The Archaeology of Jebel al-Buhais

Sharjah, United Arab Emirates

Edited by

Hans-Peter Uerpmann, Margarethe Uerpmann
and Sabah Abboud Jasim

The Archaeology of Jebel al-Buhais

A series covering the archaeology, natural environment and Stone Age cultures of Jebel al-Buhais, produced by the Ministry of Culture and Information of Sharjah, the United Arab Emirates, in cooperation with the Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Universität Tübingen, Germany.

Volume one in the series

THE ARCHAEOLOGY OF JEBEL AL-BUHAIS

SHARJAH, UNITED ARAB EMIRATES

Funeral Monuments and Human Remains from Jebel al-Buhais

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Hans-Peter Uerpmann, Margarethe Uerpmann and Sabah Abboud Jasim

Published by the

Ministry of Culture and Information
Government of Sharjah
United Arab Emirates

In collaboration with the

Institut für Ur- und Frühgeschichte
und Archäologie des Mittelalters
Universität Tübingen, Germany

and

Kerns Verlag
Tübingen

Published by the
Ministry of Culture and Information
Government of Sharjah
United Arab Emirates

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Institut für Ur- und Frühgeschichte
und Archäologie des Mittelalters
Universität Tübingen, Germany

And in cooperation with
Kerns Verlag
Postfach 21 05 16, 72028 Tübingen, Germany
for international distribution

Printed in Germany.

ISBN: 3-935751-06-0.

Design by Kerns Verlag.

Foreword

It is with great pleasure that I present this series of publications which are the outcome of many years of hard work and professional commitment on behalf of the local team at the Directorate of Antiquities in Sharjah in collaboration with academics from the University of Tübingen in Germany.

The United Arab Emirates is a dynamic country which has witnessed an astonishing rate of development during the past 35 years; however, it is also a country with a rich cultural heritage. In recognition of this, I have strived to expand our knowledge of Sharjah's history, using archaeology as the tool by which to retrieve information about the Emirate's past and its ancient populations.

Consequently, the past decade has been a time of great archaeological advancement and achievement within the Emirate of Sharjah. Particular emphasis has been placed on supporting such facilities as to make Sharjah a centre for archaeological excellence across the world. The Sharjah Archaeological Museum is now a unique and modern cultural resource that has received international acclaim since its inauguration in 1997. Furthermore, the development of excellent working relationships between the Department of Culture and Information in Sharjah and eminent archaeologists from distinguished international universities has resulted in a diverse and highly professional body that consistently attains its self-imposed high standards.

The archaeological accomplishments at Jebel al-Buhais, which are the foundation of this series, are further reflected in changes currently underway at the Sharjah Archaeological Museum, where an entire hall will be dedicated to the display of materials recovered from the site BHS 18. This is indicative of the archaeological significance and richness of this remarkable site and further confirmation of the professionalism and diligence of those involved in archaeology within the Emirate of Sharjah.

I would like to thank those who contributed to this series for their hard work and commitment to my vision of archaeological excellence within the Emirate of Sharjah.

His Highness Sheikh
Dr. Sultan bin Mohammad Al-Qasimi
Ruler of Sharjah,
Member of the Supreme Council of the United Arab Emirates

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Foreword from the editors

The area of Jebel al-Buhais has become a key source in understanding the archaeology of southeastern Arabia. This is due to intense studies which began in the late 1980s with archaeological explorations carried out by the French mission to the Emirate of Sharjah and supported by a team from the Autonomous University of Madrid. In 1994 the local team of researchers from the Directorate of Antiquities of the Department of Culture and Information of the Government of Sharjah took over the main activities in the area by carrying out surveys and sondages all along the eastern flank of the mountain. In 1995 the discovery of a camel skeleton in one of the subterranean graves of the Late Bronze Age (BHS 12) led to an invitation of Hans-Peter and Margarethe Uerpmann, who in due course dealt with this and other camel burials in the area. It was a fateful coincidence that in the course of excavating the camel skeleton at BHS 12 the graveyard of BHS 18 was discovered by the local team directly in the vicinity. As a specialist for the Arabian Neolithic, Margarethe Uerpmann immediately recognized the unique potential of this discovery. A joint project was soon agreed upon between the Sharjah Directorate of Antiquities and the Institute of Pre- and Protohistory and Medieval Archaeology of the University of Tübingen. Joint excavations at BHS 18 began in 1996 and ended after ten field seasons in 2005.

The present volume, which is the first in a series dedicated to the archaeology of the Jebel al-Buhais area, is intended to present an overview of the explorations carried out by the Sharjah Directorate of Antiquities and to describe the human remains from the numerous grave structures found in this area. The contribution by Sabah Abboud Jasim documents the astounding continuity of funeral sites in the al-Buhais area throughout different prehistoric periods and the sometimes overwhelming wealth of finds from some of them.

The second part of this volume, by Adelina Uerpmann, Johannes Schmitt, Nicole Nicklisch and Michaela Binder, deals with human remains collected at some post-Neolithic burial sites in the Buhais area. We are particularly thankful to the authors for their work in extracting so much information from the scarce remains, which could be preserved after the excavations of the Sharjah team took place in 1994 and 1995. They were collected from the open sites during the activities of the Joint al-Buhais Project from 1996 to 1999. Although this contribution can not present results based on a population level, it does provide a significant amount of evidence linking the area to the known developments of human populations in the wider Gulf region during the Bronze and Iron Ages.

As one of the key sites in understanding the Neolithic period in Southern Arabia, BHS 18 will play a central role in this series of publications. As the site was excavated over a period of 10 years, an intermediate evaluation of the anthropological findings from BHS 18 became indispensable. The contribution by Henrike Kiesewetter to this volume represents her doctoral thesis in palaeoanthropology and comprises the human skeletal material excavated between 1996 and 2000. The human remains excavated from 2001 to 2005 have not yet been studied in detail and will be the subject of a later publication. Though some of the results of Henrike Kiesewetter's study remain, therefore, preliminary, they are for the most part representative for the ancient population of the site. These remains are an invaluable source of information for the early history, not only of the area itself, but also for the whole of southeastern Arabia. BHS18, as an important graveyard of the Neolithic period, has yielded a vast amount of valuable insights into the archaeology of the 5th millennium BC. The individuals buried there might number as many as one thousand, but about one-fifth of them were left unexcavated in the ground. Another missing quantity, which can only be roughly estimated from the many stray finds of bones without skeletal context, constitutes the burials that were already destroyed when later graves or other disturbances were dug into them. The approximately 500 individuals which were counted and analysed for this study do not, in any case, represent the total number of burials at the site.

Generally speaking, the discovery of the Neolithic graveyard of al-Buhais was a particular event in the history of archaeology in southeastern Arabia. It opened up a new window onto the early inhabitants in a part of the world where insight into the lives of prehistoric populations is usually restricted to the meagre interpretations deducible from flints and other stones, which are the only materials durable enough to withstand the destructive influences of the harsh desert environment. The human remains, buried by their kin some 6000 to 7000 years ago, often with their personal adornments, and in a sediment containing the traces of their livelihood, convey a wealth of information that helps lead us toward a better understanding of early human mastery over a difficult environment. It is our task as excavators of the site to translate this information to those who could not experience the excitement of discovering the buried remains in the ground and of directly receiving the messages which they carried with them.

Hans-Peter Uerpmann, Margarethe Uerpmann, Sabah Abboud Jasim
Sharjah, March 2006

Part 1

The Archaeological Sites of Jebel al-Buhais

Above. *View of Jebel al-Buhais with grave structures of BHS 85 in the foreground.*
Previous page. *Jebel al-Buhais viewed from the north.*

Part 2

Post-Neolithic Human Remains from the Jebel al-Buhais Area

Post-Neolithic Human Remains from the Jebel al-Buhais Area

Adelina Uerpmann, Johannes Schmitt, Nicole Nicklisch and Michaela Binder

Introduction • The Archaeological Sites • The Site BHS 85 • The Human Skeletal Remains • General Evaluation of Dental Pathologies • Pathologies and Occupational Markers of Stress • Concluding Remarks

Introduction

THE SITES BHS 3, 8, 12, 64, 66, AND 78 were excavated by the Directorate of Antiquities of the Department of Culture and Information of the Government of Sharjah from 1994 to 1999. Human remains recovered at the sites were mostly left *in situ* and partly recorded by H. Kiesewetter and H.-P. Uerpmann after excavations had been completed. Their notes are reported below (paraphrased and set off in italics). Only a limited sample of these remains were kept for further studies and could be examined by the present authors in 2004 and 2005 at the excavation house in Mleiha (UAE) and in the Archaeobiology Laboratory of the Institute of Pre- and Protohistory and Medieval Archaeology of the University of Tübingen, Germany. While the state of preservation of the skeletal remains varies, with most specimens very fragmentary, some individuals do present a higher degree of completeness. Some sites yielded only small bone fragments, which could not be assigned to individuals.

The site of BHS 85 was excavated by the Directorate of Antiquities from 2001 to 2005. When human skeletons were discovered *in situ* inside a sheltered niche under the adjacent rock, the authors, who at this time were members of the excavation team of the Joint al-Buhais Project, took over their preparation and excavation. The human remains were studied in Mleiha in 2005 and are stored in the palaeoanthropological collections of the Institute of Pre- and Protohistory and Medieval Archaeology of the University of Tübingen.

From an anthropological point of view, the focus of this study has been—apart from documentation—on dental pathologies and skeletal markers of habitual stress, enthesopathies and degenerative changes. These topics were chosen mainly due to the small number of uncovered individuals and the fact that they do not belong to a discrete population, which precludes demographic analyses. The examination of dental pathologies permits the reconstruction of diet and subsistence patterns (e.g., Littleton and Frohlich 1989), while skeletal stress markers are activity related, thus providing insight into the lifeways, the habits and circumstances, of a particular individual. As humans are constrained not only by their own biology but also by their environment (Littleton 1998), adaptations can be expected to occur which also affect the skeleton. Repeated stress exerted on particular bones modifies the osseous tissues and can result in the formation of exostoses, spurs and lips expanding particular areas of the skeleton, especially in parts of the bones where ligaments and muscles insert. Ossified ligament attachments are then called enthesopathies. Some activities such as squatting or kneeling may lead to the development of accessory articular facets (Kennedy 1989). However, specific bone modifications may not always be attributed to a particular pattern of activity, but can reflect a whole range of habitual behaviours (Capasso, Kennedy et al. 1999). A general understanding of how human beings interacted with their environment in prehistoric times, otherwise reconstructed from geological, biological and archaeological records, is the goal of the present study.

The Archaeological Sites

The post-Neolithic archaeological sites, which yielded the human remains presented below, are described in more detail by Sabah A. Jasim (see Part I, this volume). Table 1 provides an overview of some of the relevant features of these sites.

Only certain forms out of the many types of Bronze and Iron Age grave structures found in southeastern Arabia are present in the surroundings of Jebel al-Buhais. The oldest of these are the so-called bee-hive graves of the Hafit period of the early Bronze Age. There are many of these graves in the area, but none of the excavated examples have yielded human remains which could be included in this study. The only exception is BHS 64, where the studied human remains are from an intrusive burial, probably dating to the Pre-Islamic period.

Graves of the Umm an-Nar type, belonging to the later part of the Early Bronze Age, were not encountered during the archaeological explorations around Jebel al-Buhais.

The most impressive grave structures of the 2nd millennium BC (middle and late Bronze Age) in the al-Buhais area are the cloverleaf- and U-shaped subterranean graves. Their grave chambers were used over a long time period for successive burials, and usually include interments from the Iron Age or even the Pre-Islamic period as well.

Examples of U-shaped graves are BHS 8 and 12, which are in close vicinity to the Neolithic graveyard of

Table 1. *Relevant features of the post-Neolithic archaeological sites.*

Site	Type	Archaeological period	Figures
BHS 3	Oval subterranean grave	Late Bronze Age	Fig. 1
BHS 8	U-shaped subterranean grave	Middle to Late Bronze Age	Fig. 2
BHS 12	U-shaped subterranean grave	Middle to Late Bronze Age, reused in later period	Fig. 3
BHS 64	Bee-hive grave	Reused in later period	-
BHS 66	Cloverleaf-shaped subterranean grave	Late Bronze Age, reused in the Iron Age	Fig. 4
BHS 78	Rockshelter	Mostly Iron Age	-
BHS 85	Multi-chambered graves	Iron Age	Fig. 5

Fig. 1. *Grave BHS 3.*

Fig. 2. *Grave BHS 8.*

Fig. 3. *Grave BHS 12.*

Fig. 4. Grave BHS 66.

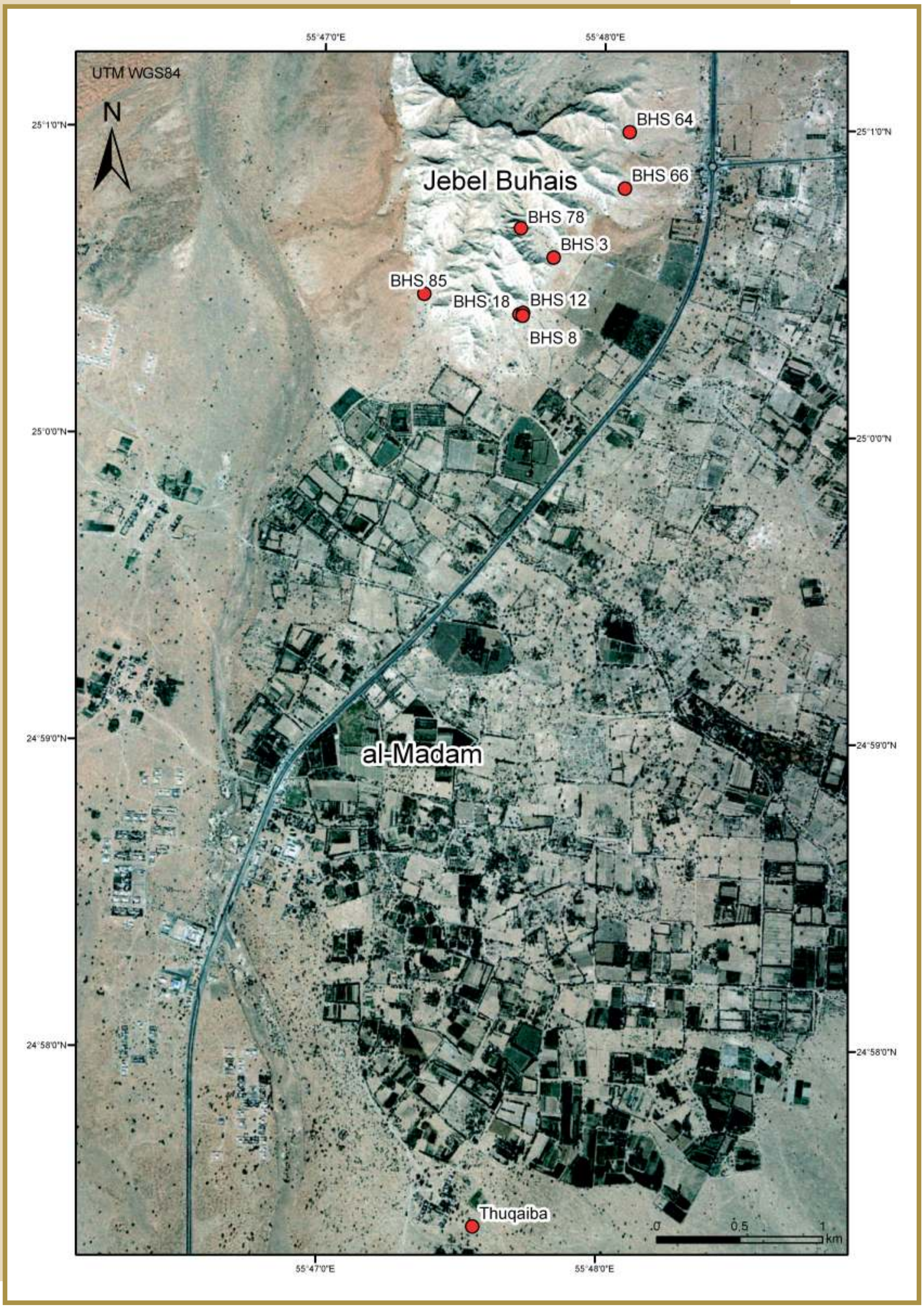
Fig. 5. BHS 85, overview of the graves during the excavation.

BHS 18 (Fig. 6). BHS 66 offers the unique example of a cloverleaf grave in the area. There are many smaller grave structures near Jebel al-Buhais belonging to the Late Bronze Age, but human remains came to our attention only from BHS 3.

Apart from reusing older grave structures, the Iron Age population of the area also buried some of their dead in small natural caves or overhangs at the rocky slopes of the mountain. This is the case at BHS 78 and also at BHS 85. In the latter case, the stone walls built to delimit the graves placed into niches of the rock were extended along the rocky slope in order to form shallow compartments for further graves. This site will be described in detail as the authors were able to participate in the excavation of the site in 2004 and 2005.

The human remains from the sites excavated before this time were not systematically collected. At the sites dealt with in this report, the remains were left more or less

Fig. 6. *Satellite view of the Jebel al-Buhais and al-Madam area indicating the position of the sites dealt with in this chapter.*



in situ inside the grave structures. There they were briefly examined by Henrike Kiesewetter and Hans-Peter Uerpmann during earlier excavation seasons at al-Buhais 18. Only a small sample of the exposed skeletal material could be collected for further studies. These will be described in more detail in a later section of this chapter, where the observations reported by H. Kiesewetter to the Sharjah Directorate of Antiquities are also included.

The Site BHS 85

BHS 85 is an Iron Age graveyard situated at N25.00765 E55.78932 (WGS84) near a small rocky outcrop on the southwestern side of Jebel al-Buhais. The general situation can be observed in Figures 6 and 7. There are a number of graves around this outcrop, which reaches an altitude of about 5 m above the surroundings. During the French surveys of 1990, the western side of the outcrop was excavated (Barbier et al. 1997), while a series of grave structures on the eastern side was excavated by the Sharjah Directorate of Antiquities from 2001 to 2005. These structures yielded only minute fragments of human bone from underneath some of the limestone blocks used for the construction of the chambers. It is assumed that most of the skeletal remains dissolved completely in the sandy fill of the grave chambers, which were identified as such because of the archaeological finds. When skeletons began to appear in niches sheltered by the rock, the authors joined the excavation in order to apply the methods developed in uncovering the graveyard of BHS 18 for documentation and excavation of the human remains.

The site consists of six structures surrounded by walls erected from natural calcareous blocks along the rocky outcrop on the terrace separating the rock from the course of the wadi nearby. The walls are preserved to a height of about 50 cm or three courses of blocks, respectively. The area inside the structures is about 20 m^2. The smallest room has a diameter of only about 1 m, while the largest measures approximately 5 m by 2 m (Fig. 8).

On the rocky slope of the outcrop itself there are three further chambers consisting of niches in the rock delimited towards the outside by walls of broken limestone. These niches comprise only about 1 m^2 each. Within two of them the excavators uncovered human bone remains. The skeletons as well as the other grave goods were fairly well preserved. This is due to the fact that the overhanging rock sheltered these graves and prevented rainwater from permeating through the layers.

Fig. 7. *View of BHS 85 from the slope of Jebel al-Buhais.*

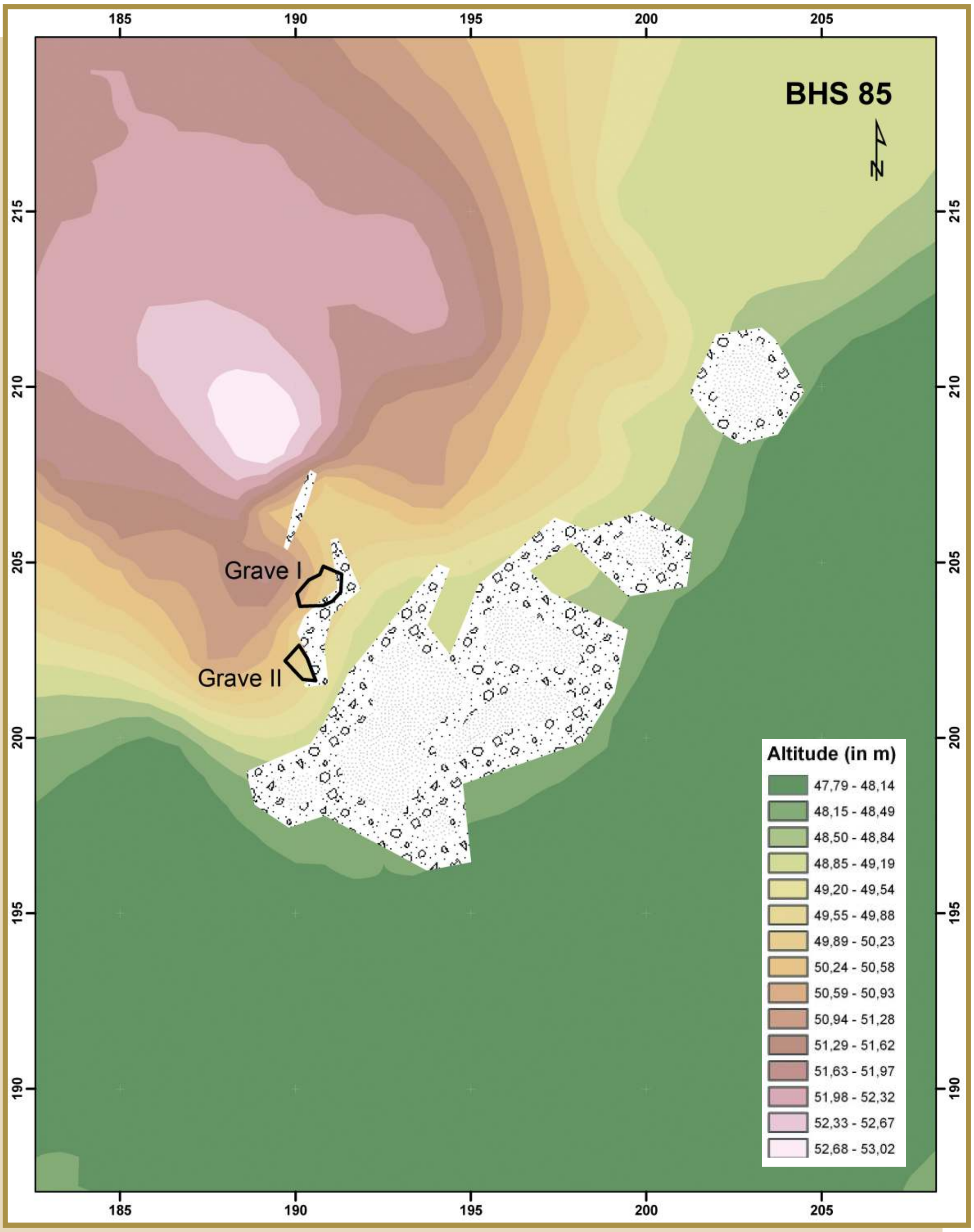


Fig. 8. *Topographical sketch of contour lines and structures of BHS 85. The black outlines mark graves I (north) and II (south).*

Excavation of the Human Remains at BHS 85

Small-scale excavations occurring over limited time frames are organized to take special advantage of modern methods for data and graphics processing. These methods help in gaining maximum insight within a short period of time. Employing these methods mainly depends on the extensive collection of precise survey data. During the excavation of the human remains at BHS 85, total stations (Leica and Sokkia) were used to record 3D-coordinates. They were connected to an Itronix HUSKYfex21 field-computer running the EDM-program created by Shannon P. McPherron and Harold I. Dibble (McPherron and Dibble 2005). This program reads the coordinates from the total station and combines them with additional information, e.g., a description of the measured item, and stores them with every measurement.

At BHS 85, measurements taken with the total station were either made with a reflector or directly with the laser, depending on the circumstances. Because of the cramped conditions within the niches under the rock, direct laser measurements were often the only possibility for measuring. Since not enough room was available for the reflector, an additional advantage was thus created in that the fragile bones did not have to be touched during measurement.

Apart from 3D-recording of the skeletons and finds, the whole site was surveyed for mapping elevations and grave structures. For this purpose a total of 200 points were taken in the surroundings. The program ArcView of ESRI was used as a geographical information system (GIS) in order to analyse and visualize the results. This GIS also helped in attributing artefacts found in the graves to particular skeletons.

Ortho-photographs were made in order to document skeletons, finds and archaeological observations. For this purpose measuring points were incorporated into the photographs of every excavation planum. With the help of the 3D-coordinates of these points, the digital photographs were then corrected and geo-referenced. This process is schematically exemplified in Figure 9. The figure on the left is the "raw" picture, which is distorted due to the angle and the optics of the photography. At least five measuring points are positioned when taking the photograph and subsequently 3-D-recorded with the total station. Based on their coordinates, the optical distortion of the entire picture can then be mathematically eliminated. In our case we used the program "Airfoto" of I. Scollar (Unkelbach Valley Software Works) for this process. After its application the digital picture is to scale and no longer distorted.

The ortho-photographs are then included into the GIS. This allows, for instance, an analysis of the succession of skeletons in the graves. As the photographs are to scale, they can also be used to measure the skeletons with the help of the computer and to visualize their exact positions in the graves and in relation to the other skeletons. For this purpose semi-transparent pictures of different levels can be superimposed (Fig. 10).

Grave I

The position of grave I is indicated in Figures 5 and 8. It is situated about 2 m north of grave II. To the northwest it is limited by the rock, while the other side is formed by a stone wall which is preserved three courses high. The interior space measures about 1.4 x 0.9 m, and is orientated northeast to southwest. A complete and undisturbed skeleton (individual 1) was found in this grave.

Individual 1 was lying on its right side with the skull in the southwest facing the open side of the grave. The arms were folded against the chest and the knees were bent (Fig. 11). Some stone beads were found representing grave goods. About 80 cm of clean sand lay between the skeleton and the rocky bottom of the niche.

Grave II

Grave II is situated south of grave I at a somewhat lower altitude. The rock limits the grave in the west and forms a sheltering overhang over the niche. Towards the east and in the south the grave is delimited by a stone wall. The interior space is about 1.2 m long and 0.9 m wide, and orientated north-south. The sediment inside the grave was fine-grained dune sand, which included some flint artefacts. These artefacts indicate that the grave was filled up artificially with local sediment, as a thin scatter of Neolithic flints was recovered on the surface of the terrace where the graves occur. Remains of a total of four individ-

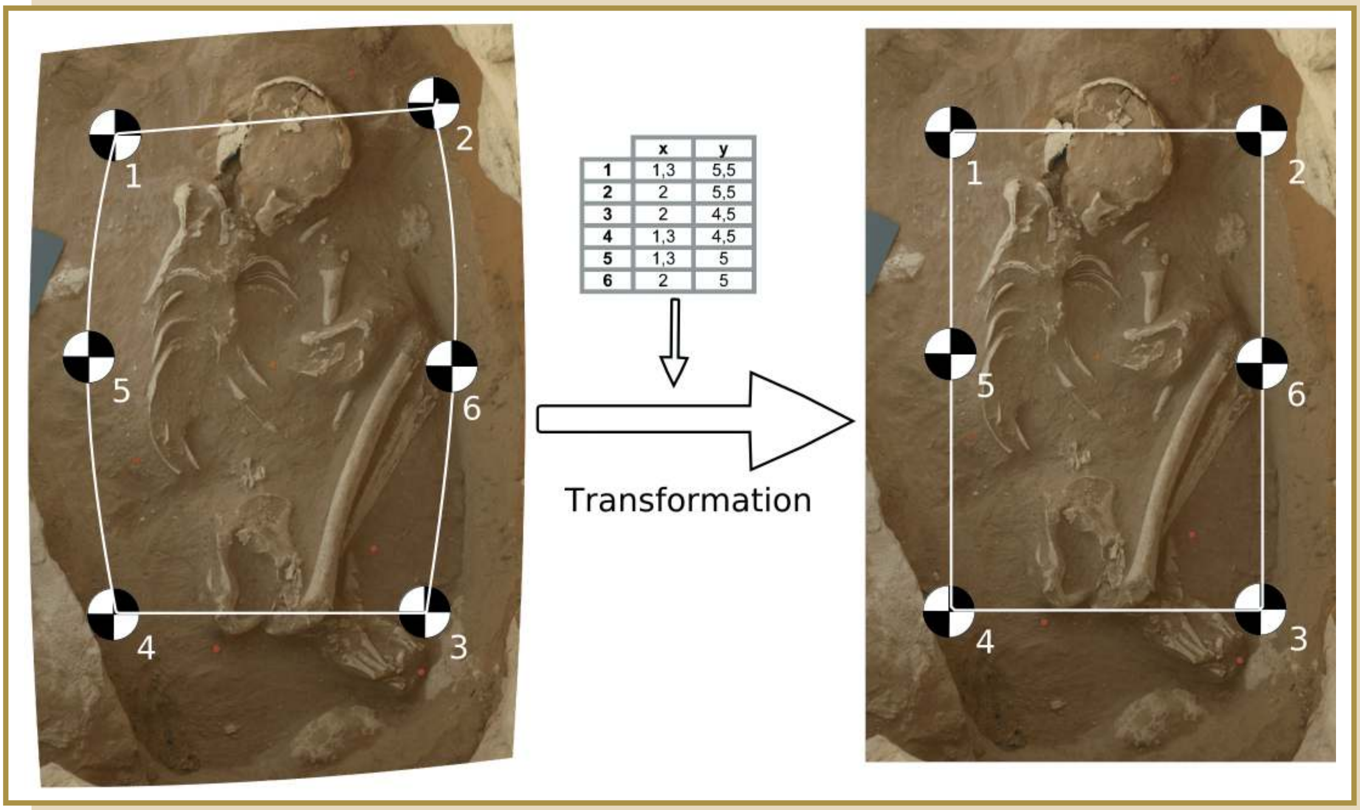


***Fig. 9.** Schematic demonstration of the process of ortho-rectifying of an excavation photograph.*

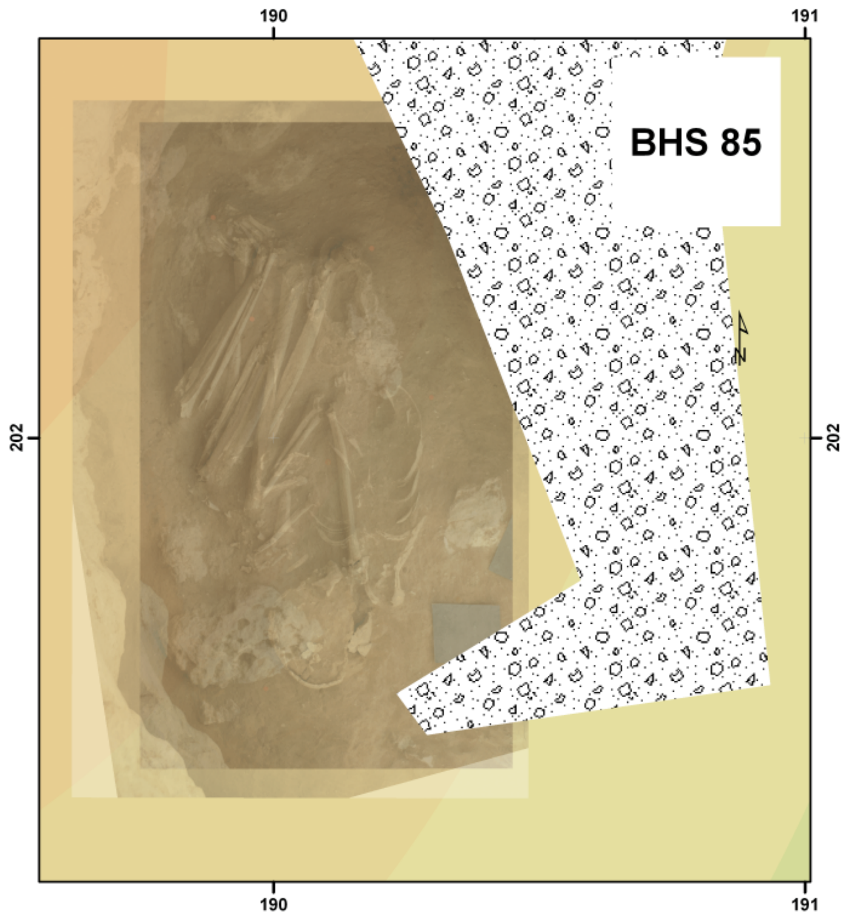


Fig. 10. Superimposed ortho-pictures in ArcView.

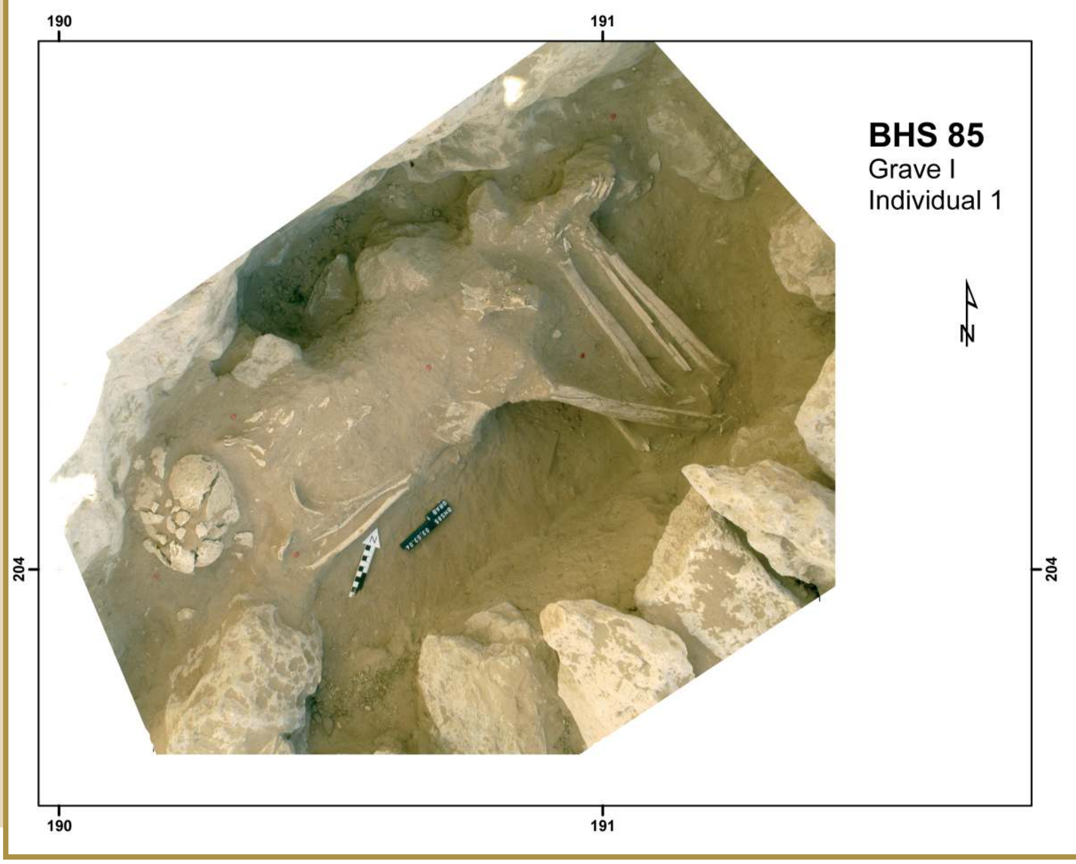


Fig. 11. Grave I, individual 1.

uals were excavated from grave II (individuals 2–5). Their position in the grave will be described separately below.

Individual 2 was the uppermost skeleton in the grave (Fig. 12). Unfortunately, it was heavily disturbed. Presumably the orientation was south-north with the skull lying close to the rock in the north of the chamber. Parts of the chest and of the upper extremities were still in articulation, and the body was deposited on its right side, probably with the legs flexed. As in the other grave, stone beads were uncovered with this individual, and as a special grave gift an iron lance head was found, which was heavily corroded and therefore quite fragile (Fig. 13), located at the height of the chest of individual 2. Unfortunately, it was not completely clear whether the lance head actually belonged with this individual.

Individual 3 (Fig. 14) was found some 10–20 cm below individual 2. It was buried in a flexed position with the head in the north, in the very same manner as individual 2. It was also affected by the disturbance of the latter. Because of this, it was difficult for some bones to be attrib-

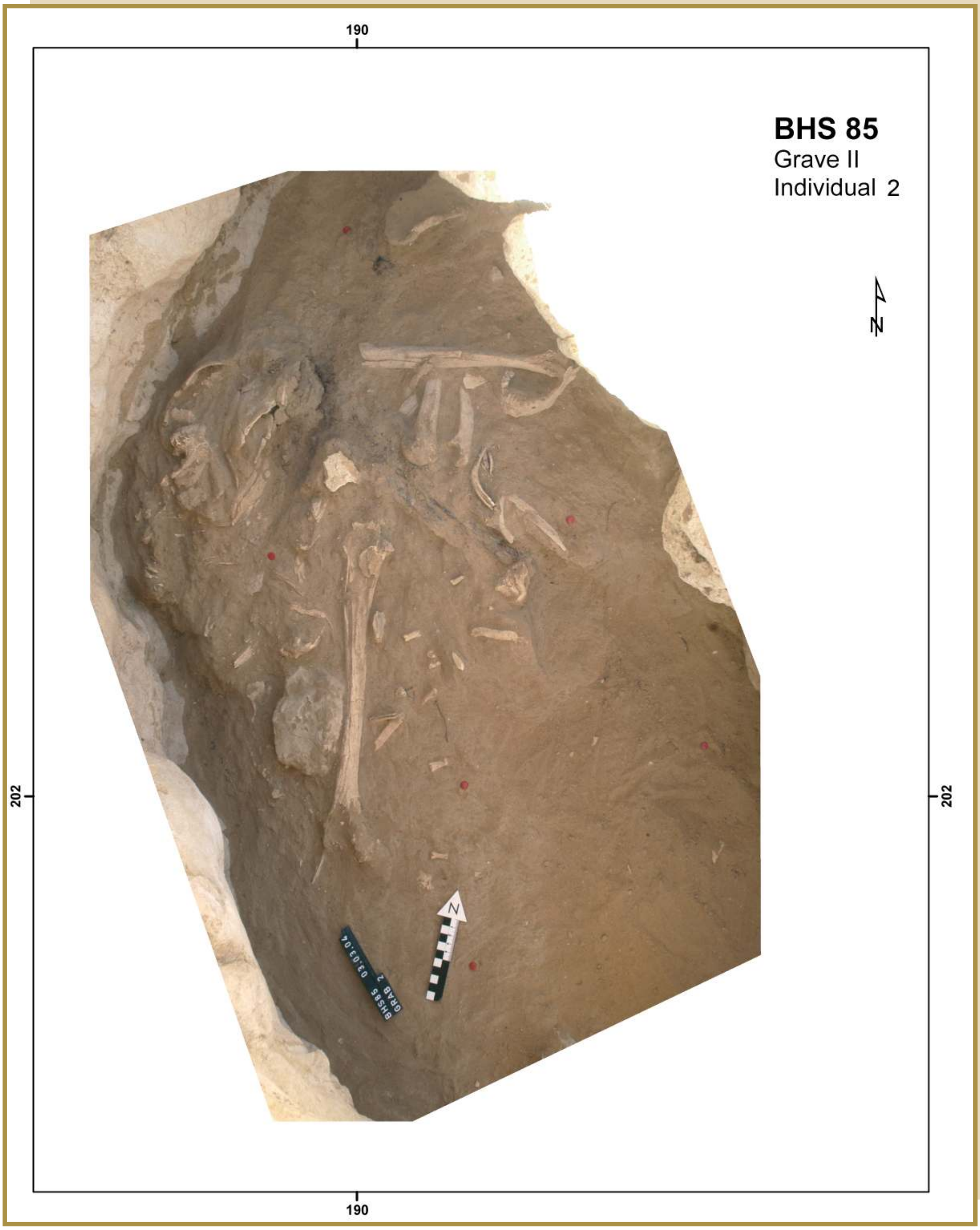


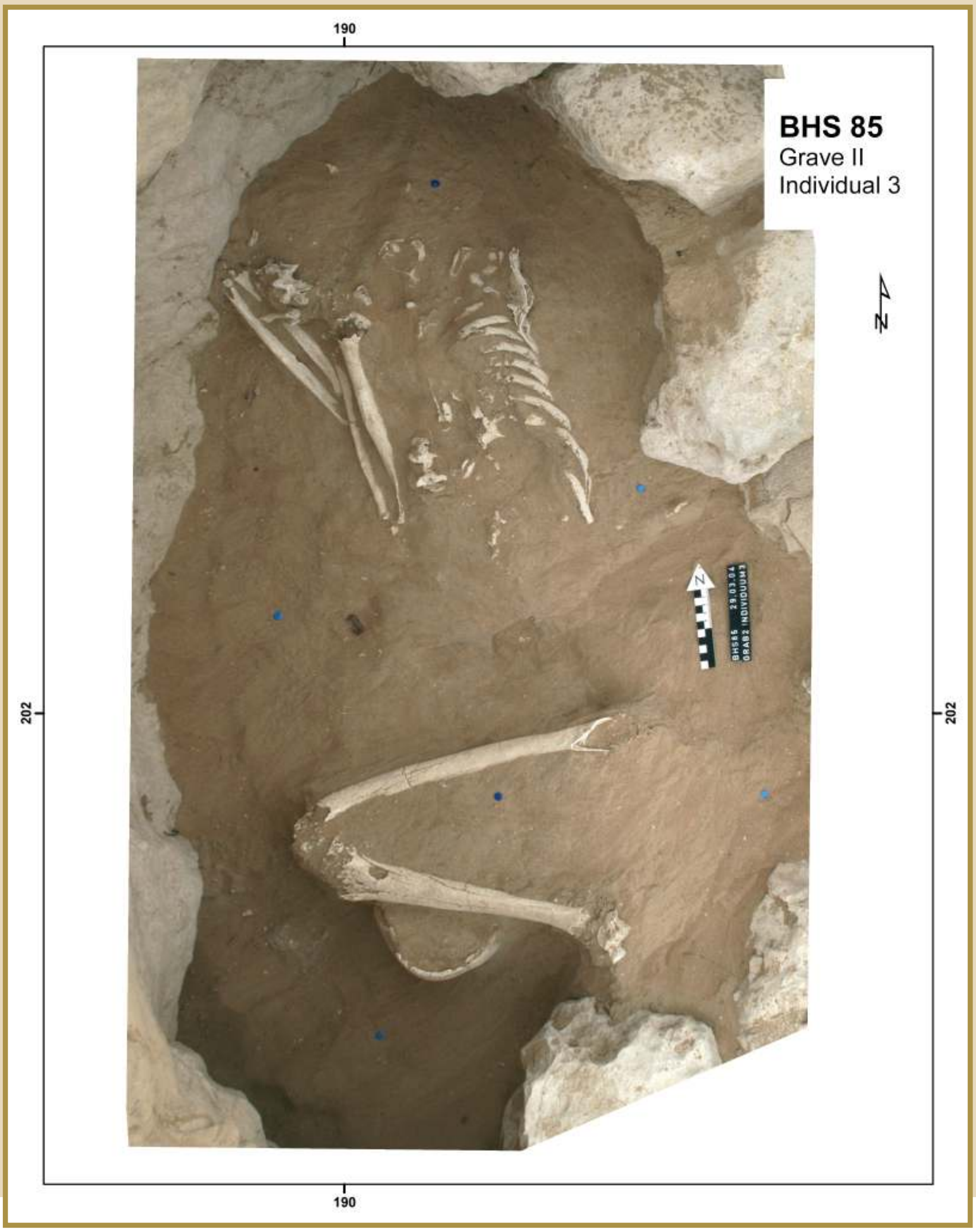
Fig. 12. Grave II, individual 2.

uted to either individual 2 or 3. The skull of individual 3 is highly fragmented, and the bones of the hip region have disintegrated in the sand without any recognisable disturbance to the skeleton.

Individual 4 (Fig. 15) lay with its head directly below the feet of individual 3. The rest of its body was separated from individual 3 by some 10 cm of sand. The skeleton of individual 4 is complete and found undisturbed. Contrary to all the other recovered skeletons, it was buried on its left side. The legs were extremely flexed towards the body, with the bent arms lying in the narrow space between the chest and the legs. A large fragment (c. 20 x 15 cm) of an incised steatite vessel was found some 10 cm below the shoulders of this individual. No other fragments of this vessel were found in the grave, and it remains unclear whether

Fig. 13. Lance head from grave II.

Fig. 14. Grave II, individual 3.



it belonged to the context of the grave. Nothing else was found below individual 4, although there was another metre of sand before the rocky bottom of the niche was reached.

Individual 5 is represented only by an isolated mandible, which was found at the altitude of individual 2.

Discussion

Within the structures along the east side of the rock, some very small fragments of human bone could be recovered from between the calcareous stones of the walls, allowing us to draw the conclusion that these structures were graves as well. This conclusion is also supported by the findings of Remy Boucharlat, who in 1990 excavated similar structures on the other side of the rock (Barbier et al. 1997). At that time seven structures were exposed, three of which yielded materials that could be evaluated. The size of these structures, as well as their state of preservation, is comparable to those described here. Usually only the first three courses of stones were preserved of the walls, with preservation of the human bones being very poor. Five individuals are represented among the finds. Up to two burials per grave, but no collective burials, are assumed to have occurred. This conclusion is based on considerations about the space necessary for the deposition of several corpses at once. Apparently there were no indications for a successive multiple use of the graves, comparable to our observations

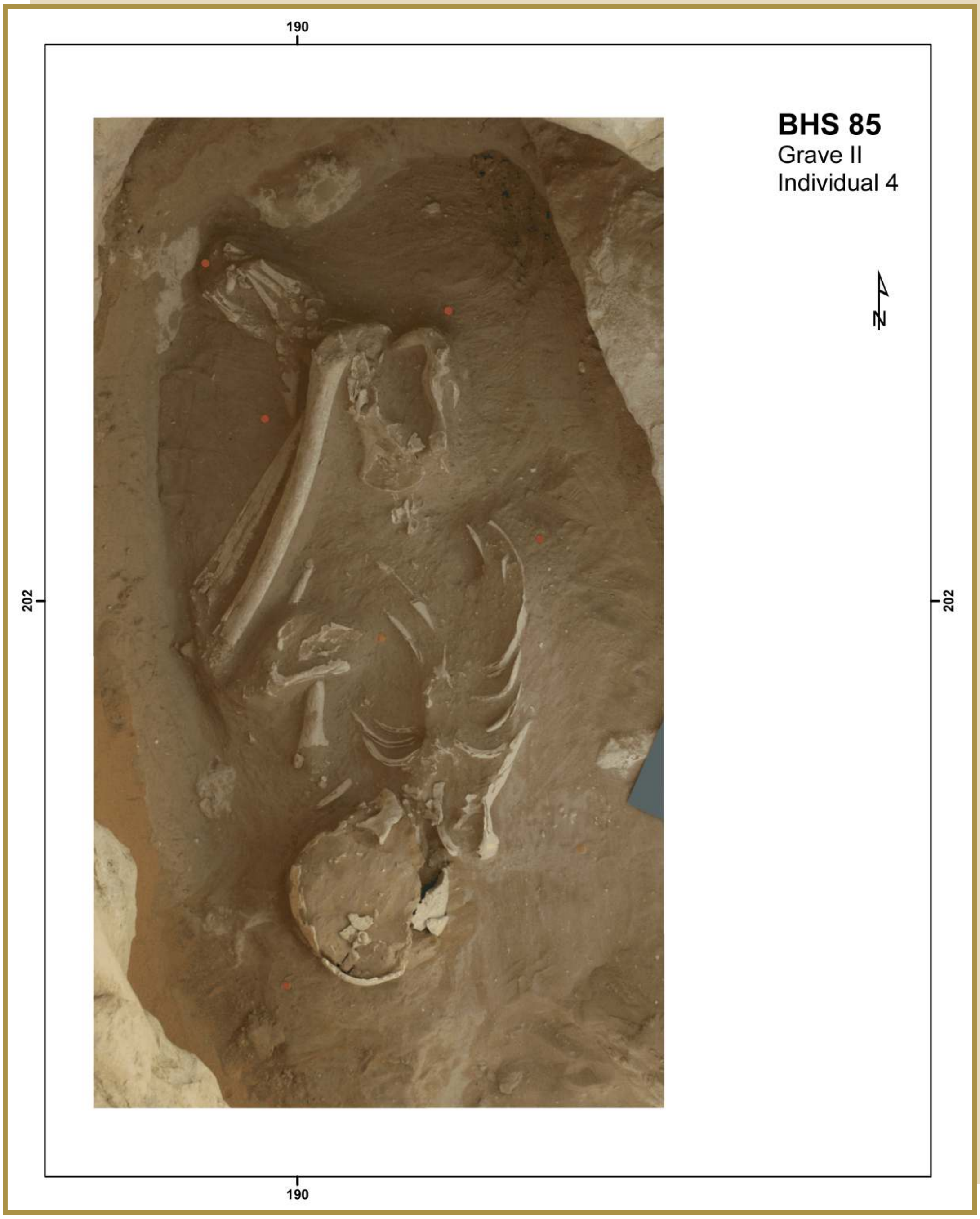


Fig. 15. *Grave II, individual 4.*

for grave II (see above). In contrast to our findings, some animal remains of sheep or goat were encountered as well. The archaeological finds, however, were quite similar to the finds from the east side of the rock. Here we found beads (Fig. 16), a metal belt-buckle (Fig. 17), fragments of soft stone vessels (Fig. 18), and pottery sherds (Fig. 19), all of which correspond with the Iron Age dating of the site. Unfortunately the finds from grave II cannot be assigned to one of the individuals, perhaps with the exception of the lance head, which was so high in the grave that it ought to have been deposited together with individual 2.

Very little can be said concerning burial customs due to the small number of individuals we were able to observe. It should be noted, however, that the three individuals, which were buried on their right side, are probably all male, while the only one buried on its left side has indistinct to slightly male sexual features. Otherwise the orientation and the restricted size of the niches in the rock do not leave much room for variation with regard to a particular positioning of the corpses. At the later burial sites near Samad (Oman) there is a clear tendency for burying males on their right and females on their left side (Yule 2001, p. 168).

Fig. 16. Selected beads from grave II.

Fig. 17. Metal buckle from grave II.

Fig. 18. Fragments of soft stone vessels from grave II.

Fig. 19. Pottery fragments from grave II.

It is, however, possible to estimate the number of inhumations at the site. Based on the fact that in grave II there were remains of four individuals in an area of only 0.8 m^2, one may assume that about 100 individuals may have been buried on the east side of the rock. With a similar extent of the necropolis on the other side of the rock, the number could be doubled. One could hypothesize that BHS 85 might be the burial ground for the Iron Age settlement at Thuqaibah on the other side of the al-Madam Oasis at a distance of about 6 km (Fig. 6). This site yielded differentiated settlement structures, potentially including a falaj, a construction of an underground water canal (Córdoba 2004). Considering, though, the high density of the Iron Age II population in the general area, it may well have to be assumed that there was a much closer settlement of this period in the now cultivated part of the al-Madam Oasis.

The Human Skeletal Remains

Methods

The human remains from the post-Neolithic sites in the Buhais area were dealt with according to standard methods of physical anthropology. For the assessment of the age at death, the state of the cranial sutures (ectocranial) was analysed (Meindl and Lovejoy 1985) as were tooth eruption and attrition (Lovejoy 1985). If preserved, the metamorphosis of the symphyseal surface of the pubis of the *os coxae* was used as an age indicator (Todd 1920). For younger adults the state of closure of the epiphyses offered further clues to the age of a skeleton (Buikstra and Ubelaker 1994). The individuals were classified into age groups.

The determination of sex was carried out on the basis of pelvic and cranial criteria (Acsádi and Nemeskéri 1970). The morphological indicators of the pelvis were scored higher than those of the skull because their sexual dimorphism depends on the process of giving birth. Another method used for the estimation of sex was that described by Phenice (1969), which considers morphological features of the *os pubis*. Following the osteometric sexing method after Jit and Singh (1966), the clavicle length was taken into account (males >150 mm and females <123 mm).

Osteometric data were collected where possible, but for most individuals only a small number of measurements could be assembled. Body height was estimated from the maximum lengths of the long bones, using Pearson's regression formulas (Pearson 1899).

Dental and skeletal lesions as well as skeletal markers of stress were examined and recorded macroscopically.

BHS 3

The site BHS 3 (Fig. 1) is an oval subterranean grave structure consisting of a chamber dug to a depth of about 1 m into the gravel of the footplain of Jebel al-Buhais and surrounded by a wall of large broken stones.

According to the report by H. Kiesewetter, the bone remains were very badly preserved and consisted mainly of small fragments which could not be determined anatomically. Only a larger shaft-fragment could be assigned to a human femur and was kept as a sample.

The specimen mentioned above is the only human remain from BHS 3 which could be studied for this report. It represents a shaft fragment of a robust femur.

BHS 8

BHS 8 (Fig. 2) and 12 (Fig. 3) are U-shaped, subterranean grave chambers of the Wadi Suq period, resting not far from each other and in the vicinity of the Neolithic graveyard of BHS 18. Human remains were left on the floor of the chambers after excavation and briefly examined by H. Kiesewetter and H.-P. Uerpmann in 1996.

From BHS 8 H. Kiesewetter reports a burial of an adult female(?) in flexed position next to the grave entrance, which leads into the southern part of the chamber. There were six other burials in the southern part of the grave chamber, all of them disturbed. Scattered human remains were also observed in the northern part of the chamber. Age estimates were possible for some individuals in the south chamber: one was 20–35 years old, two 30–40 years, and one 35–50 years. In addition there were remains of at least two children between 6 and 10 years of age. Apart from the skeleton near the entrance sex determinations were not possible. In 1999 the floor of the grave was further excavated by the local team. Skulls of seven adults were discovered, which were not further examined.

The human remains collected from BHS 8 are poorly preserved, with only small fragments of bone present.

BHS 12

For the grave BHS 12 H. Kiesewetter reports only small fragments of human bone observed in 1996 on the exposed floor of the grave chamber. At the western end of the northern part of the grave chamber there was a later burial exposed at a level about 1 m above the Bronze Age floor of the grave. This burial contained the skeleton of a man over 60 years old in a tightly flexed position on his right side with arms and legs bent close to the body. The skeleton was orientated east-west with the head in the west facing south. According to H.-P. Uerpmann, this skeleton was excavated in 1998. It is assumed that the camel burial discovered near the entrance of the grave on its east side was associated with this human burial, because it was also dug into the Bronze Age grave structure to *about the same depth. The camel skeleton was excavated in 1995 by H.-P. and M. Uerpmann. The dark sediment inside the camel chest, representing its stomach contents, produced a radiocarbon date of 1381 ± 23 BP (Hd 18804), which corresponds to 640–680 AD (H.-P. Uerpmann and M. Uerpmann 1999).*

In 1999 the sediment underneath the intrusive burial was excavated. According to H. Kiesewetter, a male and a female(?) skeleton were found, both disturbed by the intrusive burial. The age at death of the man was estimated at about 30 years, that of the potential woman between 30 and 40 years. At the bottom of the grave chamber scattered human and animal bones were observed. Some better preserved specimens were collected as samples.

The material from BHS 12 (Fig. 3), which was studied for this chapter, represents the individual from the intrusive burial and some of the specimens from disturbed burials mentioned above in the report by H. Kiesewetter.

BHS 12	*Individual 1*
Preservation:	moderate
Sex:	indifferent
Age:	40–50 years
Stature:	~1,68 m

The first individual shows a moderate state of preservation: the skull, hands and feet, vertebrae and ribs are fragmentary. One clavicle is missing. The other skeletal elements are present but fragmentary, and nearly no joints are available for examination.

Contrary to the assessment of Kiesewetter, who considered this individual to be a male, we feel unable to determine its sex, because it shows both male and female features at the pelvis and the skull.

The extreme tooth wear and skull suture obliteration indicate an age at death of 40 to 49 years. However, the epiphyses S2 and S3 of the *os sacrum* are not yet fused, which makes the individual younger than 25 years. There are two possible explanations for this discrepancy: Either the skull and sacrum are not of the same individual or the fusion of the sacrum was delayed due to an unknown cause. As the skeleton was undisturbed at the time of excavation (H.-P. Uerpmann, personal communication 2005), the first possibility must be excluded.

Only the humerus was well enough preserved for measuring and yielded a length of 335 mm, which allows an estimate of the body height of about 1.68 m.

Habitual stress markers and pathologies. Due to the fairly poor state of preservation, only a few markers of occupational stress in the lower extremity could be detected in individual 1. The femur displays a markedly hypertrophied *linea aspera*. Its diaphysis is abnormally shaped with a medial rotation of the distal articular end and the tibia is strongly platycnemic.

Dental findings. The 12 observable teeth and the mandible display some special features: The chewing surfaces show severe attrition (Figs. 20, 21), which even led to an opening of the dental pulps of the middle incisors. In addition, the teeth of the front region are askew. In one of the lower molars we observed a destruction of the occlusal surface due to caries.

A second individual from the sediment below the intrusive burial is only represented by a right humerus and radius as well as fragments of clavicles, fibulae and vertebrae. No special features were observed. The additional long bone fragments collected by Kiesewetter (see above) represent at least two more individuals from intermediate levels of the grave and at least one individual from the deepest level. Again there are no peculiarities to report.

Fig. 20. *Severe dental wear of the lower teeth (BHS 12, Individual 1).*

Fig. 21. *Severe tooth wear of isolated teeth (BHS 12, Individual 1).*

BHS 64

An intrusive burial, very similar to the one in BHS 12, was also found in the “bee-hive” grave structure BHS 64 near the northern end of Jebel al-Buhais (Fig. 6). Like the intrusive skeleton at BHS 12 (Fig. 3), this individual was buried tightly flexed in a narrow hole cut into the top of the older grave. The skeleton was excavated by the Tübingen team and taken as a sample (see below). No other human remains were preserved in this grave, which according to its architecture, should belong to the Hafit period of the Early Bronze Age.

BHS 64	*Individual 1*
Preservation:	good
Sex:	male
Age:	35–40 years
Stature:	~1,63-1,67 m

The state of preservation of the individual found in grave BHS 64 is fairly good. The skull, scapulae, vertebrae and ribs, as well as the hands and feet, are fragmentary. All other skeletal elements are well preserved, and many joints could be evaluated.

The pelvis and skull were considered for sex determination. All features indicate that the individual was male, even though the long bones are gracile and the stature was relatively short.

The pubic symphysis was present and its surface could be used as an age indicator. It was classified as phase VII (after Todd 1920), which indicates an age at death between 35 and 39 years. The tooth wear also suggests an age between 35–40.

Body height determinations, which were done according to Pearson (1899), yielded 1.67 m for the radius, and 1.64 m for both femur and tibia.

Habitual stress markers and pathologies. In the humerus, markers of increased muscular activity are to be found at the *tuberositas deltoidea* as well as along the *crista supracondylaris lateralis*, which is the originating site of the long extensors of the forearm and hand. In the ulna, the *supinator* crest is markedly hypertrophied. In its distal portion, there is an enthesopathy at the attachment site of the *pronator quadratus* muscle. Due to the state of preservation, an evaluation of the corresponding area of the radius was not possible. Pronounced bone ridges at the medial and lateral margins of the proximal phalanges can be attributed to increased stress on the flexing muscles of the hand and fingers.

Much more obvious are the signs of activity-related changes in the lower extremity. The femur displays marked pilasterism and therefore strong bowing. The abnormal shape results in a pronounced medial rotation of the distal articular end. Enthesopathies occur at the attachment sites for the *vastus medialis* of the *quadriceps femoris* and the *adductor* muscles inserting at the *linea aspera* (Fig. 22). Hypertrophy of the insertion site of the latter is observable all the way down to the *adductor tubercle* at the distal articular end of the femur. In particular the *adductor magnus* insertion at the distal end of the *linea aspera* produces a sharp bony ridge. A distinct facet called a Charles' facet (Capasso et al. 1999) is located below the *adductor tubercle*. At the posterior surface of the distal end exostoses are to be found around the origin of the medial head of the *gastrocnemius* muscle.

The tibial head displays marked retroversion, and the overall shape of the tibia is strongly platycnemic. On the anterior side of the distal tibial joint, a clear squatting facet is to be observed proximal to the joint surface (Fig. 23). The corresponding facet at the superior surface of the talus is clearly visible as well.

Despite the fairly good state of health of the individual, some pathological changes, mainly due to degenerative processes, are to be found in the spine. The lesion on the upper rim of the vertebral body of L5 is probably caused by kyphosis. Unfortunately, no other vertebral bodies, which could have confirmed this diagnosis in displaying corresponding lesions, were preserved. The articular facets of some of the preserved vertebrae show slight signs of spondylarthrosis, but those are most likely due to the normal aging process of the individual. More severe osteophytic outgrowth only occurs in the joint facets between the sacrum and L5. Furthermore, the sacrum shows a strange angulation in the area of S3, but the underlying cause of this shape abnormality remains unknown.

Dental findings. The mandible of the individual is in a fairly good state of preservation. Only the alveoli of the front part are partly destroyed. Both wisdom teeth show carious lesions in the necks (Fig. 24) and, in one instance, also at the mesio-lingual edge of the crown. Four of the 12 teeth display linear enamel hypoplasia.

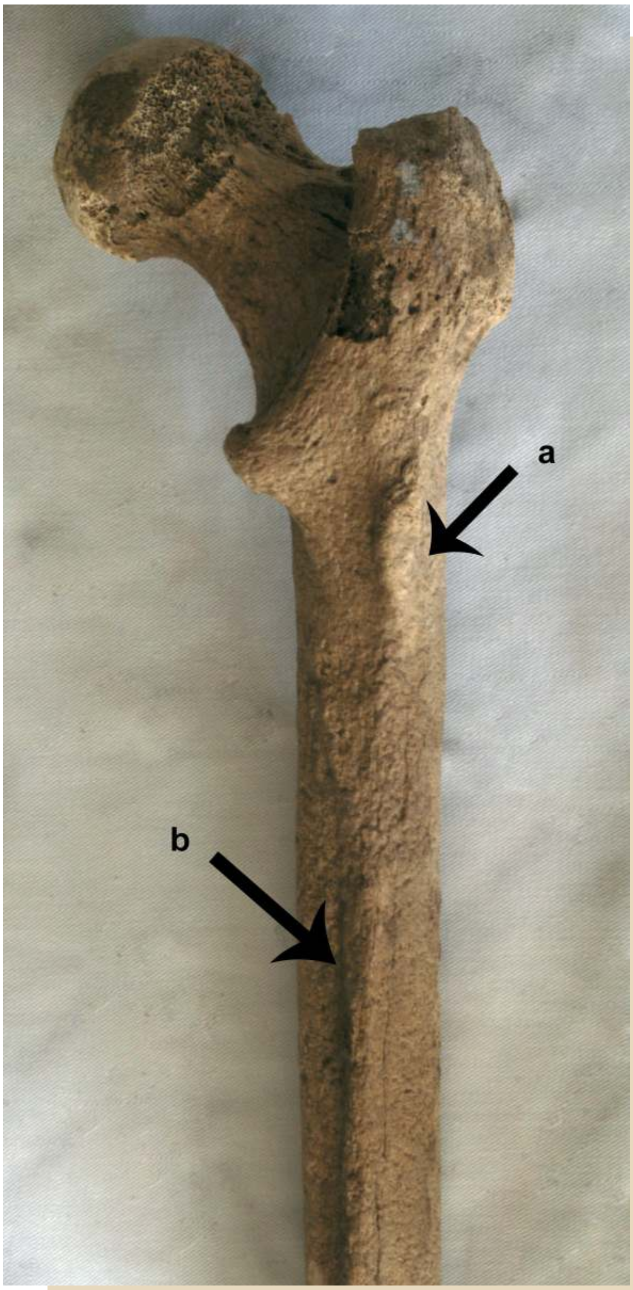
BHS 66

Grave BHS 66 (Fig. 4) is a peculiar structure consisting of four grave chambers situated around a short common corridor in the centre with an entrance from the east. It was constructed during the Late Bronze Age and reused in the Iron Age. Accordingly, two horizons of burials were observed in some of the chambers. The chambers were called A to D in the sequence of excavation, with A being in the south-west, B in the north-west, C in the north-east, and D in the south-east.

For chamber A, H. Kiesewetter and H.-P. Uerpmann report the heavily disturbed remains of at least 2 individuals.

In chamber B only the upper horizon (Iron Age) was opened at the time of examination. There was a disturbed female skeleton apparently buried in a flexed position on its left side with the face to the north and the head to the west. Age was estimated as 20–30 years; the length of the femur was c. 410 mm and that of the tibia c. 355 mm (measurement 1b after Martin 1928). In addition, there were parts of a disturbed skeleton of a child of about 5 years. The greatest length of the femur was c. 215 mm, that of the ulna c. 130 mm. The skull had obvious cribra orbitalia. The germs of some teeth and the unfused arches of the vertebrae of a 1–2 year old child were uncovered as isolated finds. In the entrance of this chamber, two adult femora and a skull were visible in the section through the lower sediment levels of the grave fill.

Chamber C was excavated to a level of the Late Bronze Age at the time of examination. There were bone splinters indicating a skeleton in flexed position and a skull fragment on its right side with externally open Lambda and Coronal sutures. From a third individual there were remains of a



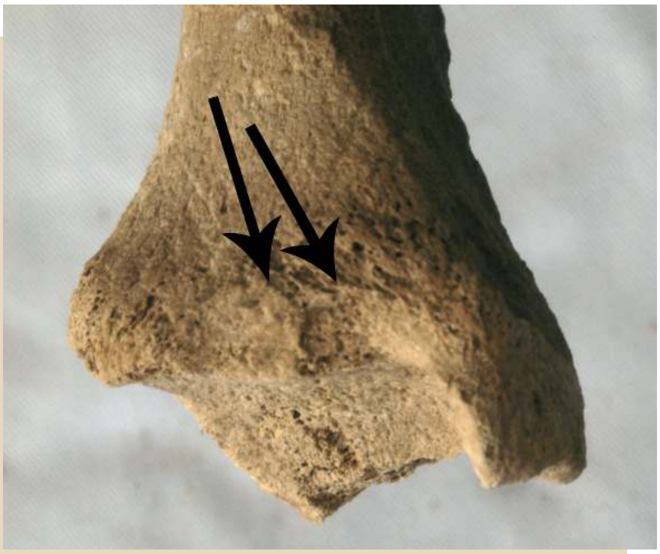


Fig. 23. Squatting facet, imprinted on the distal end of the Tibia (BHS 64).

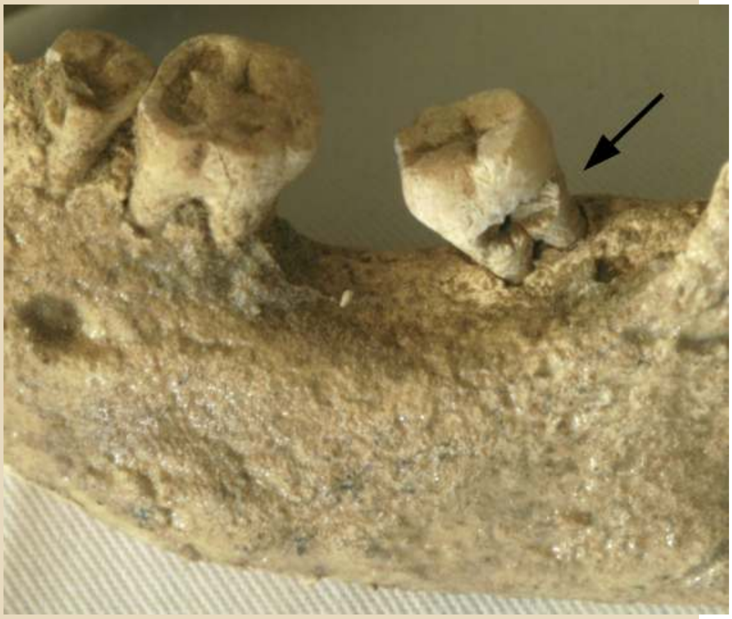


***Fig. 22.** Stress markers of the femur. **(a)** Tuberositas glutealis. **(b)** stress markers of the adductor muscles (BHS 64).*

***Fig. 24.** Carious lesion in the tooth neck of the wisdom tooth and ante mortem tooth loss of the second molar with complete resorption of the alveolus (BHS 64).*

lower leg and foot. Deeper within the fill of this chamber and only partially visible, a skull was found on its right side along with two femora.

Chamber D was examined when its back part was only excavated to the upper level, whereas the entrance part was opened to the lower level. On the upper level there were the remains of at least 5 individuals. One was represented by the upper part of an adult skeleton on its right side with the head in the east and the arms bent towards the body. The second consisted of the legs of a flexed skeleton, the head of which had been in the north-west of the chamber. A presumably female skull on its right side facing east represents the 3rd individual. The lambda suture is closed internally but not externally, the coronal suture partly fused externally. A mandible found near to this skull indicates intra vitam *loss of some molars. From their position, a pair of legs might belong to this skull, but are laid on their left side and should therefore represent a different individual. The 5th individual is represented by a male skull on its right side lying near the knee of the skeleton mentioned above. The coronal suture is externally* *open. This skull was kept for further examination (see below). From the lower level of chamber D there is another male skull on its left side facing south. Frontal and coronal sutures are externally open and there is an os inca. Fragments of pelvis and femur directly at the back of this skull indicate another individual, and a 3rd individual is represented by a presumably male skull lying on its back facing upward and slightly to the north. Its coronal suture is open.*

The central corridor of grave BHS 66 was excavated to the lowest level. Heavily disturbed remains of at least four individuals were observed there, including a mandible with *intra vitam* loss of molars and premolars.

BHS 66-D	*Individual 1*
Preservation:	moderate
Sex:	male?
Age:	30–40 years
Stature:	--

From grave BHS 66 only the fragmented skull and a mandible from chamber D were available for this study. The skull indicates that the individual was male. The analysis of cranial sutures and tooth wear places the individual in the age group of 30–40 years.

Dental findings. The observable teeth are in relatively poor condition. The osseous structures of the upper and lower jaws are preserved enough as to provide an understanding of the alveoles. Premature resorption suggests *intra vitam* tooth loss of six teeth. Three of the 14 teeth show carious lesions.

BHS 78

The site BHS 78 is not a grave structure but a series of rockshelters along the eastern flank of the Jebel al-Buhais which were used as habitation and workshop sites during the Iron Age. Some burials were found in the layers which formed under the rockshelters.

H. Kiesewetter reports the skeleton of a female of 25–40 years of age. It was buried in a small pit and found in a flexed position on its right side with legs and arms bent. The burial was orientated east-west with the head in the west. All bones were poorly preserved, and only small fragments of the skull were found. Several bowls of bronze and steatite were placed around the skeleton, which was adorned with a necklace of carnelian and bronze beads and a bronze finger ring.

Below this skeleton there was a completely disturbed burial of a juvenile individual. In between and below its bones 5 bronze arrowheads, a pin-shaped iron object with a length of c. 12 cm and some animal bones were found. Further down the slope fragments of at least two adult skulls and a few fragments of long bones were discovered. One of the skulls is quite robust and represents, in all probability, a male individual.

The remains of a minimum of one juvenile and six adult individuals were recovered from the site in 1998 prior to the arrival of the Tübingen team. Four individuals, among them at least two females and one male, could be identified from the slope section, none of them older than 40 years. The remains of a male individual (30–40 years old), an adult female, and a juvenile were found underneath the rockshelter. An isolated molar shows a carious lesion on its occlusal surface, and indications of inflammatory processes are visible in a tarsal bone.

Studied material. Only a small number of very fragmented human bones collected together with the animal remains could be studied. They belong to at least three individuals consisting of two adults and one neonate infant. No special features were noted.

Dental findings. No jaws are preserved. Fifteen isolated teeth are partially very fragmented. The premolars show dental hypoplasia. One premolar is not yet fully developed. From the edge of its crown downward the root is still missing. Carious lesions or other dental pathologies were not observed. Among the finds there are also some milk-tooth fragments of a neonate infant. This suggests that a baby was also buried at the site.

BHS 85

As described above, two graves at BHS 85 (Fig. 5) containing human skeletons were excavated by the authors in 2004 and 2005. From these two graves a minimum number of five individuals could be recovered. One skeleton (individual 1) was buried in grave I, the other four (individuals 2–5) in grave II. The state of preservation of the bones was variable.

BHS 85	Individual 1
Preservation:	moderate
Sex:	male?
Age:	30–40 years
Stature:	~1,65-1,78 m

Individual 1 (Fig. 11) was found articulated, buried in a squatting posture in grave I. The state of preservation was moderate and worsened after the uncovering and excavation of the skeleton. The cranium is fragmented, while only parts of the frontal and occipital bone, as well as parts of the parietal bones, are present. Three maxillary and three mandibular teeth are at hand. The mandible is very poorly preserved. The postcranial long bones of the upper and lower extremities are all present, but only consist of the diaphyses, while no joints could be examined. The vertebrae, clavicles, scapulae and pelvis, as well as some hand bones, are also very fragmented.

For the assessment of sex only the skull and some postcranial elements could be used as the pelvis was too fragmentary. The skull showed a preponderance of male features, but some attributes were indifferent. According to Jit and Singh (1966), the clavicle length of 155 mm also indicates that this individual was male, and the body height points in the same direction. Considering the evidence at hand, the skeleton seems to be that of a male, but the absence of the most diagnostic features of the pelvis precludes a definite determination of sex.

The state of the cranial sutures and the advanced dental attrition indicate that individual 1 was at least adult, and it is likely that its age at death was between 30 and 40 years.

Stature. Some measurements of bones could be taken *in situ* before their recovery as their whole shape was visible (Table 2). From these measurements, a body height between 1.65 m (humerus) and 1.78 m (femur) could be estimated. As the lower extremities correlate closer to the body height than the upper ones, a size of more than 1.70 m can be assumed.

Habitual stress markers and pathologies. In the proximal portion of the humerus, a series of enthesopathies are to be found which can be attributed to activity-related stress affecting the shoulder joint. The alterations involve the insertion sites of the *pectoralis major* and *teres major* muscles at both margins of the intertubercular groove and, most particularly, the insertion of the *deltoideus* muscle at the *tuberositas deltoidea*. In the proximal ulna, hypertrophy of the *supinator crest* is observed, as well as hypertrophy of the insertion of the *brachialis* muscle. The *margo interosseus* is strongly developed, both in the ulna and the radius (Fig. 25). Bony ridges at the medial and lateral borders of the proximal phalanges of the hand are related to an increased activity of the inserting flexing muscles of the hands (Fig. 26).

Marked hypertrophy of the *tuberositas glutealis* at the proximal portion of the femoral shaft can be observed and is due to increased activity of the *gluteus maximus* muscle. Furthermore, there are the enthesopathies at the attachment sites of the adductor muscles inserting into the *linea aspera* and at the origin of the *vastus medialis* of the *quadriceps femoris*. In terms of shape, the femora are platymeric. The tibia is platycnem with a pronounced hypertrophy of the *linea musculi solei* which provides the origin for the *soleus*, *tibialis posterior* and *flexor digitorum longus* muscles.

Dental findings. Only six teeth are present. The alveolar resorption at the left side of the mandible shows *intra vitam* tooth loss of four teeth. One upper canine displays a carious lesion. Other anomalies or pathologies could not be detected.

BHS 85	*Individua1 2*
Preservation:	moderate
Sex:	male
Age:	20–40 years
Stature:	--

The skeletal remains of individual 2 (Fig. 12) are only moderately preserved and were recovered from a disturbed burial in grave II. Due to the disturbance of the upper layers of grave II some skeletal elements of individuals 2 and 3 could not be separated because they display a similar robusticity. The skull is very fragmentary, whereas the mandible is nearly complete. The scapulae, clavicles, left humerus and sacrum are missing. The same is true for the right ulna, radius and femur and both fibulae. The right *os coxa* is preserved, the foot and hand bones and right tibia are fragmentary.

The morphological features of the cranium, mandible and pelvis (Fig. 27) show that the individual was male. Tooth wear and postcranial skeletal elements indicate an age at death of at least 20 to 40 years.

Habitual stress markers and pathologies. In the humerus (Fig. 28), the areas affected by increased muscle markings involve the insertions of the *pectoralis major* and *teres major* muscles at the margins of the intertubercular

Fig. 25. *Strongly developed Margo interosseus of the Radius and Ulna (BHS 85, Individual 1).*

Fig. 26. Bony ridge of a hand phalanx resulting from increased activity of the flexor muscles (BHS 85, individual 1).

groove as well as the deltoideus muscle inserting into the *tuberositas deltoidea*. Furthermore, the origins of the long extensor muscles of the forearm at the *crista supracondylaris lateralis* are strongly developed. In the head of the ulna, a marked hypertrophy of the *musculus brachialis* insertion can be observed. The pronounced bony ridge on the medial edge of the ulnar head might be the consequence of increased stress on the *musculus pronator teres*. The dorsal surface of the olecranon shows a remarkable hypertrophy of the origins of the *musculus flexor digitorum communis*. This feature is also reflected in bony ridges at the attachment sites of the muscle on the medial and lateral borders of the phalanges. Referring back to the elbow joint, the insertion site of the *anconeus* muscle shows pronounced development as well. Enthesopathies due to stress to the *biceps brachii* muscle can be observed at its attachment site at the radial tuberosity. In its distal area, hypertrophy can be found at the insertion site of the *musculus pronator quadratus*, corresponding with a marked hypertrophy of its origin at the *crista pronatoris* of the ulna. Due to the fact that only one arm could be securely associated with individual 2, no conclusions could be drawn about a possible asymmetry.

In the lower extremity, enthesopathies are to be found at the insertions of the *gluteus maximus* muscle on the posterior surface of the femur. The *linea aspera* shows marked hypertrophy with the femur thus being pilastric. The sites of origin of the *quadriceps* muscles on the upper part of the medial surface of the femoral shaft are strongly pronounced as well. In its distal part exostoses were observed at the origin of the medial head of the *gastrocnemius* muscle. The corresponding areas of the tibia could not be evaluated due to heavy erosion of this part. Muscle markings of the tibia involved the origins of the *soleus*, *tibialis posterior* and *flexor digitorum longus* muscles along the soleal line (Fig. 29).

The phalanges of the foot exhibit bony ridges on their medial and lateral borders, resulting from stress of the plantar flexing muscles. The proximal articular surfaces of the proximal phalanges show a strong rotation upwards.

Dental findings. The mandible of individual 2 is in a good state of preservation (Fig. 30). In total, 18 teeth are present. Of these, only the lower molars are positioned in the alveoli. One tooth shows pathological alterations in terms of a carious lesion (*Caries profunda*) which destroyed the dental pulp. The individual lost three teeth *intra vitam*.

BHS 85	*Individual 3*
Preservation:	moderate
Sex:	male?
Age:	40–60 years
Stature:	--

Individual 3 (Fig. 14) was found articulated in a right-sided squatting posture in grave II, but was partly disturbed. Due to this, some skeletal elements could not be separated from the remains of individual 2. The skull is very fragmentary, while the mandible is nearly complete. The scapulae and clavicles, as well as the pelvis and sacrum, are not present. The left lower extremity is also not preserved. The vertebrae, ribs, hands and foot bones are fragmentary.

Robusticity of the long bones and the morphology of the mandible indicate male sex for individual 3. No cranial or pelvic features could be considered, which leaves the sex determination uncertain.

The state of obliteration of the observable cranial sutures and the tooth wear indicate that the individual was 40–60 years of age at the time of death. The high frequency of *antemortem* tooth loss with completely resorbed alveoli emphasizes the relatively advanced age.

Habitual stress markers and pathologies. In individual 3, increased physical stress on the shoulder joint is reflected in enthesopathies of the *deltoid* as well as of the *teres major*, *pectoralis major* and *latissimus dorsi* muscles at their attachment sites at the humerus. The slight hypertrophy of the origin of the *triceps brachii* inferior to the *cavitas glenoidalis* of the scapula could be understood in relation to the observation made above. At the distal end of the humerus, marked enthesopathies can be found at the *crista supracondylaris lateralis*, which provides the origin of the long extensors of the forearm and hand. Concerning the question of a possible asymmetry due to a dominant use of one side, the right humerus seems to be longer than the left one, even though no difference in occurrence or robusticity of the muscle markings between both sides can be observed. In the ulnar head, signs of strong muscular activity are to be found at the insertion sites of the *pronator*

Fig. 27. *Male morphological features of the pelvis of individual 2 from BHS 85.*

Fig. 28. *Activity-related stress markers of the Humerus (BHS 85, individual 2).*

Fig. 29. *Tibia with activity-related stress markers of the attachment site of the* M. popliteus *and the origin of the* M. soleus *(BHS 85, Individual 2).*

Fig. 30. *Mandible, individual 2 (BHS 85).*

teres, *brachialis* and, though to a lesser extent, the *anconaeus* muscles. The site of origin of the *flexor digitorum communis* muscle is hypertrophied as well. The enthesopathy of the *pronator quadratus* muscle at its origin at the distal portion of the ulna corresponds with a similar lesion at the muscle's insertion site at the distal radius. The *tuberositas radii* shows a strongly pronounced hypertrophy due to increased stress on the *biceps brachii*. The phalanges of the hand exhibit bony ridges at their medial and lateral borders which arise due to stress on the flexors of the hands inserting into them. Signs of increased activity of the muscles of the hand could be observed at the metacarpalia as well.

The most striking enthesopathies in this individual are to be found at the insertions of the *gluteus maximus* (Fig. 31) and adductor muscles. In the latter, especially the *adductor longus* insertion along the middle third of the *linea aspera* is strongly pronounced. The proximal portion of the *vastus medialis* of the *quadriceps femoris* muscle seems to be hypertrophied as well. Furthermore, exostoses at the site of origin of the medial head of the *gastrocnemius* muscle at the distal end of the femur was observed. The tibia is platycnem, with strong enthesopathies along the soleal line, which provides the origin for the *soleus*, *tibialis posterior* and flexor *digitorum longus* muscles.

The talus shows a distinct facet on its superior surface which can be attributed to habitual squatting. The corresponding area of the distal tibial joint was unfortunately not preserved. Furthermore, the phalanges of the toes show dorsal rotations of their proximal joint surfaces as well as ridges at their medial and lateral borders associated with an increased stress to the plantar flexing muscles, similar to that in individual 2 (Fig. 32).

Even though the individual was generally in a good state of health, the joints show signs of partly severe degenerative changes. These can only be attributed to the advanced age of the individual to a limited extent, but more likely seem due to a strong physical demand. Most notably, the sternal and vertebral ends of the ribs are affected. In some cases even the onset of immobilisation must be assumed. Degenerative changes in the spine involve the articular facets (*Spondylarthrosis deformans*) as well as the vertebral bodies (*Spondylosis deformans*). While in the cervical portion only the vertebral bodies are affected, both elements are affected in the thoracic and lumbar spine.

Further signs of osteoarthrosis are to be found in the ulnar head along the radio-ulnar joint. The majority of the other joints could unfortunately not be evaluated due to the poor state of preservation.

Dental findings. The dental finds of individual 3 are represented by a relatively well-preserved mandible (Fig. 33) and five isolated teeth. Four of these are preserved only as tooth stubs with open dental pulps. The resorbed mandibular alveoli show that the individual lost all of its lower molars *intra vitam*. A lesion in one alveole in the region of the front teeth might be the result of an inflammation which formed a cyst.

The state of the teeth and jaws support the age determination given above, indicating an older individual.

BHS 85	*Individual 4*
Preservation:	good
Sex:	male??
Age:	30–50 years
Stature:	~1,63-1,71 m

Individual 4 (Fig. 15) is well preserved and was found articulated in a left-sided squatting posture in grave II. The skull is fragmentary (Fig. 34), with the left side especially destroyed. The mandible is complete. The scapulae, ribs and vertebrae are very fragmented. All long bones are present, but in many cases the epiphyses are not preserved. The left *os coxa* is nearly complete, while the right one is fragmented. The *os sacrum* is missing. Hand and foot bones are fragmentary.

The skull and pelvis of individual 4 exhibit both male and female features but show a preponderance of male indicators. The clavicle length is 152 mm which lies in the range for males (Jit and Singh 1966). Altogether the characteristic traits indicate male sex, but the sex determination remains uncertain.

The obliteration of the cranial sutures and the tooth wear classify individual 4 into the age group of 30 to 50 years at death.

The estimation of the stature of individual 4 yielded a body height between 1.63 m and 1.71 m (Table 2).

Habitual stress markers and pathologies. In contrast to the other individuals, only slight signs of increased muscular stress are found in the upper extremity. The *tuberositas deltoidea* is only slightly pronounced, and the same holds true for the *crista supracondylaris lateralis*. Merely the attachment sites of the *supinator* muscle at the *crista supinatoris* of the ulnar head (Fig. 35) and the insertions of the flexing muscles at both sides of the carpal phalanges show marked development.

More signs of strong physical activity are to be found in the lower extremity. Similarly to the changes observed in the other individuals, the attachment sites of the *gluteus maximus* and the *adductor* muscles were hypertrophied (Fig. 36). The femur is pilastric with a highly developed *linea aspera*. The tibia is platycnem and enthesopathies could be found along the soleal line. Furthermore, the insertion site of the Achilles' tendon at the calcaneus indicates exostoses.

The only pathological changes found in this individual are due to degenerative processes and concern the articular facets of the spine as well as the distal articulations of the distal phalanges of the hand. However, these are not very severe.

Dental findings. In total, 19 teeth are preserved, of which only the molars of the well-preserved mandible are still situated in their alveoli (Fig. 37). All other teeth are isolated. The crowns and roots of all teeth are very fragile, which makes reconstruction and analysis difficult. Resorbed alveoli show *intra vitam* tooth loss of two premolars (35 and 45).

BHS 85	*Individual 5*
Preservation:	mandible only
Sex:	?
Age:	20–30 years
Stature:	--

Individual 5 consists of only a relatively gracile mandible which is nearly complete. No determination of sex could be obtained.

The state of the tooth wear suggests an age at death between 20 and 30 years.

Dental findings. Only the left half of the mandible is preserved (Fig. 38). The molars (36, 37 and 38) are positioned in the alveoli. The other preserved teeth are isolated. Two of these are deciduous teeth. The canine 33 is still situated in the mandible and has not yet erupted. This suggests that a deciduous tooth repressed it, indicating that individual 5 was an adult with some persisting deciduous teeth. One molar is affected by a carious lesion at the neck of the tooth. The incisors, canines and premolars display linear enamel hypoplasia.

General Evaluation of Dental Pathologies

Pathological or degenerative tooth alterations play a central role in reconstructing the living conditions of a population. It is an advantage that teeth—due to their structure and chemical composition—are very often preserved among archaeological human remains. Dental caries and calculus, as well as tooth attrition and abrasion, provide evidence

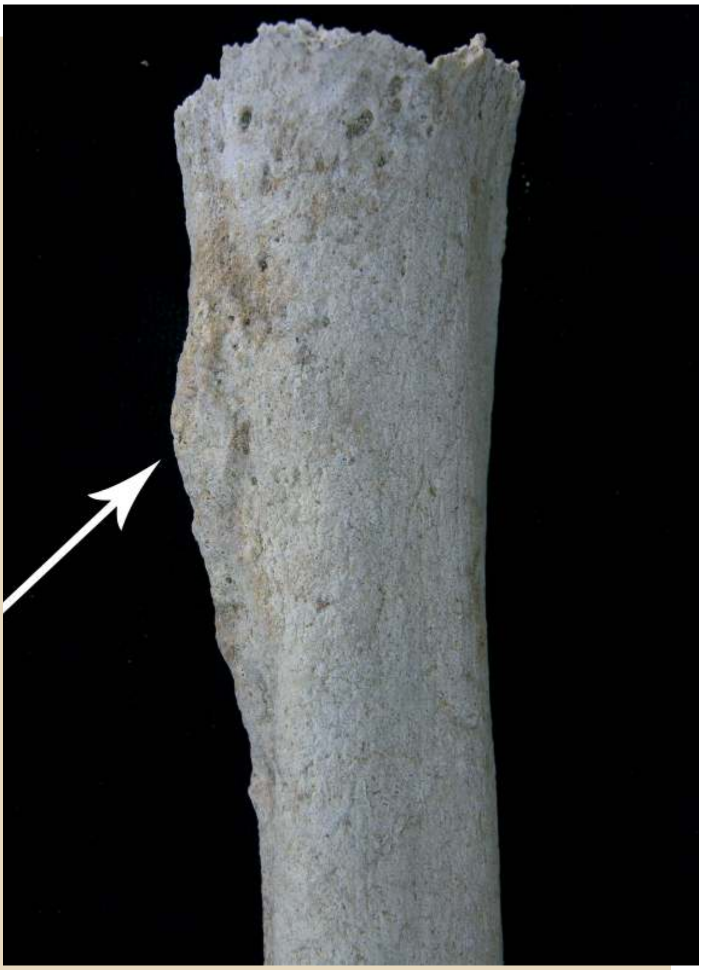


Fig. 31. *Femur with strongly developed Tuberositas glutealis (BHS 85, individual 3).*

Fig. 32. *Phalanges of the toes with dorsal rotations of the proximal joint surfaces and ridges at their borders associated with increased stress to the plantar flexing muscles (BHS 85, individual 3).*

Fig. 33. *Mandible, individual 3 (BHS 85).*

Fig. 34. *Fragmented skull of individual 4 (BHS 85).*

Table 2. *Overview of body height estimates.*

Site	Individual	Element	Greatest length	Body height estimate (Pearson 1899)
BHS 12	1	Humerus	335 mm	1.68 m
BHS 64	1	Radius	250 mm	1.67 m
BHS 64	1	Femur	440 mm	1.64 m
BHS 64	1	Tibia	360 mm	1.64 m
BHS 85	1	Radius	270 mm	1.71 m
BHS 85	1	Humerus	340 mm	1.65 m
BHS 85	1	Femur	500 mm	1.78 m
BHS 85	1	Tibia	440 mm	1.70 m
BHS 85	4	Radius	255 mm	1.69 m
BHS 85	4	Humerus	320 mm	1.63 m
BHS 85	4	Femur	480 mm	1.71 m
BHS 85	4	Tibia	370 mm	1.66 m

concerning nutritional status, dental care or—in the case of using the teeth as a "third hand"— working habits. Below, the dental pathologies will be described of the human remains from the post-Neolithic sites at Jebel al-Buhais and, despite the small sample, an attempt will be made to interpret the findings in relation to comparable studies.

Dental Caries, Attrition and Tooth Loss

Dental caries is one of the most significant diseases of civilisation occurring today. The western industrial nations tend to negate this fact due to advanced modern medical treatment which belies the problem. In former time periods treatment was rarely possible, and the disease could well be deadly. Dental caries is an "old disease." Its rapid rise correlates with the advent of agriculture. In this context, the composition of what a particular human population eats is of special interest.

Dental caries develops when dietary sugars are converted into acids by bacterial metabolism in the tooth-plaque. These demineralise and dissolve the tooth enamel, and gradually the dentine, over a certain period of time. The forming of such lactic acids depends on food composition. A diet rich in carbohydrates intensifies acidification

Fig. 35. Enlarged supinator crest at the Ulna (BHS 85, individual 4).

Fig. 36. Femur with marked Tuberositas glutealis *(BHS 85, individual 4).*

Fig. 37. Mandible, individual 4 (BHS 85).

Fig. 38. *Mandible, individual 5 (BHS 85).*

and therefore the susceptibility to dental caries (Littleton and Frohlich 1989; Aufderheide and Rodríguez-Martín 1998). Particularly the concentration of saccharose in a diet that is rich in carbohydrates is an important factor (Carli-Thiele 1996). Other sugar derivates, such as fructose, also increase the risk of dental caries developing. If the protein content of the diet increases and the amount of carbohydrates diminishes, the susceptibility to dental caries decreases (Caselitz 1986). Not only an unfavourable diet but also malnutrition can have negative effects on dental health. Malnutrition with an undersupply of vitamins (e.g., vitamin A, C or D) and minerals can disturb the enamel and dentine development and hence decrease the quality of tooth structure.

Besides nutrition, some other factors also affect cariogenesis. Tooth structure and its sensitivity are factors dependent on genetic predispositions of an individual, while a lack of oral hygiene will further the development of carious lesions (Carli-Thiele 1996). Cariogenesis displays a complex action, in which the factors mentioned above interact in different combinations and result in a disturbance of the substance of a tooth. Caries frequency describes the distribution of caries in population groups and is therefore an indicator for the incidence of carious lesions in a population (Alt 2001). Caries frequency is also a suitable measure for interpopulation studies.

Of the nine individuals available for this study, six revealed carious lesions in different stages (e.g., Fig. 24). A caries frequency of 67% is relatively high. The high percentage must of course be interpreted with caution due to the low number of examined individuals and to the fact that they do not represent a real population. Nevertheless, it correlates with other Late Bronze or Iron Age data from Bahrain and Oman (Littleton and Frohlich 1989; Nelson et al. 1999). The consumption of dates, sweet and rich in carbohydrates, and therefore a cause for the development of caries lesions, accounts in large part for the high rates of the disease in that region. The cultivation of dates can be demonstrated in the Arabian Gulf region since the 3rd millennium BC and plays an important role in agriculture (Nelson et al. 1999; ECSSR 2003).

Carious lesions, which cause defects in the enamel and dentine, can lead to inflammations of the dental pulps which can be transferred apically and cause osteolytic reactions in the jaw bones. This can result in apical granulomas or radicular cysts (Alt 2001). The latter seems to be the case in the structural changes in an alveole of the mandible of individual 3 (Fig. 33) from the site BHS 85.

Six out of eight observable jaws display resorbed alveoli, which indicate *antemortem* tooth loss. In most cases the first two molars (M1 and M2) and premolars (particularly P2) are affected. Besides carious lesions, inflammatory processes or trauma can lead to tooth loss. In consideration of the high frequency of dental caries, it is nevertheless most likely that this was the main reason for tooth loss in the populations from Jebel al-Buhais. Other studies also suggest the same (Littleton and Frohlich 1989; Nelson et al. 1999).

Nelson et al. (1999) postulate, for their findings from Samad (Oman), that the masticatory activity was displaced to the front teeth after the loss of the molars and premolars. This increased the attrition of the front teeth. This assumption cannot be confirmed for the small sample from Jebel al-Buhais. The individuals show highly varying states of attrition. The individual from BHS 12, for example, displays severe attrition of all teeth (and particularly of the molars and premolars), while individual 4 from the site BHS 85 does not. Both individuals were determined to have been approximately the same age at the time of death.

Dental Calculus and Parodontopathies

Unlike caries lesions, the development of dental calculus is caused by an alkaline pH-value in the oral cavity. A diet rich in proteins can stimulate an alkaline oral environment (Orschied 1996). The deposition of dental calculus is further dependent on the age of an individual, the viscosity and composition of the saliva and the position of the teeth (Strohm and Alt 1998). For the anthropological sample from the post-Neolithic sites at Jebel al-Buhais, no calculus could be detected. This can be attributed to taphonomic processes, but it also correlates with the dietary situation of the population, which was probably dominated by cereals, fruits (particularly dates) and vegetables, along with some meat. Littleton and Frohlich (1989), as well as Littleton (2003), also found a low rate of dental calculus in their Iron Age samples from Bahrain. Because of the fragile alveolar structures of the individuals from Jebel al-Buhais no parodontopathies could be observed

Dental Hypoplasia

Dental hypoplasia is correlated with non-specific deficiencies, inflammatory diseases and particularly gastrointestinal disorders (in childhood). An individual can develop dental hypoplasia *in utero* or during infancy. For that reason, the defects can be observed both in the deciduous and secondary dentition (Carli-Thiele 1996). These irreversible defects in the enamel can be classified into two groups: punctual and linear enamel hypoplasia (Schultz et al. 1998). Linear enamel hypoplasia is a macroscopically visible groove in the tooth crown, while punctual hypoplasia forms pits.

Out of the nine individuals we studied from the sites at Jebel al-Buhais, three display linear enamel hypoplasias. Two of these individuals, furthermore, show disturbances of tooth eruption. Individual 5 from BHS 85 and the skeleton from BHS 78 show a canine and a premolar, respectively, with retention.

Generally, most enamel defects seem to occur at the age between two and four years. This is correlated with the dietary conversion from breast milk to chewed food (Schultz et al. 1998). The occurrence of gastrointestinal disorders due to these dietary changes play an important role in this context (Carli-Thiele 1996; Haidle 1997).

In association with the high incidence of dental hypoplasia in the material from Bahrain, Littleton (Littleton 1998, 1999) discusses the effect of the high percentage of fluoride in the drinking water. Water is one of the things a baby receives as a substitute for breast milk. Littleton refers to the hypothesis that fluoride interferes with the absorption of calcium and therefore negatively affects enamel development (also see Massler and Schour 1952; Fejerskov et al. 1977; Nikoforuk and Fraser 1981). Elevated values of fluoride are also known for the Emirates (Blau 2002). The characteristic skeletal and dental changes due to fluoridosis, such as wrinkling and pitting of the tooth enamel (Blau 2002), and abnormal bone formation of the skeleton (Ortner 2003, p. 406–410), could not be observed in the present sample from Jebel al-Buhais (cf. also Kiesewetter, this volume).

Nevertheless, the influence of fluoride on dental growth does not seem to be completely clear. Some studies even confute a correlation between the concentration of fluoride in the drinking water and enamel hypoplasia (Ericcson 1977; Molnar and Molnar 1985).

Whatever the exact reasons may have been for the individuals from al-Buhais to have developed enamel hypoplasia, a stressful situation during infancy must have taken place in order to leave these marks in the studied dentitions.

Pathologies and Occupational Markers of Stress

BHS 85

Individuals 1, 2 and 3 display enthesopathies at the insertions of the *pectoralis major*, *teres major* and *deltoideus* muscles. Those muscles are involved in a number of movements in the shoulder joint. The *deltoideus* raises the arm to a right angle with the trunk. Assisted by the *pectoralis major*, its anterior fibres draw the arm forward while the posterior fibres, with the aid of the *teres major* and *latissimus dorsi* muscles, draw the arm backward. Moreover, the *teres major* and *pectoralis major* act in drawing the arm back to the side of the trunk after being raised by the *deltoideus*. Further actions in which these muscles become active involve the movement of the arm across the chest. Together with the *latissimus dorsi* they are referred to as "climbing muscles," as they pull the trunk upwards if the arm is fixed (Wilczak et al. 2004). This pattern of stress to the shoulder joint suggests a number of different activities. It was described among Inuit populations arising from a repetitive flexion and extension of the arm towards the chest with the elbow bent while scraping animal hides (Hawkey and Merbs 1996). Similar lesions were observed in middle Holocene individuals from the Sahara, also potentially related to the preparation of animal hides (Binder et al. 2005). The same movement is involved in the process of grinding seeds or grain when using heavy grinding stones. Grinding stones are known in large numbers from the contemporary Iron Age site of Muweilah (Davies 1998); thus it seems plausible that the people buried at the BHS 85 site made use of them in order to prepare flour as well. The heavy attrition of the teeth of the individuals also suggests the use of grinding stones, as it is possibly caused by abrasive material produced during grinding. Furthermore, this pattern of stress markers in the shoulder joint should be expected in the lifting and carrying of heavy objects (Wilczak et al. 2004).

The *brachialis* and the *biceps brachii* muscles both act as the major flexors of the elbow. If the forearm is fixed, the *biceps brachii* and the *brachialis* pull the body towards the forearm. Hypertrophy of their insertion sites at the radius and the ulna were detected in individuals 1, 2 and 3, with those areas not being well enough preserved in individual 4. These lesions are commonly found in relation to carrying loads with the forearms extended and the elbows flexed, while the upper arm remains at the side of the body (Capasso et al. 1999, p. 66, 71; Wilczak et al. 2004, p. 441). The overall pattern of stress markers in the humeri of the individuals from BHS 85 thus points to general heavy labour involving different kinds of activities, with lifting and carrying of heavy objects probably being the more significant of these. This pattern is probably what might be expected in an early agricultural population.

The *biceps brachii* also acts in the supination of the forearm, assisted by the *supinator* muscle. Its attachment site at the *supinator crest* at the ulnar head is markedly developed in individuals 2, 3 and 4. Enthesopathies at this site have been ascribed to a wide range of activities that involve manipulating loads with the elbow extended, including fruit picking and using heavy tools with a long reach, such as axes (Capasso et al. 1999, p. 77). Furthermore, this lesion was associated with throwing motions, as the throwing of objects involves strong supination and hyperextension of the elbow joint. Enthesopathies of the *supinator crest* are commonly reported in hunter-gatherer populations who use a variety of projectiles in hunting (Capasso et al. 1999). They usually occur together with hypertrophy of the insertion of the *anconeus* muscle, which becomes active in the hyperextension phase of the motion. The use of spears is widely known for that time period, and an iron lance or spearhead was retrieved from the site. Thus, enthesopathies due to the use of spears could be expected in the individuals of BHS 85. Nevertheless, all but individual 3 lack the *anconeus* enthesopathy. As this could probably be due to the state of preservation as well, we can and will not use the pattern of musculoskeletal stress markers in the elbow as an argument for or against the use of spears in hunting and fighting in these individuals, but the probability remains.

With regard to *supinator crest* enthesopathies being related to manipulating loads with an extended elbow, another possible habitual activity should be considered. The subsistence of people in this region during the Iron Age heavily depended on the exploitation of date palms (Potts 2002). Apart from the numerous archaeological finds of date stones, the consumption of dates is also reflected in the high frequency of caries lesions and overall poor condition of the dentition. The harvesting of dates involves repetitive movements, with the arms raised above the head, movements that can be compared to those involved in fruit picking. Therefore, it seems possible that the enlarged *supinator crests* observed in the individuals of BHS 85 could be related to the cultivation of dates.

Further markers of musculoskeletal stress were found in the attachment site for the muscles that act in the flexing of the hand and fingers. These muscles become particularly active in grasping movements. All four individuals of the burial site BHS 85 show lesions in these attachment sites. As grasping is involved in every occupation carried out with a tool, these lesions cannot be attributed to a specific activity, but rather seem to be a general indication of heavy labour.

The most severe enthesopathies could be observed in the lower limbs, especially in the attachment sites of the muscles of the hip joint. All of the BHS 85 individuals exhibit lesions along the insertions site of the *gluteus maximus* in the proximal portion of the femur below the greater *trochanter* as well as at the insertions of the *adductor* muscles along the *linea aspera*. The *gluteus maximus* is an extensor and abductor of the thigh. As such, this muscle is highly important in movements involving climbing and raising the trunk from a flexed posture. The adductors act in the adduction as well as in the outward rotation of the thigh. They are especially important in horseback riding, as the contraction of these muscles grasps the saddle between the legs. Moreover, they are important in maintaining balance while walking. Further enthesopathies in the proximal portion of the femur can be ascribed to stress to the *vastus medialis* of the *quadriceps femoris*. This muscle is one of the main extensors of the knee and becomes particularly important in motions such as stair climbing.

Hypertrophies of the above-mentioned muscle attachment sites have been reported in a number of different groups, all of whom were involved in strenuous locomotion activities. These include Canadian fur traders, who jogged up and down steep portage trails while carrying heavy packs, horseback riders and cart drivers from the Royal Cemetery of Ur (Capasso et al. 1999), as well as nineteenth century African American slaves (Wilczak et al. 2004). In the latter, it was suggested that the enthesopathies were due to hip flexion/extension stress while picking up heavy loads by either bending the hip or by lifting them from a squatting posture.

In the tibiae, enthesopathies were mainly found along the soleal line, which provides the origin for the *soleus*, *tibialis posterior* and *flexor digitorum longus* muscles. The *soleus* muscle forms the *triceps surae* together with the *gastrocnemius* muscle whose site of origin at the distal end of the femur was hypertrophied in individuals 2 and 3 as well. The Achilles' tendon is the common insertion for these muscles into the calcaneus. Enthesopathies at this site could be expected as well, and are observed in individual 4. No calcanei were preserved in the other individuals. The main function of these muscles is the extension of the foot at the ankle joint, and they are constantly called into action during standing, walking, dancing and leaping. In standing, the *soleus* muscle stabilizes the leg upon the foot and thus prevents the body from falling forward. The *gastrocnemius* is moreover important in the flexing of the femur upon the tibia. Enthesopathies in the tibiae were again reported in the Canadian fur traders and attributed to the movement along steep portage trails while carrying heavy loads (Capasso et al. 1999, p. 122). The alterations of shape observed in the tibiae, referred to as platycnemia, also fit well within this picture, as they are ascribed to mechanical stress to the lower limb and were commonly reported in hunter-gatherer groups traveling over large distances in rough terrain (Dutour 1986; Capasso et al. 1999, p. 128; Binder et al. 2005).

With regard to the individuals from BHS 85, interpreting the signs of increased physical activity found in the lower limbs is not an easy task. As for the severe adductor enthesopathies, riding camels could have been the cause for these to develop. The domestic camel has been known since the Iron Age in this area (H.-P. Uerpmann and M. Uerpmann 2002) and therefore their use as mounts is not to be excluded. But as other skeletal markers attributed to riding, such as facets on the femoral heads (Palfi and Dutour 1996), could not be evaluated due to the state of preservation, no conclusion about this kind of activity can be drawn at this point. More likely it seems that the hypertrophic muscle attachment sites can be ascribed to the lifting and carrying of heavy loads, as was described for nineteenth century African American slaves (Wilczak et al. 2004).

Furthermore, the possibility of the lesions being related to extensive walking across steep and rough terrain should be considered likely as well, in particular regarding the enthesopathies of the tibia. The burial site of BHS 85 is located at the southern slopes of the Jebel al-Buhais. Movement around the area, for reasons related to trade or herding, would possibly require a great deal of climbing up and down the rocky slopes of the Jebel and the adjacent hills. Moreover, it seems likely that, given the marginal nature of the environment, it was necessary to travel long distances by foot in order to acquire certain natural resources or goods, which could have also resulted in the development of the enthesopathies described above.

In summary, we cannot ascribe the markers of physical stress found in the human remains to any specific kind of labour or activity, a point which was not the aim of this study to begin with. The conclusions that can be drawn from the pattern of stress observed in the individuals from BHS 85 indicate they were involved in a number of different kinds of heavy physical labour, as should be expected in an early agricultural society. Furthermore, it seems likely that the every day life of the people buried at the BHS 85 site included extensive walking over the rough surrounding areas.

BHS 12 and 64

The isolated intrusive burials found at BHS 12 and 64 might demonstrate a military source, as indicated by finds of iron arrowheads, the position of which near the body provides evidence that both individuals were buried with a quiver. A camel burial at BHS 12 can probably be associated with the intrusive human individual from that grave. If the radiocarbon date for the camel burial is extended to the two human interments, they might be related to the battles which took place in the general area during the spread of Islam.

The patterns of musculoskeletal stress markers of the individuals from BHS 12 and 64 are different from those of BHS 85. Of particular interest are the changes due to physical stress to the muscles of the lower limb. The enthesopathies and morphological changes in the tibiae such as the tibial head retroversion and the facet above the distal articular surface (Fig. 23) are commonly observed in groups that have chosen habitual squatting as their preferred resting or working position (Capasso et al. 1999, p. 125). As this habit is still widely practiced in the UAE (Blau 1996), it does not seem astonishing that it was already practiced by the ancestral populations of this region.

More difficult to interpret are the changes observed in the femur. Both individuals show marked hypertrophy of the *linea aspera* (e.g., Fig. 22) combined with a well-developed pilaster, a bowed femoral shaft and a medially rotated distal end. It seems possible that the individuals were habitually riding camels (or horses). The strong development of the *gluteus* and *adductor* muscle insertions provide further evidence for the two individuals being riders. Another indicator for this is derived from the acetabulae, in which the articular surface shows superior elongation, a trait possibly related to continuous flexing of the hip in riding. Unfortunately, the femoral heads are not preserved. The presence of a facet on the anterior surface of the femoral neck is sometimes mentioned in relation to riding as well (Palfi and Dutour 1996).

Even though there are indications, as mentioned above, that both individuals were involved in riding animal mounts, we cannot draw definitive conclusions from the material at hand. The question of the manifestation of riding in the skeleton is a matter of some discussion among researchers and remains unclear at present. Therefore, we can only mention the possibility, which of course gains credibility through the camel burial associated with the individual from BHS 12.

Concluding Remarks

Beginning with the Neolithic graveyard of BHS 18, burials of all other prehistoric periods, except the Umm an-Nar phase, have been found along the eastern slopes of Jebel al-Buhais. Unfortunately, the very poor bone preservation prevented a complete collection of the human remains to be assembled. Therefore it is not possible to obtain demographic results for the populations who inhabited the area after the end of BHS 18, nor is it possible to make direct comparisons between the Stone Age inhabitants and those of the later prehistoric periods. As most of the material studied here comes from the Iron Age, this is then the period from which we can draw some interesting conclusions from the available skeletal finds.

Burial customs in the Iron Age were quite diverse: often corpses were simply buried in older grave structures. Such cases were observed both in the U-shaped graves of BHS 8 and 12 and the cloverleaf grave of BHS 66. Contrary to this, the multi-chambered graves at BHS 85 indicate an independent grave architecture of this period. This may actually have developed from the third kind of interments found in the area, which are burials in crevices and under rockshelters along the slopes of the Jebel. The preserved skeletons at BHS 85 were found under overhangs of the adjacent rock, and they were protected by a closing wall on the outside. The other grave chambers at BHS 85 can be seen as additional compartments set in front of the rockshelter graves.

From an anthropological point of view, the Iron Age finds from the Jebel al-Buhais area confirm observations in other parts of the Gulf region which indicate an increased frequency of dental pathologies—in particular, caries—during this period and into the late Pre-Islamic time period (e.g., Nelson et al. 1999). This is corroborated by the dental findings from the two supposed warriors from BHS 12 and 64. Otherwise, these two individuals yielded highly interesting observations with regard to their supposed occupation. Their leg bones indicate alterations due to habitual riding, an observation which fits well with the camel burial found at BHS 12 not far from the burial of the warriors. In general, the anthropological investigation of post-Neolithic human remains from the Jebel al-Buhais area provides further details into the increasing diversity of the late prehistoric and early historic populations of south-eastern Arabia.

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