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Abbreviations

BAR IS	*British Archaeological Reports, International Series*
GAMAR	*Gdańsk Archaeological Museum African Reports*
JAS	*Journal of Archaeological Science*
JEA	*Journal of Egyptian Archaeology*
PAM	*Polish Archaeology in the Mediterranean*
PNAS	*Proceedings of the National Academy of Sciences*
SDAIK	*Sonderschrift des Deutschen Archäologischen Instituts, Abteilung Kairo*

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INTRODUCTION

> Somewhere on the other side of the ocean an amateur archaeologist spends another evening travelling virtually across the wilderness of the Eastern Desert. He is poring over the remains of Roman trails between the Nile Valley and the Red Sea coast. Ruins of military forts, tumbledown villages clustered around wells and mines of semiprecious stones. The quality of satellite images downloaded from the Internet is astounding: you can see bushes, bigger rocks, the different fractions of water-segregated sand and gravel, the water appearing in the mountain wadis once every few years. There is a place, practically in the center of the Eastern Desert, where mountain passes connect the natural trails leading to the river in the west and the sea in the east. On this fantastic journey over space and time, our virtual traveler discovers an unnaturally geometric form. He calls a man who has made it his life to cover the trails of this forbidden land in person—Steve Sidebotham, a professor of ancient history at the University of Delaware. But he is at a loss, he's never seen anything quite like that, and his Bedouin contacts on the ground do not seem to know what he is talking about. But having the GPS coordinates, he can try to find the site without a local guide. The following Friday, he sets out in search of this mysterious object. Friday is a good day because it is a day off from excavation work at the main site of the Polish-American project at Berenike.
>
> Wadi Khashab is a truly magical place. A Bedouin family lives here: a man, a woman, three dogs, two donkeys, one camel and a herd of goats. And countless standing stones—mute witnesses of days gone by, even though no one knows how long ago. Nobody knows their name—the Bedouin speak only of the wood from a withering acacia. And these stones? The Bedouin don't want to talk about them…

This post appeared on the Patrimonium Foundation website in 2012, at the beginning of our project at Wadi Khashab. We would be immersed in the same atmosphere of science, coupled with a literary mood, for the next few years.

Three seasons of excavations were carried out at the site thanks to funding from the Polish National Science Centre (NSC), and the data and results of this work are published courtesy of the Polish Centre of Mediterranean Archaeology, University of Warsaw (PCMA UW), under the auspices of which the project was conducted in Egypt. The publication has been prepared in spite of the fact that the investigations uncovered only about half of the complex. More work should be done, but with the increasing difficulty in obtaining official permits for work in remote parts of the Eastern Desert, perspectives for further excavations at the site anytime in the near future are very limited. Even so, the multitude of archaeological, archaeozoological and anthropological data and the unique nature of the site, as well as the cognitive value of the findings, justifies a full publication in monograph form.

Geographical setting

The easternmost part of the Sahara, known as the Eastern Desert [*Fig. 1*], lies east of the Nile (analogously as the Western Desert west of the Nile). The Red Sea Hills in its eastern part (Atbaj|Itbaj), in Egypt and Sudan, fringe the Red Sea coast from the Nile Delta to the Ethiopian Plateau, bordering in the east the Arabian and Nubian deserts (*Itbāy…* 2012). The highest peaks here are Gabal Ūdah (2,259 m asl) in Sudan and Gabal Shā'ib al-Banāt (2,187 m asl) in Egypt. The mountains are strongly articulated with dry wadis or khors, opening to the Red Sea in the east and the Nile Valley in the west.

The Red Sea Hills rise over 2,000 m as a result of an uplift some 23–34 million years ago when the Red Sea itself was formed in the Oligocene. The rock itself is 550–900 million years old, being composed of the Neoproterozoic volcano-sedimentary rock of the Arabian-Nubian Shield (same formation as the Sarawat Mountains of Saudi Arabia and the mountains of the Sinai Peninsula), exposed due to processes taking place after the Oligocene uplift. The rejuvenation of streams that it caused led to increased erosion which removed most of the limestone and sandstone to expose the basement layer (see Bosworth 2015). Gold and metal ores (uranium, among others) as well as semi-precious amethysts and beryls are found there.

In winter, peaks higher than 1,500 m asl attract humidity from the rising masses of air, whereas the summer is characterized by heavy storms with strong electrical discharges and dangerous flash floods. This results in lush growth of desert vegetation, which is fodder for the wild animals: dorcas gazelles (*Gazella dorcas*) and rock hyraxes (*Procavia capensis*).

Wadi Khashab—Valley of the Wood—is the upper part of a wide, seasonally active wadi in the western Red Sea reception basin, exiting into the Nile at the location of Kom Ombo. The localization of the archaeological site (24°19′23.98″ N 34°31′28.64″ E) seems not to be accidental. It marks the contact zone of two systems of rainfall drainage; beside the one mentioned above, there is Wadi Gemal opening to the east, toward the Red Sea coast [see *Fig. 1*]. In this region the groundwater table makes possible the growing of acacia and a few other species of trees (hence the toponym) along with bushes and herbaceous plants [*Fig. 2*]. Nowadays the region is inhabited by single families of nomad Ababda and their herds of goats. Their continuous presence is confirmed by single graves of an Islamic character scattered over a large area, or other stone installations marking the position of camps [*Fig. 3* bottom].

Archaeological context

Compared to the Nile Valley or even the Red Sea coast, the Eastern Desert is little-known archaeologically (Rohl 2000; Friedman 2002; Starkey 2005; Sidebotham, Hense, and Nouwens 2008). This state is due to political as well as ecological reasons. The living conditions are starkly unfavorable, making it a sparsely populated area. The Egyptian–Sudanese border runs through the area, and the tense political situation regarding its course has restricted access to many important sites, like El Arib (Murray 1926) in the so-called Halaib triangle claimed by both Egypt and Sudan. In geological terms, it is also an extremely diverse area with a richness of rare minerals (e.g., gold, beryl, uranium; *Geologic map of Egypt* 1981). Ever since antiquity, the acquisition of these natural resources has limited access to certain areas, restricting also archaeological surveying in the region.

The earliest presence of hominids in the Eastern Desert most probably precedes the migrations of the anatomically modern humans. Handaxes discovered at Wadi Bili (Vermeersch et al. 2005) testify to pre-sapient beings living in the Red Sea Hills. Artifacts left by *Homo sapiens* were recorded on numerous sites with waste from stone tool production in the Levallois tradition;

Fig. 1. Location of the site of Wadi Khashab in the Red Sea Hills, between two main water drainage basins (dashed line in red marks the drainage divide); inset, position of the site in relation to other locations in northeastern Africa (satellite image courtesy of Google Earth)

Fig. 2. Wadi Khashab, looking west

Fig. 3. Wadi Khashab: top, a stand of acacias next to the main site in the middle of the valley; bottom left, (modern?) Islamic grave in the vicinity of the main site; bottom right, stones marking the remains of a (modern?) makeshift camp shelter

the best known among these is the Sodmein Cave (Van Peer et al. 1996). Even so, it is believed that the area was settled only during the pluvials, that is, periods of increased rainfall, and no local forms of early cultures ever emerged. The region was settled again by humans in the early Holocene (Vermeersch et al. 1996; 2002; 2015). Hunters and gatherers visited Sodmein Cave some 7.1–6.4 ka (kilo-years ago), and the first pastoralists are attested in the deposits about 6.2–5.0 ka. Important evidence from this phase concerned the introduction of domesticated small ruminants to Africa. The climate is believed to have begun deteriorating 5000 years ago, making the Red Sea Hills unsuitable for permanent settlement. The Eastern Desert was a goal for expeditions in search of gold from the Old Kingdom, and the region was traversed by cattle herders referred to in the written sources as the Medjay (Liszka 2011). Galleries of rock art found in the area are presumably the work of these people (Morrow and Morrow 2002) and so are monumental funerary enclosures known from Wadi Allaqi (Sadr et al. 1994), El Arib and, apparently, Wadi Khashab. The Eastern Desert became strategically important in the last few centuries BC, chiefly as a source of semi-precious stones and gold. The trails that passed through it, connecting the Nile Valley with the new centers of transcontinental trade on the Red Sea, like Berenike (Sidebotham, Hense, and Nouwens 2008), suddenly needed to be policed.

The megalithic complex at Wadi Khashab was located on the floor of a valley that is a few hundred meters wide [***Fig. 3*** top]. A bed of gravel along the southern edge of the valley channels the occasional rainfall. The northern side has been under no major erosional pressure that could have changed the landscape at least from the late Pleistocene. Only the tiniest dust fraction is blown or washed away, and the surface, covered with rock detritus, yields finds of Paleolithic artifacts alongside evidence of modern Bedouin shelters. The objects discussed in this volume, that is, the prehistoric human and animal burials within a stone enclosure and surrounded by standing megalithic slabs of stone and stone pavements, were established on the same level. Underlying the ground surface is a laterite bed of rock detritus and reddish dust. About 0.70 m under the modern surface, there are gravel levels, which were revealed in the deeper robbers' pits.

Monumental funerary enclosures of analogous form, scale and date are known from at least two other locations in the Eastern Desert (e.g., Lanna and Gatto 2010: 323, Fig. 6; Gatto et al. 2014). They have never been explored properly by archaeologists. One is El Arib near Halaib, the other Wadi Allaqi in the Nubian Desert (at least two features). In both cases, large stone rings of different sizes were noted at the sites, along with burials or cattle remains on the surface. A few sherds of Predynastic pottery come from El Arib|Bir Asele (Sidebotham, Hense, and Nouwens 2008: 200). The sites in Sudan are radiocarbon-dated to the mid-5th and late 4th millennia BC (Sadr et al. 1994), although the latter dating could be analogous to Wadi Khashab, marking the time when the megaliths of the Eastern Desert were plundered in search of gold (Gatto 2019). The Predynastic cemeteries of A-Group communities in the Nile Valley also contained cattle burials (Flores 2003; Gatto 2019).

Monograph structure

The data presented in this monograph is structured into five key chapters. The history of research at the site of Wadi Khashab through the end of the grant financed by the Polish NCS, that is, 2016, is presented in the first chapter. The next chapter discusses the archaeological sources and cultural artifacts, following a spatial division, starting with the funerary enclosure, then the stone slabs and other finds in position around the complex. The features and objects are illustrated comprehensively, even if not all of the extensive photographic documentation (more than 1,000 items) has been included. The next two chapters are devoted to, first, a detailed presentation of the archaezoological source material and, second, a discussion of the significance of the results in the context of the current knowledge on cattle domestication and early cattle mobility in north-eastern Africa. The morphology of the animals from Wadi Khashab is discussed in comparison with other ancient animal populations from the Nile Valley. The contribution of the Wadi Khashab research to the study of the mobility of early pastoralists in sub-Saharan Africa is presented, as well as the importance of the complex for understanding the symbolism of cattle and sheep in the burial practices of the early African pastoral culture. Closing the book is a summary and reconstruction of the stages of development of the complex in Wadi Khashab, including an artist's view of what it may have looked like in the two stages of its existence.

Chapter 1

DISCOVERING WADI KHASHAB

The archaeological investigation of the Eastern Desert and the Red Sea Hills, a peripheral part of Africa in the common (albeit mistaken) view, is the objective of only a few teams, both European and American in origin, and frequently of long standing as far as work in the region is concerned. The Belgian Middle Egypt Prehistoric Project studies the oldest phases of occupation in the region of el-Gourna (Moeyersons et al. 1996). Ancient mines are an important category of sites in the mountains. The Roman mines at Mons Porphyritis have been investigated by the University of Southampton (Harrell 2002), and the Byzantine mines at Bir Umm Fawakhir were studied by a team from the Oriental Institute of the University of Chicago (Meyer 1995). Surveys of the Eastern Desert focused on rock art were carried out by the American Eastern Desert Survey (Rohl 2000) and the Rock Art Topographical Survey (Morrow and Morrow 2002). A Polish team from the Institute of Archaeology and Ethnology of the Polish Academy of Sciences has been working at Bir Nurayet in the Sudanese part of the Eastern Desert (Bobrowski et al. 2013), recording monumental rock-art galleries and sites spanning all periods from the Paleolithic through the modern age. French, Spanish and Italian missions are studying the Ptolemaic and Roman history of the Egyptian part of the Eastern Desert (Bragantini et al. 2018; Brun 2018).

The international Berenike Project, since 2008 run by the PCMA University of Warsaw and the University of Delaware, is concentrated on studying the ancient port of Berenike on the Red Sea coast of Egypt. Steven E. Sidebotham has also been surveying the hinterland of the ancient harbor as well as the mountains of the Eastern Desert within a radius of several dozen kilometers from Berenike (Sidebotham and Zych 2010; 2017). Wadi Khashab was one of the sites that the Berenike team surveying the Eastern Desert visited and documented, following advice from James A. Harrell, who first located it in 2009 using satellite images.

The stone structures situated at the northern edge of the wadi were visited twice in January 2010. Sidebotham tracked the GPS coordinates on January 8, noting the presence of a stone enclosure 18 m in diameter, built of slender pieces of natural stone up to 2 m long, set vertically or at an angle around a raised, roughly circular area. The feature was pitted with numerous robbers' trenches; two of these could even be seen on the satellite images. Sidebotham collected bones of a large mammal, which he believed at the time to be a camel, but no surface pottery evidence to date the site [*Fig. 4*]. The presence of additional fallen stone steles was also noted (Sidebotham and Zych 2012: Fig. 29). Martin Hense drew the first plan of the megalithic structure at the center of the site, as well as some of the surrounding satellite steles, using TS surveying data collected by Berenike team member Łukasz Wojnarowicz, assisted by Anna Maria Kotarba Morley. He marked the various robbers' pits as well as the damage to the enclosure wall that was originally interpreted, based only on the satellite images, as a "gateway" (Sidebotham and Zych 2012: Fig. 30).

The bones collected at the site were brought to Berenike, where they were examined by archaeozoologist Marta Osypińska and found to represent a specimen of "primigenious" cattle [*Fig. 5*].

Fig. 4. The main enclosure at Wadi Khashab in January 2010; the bones in the foreground were first taken to be camel bones

Fig. 5. Berenike Project's archaeozoologist Marta Osypińska studying the collection of cattle bones in 2010

The osteometric values collected then suggested early African longhorn cattle, the kind currently known from southern Sudan and Ethiopia, rather than ancient cattle populations. The likelihood of such animals living locally in the Eastern Desert in the Hellenistic or Roman periods is close to zero. If anything, they could have represented part of a Nubian tribute for Egyptian rulers as far back as the New Kingdom. This dating was accepted at the time. A bone sample was taken for radiocarbon dating, but the dating was unsuccessful because of the absolute loss of collagen in these remains.

In January 2012, prehistorian Piotr Osypiński, then working for the Berenike Project, returned to the site for a deeper survey and fuller documentation of the mysterious feature. New measurements were taken to supplement the original TS surveying data, and particular features were documented more thoroughly. Joining the documentation team for the three days of work at the site was another member of the Berenike Project, archaeologist Marek Woźniak.

All of the tumbled stone steles surrounding the main enclosure were documented in detail. These were monoliths measuring from 1.70 to 2.50 m [*Fig. 6* bottom]. Circular stone pavements roughly 2.00 m in diameter were observed northwest of the enclosure, whereas features documented northeast of the site in 2010 were identified as the remains of modern Bedouin presence [*Fig. 6* top]. It is very likely that these structures are used periodically by nomadic pastoralists moving with their herds through Wadi Khashab. They also made the excavators aware of the difficulty in distinguishing ancient features from modern ones.

Testing in the central feature included two trenches, which were 1 m wide and gave a stratigraphic section of a combined length equal to 18 m, aligned with the long axis of the complex oriented northeast–southwest [*Fig. 8*]. Three burials were recorded in these trenches; two of these corresponded to the robbers' pits known already from the 2010 visit to the site. The third was a burial (Burial 1) that had not been visible before. Large stone slabs surrounded this burial located in the central part of the site. Inside the pit was the complete skeleton of a domesticated bovine. All the elements of the burials were recorded with orthophotographic methods (hence the blue bottle caps in almost all the photos) (Sidebotham and Zych 2012: Fig. 31).

Burial 2 corresponded to one of the two pits seen on the satellite images; its edge was lined with a dump of small stones among which fragmented bone remains could be seen [see *Fig. 8*]. This indicated the funerary character of the feature. Excavation of the pit revealed relics of the original stone superstructure of the burial, which was preserved on the southern side.

The third burial (Burial 3), explored in detail in 2012, had also been robbed, leaving a distinct pit and animal bones that were collected in 2010. The 2012 trench missed the pit but revealed fragments of a stone superstructure that was demonstrated later (in 2015) to belong to another burial (F.14).

Another circular ring of stones was recorded a few dozen meters northwest of the megalithic enclosure. The central part of this ring consisted of a cluster of toppled stone slabs [*Fig. 6* center]. Surrounding this feature in a radius of about 20 m were single smaller stone steles, some still fixed vertically in the ground, others fallen, although evidently once standing like the others as indicated by the differentiated patina on their surface, which was lighter where the stone had originally been inserted into the ground.

The results of this early stage of research on the site were presented first by Iwona Zych, Marta Osypińska and Piotr Osypiński on June 25, 2011 at the 18th Nubiological Conference organized

Fig. 6. Berenike team surveying the site in 2012: top, modern Bedouin structures, looking east; center and bottom, Marek Woźniak documenting an ancient installation outside the main enclosure and one of the monolithic slabs

annually in Gdańsk-Gniew by the Gdańsk Archaeological Museum, and then again on June 5, 2012 by Piotr Osypiński at the "Poles on the Nile" conference organized at the University of Warsaw by the Institute of Archaeology and the PCMA UW. In 2013, the Polish National Science Centre (NSC) awarded a research grant to Piotr Osypiński, then a staff member of the Poznań Patrimonium Foundation, to study the prehistoric ceremonial complex in Wadi Khashab in the Egyptian Eastern Desert (Grant No. 2012|07|N|HS3|04056, Preludium 4 series). The Berenike Project with co-director Iwona Zych from the PCMA UW facilitated the logistics of the project, both on the formal level and on the ground. The Wadi Khashab expedition obtained a separate permission from Egypt's Supreme Council of Antiquities (SCA) and started work as an independent project, continuing, however, to be hosted by the Berenike Project in terms of everyday operations. The adopted model was to spend whole days at the site, while commuting the 150 km back and forth from the camp base at Berenike.

Fig. 7. Wadi Khashab team over the years: bottom left, in 2014; top, in 2015; bottom right, archaeozoological field lab in 2014

The first season of excavations carried out within the frame of the NSC grant took place in January 2014. The project was directed by Piotr Osypiński and included archaeologist Marek Woźniak, archaeozoologist Marta Osypińska and volunteer-turned-driver Michael Fleming, assisted by SCA inspector Abderahim Mahmoud Ahmed. A team of local Bedouin constituted the workforce [*Fig. 7*]. The archaeozoologist assisted in the fieldwork, doing most of the bone examination and analysis on site in order not to transport the explored osteological material back to the base camp. The bones were in too brittle a condition to survive the operation, and, in any case, the undisturbed character of most of the animal burials made it all the more important to observe their position *in situ*.

A larger fragment of the southwestern part of the main enclosure was cleared, revealing at least ten features [*Fig. 9*]. A uniform site-coding system was introduced, with the human and animal cemetery inside the stone enclosure with the set of stone steles codenamed WKh1. The features inside the cemetery were also recorded according to the new system [*Table 1*].

The mounting of the large stone stele S.5, one of the few surrounding the stone enclosure, was investigated by clearing a square 4 m by 4 m around it. The fact that there was no related pit indicated the construction technique used for building the megalithic ring. The steles were positioned vertically on the ground surface using a number of other smaller rock chips around their base to keep them in position.

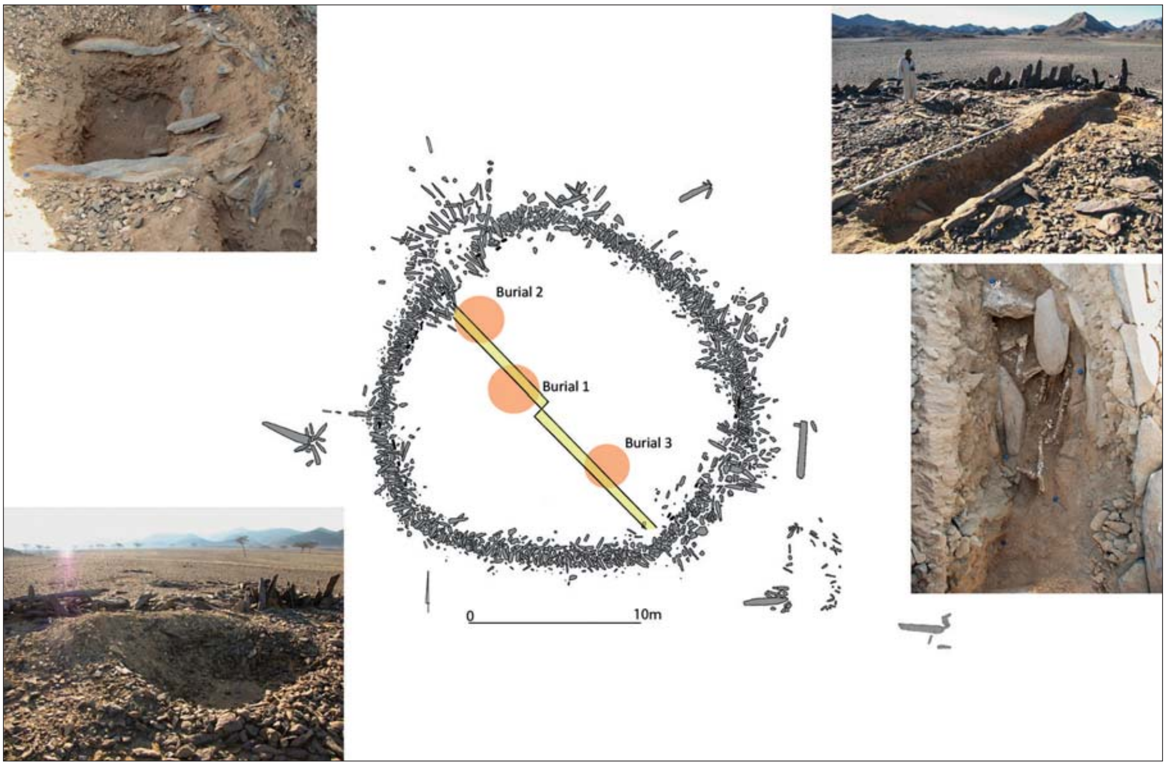


Fig. 8. Plan of the main enclosure following the test season in 2012; insets, clockwise from top right, long cross trench cutting across the site, looking west; Burial 1, *in situ*; robbers' pit on the spot of Burial 2; remains of the original stone casing of the grave in Burial 2

Other sites were noted in the survey of the wadi in the immediate neighborhood of cemetery WKh1 [*Table 2*].

The results of the 2014 season yielded data that were helpful in establishing the chronology of the site. A ceramic bowl, shattered into pieces, was found among the stone rubble directly next to feature F.8 (see below, *Fig. 16* and pages 22–23). As it turned out, it would be the only pottery find from the Wadi Khashab cemetery. Charcoal lumps from the original ground surface below the stone debris forming the mound at the cemetery were sampled and moved to the storeroom in Berenike for laboratory analyses once permission from the SCA came through. The osteometric analysis of the bones of the bovine from burial F.1 provided indisputable evidence of a prehistoric variant of indigenous African cattle known from northeastern Africa.

The results of the fieldwork were presented again at the June 2014 Warsaw conference "Poles on the Nile". In July, Piotr and Marta Osypiński discussed their findings at the 14th PanAfrican Archaeological Association Congress in Johannesburg (South Africa) and in August at the 13th International Conference for Nubian Studies in Neuchâtel (Switzerland). A report on the current stage of research at Wadi Khashab appeared in *Nyame Akuma*, the bulletin of the Society of Africanist Archaeologists (Osypiński and Osypińska 2014).

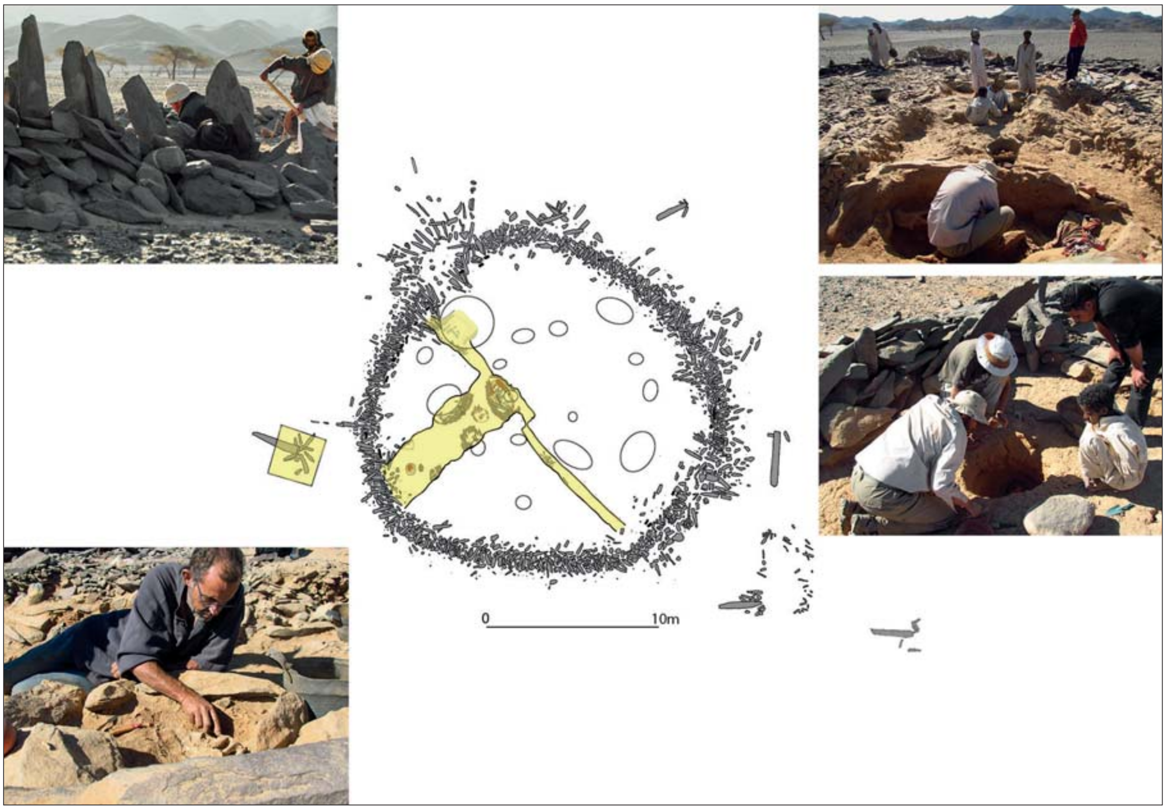


Fig. 9. Plan of the main enclosure following the first grant season in 2014; insets, clockwise from top right, exploration of F.1 in the foreground, other cleared burials in the background; exploring the child burial in F.10; Mike Fleming assisting in the cleaning of a burial; exploration of features inside the enclosure in 2014

Table 1. Features identified in the main enclosure at Wadi Khashab

No.	Feature	Description	Exploration history
F.1	Cattle burial	Furnished with a stone superstructure	= Burial 1, recorded in 2012, explored in 2014
F.2	Presumed human burial	Furnished with a stone superstructure, almost completely destroyed in antiquity; minute deposits of ashes and fragmented bones were discovered on the original ground surface between F.2, F.1 and F.4	= Burial 2, explored in 2015
F.3	Cattle burial	First noted in 2010 (Burial 3)	Animal bones collected from the dump next to a robbers' pit; not explored in 2014/2015
F.4	Cattle burial	Large feature furnished with a stone superstructure	Explored in 2015
F.5	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, not explored in 2014/2015
F.6	Cattle burial	Large pit; skull immobilized in position by elements of a stone superstructure	Explored in 2015
F.7	Sheep burial	Small feature furnished with a stone superstructure	Fragmentarily cleared, explored in 2015
F.8	Flat stone slab	Lying on the original ground surface, around it a shattered ceramic bowl	Collected in 2014
F.9	Burial(?)	Small feature with fragmentarily preserved stone superstructure	Fragmentarily cleared, but not explored in 2014/2015
F.10	Child burial	Under a stone blockage but with no evidence of a superstructure; burial furnished with ornaments	Explored in 2015
F.11	Posthole	Evidence of original vertical positioning of stones surrounding the cemetery	
F.12	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.13	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.14	Cattle burial	Large pit; skull immobilized in position by elements of a stone superstructure	Explored in 2015
F.15	Sheep burial	Small feature furnished with a stone superstructure	Explored in 2015
F.16	Sheep burial	Small feature furnished with a stone superstructure	Explored in 2015
F.17	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.18	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.19	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.20	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.21	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.22	Burial(?)	Small feature furnished with a stone superstructure	Surface cleared, but not explored in 2015
F.23	Posthole	Evidence of original vertical positioning of stone stele	

Table 2. Sites surveyed in the immediate vicinity of the main enclosure at Wadi Khashab

Site / coordinates	Description	Exploration history
WKh2 24°19′25″N / 34°31′28″E	Cluster of small stone steles and pavements around a larger, completely destroyed stone structure + one remote installation on the northwestern fringe of the ceremonial complex (WKh2a)	Recorded in 2012
WKh3 24°19′25″N / 34°31′27″E	Zone with lithic artifacts identified as Middle Stone Age products: six basalt forms including one discoidal core, four flakes with faceted butts and one sidescraper [*Fig. 11* right]	Recorded in 2012
WKh4 24°19′26″N / 34°31′33″E	Remains of modern(?) settlement	Recorded in 2010
WKh5a 24°19′22″N / 34°31′25″E **WKh5b** 24°19′27″N / 34°31′26″E **WKh5c** 24°19′10″N / 34°31′30″E	Three single tumuli of a diameter equal to about 3 m, chronology not established, situated in different parts of the wadi with a radius of a few hundred meters from the animal cemetery enclosure WKh1 [*Fig. 11* left]	Recorded in: WKh5a – 2010 WKh5b – 2012 WKh5c – 2014

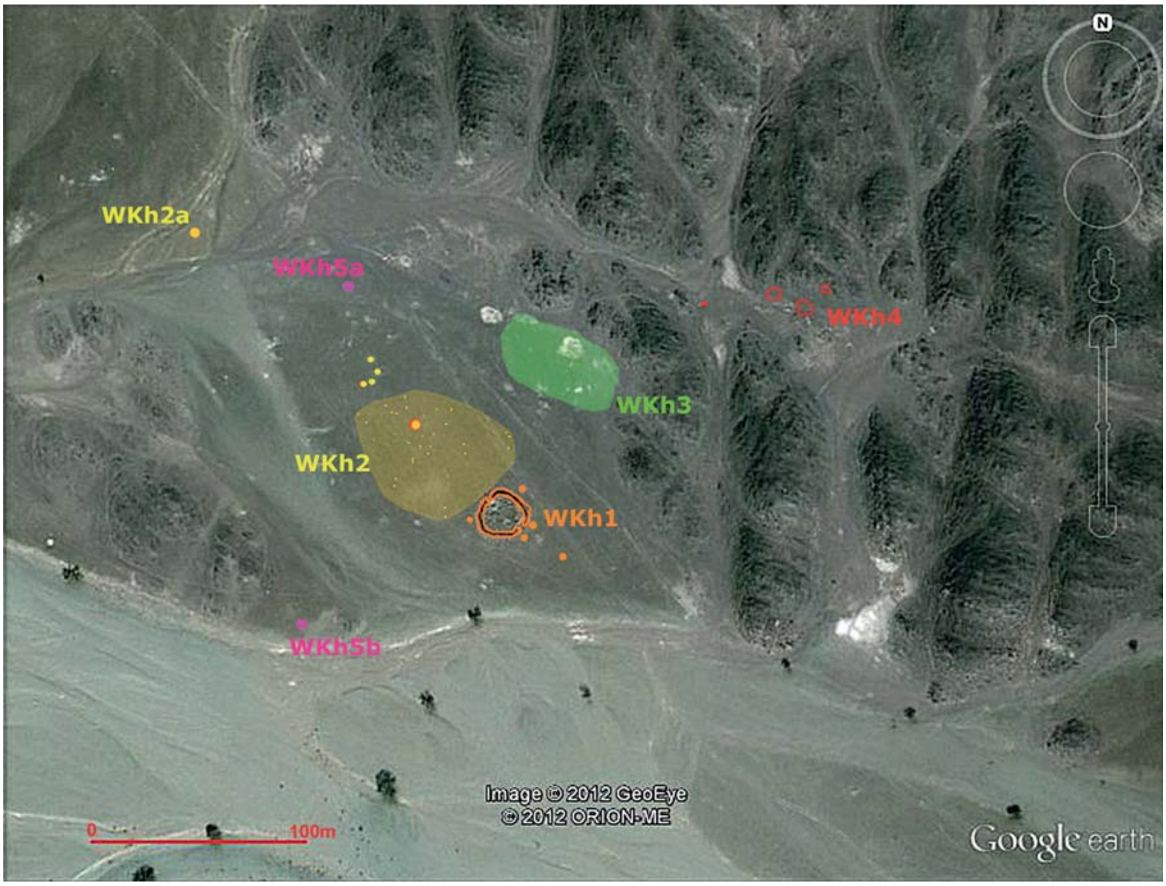


Fig. 10. Wadi Khashab valley with the location of sites in the immediate vicinity of the main enclosure (satellite image courtesy of Google Earth)

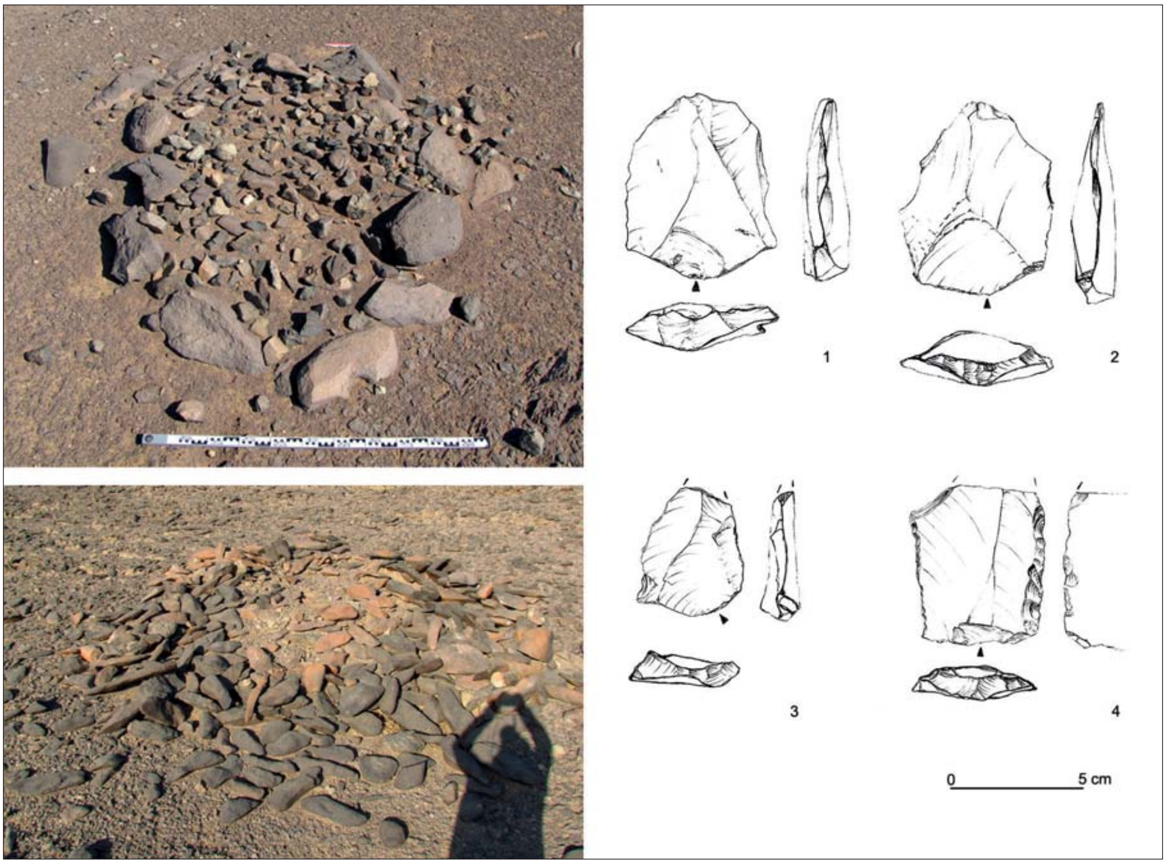


Fig. 11. Sites in the vicinity of the main enclosure: left, WKh5, two of three single tumuli of unidentified date; right, Middle Stone Age basalt tools: 1–3 – Levallois flakes; 4 – sidescraper on Levallois flake

Fig. 12. The main enclosure at the end of the grant season in 2015, looking northeast; in the background the half of the complex that was left unexcavated

The next fieldwork season in January 2015 was also organized from Berenike and with the assistance of Berenike Project team members. The southwestern part of the megalithic enclosure was cleared in order to determine the number and character of the features to be found there under the 20 cm to 40 cm thick layer of rock rubble filling the interior of the enclosure [*Fig. 12*]. A methodical examination of this area yielded altogether 13 new features, bringing the total for the excavated part of the cemetery to 23.

Feature F.2 was cleared by cutting through its center in order to reveal the original superstructure. It turned out to be practically circular at the base, with a square extension on the southern side. Highly fragmented human bones and traces of burning were noted next to the stone superstructure, as well as a burnt fragment of ostrich eggshell and an artifact made of ivory, identified provisionally as a bracelet. At this stage, these finds were interpreted as belonging to the original furnishings of the grave, thrown outside during the plundering that occurred in antiquity.

Feature F.4, situated directly next to F.2, was cleared in its entirety and turned out to be the burial of a young bull, laid in the pit on its left side, similarly to the bull from burial F.1. The skeleton had been damaged extensively by the plundering of the cemetery in antiquity; fragments of the skeleton were discovered on the dump next to the pit, among the stones from the upper part of the superstructure.

A cow was found lying in the pit of Burial F.6. It was resting on its right side, its head immobilized between stones so that the horns would be pointing upwards. This skeleton was also severely damaged by plundering in antiquity. The dumped remains inside the robbers' pit included heavily fragmented bones (presumed to be from the original burial), including a calf and single lumps of charcoal. Feature F.14, the superstructure of which had been recorded already in the test trench of 2012, also turned out to conceal the remains of a cow, lying in a similar position to F.6, on the right side and with the skull immobilized between stones so as to make the horns point upward.

One of the graves with a smaller superstructure, F.7, turned out to be an undisturbed burial of a sheep. Its position in the pit was quite curious: on its left side, the neck arching back so strongly that the head lay on the body. Relics of an organic artifact found lying under the body were examined by archaeobotanist Jarosław Zieliński, who identified it as a wooden container (bowl) with the animal's entrails. Single lumps of charcoal were also discovered among the stones of the superstructure. Features F.15 and F.16 proved to be burials of sheep marked on the surface with small superstructures.

Regarding feature F.9, the superstructure was cleared, but in the end the burial remained unexplored. Features F.12, F.13, F.17 and F.18 also had small-sized stone superstructures that had been partly dismantled in antiquity (by those plundering the cemetery?). These were not explored in 2015.

Feature F.11 was explored in order to understand the role of the small pits that were noted in the zone of the stone ring around the cemetery. It suggests that at least some of the stones may have been dug into the ground.

The most mysterious of the features excavated in 2015 was F.19, a structure made of massive stone slabs of the kind used for the enclosure. The stones lay horizontally, in the manner of modern shelters built by nomads in the desert, but completely unlike the other stone superstructures marking the animal burials in the cemetery. Numerous mollusk shells with drilled holes were found between the stones of this structure. At the present stage of the research, this feature should be associated either with the plundering phase or with a secondary reuse of the space as a temporary shelter.

At the close of the season, all the excavated pits were backfilled. The remaining stone rubble was arranged into a ramp outside the cemetery enclosure, providing a platform for viewing the site from the south. The 2015 season was the last at the site, the project being suspended due to the complex geopolitical and internal situation in the region and difficulties with obtaining permits for archaeological work on a regular basis in an area considered a frontier zone, as well as being located within the territory of a national park.

Back home, the collection of archaeozoological data was studied, resulting in a comprehensive morphological analysis of the animals buried at Wadi Khashab as compared to the known prehistoric and ancient populations of cattle from northeastern Africa. Moreover, measurements of the isotopes in animal tooth enamel permitted an in-depth look at animal mobility and adaptation strategies of the late prehistoric animal populations from the Eastern Desert. The FUAM laboratory in Poznań received samples of charcoal for radiocarbon analysis. The results were presented again at local conferences in Poznań and Warsaw in June 2015 and at the international seminar *"Imperial" Berenike and its Antecedents on the Red Sea Coast* coorganized by the PCMA UW and the SCA in Cairo on March 23, 2016. A summary of the research was published in the journal *Azania: Archaeological Research in Africa* (Osypiński and Osypińska 2016). In addition, the data from Wadi Khashab constituted an important component of knowledge about the morphology of early forms of domesticated African cattle in Marta Osypińska's habilitation book (2018).

Chapter 2

ARCHAEOLOGICAL SOURCES

2.1 The enclosure and the large steles around it

The human and animal cemetery appears to have been the central feature of the site at Wadi Khashab [*Fig. 13A, B*; see also large-size plan under the cover]. It was surrounded by a roughly circular stone enclosure measuring close to 18 m in diameter, with stone steles (long, narrow natural slabs) more than 2 m high mounted around the perimeter. The features inside and outside the complex, despite their hypothetical chronological differentiation, were all aligned northwest–southeast. The focal point of the cemetery was a burial, presumed to be human, located by the northwestern side of the enclosure. This burial, which was designated as F.2, belonged to the oldest phase of the complex as indicated by the stratigraphic data from the excavation of this almost completely destroyed feature. All the cattle burials excavated so far were oriented in relation to this particular feature, with their heads pointing in its direction.

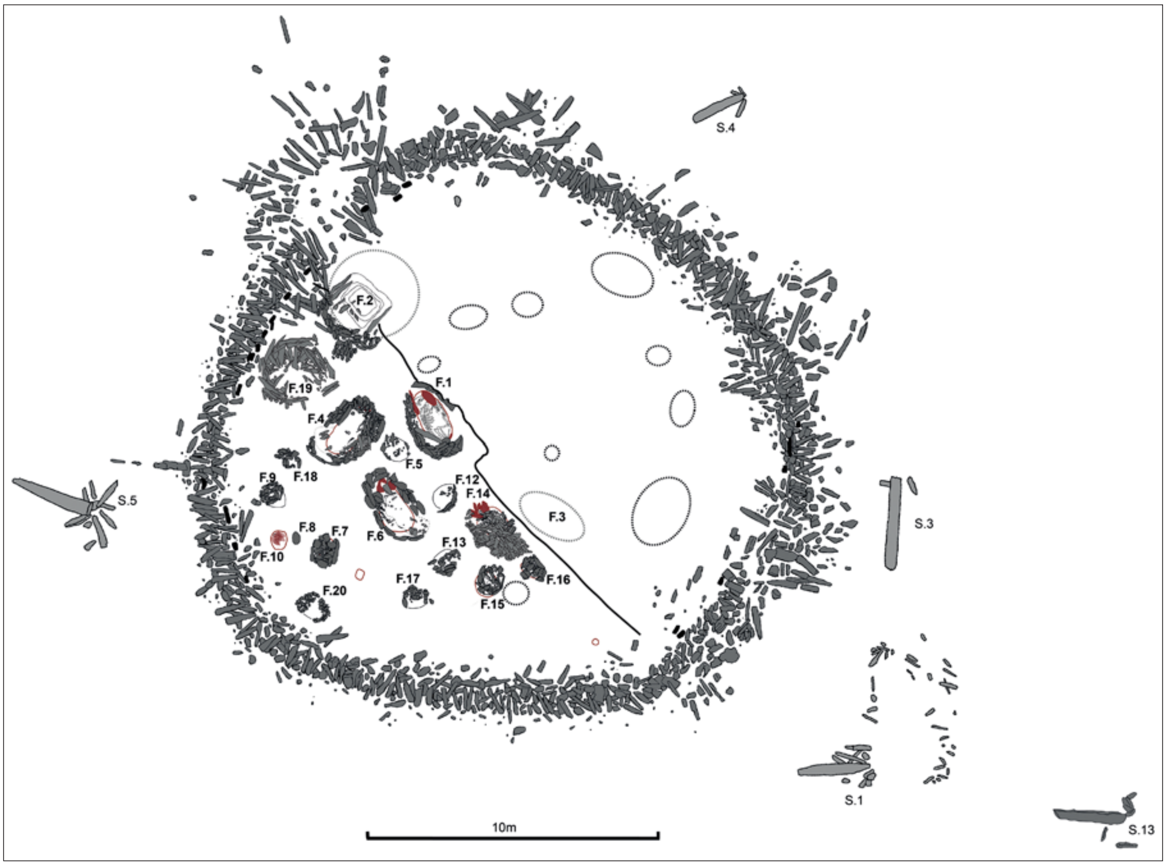


Fig. 13A. Plan of the main enclosure with the identified and excavated features inside the complex and stone steles around it (state following the second grant season in 2015)

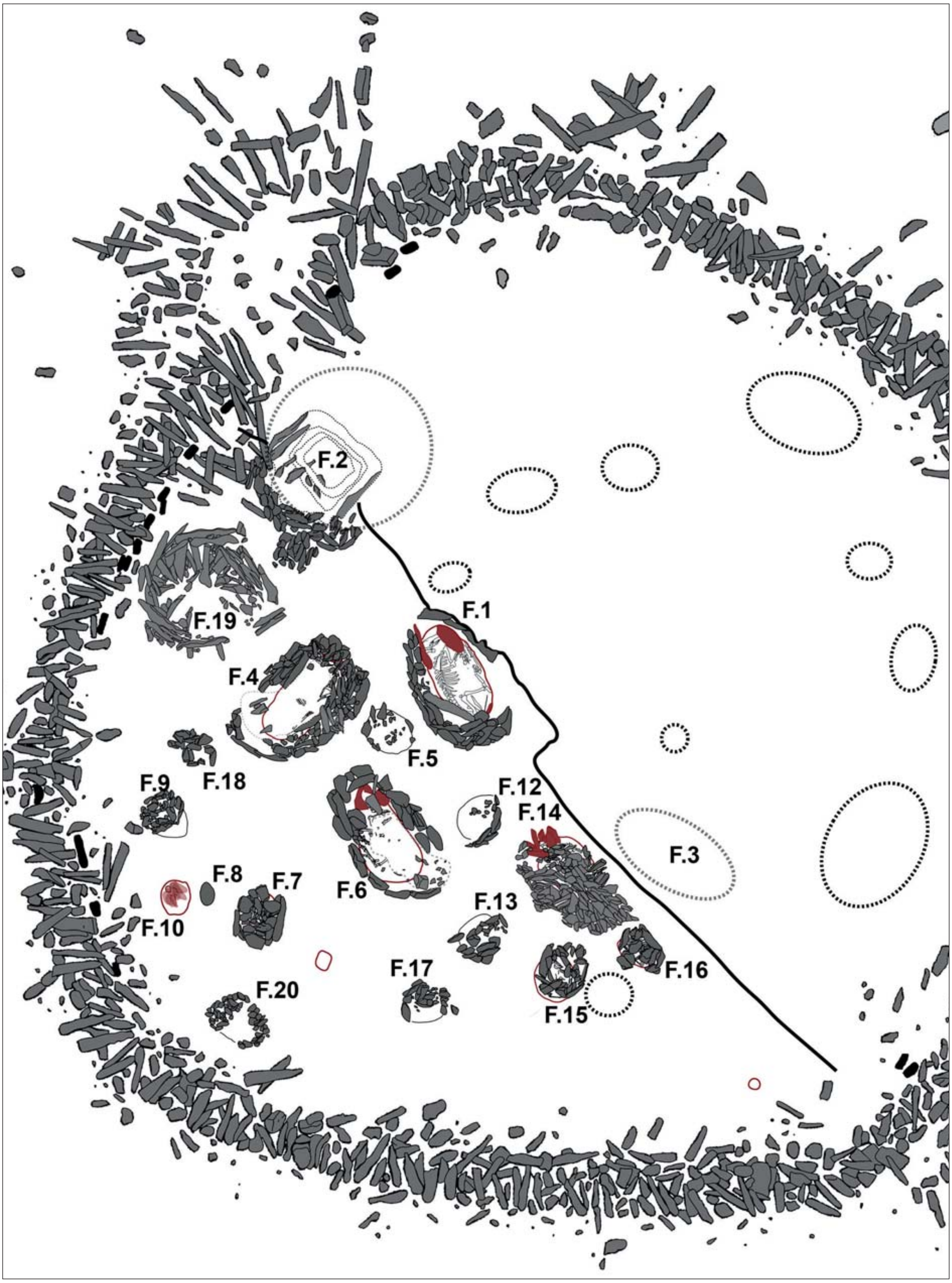


Fig. 13B. Detail of the plan of the excavated part of the main enclosure, state following the second grant season in 2015

Fig. 14. The main enclosure in Wadi Khashab: top, general view in 2010, seen from the northwest – the gap in the row of stone slabs at the center is the location of a presumed gateway; bottom, view of the enclosure at the end of the season in 2015, looking northwest – original mound surface visible on the right side of the feature

The orientation of the stone steles outside the cemetery appears to reflect a similar scheme, also aligned northwest–southeast. The single stele S.13 is the most distant outlier southeast of the enclosure. To the northwest the steles occurred in pairs (S.1+S.3 and S.4+S.5) and spread out to encircle the cemetery.

On the ground, the stone enclosure observed on satellite images shows evidence of advanced destruction, particularly in the section neighboring on the robbed burial F.2. The missing stones and the extensive scattering of dismantled elements had initially suggested a gateway in this part of the enclosure wall [*Fig. 14* top]. Examination of the remains *in situ* did not confirm the existence of a clear entrance arrangement, apart from perhaps some exceptionally long, narrow stone slabs set up vertically in this part. However, similar stones could also be seen on the opposite side of the complex. One thing that could be used to argue in favor of the entrance being here, even without any formal elements, such as reinforced jambs, is the alignment of burial features inside the enclosure, which can be correlated to an animal herd following a human in this direction.

The structure of the enclosure wall is also not quite self-evident. Some of the stones, occasionally more than 1.50 m long, still rise vertically from the ground (marked in black on the plan), but the bulk of the rocks are either angled or lying horizontally [*Figs 14, 15*]. Apparently, some of the stones were erected vertically without digging them in to any great depth, supported and reinforced with a large number of smaller pieces of rock. Single steles on the outside of the enclosure appear to have been mounted in a similar fashion (see below). The elements that were angled inside (shown in *Fig. 15*) were apparently placed on a base layer of rock fragments, at least 0.40 m thick. The layer seems to have covered the whole area of the cemetery and has suffered extensively

Fig. 15. Close-up of the positioning of stone slabs in the enclosure wall (state at the beginning of excavations in 2014)

from robbing in antiquity (pits, piled material from the robbers' pits, secondarily deposited stone elements). Despite the evident care put into their construction, the original burial superstructures appear to have been intentionally covered with a layer of rubble and sand, turning the cemetery into a massive monument.

The construction of the stone enclosure and the cemetery inside it may have been contiguous in time, but it is equally possible that time had elapsed between the burials and the covering of the cemetery with one big mound and its skirting with a row of stones. The gap in time is suggested by the relatively late date of the ceramic bowl found in the lower parts of this layer of rubble and sand. The stratigraphic evidence for the robbing of the burials reveals that they were disturbed already in antiquity, before the rubble mound was formed, but that the robbing continued also afterward, as indicated by the pits seen today, which cut through this layer.

The argument in favor of a later date for the large rubble mound covering the whole cemetery would place this feature in line with the much smaller tomb superstructures known from Lower Nubia (e.g., Hafsaas 2006: Fig. 2). There, the burials, which were made in stone box graves or occasionally even barrel-vaulted brick chambers, were covered with flat-topped mounds of loose stones and sand, revetted with stone slabs. The long, vertical stones were another reference to the funerary structures of the C-Group known from a few cemeteries (after Hafsaas 2006: 29–31) and identified with the early phases of the existence of this culture.

Having studied the ceramic bowl from photographic and drawing documentation, Maria Carmela Gatto has offered the following remarks:

> "Bowl with rounded, direct, slightly inverted rim and flat base. Handmade. Thickness: rim about 0.5 cm, body about 0.3 cm, base roughly 0.7 m. Fabric is mineral-tempered, small sub-angular inclusions in low percentage in the matrix; likely the mineral tempering was naturally present in the clay and not intentionally added. The clay may have been collected from wadi sediments. Surfaces are brown-smoothed; the outer is decorated with a deeply-incised (grooved) pattern, of horizontal lines obtained with a comb; the rim top and band are decorated with an incised herring-bone or chevron pattern, and a similar pattern is also present on the base. The break is zonal to black. Fire temperature would have been quite low.
>
> Pots with similar decoration have been found in Nubia and Upper Egypt, as well as in the surrounding desert. The closest examples to the Wadi Khashab vessel are found both in Lower Nubia and Upper Egypt in C-Group contexts (domestic and funerary), dated to the Middle Kingdom and the Second Intermediate Period (Gratien 2000: 113–128 and plates); a few examples from the settlement of Wadi el-Sebua are very similar to our pot (Gratien 1985: Fig. 12, in particular, sherd 157b). Recent analogous finds are reported from Elephantine Island and Hierakonpolis, dated to the Middle Kingdom and Second Intermediate Period (Raue 2018: Pl. 141, drawing 75.4, Pl. 167; Schröder 2014: 27 drawing of cooking pot at bottom right; De Souza 2019: 226, Fig. 39b).
>
> Similar artifact types are known also from coeval burials in the zone of the Fourth Nile Cataract (Kołosowska, Mahmoud El-Tayeb, and Paner 2003: Pl. 7; Bagińska 2010: Fig. 3t). Sherds with comparable decoration are known also from the Kassala region in East Sudan (De Souza 2019: 245, Fig. 83b)."

In summary, the conclusion to be drawn from the above is that the layer covering the cemetery, along with the stone skirting around it, originated from a period later than the original burial ground of the herd of animals following a human, the one buried in F.2.

Fig. 16. Ceramic bowl from Wadi Khashab: reconstructed pot and reconstruction drawing of the shape

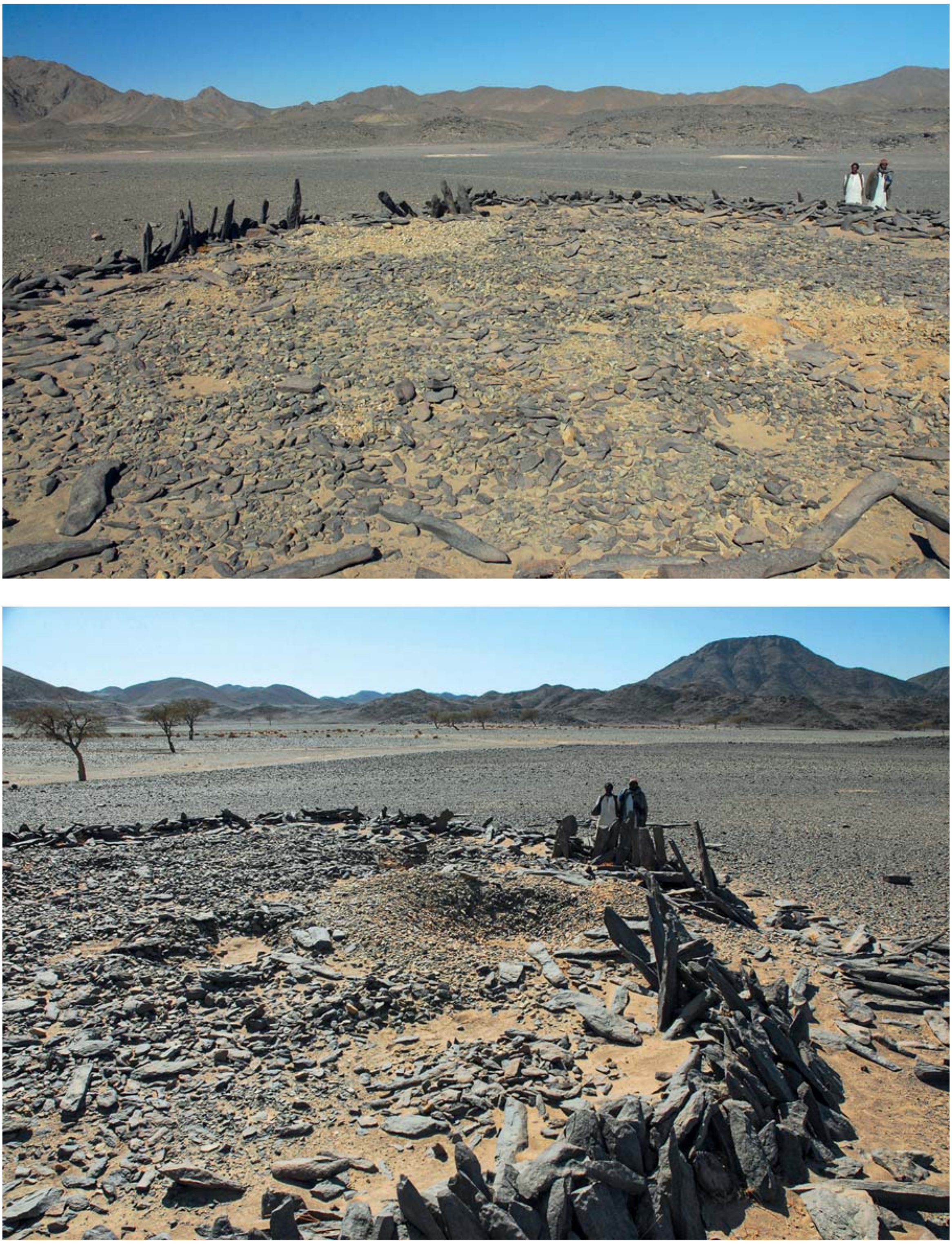


Fig. 17. The main enclosure in 2010: top, looking southwest; bottom, looking southeast; note the caldera on the spot of feature F.2 in both images

2.1.1 Human burial (Feature F.2)

State of preservation and evidence of plunder

Feature F.2 (formerly Burial 2) attracted the attention of passers-by even after the sacred ceremonial center ceased to function. And it must have been repeated attention, considering the complexity of the evidence for the plundering that surrounded the original burial. The main robbers' pit had a diameter of close to 2 m, visible even on satellite images of the site. A dump of thick gravel encircled the pit, all of it coming from inside the hole, which reached more than 0.70 m below the modern ground surface [*Fig. 17*]. No other feature at Wadi Khashab had been plundered this deep. Excavation by the project team could not establish the original depth of the plundering in antiquity, but it most certainly exceeded 1 m [*Fig. 18*].

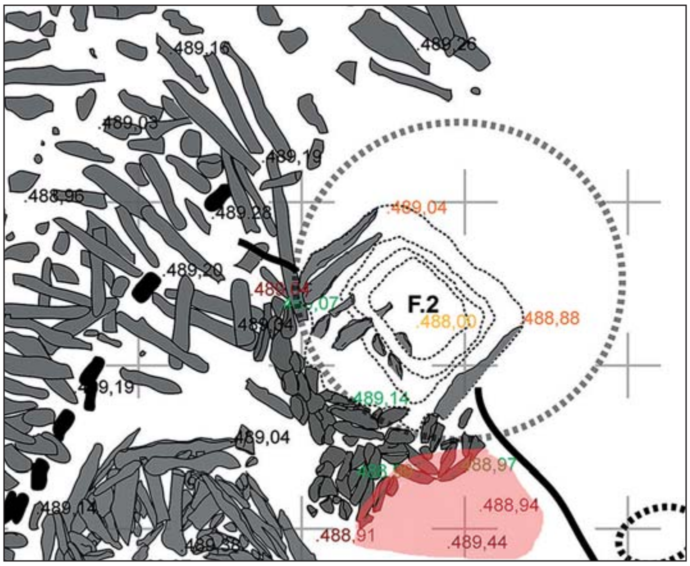


Fig. 18. Close-up plan of burial F.2 in the main enclosure (north is at top); color-coded depth of exploration in values above sea level: yellow – maximal depth; red – original ground level; green – original height of superstructure; black – present-day level of rubble layer inside the enclosure; area shaded in red – position of charcoal and burnt items

The walls of the robbers' pit appear to have been stabilized with stones presumably salvaged from the enclosure, which is dismantled at this point. The alternative explanation is that they are part of the original blocking of the entrance to the burial chamber. Analogous elements were used for the construction of the neighboring feature F.19 (see below), which may also be associated with the plundering of the cemetery (or at least of feature F.2). Either this burial was the first to be plundered and gave the robbers a good idea of how to approach the other burials or else it was plundered repeatedly, each time reaching deeper than before.

At least two phases of plundering can be recognized. The latest pit, resulting in a huge caldera and a dump next to it, as well as the slabs set horizontally in the side to stabilize the wall of the pit, must have followed the creation of the mound with the stone ring around it, the latter dated to the same horizon as the C-Group in Nubia (2400–1550 BC). However, evidence of plunder, in the form of very fragmented human bones, was noted also directly under the mound [*Fig. 19* top]. Burnt pieces of the original grave goods accompanied the bones: fragments of ostrich eggshell

Fig. 19. Elements of the original burial: top, human bone fragments; bottom left, burnt fragments of ostrich eggshell; bottom right, fragment of an ivory bangle with a view of the section

(container?) and of an ivory bangle [*Fig. 19* bottom]. Small lumps of charcoal which were recovered from the dump gave a radiocarbon date of 3200–3100 calBC (Poz-60960: 4545 ± 30 BP). All the presented dates were calibrated with OxCal software, version 4.2.3 (Bronk-Ramsey and Lee 2013). Recalculation with the OxCal 4.4 version available at the time of publication does not give significantly discrepant results, hence the interpretations based on this dating stand.

Location

Feature F.2 was located northwest of the animal burials, which are considered to be hypothetically of the same presumed chronology. Once the mound covered all of the burials and the stone enclosure was built around it, the feature found itself at the northwestern edge of the complex. The position was not accidental, although it is difficult to say exactly what determined it (possibly permanent elements of the landscape, like one of the surrounding mountains). In the context of the Nabta Playa "calendars", one could also admit, even if not prove, the possibility of an orientation arranged around the star constellations. It is also impossible to know whether the second phase was driven by the same principles read into the landscape (if this supposition holds) or whether it simply copied the existing arrangement. It should also be noted that the original plundering of the feature occurred when the feature was clearly in view, because the first robbers' pit was situated right on top of the burial. The same cannot be said of the plundering of the animal graves.

Structure

The burial chamber cannot be reconstructed, either in shape or size, or the form of securing the entrance. The plundering destroyed all evidence except perhaps the horizontal slabs apparently holding up the lateral walls, which could possibly be the remains of the original blocking of the entry to the chamber. All that remains is a fragmentarily preserved superstructure of rock chips, the stones measuring 20–30 cm across on average. The superstructure was presumably circular with a diameter of approximately 2 m and a small rectangular pavement projecting on the southern side [*Figs 18, 20* bottom]. This platform measured 0.50 m by 0.50 m and was constructed of the same kind of stones as the superstructure. The relative height of the superstructure did not exceed 0.20 m (counting from the original ground surface, see *Fig. 20* top). It is now preserved on the edge of the original circular burial feature, and it may have once covered the whole pit, but there is no evidence of this.

Function and furnishings

The sepulchral function of this feature is recognized solely based on formal parallels to the superstructure and the overall context. The ivory bangle fragment and pieces of a presumed ostrich-eggshell container described above represent the original furnishings, dropped by grave robbers from the end of the 4th millennium BC. However, excavation in the immediate surroundings of the pit uncovered in a secondary context (see below, § 2.1.4, feature F.19) many pieces of ornaments made of shells of Red Sea mollusks of at least three species: *Conus fulgetrum*, *Monodonta calinifera* and *Clanculus pharaonicus*. The ornaments may be hypothetically assigned to the original furnishings of the burial or to ceremonies that were not directly connected with this particular burial. However, they could also belong to a later phase in which the grave was plundered.

All of these artifacts are practically timeless and cannot be satisfactorily attributed to a specific culture. Containers made of ostrich eggshells are present in virtually all cultural units recorded in Lower Nubia and the same goes for ivory bangles. Bangles, that is, solid armrings, are rather common in burials along the Nile. In Sudan, they have been found in late Mesolithic graves at el-Barga (Honegger 2004: 33), and in Neolithic contexts, such as the cemeteries at Kadruka

Fig. 20. Burial F.2: top, the superstructure in section, showing the accumulated deposit over it, looking south, 2012; bottom, the feature after clearing, looking north, rectangular pavement in the foreground, 2015

(Reinold 2000: 12) and Kadero (Krzyżaniak 2004: 50–51). Bangles were also part of the adornment of the Badarian population in Upper Egypt (Midant-Reynes 2000: 155) and the Lower Nubian A-Group (Nordström 1972: 127). Representatives of the C-Group population also made bangles from a variety of materials. Circular bangles were cut from marine snail shells or carved from ivory (Williams 1983: 83).

2.1.2 Animal burials

Feature F.1

Feature F.1 (formerly Burial 1) lay approximately 1 m southwest of the assumed human burial F.2. Its position was noted already in 2012, although there was no trace of it on the surface. It turned out that it had been plundered in antiquity, the robbers knowing exactly where to dig, because they located their pit directly over the burial. The robbing started from the surface of the mound that covered the entire site of the cemetery in the second phase, hence not earlier than the mid-2nd millennium BC. It would mean that the position of the grave must have been marked in some way on the surface of the mound; otherwise the plundering could not have been so precise. The actual pit and its stone fill were distinct during the excavation in 2012 [*Fig. 22* top], demonstrating that unlike F.2, care was taken for some reason to rebury these remains, apparently even making sure that any traces on the surface would be masked. Interestingly, the robbers' pit reached the level of the burial, but did not disturb the skeleton. The whole action is thus incomprehensible, and we shall probably never know why the digging was interrupted and the burial reconstructed so meticulously.

The burial was made in an oval pit oriented southwest–northeast, approximately 1.50 m long and 0.70 m wide; the depth was 0.25 m at the maximum [*Fig. 21*]. The walls of the grave pit were reinforced with stone slabs positioned vertically by the head and the back part of the body. The animal rested in the pit on its left side, with its head to the northeast, limbs contracted under the belly [*Fig. 22* bottom]. The head was laid on the left cheek, inclined a little, missing the frontal bone and the horns [*Fig. 23*]. Either they had eroded, being nearest to the surface, or removed intentionally at the time that the burial was made; the latter seems more likely in view of there being no trace of bone where it should have been, despite no evidence of plunder. Moreover, the rest of the skeleton was in relatively good condition, arguing thus against the possibility that only the frontal bone had been eroded.

The burial was not furnished in any way. A stone of natural, somewhat rounded form, measuring 0.45 m by 0.20 m, was placed directly on the body, near the nostrils. The stone recalls in size and shape the tomb markers from late Neolithic and Kerma cemeteries, but its position inside the pit does not support an identification of this kind.

A superstructure made of irregular pieces of stone was carefully arranged in an oval shape above the burial; it measured 2.40 m by 1.40 m at the base, and was 0.15 m high when constructed [see plan, *Fig. 21*]. Part of it was missing in the center, directly above the burial, as a result of the secondary robbers' pit, and in the section to the east. A single long stone rested on top of the superstructure, presumably discarded there during the plundering of the cemetery before the circular mound was formed over it.

It is conceivable that this event, that is, the abandoning of the long stone on the remains of the grave superstructure, is concurrent with other traces of plunder, which have been radiocarbon dated elsewhere on site to the end of the 4th millennium BC.

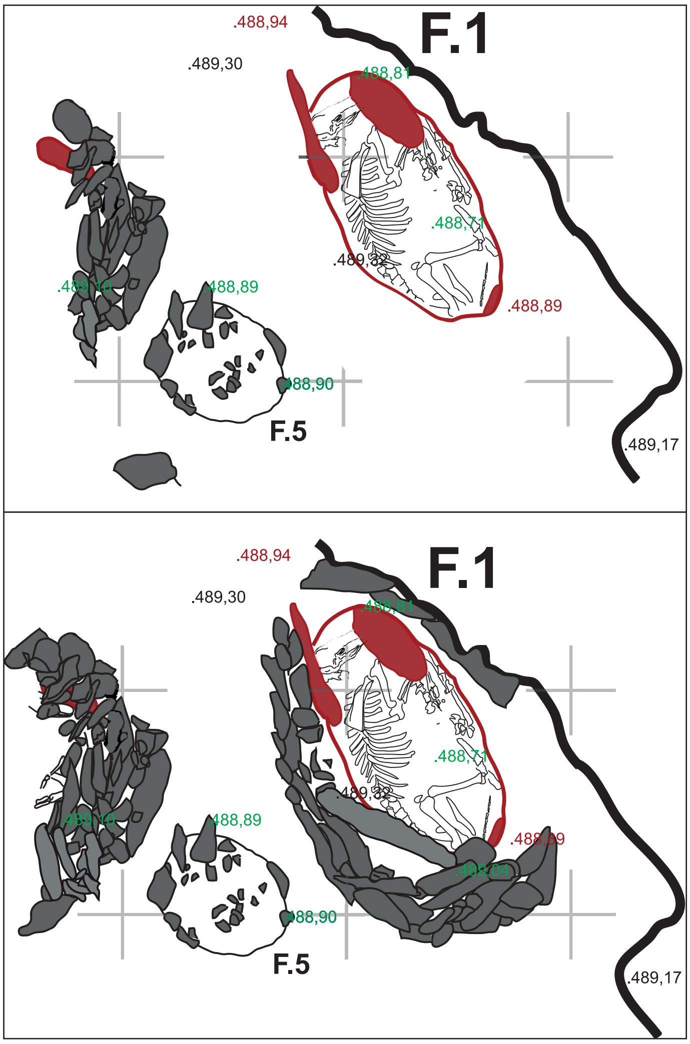


Fig. 21. Animal burial F.1 (north is at top): top, level of burial pit and, bottom, level of superstructure; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of superstructure; light green – original bottom of the pit; black – present-day level of rubble layer inside the enclosure

Fig. 22. Animal burial F.1: top, details of the fill of the secondary pit; center, slab above the burial and the last stone of the secondary pit; bottom, details of the superstructure preserved along the southern and western side of the grave pit

Fig. 23. Animal burial F.1: top, the skeleton *in situ*; bottom, close-up of the skull in position (box)

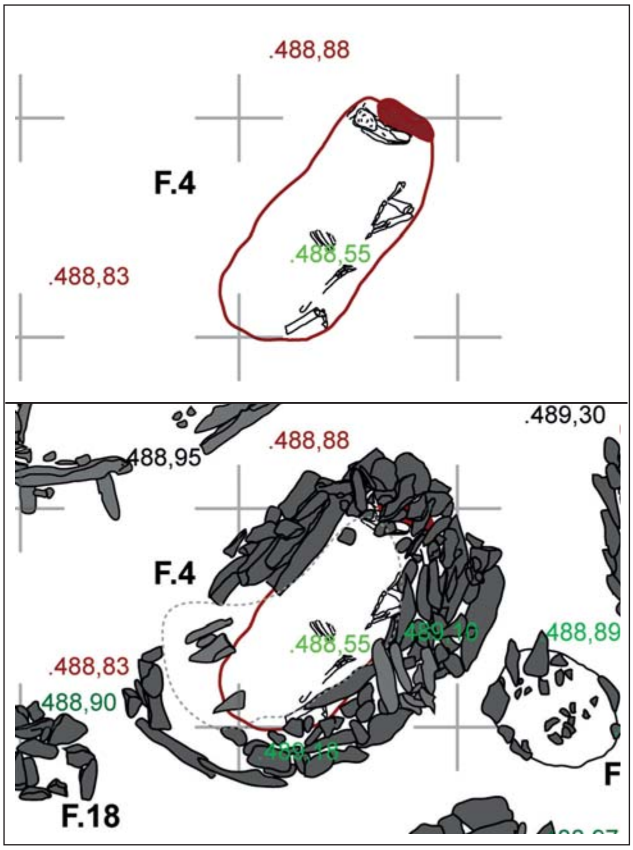


Fig. 24. Animal burial F.4 (north is at top): top, level of burial pit and, bottom, level of superstructure; elements from the robbery phase in light gray; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of superstructure; light green – original bottom of the pit; black – present-day level of rubble layer inside the enclosure

Fig. 25. Animal burial F.4 in the center of the main enclosure: general view, looking south (state in 2015)

Feature F.4

Another bovine burial, F.4, was located approximately 2 m south of F.2 and about 1 m east of F.1 [see *Figs 13, 24*]. The generally oblong but irregular grave pit was aligned southwest–northeast, the long axis measuring 1.30 m, the short one 0.60 m, with a maximum depth of 0.25 m. Its position could not be seen on the mound surface, hence it was definitely not plundered after the circular mound had been put into place over the whole cemetery. Prior to that, however, it was clearly disturbed, and the extent of the robbing was such that it destroyed practically the whole animal skeleton. The robbers also discarded the central and extreme western parts of the superstructure in order to dig their pit [see *Figs 24, 25*].

Fig. 26. Animal burial F.4: top, skeleton remains viewed looking northwest; bottom, close-up of the skull in position (box)

The robbing avoided the extreme ends of the skeleton, leaving enough of the bones in place to determine the original position of the body. The animal was laid to rest on its left side, with the head to the northeast and the limbs contracted under the belly. The head lay on the left cheek, directly upon the one stone slab that reinforced the wall of the grave pit at the northern end [*Fig. 26*]. The frontal bone showed evidence of serious damage, and the position of the skull was such that the likelihood of the horns still being present at the time of burial is low.

The stone superstructure above the burial was of oblong shape and measured 2.20 m by 1.20 m along the main axes at the base. Judging by the preserved elements, it was not higher than 0.30 m [see *Fig. 24*]. A few stones belonging to the phase of plundering of the cemetery before the introduction of the mound were recorded on top of the preserved parts of the original superstructure (marked in light gray on the plan).

Feature F.6

The third bovine burial, F.6, was located in the second line behind the human burial (F.2), approximately 1 m southeast of F.4 [*Fig. 27*]. The oval grave pit was originally aligned southeast–northwest. It was 1.40 m long and 0.70 m wide, with a maximum depth of 0.20 m. It shared the same fate as burial F.4, having been plundered before the circular mound was put in place. The robbers removed the central and southeastern part of the superstructure and dug to the bottom of the grave, damaging a large part of the animal skeleton [*Figs 28, 29*].

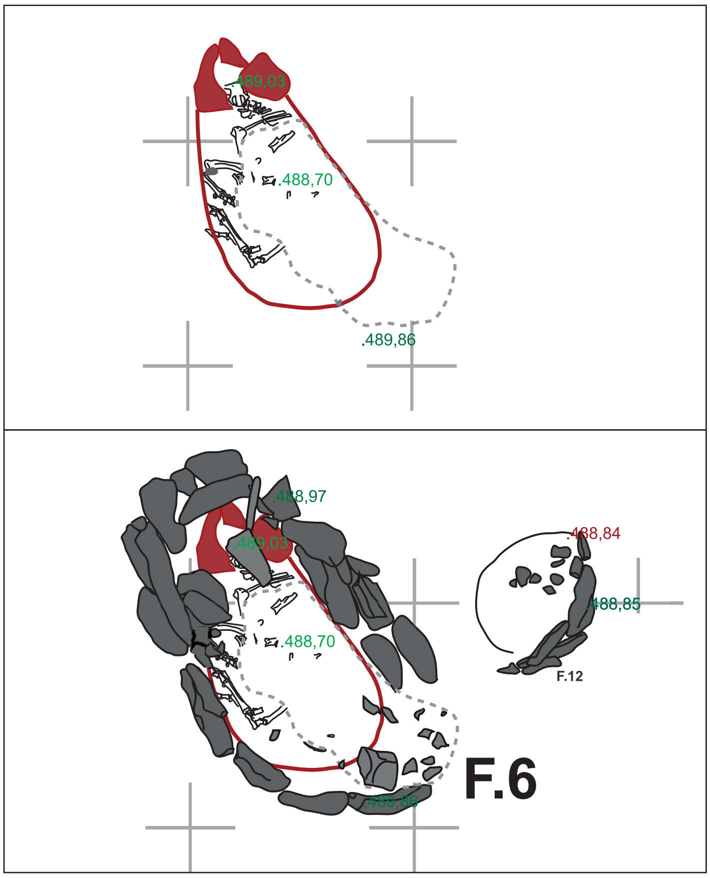


Fig. 27. Animal burial F.6 (north is at top): top, level of burial pit and, bottom, level of superstructure; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of superstructure; light green – original bottom of the pit; black – present-day level of rubble layer inside the enclosure; area shaded in dark pink indicates location of bones of foetal individual

Fig. 28. Animal burial F.6: the superstructure viewed looking south

The damaged bones of a bovine skeleton and single bones of a calf (pre-natal age) were found in the fill of the robbers' pit, among dust and small chips of stone [see *Figs 27, 29*]. Lumps of charcoal from this fill have been revealed to be concurrent with the plundering of the human burial F.2 (see above, § 2.1.1), as they were radiocarbon-dated to between 3352 and 3089 calBC (94.3%; Poz-69950: 4495 ± 35 BP).

The extreme head and back parts of the animal skeleton remained in place, indicating the original position of the body, which had been laid on its right side, with the head to the northwest and the limbs contracted under the belly. The head was immobilized vertically in position, nostrils pointing down [*Fig. 30*]. For this purpose stone slabs had been placed vertically against the walls of the grave pit at the northwestern end. The frontal part of the skull shows severe damage, while the position of the head indicates that at the time of burial the horns were no longer in place. The alternative is, assuming that the bucranium had not been cut off beforehand, that the horns actually extended above the stones of the superstructure.

The oblong superstructure of stones measured 2.20 m by 1.20 m at the base. Judging by the stones still *in situ*, it could not have been higher than approximately 0.15 m [see *Fig. 27*]. Here, too, a few stones lying on the surface of the superstructure should be related to the phase of plundering of all of the burials (marked in light gray on the plan).

Fig. 29. Animal burial F.6: general view of the excavated burial: top, looking northwest; bottom, looking southwest

Fig. 30. Animal burial F.6: top, remains of the base of the skull; bottom, position of immobilized head

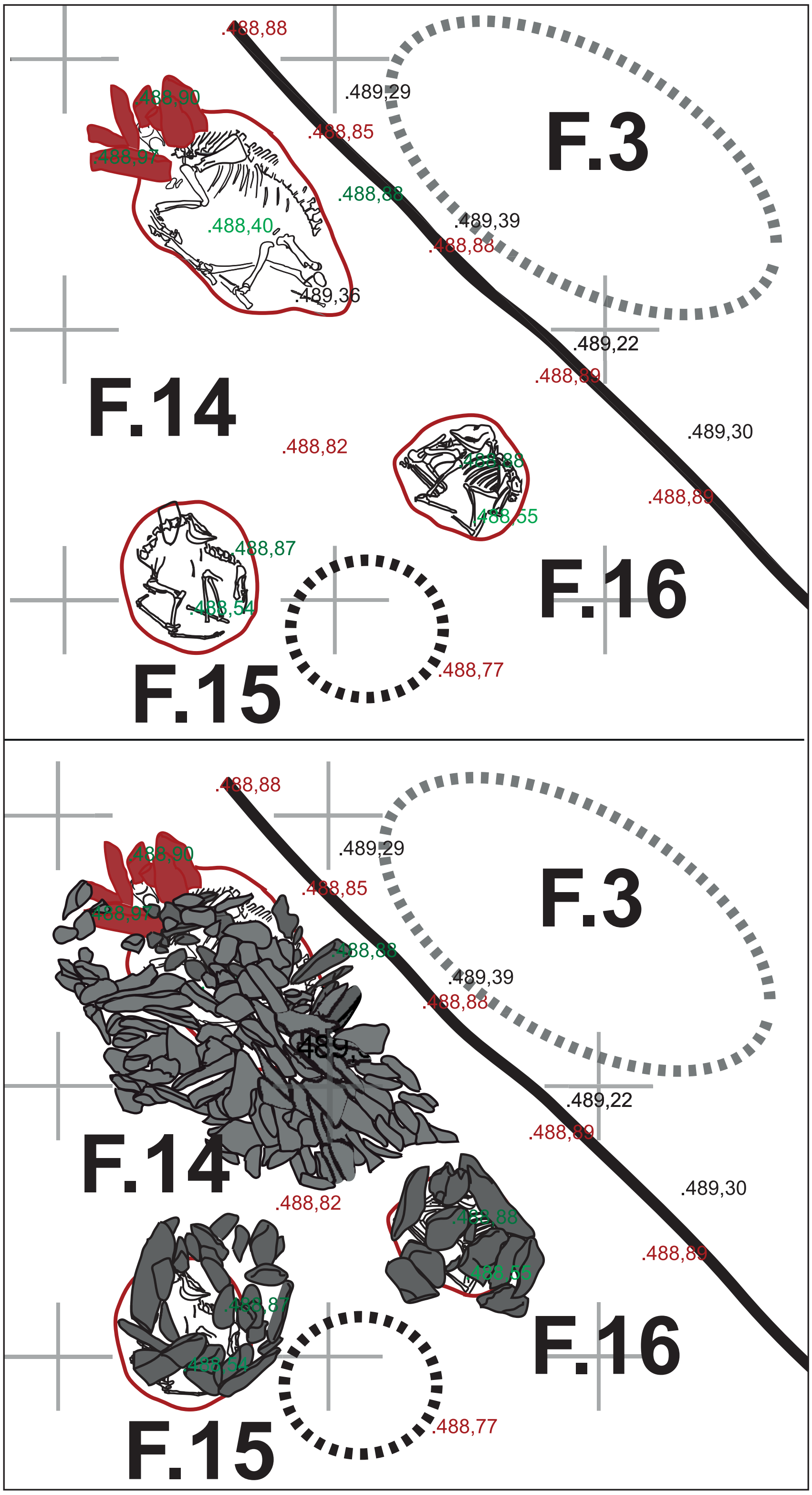


Fig. 31. Animal burials F.14, F.15 and F.16 (north is at top): top, level of burial pits and, bottom, level of superstructures; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of super-structure; light green – original bottom of the pit; black – present-day level of rubble layer inside the enclosure

Feature F.14

F.14 was yet another bovine burial and was located, like F.6, in the second line behind the human burial F.2, approximately 2 m southeast of F.1 [see above, *Fig. 13*].

The long axis of the grave pit was aligned southeast–northwest and measured 1.20 m; the width of the pit was 0.70 m and the depth approximately 0.40 m. The edges of the superstructure were revealed in 2012 in the test trench that explored the area of the damaged feature F.3 and were then considered part of that burial. No trace of either the original burial or the robbers' pit could be seen on the surface of the mound that covered the entire cemetery. The robbers dug into the northern part of the grave pit, most likely reaching the level of the skeleton, but like burial F.1, they desisted without damaging the bones. The northwestern part of the superstructure was dismantled at this time, the stones deposited on top of the remaining, southern part of the tomb [marked in light gray on the plan in *Fig. 31*; see also *Fig. 33*].

The body of the animal rested on its right side with the head to the northwest and the limbs contracted under the belly. Similarly to burial F.6, a few vertical stone slabs had been installed at the northwestern end of the pit in a way that immobilized the head of the animal in vertical alignment with the nostrils pointing down [*Fig. 32*]. The frontal bone of the skull was also damaged and the horns were missing, as was the case with burial F.6.

The oblong superstructure, which was approximately 0.15 m high, judging by the stones still preserved *in situ*, measured at the base 2.20 m and 1.20 m on the long and short axes respectively [see *Fig. 31*].

Fig. 32. Animal burial F.14; the head immobilized between vertical slabs

Fig. 33. Animal burial F.14 superstructure: top, stones from the northern end removed and deposited on top of the southern end (to the left in the photo) of the superstructure, looking west; bottom, original elements of the superstructure in place at the southern end and the tops of slabs immobilizing the head of the animal seen sticking out of the ground on the northern side (to the right in the photo)

Other features

A series of smaller features, with diameters of approximately 1 m, were scattered between the bovine burials. The superstructures in these cases were also made of stones but arranged less carefully. The three that were explored were chosen because the state of preservation of the superstructures suggested undisturbed burials. All were found to contain single skeletons of adult sheep, complete and without any evidence of damage, like the cut horns of the bovine counterparts. None of these features had any kind of representation on the surface of the circular mound covering the whole cemetery.

Feature F.15

Burial F.15 was located approximately 1 m south of the bovine burial F.14. The grave pit was circular in shape, about 0.70 m in diameter and roughly 0.30 m deep [see *Figs 31, 34*]. It was barely big enough for the body, which had to be forced into the pit with the limbs strongly contracted under the belly, the neck bent unnaturally and the head resting on the body. The animal had been laid in the grave on its right side, with two flat stones laid on top of it (although these could be the lowermost stones of the superstructure) [*Fig. 34* center]. The skeleton was complete.

The superstructure was in good condition. Its diameter at the base was approximately 0.90 m, its height 0.10 m [see *Figs 31, 34*].

Feature F.16

Burial F.16 was located about 1 m east of F.15 and less than 1 m southeast of the bovine burial F.14. The grave pit was roughly circular in plan, approximately 0.70 m in diameter, and close to 0.30 m deep [see *Figs 31, 35*]. This again necessitated a maximum contraction of the body of the sheep, in order for it to fit into the pit. This time the animal rested on its left side, its limbs contracted under the belly, its neck bent back strongly and the head laid back on the body [see *Fig. 35*]. The skeleton was complete.

The superstructure was identical with that of burial F.15: 0.10 m high and roughly 0.90 m in diameter at the base.

Fig. 34. Animal burial F.15 (north is at top): top, superstructure viewed from above; center, stone slab on top of the skeleton; bottom, burial of a sheep

Fig. 35. Animal burial F.16 (north is at top): top, superstructure viewed from above; bottom, skeleton of a sheep

Feature F.7

Feature F.7 was located in the western part of the cemetery, about 1.50 m southwest of the bovine burial F.6 [see *Fig. 13B*]. It was a roughly circular grave pit, approximately 0.60 m in diameter and about 0.40 m deep [*Fig. 36*]. The arrangement of the burial repeated that of F.15, with the body on the left side, the neck strongly bent back and the head resting on the body, the limbs contracted under the belly [*Fig. 37* bottom].

There were no grave furnishings, but right by the head there were remains of an organic substance. It consisted of animal tissue, apparently placed on a piece of wood [*Fig. 38*].

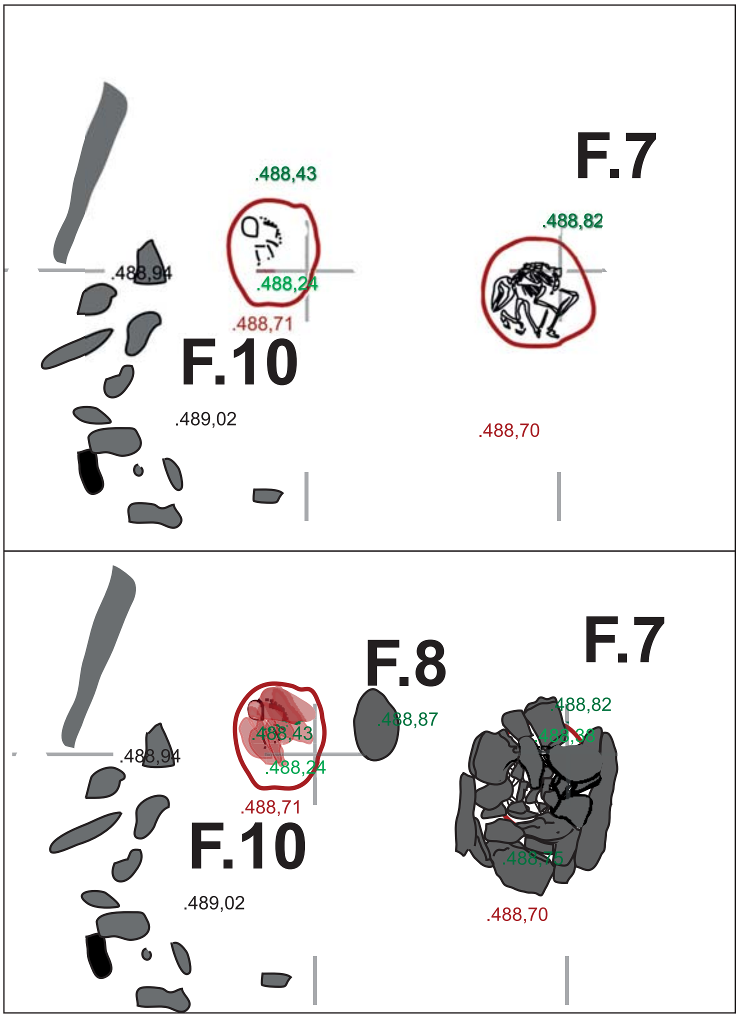


Fig. 36. Animal burial F.7 and child burial F.10 with slab feature F.8 (north is at top): top, level of burial pits and, bottom, level of superstructures; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of superstructure; light green – original bottom of the pit; black – present-day level of rubble layer inside the enclosure

Fig. 37. Animal burial F.7: top left, superstructure viewed from above; top right, upper surface of the fill of the pit viewed from above (north is at top); bottom, burial of a sheep (north is on the left)

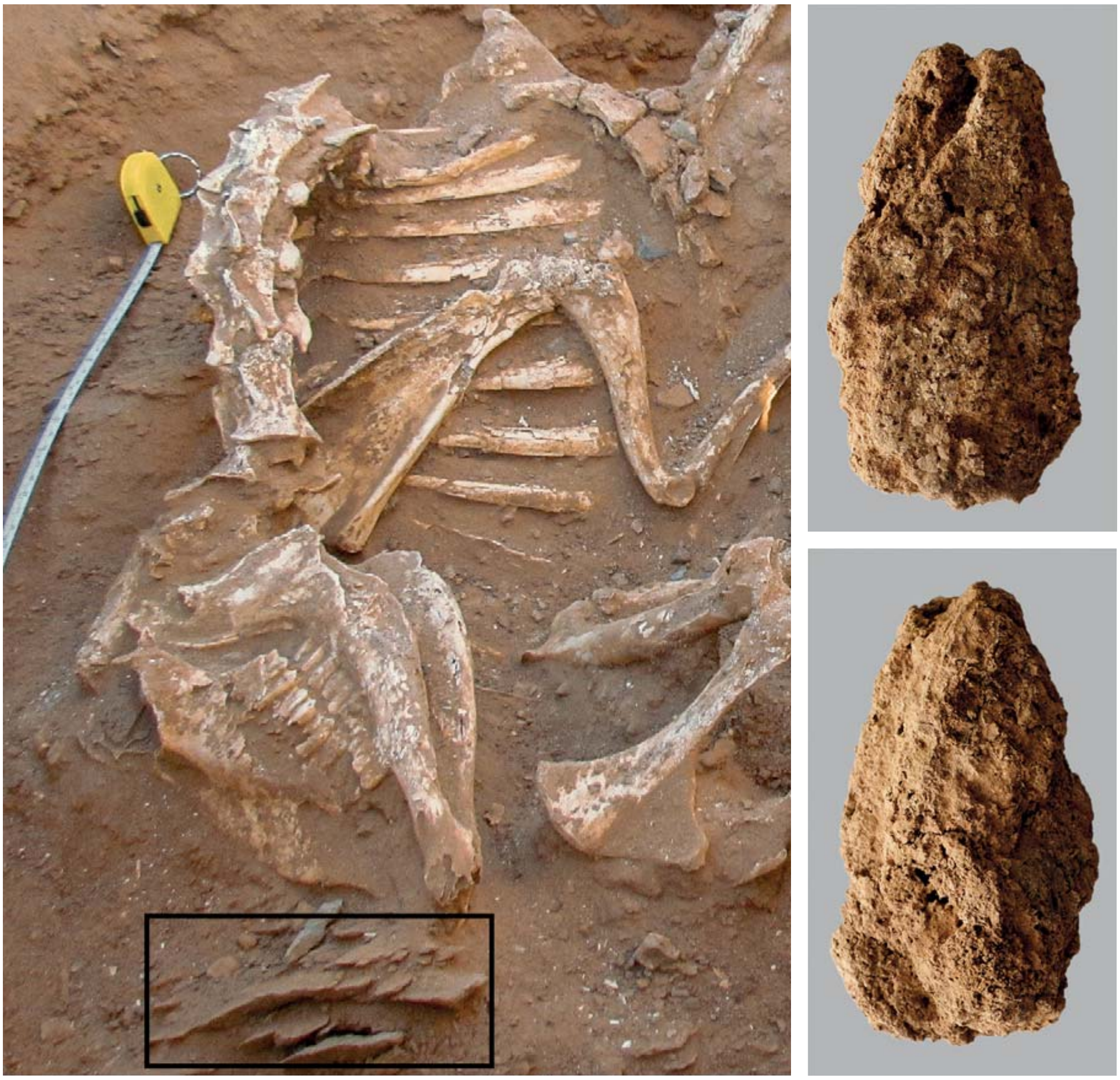
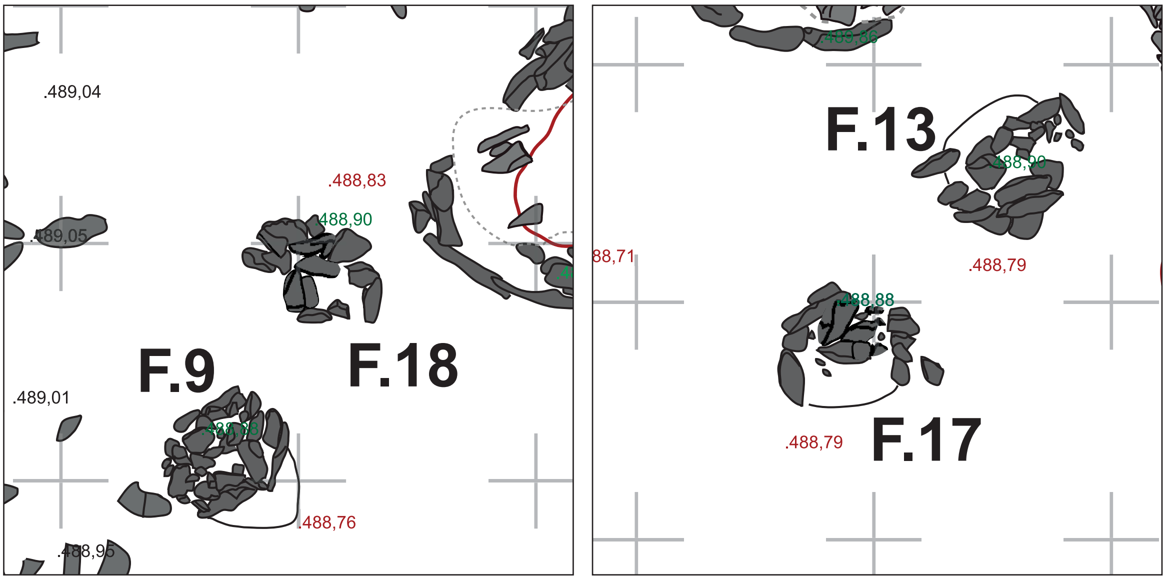


Fig. 38. Animal burial F.7: detail of the head with the position of the organic package; on the right, top and bottom views of the organic package

Features F.9, F.13, F.17, F.18 and F.20

Features with superstructures of the same kind as those identified as marking sheep burials were recorded among the cattle burials as well as outside of this zone [see *Fig. 13*]. The damage suggested plundering in antiquity, hence, being constrained by time, the excavators decided against the exploration of these features. The superstructures were documented and found to be approximately 0.10 m high above the ground and no more than 1 m in diameter [*Fig. 39*].



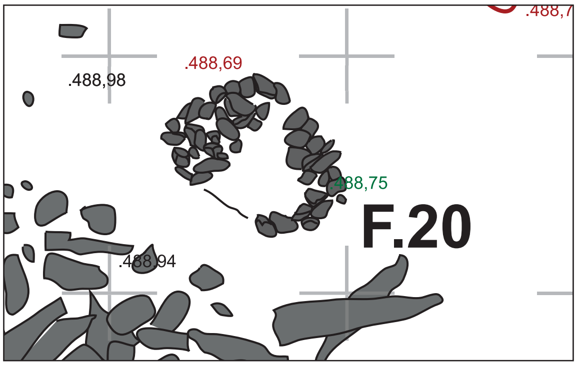


Fig. 39. Features F.9, F.13, F.17, F.18 and F.20 (north is at top): level of superstructures; color-coded depth of exploration in values above sea level: red – original ground level; dark green – original height of superstructure; black – present-day level of rubble layer inside the enclosure

2.1.3 Child burial (Feature F.10)

The child burial (Feature F.10) is the only undisturbed human burial found so far in the cemetery complex at Wadi Khashab. It was located approximately 1 m west of the sheep burial F.7, on the periphery of the group of animal burials "following" the human buried in F.2 [see *Fig. 13*]. The burial was also distinguished from the other graves by the absence of a superstructure. Instead, the opening to the burial chamber was blocked with large stones (the human burial F.2 was severely disturbed, but it does not seem to have had such a blocking of stones).

The grave pit was filled with dust and sand of reddish color, different than in the other burials [*Fig. 36* top right]. However, chemical analyses were not performed, hence it could have been the natural color of soil at the time that the grave was filled or else the sand had been intentionally mixed with ocher.

A neat superstructure of stones was arranged above the grave. It was roughly rectangular in shape, 0.70 m by 0.50 m, rising no more than 0.12 m above the ground [*Fig. 36* top left].

Isolated pieces of charcoal found among the stones of the superstructure produced a radiocarbon date of between 3340 and 3022 calBC (95.4%; Poz-70005: 4465 ± 35 BP). However, since there is no evidence for this burial being disturbed (unlike the human burial F.2 and the bovine burials), the date cannot be taken as indicating when the feature was installed. The burning from the end of the 4th millennium BC present on the site surface has to be related to the plundering of the cemetery, and the charcoal among the stones of the superstructure is there most likely by chance.

The grave pit in this case was roughly oval in plan, 0.50 m by 0.40 m, and had been dug to a depth of 0.50 m. The shaft going down to the burial was found to be blocked with a dozen or so stones placed in three courses, one above the other [*Fig. 40*].

Fig. 40. Child burial F.10: three successive levels of stones blocking the burial shaft

The skeleton of the child appears to have been buried in sitting position, the back leaning against the north wall of the pit, the legs drawn up to the chest. It seems to have slipped a little to the left, presumably when the stones of the blocking were being fitted in place [*Fig. 41* center].

Analogous forms of child burials, including both positioning of the body inside the grave pit and the structure of the grave, are encountered in cemeteries of A-Group communities in the Nile Valley (Nordström 1972; Gatto 2006; Zegretti 2012).

The age of the child was estimated at about 1–2 years based on the presence of milk teeth and the degree of ossification of parts of the skeleton (Lewis and Flavel 2006).

Fig. 41. Child burial F.10: center, position of the body viewed from above (north is at top); top right, detail of the beads found between the bones; top left, beads; bottom left, detail of shell ornaments by the skull; bottom right, shell ornaments

The child was given a burial gift in the form of a necklace of Red Sea shells (*Conidae*) and a string of blue faience beads, each 2 mm in diameter, around the left ankle [*Fig. 41* top and bottom]. One of the shells was radiocarbon-dated, producing a date in line with the functioning of communities of early A-Group in Nubia or else Naqada IIB–D in Upper Egypt: 3647–3352 calBC (Poz-70382: 5285 ± 35 BP). This suggests the secondary nature of this burial with regard to the earliest phase consisting of the animal burials and the human burial F.2. The peripheral location of this grave in relation to the other explored features would also argue in favor of its different age.

Slab of stone (Feature F.8)

A single flat slab of stone (Feature F.8) lay on the primary ground surface level about 0.20 m northeast of the child burial F.10 [*Fig. 42*]. It was found under the rubble forming the mound over the entire cemetery. Of roughly oblong shape, it was 0.45 m long, 0.30 m wide and 0.15 m thick. Scattered around it were the sherds of a ceramic vessel (see above, § 2.1, pages 26–27). One could speculate that it was a tomb marker (a fairly common sepulchral feature among C-Group populations) or an object of ceremonial use (small offering table?), which could explain its relation to the shattered ceramic bowl. In stratigraphic terms, it should be related to the same horizon as the said ceramics (mid-2nd millennium BC).

Fig. 42. Child burial F.10: grave pit in relation to Feature F.8 (flat slab)

2.1.4 Feature F.19

A stone structure lying immediately southwest of the human burial F.2 did not turn out to be a grave superstructure despite the fact that it was inside the enclosure [see *Figs 13, 43*]. Its function and chronology could not be established.

It evidently predates the mound that covered the entire funerary enclosure, but the stones used in its construction are much like those used for the stone skirting around the complex. It could mean that the stone fence around the site preceded the mound itself.

The feature is on the same primary ground level as the first burials in the cemetery, but the construction technique is entirely different from that observed in the grave superstructures. The stones were set flat around the circumference of a circle that had a diameter of 1.50 m; in the northern part, they appear to have been standing vertically [*Fig. 45*]. Analogous structures are reported from the Eastern Desert mountains, where they are interpreted as temporary shelters built by nomads as protection against wind and as places for safely keeping supplies for their herds. It is possible that sometime after the complex had been built, but before the moment when the mound was introduced over the entire cemetery, that is, between the early 4th and the mid-2nd millennia BC, the site may have been used for a different (and possibly less ceremonial) purpose.

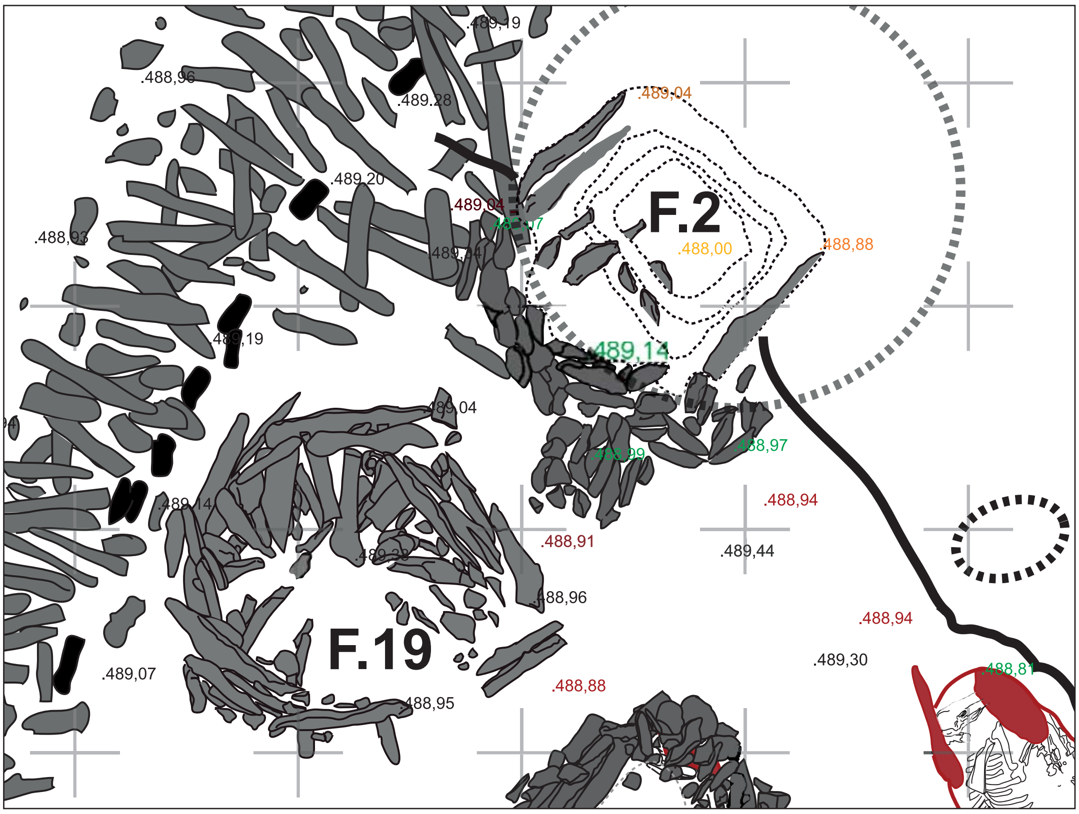


Fig. 43. Feature F.19 (north is at top): level of the superstructure; color-coded depth of exploration in values above sea level: red – original ground level; black – present-day level of rubble layer inside the enclosure

Fig. 44. Shells found among the stones of feature F.19: top left and right, selected shells *in situ*; center, *Conus fulgetrum*; bottom left, *Clanculus pharaonicus*; bottom right, *Monodonta calinifera*

Red Sea shells were discovered among the stones of feature F.19 [*Fig. 44* top row]. The shells presumably came from a necklace. Three different species, all with drilled holes for stringing, were identified: *Conus fulgetrum* (27 pieces), *Monodonta calinifera* (5 pieces) and *Clanculus pharaonicus* (2 pieces). One possibility is that they may have belonged to the grave furnishings of the human buried in F.2, or they could have been lost by someone passing by.

Fig. 45. Feature F.19: view looking south

2.1.5 Steles of stone around the cemetery

In 2010, when the site was first surveyed, long stones were scattered around the central enclosure, attracting attention by their position [*Fig. 46*]. Mapping of the site gave an idea of the spatial relations of these five outlying elements with regard to the central enclosure [see *Fig. 13*]. Their arrangement appears to repeat the plan of the sacral complex. Stele S.13 is the farthest out to the southeast, 15 m from the enclosure. Steles S.1 and S.3 are approximately 10 m away from one another, 5 m to 7 m away from the enclosure, also southeast of the complex. They can be seen as a pair, matching the last two, S.4 and S.5, which are also a pair. Stele S.4 is 4 m from the enclosure, but north of it, and S.5 a similar distance, but southwest, and they stand 20 m apart. These five monoliths appear to be aligned, forming two converging lines with S.13 at the point of intersection.

The steles were all mounted in the same way. The large monoliths, 1.70 to 2.50 m long, are stood up on end and supported by smaller stones at the base in order to stay upright. Testing around S.5 did not reveal any kind of pit that would suggest that these stones were sunk into the ground [*Fig. 47*]. Contrary to the small stones from the cluster northwest of the cemetery (see

Fig. 46. Monolithic stone steles around the main enclosure: top, stele S.13, looking east; center left, stele S.4, looking east; center right, stele S.5, looking southwest; bottom, stele S.3, looking east (for location of the steles, see *Fig. 13*)

below, § 2.2), none of the long stone splinters had the telltale patina that could attest to their being dug into the ground.

The long stones in satellite positions around the enclosure did not demonstrate any evidence of deliberate fashioning by human hand. The rock in the nearby outcrops has a tendency to fracture into such long slender pieces. Finding them and bringing them to the site would not have been difficult for an organized group of people with a mind to build this complex.

There is nothing that could help to date the erection of these monoliths around the cemetery. Their formal appearance and positioning around the enclosure suggest a one-time action, but it is impossible to determine whether this was concurrent with the human and animal burials from the original phase of the cemetery (at least the first half of the 4th millennium BC) or the building of the mound over the entire cemetery with the outer stone skirting (most probably in the mid-2nd millennium BC). The technique for mounting the long stones upright suggests ties with an analogous technique for the construction of mounds during the functioning of the C-Group in the Nile Valley (see above, § 2.1).

It is also impossible to determine when the stone steles collapsed. In 2010, they were all seen tumbled to the ground in different directions [*Table 3*]. Many smaller pieces of stones once supporting the upright monoliths were found next to some of them; others did not have as much, if at all [see *Figs 46, 47*].

Fig. 47. The original surface around stele S.5

Table 3. Large steles surrounding the enclosure at Wadi Khashab

Stele	Length (m)	Falling direction
S.1	2.05	west
S.3	2.55	south
S.4	1.72	southeast
S.5	2.30	northeast
S.13	2.09	east

2.2 Cluster of small steles and pavements (WKh2)

2.2.1 Central structure WKh2

A cluster of stones less than 1 m long is located 50 m northwest of the burial enclosure. The site, codenamed WKh2, was noted already in 2010. It also comprises a series of small stone steles dug into the ground in a zone extending 20 m from the central cluster. The latter is composed of a few dozen stones gathered on the surface in an area 5 m in diameter, occasionally one above the other [see *Figs 6, 48*]. None of them have any patinated surfaces, hence they were not dug into the ground and should therefore be considered as supporting objects, like the big monoliths from around the cemetery (see above, § 2.1.5). Alternatively, they may have once formed part of a windbreak for a fire or a shelter of which nothing has remained. It is impossible to determine the function of this part of the site or even its chronological relation with the WKh1 ceremonial complex. The two zones may be connected with one another chiefly because they are situated on the same axis (315°) that runs through most of the ceremonial remains (animal burials, feature F.2 and the monolithic steles around the cemetery) and the central structure of WKh2.

2.2.2 Small steles around the central cluster WKh2

Spread around the central cluster WKh2 [see *Fig. 48*] are stone elements either still fixed in the ground (now heavily cracked) or relatively recently removed from their place, as indicated by the differently patinated parts that had been underground; finally, there are also stones of analogous size, but without any clear evidence of being stuck in the ground. Only the position of steles still in place is certain, the rest are in secondary positions, presumably close to where they had once stood [*Fig. 50*].

One should note that some of the blocks of stone are eroded like natural rock, fissured along natural breaks in the rock [*Figs 49A–B, 50*]. Natural and anthropogenic factors are equally responsible for the current state of many of the installations. It may be assumed that most of the flat and relatively small pieces of stone around some of these steles can be a product of their erosion rather than the existence of multiple other steles in one spot. To test this hypothesis, the ground around stele S.16 was cleared, revealing no sign of any other hole which could have served to mount another stele immediately next to the one still stuck in the ground. Instead, two fragments lying nearby could be recomposed with the still standing piece to reconstruct its original height [*Fig. 51*].

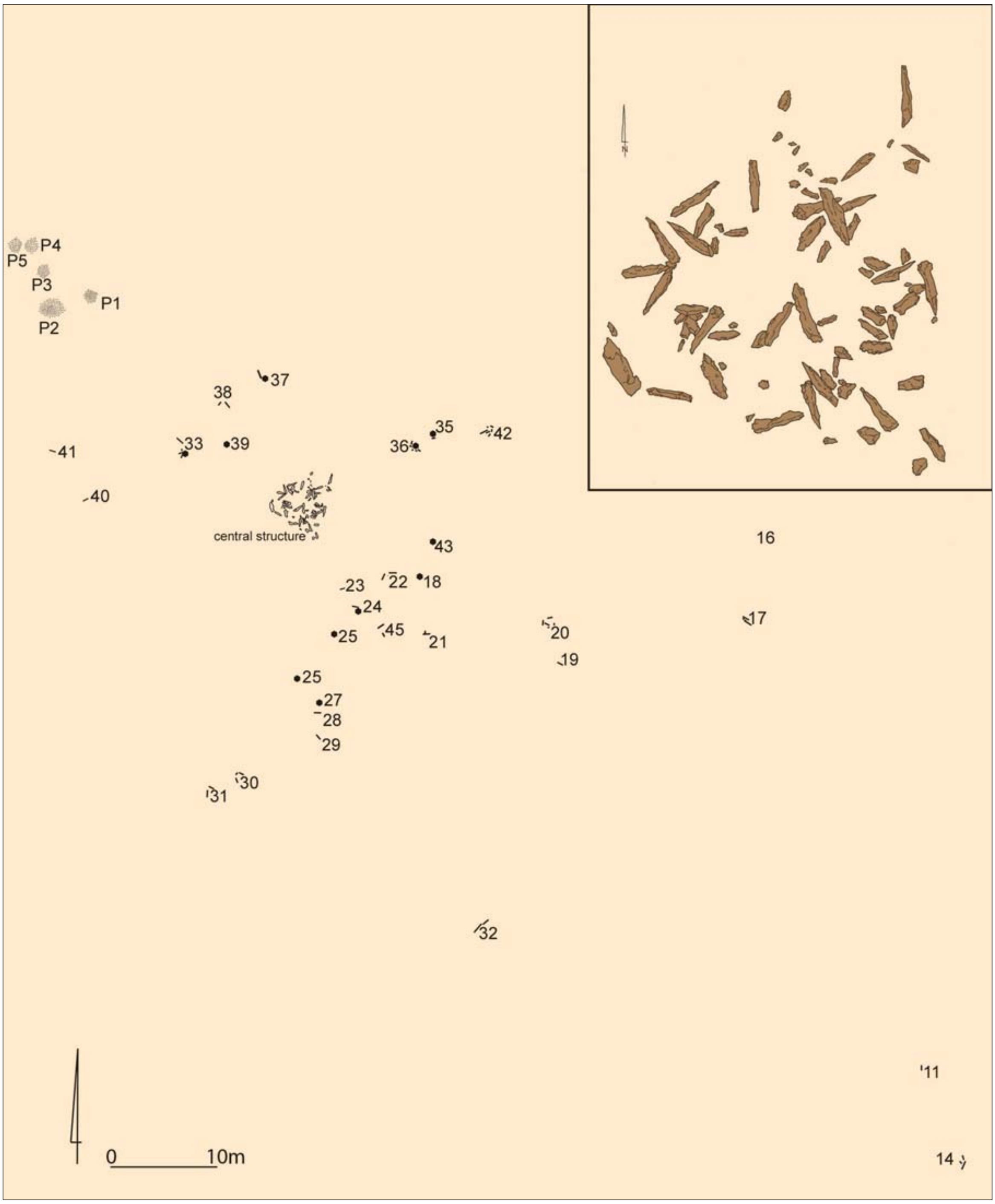


Fig. 48. Cluster of small stone steles around the installation WKh2; inset, detail of the central structure

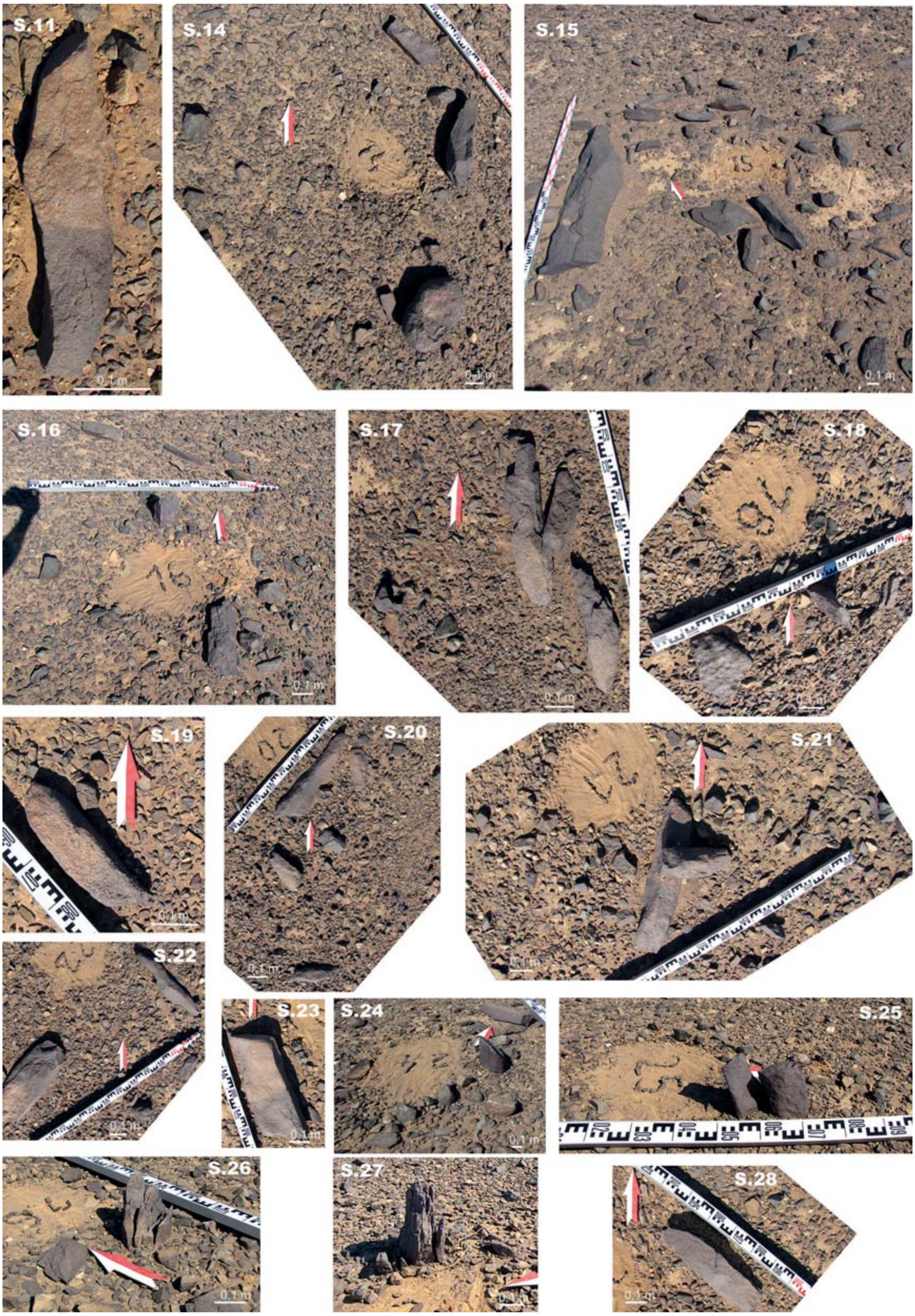


Fig. 49A. Small stone steles and their fragmented remains (S.11 through S.28; the numbers refer to the plan in *Fig. 48*), some *in situ*, showing natural fracturing of the stone, many with clearly differentiated patina on the surface; instances of presumed re-deposition of broken fragments of different steles

Fig. 49B. Small stone steles and their fragmented remains (S.29 through S.45; the numbers refer to the plan in *Fig. 48*), some *in situ*, showing natural fracturing of the stone, many with clearly differentiated patina on the surface; instances of presumed re-deposition of broken fragments of different steles

List of identified stele positions [see *Fig. 49A–B*]:

S.11 – the part with the lighter shade of the patina was stuck in the ground;
S.14 – shattered naturally into several pieces;
S.15 – large number of small pieces of stone, possibly the result of deliberate breaking (vandalism) or reuse of the stone;
S.16 – preserved in fragments, the lower part in position (for a reconstruction, see *Fig. 51*);
S.17 – clearly differentiated patina; stele naturally fractured into three pieces;
S.18 – lower part still fixed in the ground;
S.19 – clearly differentiated patina;
S.20 – preserved in fragments; clearly differentiated patina;
S.21 – preserved in fragments; the part now underneath bears traces of differentiated patina;
S.22 – preserved in fragments, possibly different broken steles re-deposited together, both with differentiated patina;
S.23 – differentiated patina;
S.24 – lower part, fractured, still in position [*Fig. 50*];
S.25 – lower part, fractured, still in position;
S.26 – preserved in fragments, the lower part fractured but still in position;
S.27 – lower part fissured but still in position;
S.28 – clearly differentiated patina;
S.29 – clearly differentiated patina;
S.30 – preserved in fragments or a clustering of fragments from different steles; differentiated patina;
S.31 – preserved in fragments or a clustering of fragments from different steles; differentiated patina;
S.32 – preserved in fragments or a clustering of fragments from different steles; differentiated patina;
S.33 – preserved in fragments or a clustering of fragments from different steles;
S.34 – preserved in fragments; the lower part fissured but still in position;
S.35 – lower part fissured but still in position;
S.36 – preserved in fragments, lower part fissured but still in position;
S.37 – preserved in fragments, lower part fissured but still in position;
S.38 – preserved in fragments or a clustering of fragments from different steles; differentiated patina;

Fig. 50. Stele S.24 preserved in fragments; the lower part (by the arrow pointing north) still in position

S.39 – lower part still in position;
S.40 – clearly differentiated patina;
S.41 – clearly differentiated patina;
S.42 – preserved in fragments, at least one piece with clearly differentiated patina;
S.43 – lower part still in position;
S.45 – preserved in fragments or a clustering of re-deposited fragments from different steles.

Fig. 51. Stele S.16 reconstructed from pieces, the ground around it cleared of overlying stone detritus; in the near background, the central installation of WKh2 and the cemetery enclosure WKh1 in the distance

2.2.3 Stone pavements

Stone pavements were features located, like the others, on the Wadi Khashab axis (315°), approximately 30 m northwest of the central cluster of WKh2 [see *Fig. 48* top left]. They were of roughly oval shape, not exceeding 1 m in diameter. The small chips of stone used to make them were usually no bigger than 10 cm across; a large slab in pavement P.1 was the sole exception. No regularity of arrangement was noted, nor were there strictly defined boundaries to the pavements [*Fig. 52*].

The pavement with the larger slab was cleared [*Fig. 52* top right] and tested to see whether or not it marked an underground deposit. There was no structure under it. Nor were there any artifacts (pottery, bones, burning, etc.) among the stones that could suggest a function and date for this installation. The same was true of the remaining four pavements clustered in this place.

Analogous pavements of this kind have been recorded in the Eastern Desert (Vermeersch et al. 2005) and interpreted as testimony of Neolithic cultures reaching out into this region (like in the case of other finds from the much vaster region of the Sahara [Gabriel 1987]). They are commonly described as fireplaces or “steinplatze”.

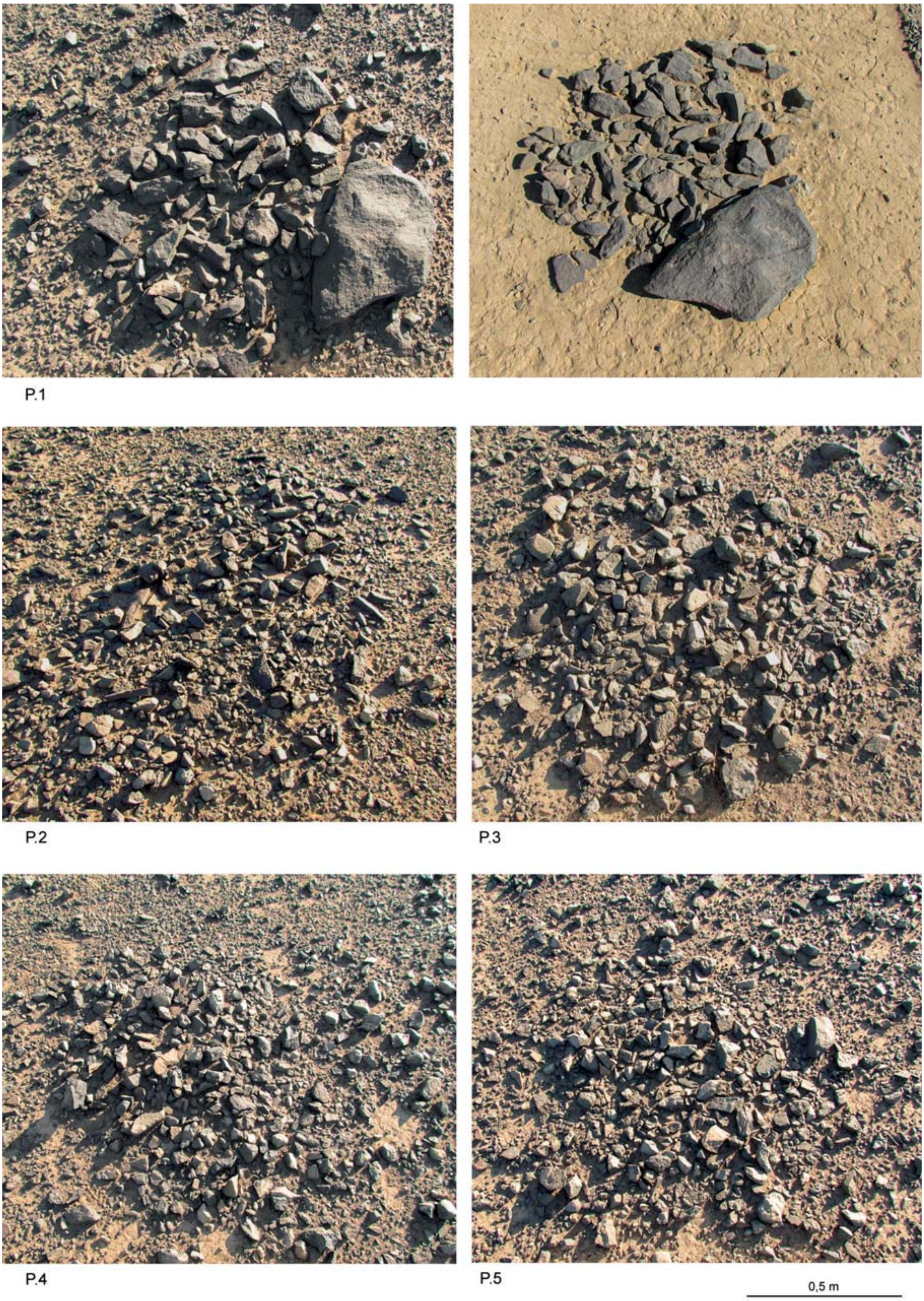


Fig. 52. Stone pavements at WKh2; top right, pavement P.1 after cleaning

2.2.4 Fringe installation WKh2a

This isolated installation is the northwesternmost element of the Wadi Khashab complex, some 200 m away from the monolithic stone stele S.13, which stands at the southeastern corner of the complex [see *Fig. 13*]. It is made up of three small stone steles, all still fixed in position. The stones themselves are also of different shape than the long and narrow pieces used for making the steles in the WKh2 cluster. The stones are flat and wide, the corners rounded [*Fig. 53*]. The arrangement—one stele lengthwise and two crosswise with a space in between, vividly recalling the aperture and sight of a traditional viewfinder—may be an indication of the function of this installation. If the thinking here is correct, then the installation would have been used to sight the direction straight to the east.

Fig. 53. Installation WKh2a, looking southeast with the other elements of the Wadi Khashab complex in the background; top, looking east through the "viewfinder"

With no cultural artifacts whatsoever from the vicinity of this installation, its chronology remains unknown: it could equally well be part of the prehistoric ceremonial complex as a trace of the ephemeral presence of nomads at a much later date. The same reflection stands for all the installations discussed here. The devastated central installation at WKh2 as well as the installation of small steles around it, the arrangement illegible due to devastation, and even the set of stone pavements could have belonged to the nearby ceremonial complex of Neolithic origin—an analogous structure is known from Nabta Playa in the Western Desert (Wendorf and Schild 2001). However, a much later date cannot be excluded, assigning these installations to occupation by people penetrating the wadi in the vicinity of the prehistoric mound, which is, and must have been equally so in the past, a distinctive landmark in this part of the Red Sea Hills.

Chapter 3

ARCHAEOZOOLOGICAL SOURCES

The archaeozoological research included species and anatomical identification, age evaluation based on the ontogenetical development of the skeleton and the state of the dentition (Lutnicki 1972; Müller 1973; Amorosi 1989; Węgrzyn et al. 1994; Lasota-Moskalewska 2008). Sex had to be identified based on the width–length indicators of the metatarsal and metacarpal bones (Howard 1963; Wiig 1985; Telldahl et al. 2012) and pelvis morphology (Grigson 1982), because the frontal bones of all the bovine skulls were damaged and the horncores were not preserved. The sex of sheep was identified based on the horncores (Lasota-Moskalewska 2008) and skeleton morphology (Ruscillo 2003). Measurements followed standard methodology (Driesch 1976). Calculations of height at the withers were done applying the appropriate coefficients for cattle (Fock 1966; Matolcsi 1970) and sheep (Teichert 1975; Driesch and Boessneck 1985). The skeletons were checked for pathological changes and|or post-depositional damage.

Aiming at the most comprehensive analysis of the morphology of cattle and sheep from Wadi Khashab, the standard comparative studies of specific osteometric data (e.g., Meadow 1999; Pöllath and Peters 2005; Chaix 2007) were supplemented with the point method (Lasota-Moskalewska 2008). This method requires converting nominated measurements into points that are non-nominated and then comparing the two on a 100-point scale. On this scale 0 indicates the smallest and 100 the largest measurement value for a given characteristic of a given species and a given geographical zone. Whatever the characteristic, 30 points always correspond to 30% of the maximum spread of the measurement values. For the purpose of analyzing the morphology of the cattle and sheep from Wadi Khashab, point scales were prepared for the population from the Nile Valley based on osteometric data of cattle, aurochs and sheep from archaeological collections at many different sites in Egypt and Sudan, spanning a very broad time spectrum, for example, Merimde (Neolithic), Maadi III (Predynastic, 4th millennium BC), Adaïma (Predynastic, 4th millennium BC), Kerma (2500–1500 BC), Tell el-Dab'a (3rd century BC), Berenike Trogodytica on the Red Sea (1st century BC–5th century AD), Meroe (1st–2nd centuries AD), Selib (1st–2nd centuries AD), Muweis (1st–3rd centuries AD), Gebel Barkal (1st–3rd centuries AD), el-Zuma (5th century AD), Old Dongola (6th–17th centuries AD), Soba (6th–9th centuries AD) and Banganarti (7th–12th centuries AD).

3.1 Cattle

3.1.1 Burial F.1

Domestic cattle (*Bos taurus*, Linneus 1758)
♂, 4–5 years, withers height (WH) 135 cm

The skeleton is almost complete [*Fig. 54; Table 4:A*]. A single individual was buried in the grave, the body lying on the left side, aligned north–south, head to the north-northwest. The anterior limbs were strongly contracted under the body, the left limb maximally pulled up to the chest, the right slightly more free. The posterior|pelvic limbs were also contracted and pulled up to the abdomen. The right-side anterior and posterior limbs were crossed under the abdomen in the metapodial sections. The body was fitted precisely into an oval pit [see *Figs 21–23*]. The bones were damaged extensively due to diagenetic factors, that is, water and temperature. Observed serious loss of collagen, friability and powdering. Cortical bone slightly mineralized.

Cranium. Cranial fragments were the least well preserved elements of the burial [*Fig. 55*]. Destroyed bones included the frontal bones (*os frontale*), temporal bones (*os temporale*) and facial bones: nasal (*os nasale*) and lacrimal (*os lacrimale*). The horncores were also lost. Fragments of the jaw (*maxilla*) and the lower parts of the orbits and occipital bone (*os occipitale*) were observed.

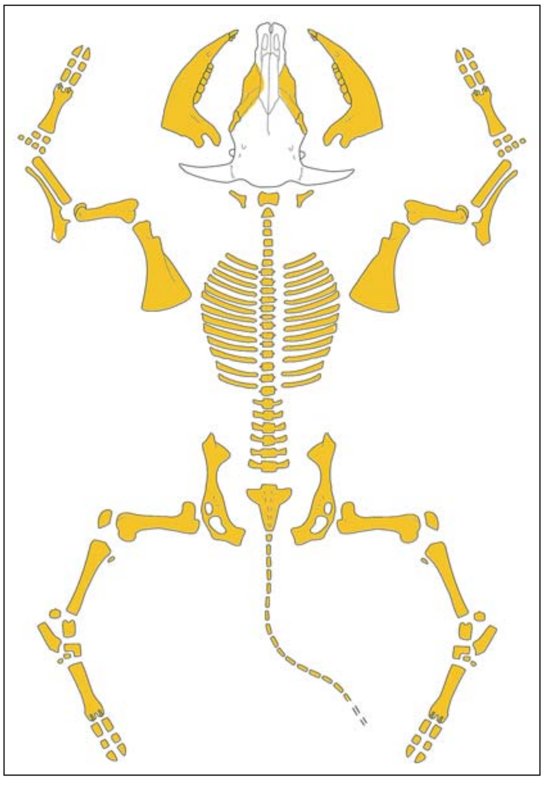


Fig. 54. Burial F.1 (cattle): preserved elements of the skeleton

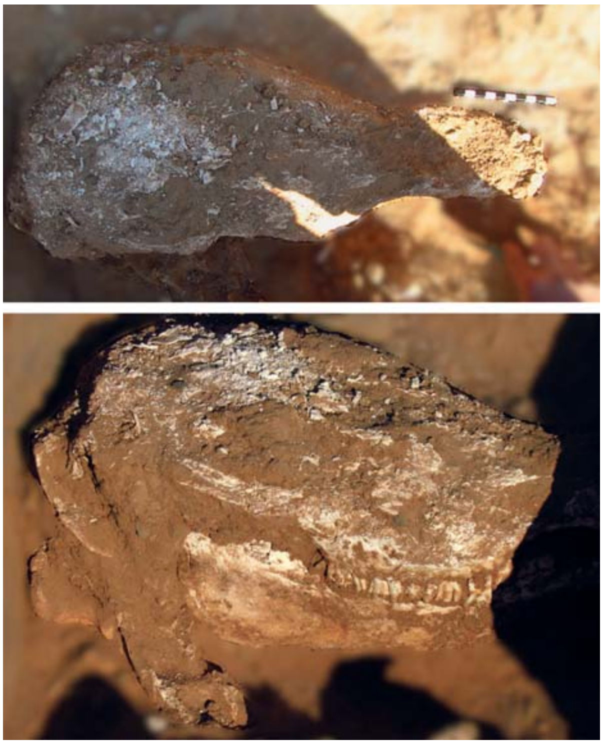


Fig. 55. Burial F.1 (cattle): state of preservation of the skull, top and right-hand-side views

Dentition. The teeth from the upper dental arches were well preserved, complete on both sides, the necks tartared (*cementum*). The mandible survived except for the part with incisors observed *in situ* and the branches of the jaw [*Fig. 56* top]. The heavy wear of the crowns of the incisors, especially I1, I2, and to a lesser degree I3, is noteworthy [*Fig. 56* bottom]. The premolars and molars were in very good condition. The dentition was complete and the teeth all permanent. Tartar also partly coated the teeth in the mandible. Based on the dentition, the age of the animal can be estimated at 4–5 years (Müller 1973).

Vertebral column. The spine was well preserved. No pathological changes could be observed. There was no bifurcation of the spinous processes (*processus spinosus*) either in the thoracic or the lumbar parts, although the processes were strongly elongated and distinctly thickened at the ends [*Fig. 57*]. The ribs were in very poor condition; they had to be examined *in situ*. No irregularities or pathological changes could be observed. The sternum also did not show any pathological changes or irregularities. The tail was lowered, alongside the body.

Fig. 56. Burial F.1 (cattle): dentition

Fig. 57. Burial F.1 (cattle): thoracic spinous processes: top, *in situ* and, bottom, after exploration

Scapulae. Both the right and left shoulder bones (*scapula*) were well preserved except for the *spina scapulae*, which was crushed insignificantly. The ossification process was complete. No pathological changes were observed.

Humerus. The right humerus was preserved very fragmentarily, the left one was in much better condition. The process of ossification was complete. No pathological changes or irregularities were observed.

Antebrachial skeleton [*Fig. 58:B*]. The right radial bone was poorly preserved. Loss of organic components resulted in a large part of the diaphysis and epiphysis being crushed. The left bone under the body was in somewhat better condition; it had become partly mineralized. The preservation of the ulna was similar. The ossification process was complete in the zeugopodium section.

Carpal bones (*ossa carpi*). All the carpal bones were recorded in anatomical position.

Metacarpals. The right metacarpals III and IV were so poorly preserved that only their position could be determined; the left ones were in better condition [*Fig. 58:C*], placed close to the chest, reflecting how strongly the left leg had been pulled up. Ossification was complete. No pathological changes or irregularities of build could be seen.

Phalanges (*ossa digitorum manus*). The right limb digits were in much poorer condition than their left counterparts, but even so, all the digits of the anterior limbs were recorded in place. All the epiphyses were completely fused with the diaphyses. No pathological changes were noted. A characteristic positioning of the digits—unnaturally straight and spread out—betrayed post-depositional postmortem rigidity (*rigor mortis*) [*Fig. 58:A*]. In view of this observation it may be assumed that the body was laid in the grave shortly after the death of the animal (two to four hours), because only then such a precise positioning of the digits would be possible.

Pelvic girdle (*cingulum membri pelvini*). The right side was in much worse condition compared to the left. Observation and measurements were possible only *in situ*. A large fragment of the left side of the pelvis was excavated. It was fused together by ankylosis. The morphometrics of the pelvis suggest a male.

Femur (*os femoris*). Both femur bones were strongly pulled up to the abdomen. Again, the right bone was fragmentarily preserved, almost totally crumbled, while the left one was in relatively good condition. Ossification had been completed. No pathological changes or irregularities have been noted.

Patella (*patella*). Both patellae were recorded in their natural anatomical position. No irregularities were noted.

Tibia (*tibia*). Both tibia bones were in natural anatomical position. While both the femurs were pulled up to the abdomen, the back zeugopodium revealed differences in the arrangement of pelvic bones. The right limb was evidently more drawn up and bent at the knee and ankle joints. The left one was positioned parallel to the body, alongside the abdomen. The knee and ankle joints were practically straight. The right tibia was less well preserved than the left one, and especially its epiphyses, but the left bone could be measured. The ossification process and fusion of the epiphyses was complete. Pathological changes were not noted.

Tarsals (*ossa tarsi*). All the tarsal bones were in anatomical position. Bones of the right side were in slightly poorer condition. Metatarsals III and IV (*os metatarsale* III and IV) [*Fig. 58:D*] of the right side were positioned on top of the left tibia. The right metapodium was preserved in worse condition than the left one. Ossification of both bones was complete. Pathological changes or irregularities were not observed.

Phalanges (*ossa digitorum pedis*). All the phalanges were found in anatomical position. Some of the digits could be recorded only *in situ* because of the degree of deterioration, which was influenced by the location of the burial. Bones nearer to the ground surface would have been more exposed to the penetration of rainwater.

Fig. 58. Burial F.1 (cattle): front and back limb bones: A – limbs *in situ*; B – brachial and antebrachial bones; C – metacarpals; D – metatarsals

3.1.2 Burial F.3

Domestic cattle (*Bos taurus*, Linneus 1758)
♂, > 4 years, WH about 150 cm

Fragmentarily preserved skeleton, discovered and collected during the first reconnaissance at the site [*Fig. 59; Table 4:B*]. Broken animal bones were noted alongside a pit evidencing modern robbing, which had disturbed the anterior limbs and neck of the animal. Six cervical vertebrae (*vertebrae cervicales*) were preserved in relatively good condition, whereas two scapulae were quite fragmented [*Figs 60, 62*], the left one preserved as a slightly bigger fragment. No pathological changes were observed in the preserved ventral angle (*angulus ventralis*) of the bone.

Humerus. Parts of both long bones: the left one reconstructed from fragments, the right one preserved only in the distal part [*Fig. 61:A*]. Full ossification was noted on the preserved parts. No irregularities or pathological changes were observed. The color of the breaks and the fact that one of the long bones could be reconstructed are proof that the fragmentation occurred relatively recently, already after the bones had been thrown out of the grave.

Radius. Numerous fragments of the forelimbs could be reconstructed to a limited extent [see *Fig. 61*]. The left bone was in better condition, the right one more damaged structurally, brittle and powdering. In both of the bones, the epiphysis was completely fused with the shaft. No pathologies or irregularities were noted, while the fragmentation was evidently due to modern

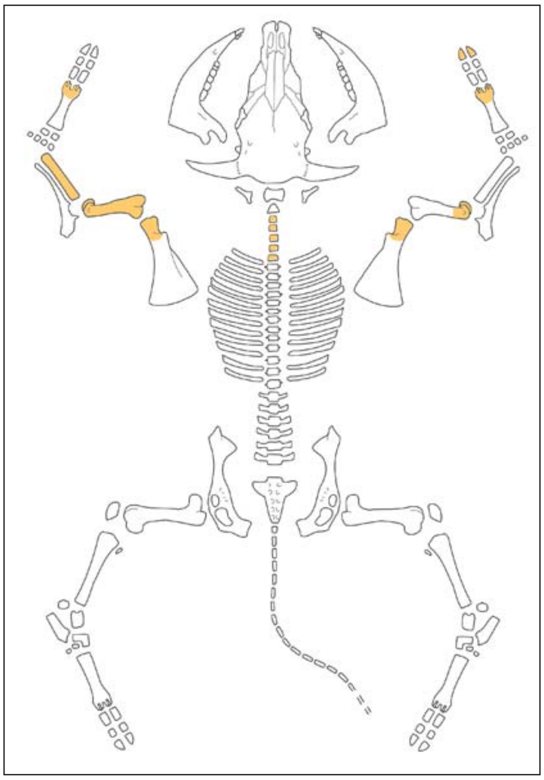


Fig. 59. Burial F.3 (cattle): preserved elements of the skeleton

Fig. 60. Burial F.3 (cattle): cervical vertebrae

Fig. 61. Fragmentary bones from burial F.3 (cattle):
A – humeri; B – ulna; C – radii; D – metacarpals; E – phalanges III

robbing. The olecranion was also fragmentarily preserved, as were the metapodium and acropodium. Only the distal epiphyses remained fully fused with the surviving pieces of the shafts of metacarpal bones. The left one was in better condition in terms of its structure. Once again, there were no pathological changes or irregularities. Two of the digit III bones from the right anterior limb were collected for analysis; they were preserved whole, although much demineralized, which resulted in their brittleness and powdering [see *Fig. 61:E*].

Fig. 62. Burial F.3 (cattle): scapulae

Despite the damage to this skeleton, it was possible to reconstruct some of the data concerning this burial. The differentiated state of preservation of the bones from the lateral sides of the body suggested that the animal had been laid in the grave pit most likely on its left side. The bones from this side of the animal were better preserved, following a rule observed during the excavation of other burials at Wadi Khashab, where the side of the animal on which it had been laid was always structurally stronger. Osteometric comparison of the animal from burial F.3 with the other excavated individuals demonstrated it to be the biggest and most massive individual here. It appears to have been fully mature, that is, over 4 years old. On morphological and osteometric grounds, the animal should be considered a mature male.

3.1.3 Burial F.4

Domestic cattle (*Bos taurus*, Linneus 1758)
♂, 2–2.5 years, WH about 145 cm

Fragmentarily preserved individual, the bones largely damaged by modern robbing [*Fig. 63; Table 4:C*], leaving only the bones that were discarded by the robbers next to the walls of the original earth pit [see *Figs 26, 64*]. The pit was relatively shallow, oval in outline and oriented northeast–southwest, the head to the northeast. The animal had been buried on its left side, the limbs strongly contracted under the body. The head was leaning with its left side against a stone slab reinforcing the side of the pit in this place; it was placed with the frontal bone upward. The limb bones of the animal were located close to the top of the shallow pit, which resulted in severe brittleness due to diagenetic factors, to which damage due to vandalism was only added.

Cranium. The skull was the best-preserved part of this skeleton despite being positioned just under the surface and presumably undergoing the procedure of horn removal that significantly damaged the neurocranium [*Fig. 66*], resulting in disintegrated frontal, nasal, lacrimal and parietal bones. Residual fragments, observed *in situ*, included the maxilla, incisive, zygomatic and occipital bones. The teeth of the upper right row were relatively well preserved. All the cheek teeth were permanent and fully erupted, indicating that the animal was slaughtered sometime between the

24th and 30th month of its life. The condition of the skull excluded exploration and lifting of the bones; therefore, it had to be measured *in situ*. The mandible was preserved mainly on the left side, with the *corpus mandibulae*, the row of teeth and the incisive part in relatively good condition, although without the incisors.

Spine. Nothing remained of the axial skeleton. Of the spine only a fragment of the first cervical vertebra (*atlas*) was noted and nothing from the thoracic part.

Anterior limbs. Both anterior limbs from the forearm or zeugopodium were strongly bent at the ankle joints and pressed into the wall of the pit [*Fig. 65*]. The distal half of the radial bone along with carpal, metacarpal and digital bones of the right limb were preserved *in situ*. As for the left anterior limb, the distal epiphysis of the radial bone was preserved along with the carpal, metacarpal and digital bones. The distal epiphyses were not fused, meaning that the animal was slaughtered before reaching the age of 3.5–4 years, when the fusing is complete. No pathological changes were noted, and there were no irregularities to be seen on the preserved pieces of the radii and carpal bones. Epiphyses fusing of the metacarpal bones, which takes place by the age of 2–2.5, was poor. Despite the young age of the individual, which had not completed the growth cycle, the bones testify to a distinctly massive build.

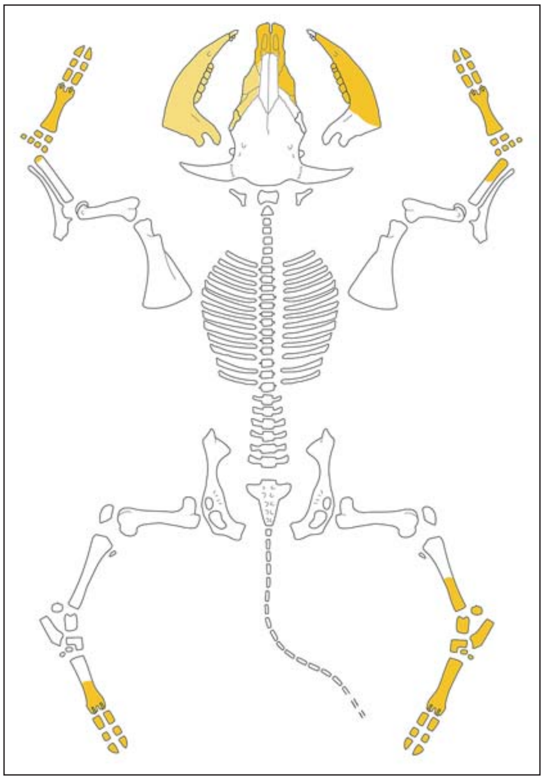


Fig. 63. Burial F.4 (cattle): preserved elements of the skeleton; a lighter shade of yellow indicates bones that could not be measured

Phalanges. The first digits of both limbs demonstrated completed fusing of the epiphyses and shafts, which usually takes place around the 20th–24th month, thus determining the age after which it was slaughtered. Neither of digits II and III revealed any irregularities or pathological changes.

Posterior limbs. The preservation of the pelvic girdle was even more fragmentary. The posterior limbs were reduced to the metapodial and autopodial sections. The positioning of the bones in the pit suggested that the legs had not been pulled up under the body and lay more freely, the left limb slightly closer to the abdomen than the right one, resting against the wall of the pit. The metatarsals were preserved in the distal part from about mid-shaft; the epiphysis was not fused with the shaft. The synostosis of the digits was complete. The spread of the digits in relation to one another was characteristic [see *Fig. 65*], as already seen in burial F.1, and testifying to post-mortem rigidity. The right limb was positioned higher, the digits reaching the top of the pit outline. A whole metatarsal bone with unfused distal epiphysis has been preserved. All the digits were in anatomical position and undisturbed. All three (I, II and III) were fully ossified. They were characteristically bent back. No damages, irregularities or pathological changes could be seen on the remains of the right limb.

Fig. 64. Burial F.4 (cattle): state of preservation

Fig. 65. Burial F.4 (cattle): limbs

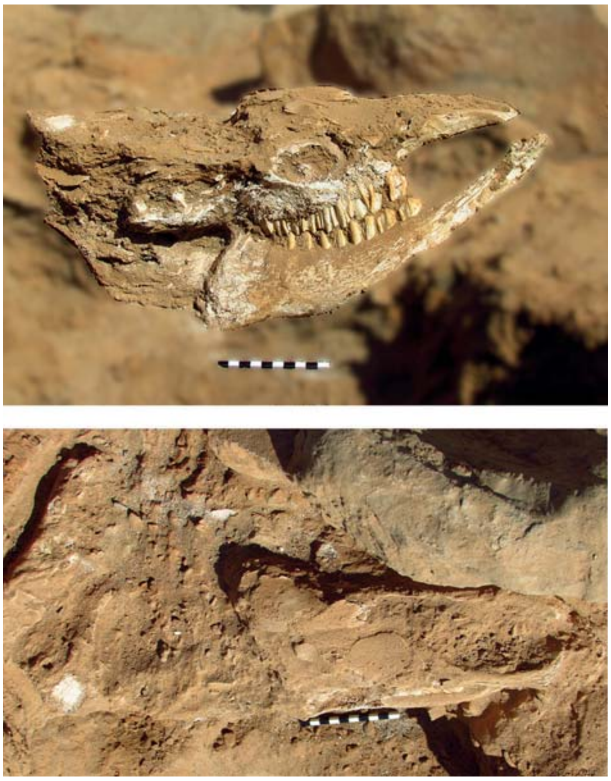


Fig. 66. Burial F.4 (cattle): damaged neurocranium

3.1.4 Burial F.6

Domestic cattle (*Bos taurus*, Linneus 1758)
♀, > 4 years, WH 129 cm

Fragmentary skeleton [*Fig. 67; Table 4:D*]. The body was laid in an oval pit aligned more or less north–south, the head to the north. The animal rested on its right side, the limbs strongly pulled up to the abdomen [see *Fig. 29*]. The position of the head is noteworthy as it appears to have been immobilized with the face down and the occipital part up. A few large stones were used for the purpose. The position demanded that the neck of the animal be bent at an unnatural angle after death [*Fig. 68*]. Modern robbing destroyed much of the skeleton, leaving behind only the bones that were close to the edges of the grave pit, that is, the skull, the cervical part of the spine and the limbs [*Fig. 71*]. The bones of a foetal calf were discovered in the robbers' fill, during exploration of the area around the abdomen of the animal [*Fig. 69*]. These were fragments of the skull, two calcaneus bones and four fragments of the thigh bones (*femur*). In light of this, it is highly likely that a pregnant cow was buried here.

Cranium. The head of the animal was located at the highest level in the burial, obviously making it prone to the most excessive damage of the skull (apart from the hypothetical removal of the bucranium), as was the case in burials F.1 and F.4. The frontal bone with the horncores was completely gone. The specific positioning of the head resulted in the complete destruction of the nape of the neck. Only the occipital condyle and the lateral side of the occipital bone were preserved in this part [*Fig. 70*].

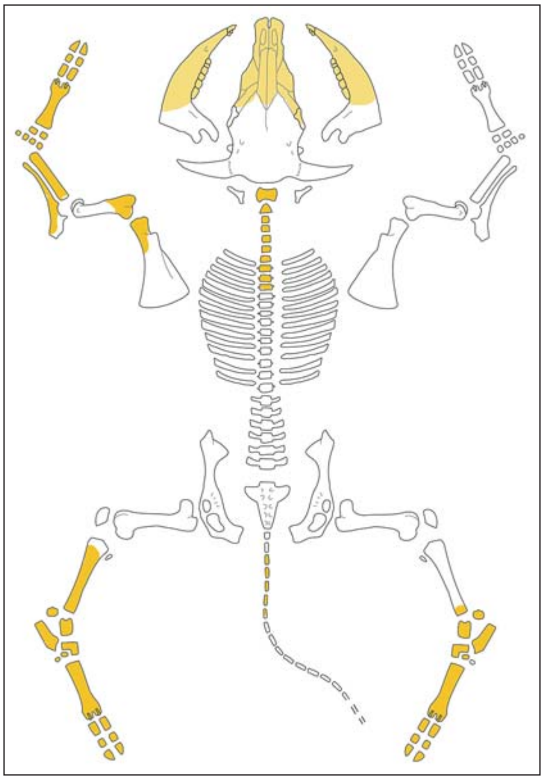


Fig. 67. Burial F.6 (cattle): preserved elements of the skeleton; a lighter shade of yellow indicates bones that could not be measured

Spine. All the cervical vertebrae were in anatomical position, but the first vertebra (*atlas*) was significantly damaged. Four of the first thoracic vertebrae were fragmentarily preserved. The modern robbers' pit destroyed the rest of the axial skeleton as well as the rib cage. Caudal vertebrae were located in anatomical order by the south wall of the pit and aligned with it.

Scapula. A fragment of the right scapula, the ventral angle (*angulus ventralis*), was preserved; slightly less of the caudal margin (*margo caudalis*) than of the cranial one (*margo cranialis*). The *spina* of the scapula was completely destroyed.

Humerus. The left humerus was mostly lost. Only the proximal epiphysis and a small section of the shaft were preserved.

Radius and ulna. Only the right anterior limb was preserved, although the bones of the forearm were severely eroded. The limb rested against the wall of the pit, bent at the carpal joint. The proximal parts of the radius and ulna were not preserved. The proximal epiphysis of the radial bone as well as

Fig. 68. Burial F.6 (cattle): head

Fig. 69. Burial F.6 (cattle): foetal calf remains

Fig. 70. Burial F.6 (cattle): condition of fragments of the skull and the first vertebrae, *in situ*

Fig. 71. Burial F.6 (cattle): skeleton in the pit

the oleocranion were destroyed by the edge of the robbers' pit. The shaft of the radial bone in the distal part was also severely damaged. Carpal bones have been preserved. The bones of the arm and forearm demonstrated full ossification, at least in the preserved elements.

Metacarpals. The right metacarpal bones III and IV were well preserved (*ossa metacarpalia* III and IV). Intensive erosion resulting in surface peeling (most probably due to water action) was observed in the middle part of the shafts. There were no pathological changes or irregularities to be seen on the bones. Sesamoid bones in anatomical position were recorded on the distal part of the metacarpal bones.

Phalanges. The digit I bones were well preserved and in anatomical position. They demonstrated full ossification and nothing in the way of pathological changes or irregularities. Only the left digit II was preserved complete, the right one being damaged most probably during the robbing, and the same can be said of digits III, that is, only the left one is complete.

Pelvic limbs. The pelvic limbs were in better condition. The buried animal had the legs pulled up to the abdomen and bent at the tarsal joints (*articulatio tarsi*), leaning against the wall of the grave pit.

Tibia. The left tibia was in a fragmentary state, preserved only as the distal epiphysis, but in anatomical position, adjoining the ankle bones. It demonstrates damage caused by the robbers'

Fig. 72. Burial F.6 (cattle): limb bones in detail, *in situ*

Fig. 73. Burial F.6 (cattle): A – talus; B – calcaneus; C – metatarsal; D – phalanges I of anterior (left) and posterior (right) limbs; E – phalanges II; F – phalanx III; G – phalanges of the anterior (right) and posterior (left) limbs

pit, which cut through the bones. The epiphyses were fully fused with the shaft. The entire ankle joint was in anatomical position. It showed no irregularities of structure or pathologies.

Metatarsals. The metatarsal bones were in relatively good condition [*Fig. 72*]. Diagenetic factors had the greatest impact on the preservation of the middle part of the shaft. The epiphyses were fully fused with the shafts. No changes of a pathological kind or irregularities in the structure of this bone were noted. The metatarsal sesamoid bone was in undisturbed position. The left foot lay in a position that showed straight joints. An insignificant bend toward the tail was observed only in the proximal interphalangeal joints of the foot. Both digits I were in good condition. The epiphyses were fused with the shafts. Digits II and III were in anatomical position and revealed no irregularities of bone structure or pathological changes.

Pelvis. A bigger fragment of the right pelvic limb was preserved. It rested under the left limb, the metapodium section also leaning against the wall of the pit. The ankle of the limb was bent at a right angle. Practically the whole tibia shaft with the distal epiphysis adjoining the tarsal bones was discovered *in situ*; the proximal epiphysis of this bone was most probably lost to the robbers'. The distal epiphysis was completely fused. No pathological changes or irregularities of bone structure were observed.

Bones of the foot. All the tarsal bones of the left limb were in anatomical position and well preserved [*Fig. 73*]. The left metatarsal bones were also relatively well preserved. Both epiphyses were fully fused with the shafts. No irregularities of the bone structure were noted. All the digits of the left limb were in anatomical position. The limb was bent slightly toward the tail in the intermetatarsal joints (*articulationes metatarsophalangeae*). All the digits of the left pelvic limb were explored. They all appeared to be fully ossified. No irregularities of bone structure and no pathologies were noted.

3.1.5 Burial F.14

Domestic cattle (*Bos taurus*, Linneus 1758)
♀, > 4 years, WH 130.6 cm

Skeleton of a single individual, completely preserved [*Fig. 74*]. The burial was made in an oval pit. There was no evidence of modern robbing [*Fig. 75*; *Table 4:E*; see *Fig. 33*]. The body rested on its right side, aligned northwest–southeast, the head to the northwest. The anterior limbs were freely bent toward the abdomen, the posterior ones almost straight, also pulled up to the abdomen. The lower parts of the pelvic limbs were crossed, the metapodial and autopodial sections of the left limb lying on top of those of the right [see *Fig. 75*].

Cranium. The head was immobilized with a few large stones so that the facial part was turned down, as in the case of burial F.6. Here, as in the other burials, the head was the highest-lying part of the animal, and especially the neurocranium, occipital and frontal bones were immobilized in this, the highest, position. Apart from the hypothetical removal of the bucranium, this position evidently contributed to the dramatically poor preservation of the skull. Indeed, only the splanchnocranium was preserved. A large fragment of the mandible, including the angles, was also destroyed by diagenetic factors.

Vertebral column. The cervical vertebrae, with the exception of vertebrae VI and VII, were also completely decomposed. The rest of the axial skeleton could easily be traced *in situ*. The grave pit in this case appears to have been more circular than the others, which required the body to be more hunched up than in the other cases. Thus the spine was more curved. The rib cage was poorly preserved, hence to be observed only *in situ*. For the same reasons the thoracic vertebrae could not be fully examined, and the spinous processes had to be inspected without lifting. All the vertebrae, from the thoracic to the caudal, were in anatomical arrangement. The tail was laid alongside the wall of the pit.

Scapula. The left scapula was in anatomical position, but could be examined and measured only *in situ* because of poor preservation. The ossification process was complete, and the bone demonstrated no irregularities of structure or pathological changes.

Humerus. The humerus was found in proper anatomical position, although turned at a right angle to the scapula. The state of preservation was generally poor, the proximal part of the shaft having been destroyed just below the proximal epiphysis. Most of the osteometric data had to be recorded *in situ*. Both epiphyses were fully fused with the shaft. There were no irregularities of bone structure or pathological changes to be seen.

Forelimb (left). The left forelimb was bent forward at the elbow joint (*articulatio cubiti*), actually at a right angle in relation to the shoulder. The left radial bone was complete, the epiphyses fully fused with the shaft. There were no pathological changes to be recorded. The ulnar bone was poorly preserved, the oleocranion lost, and only the shaft remained in place.

Metacarpals. All the carpal bones were in anatomical position, the joint bent and the metacarpal and digit bones at a right angle in relation to the forelimb. The distal parts of the anterior limbs rested against the wall of the pit. The left metacarpal bone was uncovered whole; the epiphyses were fully fused with the shaft. Pathological changes were not in evidence, nor were there any observable irregularities of the bone structure. All the digits demonstrated full ossification and no sign of any irregularities or pathologies.

Limbs. The right anterior limb was not uncovered. The poor state of preservation of the bones and the density of the fill with a large number of stones in a pit that was relatively deep argued against completing the excavation, which was taking place at the end of the last, as it turned out, digging day.

Pelvis. The pelvic girdle and limbs lay slightly higher than the thoracic part and head. Since the animal was on its right side, the left one was more exposed to climatic factors and hence in a poorer state of preservation. Despite this, the pelvic bones could be examined, leading to the determination that the animal was a cow.

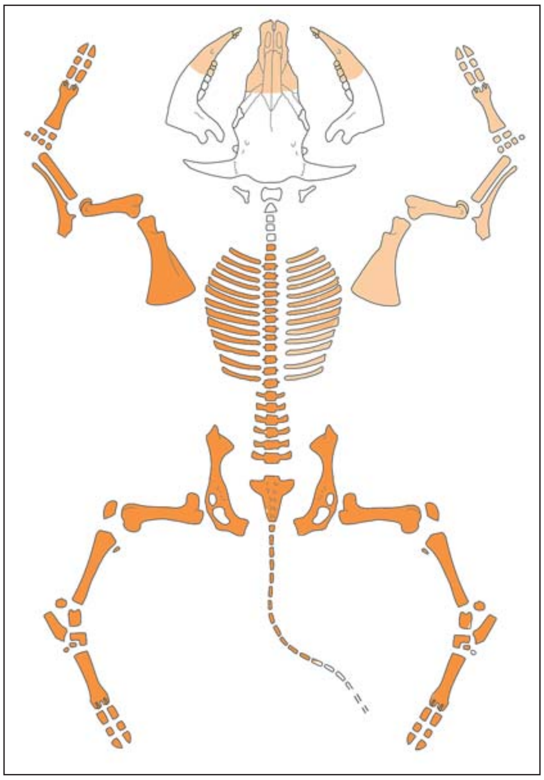


Fig. 74. Burial F.14 (cattle): preserved elements of the skeleton; a lighter shade of pink indicates bones that could not be measured

Femur (left) and patella. The left femur was preserved whole and was discovered in anatomical arrangement. The head rested against the acetabulum of the pelvis. The epiphysis was fully fused with the shaft. The knee joint (*articulatio genus*) was bent at a right angle. The patella was found near the distal epiphysis of the left femur.

Tibia (left). The left tibia was also in place and in anatomical position. The epiphyses were fully ossified and fused with the shaft. The middle part of the shaft of the left tibia rested on the right knee joint. No irregularities of bone structure or pathological changes could be seen on the tibia. The tarsal joint (*articulatio tarsi*) of the left leg was also complete from an osteological point of view and properly built.

Metatarsals (left). Considering the overall poor state of preservation of skeleton F.14, the left metatarsus was very well preserved. It lay in an atypical position, which is noteworthy: the limbs were crossed at the left metapodium and the right tarsal joint. The left metatarsus was fully ossified and revealed no pathological changes. Starting from the metatarsal joint, the limb lay straight with no bending at the further joints. The left-foot digits were also complete. Ossification was complete in all of them. There were no evident irregularities of bone structure.

Fig. 75. Burial F.14 (cattle): top, overview of the grave; bottom right, position of the limbs

Femur (right) and patella. The right femur rested in anatomical position, the head still in the acetabulum. The epiphyses were fully fused with the shaft. No pathological changes or trauma was in evidence. The limb was slightly bent at the knee in a natural position. The right patella was found in its anatomically proper place.

Tibia (right). The right tibia was in very good condition, the epiphyses fully fused with the shaft, without evidence of irregularities or pathological changes. The right metatarsal joint was almost straight, and from an osteological point of view it was complete and showed no morphological irregularities.

Metatarsals (right). The right limb in the metapodial part rested against the wall of the pit. The epiphyses of the metacarpal bones were fully fused with the shafts. The state of preservation was good. Sesamoid bones were recorded in anatomical position. There were no irregularities of bone structure or pathological changes on the right metatarsus. The digit joints were not bent. All the right digits were in good condition, all were fully ossified and showed no pathological changes or degenerative disease. The digits of the right pelvic limb rested directly next to the digits of the left thoracic limb.

None of the burials yielded any artifacts that were not natural parts of an animal skeleton.

3.2 Sheep

3.2.1 Burial F.7

Sheep (*Ovis aries*, Linneus 1758)
♂, 3–4.5 years, WH 75 cm

Complete skeleton, found in a small, deep pit, without traces of modern disturbance [*Fig. 76*; *Table 5:A*; see *Fig. 37*], hence well preserved. The bones were extremely brittle and easily broken due to a severe loss of collagen, but on the whole the skeleton was in very good condition.

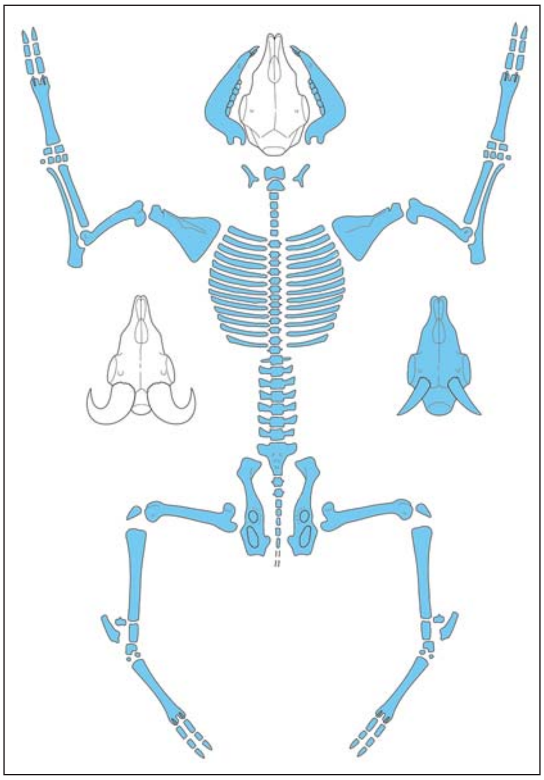


Fig. 76. Burial F.7 (sheep): preserved elements of the skeleton

Cranium. The cranium was complete [*Fig. 77*], but damaged by diagenetic factors in the section of the right supraorbital margin (*margo supraorbitalis*) and the left nasal bone (*os nasale*). A relatively small horncore (*processus cornuales*) was preserved on the right side, pointing down outside the skull; the left one was lost. A full set of teeth was preserved in the upper right and left dental arches; all the teeth were permanent. The mandibles were also in excellent condition except for slight damage to the angle of the jaw. The teeth in the lower dental arches were complete and all permanent.

The extensive wear of the crowns of teeth M1 in the jaw is noteworthy as it seems to be deliberate rather than the effect of a natural occlusion defect.

All the cervical (*vertebrae cervicales*), thoracic (*vertebrae thoracicae*), lumbar (*vertebrae lumbales*), sacral (*os sacrum*) and caudal (*vertebrae caudales*) vertebrae were in place. The spine showed no irregularities of build or pathological changes. All the ribs (*costae*) and the sternum (*sternum*) were also in place and devoid of any traces of illness or irregular bone structure.

Scapula (*scapula*). The right scapula could be examined *in situ*, but the cortical bone had been severely demineralized due to diagenetic factors. The shoulder bone crest (*spina scapulae*) had been crushed in part, and the ventral angle (*angulus ventralis*) had broken away and been crushed. The left scapula was in much better condition, showing less extensive damage due to atmospheric conditions.

The proximal epiphysis (*epiphysis proximalis*) of the right humerus (*humerus*) was seriously damaged; the shaft of this bone and the distal epiphysis (*epiphysis distalis*) were in sufficiently good condition to be excavated and measured in detail. No pathological changes could be observed on either of the humeri. The epiphyseal fusing was complete in both cases.

Antebrachial skeleton. Bones of the antebrachial skeleton were discovered in undisturbed anatomical position. There was no major damage. Both the radius and ulna were fully formed and ossified. Nothing in the way of pathological changes or irregularities of bone structure was apparent.

Metacarpals. The right and left hand bones (*skeleton manus*) were in anatomical position. All the carpal bones (*ossa carpi*) were in place, as were metacarpals III and IV (*os metacarpale* III and IV) and digits (*ossa digitorum manus*). The epiphyseal fusing of all the bones was complete. All were fully formed, properly structured and healthy.

Fig. 77. Burial F.7 (sheep): skull and mandible

Pelvic girdle. All the bones (*ossa membri pelvini*) were in anatomical order. Diagenetic factors affected mainly the pelvis (*os coxae*), but even so this part of the skeleton showed no evidence of pathological changes or irregular build.

Diagenetic factors were also responsible for the decidedly worse state of preservation of the right femur (*femur*) compared to the other osteological parts of the pelvic limbs. The proximal epiphysis (*epiphysis proximalis*), including the head of the femur (*caput ossis femoris*), were crushed, while the distal part of the shaft and the distal epiphysis (*epiphysis distalis*) were preserved in good condition. The left femur had no major damages [*Fig. 78:A*]. Both limbs were strongly bent at the hips (*articulatio coxae*), and the same could be observed for the knee joints (*articulatio genus*). Both tibiae (*tibia*) were also in good condition and without evidence of damage [*Fig. 78:F*]. All the epiphyses of bones making up the lower leg skeleton (*skeleton cruris*) were fully ossified

Fig. 78. Burial F.7 (sheep): A – left femur (two aspects); B – metatarsal; C – tibia; D – tarsals; E, F – phalanges of the posterior limb (two aspects)

and fused with the shafts. No evidence of irregularities of bone structure or pathological changes could be observed.

The pelvic limbs were also strongly bent at the tarsal joints (*articulatio tarsi*). The metatarsals (*ossa metatarsi*) were at a right angle to the tibiae. All the tarsal bones (*ossa tarsi*) were in position and revealed no irregularities of build [*Fig. 78:D*]. The metatarsals on both sides were well preserved and without damage, revealing fully fused epiphyses [*Fig. 78:B*]. No pathological changes were observed in the metapodial part of the pelvic skeleton. On the whole, the legs of the sheep were preserved intact and in anatomical order, with all the digit bones fully formed and with completed epiphyseal fusion. No pathological changes or other irregularities were observed.

3.2.2 Burial F.15

Sheep (*Ovis aries*, Linneus 1758)
♀, > 3 years, WH 68.7 cm

The burial was in very poor condition. The axial skeleton was preserved fragmentarily [*Fig. 79*]; the skull was in slightly better condition and so were some of the limb bones. Diagenetic factors were primarily responsible for the state of preservation of the bones.

Cranium. The cranium was damaged insignificantly in the part of the frontal bone (*os frontale*) and the left bone of the maxilla (*facies facialis*) [*Fig. 80; Table 5:B*]. The animal had no horns.

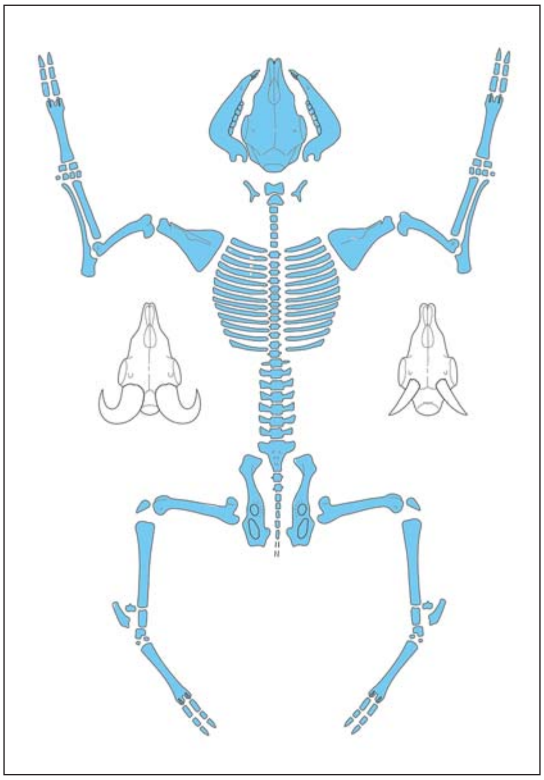


Fig. 79. Burial F.15 (sheep): preserved elements of the skeleton

Fig. 80. Burial F.15 (sheep): skull

A full set of teeth, all permanent, was present in the right and left dental arches. The teeth were coated with tartar, the molar crowns (chiefly M1) especially thickly [*Fig. 81*]. The M3 teeth, particularly the crowns in the distal section, were strongly worn. Apart from this, no other irregularities of structure or pathological changes were observed.

Mandibles. Both mandibles (*mandibula*) were almost complete, missing only the ramus (*ramus mandibulae*). None of the teeth in the dental arches was missing and all were permanent. They, too, were coated with tartar, although in a thinner deposit than that noted on the teeth of the upper arches. Pathological changes were not noted and neither were any irregularities of bone structure.

Vertebrae. The cervical vertebrae (*vertebrae cervicales*) were in fragmentary condition and could be recorded only *in situ*. They were found in anatomical order, but crumbling due to the impact of climatic factors. The state of preservation of the thoracic vertebrae (*vertebrae thoracicae*) and ribs (*costae*) was similar, unlike in the case of the lumbar vertebrae (*vertebrae lumbales*), which were relatively well preserved. The caudal vertebrae were all but gone.

Scapula. The right scapula (*scapula*) remained in good condition, the left could be examined only in the ground. Both were fully ossified. There were no apparent irregularities of bone structure or pathological changes.

Humerus. The left humerus was in good condition. The epiphyses were fully fused with the shaft. No irregularities were noted. The right humerus was almost completely destroyed. The antebrachial skeleton was partly preserved. Only the left radial and femoral bones were in any state to be examined and measured. The right bones had to be observed *in situ* in view of their almost total destruction.

Fig. 81. Burial F.15 (sheep): dentition

Metacarpals. The hand bones (*skeleton manus*) were in relatively good condition. Both the metacarpals (*ossa metacarpi*) and wrists presented the anatomical order. The epiphyses of all the metacarpals had finished fusing with the shafts and the same could be said of the digits. The latter were fully ossified.

Pelvic girdle. The pelvis was preserved fragmentarily. The femur bones were utterly destroyed, none complete, but their position in the burial followed the anatomical order. The femurs were freely laid below the abdomen. The right tibia was at a right angle to the femur. The left limb was slightly more strongly bent at the knee. The two tibiae were in a relatively good state, with the epiphyses being the most damaged, but both well fused with the shaft. No pathological changes or irregularities were observed.

Metatarsals. Most of the tarsal bones were recorded, all discovered in anatomical order. The metatarsals (*ossa metatarsi* III and IV) were positioned at a right angle to the lower part of the limb. They were poorly preserved, only the right one being sufficiently well preserved to be measured.

Phalanges. Water had left the digits in very poor condition, practically destroyed, so they could be observed only in the ground. They were in anatomical order. The ossification process appears to have been complete. A small growth was observed on the shaft of the left digit II, presumably evidence of trauma, which could have caused the animal to be slightly lame.

3.2.3 Burial F.16

Sheep (*Ovis aries*, Linneus 1758)
♂, > 4.5–5 years, WH 75.3 cm

A complete skeleton, preserved in relatively good condition [*Fig. 82; Table 5:C*]. Some parts suffered from the influence of diagenetic factors, mostly water penetration and high temperature. The result was demineralization of the bones, which in effect became very brittle. The compact bone (*substantia compacta*) on the flat bones (*os planum*), such as the skull or irregular bones (*os irregulare*), was peeling and crumbling on the surfaces that were the most exposed to the destructive factors.

Cranium. The cranium rested on the right side, allowing the entire left side to erode away; completely destroyed were the bones on the left: maxilla (*maxilla*), orbital margin (*margo orbitalis*), side of the face (*os faciale*), and the parietal (*os parietale*) and occipital (*os occipitale*) bones. The right side, however, was practically untouched [*Fig. 83*]. It preserved a corneal process turned down and out. All the teeth were present in the upper dental arches. The teeth were all permanent. A very thick coat of tartar on the cheek-side of the premolars and slightly less thick on the molars may have handicapped chewing. One should also note the more extensive wear on the back M3 teeth in the upper arches.

Mandible. The mandible was in better condition than the skull and maxilla, having lost only insignificant parts of the angles. The incisors were not present, but the other teeth were all in place. All were permanent teeth. The missing M1 tooth on both sides of the mandible is noteworthy as the cicatrization of tooth sockets indicates that the teeth had been removed in the lifetime of the animal [see *Fig. 83*].

Vertebrae. The cervical vertebrae (*vertebrae cervicales*) were found in anatomical order and position, but were not well preserved, especially the first (*atlas*) and axis vertebrae. Pathological changes were not recorded, nor was there any damage or irregularity of the neck vertebrae. Other vertebrae: thoracic (*vertebrae thoracicae*), lumbar (*vertebrae lumbales*), and sacral (*os sacrum*), were in satisfactory condition, while the caudal vertebrae (*vertebrae caudales*) had all but disappeared.

Ribs. The ribs (*costae*) could be observed only *in situ* (except for the first pair) and the same should be said of the sternum. The chest skeleton (*skeleton thoracis*) was in anatomical order, preserved sufficiently to show no irregularities of build, damage or pathological changes.

Scapula. The right scapula (*scapula*) solely was in good shape, the left one heavily damaged. Both bones were fully ossified and revealed no irregularities of bone structure.

Humerus. The right humerus was also in good condition except for the slightly damaged lesser tubercule (*tuberculum minus*). The compact bone structure of the left humerus was completely crushed.

Antebrachial skeleton. The bones of the right and left antebrachial skeleton (*skeleton antebrachii*) were at a right angle to the arm bones, even though the bend in the elbow joint (*articulatio cubiti*) was not too strong. The radial bones had the epiphyses fully fused with the shafts. The left radius was completely destroyed and was recorded only as far as it could be observed *in situ*. In the case of the right bone, the central part of the shaft had decomposed completely.

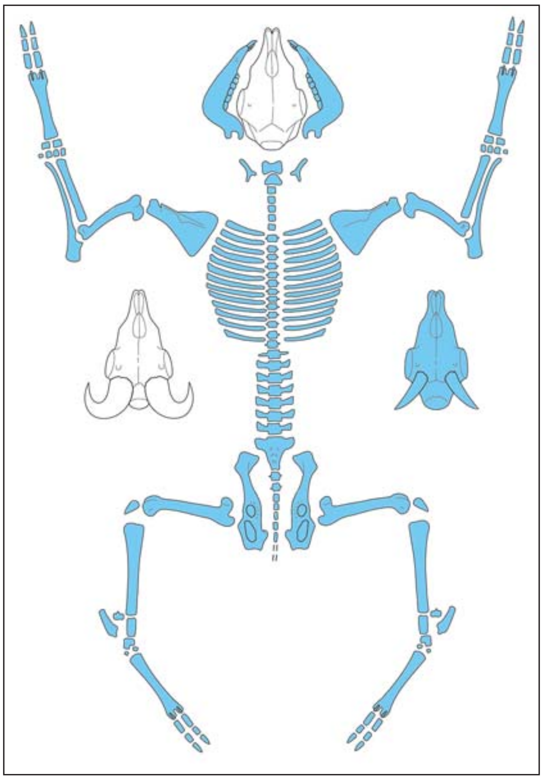


Fig. 82. Burial F.16 (sheep): preserved elements of the skeleton

Fig. 83. Burial F.16 (sheep): skull and mandible

Metacarpals. All the metacarpal bones were in place. Both limbs were bent at the carpal joints (*articulatio carpi*), the bones at a right angle to the antebrachial part of the skeleton. The left metacarpals III and IV (*os metacarpale* III and IV) were severely damaged, with the compact bone structure practically removed from the entire surface. The right metacarpals were in much better condition. Both showed complete fusion of the epiphyses with the shafts. The digits were in a straight position. All the left-side digits (*ossa digitorum manus*) were in place, but the right-side ones were destroyed. All digits had full fusing of the epiphyseal surfaces. There were no apparent changes caused by diseases or any other irregularities of the bone structure.

Pelvis. The bones of the pelvic limbs (*cingulum membri pelvini*) were in relatively good condition. The pelvis (*pelvis*) rested on the left side in anatomical order. The ossification of the ischial tuberosity had reached completion (*tuber ischiadicum*).

Femur. Both femurs were in anatomical order, and the heads (*caput ossis femoris*) rested in the acetabula. The right limb was bent maximally at the hip (*articulatio coxae*), the left one in a more relaxed position. The greater trochanter (*trochanter major*) of the right femur was slightly damaged, the surface beginning to peel away. The rest of the bone, like the left femur, was in good condition. The epiphyses of both bones were fully fused with the shafts. There were no pathological changes or irregularities of bone structure.

Posterior limbs. The lower limbs were positioned differently, but both were in anatomical order. The right one was bent at the stiffle (*articulatio genus*) at a right angle, the left one actually bent back on itself, so that the bones were in parallel position. The tibiae were in very good condition. The epiphyses were fused with the shafts. No pathological changes or irregularities of the bone structure were observed.

Metatarsals. All the tarsal bones of both limbs were recorded in anatomical order, but the bones of the feet (*skeleton pedis*) were found in two different positions. The right limb was naturally bent at the tarsal joint (*articulatio tarsi*), while the metatarsals (*os metatarsale*) were at a right angle to the tibia. The left limb was maximally bent at the ankle, so that the metatarsal bones lay parallel to the tibia. The position of the left pelvic limb appears quite unnatural and forced. The ossification process was complete. Pathological changes were not in evidence, nor were there any irregularities of bone structure.

Phalanges. Not all the digits were explored owing to the poor state of preservation, but they were all found in anatomical order. All the ossification processes were completed. No pathological changes were observed.

Table 4. Osteometry of the cattle skeletons from Wadi Khashab
Key: + bone present; – bone missing; (521) estimated value of measurement

A. Burial F.1

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	(521)		
Horncore	–	–	
Maxilla	+	+	
Superior P1	–	–	
Superior P2	–	–	
Superior P3	–	–	
Superior M1	L-22.59 B-19.97	–	
Superior M2	L-26.43 B-23.94	–	
Superior M3	L-30.64 B-22.98	L-30.49 B-25.08	
Mandibula			
I1	+	+	
I2	+	+	
I3	+	+	
Length of the cheektooth	144.27	144.65	
Inferior P1	+	+	
Inferior P2	+	+	
Inferior P3	+	+	
Length of the premolar row	53.45	53.54	
Inferior M1	+	+	
Inferior M2	+	+	
Inferior M3	L-42.64/B-16.35	L-43.88/B-17.82	
Length of the molar row	89.21	90.95	
Atlas	+		
Axis	LAPa-78.90 H-116.98 LCDe-121.25		
V. cervicales	+		
V. thoracicae (greatest height)	I-214.02 II-243.80 III-265.36 IV-234.67 V-192.45 VI-189.49		
V. lumbales	+ +	–	
O. sacrum	–	–	
V. caudales (greatest height)	I-50.66 II-47.18 III-44.23 IV-41.29 V-39.78 VI-32.00 VII-28.53	–	

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Costae	+	+	
Sternum	+		
Scapula	GLP-77.66 SLC-56.65	GLP-79.12 SLC-57.18 HS-372.00 Ld-187.10 DHA-370.00	
Humerus	Bd-82.28 BT-72.45	GLC-290.16 GLl-307.02 SD-49.54 Bd-76.89 BT-71.72	127.1 138.4
Radius	GL-307.26 Ll-307.02 Bp-81.70 SD-43.90 Bd-74.53	GL-330.14 Bp-76.93 SD-42.37 Bd-74.59	141.9
Ulna	LO-101.40 DPA-66.77 SDO-51.75	LO-100.42 DPA-67.69 SDO-51.31	
Ossa carpi	+	+	
Os metacarpale	GL-224.75 Bp-60.93 SD-35.15 Bd-62.28	GL-225.40 Bp-58.08 SD-36.19 Bd-63.40	134.8 135.2
Phalanx proximalis	**L**: GL-69.74 Bp-32.82 SD-27.28 Bd-29.46 **R**: GL-68.41 Bp-31.89 SD-27.22 Bd-29.76	**L**: GL-66.98 Bp-32.86 SD-26.78 Bd-30.45 **R**: GL-67.22 Bp-33.88 SD-27.48 Bd-31.39	
Phalanx media	**L**: GL-47.88 Bp-31.02 SD-26.12 Bd-26.95 **R**: GL-49.32 Bp-30.91 SD-25.53 Bd-25.29	**L**: GL-48.38 Bp-31.41 SD-25.89 Bd-26.57 **R**: GL-45.38 Bp-31.71 SD-26.43 Bd-27.55	
Phalanx distalis	**L**: DLS-83.60 Ld-63.79 **R**: DLS-83.10 Ld-62.06	**L**: DLS-80.46 Ld-61.86 **R**: DLS-84.22 Ld-64.91	
Pelvis	LA-78.43	+	
Femur	+	GL-395.00 SD-41.31 BD-98.46	127.5
Patella	+	GL-65.45	
Tibia	Bd-61.47	GL-395.78 Bd-61.35 SD-41.44	136.2
Talus	GLl-71.32 GLm-66.37 Bd-46.01	GLl-71.71 GLm-66.52 Bd-45.79	
Calcaneus	GL-151.26	GL-153.26	
Ossa tarsi	+	+	
Os metatarsale	GL-262.68 Bp-52.73 SD-30.21 Bd-59.20	GL-262.47 SD-31.77 Bp-49.89 Bd-56.97	140.5 140.4
Phalanx proximalis	**L**: GL-68.90 Bp 30.89 SD-25.81 Bd-29.55 **R**: GL-69.08 Bp-30.54 SD-26.46 Bd-32.88	**L**: GL-66.56 Bp-29.62 SD-26.19 Bd-32.33 **R**: GL-66.81 Bp-29.65 SD-27.66 Bd-29.48	
Phalanx media	**L**: GL-49.94 Bp-30.31 SD-25.66 Bd-25.50 **R**: GL-47.37 Bp-30.99 SD-24.59 Bd-26.39	**L**: GL-47.75 Bp-30.64 SD-25.51 Bd-26.37 **R**: SD-25.42 Bp-29.73 GL-47.73 Bd-25.84	
Phalanx distalis	**L**: DLS-75.04 **R**: DLS-74.48 Ld-59.03	**L**: DLS-69.01 Ld-55.83 **R**: DLS-74.73 Ld-58.78	

B. Burial F.3

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium	–		
Horncore	–	–	
Maxilla	–	–	
Mandibula	–	–	
Atlas	–		
Axis	–		
V. cervicales	× 6		
V. thoracicae	–		
V. lumbales	–		
O. sacrum	–		
V. caudales	–		
Costae	–	–	
Sternum	–		
Scapula	GLP-81.36 SLC-57.14	GLP-80.38 SLC-59.24	
Humerus	Bd-87.24 BT-75.33	Bd-87.35 BT-82.4	
Radius	Bp-84.10 Bd-79.80	+	
Ulna	+	–	
Ossa carpi	–	–	
Os metacarpale	Bd-63.97	Bd-62.80	
Phalanx proximalis	–	–	
Phalanx media	–	–	
Phalanx distalis	–	**L**: DLS-87.76 Ld-67.12 **R**: DLS-77.87 Ld-66.35	
Pelvis	–	–	
Femur	–	–	
Patella	–	–	
Tibia	–	–	
Talus	–	–	
Calcaneus	–	–	
Os centrotarsale	–	–	
Ossa tarsi	–	–	
Os metatarsale	–	–	
Phalanx proximalis	–	–	
Phalanx media	–	–	
Phalanx distalis	–	–	

C. Burial F.4

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	500		
Horncore	–	–	
Maxilla	+	+	
Length of the cheektooth	–	147.54	

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Length of the premolar row	–	59.73	
Length of the molar row	–	93.62	
Superior M3	+	L-35.59	
Mandibula	+	+	
I1	–		
I2	–		
I3	–		
Length of the cheektooth	–	155.56	
Lenght of the premolar row	–	55.66	
Inferior M3	–	L-44.56	
Lenght of the molar row	–	101.41	
Length of the diastema		93.13	
Atlas	+		
Axis	–		
V. cervicales	–		
V. thoracicae	–		
V. lumbales	–		
O. sacrum	–		
V. caudales	–		
Costae	–	–	
Sternum	–		
Scapula	–	–	
Humerus	–	–	
Radius	–	(Bd-76.36)	
Ulna	–	–	
Ossa carpi	+	+	
Os metacarpale	+	(GL-248.82) Bd-66.88 SD-35.80 DD-29.61 (Bd)	♂ (155.5) ♀ (149.3)
Phalanx proximalis	**R**: GL-72.88 GLpe-72.07 Bp-31.03 SD-29.07 Bd-30.61	**R**: GL-73.46 GLpe-72.67 Bp-33.65 SD-29.08 Bd-32.95	
Phalanx media	+ +	+ +	
Phalanx distalis	+ +	+ +	
Pelvis	–	–	
Femur	–	–	
Patella	–	–	
Tibia	–	SD-37.35 Bd-58.07	
Talus	–	GLl-70.37 GLm-65.63 Bd-42.11	
Calcaneus	–	GL-139.58	
Os centrotarsale	–	GB-59.29	

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Ossa tarsi	–	+	
Os metatarsale	–	(GL-253.96) Ll-238.66 Bp-48.58 SD-28.30 DD-29.59 (Bd-57.61)	♂ (140.9) ♀ (135.8)
Phalanx proximalis	**R**: GL-77.22 GLpe-73.02 Bp-31.57 SD-28.28 Bd-30.45	**R**: GL-67.98 GLpe-63.84 Bp-30.18 SD-25.08 Bd-28.33 **L**: GL-68.64 GLpe-62.52 Bp-29.12 SD-25.66 Bd-29.55	
Phalanx media	+ **R**: GL-52.33 GLpe-48.48 Bp-32.28 SD-26.28 Bd-28.27	**L**: GL-46.39 GLpe-44.12 Bp-29.40 SD-24.26 Bd-25.89 **R**: GL-45.92 GLpe-44.07 Bp-29.43 SD-24.44 Bd-24.94	
Phalanx distalis	GL-70.90 Ld-58.11 +	+ +	

D. Burial F.6

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	+		
Horncore	–	–	
Maxilla	+	+	
Dentes	Heavily worn molars		
Mandibula	+	+	
Atlas	+		
Axis	+		
V. cervicales	+		
V. thoracicae (greatest height)	+/– I-259.96 II-260.00		
V. lumbales	–		
O. sacrum	–		
V. caudales	+		
Costae	–	–	
Sternum	–		
Scapula	SLC-54.40 GLP-69.62	–	
Humerus	+/–	–	
Radius	(GL-284.90)	–	(122.5)
Ulna	(GL-350.00)	–	
Ossa carpi	+	–	
Os metacarpale	GL-213.69 SD-34.30 DD-23.43 Bd-57.67	–	128.2

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Phalanx proximalis	**L**: GL-61.35 GLpe-60.47 Bp-30.68 SD-26.30 Bd-28.69 **R**: GL-61.39 GLpe-61.01 Bp-31.53 SD-26.63 Bd-27.74	–	
Phalanx media	**L**: GL-44.74 GLpe-41.48 Bp-30.62 SD-25.66 Bd-25.90 **R**: GL-44.26 GLpe-40.79 Bp-30.09 SD-25.32 Bd-24.71	–	
Phalanx distalis	**R**: GL-82.45 Ld-61.16	–	
Pelvis	–	–	
Femur	–	–	
Patella	–	–	
Tibia	Bd-61.05	SD-37.35 Bd-58.07	
Talus	GLl-70.46 GLm-65.52 Bd-42.74	GLl-70.46 GLm-65.63 Bd-42.11	
Calcaneus	GL-137.82	GL-139.58	
Os centrotarsale	GB-56.48	GB-55.66	
Ossa tarsi	+	+	
Os metatarsale	GL-249.24 Ll-238.43 Bp-47.54 SD-29.97 DD-30.02 Bd-52.53	GL-246.11 Ll-238.66 Bp-48.58 SD-28.30 DD-29.59 Bd-57.61	133.3 131.6
Phalanx proximalis	**L**: GL-68.64 GLpe-62.52 Bp-29.12 SD-25.66 Bd-29.55 **R**: GL-67.98 GLpe-63.84 Bp-30.18 SD-25.08 Bd-28.33	**L**: GL-69.03 GLpe-61.77 Bp-30.27 SD-24.54 Bd-28.89 **R**: GL-67.14 GLpe-63.46 Bp-29.84 SD-27.36 Bd-30.29	
Phalanx media	**L**: GL-46.39 Bp-29.40 SD-24.26 Bd-25.89 **R**: GL-45.92 Bp-29.43 SD-24.44 Bd-24.94	**L**: GL-46.01 Bp-29.08 SD-23.10 Bd-25.08 **R**: GL-45.86 Bp-29.43 SD-25.02 Bd-25.95	
Phalanx distalis	+ +	**L**: GL-77.57 Ld-61.65 **R**: GL-74.39 Ld-58.25	

E. Burial F.14

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium	–		
Horncore	–	–	
Maxilla	+/–	+/–	
Mandibula	+/–	+/–	
Atlas	–		

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Axis	–		
V. cervicales	+/–		
V. thoracicae	+		
V. lumbales	+		
O. sacrum	+		
V. caudales	+		
Costae	+	+	
Sternum	+		
Scapula	HS-370.00 DHA-350.00 Ld-117.65 SLC-63.11 GLP-61.16	+	
Humerus	GL-320.06	–	132.5
Radius	GL-290.56	–	124.9
Ulna	+	+	
Ossa carpi	+	+	
Os metacarpale	GL-216.28 Bd-57.38 SD-31.78		128.5
Phalanx proximalis	**L**: GL-63.80 GLpe-61.39 Bp-32.31 SD-26.47 Bd-26.99 **R**: GL-61.85 GLpe-61.80 Bp-30.47 SD-25.89 Bd-27.35	**L**: GLpe-61.91 Bp-30.24 SD-26.24 Bd-28.17 **R**: GL-62.00 GLpe-61.55 Bp-29.80 SD-25.60 Bd-24.04	
Phalanx media	**L**: GL-44.49 Bp-29.15 SD-24.71 Bd-24.83 **R**: GL-45.71 Bp-29.81 SD-23.97 Bd-25.01	**L**: GL-44.88 Bp-29.80 SD-24.42 Bd-27.00 **R**: +	
Phalanx distalis	**L**: DLS-73.77 Ld-59.24 **R**: DLS-79.81 Ld-59.83	**L**: DLS-70.55 Ld-57.27	
Pelvis	+	+	
Femur	+	+	
Patella	+	+	
Tibia	GL-370.45 Bd-62.77	GL-373.33	127.8 128.7
Talus	GLl-70.38 GLm-61.22 Bd-44.29	GLl-68.20 Bd-42.02	
Calcaneus	GL-135.97	GL-127.85	
Ossa tarsi	+	+	
Os centrotarsale	GB-55.98	GB-54.15	
Os metatarsale	GL-253.67 Bp-48.24 SD-30.04 DD-31.82 Bd-55.12	GL-254.48 Ll-241.47 Bp-51.22 SD-30.10 DD-30.48 Bd-55.70	135.7 136.1
Phalanx proximalis	**L**: GL-68.95 GLpe-66.22 Bp-28.11 SD-23.68 Bd-27.09 **R**: GL-66.83 GLpe-65.64 Bp-29.03 SD-25.60 Bd-28.58	**L**: GL-64.71 GLpe-60.36 Bp-31.01 SD-25.62 Bd-30.18 **R**: GL-65.94 GLpe-63.07 Bp-30.31 SD-23.99 Bd-26.99	

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Phalanx media	**L**: GL-42.27 Bp-31.32 SD-23.52 Bd-23.11 **R**: GL-42.75 Bp-29.37 SD-24.24 Bd-22.88	**L**: GL-41.77 Bp-32.22 SD-26.13 **R**: GL-41.69 Bp-29.42 SD-23.81 Bd-26.23	
Phalanx distalis	**L**: DLS-69.27 Ld-55.43 **R**: DLS-69.72 Ld-52.73	**L**: DLS-68.33 Ld-54.35 **R**: DLS-68.98 Ld-51.87	

Table 5. Osteometry of the sheep skeletons from Wadi Khashab
Key: + bone present; – bone missing; (521) estimated value of measurement

A. Burial F.7

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	224		
Horncore	+	+	
Maxilla	+	+	
Mandibula (length from the angle: Gonion caudale-infradentale)	183.26	182.7	
Inferior M3	L-29.18	L-28.03	
Atlas	+		
Axis	+		
V. cervicales	+		
V. thoracicae	+		
V. lumbales	+		
O. sacrum	+		
V. caudales	+		
Costae	+	+	
Sternum	+		
Scapula	HS-166.48 GLP-34.88	HS-167.51 SLC-23.45 GLP-35.78	70.2 70.7
Humerus	GL-159.02 Bd-32.49 BT-32.34	Bd-32.71	68.0
Radius	GL-181.84 Bp-33.64 Bd-31.27	GL-192.37 Bp-33.75 Bd-30.44	73.0 77.3
Ulna	+	+	
Ossa carpi	+	+	
Os metacarpale	GL-177.54 Bp-25.28 SD-12.07 Bd-26.01	GL-166.65 Bd-26.0	86.8 81.4
Phalanx proximalis	**L**: GL-42.66 GLpe-42.18 Bp-13.36 SD-10.48 Bd-12.83 **R**: GL-44.42 GLpe-40.62 Bp-13.52 SD-10.83 Bd-13.10	**L**: GL-43.90 GLpe-40.85 Bp-13.41 SD-10.70 Bd-13.32 **R**: GL-43.53 GLpe-41.95 Bp-13.08 SD-10.47 Bd-12.71	

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Phalanx media	**L**: GL-23.25 Bp-12.06 SD-9.35 Bd-10.02	**R**: GL-23.35 Bp-13.94 SD-9.56 Bd-10.01 **L**: GLpe-23.32	
Phalanx distalis	**L**: DLS-31.60 Ld-28.78 **R**: DLS-36.46 Ld-27.99	**L**: DLS-37.23 Ld-28.64 **R**: DLS-31.21 Ld-26.41	
Pelvis	+	+	
Femur	GL-201.96 Bd-40.13 SD-19.35	GL-197.40 GLC-198.38 SD-19.87 Bd-39.97	71.3 69.6
Patella	+	+	
Tibia	GL-247.69 SD-14.83 Bd-26.66	Bd-26.24	74.6
Talus	GLl-33.22 GLm-30.6 Bd-20.01	GLl-32.83 GLm-31.0 Bd-19.6	75.3 74.4
Calcaneus	GL-63.79	GL-62.48	72.7 71.2
Os centrotarsale	–	GB-23.95	
Ossa tarsi	+	+	
Os metatarsale	GL-177.49 Bp-22.61 SD-12.73 Bd-25.03	GL-179.19 Ll-173.48 Bp-21.38 SD-12.55 Bd-25.01	80.5 81.3
Phalanx proximalis	**R**: GL-42.32 Bp-12.79 SD-10.25	**L**: GL-42.62 Bp-12.36 SD-9.20 **R**: GL-42.33 GLpe-39.98 Bp-12.81 SD-10.10 Bd-12.10	
Phalanx media	**R**: Bp-11.92 SD-8.18 Bd-9.59 GLpe-23.28 GL-23.22	+	
Phalanx distalis	**R**: DLS-30.51 Ld-25.57	+	

B. Burial F.15

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	220.65		
Horncore	–	–	
Maxilla	+	+	
Mandibula (length from the angle: Gonion caudale-infradentale)	189.23	189.66	
Atlas	+		
Axis	+		
V. cervicales	+		

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
V. thoracicae	+		
V. lumbales	+		
O. sacrum	+		
V. caudales	+		
Costae	+	+	
Sternum	–		
Scapula	+	SLC-21.36 GLP-35.86	
Humerus	GL-175.23 SD-15.14 Bd-30.31 BT-27.84	GL-173.66	75.0 74.3
Radius	GL-192.02	GL-180.52	77.2 72.5
Ulna	+	+	
Ossa carpi	+	+	
Os metacarpale	GL-163.62 Ll-161.10 Bp-24.36 SD-13.45 Bd-25.77	GL-165.77 Ll-160.74 Bp-25.16 SD-13.80 Bd-24.30	81.0 81.0
Phalanx proximalis	**L:** GLpe-43.28 Bp-14.76 SD-10.49 Bd-10.46 **R:** GLpe-44.50 Bp-14.01 SD-10.54 Bd-12.40	**L:** GLpe-42.25 Bp-13.26 SD-9.98 Bd-11.11	
Phalanx media	**L:** GL-26.05 Bp-12.86 SD-8.59 Bd-9.25 **R:** GL-26.31 Bp-12.91 SD-8.47 Bd-8.50	**L:** GL-26.88 Bp-13.12 SD-8.59 Bd-9.82	
Phalanx distalis	+	+	
Pelvis	+	+	
Femur	GL-214.00 GLC-211.17 SD-17.04 Bd-40.06	Bd-39.56	75.0
Patella	+	+	
Tibia	+	GL-248.45 SD-15.84 Bd-25.10	74.7
Talus	GLl-30.54 GLm-29.31 Bd-20.18	GLl-30.71 GLm-29.04 Bd-20.24	69.2 69.6
Calcaneus	+	GL-63.30	72.5
Os centrotarsale	GB-24.16	+	
Ossa tarsi	+	+	
Os metatarsale	+	GL-174.39 Ll-170.06 Bp-20.78 SD-11.23 Bd-23.83	79.1
Phalanx proximalis	GLpe-44.91 Bp-11.63 SD-8.89 Bd-10.63	–	
Phalanx media	**L:** GL-27.22 Bp-11.68 SD-8.43 Bd-8.50 **R:** GL-27.26 Bp-11.63 SD-7.79 Bd-6.88	–	
Phalanx distalis	–	–	

C. Burial F.16

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Cranium (condylobasal length)	232.15		
Horncore	–	+	
Maxilla	–	+	
Mandibula	+	+	
I1	–	–	
I2	–	–	
I3	–	–	
Length of the cheektooth	175.50	184.59	
Atlas	+		
Axis	+		
V. cervicales	+		
V. thoracicae	+		
V. lumbales	+		
O. sacrum	+		
V. caudales	+		
Costae	+	+	
Sternum	–		
Scapula	+	GLP-36.07 SLC-21.25 DHA-157.58	66.4
Humerus	+	Bd-33.89 SD-16.30 BT-31.60	
Radius	+	GL-185.20 Bp-35.06	74.4
Ulna	+	+	
Ossa carpi	+	+	
Os metacarpale	+	GL-162.95 SD-13.87 Bd-24.41 Bp-24.77	79.7
Phalanx proximalis	**L**: GL-42.36 GLpe-39.67 Bp-13.07 SD-10.89 Bd-12.60 **R**: GL-43.38 GLpe-40.76 Bp-12.75 SD-10.73 Bd-13.23	**L**: GL-42.63 GLpe-40.55 Bp-12.81 SD-10.56 Bd-12.61 **R**: GL-42.79 GLpe-40.15 Bp-13.49 SD-10.88 Bd-12.80	
Phalanx media	+ +	**L**: GL-25.40 Bp-13.11 Bd-10.57 **R**: GL-24.69 Bp-13.24 Bd-10.28	
Phalanx distalis	+ +	**L**: DLS-35.25 Ld-28.21	
Pelvis	+	+	
Femur	GL-205.72 GLC-204.41 Bd-40.52	GL-208.30 GLC-204.07 SD-17.34 Bd-39.55	72.6 73.5
Patella	+	+	
Tibia	GL-262.03 Bp-44.80 SD-14.48 Bd-28.87	GL-262.70 Bp-43.93 SD-14.63 Bd-28.80	78.8 79.0

SKELETAL PART	LEFT (mm)	RIGHT (mm)	WH (cm)
Talus	GLl-30.40 GLm-29.21 Bd-18.34		68.9
Os centrotarsale	GB-26.04	GB-25.50	
Calcaneus	+	GL-64.48	73.5
Ossa tarsi	+	+	
Os metatarsale	GL-178.59 Bp-22.11 SD-12.10 Bd-25.48	GL-177.33 Ll-170.26 Bp-22.14 SD-11.84 Bd-23.33	81.0 80.5
Phalanx proximalis	– +	GL-42.39 GLpe-39.63 Bp-12.40 SD-9.68 Bd-11.02	
Phalanx media	+ +	GL-24.83 Bp-13.19 Bd-10.03	
Phalanx distalis	+ +	+ +	

Chapter 4

THE ANIMALS OF WADI KHASHAB IN THE CONTEXT OF DOMESTICATION AND EARLY PASTORALISM IN NORTHEASTERN AFRICA

4.1 The morphology of cattle and sheep from Wadi Khashab

The almost complete animal skeletons or large fragments thereof, collected from graves in the Wadi Khashab complex, have given a very rich series of osteological, osteometric and archaeozoological data on early cattle (see *Chapter 3*). For obvious reasons, the Wadi Khashab material could not yield the standard set of information, on economy and meat consumption among others, that is provided by osteological material from settlement sites. The core data obtained from the Wadi Khashab assemblage concern the morphology of early cattle kept by prehistoric communities in northeastern Africa.

The data come from measurements of particular elements of the skeleton and the observation of characteristic features of build and morphology. The burial context of the remains favored the preservation of many important metrics, such as the full length of particular limb bones, which is crucial for assessing height at the withers. Measurements of this kind frequently cannot be obtained from osseous material found at settlement sites, as it is consumption-related and so very fragmented as a rule. In this context, the sites chosen for comparative analysis were the cemeteries in Kerma and al-Barsha, which also yielded animal remains from intentional deposits or "burials". The set of osteometric data from Wadi Khashab is currently one of the richest bodies of information of this kind on early African cattle.

The research issues concerning animal morphology that were addressed based on the Wadi Khashab data started with the identification of features typical of early African cattle morphology shared by all the examined specimens. Subsequently, these characteristics were compared with material from prehistoric populations known from the Nile Valley and the eastern Sahel, searching for potential similarities and parallels.

The research took into account a broad chronological and geographical range of material yielding sufficiently large sets of osteometric data for cattle chiefly from the Nile Valley, in Egypt as well as Sudan. The assemblage from Kerma, studied and published by Louis Chaix (2007), was the most important set for comparative analysis due to the huge quantity of data, a relatively early date (2050–1750 BC) and its localization on the Third Nile Cataract. It was collected over several years of excavations both in the city, a major urban center of Kerma civilization, and in the royal necropolis adjoining it. The importance of cattle in Kerma culture, especially in the funerary sphere, was substantial. Chaix described thousands of so-called bucrania from longhorn cattle deposited with the royal burials and identified a practice of horn deformation. The huge number of bucrania and the important economic role of cattle observed in material from the city, in the context of the environmental conditions identified at the site and the results of biochemical analyses, led Chaix to hypothesize that a large part of the cattle population, the remains of which were found at Kerma, originated from outside of the microregion of the Kerma Basin and may have been imported from very distant regions (Chaix 2000).

Wherever possible, the Wadi Khashab osteometric data was examined in a much broader perspective, including relevant data from Neolithic sites in Egypt and Sudan: Wadi el-Arab, el-Barga, el-Kadada (Chaix 2011), Merimde-Benisalâme, Khasm el-Girba and Kadruka (Driesch and Boessneck 1985; Peters 1986; Chaix 2011); the predynastic sites of Maadi III (Boessneck, Driesch, and Ziegler 1989) and Adaïma (Van Neer 2002); the material from Dayr al-Barsha dated to the New Kingdom through the Third Intermediate Period, that is, about 1000 BC (Linseele et al. 2017). Osteometric data for the Ptolemaic period came from the site of Tell el-Dab'a VII (Boessneck and Driesch 1992), whereas information for late Roman times was derived from the assemblage of animal remains discovered in the 4th- and 5th-century layers at the Red Sea harbor of Berenike. With respect to the latter, the cattle remains from a substantial refuse dump associated with the functioning of Berenike's largest temple most probably did not reflect local husbandry. Large herds of longhorn cattle could not have been raised in the specific climatic, environmental and hydrological conditions of the coastal city in the 4th and 5th centuries, which were not substantially different for the 800 plus years of its existence since the Ptolemaic period. Thus, the numerous animals represented among the bones from a probably temple-related rubbish dump represent animals imported from regions more conducive to this model of breeding. Considering the morphological characteristics of the cattle discovered at Berenike, the herd could have been brought from the Sahel, that is, the territories of modern Sudan or Ethiopia, Eritrea and even Southern Sudan.

The youngest set of osteometric data, in chronological terms, comes from cattle remains excavated in settlement contexts in two of the great centers of medieval Makuria in Nubia (8th–14th centuries AD): Old Dongola and Banganarti (Osypińska 2018). These two sites are at the same time the furthest centers to the south that have been included in this comparative study. Both lie in the Southern Dongola Reach, between the Third and the Fourth Nile Cataracts, in the territory of modern Sudan. The medieval assemblages of cattle bones represent exclusively consumption and settlement remains.

4.1.1 Cattle from Wadi Khashab: morphometrical analysis

The osteological and osteometric data from the cattle skeletons found at Wadi Khashab were subjected to a multifaceted analysis. First to be considered were the proportions of body parts, the height at the withers and characteristic features of the build of individual specimens. Next came a comparison of the similarities and differences of the build of individual animals—looking for data on features shared by a given population in order to be able to determine whether the Wadi Khashab specimens represented one population or were morphologically different animals. Lastly, individual parts of the skeletons were studied, and osteometric data concerning the animals from Wadi Khashab was compared with those on cattle from other sites.

Cranium

Skulls were preserved in four of the cattle burials, but their fragmentary condition made it impossible to collect the kind of metric data that would allow for the morphological characteristics of the cranial skeleton to be compared to other, better-preserved material, for example from Kerma or Dayr al-Barsha. In this situation, the analysis was supplemented with a description of non-metric characteristics.

The first issue was to determine whether this cattle was horned and whether the animals represented a short- or longhorn variety. No part of the frontal bone or the horncores was preserved in any of the four burials, leaving no evidence of the form of the horns, assuming that the animals were horned. These parts of the skeleton were missing presumably due to specific conditions of deposition and the practice of immobilizing the heads of the animals in a very characteristic way. The bulls had their heads placed between stone slabs so that the frontal bone and most likely also the horncores were directed up; the females, on the contrary, had the heads immobilized with the facial part straight down. In both cases, assuming that the horns were in place at the time of burial, they would have protruded from the stone superstructure built over the burial.

The available metric data, especially with regard to the upper and lower rows of teeth, matches the upper range of values noted for the cattle population from Kerma. However, the Wadi Khashab animals, mainly the two bulls, had slightly longer third molars (M3), both upper and lower. Compared to the al-Barsha cattle, the Wadi Khashab animals had slightly longer crania (condylobasal length) with only 1 of the 14 specimens from al-Barsha having a similar condylobasal length. The skulls of the cattle from Wadi Khashab were long and slender, the profile straight. The edges of the eye sockets, where preserved, were flattened.

Vertebrae

The poor preservation of the vertebrae and ribs yielded no metric data except for the *axis* in F1. Nonetheless, observation of the axial skeleton *in situ* indicated that none of the four animals had the bifid dorsal vertebral spines of the thoracic and lumbar vertebrae characteristic of zebu cattle (Grigson 1980). The cattle from al-Barsha had such a feature (Linseele et al. 2017). The spinous processes of the thoracic vertebrae of the cattle from Wadi Khashab were clearly elongated and thickened in the distal part [see *Fig. 57*]. This feature suggests a certain degree of humpedness, although not as prominent as in the zebu variety. The hump, developed as an adaptive feature independently of the Asiatic zebu, is typical of indigenous African cattle (Grigson 2000).

Scapulae

At Wadi Khashab, there are six scapulae preserved from four specimens of cattle [*Fig. 84*; see also *Figs 54, 61, 74*]. The greatest length of the *processus articularis* (GLP) and the smallest length of the *collum scapulae* (SLC) values were best suited for comparative analysis with data from other sites because the data for the distal parts of these bones are the most frequently collected measurement from the excavated material from settlements. The SLC also provides a good illustration of the sexual dimorphism of the cattle (after Chaix 2007). The data from Wadi Khashab indicate that sexual dimorphism in this herd was distinct, similarly to Kerma cattle population.

The GLP values from Wadi Khashab are close to the upper range of values from Kerma, but the lower limit from Kerma runs much lower. The al-Barsha cattle presented a GLP range that was slightly lower than that of the Wadi Khashab animals, although the modal values were very

Fig. 84. Scapulae from burials F.1 and F.14

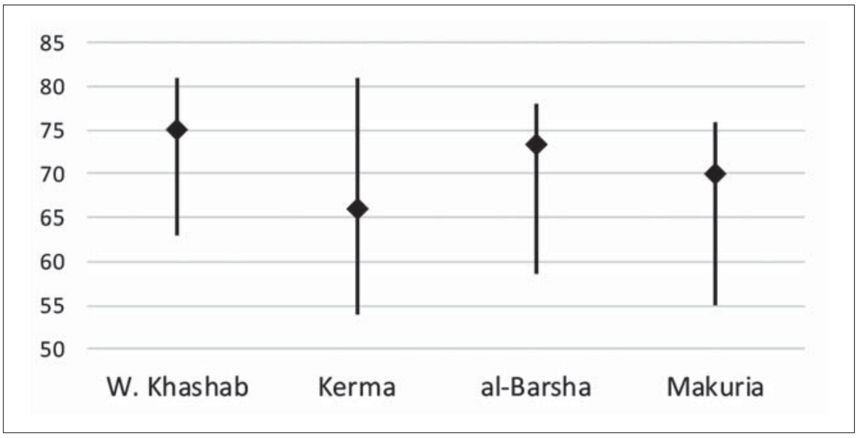


Fig. 85. GLP values for cattle from Wadi Khashab compared to values for the Kerma, al-Barsha and Makuria cattle (in mm)

close in the two sets. The lowest in this set were the values for Nubian medieval cattle compared in this study. The upper limits were below those from al-Barsha, whereas the lower ones were close to the lower values for Kerma cattle [*Fig. 85*].

Humerus

A statistically credible comparative analysis of particular characteristics of the humerus was not possible because of the lack of sufficient metric data [see *Figs 58, 62, 75*]. However, the height at the withers was calculated using available metric data from the humeri and compared with values established for the cattle from al-Barsha [*Fig. 86*]. The difference was very evident, indicating different characteristics of skeleton structure for the two cattle populations. The withers height of the animals from Wadi Khashab was within a clearly lower range of 138 cm to 127 cm (median 132 cm), whereas the same measurement for the cattle from al-Barsha was within the 151 cm to 129 cm range (median 138 cm).

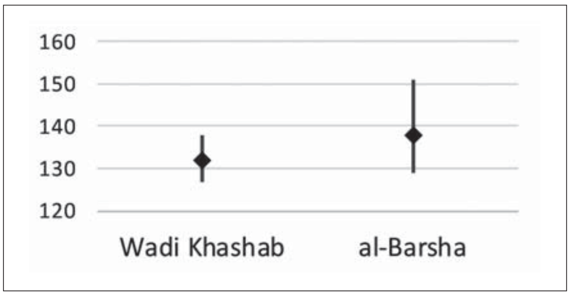


Fig. 86. Withers height calculated for cattle based on the humerus (in cm)

Radius

The metric values for the proximal epiphysis (Bp) of the radial bone of the cattle from Wadi Khashab fall into a rather narrow range of 84 mm to 76 mm, the median being 78 mm. For the cattle from Kerma, the range was understandably much broader, due to the much larger set of data [*Fig. 87*].

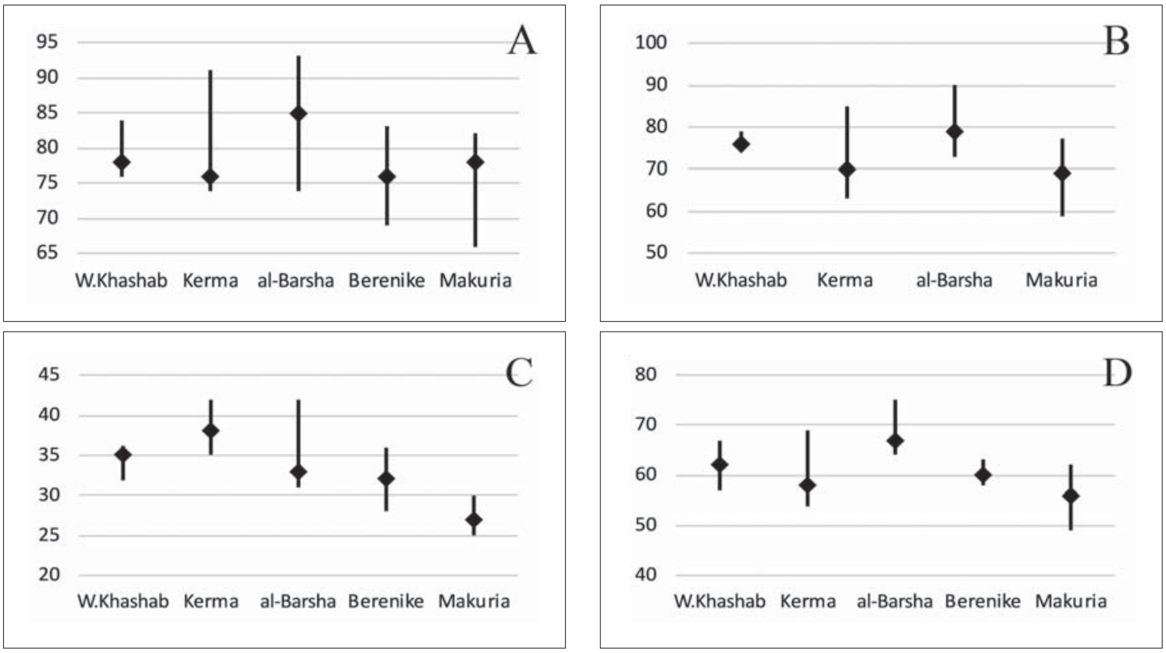


Fig. 87. Measurements of cattle bones compared across sites from northeastern Africa (in mm): A – radius proximal epiphysis width intervals; B – radius distal epiphysis width intervals; C – metacarpal bone shaft width intervals; D – metacarpal distal epiphysis width intervals

Interestingly, the median of this characteristic was very close at Wadi Khashab and at Kerma, suggesting that most of the animals in these two populations were of similar size. A greater differentiation of the width of the proximal epiphysis of the radius was observed in cattle from al-Barsha, with individuals with Bp values greater than in Kerma cattle and as small as the smallest from Kerma. Interestingly, cattle from younger contexts (from both Berenike and sites in Makuria) had elbow joints of evidently lighter build.

A comparison of the width of the distal epiphysis (Bd) of the radius indicated that Kerma cattle were the most differentiated in terms of the size of the carpal bones. The width of the distal epiphysis of the radius of the Wadi Khashab animals fell right in the middle of the relevant range for the cattle from Kerma. This part of the skeleton was the most massive in the cattle from al-Barsha and the most slender in cattle from medieval Nubia [*Fig. 87:B*].

Withers height calculated from the greatest length (GL) of the radius fell between 142 cm and 122.5 cm (median 128 cm) for the Wadi Khashab cattle. The same characteristic calculated for the cattle from al-Barsha was between 159 cm and 119 cm (median 141 cm) and for the Makurian cattle between 136 cm and 129 cm (median 133 cm) [*Fig. 87:A*].

Metacarpals III + IV

In terms of the width of the shaft of the metacarpals (SD), the animals from Wadi Khashab [*Fig. 88*] were clearly more slender-legged than the cattle from Kerma and al-Barsha [*Fig. 87:C*]. Cattle from late Berenike (4th–5th centuries AD) were morphologically the closest in this respect. And the thinnest limbs belonged most probably to the cattle from Makuria.

The similarities in the width of the distal epiphysis (Bd) of the metacarpals [*Fig. 87:D*] are interesting as well. The biggest differentiation is seen in cattle from Kerma, and the Wadi Khashab cattle as well as the Berenike cattle fit very well into this range. The cattle from medieval Makuria also showed a close relation to the Kerma, Berenike and Wadi Khashab cattle, although once again with clearly the lowest values in the range. Only the cattle population from al-Barsha represented a clearly more massive build of both joints and bones [see *Fig. 87*].

A comparison of withers height based on the greatest length (GL) of the metacarpals yielded interesting results [*Fig. 89:B*]. The cattle from Wadi Khashab demonstrated the greatest values of all the examined populations (from 155 cm to 128 cm, median of 142 cm). For the al-Barsha cattle, this value was in

Fig. 88. Metacarpals: top, burial F.1; bottom, burial F.3

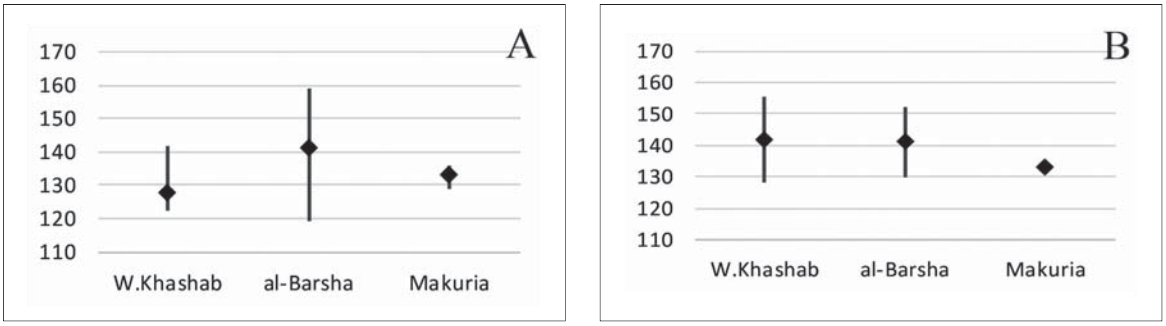


Fig. 89. Withers height of cattle compared across sites from northeastern Africa (in cm): A – withers height calculated from radius length; B – withers height calculated from metacarpal length

the range of 152 cm to 130 cm (median of 141 cm). For medieval cattle from Makuria there was only one withers height calculation based on metacarpals and it was 133 cm.

Phalanges (anterior)

The length of phalanx I [*Fig. 90*] could be subjected to a particularly broad comparative osteomorphological analysis due to the availability of metric data. The comparison included populations from different periods and geographical regions [*Fig. 91*]. The Wadi Khashab cattle featured clearly elongated digits of the thoracic|anterior limb, distinctive from the phalanges recorded for cattle from both Neolithic and predynastic sites in the Nile Valley. The nearest in terms of morphology were the phalanges of the cattle from Kerma (although the latter population also included animals with slightly shorter phalanges). The cattle from Ptolemaic sites in the Nile Valley and late Berenike was also comparable. The shortest phalanges were found in cattle from Meroitic and Makurian contexts [see *Fig. 92*].

A comparison of phalanx shaft length and width in the various cattle populations from Wadi Khashab, Kerma and Makuria gave interesting results concerning the proportions and massiveness of the acropodium in these animals [see *Fig. 91*]. The Wadi Khashab cattle had a length–width ratio that indicated a more slender build of the limbs, especially within the acropodium. The bulk of the points for this population fits well within the main cloud of points for the cattle from Kerma, although there was a noticeable cluster indicating a larger length with the same width than was the case with regard to the Kerma cattle. In turn, a series of metric data from the al-Barsha remains demonstrated a wider phalanx width than in Nubian cattle. The cattle from Makuria are in opposition in this respect, the proportions of the first phalanx in this group having the lowest width despite a rather broad length range, including in the set also the outliers. The cattle from late Berenike basically fit in the point clouds for the Kerma and Wadi Khashab cattle populations, although there is also a clustering of lower values similar to Makurian cattle.

Tibia

Limited data did not allow for an osteometric comparison of the pelvic and femur bones, but it was possible to compare the width of the distal epiphysis (Bd) of the tibia, which can be taken as an indication of the size and proportions of the knee joint [*Fig. 93*]. The range of the data for the Wadi Khashab and Berenike cattle was very narrow and showed little differentiation, but this

Fig. 90. Bones of the acropodium of the thoracic/anterior limb of cattle from burials F.1, F.4, F.6 and F.14

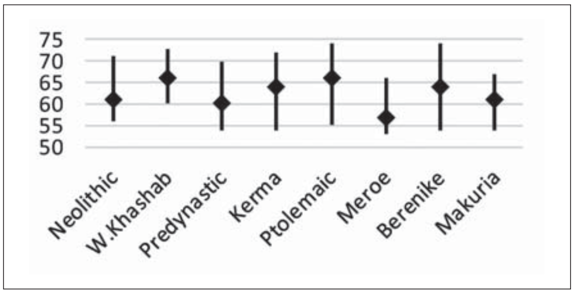


Fig. 91. Length of phalanx I of the thoracic limb of cattle from archaeological sites in northeastern Africa (in mm)

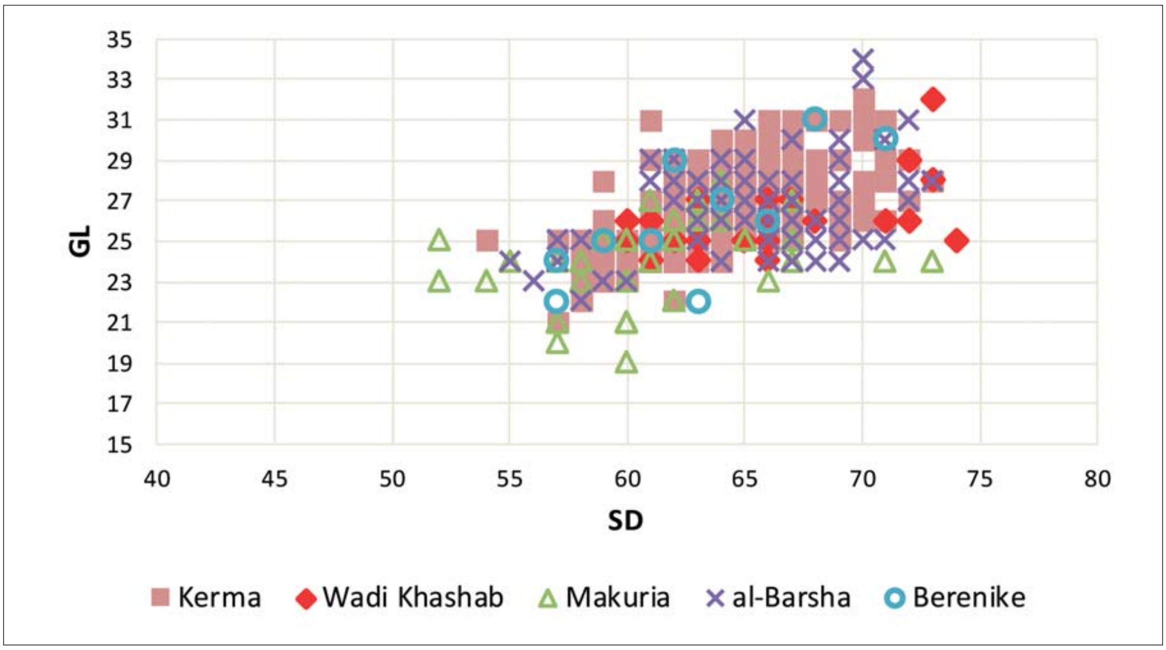
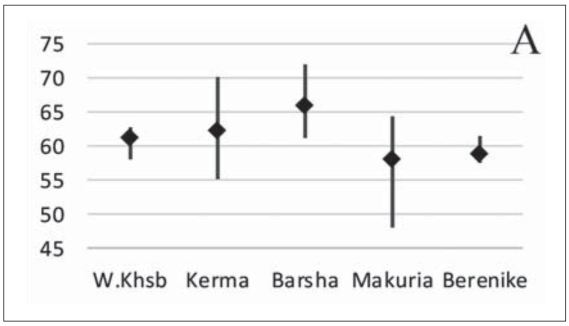


Fig. 92. Comparison of the build of phalanx I of cattle from different archaeological sites from northeastern Africa (in mm)

Fig. 93. State of preservation of the tibia bones from burials F.6 and F.14

could be the result of a relatively small sample. The sets from Kerma and medieval Makuria demonstrated large ranges. The highest median of the width of the distal epiphysis was observed in this group, along with a fairly narrow range, the lowest values of which corresponded to the average Kerma values, while the highest values for the al-Barsha set exceeded metric data from the other analyzed populations [*Fig. 94*]. In consequence, the al-Barsha cattle should be seen as the population with the most massive build. The cattle from medieval Makuria is in opposition, being characterized by the most slender build of the distal epiphysis of the tibia, the range of the lowest values falling well below the data from the other sites. However, despite seeing data for the most slender knee joints in all of the examined cattle, the median for the medieval cattle from Makuria was only slightly lower than that for cattle from Kerma or Wadi Khashab. Interestingly, in this respect, the late Berenike cattle was nearest to the Makurian cattle [see *Fig. 94*].

The withers height calculated for the Wadi Khashab cattle from the greatest length (GL) of the tibia was between 136 cm and 127 cm, corresponding to the lower values calculated for the cattle from al-Barsha [*Fig. 94:B*]. This value for medieval cattle was between 127 cm and 119 cm.



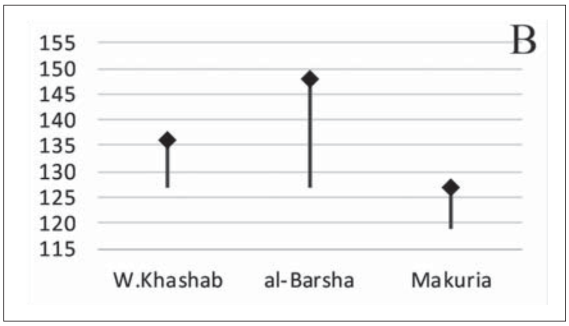


Fig. 94. Measurements of cattle compared across sites from northeastern Africa:
A – tibia distal epiphysis width (in mm); B – withers height range based on tibia length (in cm)

Calcaneus

A comparative analysis of the greatest length of the calcaneus (GL) included a broad range of both wild and domesticated cattle from northeastern Africa [*Fig. 95*]. The size range of the calcaneus in African aurochs exceeds that of domesticated cattle. The Wadi Khashab animals fit well into the middle range determined for Kerma cattle in this respect, and the medians for the two groups are almost identical. The Neolithic cattle population from Maadi also reveals a considerable similarity to these two sets. It is otherwise for the al-Barsha cattle, which include the highest values and represent the highest modal value [see *Fig 95*]. In terms of the calcaneus length range, the cattle from late Berenike was very close to the prehistoric and predynastic specimens, although the median was slightly lower than for early cattle. The values for the animals from Tell el-Dab'a were

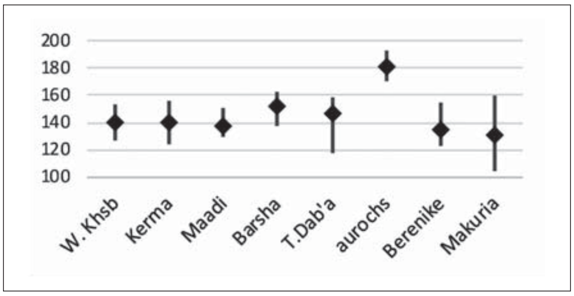


Fig. 95. Calcaneus length in wild and domesticated cattle from different sites in northeastern Africa (in cm)

more differentiated compared to the described populations, recording both higher as well as definitely lower values than for the cattle from Wadi Khashab, Berenike and Kerma. Nonetheless, the median calcaneus length for cattle from the Ptolemaic period was higher than for the older populations from northeastern Africa. Interestingly, Makurian cattle presented the greatest range of calcaneus length, the highest values matching values noted for domesticated cattle, and the lowest being distinctly below the data from other sites.

Talus

A comparative analysis of the greatest length of the talus (GLl) did not give a uniform picture. It was exceptionally homogeneous in the Wadi Khashab cattle, giving a very narrow size range. The populations from Kerma, al-Barsha and Makuria were much more differentiated in this respect [*Fig. 96*]. Relatively little differentiation was noted in the material from Berenike, although this could be due to limited data. The ranges for cattle from Kerma and medieval Makuria seem the most analogous in this respect, including very similar median values. However, the material from Makuria did not record the highest values known from Kerma, while slightly lower values were recorded. In terms of median values for this element, the cattle from Berenike seems to be close to the cattle from Kerma and Makuria, although without the highest values recorded for both these collections. The cattle from al-Barsha forms a clearly distinct group with the median value for this population being clearly the highest and the range also encompassing the highest values.

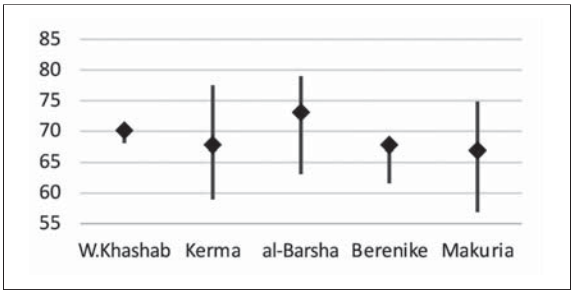


Fig. 96. Range of the greatest length of the talus (GLl) for cattle from different sites in northeastern Africa (in mm)

Metatarsals III and IV

Complete metapodium bones are rare in material from settlements representing consumption waste. Thus, a comparative analysis of the width of the proximal epiphysis (Bp) and the width of the shaft (SD) of the metatarsals was undertaken. The range of the width of this element in the cattle from Wadi Khashab was fairly narrow, unlike the broad ranges recorded for both Kerma and medieval Makurian cattle [*Fig. 97:A*].

The median values for the width of the proximal epiphysis in the Wadi Khashab and Kerma cattle were very similar. The Makurian cattle was generally characterized by a range of lower width values and a lower median.

The results for the width of the distal epiphysis (Bd) of the metatarsals was interesting to say the least [*Fig. 97:B*]. The Wadi Khashab cattle showed little differentiation in this respect, although the median was the highest compared to all the examined populations. In turn, the cattle from Kerma presented the broadest range of all the cattle studied here, whereas the cattle from al-Barsha was little differentiated and had a median only slightly lower than that of the cattle from Wadi Khashab and higher than that calculated for the animals from Kerma. The cattle from Berenike demonstrated a relatively large range, the median value approaching that for Kerma cattle. Medieval cattle from Nubia seems to have shown the lowest range of the examined values, and the median in this case was also lower than in the other material [see *Fig. 97:B*].

Looking at the shaft width (SD) of the cattle metatarsals, the most massive build was noted with regard to the animals from al-Barsha [*Fig. 97:C*]. Relatively high values were also noted for the animals from Wadi Khashab, where the median was identical with that of the al-Barsha population. The Kerma and Makurian cattle presented metatarsal shaft widths that were very similar between them, both in terms of the ranges and the median.

Phalanges (posterior)

The greatest length (GLpe) of the first phalanx of the posterior|pelvic limb was also compared [*Fig. 98*]. The high values for this element with regard to the cattle from Wadi Khashab are comparable to the maximum values for Kerma cattle and cattle from late Berenike. However, the Kerma cattle was greatly differentiated in this respect, the range including also the lowest recorded metric values. The median for the Wadi Khashab cattle was also the closest to the animals from Berenike and close to the cattle from al-Barsha. The lowest median was noted for the population of Makurian cattle [see *Fig. 98*].

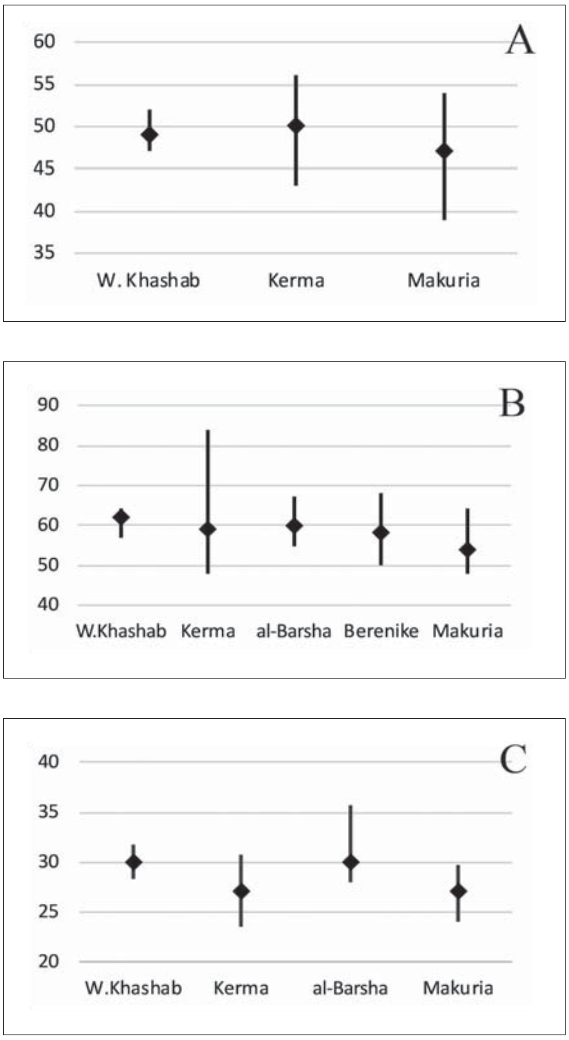


Fig. 97. Measurements of cattle metatarsals compared across sites from northeastern Africa (in mm): A – proximal epiphysis width interval (Bp); B – distal epiphysis width interval (Bd); C – metatarsal shaft width (SD)

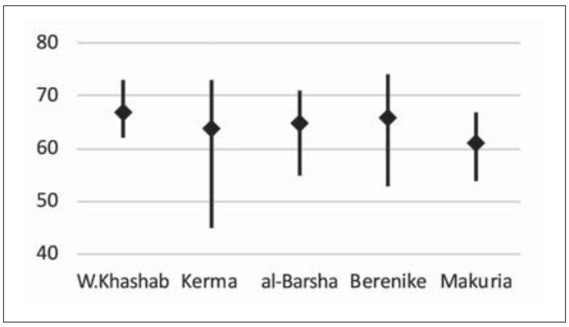


Fig. 98. Greatest length of phalanx I of the posterior limb in cattle from different sites in northeastern Africa (in mm)

4.1.2 Wadi Khashab cattle morphology versus morphology of other African cattle

Osteometric data for the mature bull from burial F.1, transposed into points on a point scale, fell in the interval of between 15–19 and 90–94 points [*Fig. 99:A*]. The biggest clustering of points is to be observed in the 50–54 (15.12%), 30–34 (13.44%) and 45–49 (12.6%) intervals, corresponding to middle-sized cattle. The values that corresponded to high points concerned chiefly the maximum length of the metapodia and acropodia.

The other bull from burial F.4 was morphologically close to the bull from burial F.1. Despite its young age, some of the parts of its skeleton were larger than in a fully mature individual. The values on the point scale were contained in the interval of between 20–24 and 90–94 points [see *Fig. 99:A*]. The greatest clustering is noticeable in the 40–44 and 60–64 point interval. This particular animal displayed the characteristics of the most massive body build of all four of the examined individuals. In similarity to the bull from burial F.1, this one also had high points corresponding chiefly to the data on metapodium and acropodium length.

The remains of a mature cow from burial F.6 were placed between 5–9 and 80–84 points on the point scale [*Fig. 99:B*]. The biggest clustering was observed distinctly in the 40–44 and 45–49 categories, determining the medium size of the animal. A certain clustering of points may be observed also in the 25–29 interval, corresponding to values typical of cattle presenting a slighter body build. The charting of osteometric data from burial F.14, which featured another mature female, on the point scale gave a picture very similar to that for the cow from burial F.6. The broad interval from 0–4 to 90–94 suggested the greatest differentiation in the body build of this animal, incorporating both features of a slighter build and elements corresponding to large size, compared to other populations of African cattle. Similarly to the male skeletons, low point values corresponded to the width|length values for bones from the stylopodium and zeugopodium parts of the skeleton. The broad point interval, and especially the significant frequency of points in intervals corresponding to cattle of a slender build for the female from burial F.14, could explain the differences with respect to the female from burial F.6. The metapodium and acropodium bones which survived the plundering in burial F.6 represent the parts of the limbs that are characterized by more massive size, especially in terms of length, in the examined population, while the parts featuring a slighter build, that is, the proximal parts of the bones, have not been preserved.

The picture emerging from the transposition of the osteometric data onto a point scale [*Fig. 99:C*] is of a homogeneous, well crossbred and stable population with predominant morphological "medium" sizes in the 30–60 point interval. However, some of the morphological characteristics of the cattle from Wadi Khashab corresponded to "large" sizes of the cattle from northeastern Africa. "Small"-size characteristics were also recorded, but they were definitely in the minority.

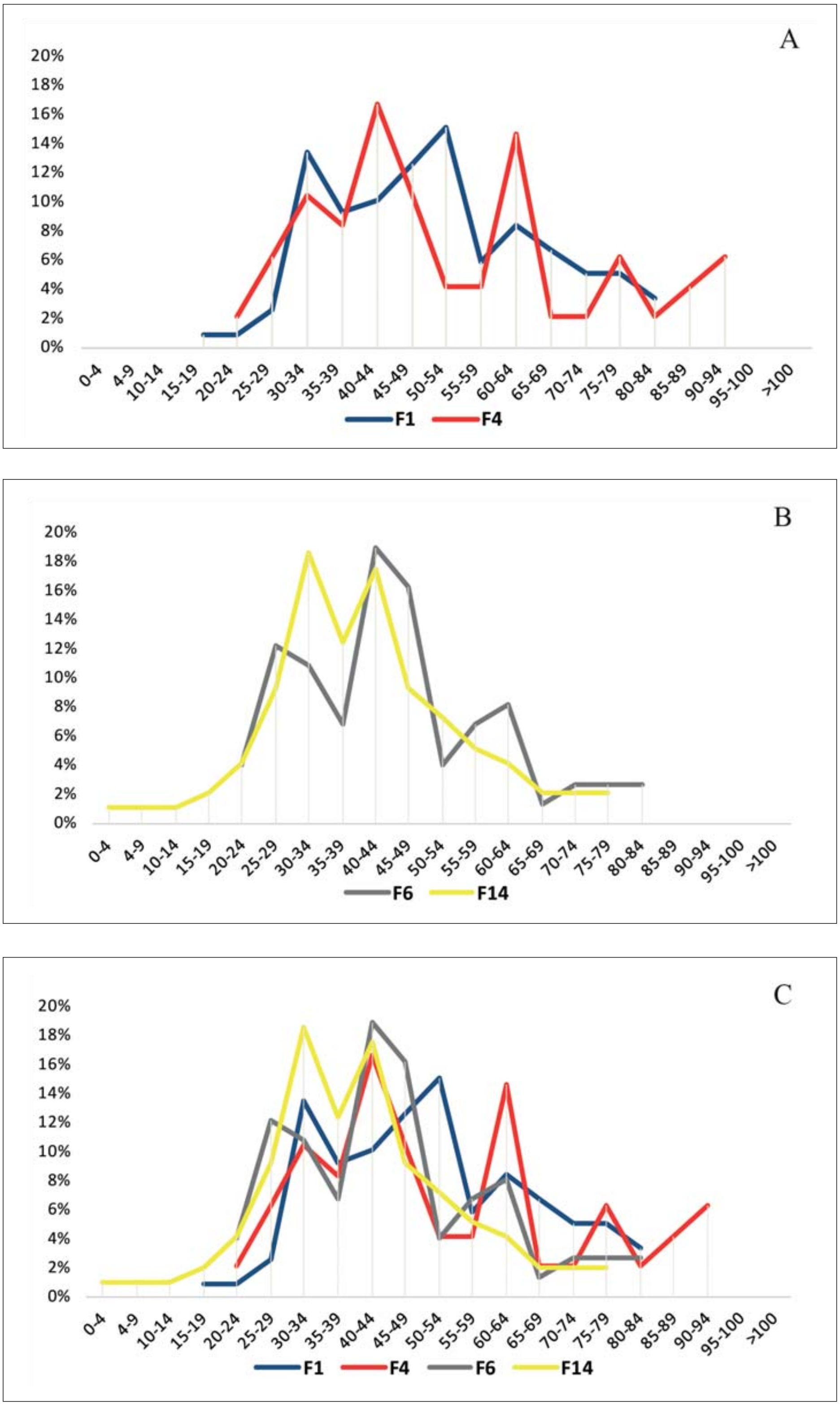


Fig. 99. Comparison of the morphology of cattle from Wadi Khashab using osteometric data transposed into points on a point scale: A – mature males/bulls; B – mature females/cows; C – morphology of cattle from Wadi Khashab on the grounds of osteometric data transposed into points

Wadi Khashab and Kerma

Compared on a point scale with the population of cattle from Kerma [*Fig. 100:A*], the two groups ranged very broadly from 0–4 points to 100 and 94 for, respectively, Wadi Khashab and Kerma. A comparative analysis showed the biggest clustering of points within the ranges corresponding to the medium sizes. Interestingly, for both the Wadi Khashab and the Kerma populations, the highest percentages concerned values around 30–34, 35–39, and 50–54 points [see *Fig. 100:A*]. The curves for both populations based on points were almost identical. The only observed difference was the frequency of small sizes, slightly higher in the case of the Kerma cattle than at Wadi Khashab. The results of this comparison justify the idea that the two populations were morphologically very close to one another.

Wadi Khashab and Dayr al-Barsha

A similar comparison on the points scale of the Wadi Khashab animals with the group from Dayr al-Barsha revealed significant differences between the two populations. The al-Barsha cattle is very homogeneous morphologically, with big and very big animals dominating the spectrum. Even taking into account sexual dimorphism (the al-Barsha assemblage appeared to be composed of males, including castrates), the cattle from Wadi Khashab had many more characteristics that tested medium or small on the scale [*Fig. 100:B*]. In the al-Barsha group, the biggest clustering of points occurred in the 50–54, 55–59 and 40–44 point intervals. Meriting attention are also the clusters of points in the large-size interval, which are higher than in the Wadi Khashab group, and points in intervals not recorded for the populations at Wadi Khashab and Kerma: 95–100 and > 100 points.

Based on the charted results, the cattle from al-Barsha can be said to be evidently larger and more massive in body build compared to the cattle from Wadi Khashab.

Wadi Khashab and Berenike

The two populations, from Wadi Khashab and late Berenike, turned out to be within an identical range of points: from 0–4 to 90–94 [*Fig. 100:C*]. The greatest clustering of points in both groups was around the middle-size intervals: from 30–34 to 45–49 points. However, the cattle from Berenike tended to have more "small" characteristics and slightly fewer "large" characteristics than the cattle from Wadi Khashab. Despite the considerable morphological similarities, the cattle from the temple context in Berenike (5th century AD) may have been of slightly lighter body build.

Wadi Khashab and Makuria (Banganarti and Old Dongola)

The osteometric data from Old Dongola and Banganarti, large centers of medieval Nubia, were the fourth appropriately large series used for comparative analysis with the Wadi Khashab group [*Fig. 100:D*]. Significant differences were recorded, but also observable parallels between the two pictures. The medieval Nubian cattle had a distinctly higher percentage of small and very small sizes [see *Fig. 100:D*] and nothing like what was noted for the Wadi Khashab cattle. The greatest

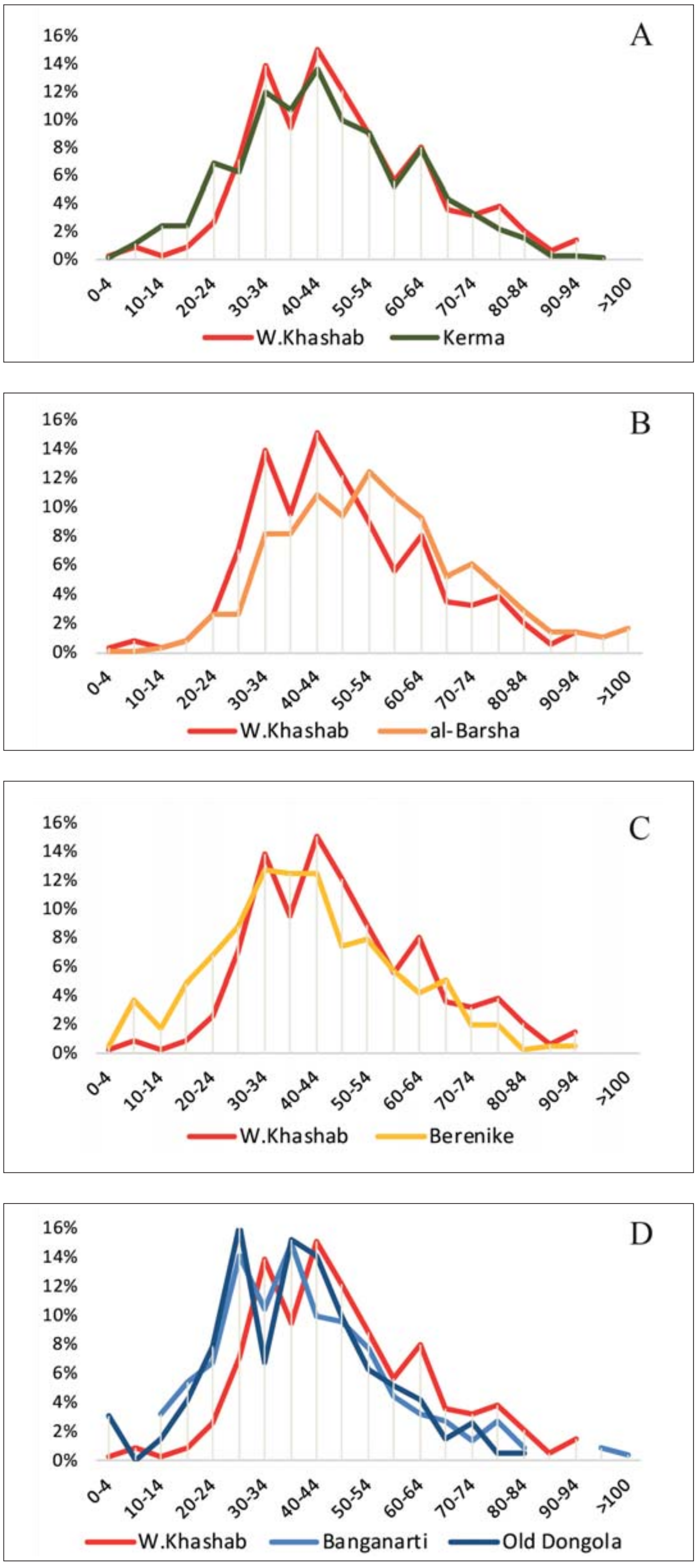


Fig. 100. Comparison of the cattle morphology between sites using osteometric values transposed into points:
A – Wadi Khashab vs. Kerma; B – Wadi Khashab vs. al-Barsha;
C – Wadi Khashab vs. Berenike; D – Wadi Khashab vs. Banganarti and Old Dongola (Makuria)

clustering of points for the medieval populations was in the 25–29, 35–39 and 40–44 points categories, that is, the group of small and small-to-medium sizes. Of interest is the observable high percentage of values in the 40–44 interval for osteological material from Old Dongola, coming close to the values from Wadi Khashab. These data originated mainly from the late Makurian deposits found on the citadel hill. It is highly probable that some of the cattle herds from 13th- and 14th-century Old Dongola were imported to the Makurian capital; these could well have corresponded morphologically to the native African type of longhorn cattle (Osypińska 2018), hence the specific picture of cattle morphology from Old Dongola.

4.1.3 Cattle from Wadi Khashab: summary

The emerging picture of the morphological type of animals buried close to 7000 years ago in a monumental ceremonial complex in a mountain wadi has also placed this small population within the context of northeastern African cattle domesticated and bred in the Nile Valley and the northeastern Sahel. Apart from describing the morphology of these animals, the data from Wadi Khashab has also helped to characterize their behavior.

The four animals (and the fifth preserved fragmentarily) from the Wadi Khashab complex represented a homogeneous and morphologically stable population with characteristic features. They were of average height at the withers (130–150 cm), evidently smaller and more slender than the so-called Egyptian longhorn cattle (Lortet and Gaillard 1903; Boessneck and Driesch 1987). Despite the lack of evidence, it may be assumed that they belonged to a horned variety and that most likely it was the longhorn variety. There are two premises arguing in favor of this idea. First, the very close morphological resemblance of the cattle from Wadi Khashab to that from Kerma, which had long, massive horns typical of indigenous African longhorn cattle (Grigson 2000). Second, the form of the burials, especially the manner in which the heads of the animals were immobilized and exposed, constitute a premise for the presence of horns. The care and precision of this intentional treatment indicates a desire to display the horns, although it is impossible to decide whether the idea was to have the horns sticking out from the superstructure and thus put on display, or the immobilizing was for the purpose of cutting them off as a bucranium.

The build of the cattle from Wadi Khashab was characteristically slender and evidently long-legged, even compared to other populations. The distal parts of the metapodia and acropodia were clearly elongated, whereas the stylopodia (humerus and femur) and zeugopodia (radius, ulna and tibia) appear to be proportionately shorter. The build and proportions of the bones of the limbs of the cattle from the wadi were similar to those known from Kerma, but visibly more slender than in the case of the cattle from the Egyptian Nile Valley in historic times. The single distinctive feature of this population, setting it apart from others considered in this study, is the massive build of the metacarpophalangeal (*articulationes metacarpophalangeae*) and metatarsophalangeal joints (*articulationes metatarsophalangeae*), referred to as "pastern" joints by breeders. In large ungulates, these joints are supported by a highly intricate network of ligaments, muscles and tendons, responsible for phalangeal equilibrium and biomechanics, which are of key importance for animal locomotion. The massive fetlocks of the cattle from Wadi Khashab support the idea of a particularly heavily burdened locomotion of this population. The herd probably covered long distances and may have also climbed the slopes of the mountain wadis in the Eastern Desert.

Humpedness was another morphological feature of the Wadi Khashab cattle, although not as prominent as in zebu-type cattle. The absence of any kind of connection with the zebu is demonstrated explicitly by the lack of bifid dorsal vertebral spines on the thoracic and lumbar vertebrae. The cattle from Wadi Khashab also displayed a clearly marked sexual dimorphism. Another feature shared by the animals from Wadi Khashab was tartar thickly coating the teeth.

The morphological characteristics of the cattle from Wadi Khashab fit in well with the picture of the cattle from Kerma, both the city and the cemetery. In spite of the 2500 years or so separating the two sites, morphologically, the cattle from Wadi Khashab appears to be almost identical with the overall description of Kerma cattle. Interestingly, there are also numerous parallels with the cattle uncovered in the rubbish dump next to the Roman temple in Berenike. In turn, the animals bred and used in medieval Nubia were of lighter build than the discussed groups, although here, too, one can observe certain morphological characteristics shared by the prehistoric and medieval Nubian cattle—namely, slender build, long-leggedness and distal sections of limbs elongated with regard to the proximal ones. The most different in morphological terms were the animals from al-Barsha in Middle Egypt, dated to the Third Intermediate Period. They were clearly more massive, higher, with different limb proportions, as well as with bifid dorsal vertebral spines of the thoracic and lumbar vertebrae. The specific form of the horncores (Linseele et al. 2017), different from the ones known from Kerma (Chaix 2007), for example, also deserves attention.

4.1.4 African cattle: morphology and origin

The morphology and origin of cattle in northeastern Africa is still a big unknown despite dozens of years of research. It is commonly assumed that the native African longhorn cattle (Egyptian longhorn was the name used by an earlier generation of scholars with regard to the variety found in Egypt) ultimately became extinct due to a rinderpest pandemic at the end of the 19th century (Grigson 1991; 2000). For a long time, descriptions of mummified remains, skulls and skeletons, made toward the end of the 19th and in the early 20th centuries, were the only source available for early cattle in northeastern Africa (Dürst 1899; Lortet and Gaillard 1903; 1907; 1909; Jackson 1934). Significant, even if few, were later descriptions of whole skeletons of oxen (Boessneck and Driesch 1987). A breakthrough came with the work of Chaix (2007) on the archaeological finds of cattle remains from Kerma in the Third Nile Cataract region. The thousands of osteometric data for animals from the city and the royal necropolis constituted an astoundingly rich set of information, the first of its kind from the eastern Sahel, encompassing both body morphology and treatment of a symbolic and cultic nature. The deposit of 15 animals from Dayr al-Barsha, described in great detail from an archaeozoological point of view (Linseele et al. 2017), was an important discovery from the territory of Egypt, thus contributing substantially to knowledge of ancient Egyptian cattle from about 1000 BC (the deposit was dated to the closing years of the New Kingdom and the ensuing Third Intermediate Period).

In this situation of a relative dearth of data on early African cattle, the Wadi Khashab burials suddenly opened the way to a large series of osteological and osteometric data of huge scientific significance in view of the early age of this material and the sexual differentiation of the animals buried in this mountain funerary complex. It is a significant contribution to the discourse on the morphology of early cattle, its origin in particular and the origin of cattle in Africa in general, including the grounds for distinguishing the *Bos africanus*, as already postulated (Grigson 1991; 2000).

Bos africanus was a cattle type morphologically and genetically different from the Near Eastern *taurine* as well as the Asiatic zebu, taking its beginning from the African aurochs. In the debate on its origins, one side, supported by some geneticists (Loftus et al. 1999), argued that African longhorn cattle was a hybrid of the zebu and *taurine* (e.g., Manwell and Baker 1980; MacHugh et al. 1997; Marshall 1998). The archaeozoological data was largely ignored, geneticists failing to notice the growing body of evidence in favor of a native origin for this cattle (Marshall 2000; Gifford-Gonzalez and Hanotte 2011). The discrepancies were particularly noticeable with regard to the origin and evolution of *sanga* cattle, considered by archaeozoologists to be native African cattle (e.g., Grigson 2000). *Sanga* cattle remains were recorded in the oldest Neolithic assemblages and their representations appeared in rock art (as early as about 5000 BC). Meanwhile, geneticists persisted in considering the *sanga* as a hybrid of the zebu imported from India. Remarking on this serious dissonance, Caroline Grigson pointed out that geneticists were limited in their sources, using only modern genetic material, hence their explanations of the origin of African and *sanga* cattle could not be credible (Grigson 2000; earlier, Bailey et al. 1996). A 1990s study (Loftus et al. 1994) of protein polymorphism and mitochondrial DNA (mtDNA) indicated an early split between the populations of *Bos taurus* and *Bos indicus* and a continued isolation already 120,000 years ago, long before domestication took place (Loftus et al. 1994; Bradley et al. 1996; Baig et al. 2005; Beja-Pereira et al. 2006). However, the Near Eastern and African cattle are relatively closely related with one another (Bradley et al. 1994; 1996). The absence of the mitochondrial DNA of African cattle in the genome of the zebu supported Epstein's view (Epstein 1957; 1971; Epstein and Mason 1984) that practically only male zebu were brought to Africa (Teale et al. 1995; Marshall 1998; Pérez-Pardal et al. 2018). The recent identification of a distinctive haplotype T1 in the genome of modern African cattle prompted a change in the approach of biochemists to the origin of African cattle (Loftus et al. 1994; Loftus and Cunningham 2000; Edwards et al. 2004). The high frequency of the T1 haplotype in mainly northeastern Africa, with a simultaneous low frequency in the Iberian peninsula as well as in the Levant, led a large part of the geneticists to theorize on a local African domestication of cattle (Achilli et al. 2009; Gifford-Gonzalez 2013). In consequence, the results of analyses of mitochondrial DNA started to be seen in a different light with whole sequences of chromosomes being exclusively accepted as proof of the presence of the genome of the African aurochs (Decker et al. 2009; Gifford-Gonzalez 2013).

Some scholars, however, would like to see the dominance of the T1 haplotype in the genome of African cattle as evidence of the early arrival of a small founding population of domesticated cattle, which was subsequently isolated for thousands of years from its native group in the Near East (Nicolotti and Guérin 1992; Achilli et al. 2008). Another concept, based on different source data, assumes that the African auroch (*Bos primigenius* | *Bos primigenius opistonomus* | *Bos primigenius africanus*) was instrumental in the emergence of the T1 mutation. As a result, there are two separate theories based on the genetic data, but fortunately they are increasingly in line with ideas already floating around for a long time in archaeozoological circles. There is general agreement as to African cattle being the oldest branch of *taurine* cattle and this supports two different hypotheses. According to the first, there were two great centers of the domestication of cattle in the world, the Indus Valley and the Fertile Crescent (Grigson 1996). In Africa, native populations of domestic cattle were formed as a result of crossbreeding with the African aurochs native to this region (Achilli et al. 2008). The second hypothesis assumes that there were three independent centers of cattle domestication: two in the valleys of the Indus and of the Euphrates and Tigris, and the third in northeastern Africa (Meadow 1986; Decker et al. 2009). This research is still in its initial stages as far as the African cattle population is concerned.

The skeletons of cattle from Wadi Khashab were analyzed using criteria for distinguishing between bones of the zebu and *taurine* described by Grigson (1980; 1984). The edge of the eye-sockets as well as the sacrum are definitely closer to what is considered typical of *taurine* cattle rather than the zebu. The Wadi Khashab animals did not have the characteristic bifurcated spinous processes on the vertebrae, which is a feature of the zebu found only sporadically in *taurine* and African cattle (Grigson 1991; 2000). A noticeable slenderness of the long bones is also typical of *Bos africanus* (Grigson 1991; 2000). This characteristic is observable in cattle from Kerma as well as al-Barsha, Berenike and medieval Makuria, but especially so in the animals from Wadi Khashab. It is more than just a slenderness of particular bones, encompassing rather a characteristic body build with longer limbs in the metapodium and acropodium parts and a shortening of the zeugopodium and stylopodium as attested in the al-Barsha cattle.

Specific behavioral factors may have influenced the shaping of the morphotype of early African cattle (as well as sheep, which were similarly long-legged at Wadi Khashab; see below). Arguing in favor of this hypothesis, assigning a formative role in the morphotype of early ruminants at Wadi Khashab to behavior, are theories linked to bone biomechanics and adaptation processes as a result of long-term overload. The massiveness of the postern joints in the cattle from Wadi Khashab, instrumental for proper locomotion, could be indicative of a lifetime spent covering long distances over difficult ground in terms of elevation and relief.

The importance of eco-geographical conditions for the formation of adaptive traits was considered in the analysis of the morphological characteristics of the cattle (and sheep; see below) from Wadi Khashab (Allen's rule; see Allen 1877). A comparative analysis with data from the Nile Valley led to the conclusion that the morphology of animals from Wadi Khashab, which was dependent to some extent on eco-geographic rules, was shaped also by unknown factors that were not affecting other populations. The cattle from Kerma, as well as the cattle known from Meroitic and Makurian sites, were populations living in the same, extremely hot and arid climatic zone. They were all generally long-legged, but none to the degree represented by the ruminants from Wadi Khashab. In addition, the animals from the mountain wadi complex had the widest shafts of metapodial and phalangeal bones and, interestingly, the factors shaping these characteristics appear to have worked without differentiating between the two species.

The present analysis clearly shows that the two cows and two bulls from Wadi Khashab (plus a fragmentarily preserved fifth animal) are currently the most representative examples of *Bos africanus*. The osteological and osteometric data from these buried animals are a source of information not only on their morphology and behavior, but also, indirectly, on the factors that shaped these characteristic traits. They appear to have developed quite early (which is an argument in the debate on the origin of *Bos africanus*) and lasted for thousands of years in the cattle population living in the Nile Valley.

The features characteristic of *Bos africanus* survived especially long in Nubia and the territory of modern Sudan. In the Nile Valley, Egypt in particular, there seems to have been a progressing differentiation of cattle, but in Sudan the direction was mainly toward a smaller size, a process that was understandable in the context of a stationary breeding model in small herds. In ancient Egypt, the so-called Egyptian Longhorn was evidently larger and more massively built than the *Bos africanus* from Kush and Nubia, possibly as a result of selective breeding. From Egypt (but not from everywhere) there is also evidence of some input from a population of slightly different morphology (e.g., the cattle from al-Barsha and Tell el-Dab'a). Comparative analyses have demonstrated that as late as in the 5th century AD, the cattle present on the Red Sea coast around Berenike was most likely imported from the south, from the Sahel. It was morphologically like the *Bos africanus* species, with long horns, long legs and slender body build, chiefly without bifid spinous processes. The morphological characteristics, and perhaps also physiological ones, of the native *Bos africanus*, of which the cattle from Wadi Khashab is now the oldest representative, were preferred for a very long time by the communities of northeastern Africa and especially of the sub-Saharan zone (Dubosson 2011; Lesure 2018).

4.1.5 Sheep from Wadi Khashab: morphometrical analysis

Remains of sheep (and goats) are noted on virtually all archaeological sites in northeastern Africa, starting from the Neolithic. Their origin is not as controversial as in the case of cattle. The sheep used and bred in Africa came in domesticated form from the Near East via the Sinai already in the Neolithic (MacDonald 2000). The oldest finds of animals of the southwestern-Asiatic type in Egypt (Delta and Fayum Oasis) are dated to the end of the 7th millennium BC and, for the most part, the 6th millennium BC (Linseele, Holdaway, and Wendrich 2016). Remains of small ruminants of Neolithic date have been recorded in the Eastern and Western Deserts, most often on sites associated with the economic model of mobile pastoralism. In the 5th millennium BC, the correlation between significant breeding of sheep and goats and a settled way of life and agriculture gradually became widespread (Linseele, Holdaway, and Wendrich 2016). There were two routes by which the small ruminants were diffused in Africa: up the Nile Valley and along the coast of the Mediterranean to the west of Africa (Blench 2000a; 2000b; MacDonald 2000).

Sheep (and goats) never matched cattle in the cultural significance they acquired among communities living for millennia in the Nile Valley and eastern Sahara (Hall 2000). They are marginalized in research, and the investigations themselves are much less advanced than in the case of cattle, this despite the fact that for many prehistoric and ancient communities they were usually *de facto* the most important element of the economy as the main source of meat and milk. One reason is the meagerness of valuable, credible data from archaeological and archaeozoological investigations, resulting from the difficulties in the precise identification of the two species, which are so similar in morphological terms that it is usually impossible to discern between the two when dealing with the usually heavily fragmented post-consumption skeletal remains. So even when osteometric data is available, it is not always possible to be sure which species the remains represented.

Among the most important work on the early populations of sheep in ancient Nubia are the studies of Chaix on the animals from the Kerma cemetery (Chaix and Grant 1987; Chaix and Callou 2011; Chaix 2013). The assemblage included 55 complete skeletons of sheep, mainly rams, which allowed an approximate description of the morphotype of the sheep population in the Middle Nile Valley about 5000–4000 years ago. Numerous morphological characteristics, such as the number of caudal vertebrae (15 on average in Kerma, while modern types have up to 35 vertebrae and sheep in Sudan have 20; wild sheep have 12–13; data after Chaix and Grant 1987), skull shape and length of the long bones, indicate that a primitive variety of long-tailed sheep, about 80 cm high at the withers, dominated the stock already in this period. The Kerma data constituted an important reference for the present study owing to its complementarity and relative chronological, geographical and, to some extent, cultural nearness. Additionally, the availability of appropriately rich osteological and osteometric data from younger assemblages made them a good source for comparative studies in the present analysis. These were remains of sheep from the chambers of post-Meroitic tumulus tombs of the 4th–5th centuries AD. The bulk of this data comes from cemeteries in the Fourth Cataract region and from the site at el-Zuma (Osypińska 2018). The comparison was considered as justified in view of the assumption, current among researchers today, that peoples from the Eastern Desert dominated among the nomadic communities entering the Middle Nile region after the fall of Meroe. Other material for comparative studies came from Soba, the capital of Alwa, dated to the 6th–9th centuries AD, and from the largest complexes of Makuria, that is, Old Dongola and Banganarti (7th–14th centuries AD). Also used for comparisons are the data from site H25 in the Selim Basin in the Third Cataract region, studied by the British Museum archaeological team; the material is dated to the rule of Tuthmosis III (Hornung, Krauss, and Warburton 2006; Thomas 2014). Last but not least were the osteometric data from Roman Berenike (5th–6th centuries AD).

Skull

The skulls of all three sheep from Wadi Khashab were in good condition. Two of them (F.7 and F.16) were preserved with horncores. The processes were small, angled to the sides and dropping down and back from the base. The horn sheaths were probably twisted in shape. The third individual was hornless. The clearly convex, hunchbacked nose profile is evident on all three skulls. The cranial sutures were fused in all three cases and the teeth were permanent in both rows.

Humerus

The width of the distal epiphysis of the humerus was selected for comparison with different historical populations of African sheep because of data availability [***Fig. 102***]. The Wadi Khashab group turned out to be of average size when compared with animals from the Nile Valley. It was also the only group without low values, that is, under 30 mm. The sheep from the post-Meroitic tumuli were clearly of lighter build at the elbow joint compared to the Wadi Khashab group, even though the median size was close in both groups. Morphologically, the sheep from medieval Makuria and Alwa were much more differentiated, with the values recorded in these osteological sets being both higher and lower than for the Wadi Khashab skeletons [see ***Fig. 102***].

The withers height of the sheep was calculated from the humerus length (GLI), using coefficients established by Manfred Teichert (1966|69, cited after Driesch and Boessneck 1974). The sheep from Wadi Khashab were between 70.7 cm and 68.0 cm high [***Fig. 102; Table 5***].

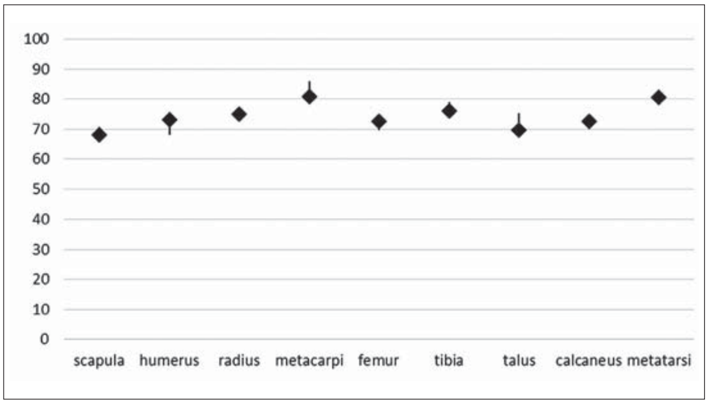


Fig. 101. Withers height of sheep from Wadi Khashab calculated from different parts of the skeleton (in cm)

Radius

Additional information on the elbow joint proportions in the sheep from Wadi Khashab came from a comparison of the width of the proximal epiphysis (Bp) of the radius bone [*Fig. 102:B*]. For this measurement the Wadi Khashab animals were in the large-sized group, the nearest being the sheep from Soba with an almost identical median of size as the sheep from Wadi Khashab. The zeugopodium bones of sheep skeletons from post-Meroitic tumuli were distinctly lighter in build. The Makurian population of sheep in the set under comparison demonstrated the greatest variability, with evidently lower values than at Wadi Khashab as well as the highest of all [see *Fig. 102:B*]. Interestingly, the median for the sheep population from Makuria was evidently lower than for the sheep from Wadi Khashab and Soba.

The withers height of the Wadi Khashab sheep based on radius length (GL) was between 75 cm and 68 cm [*Fig. 101*], that is, noticeably higher than the values calculated from the length of the humerus.

Metacarpals III + IV

Metacarpal bones are preserved as a set much more often in archaeological funerary contexts than settlement layers, hence the choice of the former for a comparison of the length of these bones (GL) [*Fig. 102:C*]. The range for the Wadi Khashab sheep was from 165 mm to 156 mm. The same measurement for sheep from post-Meroitic tumuli was distinctly smaller, from 137 mm to 123 mm. The results point to two completely different populations in terms of the proportions of the thoracic limb.

A comparison of the width of the proximal epiphysis (Bp) of the metacarpal bones confirms this conclusion [*Fig. 102:D*]. In relation to the archaeological populations of sheep from Soba, Old Dongola and Banganarti, the Wadi Khashab group had the highest recorded values, illustrating the massiveness of this part. The maximum range of 25 mm was noted also for the medieval populations of sheep from Makuria and (a very near one) from Soba. The animals from the post-Meroitic tumuli were much lighter in build as far as the metacarpal bones are concerned.

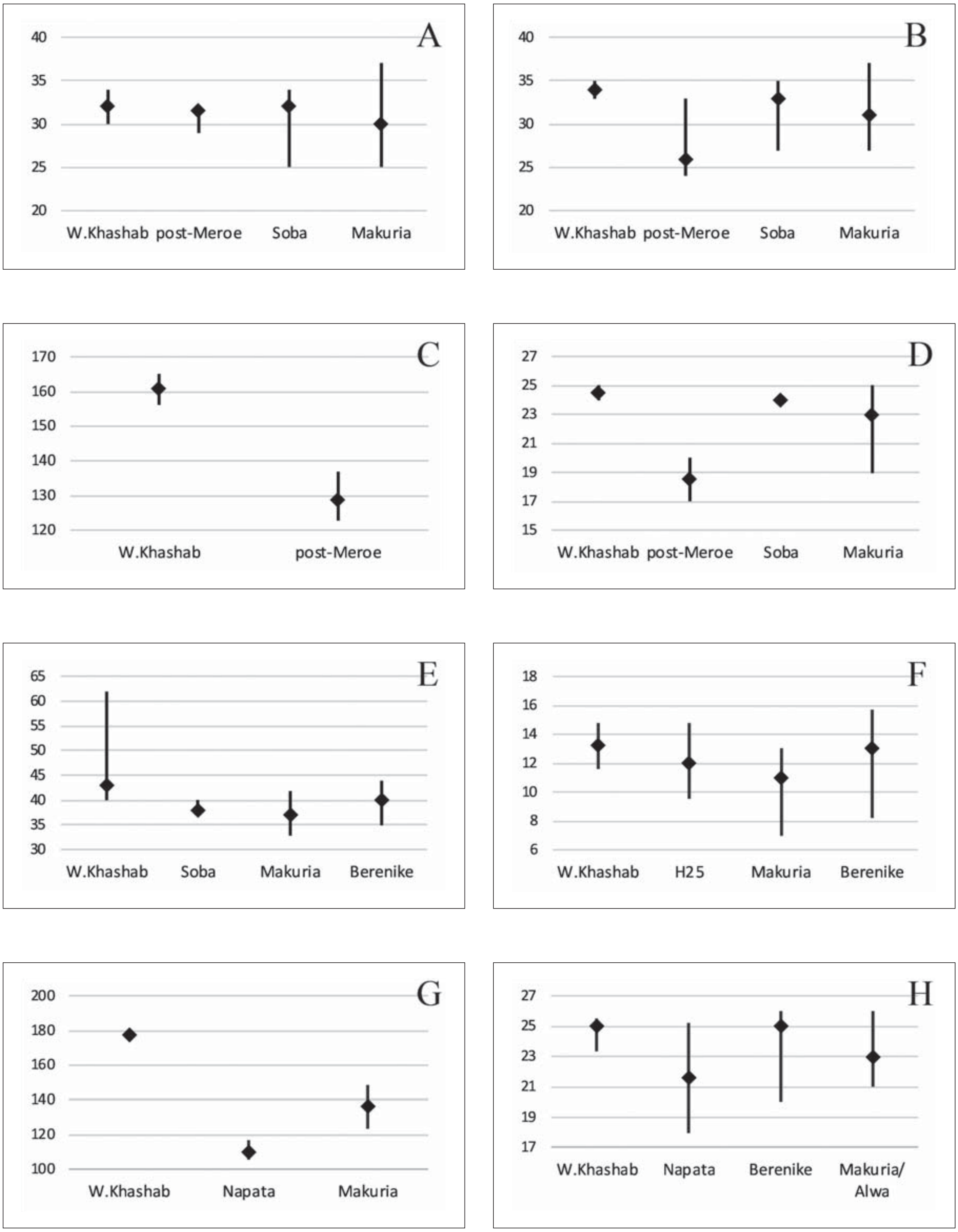


Fig. 102. Measurements of sheep compared across sites from northeastern Africa (in mm): A – humerus distal epiphysis width; B – radius proximal epiphysis width; C – metacarpal length; D – metacarpal proximal epiphysis width; E – phalanx I length; F – phalanx I proximal epiphysis width; G – metatarsal length; H – metatarsal distal epiphysis width

Phalanges I

The osteometric data for the maximum length of the first digit of the animals from Wadi Khashab demonstrated beyond doubt that there is a significant difference between these animals and sheep from the Nile Valley [*Fig. 102:E*]. The acropodium bones were clearly elongated, especially phalanx I, which was much longer than in any of the compared populations of sheep, whether ancient or medieval, including the sheep from Berenike.

Interestingly, in most cases morphological differences concerned mainly the length and not the width. The latter, illustrating massiveness, when compared to other populations showed that the Wadi Khashab animals were similar to the populations living in the region of the Third Cataract and in Berenike of the 4th–5th centuries AD [*Fig. 102:F*]. The sheep from medieval Nubia were of the lightest build as far as the limbs were concerned.

In terms of the median for this element, the Wadi Khashab animals are nearest to the sheep recorded in Berenike.

Talus

The maximum length of the talus bone (GLI) for the Wadi Khashab sheep was compared to relevant osteometric data for the sheep from Soba and the Makurian sites of Old Dongola and Banganarti [*Fig. 103*] and was found to match the upper interval from Soba. The median values for both groups are very similar. The GLI values are evidently lower for the medieval sheep populations.

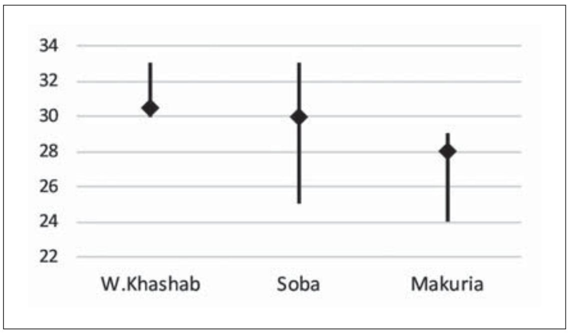


Fig. 103. Length of talus bones in sheep from sites in northeastern Africa (in mm)

Metatarsals III + IV

Metapodium sets from sheep are rare in archaeological records, hence the rather limited group for comparison regarding the length of the metatarsals [*Fig. 102:G*]. Even so, the Wadi Khashab sheep were evidently superior to the populations from the Third Cataract and medieval Nubia in terms of metatarsal length to the point of being apparently distinctive. The special build proportions, especially long-limbedness and elongated distal ends of limbs, are confirmed by a comparison of withers height calculated from different parts of the skeleton: The values for the longest metatarsals are among the highest.

Interestingly, the epiphyseal width of these bones was not proportionately larger to match the length [*Fig. 102:H*]. The data from Wadi Khashab is among the highest when compared to ranges recorded for animals from other sites, but without surpassing the animals from the Nile Valley or from Berenike as to the massiveness of this part of the skeleton. Looking at median values, the Berenike sheep appear to have been the closest to the Wadi Khashab group in terms of the width of the proximal epiphysis of the metatarsals. The median values for animals from Nubia were distinctly lower.

Point scale

The three sheep skeletons from Wadi Khashab represented a population of large animals, high at the withers. The withers height was fairly even (74–78 cm), but otherwise the sheep were differentiated by body mass and horns. An analysis of the osteometric data transposed into a point scale confirms sexual dimorphism also in skeletal build. Two of the sheep from Wadi Khashab were male and one was female. The metric characteristics of all three animals corresponded to 100 on the point scale, which is equal to the maximum values known for the population of sheep from northeastern Africa [*Fig. 104*].

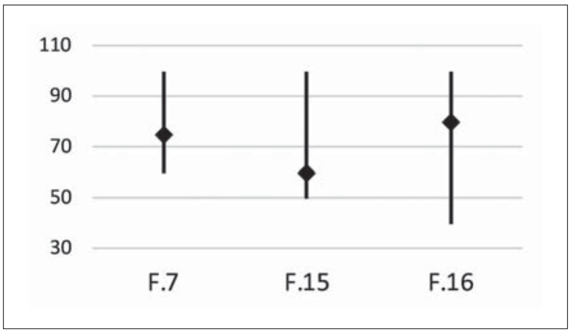


Fig. 104. Point ranges transposed from osteometric data for particular sheep skeletons from Wadi Khashab

The narrowest interval, between 60 and 100 points, was noted for the sheep individual from burial F.7. It shows that it was a big animal, high at the withers and massively built. The point median in this case was 75. The animal was a horned male. The point interval for the specimen from burial F.16 [see *Fig. 104*] was broader, between 40 and 100, the median at 80 points. One should note that the lowest values, corresponding to "small" sizes, referred mainly to bone widths, whereas those classified as "big" to limb lengths. The animal in question was long-limbed and slender in build. It was also a male with horns. The third, hornless individual from Wadi Khashab was most probably a female and the lightest in build, as indicated by the lowest point median calculated to be just 60 points.

All three sheep buried at Wadi Khashab were morphologically mature animals with a fully ossified skeleton. Similarly to cattle, the metapodial and acropodial parts of limbs presented very high length values for the long bones, not found in other sheep populations from northeastern Africa. The epiphyseal width of metacarpal bones was also very high, comparable only to the corresponding parts of sheep skeletons from medieval Soba in Alwa. In terms of withers height, the Wadi Khashab sheep were nearest to the sheep from Kerma in the Classical period (Chaix and Grant 1987) and distinctly larger than historical populations (Meroitic, post-Meroitic and Makurian periods).

4.1.6 Sheep from Wadi Khashab: summary

In terms of morphology, we are dealing with a group of large and long-limbed sheep, the males horned, the females either entirely or at least in part hornless. There was a noticeable sexual dimorphism of skeletal build, the males being more massive and slightly higher than the female. The limb proportions were very characteristic in this group, demonstrating evident parallels with the morphology of cattle from Wadi Khashab as discussed above. Specifically, it was a distinct long-limbedness with clearly elongated parts of the metapodium (metacarpals and metatarsals) and acropodium (phalanges I and II). Long-limbed ruminants, sheep included, are common in the North African populations, in ancient as well as modern times—a characteristic observed and described as "longipes" already in the early 20th century (Dürst and Gaillard 1902). It was noted also for the sheep population from Kerma (Chaix and Grant 1987) and for medieval populations of sheep (Osypińska 2018). The Wadi Khashab population deserves attention with regard to the joints that are essential to animal locomotion. The metacarpals and metatarsals present a much stronger build compared to other populations, which is equally distinctive as a trait of the Wadi Khashab sheep as height at the withers when compared to sheep bred in the Nile Valley in antiquity and in medieval times.

The only known archaeological group of sheep with a morphotype close to that established for the Wadi Khashab specimens is the population from the Kerma cemetery (Chaix and Grant 1987). The characteristics of this population, as described by Chaix, largely correspond to those noted for the Wadi Khashab sheep: average withers height, long-leggedness, horns and their shape, and a characteristic "hunchbacked-nose" profile of the head, which are typical of modern desert-type varieties of sheep (Epstein 1971). The number of caudal vertebrae was also the same as in the Kerma sheep, and it is a good indicator of the degree of domestication of the animals (Chaix and Grant 1987). Wild forms have 12–13 vertebrae in their tails, whereas the fully domesticated, bred animals can have up to 35 (Zeuner 1963; Bökönyi 1974). According to Chaix, close to 30 specimens from Kerma had 15 vertebrae, while modern Sudan Desert varieties from Nubia have 20. One of the rams from Wadi Khashab had 15 vertebrae (for the other two sheep the full set of caudal vertebrae was not preserved), suggesting that, like the Kerma sheep, it was a representative of the "primitive" long-legged variant (Chaix and Grant 1987).

The same factors probably had an influence on the forming of a specific morphology of the ruminants from the sub-Saharan zone in the early Holocene. The Wadi Khashab evidence shows that early on in the process these factors led to a selection of specific morphological (and most likely also physiological) characteristics that subsequently became prominent in African sheep, just as in the cattle from the region. These characteristics, observable already in early populations of these animals, survived over the millennia in the region to bear influence also on the morphotype of modern populations of native origin.

4.2 The mobility of early pastoralists in northeastern Africa

It is a truism to say that the early pastoral cultures of northeastern Africa were mobile communities. According to Kate Liszka, in the Old Kingdom, the term "Medjay" referred to a stereotype of nomads from the Eastern Desert, and it was only from the times of the Middle Kingdom and the Second Intermediate Period that reports started to describe an ethnos of this name (Liszka 2011). Archaeological sources indicate that cattle pastoralists penetrated the extensive territory of the Western Desert already in the 5th and 4th millennia BC. Heiko Riemer (Riemer, Lange, and Kindermann 2013) has even suggested that these cultures migrated seasonally between the Nile Valley and the region around Lake Chad (e.g., Wadi Shaw in southwestern Egypt). Finds of cattle crania from Wadi Sahal (Van Neer and Uerpmann 1989: 331) are thought to indicate ecological conditions in the Western Desert at the turn of the 4th millennium BC. The cattle from Nabta Playa appears to be much earlier in date (mid-6th millennium BC; Applegate, Gautier, and

Duncan 2001) marking a long tradition of pastoral migration in the Western Desert, among others. Domesticated cattle pastoralism has also been confirmed in the Nile Valley by the discoveries from el-Barga, which are dated to at least the 6th millennium BC (Chaix and Honegger 2014), even as numerous sites contribute evidence of the central role of cattle in late Neolithic cultures (Gautier 1989). Finally, one should mention the so-called A-Group culture from Nubia (between the First and Second Nile Cataracts), dated to between 3800 and 2900 BC (Gatto 2006; 2009). Cattle burial practices were recorded there in numerous cemeteries of this culture throughout its existence (Flores 2003).

East of the Nile, a few archaeological sites from the 5th and 4th millennia BC indicate the presence of cultures characterized by a pastoral economy centered on cattle. Two sepulchral sites with megalithic elements are known from Wadi Allaqi (Elai; Sadr et al. 1994), and remains of cattle have been recorded in both. The site of El Arib (Bir Asele) lies even further east; it has yielded cattle burials and megalithic elements in the form of stone steles (Murray 1926). The site has not been dated, but finds of predynastic pottery on the surface have been recorded (Sidebotham, Hense, and Nouwens 2008: 200).

Beside the regional Sheikh Muftah Group living around Dakhleh Oasis through the end of the 4th millennium BC (Riemer, Lange, and Kindermann 2013), Wadi Khashab is one of the northernmost sites reached by cattle pastoralists outside the Nile Valley. It remains open to question whether the Eastern Desert was a year-round *oikumene* for the late Neolithic cattle pastoralists as suggested by the numerous rock carvings depicting cattle in the central Eastern Desert some 100 km north of Wadi Khashab (Morrow and Morrow 2002), a region where they wandered cyclically on the fringes of their world. A few longhorn cattle depictions were discovered recently some 50 km east of the site, in a narrow offshoot of Wadi Abu Ghusun (S.E. Sidebotham, personal communication, 2018), hence the penetration zone of the early pastoralists also included the Red Sea coast.

The morphology of the cattle from Wadi Khashab as discussed above—build of the limbs, body proportions and humpedness—suggests behavior based on constant migration (the same can be said of the sheep; see above). To shed more light on the issue of where the animals from Wadi Khashab came from, samples of teeth were tested to determine their strontium isotope composition [*Table 6*]. The interpretation of the results of these analyses in the context of the Eastern Desert geological background and analogous research on animals from the Nile Valley will be published separately.

Table 6. Results of $^{87}Sr/^{86}Sr$ isotope analyses of the animals from Wadi Khashab carried out in the Isotope Laboratory of Adam Mickiewicz University in Poznań

Sample ID	$^{87}Sr/^{86}Sr$	Error	Animal/feature identification
WH/01/S	0.707927	± 0.000036	*Bos taurus* L., male / burial F.1
WH/02/S	0.707603	± 0.000009	*Bos taurus* L., male / burial F.4
WH/03/S	0.707134	± 0.000012	*Bos taurus* L., female / burial F.6
WH/04/S	0.707412	± 0.000009	*Bos taurus* L., female / burial F.14
WH/05/S	0.707588	± 0.000009	*Ovis aries* L., male / burial F.7
WH/06/S	0.707795	± 0.000021	*Ovis aries* L., female / burial F.15
WH/07/S	0.707410	± 0.000011	*Ovis aries* L., male / burial F.16

4.3 The role of cattle and sheep in the funerary practices of northeastern Africa

There is extensive evidence of cattle and sheep burials from many pastoral cultures in northeastern Africa, but no direct formal parallel for the complex at Wadi Khashab. Nowhere else has the relation of a man, the herder, to his herd been expressed so clearly. Nowhere else, however, are the cattle deprived of the bucrania, the most characteristic element of these burials, considered almost an emblem of the pastoral character of the cultures involved.

The oldest evidence of burials with parts of large ruminants came from the late Paleolithic Cemetery 8905 in Tushka, north of Abu Simbel (11th millennium BC), where human burials surmounted by auroch skulls were found (Wendorf and Schild 2001: 667). The discovery is cited frequently, but only the excavators from the Combined Prehistoric Expedition (CPE) believe that it represents a funerary tradition that finds continuation later in the Neolithic burials of Upper Nubia. For one, it would mean accepting the theory of a local, African origin of cattle pastoralism in this part of the continent, which would be tantamount to assuming that the African auroch was either domesticated or used in breeding. For lack of scientific proof of these processes, the inductive reasoning behind the CPE hypothesis is too weak to give the idea cogency (see Brass 2017).

The oldest undoubted funerary find is a bucranium from the burial of a child from el-Barga, radiocarbon-dated to 5750 BC (Honegger 2005; Chaix and Honegger 2014). The bucranium, coming from a domesticated animal, was treated there, along with other elements of the grave furnishings, as an indicator of the Neolithic character of the adaptation. Bucrania have been discovered also at numerous Neolithic sites in the Middle Nile Valley, at el-Kadada (Reinold 1982; Gautier 1986), Kadruka (Gautier 1987), R12 near Old Dongola (Pöllath 2008), Umm-Melyecta on the Fourth Cataract (Edwards and Fuller 2005), and el-Ghaba (Gautier 1987). As for the meaning of such finds, it was derived from a general conviction about the importance of cattle in the worlds of both the living and the dead, and the high social status of individuals whose graves were furnished with bucrania (Dubosson 2011).

The cattle burials from Nabta Playa, dated to about 5500 BC, constitute an equally old indication of the sacral role of cattle (Paris 2000; Applegate, Gautier, and Duncan 2001; Gautier 2001). The burials were made in a few dozen tumuli constructed together with some megalithic structures (including the so-called calendar) on the northern fringes of the Nabta Basin, in an area of scarce surface finds, most of which dated to the late Neolithic. The tumuli were 3–4 m in diameter as a rule, built of undressed blocks of sandstone. Small hearths were recorded around the tumuli.

An undisturbed cattle burial was discovered in one of the tumuli (E-94-1n). It was accompanied by a sheep burial placed above the bovine skeleton. Heavily eroded bones of bovines were found in three other mounds (E-94-1s – MNI: 2+1?, E-96-4 – MNI: 4, E-97-4 – MNI: 2), supplemented with some bird bones; the E-94-1s burial contained additionally a single sheep. The only absolute date (6480 ± 270 BP) comes from a radiocarbon analysis of a stick of wood deposited under the clay surface sealing the burial in E-94-1n (Applegate, Gautier, and Duncan 2001).

At Nabta Playa, the skeleton of a cow lay on its left side in a pit dug to a depth of about 0.50 m into the sand and gravel filling the wadi (Applegate, Gautier, and Duncan 2001). The burial was aligned north–south with the head to the south. The grave pit had a slight embankment surrounding it in the north, east and south. The pit was filled with sediment, which yielded the abovementioned stick used for radiocarbon-dating the find. The excavators suggested that the stick was part of a structure forming a roof over the burial chamber, covered on top with a layer of clay a few centimeters thick. The superstructure consisted of a casing made of undressed sandstone blocks of substantial size (it took three workers to lift one of these).

A look at the vertical section of the Nabta Playa tumulus (Applegate, Gautier, and Duncan 2001: Fig. 15.3) gives the indubitable impression of having been "opened" in the past, constituting an important parallel for the Wadi Khashab complex. At this point it should be said that the proposed interpretation is alternative to the official stand of the CPE in this matter (proposed and sustained by Romuald Schild). The hypothetical secondary pit evidently reached the level of the bovine burial, and the clay sediment described above would have actually been a naturally deposited layer inside the secondary pit. Drifted and washed sand formed the next layers above it, topped on the surface by a loose fill of stones. The original mound survived on three sides in the form of the said earth embankment with the stones on top.

The opening of tumuli was hardly an isolated event in antiquity. Plunder is an obvious reason, but one should not exclude an interpretation assuming deliberate exhumation, followed by a resealing of the feature after some time. Prehistoric burials should not be considered in the modern conventions of inviolability and allowing the dead to rest in peace. Contact with the dead in past societies could have taken on various forms, and it cannot be excluded that the burials, whether in the form of the dead themselves or the ritual offerings in the graves, constituted a specific kind of medium providing communication with the sacral sphere. Animal burials are spiritually incomprehensible as such and we are left with ethnological parallels, which cannot be trusted unthinkingly.

In summary, it cannot be excluded that tumulus E-94-1n was opened in the past and that after some time the pit was loosely filled with dust and stones, reconstructing in effect the form of the mound. It is also possible that the stone casing was introduced at this time and originally the mound was composed of earth alone. It would explain why there was not a single stone in the natural fill that had slid into the open pit (layer 7). The bones of the sheep were found among the stones, suggesting that they were part of the offering made at the time of the reconstruction of the tumulus.

A tumulus of analogous form (E-94-1s) recorded about 300 m north of the megalithic "calendar" at Nabta Playa is also of importance for the present discussion. The superstructure consisted of large sandstone blocks clustered in a radius of 4–5 m. Fragmented bones of sheep and three bovines were discovered between and directly under the stones, on the surface of the old sand dune (Applegate, Gautier, and Duncan 2001). The publication holds no record of grave pits in this instance. The excavators also cite parallels to similar features from the eastern Sahara (e.g., Gebel el Muqattas), interpreted as multiple-use offering places. However, the description of the faunal assemblage leaves no doubt that the limbs of one of the bovines were found in anatomical order.

The interpretation of this structure borrows from the assumption that the tumulus was opened in the past, like E-94-1n, and then reconstructed. Any trace of a shallow grave pit in the original surface of the sand dune, where the burial would have been made, as well as of the original mound, could have disappeared completely during later activities around the structure. The limbs, still in anatomical order, would represent the remains of the original burial, damaged either deliberately or by chance in the course of the "opening" of the mound. Parts of other bovines, consisting of a bucranium and a single tooth from a much older individual, would have been deposited at this time, and the same could be said of the sheep bones, here in analogy to the finds from E-94-1n.

The third tumulus to yield cattle bones (E-96-4) was represented by a clustering of sandstone blocks in a radius of 4 m, partly on bedrock and partly on a sand dune. There were no traces of a grave pit and four skeletons of cattle were found among the stones along with single bones of birds and a canine (Applegate, Gautier, and Duncan 2001). One of the bovine skeletons was preserved partly in anatomical order, while the other three individual animals were identified by single teeth; it was even considered that they could be intrusions. The poorly preserved structure of this feature does not allow for an easy separation of primary and secondary features. The scattered stones and fragmented elements of a burial suggest parallel treatment in the form of an "opening" of the mound and its later reconstruction. The additional bones may have been intrusive here, but they could have also been the reason for the "opening" of the now untraceable mound.

Last but not least, tumulus E-97-4, which is situated on top of a sandstone outcrop, contained the remains of cattle in no particular order (Applegate, Gautier, and Duncan 2001). Stones were scattered in a radius of 4 m. The published documentation reveals the outline of a limited space filled with bones and a chaotic scattering of stones. The abundant faunal remains represented probably two individuals, that is, a calf and a young animal (juvenile and subadult). There was no evidence of either filleting or burning to be observed on the bones.

In the case of this tumulus, it is just as difficult to separate secondary features from primary ones because the original mound is severely distorted. The pit, which could have been simply a void among the rocks, and the bones recorded inside it suggest the existence of an organized grave, and the chaotic spread of bone remains could be proof of later penetration of the primary burial. Even so, the completeness of the skeleton(s) indicates the burial of a complete animal(s), or else that an additional body was buried there at a later date.

The above detailed revisiting of the Nabta Playa data was prompted by the discoveries made at Wadi Khashab, which throw new light on the interpretation of these finds. The evidence from burial F.1, with the presumed opening of the grave and the following reconstruction of the original superstructure, not to mention the "revitalization" of the whole ceremonial complex, prompted the search for parallels that could corelate to the described behavior.

Interestingly, Neolithic cattle burials are known from a broad belt in the sub-Saharan Sahel: the Red Sea coast (El Arib; Murray 1926), the Nile Valley (Affad 130; Osypińska et al. 2020), Wadi Howar (Jesse et al. 2013) and sites in Niger and Algeria (Paris 2000). According to the excavator, the evidence from sites around Afunfun in Niger points to cultural ties with the Nile Valley (Paris 2000: 122). At none of these sites, however, was it possible to demonstrate a relation between human and animal burials. Indeed, in the case of the Nigerian evidence, it has even been suggested, in analogy to the practices of the modern Wodaabe nomadic herders, that we are dealing with the remains of ceremonies that are linked to burial practices either indirectly or not at all (see also Keding 1997; di Lernia 2006). The only connecting element (unless the human and animal burials occur together) is a common space. No traces of any spatial relationships could be found also between the cattle and human burials in the cemeteries of the Nubian A-Group (Flores 2003), the sole exception being the Nubian cemetery 1600/1700 at Armant, dated to the first half of the 3rd millennium BC (Gatto 2019: Fig. 7).

Manifestations of the relations of animal offerings with human burial practices can be observed in much later times (2nd millennium BC), in the burial customs of the C-Group (Bangsgaard 2010) and the cemeteries of Kerma (Chaix 2001), where a high-status human burial had a set of bucrania skirting the grave in the southern part. Ethnographic parallels and the position of the bucrania outside of the human grave led Pernille Bangsgaard (2010) to interpret these remains in the category of manifestations of "incorporation" rituals and communication with ancestors. The symbolism of sheep buried with a human in one grave would then be a reflection of the community to which the deceased had belonged. However, the Wadi Khashab evidence would not fit in with this interpretation as the sheep burials in the wadi complex are farther from the human and marked by tumuli of their own.

In summary, the manifestly presented offering character of the animal burials with removed horns and their relation to the human buried at Wadi Khashab do not find any formal parallels in the Nile Valley or outside of it, in the broad zone of the Sahel in Neolithic times. There are similarities to be observed, however, with later monuments of this kind functioning among the mobile pastoralists of northeastern Africa. This concerns in particular the rituals of opening burials and their subsequent reconstruction. The monumental complexes must have constituted a cultural landmark for generations of herders moving across the arid lands on either side of the Nile Valley, even if they no longer understood the original meaning and significance of these places. Cattle burials functioning much later in Nubia, for example in the region of the Fourth Nile Cataract (Welsby and Welsby Sjöström 2011), may have also been much later reminiscences of the Neolithic cattle burial traditions.

Chapter 5

THE WADI KHASHAB COMPLEX IN THE NEOLITHIC AND LATER: CHRONOLOGY AND FUNCTION

At the close of the 5th millennium BC, perhaps already in the 4th millennium BC, the nomadic communities functioning in the sub-Saharan Sahel established a ceremonial complex of unique form and most probably also significance [*Fig. 105*]. It should be stated clearly that our chronological assumptions regarding the foundation of the Wadi Khashab complex are based on dates that are secondary to this event. There is no analogous complex known from anywhere in the Eastern or Western Deserts, but the individual components of the Wadi Khashab enclosure correspond to Neolithic installations and ceremonial cattle burials known from the Western Desert (Paris 2000; Wendorf and Shild 2001; di Lernia et al. 2013).

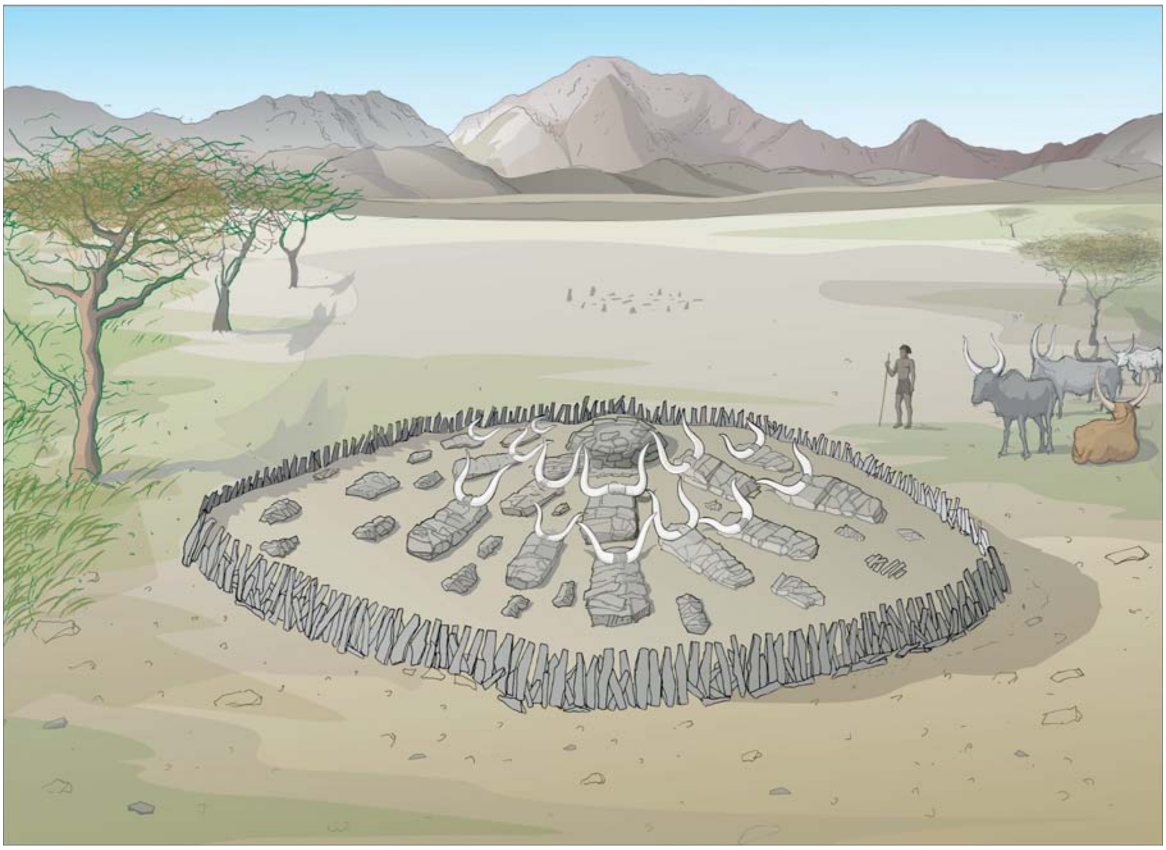


Fig. 105. Reconstruction of Phase 1 (5th–4th millennia BC): the first cemetery with a human burial (F.2) "followed" by a "herd" of cattle (F.1, F.4, F.6, F.14) and sheep (among others, F.7, F.15, F.16) burials, surrounded by a stone enclosure. From the same period, in all probability, a constellation of small stone steles and a set of stone pavements, both situated west of the cemetery (west is straight ahead in the reconstruction). A secondary element in this phase is an additional child burial (F.10), dated to 3600–3300 BC

5.1 Chronology of the site

The first to be buried at Wadi Khashab was most likely the person interred in grave F.2. Two bulls were buried closest to the human (at least considering the excavated part of the cemetery), in grave pits F.4 and F.1. Remains of a third bull burial, F.3, were discovered on the robbers' dump, hence it is more than likely that more bulls will be found once the cemetery is fully excavated. In the next line, one grave away from the human, were two cow burials, F.6 and F.14, and even farther out, three sheep burials (F.7, F.15 and F.16) of both rams and ewes (again, the number of animals will grow with the excavation of the rest of the cemetery). Each burial was furnished with its own superstructure of neatly arranged stones. A skirting of long stones surrounded the group. The stones were up to 1.50 m long and were stuck into the ground. The diameter of this circular enclosure was close to 18 m.

The main human burial and the animal burials appear to have been aligned on the 315° axis. The arrangement seems to be continued outside the enclosure. Further to the northwest was a complex of smaller stone steles fixed in the ground and recalling the installation at Nabta Playa (Wendorf and Schild 2001) and a set of stone pavements, but neither has produced any dating material to ascertain the absolute chronology of these features.

The males in this cemetery, whether cattle or sheep, were placed in the pits on their left side, while the females rested on their right side. The cattle had all lost the horns and the frontal part of the skulls. The absence of the bucrania (assuming that it is not simply due to erosion) should be seen as having ceremonial significance in view of the exceptional importance of this element, especially in the middle part of the Nile Valley, starting from the early Neolithic. Bucrania accompanied human burials, particularly of individuals with high social status, up to the times of the Kingdom of Kerma.

Feature F.2 was most probably an adult interment. Not a single ceramic sherd—relatively the best indication of date—could be found in the vicinity of the burial, while burnt fragments of ostrich eggshell and a broken piece of an ivory bangle are hardly chrono-distinctive.

The child burial F.10 is at odds with the symbolically significant arrangement of human and animal burials discussed above. It is also different in terms of the form of the grave pit and the absence of a superstructure. The child was approximately one or two years old and had a necklace of shells around the neck and a string of blue faience beads on the ankle. These ornaments and a radiocarbon date of the shell bead indicate a chronological affinity between this burial and the cultural horizon of the A-Group from Lower Nubia (Shinnie 2013). Keeping in mind the formal construction differences as well as the location of the child's grave, it most likely represents a different phase of funerary activities within the complex.

Feature F.19, which looks more like a shelter or a windbreak, may be related to this second phase of operation as well. The stones used to construct it resemble those from the circular enclosure ring, although they were not stuck into the ground. Red Sea shells found among the stones were also once part of a necklace, similar to that found around the neck of the child from grave F.10. Alternatively, however, if F.19 is not concurrent with the child burial, it could somehow be connected with the concerted plundering of the burials sometime between 3300 and 3100 BC, as attested by radiocarbon-dating of charcoal samples from relevant contexts. Therefore, the structure could have been a shelter for the robbers and the shells possibly part of the original furnishings of the robbed human burial in F.2.

The dating of the first bout of robbing at the Wadi Khashab cemetery, based on radiocarbon dates of burning around the F.2 and F.7 burials and in the fill of the robbers' pit in grave F.6, deserves comment. There is an astounding clustering of dates in the second century of the 4th millennium BC. The human burial was plundered then, as were the large bovine interments (F.4 and F.6). A very similar set of dates was published for the ceremonial site C23-2 at Wadi Allaqi in the Eastern Desert (Sadr et al. 1994), where the excavators also noted plundering in antiquity and the possibility that evidence of burning reflected the robbing phase rather than the time of the establishment of the burial ground. The date in both cases is concurrent with a growing demand for gold in predynastic and early dynastic Egypt (Klemm, Klemm, and Murr 2001; Schorsch 2017). It is not to be excluded that the Wadi Khashab cemetery fell victim to Egypt's first "gold rush".

In this context, one should mention one of the tumuli investigated by Alfredo and Angelo Castiglione in the Eastern Desert (Sadr et al. 1994), where cattle and sheep bones were discovered together with a human burial and burning remains that were dated to the mid-5th millennium BC. The tumulus (D5.1) was plundered in antiquity, the robbers missing, however, a gold bracelet. The Castigliones cited this as early evidence for trade exchange in cattle and gold between the inhabitants of the Nile Valley and the Red Sea Hills. Paradoxically, it may not have been trade that determined these relations.

The defiling of the cemetery at the end of the 4th millennium BC seems to have triggered a kind of "modernization" of the enclosure [*Fig. 106*]. A mound consisting of a thick layer of rock rubble was introduced inside the whole enclosure, skirted with long stones that were no longer stuck in the ground. This gave the end effect of a gigantic tumulus. The most likely time for this event is the mid-2nd millennium BC, during the functioning of pastoralists from the C-Group in the Nile Valley. A ceramic bowl typical of this cultural group was discovered in the bottom layers of the rubble forming a mound over the whole cemetery. Even so, at least some of the burials must have been manifested on the surface of this mound to account for the precision with which these graves (F.1, for example) were later robbed. The large monolithic stones at five points around the enclosure could also be linked to this phase. They were not fixed in holes in the ground as was the case before with the stones of the enclosure, and they find parallels at El Arib|Bir Asele (Murray 1926) and, on a smaller scale, in cemeteries of the C-Group in the Nile Valley (Hafsaas 2006). The monolithic stands evidently respect the 315° alignment of the original funerary complex, hence it must have been still somehow recognizable on the ground.

The second plundering of the site left traces that were in some cases visible even on satellite images. The mound was pitted with greater and smaller holes, more or less filled with drifted sand. Wadi Khashab seems to have been deeply rooted in the consciousness of the nomads wandering up and down the wadi trails of the Eastern Desert, and, while no interviews with the modern pastoralists were possible, their episodic presence at the site even today is marked by remains of shelters and single graves scattered in the landscape. Their view on the origins and purpose of the stone enclosure and the field of steles could be important and inspiring.

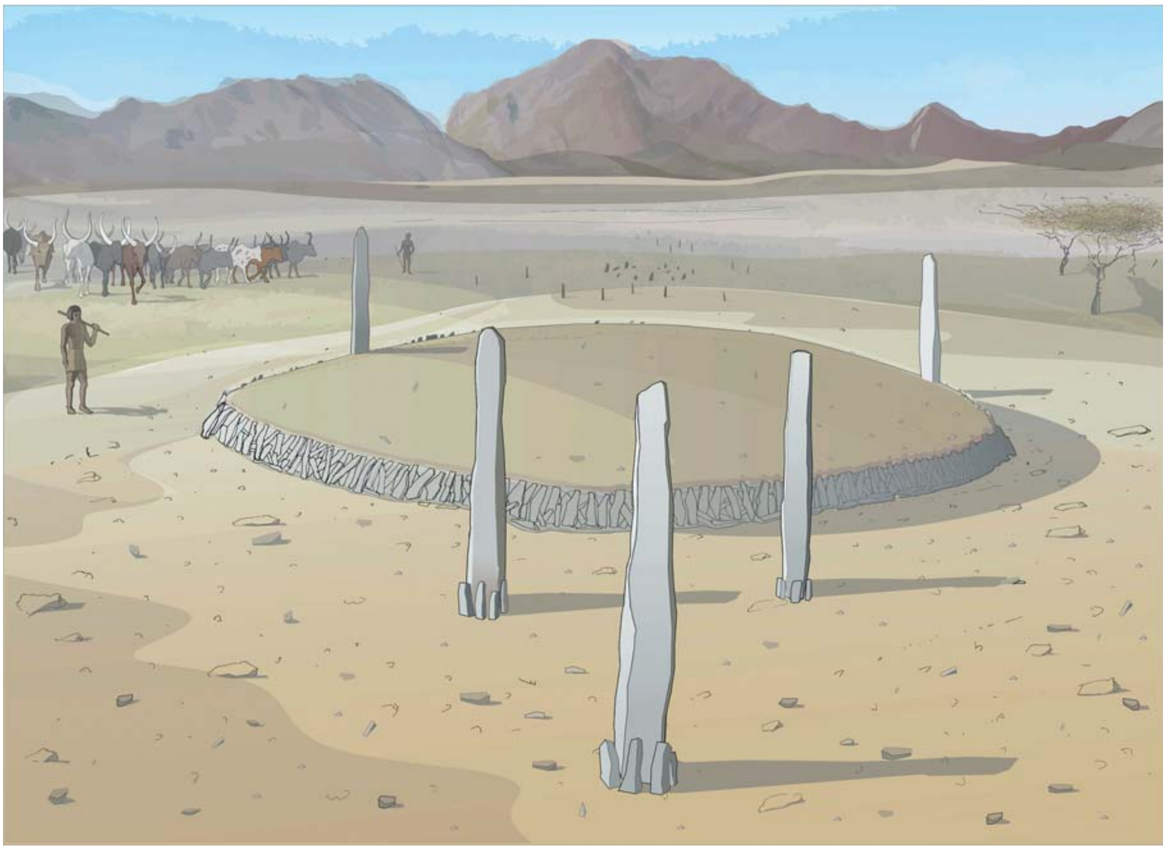


Fig. 106. Reconstruction of Phase 2 (mid-2nd millennium BC): modernization in the form of a mound composed of rubble, surrounded by a skirt of loose stone slabs; a constellation of monolithic stone steles installed around the main enclosure and aligned with the main axis of the old complex

5.2 Wadi Khashab in the prehistory of the Eastern Desert

A comprehensive analysis of the data from the excavations and examination of the faunal and material assemblage have allowed us to determine the chronology of this complex and to reconstruct the way in which it could have operated, including the cultural background and the specific importance of the animals in the symbolic, economic and cultural spheres. All things considered, the Wadi Khashab site should be interpreted as a megalithic complex belonging to the circle of early pastoral societies of sub-Saharan Africa. The way in which the complex is constructed and the treatment of the animals, chiefly cattle, suggests the presumed importance of the complex as a key ceremonial site for societies archaeologically and historically recorded over a huge territory of almost all of the Sahara and the Sahel (the central and eastern part in particular). These are societies with a cattle-centered behavior model of adaptation as described in modern anthropology (Jesse et al. 2013, with further references).

In the early 20th century, anthropologists became aware of the phenomenon of certain animals being chosen as a medium connecting the real and the other world. This thinking appears to have functioned in ancient cultures because "some animals are chosen not because they are 'good to eat', but because they are 'good to think'" (Lévi-Strauss 1962: 89). In ethnography, Melville Herskovits

(1926) introduced the term "cattle complex" to describe the system of values of societies for which cattle is the most important animal in their economies, but also, or especially, in the non-utilitarian aspects of their culture. While he did not say it straight out, Herskovits developed his concept for the pastoralists of Sudan and Chad in particular, based on his observation of communities from sub-Saharan and southern Africa for which cattle was a central element of their spiritual, social and economic life. Although modern cultural anthropologists have expressed reservations about this concept (Mtetwa 1982: 18–30; Mair 1985; Comaroff and Comaroff 1990: 212; Baxter 1996: 91–92), it continues to be used to describe cultural contexts in which cattle are something more than just a mobile pantry on hooves.

"Cattle-centered behavior" is a term gradually gaining in popularity in cultural anthropology, designed to refer to a specific cultural model that is characteristic of pastoralism in the specific form that emerged in the southeastern part of the Sahara (Clutton-Brock 1989). Archaeological and archaeozoological research supplies critical sources on the origin of this African phenomenon. The predominance of cattle in Africa's pastoral cultures is particularly noticeable among the prehistoric communities living in a vast area of northern Africa, south of the Sahara, from the Nile Valley to the west of the continent (Sawchuk et al. 2018). Wadi Khashab has now produced enough new data to turn the site into a key source for understanding the origins and earliest development of the pastoral societies of eastern Africa. To date, there are, however, no parallels for the complex at Wadi Khashab that could help to define its place in what is the current knowledge about the prehistoric peoples inhabiting the region.

Cemeteries of the A-Group from the Nile Valley have yielded rich evidence of animal burials, cattle included (Flores 1996), but the faunal assemblages are not available for morphometric study; they have either been lost or, more often, were not collected because of the less stringent standards of early exploration at the beginning of the 20th century. Without a chance to look at these bones from the viewpoint of modern archaeozoology, or the opportunity to carry out isotopic analyses, it is impossible to compare in morphological terms the material that is available, from Wadi Khashab, for example, with cattle bred by A-Group communities from Nubia, for whom it is known that cattle played an immeasurably important role also from a cultural standpoint.

A comparison of Wadi Khashab with cemeteries of the A-Group reveals more differences than similarities. Diane Flores was unable, despite a comprehensive analysis (1996), to trace any spatial relations between human and animal burials. These at Wadi Khashab seem clearly legible. The striking absence of ceramics at Wadi Khashab also stands in stark contrast with the customs of A-Group communities, which furnished the graves of their dead of high social status with an abundance of pottery vessels (Gatto 2006; Shinnie 2013). Another important difference are the neatly made stone superstructures at Wadi Khashab, which do not find parallels in A-Group cemeteries—there are usually no superstructures whatsoever in these cemeteries. In light of these differences, it would not be correct to place the origins of the Wadi Khashab complex within the sphere of the A-Group culture.

The cattle burials and ceremonial pits with bones of domesticated ruminants associated with Neolithic cultures are also fundamentally different from the megalithic complex created at Wadi Khashab. The chronology of the much larger cemetery at El Arib (Murray 1926) cannot be established with any degree of precision, but it is the only case of space being arranged in a fashion similar to that demonstrated to exist at Wadi Khashab. Neither the burials from Nabta Playa (Applegate, Gautier, and Duncan 2001; Wendorf and Schild 2001) nor those from Wadi Allaqi (Sadr et al. 1994) formed this kind of constellation focused on a central human burial. There is even less relation with human burials to be observed in the Neolithic pits with the bones (complete skeletons?) of cattle from Wadi Howar (Jesse et al. 2013) or Affad 130 (Osypińska 2018). Interestingly, many formal, significative relations, but also relations concerning the morphological features of the animals, can be seen in much later, elite burials from the classical Kerma period (Chaix 2007). Despite a significant chronological difference, the two sites, Wadi Khashab and Kerma, appear to belong to the same ideological, but also cultural and stock-breeding horizon of pastoral societies. If Kerma culture may be considered one of the latest emanations of early societies with "cattle-centered behavior", then Wadi Khashab could be an early expression of the symbolic and religious ideas of communities living in the African Sahel.

Nevertheless, Wadi Khashab is clearly rooted in the Neolithic. There is, first and foremost, the geographical (or perhaps even astronomical) orientation of the entire complex along with the installation of steles resembling the "calendar" from Nabta Playa. Seconding this is the archaeozoological data. The animals from Wadi Khashab, both sheep and cattle, correspond to types present in the earliest phases of the introduction (or domestication) of these animals in the region of northeastern Africa with the exception of the Nile Delta and the Oases, where the Near Eastern *taurine* cattle had the largest share (Rege 1999; Gautier 2002; Linseele, Holdaway, and Wendrich 2016).

The native African longhorn cattle, *Bos africanus* (Grigson 2000), is known from numerous Neolithic sites in the Middle Nile Valley, Nubia and Upper Egypt. This morphological type of cattle was associated until antiquity with a mobile pastoral model and large herds, mainly cattle, but also sheep and goats. The range of these communities is evidenced by the numerous rock art galleries all over the Sahara, depicting mainly longhorn cattle. The breeding model practiced by these communities required them to travel long distances and exploit areas with relatively good pastures and constant access to water. The current state of knowledge of the topography of ancient and prehistoric sites that can be linked to pastoral cultures indicates that as the zone of the sub-Saharan Sahel moved south, pastoral communities with their herds also retreated southwards. They were pushed from the north by the encroaching desert and restricted by the farming communities in the Nile Valley, while in the south the so-called tsetse belt with the flies that transmit trypanosomiasis, a fatal disease for both humans and ruminants, constituted a dangerous border.

In the Kerma period (2500–1500 BC), the Sahel belt crossed the Nile Valley where Upper Nubia is (Woodward, Macklin, and Welsby 2001; Williams 2009). Nowadays, pastoralists crossing the Sahel with large herds can be found in the whereabouts of Sinja and Dinder on the Blue Nile. It means that over a period of 3500 years the Sahel has moved close to 800 km southwards, giving way to semi-desert and desert. Since Wadi Khashab is 450 km north of Kerma, then, if a constant, average rate of global environmental change is assumed, the last time that pastoralists could have grazed their herds around Wadi Khashab would have been about the mid-4th millennium BC. Environmental change obviously did not occur uniformly over the whole time span mentioned and across the vast area under consideration, but the discussion above was meant solely as an indicator of the approximate time horizon of when cattle pastoralism would have been possible as a form of cultural adaptation. It is convergent with the dating of the child burial, which represents a secondary phase of use of the cemetery complex at Wadi Khashab.

The later intervention in the structure of the complex may also be linked to ecological conditions 2000 years after its establishment, which were favorable to the pastoralists and their herds. Assuming that in our case the ceramic bowl is chrono-distinctive and culturally related to pastoral communities represented by such cultures as the C-Group and Pan-Grave, then this late presence in the middle of the Eastern Desert can be explained in one of two ways. Either the pastoralists reached the site under exceptional circumstances or else local environmental conditions had changed sufficiently to allow these groups to wander once again down the wadis in the Eastern Desert all the way to the Red Sea coast.

Another intriguing issue to be considered is the challenge to the pastoral communities undertaking the conceptualization and execution of a monumental complex of this kind. Despite a certain atomization characteristic of pastoral communities, the determination and social organization of the creators of Wadi Khashab was such that they could effectively complete this task. As a group, they showed developed organization, the ability to manage logistics, and a deep and consistent ideological motivation. It says a great deal about the social relations and the organization of these early pastoral communities. And it concerns both phases of the complex at Wadi Khashab—that is, the original construction preceding or identical with the A-Group horizon and the modernization of the complex 2000 years later. Thus, we should emphasize the great relevance of the Wadi Khashab burial customs and the spatial organization of the funerary features, which are truly exceptional.

The results of the project have also contributed extensive new data on early African cattle. Wadi Khashab is one of only a handful of sites to yield such a rich body of osteological, osteometric and morphological evidence concerning early cattle and sheep. The skeletons from the site, almost complete, constitute a valuable source for the study of the morphology of early types of domestic cattle and sheep. The vast expanse of a once-green Sahara has supplied numerous premises on their breeding since at least the beginning of the 6th millennium BC (Kuper and Kröpelin 2006), but osteometric and anatomical data on the early animals has not been forthcoming so far in such complete form. The corpus from Wadi Khashab makes it possible to identify characteristic features of early African cattle populations predominant in the Sahel in highly constant form for many thousands of years—features that have invariably been missing from the discourse on the origin of domesticated cattle in Africa. The data from Wadi Khashab demonstrates beyond all doubt that the cattle represented a morphologically uniform population, which is evidence for long and stable breeding. At the same time, there are some features that distinguish this cattle from the Near Eastern *taurine* cattle, which scientists believe are typical of *Bos africanus* (e.g., Grigson 2000). The evidence from Wadi Khashab proves the presence of this cattle at 24° N latitude before the middle of the 4th millennium BC, indicating at the same time that 2000 years later cattle of this type was common in Kerma.

Wadi Khashab has also supplied data to argue in favor of the concept, put forward also by some geneticists, that *taurine* cattle was interbred with the African auroch (Bonfiglio et al. 2012; Ascunce et al. 2017). This is part of a heated debate between geneticists arguing for a Near Eastern genetic origin of this cattle and archaeozoologists raising the possibility of a local origin for a substantial part of the African cattle. Interbreeding as suggested above would explain the set of characteristic features noted already in early African cattle as well as the important cultural role of these animals for the nomadic populations of the Sahara and later the Sahel. It is a pity that the genetic material from most of the African archaeozoological discoveries is so poorly preserved that it prevents genetic studies on this material reaching back in time more than 200 years.

The complex and site have been investigated extensively, but despite the very large body of archaeological and archaeozoological data, Wadi Khashab still poses many unanswered questions and dilemmas. It continues to be a unique site, although it fits well into the overall picture of the early pastoral communities wandering with their herds of longhorn cattle across vast expanses of the central and eastern Sahara all the way to the Red Sea. The material evidence left by these communities—rock art galleries, cemeteries, megalithic complexes—attest to an exceptionally developed spirituality of these communities and the absolutely key role that cattle played in it. Research on this material is extremely difficult, as is the identification and interpretation of its function. It is easy to fall into the trap of the convenient "cultic" explanation of various phenomena and to reach for modern anthropological observations. Nonetheless, both the rock art galleries and megalithic complexes like Wadi Khashab, which are naturally a source of knowledge for researchers, are at the same time a source of reflection on the motivation that led prehistoric peoples to undertake challenges of this magnitude. In the end, there is the purely human admiration for this particular monument, which is an integral part of mankind's heritage.

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Preparation of plates and figures: E. Czyżewska-Zalewska (PCMA UW).

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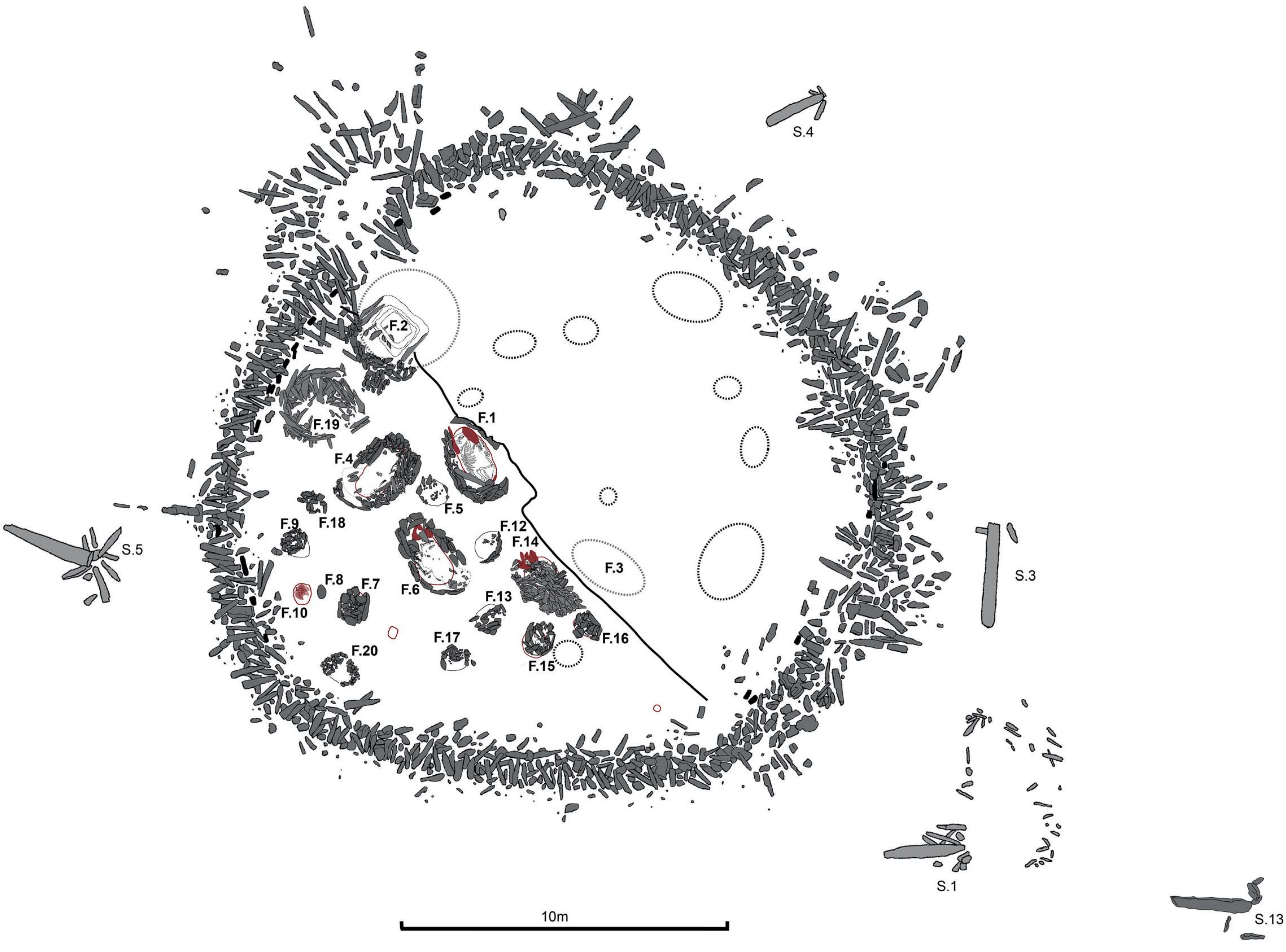

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