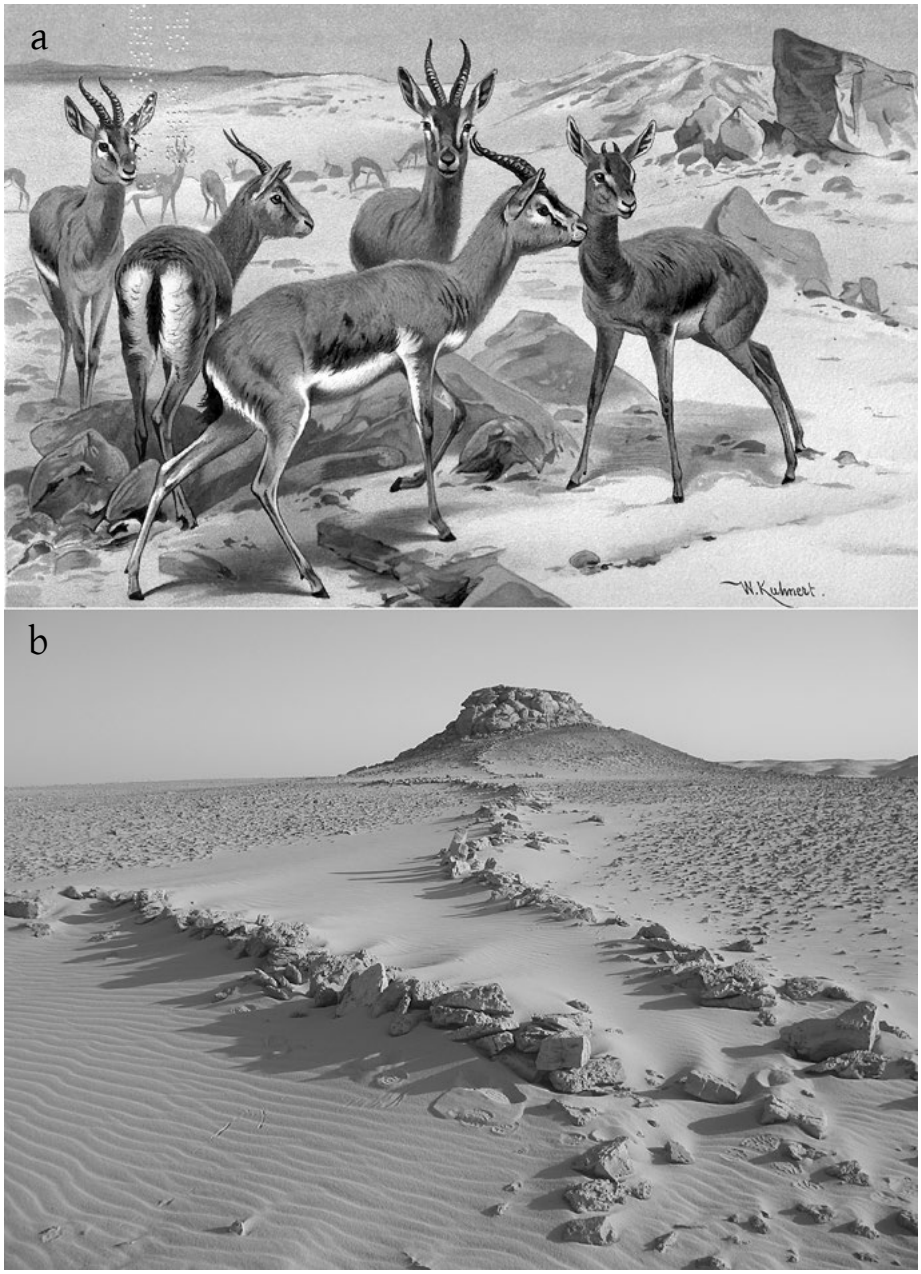

Figure 11.2. A. Dorcas gazelle may have been the most important game hunted with the use of stone lines in Upper Egypt and Lower Nubia; B. Stone line with funnel-shaped chute in the foreground, located at Sheikh Mohammed, Gharb Aswan. (Illustration after Lydekker 1894; photograph by P. Storemyr)

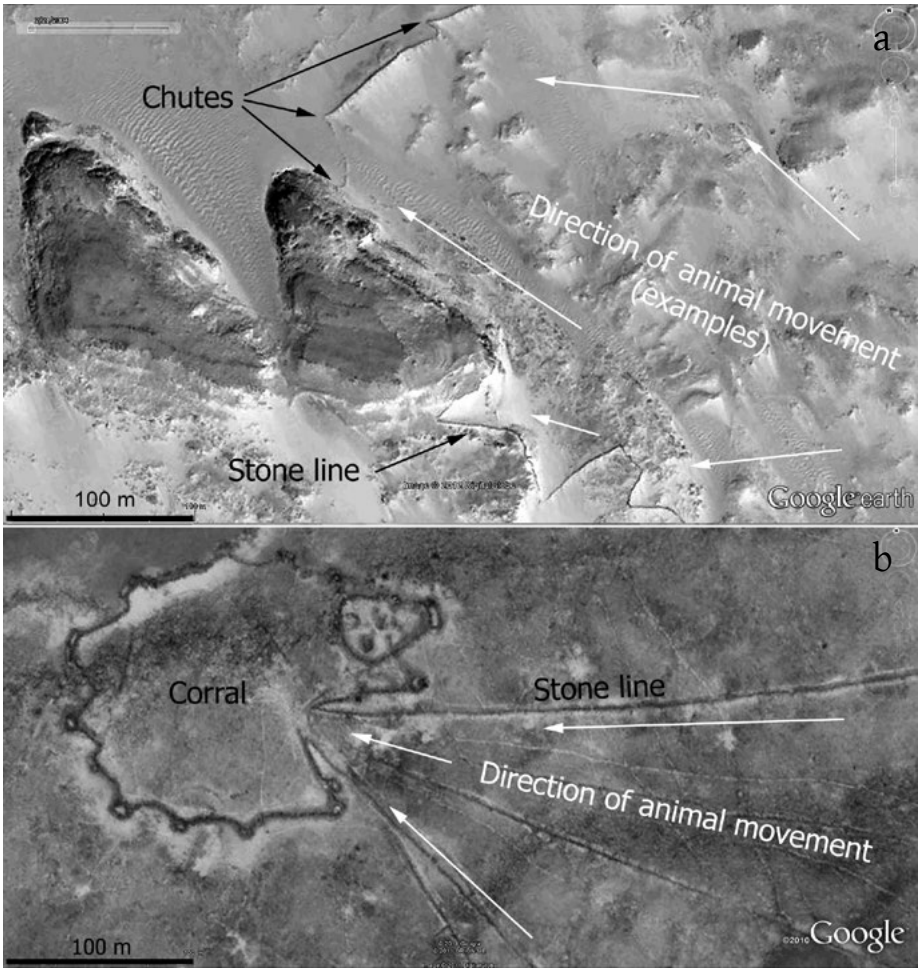

Figure 11.3. Comparison between Lower Nubian game traps (top, Wadi el-Faras) and Jordanian kites (Azraq). The former have stone lines with narrow openings (chutes) where animals were trapped; the latter have an enclosure at the end of the stone drivelines. (Google Earth™, adapted by P. Storemyr)

constructions or some sort of geoglyphs, it is difficult to understand why the chutes are generally placed at spots where animal paths are often preserved. Thus, there is no satisfactory explanation for the stone lines other than their being hunting structures or game traps.

The situation is different in North Sudan, in the Third Cataract region, where long stone lines have also been found. Tahir and Sadig (2014) convincingly argue that the function of many of these lines is for water harvesting and/or social enclosure.

There is neither ethnographic evidence nor references in ancient Egyptian and Nubian paintings, graffiti and texts that hint as to the existence and use of

the stone lines in Lower Nubia. There are also no apparent depictions of similar hunting traps in the extremely rich rock art of the region, which spans more than 15,000 years from the Late Palaeolithic to recent times (Huyge 2009). This implies that a great deal of care must be taken in the interpretation of the game traps. How old are they? Who built them? What animals were trapped? How were they used? In a region that is traditionally known for the worship of the ancient Egyptian and Nubian deities Satet and Anuket, who were associated with antelope and gazelle respectively, was it perhaps these animals that were hunted?

These are the questions dealt with in this chapter, but due to the lack of targeted excavations and direct dating few definitive answers can be provided at present. Hence, in addition to description, this chapter aims to provide a set of suggestions and hypotheses that may be useful for future work. We will take a broad look across all of Upper Egypt and Lower Nubia, from the First to the Second Nile Cataract and beyond. There are large concentrations of game traps at Gharb Aswan (West Aswan) by the First Cataract, where recent investigations have been undertaken (Storemyr 2011), but the traps also occur in the small oases of Dunqul and Kurkur, far away from the river (Figure 11.1). Though poorly known, the traps were first reported more than 40 years ago by Hester and Hobler (1969: 63–8) during their archaeological survey and excavation as part of the Nubia rescue campaign. This formidable campaign was set up by UNESCO to save as much archaeology as possible as the waters of Lake Nasser rose subsequent to the building of the High Dam at Aswan. The traps have only been very briefly mentioned by other authors, such as Gautier (1968: 99), Osborn and Helmy (1980: 1), and Riemer (2009).

There are different smaller and fewer, but comparable, published structures in the Eastern Sahara, or the Western Desert (that is, the area from the Nile in Lower Nubia to roughly the Libyan border) (Riemer 2004; 2009; see also, for example, Berger 2009; Menardi Noguera et al. 2010; Peroschi and Cambieri 2011), as well as by the third Nile Cataract in North Sudan (Edwards 2006; Soghayroun 2010; see also Tahir and Sadig 2014). Several more structures have been spotted in the Western Desert by Ursula Steiner (personal communication, 2012).

Also, a few simple structures have been reported from the Eastern Desert, between the Nile Valley and the Red Sea (Hobbs 1989: 43). However, all these traps lack the funnel-shaped chutes and instead trapping took place in simple gaps that were left in otherwise relatively straight stone lines. Thus, the game traps in Lower Nubia and Upper Egypt are, as far as published records are concerned, highly specific for this region, when compared to adjacent areas to the south, west and north-east.

Discovery

First reported by Hester and Hobler (1969: 63–8) south of the First Cataract, recent recording of the game traps were undertaken mainly with the QuarryScapes project (2005–2008; Bloxam et al. 2007; Abu-Jaber et al. 2009; www.quarryscapes.no) at Gharb Aswan, just to the north of the First Cataract, as well as with the Belgian Archaeological Mission to el-Hosh (2010). In these areas about 50 per cent of the

traps were observed in the field; the rest were recorded through remote sensing using Google Earth (Storemyr 2011). Beyond these areas a comprehensive Google Earth survey was undertaken, encompassing the whole 400-kilometre stretch from el-Hosh to the Second Cataract. The results of both of these surveys are reported in the following sections. Limited surveys using Google Earth in areas considered favourable for hunting were also carried out outside of this region, especially along the Nile Valley in Egypt and North Sudan. There are, for example, many unreported stone lines along the 300-kilometre long stretch between the Second and Third Nile Cataracts (the Batn el-Hagar region). The flanks of the Nile Valley in Egypt north of el-Hosh are so thoroughly disturbed by modern development that former traps may have been destroyed. Still, it seems unlikely that game traps were ever present in these regions, also because nothing in the literature points to their existence. The nearest known concentrations to the north are the desert kites in Sinai, structures that are clearly derived from the Middle East tradition (for example, Holzer et al. 2010).

Satellite images in Google Earth present the most efficient means for the *initial* survey of game traps since they can be very easily seen, but only when image resolution is high enough (0.5 metres to one metre). This implies that when additional high-resolution satellite images become available, the database will inevitably swell. Thus, as a result of 'armchair surveys' from 2010 to 2012, the number of game traps in Lower Nubia increased by some 25 per cent (compare Storemyr 2011: fig. 1 with Figure 11.1 in the current contribution). It goes without saying that finer details, dating, and recording of the associated archaeology can only be determined or obtained through field survey and excavation.

Chronology, cultures and climate

This chapter deals with widely spaced archaeological periods in an area where period nomenclature is complex. For the Upper Egyptian Nile Valley and the bordering deserts, which stretch from roughly Luxor to Aswan and the First Nile Cataract, I use the following terms, derived from Hendrickx and Vermeersch (2000) and Vermeersch and Van Neer (2015) (all dates are cal BCE):

- Late Palaeolithic: c. 21,000–11,000 BCE
- No documented, dated sites between c. 11,000 and 7000 BCE
- Epipalaeolithic: c. 7000–5000 BCE
- Neolithic: c. 5000–4000 BCE (sometimes conceived of as part of the Predynastic period, and in such cases omitted)
- Predynastic: c. 4000–3000 BCE
- Historic period: c. 3000 BCE onward, with the Pharaonic, Graeco-Roman and later periods

In Lower Nubia, which is the area between the First and Second Cataract and the adjacent deserts, the nomenclature is usually quite different. The Late Palaeolithic is similar to Upper Egypt, but for the later periods the following terms are often used (cf. Edwards 2004):

- Neolithic: c. 9000–4000 BCE
- Nubian A-Group: c. 4000–3000 BCE (corresponding to the Predynastic of
- Upper Egypt)
- Nubian C-Group: 2400–1550 BCE (also called Middle Nubian, corresponding to the Late Old Kingdom to the beginning of the New Kingdom of Egypt, here also including the nomadic, so-called Pan-Grave culture)

For later periods, dates are given in the text. It should be stressed that there was plentiful interaction between the cultures to the north and south of the First Cataract throughout the periods treated in this chapter. Also, there was, of course, a gliding transfer from the Epipalaeolithic, more or less nomadic way of life to widespread pastoralism, and sedentary agriculture in the Nile Valley in the historic period.

Some brief words on climate change may be helpful to orient the reader: the Late Palaeolithic was hyper-arid in the whole region, whereas the first 5000 years of the Holocene, with the African monsoon belt reaching up into Egypt until circa 5000 BCE, are part of the Holocene wet phase, which resulted in a dry savannah-like environment. After 5000 BCE the region dried out rapidly, soon resulting in the hyper-arid climate of today (Kuper and Kröpelin 2006; Bubenzer and Riemer 2007).

The archaeology of game traps at Gharb Aswan

In the 30-kilometre long stretch from Wadi Kubbaniya to the High Dam at Aswan there are a dozen or so trap 'systems' (defined as concentrations of several individual structures or lines with their chutes). They are located across and along, often above, the flanks of wadis draining the Gallaba pediplain between the Nile and the Sinn el-Keddab plateau (Figures 11.1 and 11.4). Individual structures were built as semi-continuous lines using local fieldstones (Nubian sandstone). They are rarely more than 40 to 50 centimetres high, but carefully integrated in the local terrain, following hills and hillsides, which acted as natural boundaries and reduced the amount of stone and labour required for construction. Most lines are now broken and visible only in part due to erosion and aeolian sand cover, especially in larger wadis, where they are usually much damaged. Practically all lines fan out towards the east, implying that they were built for capturing animals when they were moving away from the environs of the Nile. In favourable terrain, animal paths can sometimes be seen leading towards the trap structures.

The lower part of Wadi Kubbaniya (Figure 11.4) has the largest system, with 15 to 20 structures ranging in length from less than 100 metres to more than one kilometre (in total about 15 kilometres of lines have been preserved here; not all are included in Figure 11.4). The system blocks, in a systematic manner, all the small side wadis, valleys and entry points over a distance of around nine kilometres (as the crow flies) along the undulating western flank of the main wadi. The number of preserved chutes amount to approximately 200, not including

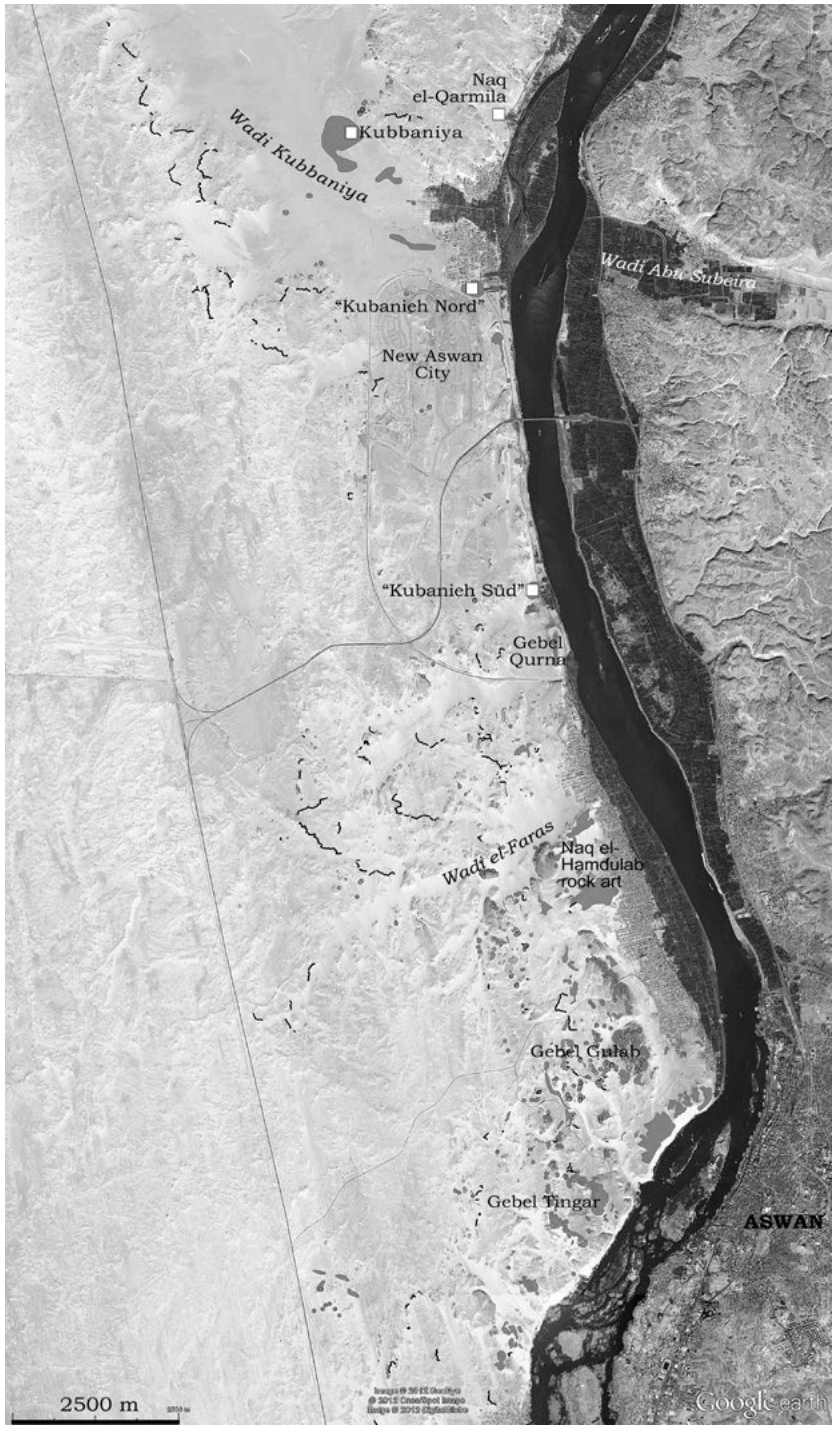

Figure 11.4. Map of Gharb Aswan with game traps (black lines), rock art (dots) and various archaeological sites/features, such as quarries and habitation sites (grey colour). Source: QuarryScapes. Basemap from Google Earth™. The Late Palaeolithic and Predynastic habitation sites in Kubbaniya (Wendorf et al. 1989) and Naq el-Qarmila (Gatto et al. 2009), respectively, as well as the ancient cemeteries at 'Kubanieh Süd' and 'Nord' (Junker 1919, 1920) are also plotted. (Google Earth™, adapted by P. Storemyr)

those that are now under sand. Another line is found close to the famous Late Palaeolithic habitation sites (cf. Wendorf et al. 1989) at the eastern side of the wadi.

Further south, close to Nag el-Hamdulab, there is a very large system west of Gebel Qurna, between Wadi el-Faras and another, unnamed wadi (Figure 11.4). These lines consist roughly of three parallel V-forms, located 1.5 kilometres apart, each measuring 1.5 to three kilometres in length. The system is made in such an intricate and systematic way that every tiny side wadi is efficiently blocked. More than 80 chutes have been counted and there are certainly more under sand dunes (or that have eroded away) (Figure 11.5). This system presumably took advantage of animal movements along both of the wadis with the stone lines directing the animals to the higher ground between the wadis, where they were trapped.

Less extensive traps are found at the top of the small valleys between Wadi el-Faras and Gebel Gulab, but just west of the latter is a two- to three-kilometre long system that must have captured animals from three small valleys. Wadi el-Tilal, which enters the Nile close to St Simeon's monastery and Elephantine Island, features several small structures, one of which deviates from the general scheme. It is built more like an enclosure and comprises a well-built chute, apparently *closed* at the far end by a (now ruined) roofed trap. The enclosure has an 'entrance' marked with orthostats. West of Gebel Tingar and Gharb Sehel there are several substantial structures and further south, in granite country close to the High Dam, is another system, perhaps with a feature resembling a corral (field observations lacking).

The game traps are generally located one to three kilometres from the Nile, but the larger ones in Wadi Kubbaniya and Wadi el-Faras are found up to eight kilometres from the river (Figure 11.4). This pattern is largely dependent on the local geomorphology: there are no traps in the 'high desert', on the Gallaba plain, outside the system of wadis and small valleys near the Nile. Taking a broad view, it would seem that the traps come in two distinct configurations: either as large, integrated systems, or as smaller, single units. Especially within the larger systems there is some evidence of reuse or repair, indicating that some stone lines were rebuilt or slightly altered/moved, perhaps as a result of observation of specific animal behaviour after the first traps were built.

Given the destruction by modern development and erosion, the overall picture is that originally the stone lines would have blocked practically all wadis between Kubbaniya and the High Dam. Preserved lines are estimated to have a total length of more than 25 kilometres. Extrapolating from a conservative average width (50 centimetres) and height (40 centimetres) of the stone lines, this implies that more than 5000 cubic metres of fieldstone was required for their construction. This is indeed a substantial body of 'architecture'.

Game traps beyond Gharb Aswan

As observed on Google Earth there are just two systems between Kubbaniya and Kom Ombo. The 40-kilometre stretch further on to el-Hosh does not have any (preserved) systems (Figure 11.1). This is probably due to the fact that the terrain dramatically changes on entering the Kom Ombo plain, and the flat, rather

Figure 11.5. The game trap system in the Wadi el-Faras area. The stone lines have been omitted to highlight the distribution of chutes (dots). (Google Earth™, adapted by P. Storemyr)

Figure 11.6. Very simple, damaged stone line across a small valley at el-Hosh, Upper Egypt. This was most likely a trap located across an animal path. The actual trap would have been placed in an opening in the middle of the line. (Photograph by P. Storemyr)

featureless desert west of the river may not have been appropriate for hunting. The rockier environs of el-Hosh, however, seem to have been more suited, and this area has the northernmost group of game traps found so far. These traps are generally similar to the complexes found further south, but one of the six or seven game-trap systems stands out because it has been constructed across a steep hill between two valleys that enter the broad Wadi Abu Tanqura. At el-Hosh there are also a few very simple stone lines, consisting of a row of small stones only, which measure 10 to 20 metres in length and block small valleys (Figure 11.6). They have an opening in the middle, through which there is usually a well-trodden animal path, and are reminiscent of structures in both the Western and Eastern Deserts, which have been interpreted as simple animal traps (Hobbs 1989: 43; Riemer 2009).

The traps along the Nile south of the High Dam (Figure 11.2), briefly mentioned by Hester and Hobler (1969: 67–8), are comparable to the ones further north, despite the fact that the local terrain is often different, with sandstone inselbergs being a major feature of the landscape. A typical trait of many stone lines in the area is that they are constructed between individual inselbergs and so block greater areas. But there are also examples of trap complexes on top of inselbergs. Individual chutes do not always fan out towards the east, but the systems of which they are part always were clearly constructed to trap animals as they moved away from the river, just like at Gharb Aswan. On Google Earth we can observe substantial systems (Figure 11.1) close to Dakka, Sayala, Amada, Afia (Figure 11.7), Karanog,

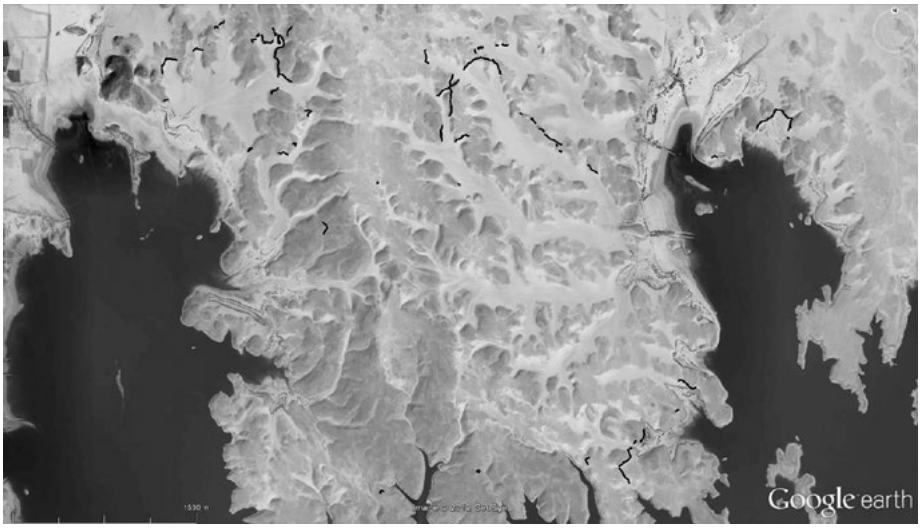

Figure 11.7. Game trap structures at Afia, Lower Nubia. The water of Lake Nasser has probably flooded several lines and chutes in this area, but it is still possible to discern a system that blocked animal routes along a stretch of 6–7 km. Note that there are more lines in the vicinity, outside of the picture. (Google Earth™, adapted by P. Storemyr)

the mouth of Wadi Toshka, Faras and Mirgissa, with smaller systems being located in between these sites. It is likely that these systems represent only the tip of the iceberg. Other structures may well have existed further downstream near the High Dam (in the Wadi Kalabsha/Wadi Kurkur areas) and close to the original river course, but these have now been flooded by Lake Nasser. Hester and Hobler (1969) indeed observed many structures between Sayala and Shellal in the 1960s, before the waters of the lake rose to the current level. The preserved stone lines have a total length of several hundred kilometres. They are generally located at similar distances from the Nile as at Gharb Aswan, but some are found up to 10 to 12 kilometres from the original river course.

Since fieldwork is lacking and many traps are now submerged under Lake Nasser, it is at present impossible to say whether there are, in addition to the many large systems, also smaller individual traps, as has been observed at Gharb Aswan. One can certainly see small traps on Google Earth, but they often seem to be part of larger systems in their vicinity. Potentially, game traps may also have been flooded on the east bank of the Nile since very few structures can be observed here on Google Earth. It is also possible that many structures have been destroyed by flash floods, given the much stronger wadi activity on the east bank (more rainfall in the Eastern Desert). Or perhaps game traps simply did not develop to the same extent as on the west bank since the terrain is more rugged and has many small wadis featuring natural 'bottlenecks' in which traps could be set that did not require stone lines to guide animals towards them. Thus, there may be environmental as well as cultural reasons why game traps are rare in this area. There seem to be some structures north of Wadi Halfa and two systems in

the Shellal granite area, just outside suburban Aswan, as well as one or two in Wadi Abu Subeira, 12 kilometres north of Aswan (Figure 11.2).

The final known systems in Lower Nubia/Upper Egypt are the traps described by Hester and Hobler (1969: 63–8) in the small Kurkur and Dunqul oases. In Kurkur there are only two small structures, but in Dunqul there are at least eight, the largest of which forms an impressive four-kilometre long semi-enclosure with about 30 preserved chutes (Figure 11.8). The stone lines here are commonly built from rugged calcareous tufa, implying that stone was not only collected in the immediate vicinity of the traps. Otherwise, the traps share the characteristics of the structures close to the Nile. Most have chutes designed for intercepting animals departing from drinking holes (generally Bir Dunqul), but in contrast to the examples along the Nile, Hester and Hobler also reported a few chutes with an opposite orientation. The latter were presumably built to catch animals going to drinking holes.

Building techniques and associated features

The game traps at Gharb Aswan and beyond are remarkably uniform, despite the fact that some systems feature numerous and very long lines with up to several hundred chutes, whereas others are short and block one wadi or valley only. All, except the traps in granite country at Shellal and in tufa terrain at Dunqul, are situated in Nubian sandstone landscapes with readily available fieldstones for construction. All took advantage of the local topography and integrated stone lines with hills and inselbergs, hillsides and wadi flanks etc. But there are, of course, some variations in design and building technique (Figures 11.9–11.11). While most of the now weathered, eroded and half-ruined stone lines were built to a height matching two to three very rough courses of fieldstone, there are several examples of highly eroded lines that consist of a single course only. Moreover, when thin-bedded sandstone was available, slabs were sometimes erected vertically. Thin slabs and long stones were also commonly used as standing stones that were integrated within the lines (Figure 11.9: c–d), perhaps to frighten the animals so they would not jump across the stone lines (Riemer 2004: 38). Chutes were normally built more solidly than the lines. They are often somewhat higher and many feature a small pile of stone and one or two standing stones at their terminal end (Figure 11.10: b, d, f). Such features were also noticed by Hester and Hobler (1969) in Dunqul and they interpreted them as having been used as anchors for nets and/or cord for trapping the animals.

Hester and Hobler (1969) observed pitfalls at the end of two chutes in Dunqul. We did not spot such pits at Gharb Aswan and el-Hosh, nor notched blocks beside the chutes like those reported from the Regenfeld area in the Eastern Sahara, which have been interpreted as anchors for snares and/or (spiked) wheel traps (Riemer 2009: 183–4). However, at the time of survey we admittedly did not look specifically for such blocks. On the other hand, we did look for artefacts such as arrows, spear heads, and bones (as an indication of butchering) near the traps but such objects were not found.

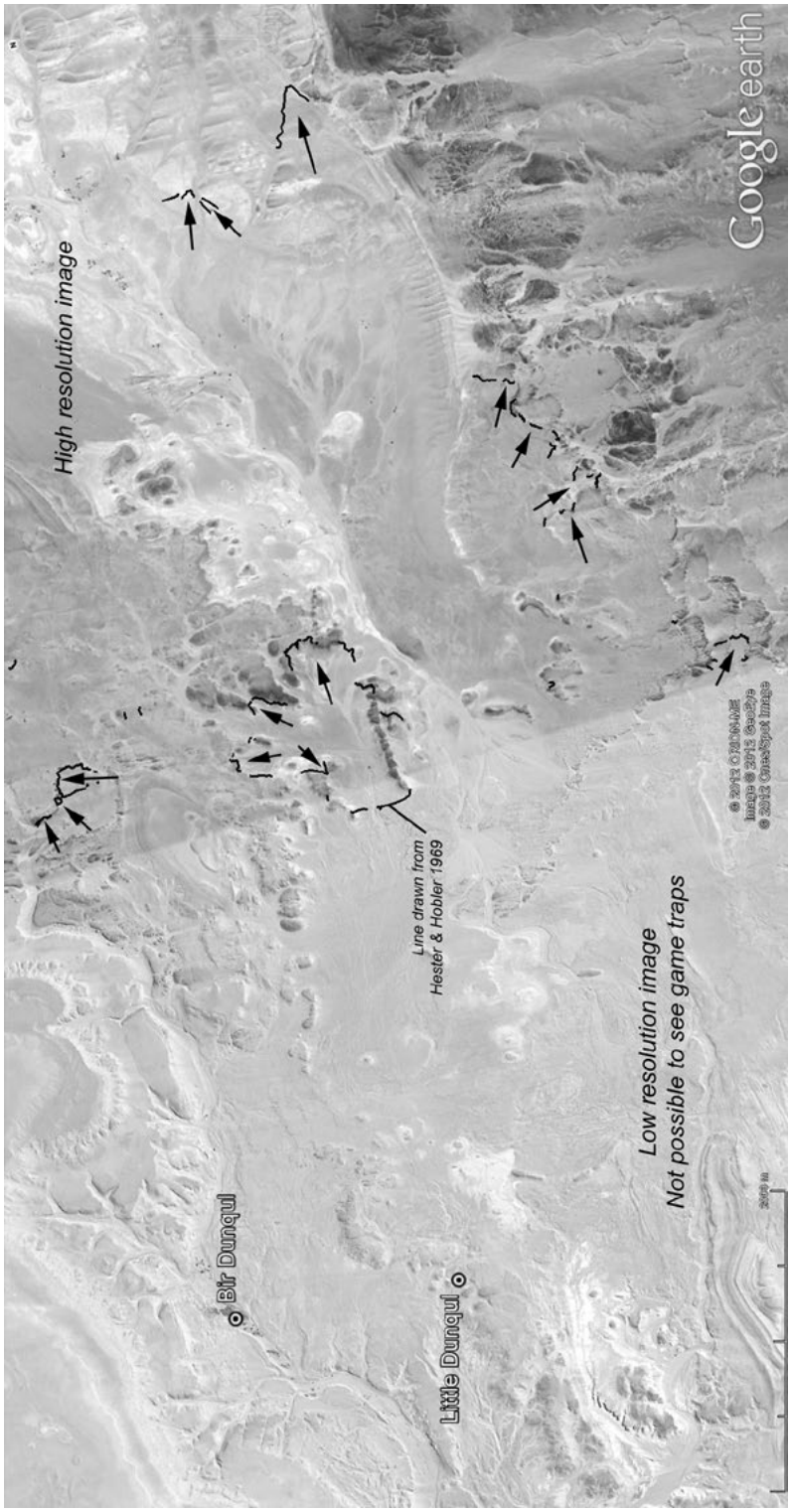

Figure 11.8. Game traps in the environs of Dunqul oasis. Arrows indicate animal movement. (There is a seam down the middle of the photo, a result of two satellite passes.) (Google Earth™, adapted by P. Storemyr)

Figure 11.9. Stone lines: A. Wadi Kubbaniya; B. Gebel Gulab at Gharb Aswan, note the weathered stone line in front and rock art in the foreground; C–D. Gebel es-Sawan at Gharb Aswan, note the standing stones; E. el-Hosh; F. Wadi Abu Subeira, note the stone lines up the slope. (Photographs by P. Storemyr)

Many structures at Gharb Aswan are closely associated with well-built stone circles, which are located at strategic places such as hilltops near chutes (Figure 11.11). They can likely be interpreted as lookouts or, perhaps, hunting blinds. The latter has been reported in the Dunqul area (Hester and Hobler 1969) and they are prevalent within the large reindeer hunting systems in Norway (cf. Pilø and Finstad, this volume), some of which are quite similar to the Lower Nubia systems (see below). Both at Gharb Aswan and at el-Hosh there are, moreover, concentrations of shelters and small habitation sites in the vicinity of some

Figure 11.10. Chutes: A. Sheikh Mohammed at Gharb Aswan; B. Wadi Kubbaniya; C–D. Gebel es-Sawan at Gharb Aswan; E. el-Hosh; F. west of Gharb Sehel. Note the chutes with standing stones (right column). These may have been used as net or cord anchors. (Photographs by P. Storemyr)

trap systems. Since our survey did not include excavation, there is little we can say about such features, though it is worth mentioning that a concentration of about 40 undated shelters and windbreaks exists close to the traps on the eastern side of Wadi Kubbaniya. However, these shelters and windbreaks may also be connected to, for example, intensive ancient stone quarrying between Kubbaniya and Gharb Sehel (Bloxam et al. 2007). Generally, at both Gharb Aswan and el-Hosh the landscape is so overloaded with archaeological features, spanning thousands

Figure 11.11. Shelter or look-out close to stone line and chute just north of Wadi el-Faras at Gharb Aswan. These features are part of an extensive trap system (cf. fig. 4–5). (Photograph by P. Storemyr)

of years, that any attempt at making inferences or temporal associations with game hunting is tricky indeed.

This is also the case for rock art, which is very important across Lower Nubia and also at the sites where field surveys have been undertaken. At Gharb Aswan and el-Hosh, the tradition of making petroglyphs dates back to the Epipalaeolithic and Late Palaeolithic, respectively. Net-like and various other geometric designs of Epipalaeolithic date may be connected with hunting, but they may also have completely different meanings, and there is generally hardly anything in the rock art that specifically refers to stone lines and chutes.[1] However, at Gharb Aswan, like elsewhere in Lower Nubia, there are numerous depictions of gazelle, mostly long-necked (dama gazelle perhaps?) and of Predynastic date (Figure 11.12) (Storemyr 2008, 2009). At el-Hosh, Epipalaeolithic fish-trap designs dominate the rock-art repertoire. These are very likely related to communal fishing (Huyge et al. 1998; Huyge 2005).

1 There are several depictions of desert kites in the rock art of the Middle East (for example, Betts and Helms 1986; Berg et al. 2004) and also of corrals related to reindeer hunting in the Alta rock art of Arctic Norway (Helskog 2011).

Figure 11.12. Predynastic rock art depicting gazelle hunting with dogs at Gharb Aswan. Site EB 129 in Storemyr (2009). (Illustration from photograph by P. Storemyr)

The age of the game traps

Edwards (2006) speculated on a Mid-Holocene date (pre-5000 BCE) for the stone lines in the Nubian heartland by the Third Nile Cataract, while Riemer (2004, 2009) placed the Eastern Sahara Regenfeld game trap in the Neolithic (circa 5000 BCE). Hester and Hobler (1969: 63–8) assigned the Dunqul and Lower Nubian systems to the 'Oasis C-Group' and later (till the Roman period). By way of comparison,

the desert kites of the Middle East may have been used from the Epipalaeolithic, but more likely the Neolithic, to recent times, peaking between circa 4000 and 1000 BCE (Helms and Betts 1987; Betts 1998; Holzer et al. 2010; Bar-Oz et al. 2011, Zeder et al. 2013).

ARCHAEOLOGICAL EVIDENCE AND SITE ASSOCIATIONS

The inferences made by Hester and Hobler (1969) are the most pertinent in the context of this chapter. However, their analysis only took account of a limited area away from the Nile and was not based on direct dating but on spatially connected archaeological features, which in most cases belonged to what they called the 'Oasis C-Group' (effectively another name for the Nubian C-Group; circa 2400–1550 BCE; cf. Edwards 2004). However, looking at Hester and Hobler's (1969: 32f) distribution maps of archaeological features, it becomes clear that there is also a certain spatial association between game traps and sites belonging to what they call the 'Libyan culture', which rather ought to be Early Nubian A-Group and/or roughly contemporary with earlier cultures of the 4th to 5th millennium BCE (Maria Gatto, personal communication, 2011). Thus, I believe one should not exclude the possibility that the game traps may be older than Hester and Hobler propose.

Since we have not carried out excavations at Gharb Aswan, we can only rely on surface finds. Pottery finds along stone lines were very scarce, but generally ranged from the Predynastic/Nubian A-Group (4th millennium BCE) to recent times. In one case, at Gebel es-Sawan, a stone line has been destroyed by a grinding stone quarry in which there are New Kingdom (1550–1070 BCE) ceramics. Stone lines and chutes close to St Simeon's monastery have been damaged by a quarry road from the New Kingdom ornamental quarries at Gebel Sidi Osman. Generally, stone lines are disturbed, sometimes destroyed, when located within or in the immediate vicinity of larger ancient quarries for grinding and ornamental stone. These generally belong to the Pharaonic and Graeco-Roman periods, but in some cases the grinding stone quarries are older (Predynastic, some even Late Palaeolithic) (Bloxam et al. 2007). In several cases camel paths belonging to desert routes have also disturbed chutes and stone lines (the camel came in general use in the area around 400–300 BCE).

The enclosure-like structure with an integrated, elaborate trap, located close to St Simeon's monastery, could, on the basis of co-located pottery, belong to the Byzantine period. Perhaps even younger are some short lines/structures near present habitation sites (for example, in the vicinity of Wadi el-Faras), which give the impression of having been altered (or repaired) more recently than the bulk of the stone lines as they are less well built and less weathered. Relatively late alterations and repairs were observed by Hester and Hobler (1969: 68) at game-traps systems near the Nile, which according to them may have been used down to the Roman period.

The condition of the stone lines is a diffuse indicator of age. Most lines are reduced to long heaps of stone, the upper courses having fallen down. Also, the lines are thoroughly eroded or entirely gone near and within wadis, or covered by aeolian sand in other wadis and depressions. Given that it takes a substantial

downpour to move the largest stones, the very small wadis will have carried minimal water and the climate has been arid to hyper-arid for the last 7000 years (Kuper and Kröpelin 2006; Bubenzer and Riemer 2007), it is reasonable to maintain that a few large flash floods over a span of thousands of years would have been responsible for the observed erosion.

As mentioned in the previous section, the Gharb Aswan landscape has a great abundance of archaeological sites. Without making premature inferences, it is worth noting that the two largest game-trap systems at Wadi Kubbaniya and Wadi el-Faras are located slightly inland from a Nubian A-Group settlement/cemetery and Pan-Grave cemetery (Naq el-Qarmila; Gatto et al. 2009) and Nubian A-Group and C-Group cemeteries (Junker 1919, 1920), respectively. In addition, there was a steady Nubian presence from the 4th millennium BCE at Elephantine/Aswan, close to the group of game traps right across the river. These are some of the northernmost sites known to have had a substantive Nubian presence in the extensive border country between Lower Nubia and Egypt. There also was a scattered Nubian presence as far north as Hierakonpolis (by Edfu) and Luxor. Since game traps are omnipresent in the Lower Nubian heartland between the First and Second Cataract, they are quite certainly not a typical ancient Egyptian phenomenon but were more likely part of a Nubian or, more generally, a southern/western tradition that could have spread northwards with the expansion of the A-Group and/or the C-Group or earlier cultures. It must be recalled here that there are other types of game traps to the west and south of Lower Nubia, which are thought to date to the Neolithic, whereas to the north and north-east one has to move several hundred kilometres to find the nearest substantial trap systems (being the desert kites of Sinai).

CULTURAL EVIDENCE – THE CONSUMPTION OF MEAT

A major problem with assigning the game traps at Gharb Aswan (and, by extension, other ones across Upper Egypt and Lower Nubia) to the Nubian A- and/or C-Group, and contemporary cultures, is related to the apparently low consumption of meat from wild animals by the members of these cultures.

Starting with the Upper Egyptian material, a review by Linseele and Van Neer (2009) (see also Boessneck 1988) shows that domestic livestock (goat, sheep, cattle) was the main source of meat long before the Predynastic period. At settlement sites gazelle and a few other wild ungulates generally make up only one per cent of the zooarchaeological material, with a somewhat higher proportion in the Late Neolithic (second half of the 5th millennium BCE). There is, of course, also a small proportion of a range of other wild mammals in the record, but primates, rodents and carnivores – or rhinoceri and giraffes – are hardly relevant to the hunt with game traps. However, the proportion of wild game is usually higher at temple and ceremonial sites, such as Hierakonpolis (site HK29A), just north of el-Hosh, where wild species (mainly *Gazella dorcas*) make up 15 per cent of the animal remains in the late 4th millennium. This has led Hendrickx (2011) to conclude that hunting was largely an elite activity already by the Predynastic period – an activity that went far beyond food procurement, tying into the realm of

religion, social status and hierarchy, like it did in later periods.[2] Such an elite and symbolic connection may also explain the extremely rich pictorial record of wild animals from ancient Upper Egypt and Lower Nubia, with gazelle being a favoured animal in hunting scenes, often with dogs, sometimes with archers (Figure 11.12). This was the case in both Predynastic rock art and paintings and reliefs on the walls of Pharaonic tombs and temples (reviews in Osborn and Osbornova 1998; Strandberg 2009). Not only dorcas gazelles are depicted, but also dama gazelles (*Nanger dama*), Soemmering's gazelle (*Gazella soemmeringi*) and slender-horned gazelle (*Gazella leptoceros*) (Boessneck 1988; Osborn and Osbornova 1998: 173ff; Linseele and Van Neer 2009). Another animal that could have been hunted using game traps, the ostrich, also figures prominently in artistic expressions, including rock art. However, these too are extremely rare in the zooarchaeological record (Linseele and Van Neer 2009).

Importantly, gazelle and other ungulates regularly seem to have been captured alive to be kept in confinement at settlement and ceremonial sites until eventually being (ritually) slaughtered (Hendrickx 2011: 246, and references therein). This could have a bearing on the design of the regional Upper Egyptian game traps since with the use of snares and nets at the end of the chutes they would have been adapted for such a practice. However, this does not mean, of course, that the traps could not also be used for killing on the spot.

There is only meagre zooarchaeological data from Lower Nubia, but the general picture appears to be similar to that of ancient Upper Egypt. Pastoralism emerged earlier in Northern Sudan/Lower Nubia than in Egypt (by 7000 BCE) and Nubian A-Group and C-Group peoples (4th to 2nd millennium BCE) seem to have largely relied on agriculture and pastoralism (Edwards 2004; Gatto 2011). Though based on scarce data, in the Second Cataract region Nordström (1972: 1–32) has shown the diminishing dietary importance of wild ungulates, with gazelle as the main species, during the 5th and 4th millennia BCE. Hunting was, of course, practised by the Nubian A-Group in the 4th millennium BCE, but its overall importance appears to have been limited. The same seems to hold true for the Nubian C-Group, though very little bone material has been obtained from C-Group habitation contexts. There is also hardly any information available about the diet of the contemporary, apparently semi-nomadic Pan-Grave culture due to the lack of excavated Pan-Grave camp/habitation sites. The best that can be said at the moment is that there is a restricted, but variable component of gazelle bones at habitation sites in Lower Nubia, as also reviewed by Bangsgaard (2010: 22–5). In some extremely rare cases large concentrations of gazelle bones have been found. One of these is a C-Group habitation site analysed by Gautier (1968: 98–9) at the Dunqul oasis, where bones from probably more than 10 individual dorcas were present (Gautier, personal communication, 2012). Importantly, this habitation site is near the game traps described by Hester and Hobler (1969).

As in ancient Egypt, gazelles were also used for ritual purposes in Lower Nubia and Northern Sudan, but apparently on a modest scale. An evaluation by Bangsgard

2 For instance, by the Late and Graeco-Roman periods there existed gazelle mummification rituals (for example, at the cemetery of Komir near Esna; summary in Strandberg 2009: 178f).

(2010) has concluded that sheep and goat remains are more prevalent in burial contexts than gazelle, and that sheep/goat were previously often erroneously identified as gazelle. This seems to match the sparse data that are available for habitation contexts. Consequently, the numerous depictions of gazelle (and cattle), mainly in rock art, may have had a similar significance as in Upper Egypt, being part of a predominantly elite religious and ideological realm.

Thus, from the 4th millennium BCE (Predynastic/Nubian A-Group period) onwards the archaeological record shows a very limited, but consistent use of hunted mammals in Upper Egypt and Lower Nubia. The key relevant species recorded, with regard to game-trap hunting, is clearly dorcas gazelle. Antelope (bubal hartebeest) and ostrich could have been hunted with game traps also, but the former was extremely rare and the latter hardly recorded, though ostrich eggshell is commonly found across the region. Gazelles were in all likelihood a minor food supplement and mainly hunted for ceremonial purposes (or perhaps as sport of the elite). *If* the game traps predominantly date to the 4th to the 2nd millennium BCE, it thus seems impossible to associate them with mass-killing practices. However, the game traps would, perhaps, have been ill-suited for such a purpose anyway as they lack enclosures in which to trap large numbers of animals simultaneously.

An entirely different picture emerges with regard to the desert kites in the Middle East; not only are the kites suitable for mass-killing, but gazelle bones (*Gazella subgutturosa*) are frequently found in the archaeological record, especially in the Neolithic (Holzer et al. 2010; Bar-Oz et al. 2011). In the Sinai dorcas gazelle was the most important prey for the hunt with desert kites (cf. Uerpmann 1987: 94–7; Holzer et al. 2010). However, in the Middle East, game may also not have been hunted primarily for food in the Neolithic and especially the Bronze Age, long after livestock had been introduced. In these periods hunting practices would thus have been directed towards social rather than economic ends (Zeder et al. 2013). Of course, hunting would also have been a food supplement in times of drought and bad harvest.

Could the game traps in Lower Nubia date further back in time, to the Neolithic or even the Epipalaeolithic? These are periods included in the Holocene wet phase, in which there can be little doubt that the mobile peoples that roamed the Nile Valley and adjacent deserts were part of the more widespread Western Desert 'Early Neolithic', with important habitation sites being located at places such as the Second Cataract, Nabta Playa, Bir Kiseiba, Kharga, Dakhla, and Dunqul and Elkab in the Upper Egyptian Nile Valley (Hendrickx and Vermeersch 2000; Gatto 2011).

An Epipalaeolithic/Neolithic (circa 7000 to 5000 BCE) date for the traps would quite closely agree with dates that have been suggested (Mid-Holocene, 6000 to 5000 BCE) for stone lines in the Western Desert and the Sudan (see above). However, there is very little evidence for meat consumption along the Nile during this period, mainly because few habitation sites have been found. The latter is likely due to the heavy erosion and deposition by the Nile river in these periods, implying that many habitation sites will have been destroyed. The only well-studied, and possibly not representative, site along the Nile, at Elkab, has a high proportion of bone from dorcas gazelle, and very little from hartebeest, in addition to auroch, which is the most abundant mammal (Gautier 1978). In Lower Nubia,

100 kilometres away from the Nile, Neolithic Nabta Playa has yielded the most substantial information together with Bir Kiseiba. Here, too, dorcas gazelles were the most common wild animal that was hunted (Gautier 1984, 2001). Despite the scarcity of the information, it is important to remember that the data corroborate with what Nordström (1972, mentioned before) concluded for the Second Cataract region, namely that gazelle steadily diminished in importance from and during the 5th and 4th millennia BCE.

Except for the environs of the Second Cataract, game traps have not been reported at these sites (nor have they been spotted on Google Earth). Gautier (2001) has interpreted hunting at Nabta Playa as opportunistic and being undertaken in the immediate vicinity of the habitation/camp sites. It is possible that the flat desert at Nabta was ill-suited for game traps, that they are covered by sand, or were made from ephemeral materials. Elkab is at the border to the Eastern Desert and we have seen that there are generally extremely few traps on the east side of the river. However, there is heavy modern development in the vicinity that may have destroyed possible traps.

Though only one Epipalaeolithic site (Elkab) along the Nile in Upper Egypt is reported in the literature, recent surveys at Gharb Aswan/Wadi Kubbaniya by the Aswan-Kom Ombo Archaeological Project have, importantly, revealed several Epipalaeolithic campsites (Maria Gatto, personal communication, 2011). This ties in with the numerous rock-art panels presumably from the same period (Storemyr 2009) and it is, of course, very important for the understanding of the archaeology in the area, including the game traps reported in the present publication. Similarly, there was a strong Epipalaeolithic presence near the game traps at el-Hosh, though there is now mainly a fine corpus of rock art that remains from this period (Huyge et al. 1998; Huyge 2005).

Although not based on archaeological evidence, speculations of an even older date of the stone lines, back to the Late Palaeolithic, have indeed been briefly put forward previously, by Osborn and Helmy (1980: 1). In this period (circa 21,000 to 11,000 BCE), with its rich archaeology in Upper Egypt and Lower Nubia, hartebeest was generally the most prevalent ungulate, followed by aurochs and dorcas gazelle, also at the habitation sites in Wadi Kubbaniya (Gautier and Van Neer 1989; Linseele and Van Neer 2009). However, the overall importance of meat from mammals seems to have been restricted since people predominantly relied on aquatic resources, fowling and systematic gathering of wild plants. Thus, it is no wonder that Kubbaniya and other Late Palaeolithic sites in Upper Egypt and Lower Nubia display one of the earliest, large-scale usages of grinding stones for processing tubers ('proto agriculture') (Wendorf et al. 1989). There ought to be no doubt that the hyper-arid climate in the Late Palaeolithic contributed to the limited importance of mammals in the diet. One could argue that there must have been more mammals than discovered in the archaeological record, since many groups of people could find a living here in the Late Palaeolithic. However, the very special geography of the Nile Valley must also be considered: subsistence, also for mammals, was only possible along an extremely narrow strip of land by the Nile and there was sparse vegetation on desert plains for animals to retreat/migrate to.

In summary, the Late Palaeolithic in many ways compares to the periods of pastoralism and farming after the Holocene wet phase from circa 5000 BCE, as in both of these periods the importance of meat from wild ungulates was limited. Though very limited evidence is available, it would seem, then, that the Holocene wet phase is the only period with substantial consumption of gazelle meat. This is a period that would have supported larger herds of gazelle because of better grounds for grazing and browsing away from the Nile.

Having speculated on the possibility that the history of the game traps could reach as far back as the Late Palaeolithic, we also ought to raise the question whether a much later dating may be conceivable, from the perspective of meat consumption (that is, from the Late period of the Pharaonic era into the Graeco-Roman period and beyond). There is little evidence along the Nile in Lower Nubia and Upper Egypt from these periods, except for generalised knowledge of the key importance of farming. It is, of course, very likely that people hunted from time to time, not least as evidenced by ritual use of gazelle in elite contexts (cf. Strandberg 2009: 178f), and also because gazelle populations seem to have lived in the area until the 19th century or so, when they were largely exterminated by modern hunting and habitat destruction (Saleh 1987; Sarant 2011). The famous traveller John Lewis Burckhardtt (1819) who took a keen interest in the desert kites in Jordan was also fond of observing gazelles during his travels in Lower Nubia (although he never mentions game traps); his notes point to quite rich populations, especially south of the Second Cataract, where the environmental conditions may have been slightly more favourable than further north. Even in the 1960s, Hester and Hobler (1969) observed a population of 50 to 100 gazelles by the Dunqul oasis.

Though highly fragmentary, this overview of the relative cultural importance of hunting throughout Lower Nubia and Upper Egypt over 20,000 years does not provide many hints to the dating of the game traps. However, it gives a basis on which to judge what animals were trapped. There can be little doubt that dorcas gazelles must have been the primary prey, probably to a limited extent followed by other types of gazelle. Moreover, it is in the Holocene wet phase (Neolithic/Epipalaeolithic) that gazelle turn up most prominently in the zooarchaeological records, though the number of sites from which this evidence derives is very restricted.[3]

3 A word of caution: it has been repeatedly argued that meat consumption from wild animals was very low in all periods, except in the Neolithic/Epipalaeolithic. But, again, the bone data is very fragmentary and generally derives from habitation and ceremonial sites. It is not unthinkable that the butchering of hunted animals took place away from such sites – and also away from the game traps. It may, in other words, have taken place at special butchering camps not yet discovered or where the bones have since long disappeared. If this is true, we may generally have a distorted perspective on the importance of hunted animals in the diet. This, of course, also has a bearing on the function of the game traps. Though the existing bone record indicates that the game traps cannot have been for killing on a greater scale, this picture may change if butchering places are discovered.

CLIMATE CHANGE AND ANIMAL MIGRATION

A remarkable feature of the game traps recorded in Upper Egypt and Lower Nubia is their sheer number and almost continuous distribution along the west bank of the Nile, with chute orientation usually indicating that trapping took place as animals moved westward from the river to the desert. Moreover, the design of the game traps is specific to this particular region, both when compared to the stone lines south of the Second Cataract and in the Western Desert and to the desert kites in the Middle East and Sinai. However, there are also possible similarities with other large-scale trapping systems. Like many desert kites in the Middle East (225ff; Betts and Burke, this volume) and the 'arrow-shaped' traps in West and Central Asia (Yagodin 1998, 2019), many of our game traps can be interpreted as to form a 'small' variety of 'chained systems' (that is, individual traps/kites that are tied together by stone lines). In the Middle East and West/Central Asia, such systems may stretch for vast distances *across* natural animal (seasonal) migration routes, implying that the animals literally walked right into the corrals/traps with only a minimal amount of active driving being required. Such systems are found at other places also; for example, long rows of large amounts of pitfalls, with or without guiding/driving lines, are related to ancient reindeer hunting in the Norwegian mountains (for example, Jordhøy 2008; cf. Pilø and Finstad, this volume).

Looking at Gharb Aswan, we may interpret the approximately nine-kilometre long stretch of traps along the western margin of Wadi Kubbaniya as a chained system (Figure 11.13). The stone drivelines are not continuous along the entire stretch, but by making use of the local topography they seem to effectively block all small side wadis and valleys along the wadi margin. The Wadi el-Faras system at Gharb Aswan and several systems between the First and Second Cataract most likely functioned in a similar manner.

The question arises whether the trap complexes across Lower Nubia were built to take advantage of seasonal migration patterns of especially dorcas gazelles, which are still widely distributed in parts of North Africa. I have not come across specific literature on migrating gazelle herds in Upper Egypt and Lower Nubia, but such evidence is available for Upper Nubia (that is, the area between the second and fourth Nile cataracts in northern Sudan). As to the behaviour of dorcas gazelles in general, Yom-Tow et al. (1995) (cf. Osborn and Helmy 1980: 511ff; Estes 1992: 63ff) mentions that they are not obligate drinkers and can endure extreme desert conditions if there are enough trees and bushes to graze on. Under such conditions they live in pairs, but where grazing is more favourable they may live in smaller family herds, consisting of five to 12 individuals in wide wadis with enough *Acacia* trees and bushes. In Libya, herds of up to 100 animals have been spotted during migration at the beginning of the cold season, when they move from drier to wetter areas. They may join other animals – for example, dama gazelle – during such migrations. After rains, they disperse on wide plains, grazing on annual plants. Ghobrial (1974) has reported modern-day migrations of gazelle herds in northern parts of the Sudan (not to be confused with the massive migration of animals, rivalling those of the Serengeti, in the grasslands of South Sudan). His studies show that after the vegetation has been exhausted in

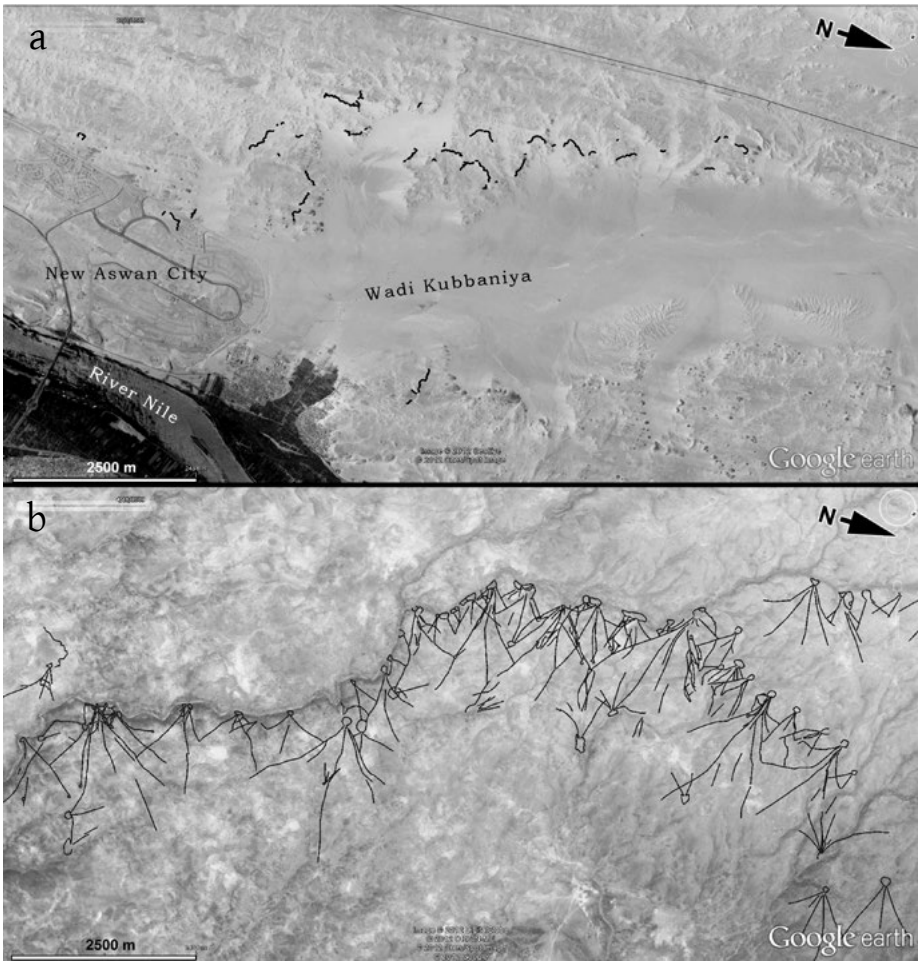

Figure 11.13. Comparison between trap systems in Wadi Kubbaniya and the Jawa area, NW-Jordan (cf. Helms and Betts 1987: fig. 3). The overall length of the two 'chained' systems is comparable (9 and 15 km, respectively), but whereas the Jawa complex features more than 150 km of stone walls, at Kubbaniya there is only some 15 km left (note, however, that erosion and sand dunes have taken their toll). The Kubbaniya complex may have had more than 200 chutes for trapping individual animals, whereas the Jawa complex boasts c. 45 corrals, each designed for trapping and killing perhaps dozens of animals. (Google Earth™, adapted by P. Storemyr)

spring and early summer, dorcas and other gazelles move considerable distances eastward towards the Nile, and migrate back to the desert/savannah with the coming of sparse annual rains in July. He observed a similar pattern of annual migration between the Red Sea Hills and the Red Sea Coastal Plain.

An important observation of Ghobrial is that migrating gazelles only spend a relatively short period by the Nile (spring to July), which may have had to do with the coming of the annual floods in June (prior to the construction of modern

hydroelectric power dams). During the three- to four-month season of flooding, it may have been difficult for ungulates to graze directly along the river, which in Upper Egypt may have had a bearing on patterns of ungulate hunting as far back as the Late Palaeolithic. At Wadi Kubbaniya and other places it has been demonstrated that hunting often was of limited importance in the period of high flood (Gautier 1989).

Unfortunately, Ghobrial does not provide further information on actual migration routes in northern Sudan. But his observations are nevertheless of significance for us, since the east-west-east migration he describes theoretically could explain the chained systems and extremely regular distribution of game traps along the west of the Nile Valley in Lower Nubia: they may have been used to hunt gazelles as they moved away from the river with the coming of the annual floods. Where would the animals have migrated? There are several options, first of all the depressions, playas, mud pans and small oases, which occur up to a distance of 100 kilometres or more west of the Nile (for example, Nabta Playa, the Toshka depression, Dunqul, Kurkur and Nuq Menih) (Figure 11.2).

There are no monsoon rains over Lower Nubia today, and this has been the case for the last approximately 7000 years. There were no regular rains in the Late Palaeolithic either. Only during the Holocene wet phase did the African monsoon belt come as far north as these latitudes, phasing out in subsequent millennia of drier and drier conditions, followed by the well-known human migrations 'out of the Sahara' (Kuper and Kröpelin 2006; Bubenzer and Riemer 2007). It is this period that most closely compares with current conditions in the Sudan, from an environmental perspective, which may have given rise to seasonal migrations that could have been taken advantage of by chained game-trap systems.

However, given that gazelles are greatly adapted to extremely dry conditions, there is also a possibility that migrations may have continued on a smaller scale even as regular rains failed to appear. This is because a high groundwater table persisted for millennia in the Western Desert. In favourable regions, such as at Chephren's quarry, 70 to 80 kilometres west of Abu Simbel, close to Nabta Playa, numerous extremely shallow wells have been found. These are related to the Late Predynastic to Middle Kingdom procurement of bluish anorthosite gneiss (Shaw et al. 2010). With such a high groundwater table and a little more erratic rain than today, we may speculate that there was enough vegetation to graze on in order to sustain possible former migration patterns, perhaps into the Old and Middle Kingdoms (until ± 2000 BCE) or even later. Moreover, at Nabta Playa there is, indeed, a Nubian C-Group presence that ties in with the C-Group occupation of the Dunqul oasis. This shows that brief human subsistence (with cattle) in the Western Desert was possible even as late as in the 2nd millennium. However, gazelle bones were not found at Nabta Playa in C-Group levels (Applegate and Zedeño 2001).

As we have seen above, under favourable conditions gazelle families and smaller herds do not necessarily migrate over long distances but are relatively stationary. The vast amount of gazelle tracks that can be seen along the Nile in Lower Nubia and Upper Egypt may testify to such localised behaviour. It is impossible to date these tracks, but they certainly could date back to times when migrations eventually stopped. If the game traps were constructed to catch

resident gazelle, a possible explanation for the traps' highly regular distribution may involve one of the specific habits of gazelles, as outlined by Yom-Tow et al. (1995), namely to walk away from places of grazing/browsing and drinking (for example, in the lower reaches of wadis and along the Nile) to higher ground, such as plateaus, for the night. Here they have a better view of the surroundings and can more easily detect approaching predators.

In contrast, John Lewis Burckhardtt (1819: 79) observed that gazelles came down from the desert at night in March 1813, in the region of Batn el-Hagar immediately south of the Second Cataract:

> These animals inhabit the western mountains in large herds, and regularly descend to the banks of the river during the night, to feed upon the herbage which grows there; I every morning found the sands above the river thickly covered with the traces of the delicate feet of this pretty animal.

This observation may relate to a specific habit of gazelles in this particular region and would not significantly alter the interpretation of the game traps. Traps located on regularly/daily used routes from the river toward higher ground may have been ideal for trapping. Gazelle are furthermore creatures of habit and tend to follow the same paths over and over. This explanation would also better fit the existence of traps in the Dunqul oasis, which are hard to relate to migrating game – unless, of course, they were used when herds moved *back* to the Nile following a seasonal migration.

In sum, insights into environmental change and animal behaviour do not give any clear hints with which to date the game traps. However, large-scale migrations, which may well have existed during the Holocene wet phase and. But also, more frequent routines of resident gazelle populations, involving movements from the banks of the Nile towards the desert and higher ground, might also explain their regular distribution.

GAME-TRAP VARIATION

Not all stone lines at Gharb Aswan and across Upper Egypt and Lower Nubia form chained systems. Though some may be part of larger systems that we cannot yet discern, there are numerous short stone lines with one or a few chutes only. In addition, a couple of enclosure-like lines with chutes and often entrance-like features have been identified. Thus, there seems to be a kind of bimodal distribution, with isolated traps on the one hand and traps occurring in systems on the other.

Looking again to West and Central Asia, in addition to the chained 'arrow-shaped' trap complexes, Yagodin (1998, 2018) mentions the existence of individual, smaller traps, just as is the case at several places in the Middle East. At Dhuweila and Jawa (Jordan) such individual kites are distributed in a different way than the larger chained systems. Whereas the latter always fan out towards the east and were aimed at trapping, in a rather passive manner, migrating animals moving westward, the former are oriented in multiple directions but carefully take advantage of the local topography. Betts (1998: 225ff) suggests two possible interpretations of this bimodal distribution: either both systems are related to

various forms of migration, or, more likely, the individual traps are younger than the chained systems and were made at a time when the mass-hunting in chained systems had led to a substantial decrease of animal populations and changes in migration patterns (cf. Bar-Oz et al. 2011). Yagodin (1998, 2018) and Betts (1998) suggest that individual traps were made for an *active* mode of hunting, in the sense that groups of hunters had to drive the animals in between the drivelines and into an enclosure or pound.

This interpretation may have some significance also for the Lower Nubian and Upper Egyptian traps. The smaller traps may be part of a tradition that continued after a peak that involved the use of chained systems, such as the one in Wadi Kubbaniya. It would seem somewhat odd, after all, if the basic features of the game traps, which appear to have been highly successful (as suggested by their large number), would not have been taken advantage of also in later periods. Possibly stone lines and chutes were not only 'translated' into smaller structures but parts of existing systems may have been reused, repaired and altered to fit new circumstances. We have already seen that Hester and Hobler (1969) at the Dunqul oasis proposed a tradition extending from the Nubian C-Group to the Roman period (up to 3000 years); such a prolonged use may also have been the case for the traps along the Nile, irrespective of whether it all started with the C-Group or much further back in time. However, having said this, it must be admitted that one could, of course, also make the reverse argument, namely that small traps were introduced first, which were then extended to form chained systems.

Lower Nubian game traps and hunting strategies

Both the available zooarchaeological record and the basic design of the traps indicate that they were never intended for killing on a scale similar to the desert kites in the Middle East. However, due to their number and distribution it would seem that the traps, at least the larger systems, were neither intended for only small-scale, opportunistic hunting, as has been proposed by Riemer (2009) for the four-kilometre long Neolithic trap system found in the Regenfeld area in the Western Desert. Riemer argues that these traps were used for passive hunting and were unmanned but monitored on a regular basis. He arrived at this conclusion not only because the design of the traps would have been impractical for catching large numbers of animals but also because of the population characteristics of the Western Desert Neolithic: small, highly mobile groups of hunter-gatherers lived in the area and their main subsistence strategy was based on 'immediate return' as opposed to 'delayed return' schemes involving food storage and a less mobile way of life, as exemplified by Middle Eastern Neolithic communities. The latter, as argued by Riemer, were capable of organising large, co-operative hunts using the desert kites, whereas Western Desert populations were not.

The Neolithic/Epipalaeolithic along the Nile may have differed from what went on in parts of the Western Desert, although there are presently almost no habitation data on which reconstructions can be based. We know from evidence from Nabta Playa and Bir Kiseiba, among others, that herding started in the areas immediately west of the Nile in the Neolithic/Epipalaeolithic (overview in, for

example, Wetterstrom 1993; Barich 1998). It is also becoming increasingly apparent that, in addition to the habitation site at Elkab, there were at least three main 'hubs' along the river where people gathered for various activities: at el-Hosh and by the First (Gharb Aswan) and Second Cataract (Wadi Halfa) (Storemyr 2009). Importantly, these areas all have concentrations of game traps. It is also worth recalling here that significant numbers of Epipalaeolithic fish traps in the rock art at el-Hosh suggest that the area was used for seasonal, communal gatherings to fish and feast (Huyge et al. 1998; Huyge 2005). This is arguably the only hint at communal hunting practices throughout Egyptian/Lower Nubian history, but it shows that we should not exclude the possibility that such practices also took place in connection with the hunt of mammals. Whether the hunt with game traps was aimed at 'immediate returns' and ritual/feasting only or if it also involved storage must remain an open question.

One of the reasons for proposing a scenario that involves a use of the game traps other than passive, opportunistic hunting strategies is closely related to the possibility that gazelle migrations took place in the Holocene wet phase (and later). In this scenario we would be looking at dozens, perhaps a hundred or more animals leaving their grazing/browsing grounds close to the Nile (for example, the lowermost reaches of a wadi), wandering west into the desert to places with sufficient vegetation to survive for the coming months. Hypothesising that this was an annual event (like Ghobrial has observed in present-day Sudan, see above), perhaps at the beginning of the flood season, it is not unlikely that people gathered at just these times to hunt.

One could argue that the stone lines and chutes, given the lack of corrals, were not suitable for large-scale hunting. This is true (at least when compared with desert kites), but with systems that blocked up to 12 kilometres of animal routes and that consist of 200-plus chutes (like in Wadi Kubbaniya) we are not looking at hunting on a small scale either, at least not if the chutes were in use simultaneously. At Kubbaniya there is, on average, a chute every 50 to 60 metres, but they are often more closely spaced, forming groups, implying the existence of several quite restricted spaces to catch/kill approaching animals (Figure 11.14). The animals may have wandered, with or without an element of active driving, towards several spots, soon finding themselves blocked by stone drivelines and trapped/killed by chutes. This is, in fact, not entirely unlike seasonal reindeer hunting in the north, which uses closely spaced pitfalls along a driveline that was aimed at intercepting migrating herds (see, for example, Jordhøy 2008; Pilø and Finstad, this volume).

If seasonal communal hunting ever took place in our region, the available evidence would suggest that it may hardly have happened during the 4th to 2nd millennium BCE or later. There are too few bones in the contemporary archaeological records and no hints at such activities in the regional rock art and ancient Egyptian textual records. Most likely hunting had already largely become an elite activity (at least in Egypt). Hence, I think that communal hunting with the use of game traps would have taken place in earlier periods, most likely the Holocene wet phase when the climate also would have supported larger herds of gazelle. However, it is important to bear in mind that hunting migrating animals may not necessarily have been a communal activity but a task carried

Figure 11.14. A c. 360 m long stretch of the stone lines in Wadi Kubbaniya features about 10 chutes, i.e. on average one chute per 30–40 m, but with a concentration in the lower left corner of the picture, where 5–6 chutes are spaced only 10–20 m apart from each other. (Google Earth™)

out by smaller groups of hunters. Moreover, as argued above, it is not impossible that annual gazelle migrations took place for a long time after the Holocene wet phase, perhaps even into the Pharaonic period.

In another scenario, revolving around animals that resided in smaller groups along the Nile (and in the oases), we may be looking at two modes of hunting. The first is passive, in the sense that the stone lines and chutes were used to trap animals when they moved from the river to the desert hinterland. Though no active driving may have been necessary, this strategy cannot have involved 'harvesting' just whatever was trapped at the chutes (with snare, cords, etc.) since the trapped gazelle would have been a very easy prey for predators and may have been eaten before they were collected by the hunter. Thus, areas with concentrations of chutes must have been monitored, and this is likely reflected by the stone-built structures (mainly circular) close to chutes, which may have functioned as lookouts or hunting blinds. Such lookouts may, of course, also have been practical for other modes of hunting.

Burckhardt (1819: 79) mentions that gazelle are frightened by straw models of hyenas:

> [They] have no other means of guarding their fields against them [gazelle], than by setting up objects to frighten them; I frequently met with the grotesque figure of a hyena, formed of straw, and mounted upon legs of wood. The hyena inhabits the mountains on both sides of the river, and is the most formidable enemy of the gazelle.

More generally, gazelle seem to be frightened by anything that looks like a predator, including humans. As discussed by Riemer (2004), this may be the idea behind the frequent inclusion of standing stones/slabs in the stone drivelines, which, on approaching from a distance, even today look like rows of people or animals. The use of such stones, perhaps together with other devices such as those observed by Burckhardt, may have been ideal for passive hunting strategies, ensuring that the gazelles did not approach the stone lines too closely (so they could have leaped over them) but rather continued moving along the trap, towards the chutes. When gazelle become frightened, as when actively driven towards traps, they tend to blindly follow even low obstacles such as single rows of stone, as discussed by Hester and Hobler (1969: 64). Active driving of small herds of gazelle towards trap systems is the mode of hunting favoured by Hester and Hobler for the Dunqul area, and it may very well have been the main or a supplementary strategy also along the Nile valley.

This mode of hunting, perhaps using dogs, may also have been a preferred one in elite contexts. In such contexts, depictions of the 'desert hunt' from ancient Egyptian records may have some relevance for understanding the use of the game traps. In one such depiction in the pyramid temple complex of King Sahure (2487–2475 BCE) at Abusir, gazelle and many other 'desert animals' are shown within an enclosure, implying that they were actively brought in for the Pharaoh, who is depicted outside the fence (overview in Strandberg 2009: 47ff). Actively driving gazelle toward chutes, where elite personalities would be stationed, can be envisioned as another version of the highly symbolic desert hunt.

Both passive and active hunting of resident gazelle populations moving between the Nile and the near desert hinterland could, clearly, have been practised in all periods covered in this chapter, from prehistory until more recent times.

Conclusion

Summing up evidence and discussion of the previous sections, I think we can be certain that the game traps in Lower Nubia and Upper Egypt were a 'Nubian', or more generally a 'southern', and not an 'Egyptian', phenomenon that was specific to the area (as compared to nearby regions). Dorcas gazelles were almost surely the key prey hunted with their use, possibly together with other gazelle species (*dama*) and even ostrich. Unless hitherto undiscovered butchering camps existed, we can be quite certain that gazelle meat was of limited importance in local diets from the Late Palaeolithic to recent times, except perhaps for the Epipalaeolithic/Neolithic. However, gazelle were of significance in religious and ideological contexts. The traps cannot have been used for the sort of mass-killing practices that have been reported for the desert kites of the Middle East. This is indicated by the design of the traps and their lack of enclosures or pounds. Furthermore, it is likely that the traps had functions that varied over time and with the availability of game.

The discussion above may provide enough footing to forward a perhaps overly bold hypothesis, namely that the larger game-trap systems, often developed as chained systems, were introduced already in the Holocene wet phase (circa

9000–5000 BCE) to take advantage of annual migrations of gazelle. This may have involved communal gatherings of the highly mobile peoples of the time. Later, these traps were 'translated' into smaller versions, reused, altered and repaired to facilitate similar and other modes of hunting as the game populations dwindled in the wake of the aridisation of the area. In all or most periods, perhaps even in the Late Palaeolithic, the traps will also have been used to hunt resident gazelle populations that moved between the Nile and the immediate desert hinterland on a regular basis. All this would imply that the configuration we are looking at today developed over many millennia.

The hypothesis may seem bold, particularly as regards the early dating, which moves Hester and Hobler's (1969) Nubian C-Group date back by several millennia. However, it should be recalled that hunting using other types of extensive permanent structures seems to have been established by the Neolithic in nearby regions to the north (Middle East) and south/west (Upper Nubia/Western Desert). Furthermore, the hypothesis does not topple Hester and Hobler's proposition, for it may be entirely correct. Their traps in Dunqul may simply have been used by C-Group herders that took advantage of a well-established practice.

It may not be difficult to substantiate or reject the main aspect of the hypothesis – that the traps extend back to the Holocene wet phase – since in some cases they might be dated using OSL (Optically Stimulated Luminescence), targeting the sediments/sands immediately below the stone structures. But it will be more difficult to get a firm grasp on how the traps were used, how they fit into broader socioeconomic frameworks, and how they took advantage of gazelle behaviour and patterns of movement.

Hence, we can safely envisage many years of research until a more comprehensive picture emerges, as has been the case with the desert kites of the Middle East. Future research should not only involve archaeological survey and excavation of the traps themselves, their surroundings and the rock art in their vicinity, but also the (re-)evaluation of animal bones from habitation sites in Lower Nubia. Moreover, the distribution and variations of the traps should be studied in relation to known habitation sites, which are now mostly under Lake Nasser. In addition, possible butchering camps should be looked for in the areas between known habitation sites and game traps. Finally, more comparative research is necessary, evaluating the traps in the region in conjunction with similar systems in the archaeological and ethnographic record.

Whatever the future may bring in terms of research on the game traps in Upper Egypt and Lower Nubia, it should be clear that they constitute a significant and very extensive piece of archaeology with much potential for enhancing our understanding of ancient hunting practices in the region.

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References

Abu-Jaber, N., E. Bloxam, P. Degryse and T. Heldal (eds), 2009. QuarryScapes: ancient stone quarry landscapes in the Eastern Mediterranean. *Geological Survey of Norway Special Publication* 12.

Applegate, A. and N. Zedoño 2001. Site E-92-8: A Late Prehistoric C-Group component at Nabta Playa. In F. Wendorf, R. Schild and Associates (eds), *The Archaeology of Nabta Playa: Holocene settlement of the Egyptian Sahara* 1: 529–33. New York: Kluwer Academic/Plenum Publishers.

Bangsgaard, P. 2010. *Ritual cows or just another flock of sheep? Faunal deposit practises at C-Group and Pan-grave cemeteries*. PhD thesis, Copenhagen University. Copenhagen

Barich, B.E. 1998. *People, Water and Grain: The Beginnings of Domestication in the Sahara and the Nile Valley*. Rome: L'Erma di Bretschneider.

Bar-Oz, G., M. Zeder and F. Hole 2011. Role of mass-kill hunting strategies in the extirpation of Persian gazelle (*Gazella subgutturosa*) in the northern Levant. *PNAS* 108(18): 7345–50. https://doi.org/10.1073/pnas.1017647108

Berg, P.-L., M. Vander Linden, S. Lemaitre, N. Cauwe and V. Picalause 2004. Desert-kites of the Hemma Plateau (Hassake, Syria). *Paléorient* 30: 89–100.

Berger, F. 2009. An area with aligned stones in the Western Desert of Egypt. *Sahara* 20: 195–8.

Betts, A.V.G. 1998. Conclusion. In A.V.G. Betts, S. Colledge, L. Martin, C. McCartney, K. Wright and V.N. Yagodin (eds), *The Harra and the Hamad: excavations and explorations in eastern Jordan*. Vol. 1: 225–30. Sheffield Archaeological Monographs 9. Sheffield, UK: Sheffield Academic Press.

Betts, A.V.G. and S. Helms 1986. Rock art in eastern Jordan: 'kite' carvings? *Paléorient* 12: 67–72.

Bloxam, E., T. Heldal and P. Storemyr 2007. *Characterisation of complex quarry landscapes: an example from the West Bank quarries, Aswan.* QuarryScapes report. Trondheim: Geological Survey of Norway.

Boessneck, J. 1988. *Die Tierwelt des Alten Ägypten*. München: C.H. Beck.

Bubenzer, O. and H. Riemer 2007. Holocene climatic change and human settlement between the central Sahara and the Nile Valley: archaeological and geomorphological results. *Geoarchaeology* 22(6): 607–20. https://doi.org/10.1002/gea.20176

Burckhardtt, J.L. 1819. *Travels in Nubia*. London: John Murray.

Edwards, D.N. 2004. *The Nubian past: an archaeology of the Sudan*. London & New York: Routledge.

Edwards, D.N. 2006. Mid Holocene game drives in Nubian landscapes? In C. Kroeper, M. Chłodnicki and M. Kobusiewicz (eds), *Archaeology of early northeastern Africa.* Studies in African Archaeology 9: 49–64. Poznań: Poznań Archaeological Museum.

Estes, R. 1992. *The behavior guide to African mammals.* Berkeley, Los Angeles and London: University of California Press.

Gatto, M.C. 2011. The Nubian pastoral culture as link between Egypt and Africa: a view from the archaeological record. In Karen Exell (ed.), *Egypt in its African context*: 21–9. Proceedings of the conference held at the Manchester Museum, University of Manchester, 2–4 October 2009. Oxford: BAR International Series 2204.

Gatto, M.C., M. De Dapper, R. Gerisch, E. Hart, S. Hendrickx, T. Herbich, H. Joris, H-Å. Nordström, M. Pitre, S. Roma, D. Swiech and D. Usai 2009. Predynastic settlement and cemeteries at Nag el-Qarmila, Kubbaniya. *Archéo-Nil* 19: 186–206.

Gautier, A. 1968. Mammalian remains of the northern Sudan and routhern Egypt. In: F. Wendorf (ed.), *The prehistory of Nubia* 1: 80–99. Dallas: Fort Burgwin Research Center and Southern Methodist University Press.

Gautier, A. 1978. La faune de vertébrés des sites epipaléolithiques d'Elkab. In P.M. Vermeersch (ed.), *Elkab II: L'Elkabien. Epipaléolithique de la vallée du Nil égyptien* 104–14. Leuven: Universitaire Pers/Bruxelles Fondation Egyptologique Reine Elisabeth.

Gautier, A. 1984. Archaeozoology of the Bir Kiseiba region, eastern Sahara. In F. Wendorf, R. Schild and A.E. Close (eds), *Cattle-keepers of the eastern Sahara: the Neolithic of Bir Kiseiba*: 49–72. Dallas: Southern Methodist University Press.

Gautier, A. 2001. The Early to Late Neolithic archaeofaunas from Nabta and Bir Kiseiba. In F. Wendorf, R. Schild and Associates (eds), *The archaeology of Nabta Playa: Holocene settlement of the Egyptian Sahara* 1: 609–35. New York: Kluwer Academic/Plenum Publishers.

Gautier, A. and W. Van Neer 1989. Animal Remains from the Late Palaeolithic Sequence at Wadi Kubbaniya. In: F. Wendorf, R. Schild & A.E. Close (eds), *The Prehistory of Wadi Kubbaniya. Volume 2: Stratigraphy, Palaeoeconomy and Environment* 119–161. Dallas: Southern Methodist University Press.

Ghobrial, L.I. 1974. Water relation and requirement of the dorcas gazelle in the Sudan. *Mammalia* 38: 88–107.

Helms, S. and A. Betts 1987. The desert 'kites' of the Badiyat Esh-Sham and north Arabia. *Paléorient* 13(1): 41–67.

Helskog, K. 2011. Reindeer corrals 4700–4200 BC: myth or reality? *Quaternary International* 238: 25–34. https://doi.org/10.1016/j.quaint.2010.10.001

Hendrickx, S. 2011. Hunting and social complexity in Predynastic Egypt. *Bulletin des Séances de l'Academie Royale des Sciences d'Outre-Mer* 57(2–4): 237–63 [published 2013].

Hendrickx, S. and P.M. Vermeersch 2000. Prehistory: from the Palaeolithic to the Badarian culture. In I. Shaw (eds), *The Oxford history of ancient Egypt*: 17–43. Oxford: Oxford University Press.

Hester, J.J. and P.M. Hobler 1969. *Prehistoric settlement patterns in the Libyan Desert*. Salt Lake City: University of Utah Press.

Hobbs, J.J. 1989. *Bedouin life in the Egyptian wilderness*. Cairo: The American University in Cairo Press.

Holzer, A., Avner, U., Porat, N. and Horwitz, L.K. 2010. Desert kites in the Negev desert and northeast Sinai: their function, chronology and ecology. *Journal of Arid Environments* 74(7): 806–17. https://doi.org/10.1016/j.jaridenv.2009.12.001

Huyge, D. 2005. The fish hunters of El-Hosh: rock art research and archaeological investigations in Upper Egypt (1998–2004). *Bulletin des Séances de l'Academie Royale des Sciences d'Outre-Mer* 51(3): 231–49.

Huyge, D. 2009. Rock art. In *UCLA encyclopedia of Egyptology*. Los Angeles. http://escholarship.org/uc/item/4qx7k7pz

Huyge, D., M. de Dapper, D. Depraetere, M. Ismail, E. Marchi, R. Mommaerts, I. Regulski and A. Watchman 1998. Hilltops, silts and petroglyphs: the fish hunters of El-Hosh (Upper Egypt). *Bulletin van de Koninklijke Musea voor Kunst en Geschiedenis/Bulletin des Musées royaux d'Art et d'Histoire* 69: 97–113.

Jordhøy, P. 2008. Ancient wild reindeer pitfall trapping systems as indicators for former migration patterns and habitat use in the Dovre region, southern Norway. *Rangifer* 28(1): 79–87. https://doi.org/10.7557/2.28.1.152

Junker, H. 1919. Bericht über die Grabungen der Akademie der Wissenschaften in Wien auf den Friedhöfen von El-Kubanieh-Süd, Winter 1910–1911. *Denkschriften der Akademie der Wissenschaften in Wien*, Philosophisch-historische Klasse 63(3). Vienna: Hermann Böhlaus.

Junker, H. 1920. Bericht über die Grabungen der Akademie der Wissenschaften in Wien auf den Friedhöfen von El-Kubanieh-Nord, Winter 1910–1911. *Denkschriften der Akademie der Wissenschaften in Wien*, Philosophisch-historische Klasse 64(3). Vienna: Hermann Böhlaus.

Kuper, R. and S. Kröpelin 2006. Climate-controlled Holocene occupation in the Sahara: motor of Africa's evolution. *Science* 313: 803–7. https://doi.org/10.1126/science.1130989

Linseele, V. and W. Van Neer 2009. Exploitation of desert and other wild game in ancient Egypt: the archaeozoological evidence from the Nile Valley. In R. Riemer, F. Förster, M. Herb, and N. Pöllath (eds), *Desert animals in the Eastern Sahara. Colloquium Africanum* 4: 47–78. Cologne: Heinrich-Barth-Institut.

Lydekker, R. (ed.) 1894. *The royal natural history*. London & New York: F. Warne.

Menardi Noguera, A., P. Carmignoto, N. Contavalli and E. Grugni 2010. The stone lines of Upper Wadi Mashi (Gilf Kebir, Egypt). *Sahara* 21: 197–205.

Nordström, H.-Å. 1972. *Neolithic and A-Group sites. The Scandinavian Joint Expedition to Sudanese Nubia. Publications* 3. Stockholm: Läromedelsförlagen.

Osborn, D.J. and I. Helmy 1980. The contemporary land mammals of Egypt (including Sinai). *Fieldiana Zoology, new series* 5. Chicago: Field Museum of Natural History.

Osborn, D.J. and J. Osbornova 1998. *The mammals of Ancient Egypt*. Warminster: Aris and Phillips.

Peroschi, M.E. and F. Cambieri 2011. Game traps, enclosures or something else? New stone lines identified in the Western Desert of Egypt. *Sahara* 22: 159–62.

Riemer, H. 2004. Holocene game drives in the Great Sand Sea of Egypt? Stone structures and their archaeological evidence. *Sahara* 15: 31–42.

Riemer, H. 2009. Prehistoric trap hunting in the eastern Saharan deserts: a re-evaluation of the game trap structures. In H. Riemer, F. Förster, M. Herb and N. Pöllath (eds), *Desert animals in the Eastern Sahara.* Colloquium Africanum 4: 175–88. Cologne: Heinrich-Barth-Institut.

Saleh, M. 1987. The decline of gazelles in Egypt. *Biological Conservation* 39(2): 83–95.

Sarant, L. 2011. Endangered species: Egypt's gazelles. *Egypt Independent*, 21 October. http://www.egyptindependent.com/news/endangered-species-egypts-gazelles

Shaw, I., E. Bloxam, T. Heldal and P. Storemyr 2010. Quarrying and landscape at Gebel el-Asr in the Old and Middle Kingdoms. In F. Raffaele, I. Incordino and M. Nuzzollo (eds), *Proceedings of the First Neapolitan Congress of Egyptology*: 200–18. Wiesbaden, Naples: Otto Harrassowitz.

Soghayroun, I.S.E. 2010: *Trade and wadis system(s) in Muslim Sudan*. Kampala: Fountain Publishers.

Storemyr, P. 2008. Prehistoric geometric rock art at Gharb Aswan, Upper Egypt. *Sahara* 19: 61–76.

Storemyr, P. 2009. A prehistoric geometric rock art landscape by the First Nile Cataract. *Archéo-Nil* 19: 121–50. https://www.archeonil.com/images/revue%20 2008%202010/AN2009-09-Storemyr.pdf

Storemyr, P. 2011. The ancient stone-built game traps at Gharb Aswan and beyond, Lower Nubia and Upper Egypt. *Sahara* 23: 15–28.

Strandberg, Å. 2009. *The gazelle in ancient Egyptian art: image and meaning*. PhD thesis, Uppsala University.

Tahir, Y.F. and A.M. Sadig 2014. A new provision to the nature and function of the wadi walls ('dry-stones') in the Nile's Third Cataract Region. *ADAB Journal of Faculty of Arts. University of Khartoum*, 33: 37–58.

Uerpmann, H.-P. 1987. *The ancient distribution of ungulate mammals in the Middle East: fauna and archaeological sites in Southwest Asia and Northeast Africa*. Wiesbaden: Ludwig Reichert Verlag.

Vermeersch, P.M. and W. Van Neer 2015. Nile behaviour and Late Palaeolithic humans in Upper Egypt during the Late Pleistocene. *Quaternary Science Reviews* 130: 155–67. https://doi.org/10.1016/j.quascirev.2015.03.025

Wendorf, F., R. Schild and A.E. Close 1989. *The prehistory of Wadi Kubbaniya*. Dallas: Southern Methodist University Press.

Wetterstrom, W. 1993. Foraging and farming in Egypt: the transition from hunting and gathering to horticulture in the Nile Valley. In T. Shaw, P. Sinclair, P. Andah and A. Okpoko (eds), *the Archaeology of Africa: food, metals and towns*: 165–226. London: Routledge.

Yagodin, V.N. 1998. 'Arrow-shaped' structures in the Aralo-Caspian steppe. In A.V.G. Betts, S. Colledge, L. Martin, C. McCartney, K. Wright and V.N. Yagodin (eds), *The Harra and the Hamad: excavations and explorations in eastern Jordan*. Vol. 1: 207–24. Sheffield Archaeological Monographs 9. Sheffield, UK: Sheffield Academic Press.

Yagodin, V.N. 2019. *Game drives of the Aralo-Caspian Region.* A.V.G. Betts and W.P. van Pelt (eds). Adapa Monographs. Sydney: Sydney University Press.

Yom-Tow, Y., H. Mendelssohn and C.P. Groves 1995. Gazella dorcas. *Mammalian Species* 491: 1–6.

Zeder, M., G. Bar-Oz, S. Rufolo and F. Hole 2013. New perspectives on the use of kites in mass-kills of Levantine gazelle: a view from northeastern Syria. *Quaternary International* 297: 110–25. https://doi.org/10.1016/j.quaint.2012.12.045