PL ISSN 0066–5924
INDEX 32597x (VAT 8%)
DOI: 10.23858/APa58.2020

Institute of Archaeology and Ethnology
Polish Academy of Sciences

Archaeologia Polona

vol. 58: 2020

Special theme:
PREHISTORY OF NORTH-EAST AFRICA
Volume dedicated to Prof. Michał Kobusiewicz
on his 80th birthday

Archaeologia Polona

Volume 58 : 2020

Editorial office:	INSTITUTE OF ARCHAEOLOGY AND ETHNOLOGY POLISH ACADEMY OF SCIENCES, 00-140 Warsaw; Al. Solidarności 105 Tel. (4822) 6202881 ext. 154; Fax. (4822) 624 01 00 E-mail: archaeologiapolona@iaepan.edu.pl Website: http://journals.iaepan.pl/apolona

DOI: 10.23858/APa
DOI: 10.23858/APa58.2020

PUBLISHED BY
THE INSTITUTE OF ARCHAEOLOGY AND ETHNOLOGY
POLISH ACADEMY OF SCIENCES, WARSAW, POLAND

Typeset:	DOBRY SKŁAD Marta Duda
Printed and bound by	PARTNER POLIGRAFIA, Białystok

Archaeologia Polona, vol. 58: 2020, 1–3
PL ISSN 0066-5924

Editorial

The current, 58th volume of *Archaeologia Polona* with the special theme – *The Prehistory of North-East Africa* is devoted to Professor Michał Kobusiewicz on the occasion of the 80th anniversary of his birth. Being aware of Michał's many significant research achievements, we would like through this collection of contributions to especially honour the African chapter of his scientific life. Although he has been engaged in activities in several African countries, over most of this period, his main areas of research were Egypt and Sudan. The Polish contribution to research on the prehistory of NE Africa has a long tradition. This goes back at least to the launch and initial projects of the Combined Prehistoric Expedition (CPE) in Egyptian and Sudanese Nubia in the early 1960s (Wendorf 1965). Michał Kobusiewicz was part of the first wave of Polish prehistorians contributing to the work of the CPE, joining the expedition in 1967. Since then, he has taken part in several dozen African missions resulting in abundant publications greatly increasing knowledge about the past of NE Africa. We may for example mention the articles in *Science* (Wendorf *et al.*, 1976; 1984) or the monograph *The Production, Use and Importance of Flint Tools in the Archaic Period and the Old Kingdom of Egypt* (Kobusiewicz 2015). A detailed account of the African activities and publications of Michał Kobusiewicz are given in the initial chapters of this volume, the first by Romuald Schild – *The African Chapter in the Scientific Life of Professor Michał Kobusiewicz* and the second, compiled by Przemysław Bobrowski – *African Research of Michał Kobusiewicz: Calendar and Bibliography*. Judging by this presentation of the geographical and chronological scope of interests and scientific results, it would perhaps not be an exaggeration to suggest that Michał Kobusiewicz, may justifiably be considered as one of the few individuals that could be considered as a colossus of African archaeology. Fred Wendorf, in his *Desert Days*, describing a field school for Egyptian inspectors writes that Michał was: "regarded as a great teacher and knew more about lithic typology than anyone in the camp, except possibly Schild" (Wendorf 2008: 272).

The papers in this volume honouring Michał Kobusiewicz have been written by his friends, colleagues, acquaintances and also by former students and present collaborators. All consider the archaeology of NE Africa with the same broad chronological and thematic scope as the interests of Professor Kobusiewicz.

The first four papers consider the oldest episodes of hominin presence in NE Africa. Mirosław Masojć and colleagues in their paper *Acheulean Bifaces from Khor Shambat, Omdurman (Sudan), Comparative Studies in the Nubian Context* discuss a recently discovered Palaeolithic assemblage from Omdurman and its statistical comparison with

several other Acheulean sites. The second paper, *The Middle Palaeolithic Assemblage with Bahari Technique from Site 21b in Deir el-Bahari (Western Thebes), Upper Egypt* by Barbara Drobniewicz and Bolesław Ginter presents interesting knapping technique observed in the Egyptian Palaeolithic assemblage from Deir el-Bahari. Marta Osypińska and colleagues focus on the *The PalaeoAffad Project and the Prehistory of the Middle Nile*. The last article in this group, by Donatella Usai, *The Qadan, the Jebel Sahaba Cemetery and the Lithic Collection*, reassesses the chronology and affiliation of the world-famous Sudanese cemetery with the oldest evidence of warfare.

The second group of contributions consider Mesolithic and Neolithic societies both from Egypt and Sudan in the form of a site reports, geophysical surveys and a synthetic papers. Lenka Varadzinová and Ladislav Varadzin report on *The First Notes on the Second Khartoum Mesolithic Cemetery at Jebel Sabaloka (Sudan)*. Another Mesolithic and Neolithic cemetery from Omdurman, Sudan is presented by Maciej Jórdeczka and colleagues in the next paper, *Neolithic Inhabitants of Khor Shambat 1, Sudan*. The third paper in this group, *Comparison of Different Gouge Collections from Central Sudan* by Katarína Kapustka and Małgorzata Winiarska-Kabacińska, involves technological and functional analysis of Neolithic gouges from Sudanese collections. An important Neolithic sites in the Egyptian Desert is discussed by Jacek Kabaciński and a group of co-authors and by Przemysław Bobrowski and colleagues in the next two papers, *Towards Understanding the Late Neolithic of the Egyptian Western Desert: Gebel Ramlah, Site E-16-02* and *The Early Holocene Archaeological Evidence (Site E-05-1) in Bargat El-Shab (Western Desert Egypt)*. It must be said that geophysical surveys have been very rarely undertaken on prehistoric NE African sites, but one is reported by Fabian Welc and Przemysław Bobrowski from the area of Bargat El-Shab in the paper titled: *Results of Geophysical Survey in Bargat El-Shab in Southern Egypt. Insight into the Early Holocene Settlement Pattern of the El Nabta / Al Jerar Interphase*. The last paper in this group, *Recent Research on Neolithic and Predynastic Development in the Egyptian Nile Valley* by Agnieszka Mączyńska, is an important review of the recent results of studies concerning the origins of the Neolithic in Northeastern Africa.

The next group, of two papers, considers the later prehistory of the area. The first of them, *A few Remarks about Cosmetic Palettes from Tell el-Farkha* by Krzysztof Ciałowicz discusses an aspect of this important site in the Nile delta. The second paper, *Flints from the Road: on the Significance of two Enigmatic Stone Tools Found along the Darb el-Tawil* written by Heiko Riemer and Karin Kindermann, discusses the phenomenon of the interpretation of surface lithic finds and the issue of knapped stone artefacts being produced and used in the period after the Stone Age in Africa.

Rock art, one of the beloved subjects of Michał Kobusiewicz's research, is the theme of the fourth and last group of papers in this volume. Friederike Jesse presents her observations from the Sudanese site Zolat el Hammad in the paper titled: *Rock Art and Archaeology – a Short Visit to Zolat el Hammad, Northern Sudan* and Paweł Lech

Polkowski discusses rock art from Egyptian Dakhleh Oasis: *Animal Hill – a Large Prehistoric Rock Art Site CO178 in the Central Dakhleh Oasis, Egypt*.

We believe that the above listed contributions, in many cases based on or discussing the results of Michał Kobusiewicz's research, represent the range of his scientific involvement with Africa, and thus form a tribute to his work. These fifteen papers have been reviewed and improved by a group of international reviewers to whom we owe our gratitude. In alphabetical order the following reviewers were so kind to contribute to improving this volume: Mirosław Furmanek (Wroclaw), Elena Garcea (Cassino), Maria Gatto (Leicester), Bolesław Ginter (Cracow), Tomasz Herbich (Warsaw), Karla Kroeper (Berlin), Alice Leplongeon (Leuven), Maria Kaczmarek (Poznan), Andrea Manzo (Naples), Arkadiusz Marciniak (Poznan), Henryk Paner (Gdansk), Tomasz Płonka (Wroclaw), Włodzimierz Rączkowski (Poznan), Andrzej Rozwadowski (Poznan), Jiří Svoboda (Brno), Philip Van Peer (Leuven), András Zboray (Budapest).

Finally, the editors would like to express our wish that this volume will reach a broad audience. It was a pleasure to edit and work on the volume to honour the Professor whom we not only respect as a scientist but also admire a lot as a person. On behalf of all the contributors to this volume, the authors and the reviewers, we would like to wish Michał many more successes and achievements in his ongoing work in Africa!

Przemysław Bobrowski
Mirosław Masojć

REFERENCES

Kobusiewicz, M. 2015. *The Production, Use and Importance of Flint Tools in the Archaic Period and the Old Kingdom of Egypt*. Oxford.

Wendorf, F. 1965. *Contributions to the Prehistory of Nubia*. Dallas, Texas, Fort Burgwin Research Center and Southern Methodist University Press.

Wendorf, F. 2008. *Desert Days: My Life As a Field Archaeologist*. Dallas, Texas, Southern Methodist University Press.

Wendorf, F., Schild, R., Close, A. E., Donahue, D. J., Jull, A. J. T., Zabel, T. H., Wieckowska, H., Kobusiewicz, M., Issawi, B. and el Hadidi, N. 1984. New radiocarbon dates on the cereals from Wadi Kubbaniya. *Science* 225(4662): 645–646.

Wendorf, F., Schild, R., Said, R., Haynes, C. V., Gautier, A. and Kobusiewicz, M. 1976. The Prehistory of the Egyptian Sahara. *Science* 193(4248): 105–114.

CONTENTS

DISCUSSIONS AND CRITICISM

BOOK REVIEWS

Photo: M. Jórdeczka

Professor Michał Kobusiewicz at Meroe (Sudan, 2012)

Archaeologia Polona, vol. 58: 2020, 221–234
PL ISSN 0066-5924
DOI:10.23858/APa58.2020.012

Results of Geophysical Survey in Bargat El-Shab in Southern Egypt. Insight into the Early Holocene Settlement Pattern of the El Nabta / Al Jerar Interphase

Fabian Welc[a] and Przemysław Bobrowski[b]

Global climatic changes which occurred at the beginning of the Holocene had a huge impact on cultural development in northeast Africa. The shift of the tropical rain zone to the north led to the transformation of the desert into a savannah. The appearance of vegetation and animals also attracted people to considerable areas of the southern part of the Western Desert in Egypt. Settlement was concentrated around natural depressions or deflation troughs, which during periods of rain would fill with water creating seasonal lakes or playas. One such place is the playa located in Bargat El-Shab. Particularly intense traces of settlement dated to the climatic optimum of the Holocene was discovered on the eastern shore of the palaeolake (Site E-05-1). Artefacts are dispersed over an area of over 2 ha. Excavation conducted in a few locations also uncovered the remains of storage pits, hearths, wells, etc., the fills of which are characterised by an enhanced magnetization of features in the ground. The geophysical survey conducted during the last season of research provided exceptionally interesting data allowing the partial recreation of the actual extent of the site and its relation with the lake basin.

KEY-WORDS: Early Holocene, Western Desert, settlements, magnetometry

INTRODUCTION

In 2019, a survey was conducted at the Bargat El-Shab site using a gradiometer to define the range and spatial structure of early Holocene settlement of the El Nabta / Al Jerar phase. The premise behind this survey was also to enable designation of the border between the coastal zone of the early Holocene reservoir and the settlement structures.

[a] Institute of Archaeology, Cardinal Stefan Wyszyński University, Kazimierza Wóycickiego Street 1/3, 01-938 Warsaw, Poland; e-mail: fabian.welc@wp.pl; ORCID: 0000-0001-6122-1884
[b] Institute of Archaeology and Ethnology, Polish Academy of Sciences, Rubież Street 46, 61-612 Poznan, Poland; e-mail: przemyslawbobrowski@iaepan.poznan.pl; ORCID: 0000-0002-7537-1856

For this purpose, profiling was applied with the use of a gradiometer within the measurement area located at Site E-05-1. The site is situated on the eastern edge of the basin, on a small elevated monadnock, made of Nubian sandstone and covered with a layer of lacustrine silty sands. The entire surface of the site, spanning around 250 m along the NS axis and 100–150 m along the EW axis, is covered with the remains of prehistoric settlement forming smaller and larger concentrations. The most legible concentration of artefactual material on the surface was observed within two distinct summits of the monadnock mentioned. Initial surface studies and excavations[1] were conducted within the area of two trenches E-05-1/1 and E-05-1/2 established at the locations of heavy concentration of stone artefacts on the surface (Bobrowski *et al.*, 2010). In the first trench, within a morphologically homogeneous layer, the presence of artefactual material from a variety of settlement phases was recorded, beginning with the oldest phase associated with the El Adam population, through artefacts associated with settlement of the climatic optimum of the Holocene of the damp El Nabta / Al Jerar phase to younger Neolithic settlement phases, referred to as Middle and Late Neolithic (Schild and Wendorf 2013: 128). The creation of this layer is associated with the exceptionally heavy deflation of the site and post-depositional processes. In the second trench, under a layer 5–30 cm thick also containing mixed multi-phase artefactual material, the bases of features – storage pits and hearths – were registered. The fills of these features contained quite frequent artefactual and archaeobiological material, including burnt plant remains. The typological analysis of the artefactual material, confirmed by absolute dating of the macroremains of plants, allows us to associate these features with the Late early Holocene El Nabta / Al Jerar settlement phase (Bobrowski *et al.*, 2010; 2020; Bobrowski 2019: 120).

The nearly homogeneous image of the entire surface, including the lack of any legible traces of archaeological structures on the surface makes recognition of the actual structure and extent of the settlement within the site described quite difficult. As mentioned above, recognition of the relation between prehistoric settlement and the Early Holocene lake reservoir was of particular significance. Given the limited time resources and the extent of regular excavation studies, the only chance here was to perform a non-invasive geophysical survey (magnetometer), based on magnetic anomalies that indicate the presence of fills of underground structures (pits and hearths) in certain locations (trenches E-05-1/2, E-05-1/4 and E-05-1/5) cause.

[1] The research was led by Przemysław Bobrowski as a part of the Combined Prehistoric Expedition in 2005–2006 and 2011–2012.

GEOLOGICAL AND GEOMORPHOLOGICAL SETTING

The El Bargat El-Shab playa is located about 16 km from Gebel Nabta (Nubia-Sheb Pediplain; see Osman 1999; Wendorf *et al.*, 2001: 11f). The catchment area of the Bargat El-Shab playa, which occupied a shallow depression at the foot of Gebel Bargat and measure up to 6 km^2 (Fig. 1). The central part of the basin is irregular in shape, about 4 km long along the northeast to south axis, and about 2 km wide in the east-west direction. The shape of the basin is determined by outcrops of erosion-resistant rocks to the west and east. Lake in Nabta Playa, the floor of the basin is covered by quaternary deposits, mostly composed of lacustrine and windblown sands created as a result of deflation processes during the Late Holocene (Wendorf *et al.*, 2001)

From a geological point of view, the area around Gebel Bargat El-Shab and Nabta Playa is dominated by a Maastrichtian-Eocene sedimentary succession divided into four main rock units: the Dungul Formation (late Eocene limestones), the Garra Formation (late Eocene-upper Palaeocene shales), the Kurkur Formation (Palaeocene limestones). The Late Cretaceous-Early Tertiary succession in the El Berget area is composed mostly of silty shales alternating with limestones. This sequence overlies a sandstone unit

Fig. 1. View of the El Bargat playa basin from the top of Gebel Bargat El-Shab. Photo F. Welc.

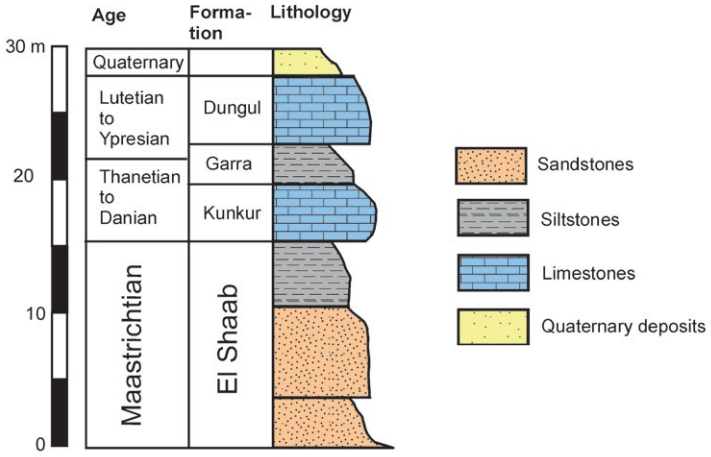

Fig. 2. The Late Cretaceous-Early Tertiary succession in the Bargat El-Shab area is composed mostly of silty shales alternating with limestones (after Sherbini *et al.*, 1989, modified by F. Welc).

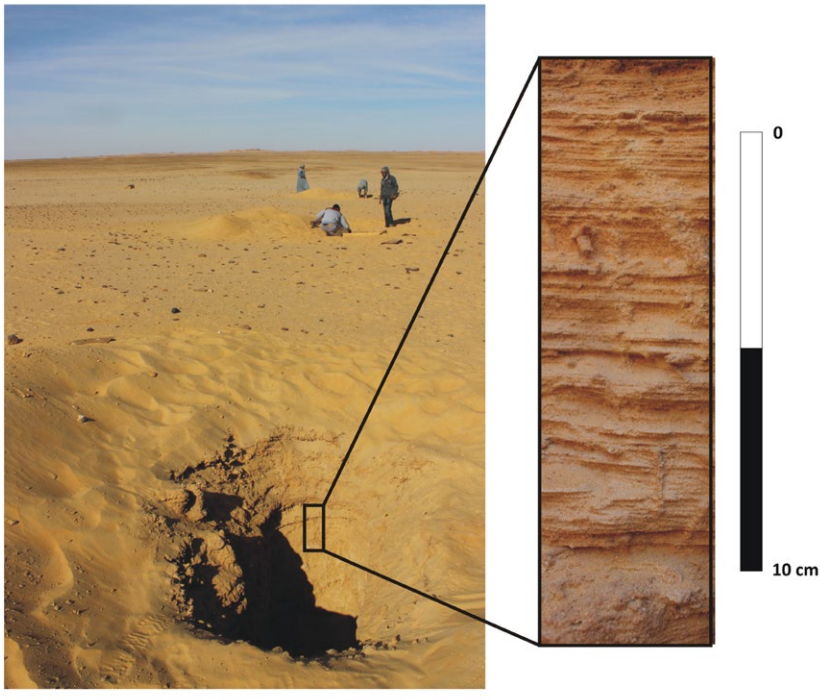

Fig. 3. The thin layered lacustrine silty sands which occupy the lowermost part of the basin in Bargat El-Shab are covered by windblown sand. Photo: F. Welc.

belonging to the Nubia Formation (Issawi 1971; Klitzsch 1983; Sherbini *et al.*, 1989; Fig. 2). In the Berget El-Shab area, the Garra formation comprises a 4 m thick bed of grey gypsiferous shale and underlies the Dungul Formation. The first formation is represented by a white, hard limestone bed (5 m thick) exposed on the top of Gebel Bargat El-Shab (Sherbini *et al.*, 1989). Early Holocene, thin layered lacustrine silty sands which occupy the lowermost part of the Bargat El-Shab basin are covered by a thin layer of windblown sands (Fig. 3).

This part of the basin filled with palaeolake sediments measures about 2 km by 2 km. Thickness of this succession is difficult to established, but in the deepest part of the basin it can be estimated to reach a few metres. In the littoral zone of the basin, interbedded sands and silts layers contain numerous calcareous marshy (reed) plant casts. Numerous tributaries are entering the Bargat Basin from all directions. During time of their activity silty-sand deposits interbedded with alluvial sediments form wadis draining the surrounding desert were deposited. Similar like in Nabta Playa deposited layered lacustrine silts in El Berget are result of precipitation of suspended matter during inundation season. In result they are poorly sorted as a result of the admixture of coarse windblown sand accumulated during arid intervals (Wendorf *et al.*, 2001).

METHODOLOGY

In general, magnetometer surveying is used to detect very small changes in the Earth's magnetic field caused mostly by concentrations of ferrous minerals in the soil (Herwanger *et al.*, 2000; Fassbinder 2005; 2015; Aspinall *et al.*, 2008). It should be emphasized here that the formation of the iron oxides in the soil is a very complex process, which depends on geochemistry, erosion rates, biological activity and local climate conditions (Evans and Heller 2004; Maher 2011; Fassbinder 2015). The anomalies observed on magnetic maps indicate remnant magnetism which is associated with sediments or features enriched with fine-grained magnetic particles affected by the magnetic field and inducted magnetism connected with sediments or materials which retain past magnetism (Fassbinder *et al.*, 2011; Fassbinder 2015; 2017). If sediments or other buried features were exposed to high temperatures, they became magnetized by thermoremanent magnetization (TRM; Fassbinder 2015; 2017). Because nearly all types of organic sediments like soils are characterized by enhanced magnetization (Armstrong *et al.*, 2012; Fassbinder 2015), anthropogenic pits or ditches refilled by topsoil generate distinctive positive magnetic anomalies (high values of nT). In contrast, negative anomalies may have numerous causes (Fassbinder 2017). Areas where there are remains of hearths or stones rich in magnetic minerals very often appear on magnetic maps as distinctive high amplitude features (Welc *et al.*, 2019).

Fig. 4. At Bargat El-Shab, gradiometer data was collected using the Bartington Grad 601 gradiometer with single sensor placed close to the ground (approx. 20 cm above the surface). Photo: P. Bobrowski.

At Bargat El-Shab, data were collected using the Bartington Grad 601 gradiometer equipped with single sensor (Fig. 4). Three adjoining grids of 40 × 30 m were measured with profiles spaced at 50 cm and 4 measurement points collected per metre; the data were then processed and filtered to generate magnetic maps using the TerraSurveyer software. In the first step, the DeStripe filter was used to equalize differences between grids. In the next step, a clipping procedure was used, which is very useful to replace extreme amplitude values outside a specified minimum and maximum, in this case in the range from -5 to 4.3 nT. Finally, the interpolation procedure was applied to increase the resolution of obtained maps of distribution of magnetic anomalies. The final procedure applied was the Low Pass filter to remove low frequency values in a data set (for more on these procedures see: www.dwconsulting.nl).

RESULTS AND DISCUSSION

As mentioned above, at Bargat El-Shab gradiometer data were collected within three adjoining grids with dimensions of 40 × 30 m. This 120 m long strip partially covers the littoral zone of the early Holocene basin and the northern part of the El Nabta / Al Jerar phase settlement marked as E-05-1 and oriented on the NE–SW axis (Fig. 5).

The results of magnetic measurements are presented below in form of black – white maps of distribution of the anomalies (called positive mode). On such maps dark areas correspond to the high amplitude anomalies measured in nanoteslas – nT, while lighter areas correspond to lower values of magnetic field strength. In other words, the areas in black indicate a concentration of sediments rich in ferromagnetic minerals; in most cases such areas are effect of extensive past human activity (Welc *et al.*, 2019).

The magnetic map indicates the presence of numerous highly magnetic zones (darker areas) round in shape (Fig. 5). These positive magnetic readings are a function of an accumulation of organic matter or ashes. It is important to note here that areas with remains of hearths very often appear on magnetic map as a distinctive feature – so called dipoles marked by a pair positive and negative point anomalies with a north – south orientation. Without a doubt, concentrations of the positive magnetic anomalies seem to show

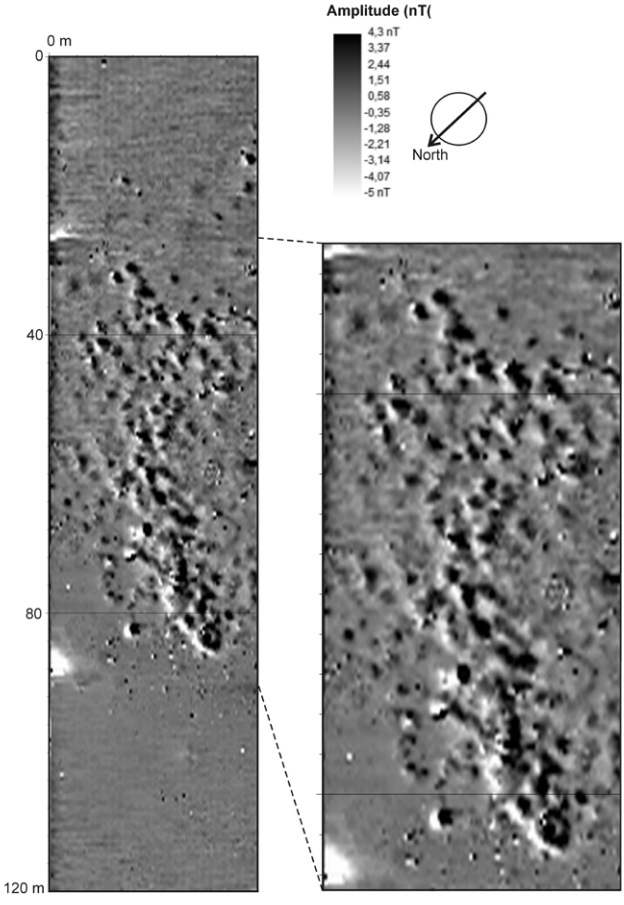

Fig. 5. Results of the magnetic survey carried out at Site E-05-1. Photo: F. Welc.

evidence of human activity in the zone, but their age and stratigraphic context could not be determined using only magnetic maps (Welc *et al.*, 2019).

As mentioned above, the magnetic image reveals the concentration of numerous oval-shaped anomalies that on the basis of analysis of their amplitude value can be identified as remains of hearths or storage pits. Moreover, we can see that some of these anomalies overlap each other, suggesting that the site had several phases of occupation. These assumptions confirm the results of excavations carried out at trenches E-05-1/4 (within the tested area) and E-05-1/2 (within the northern summit of the monadnock; Fig. 6). Characteristic oval features with a diameter of about 1–2 m were uncovered there, most of which are remains of hearths. Within some of them, burnt stones have also been preserved that give a strong magnetic signature on the presented map (Figs. 5 and 7).

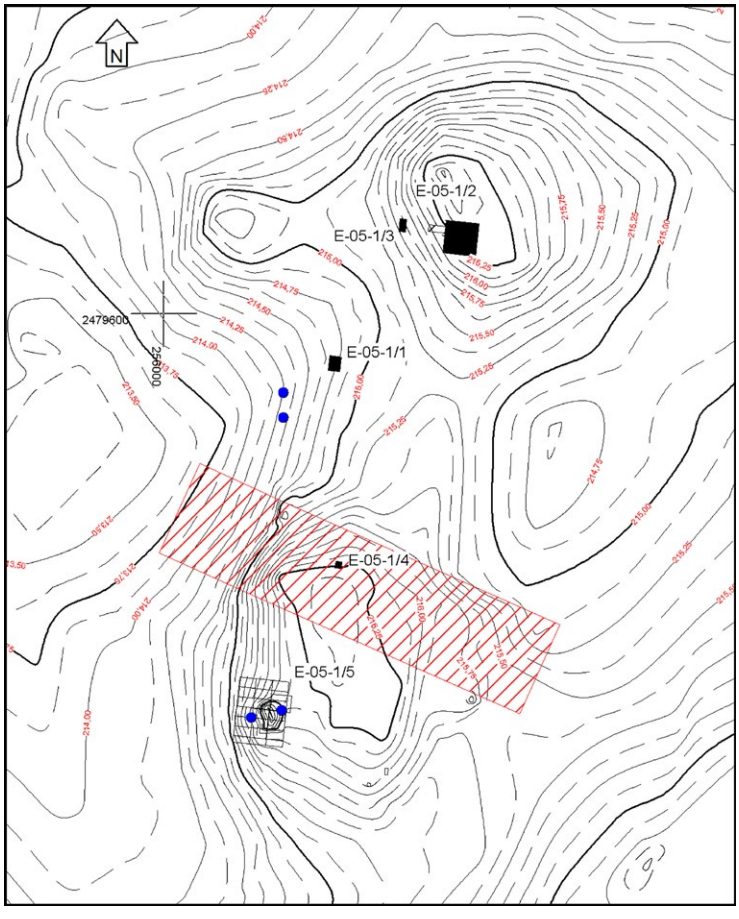

Fig. 6. Map of the archaeological Site E-05-1 excavated in the Bargat El-Shab area. Drawn: P. Wiktorowicz.

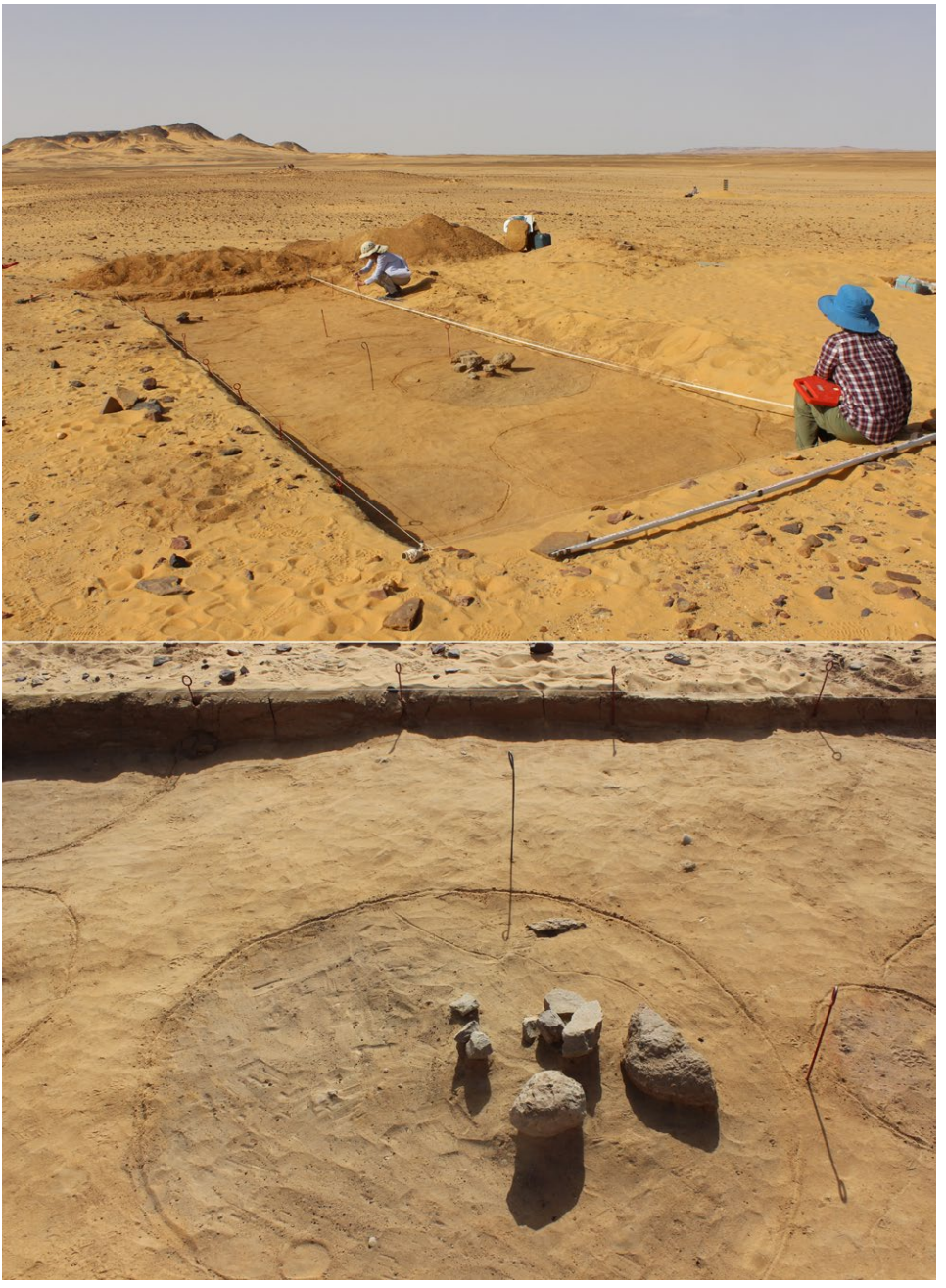

Fig. 7. Remains of the early Holocene hearths and pits excavated within the Site E-05-1/2. Photo: F. Welc.

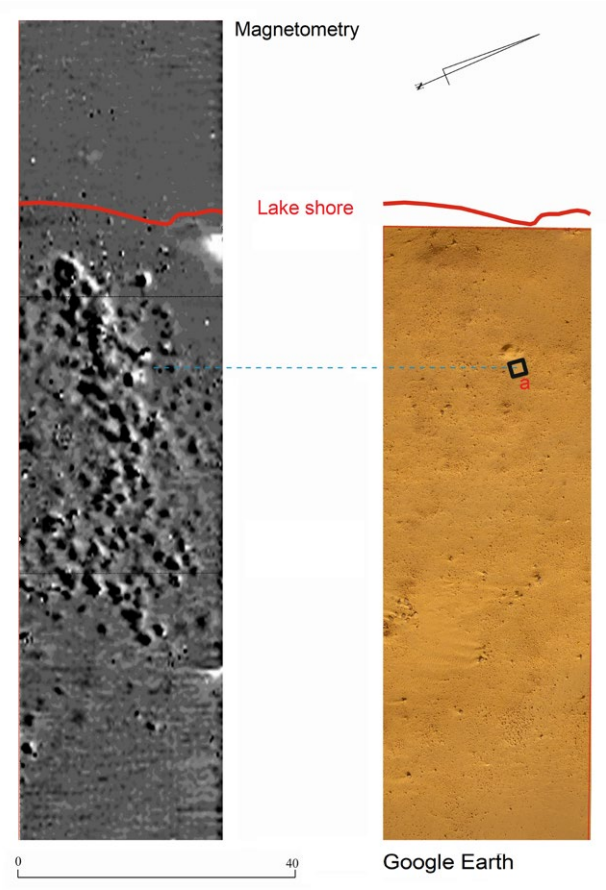

Fig. 8. Magnetic map and Google image of the early Holocene settlement with east edge of the former lake and trench E-05-1/4 (a) marked. Drawn and photo: F. Welc and P. Wiktorowicz.

Very interesting information was obtained after comparing and applying the magnetic map to the topographic map (Fig. 8). This combination allows us to draw a border between the edge zone of the former Holocene lake and a small flat elevation on which the Neolithic settlement of the El Nabta / Al Jerar phase was located. It is clear that the remains of hearths and storage pits are concentrated on gentle elevation slopes, probably above the highest water levels in the lake. It is interesting that the flat top of the hill does not seem to be occupied by hearths and other settlement structures. From the east, magnetic studies also do not reveal clear traces of settlement. On the one hand, we can assume that the lack of features on the southern summit of the monadnock is the result of a heavy deflation of the site, which completely levelled any features in the ground in that part. On the other hand, however, we cannot rule out that the image presented on the magnetic map reflects a completely different function (non-utility) of this part of the El Nabta / Al Jerar site. The clear lack of features on the magnetic map

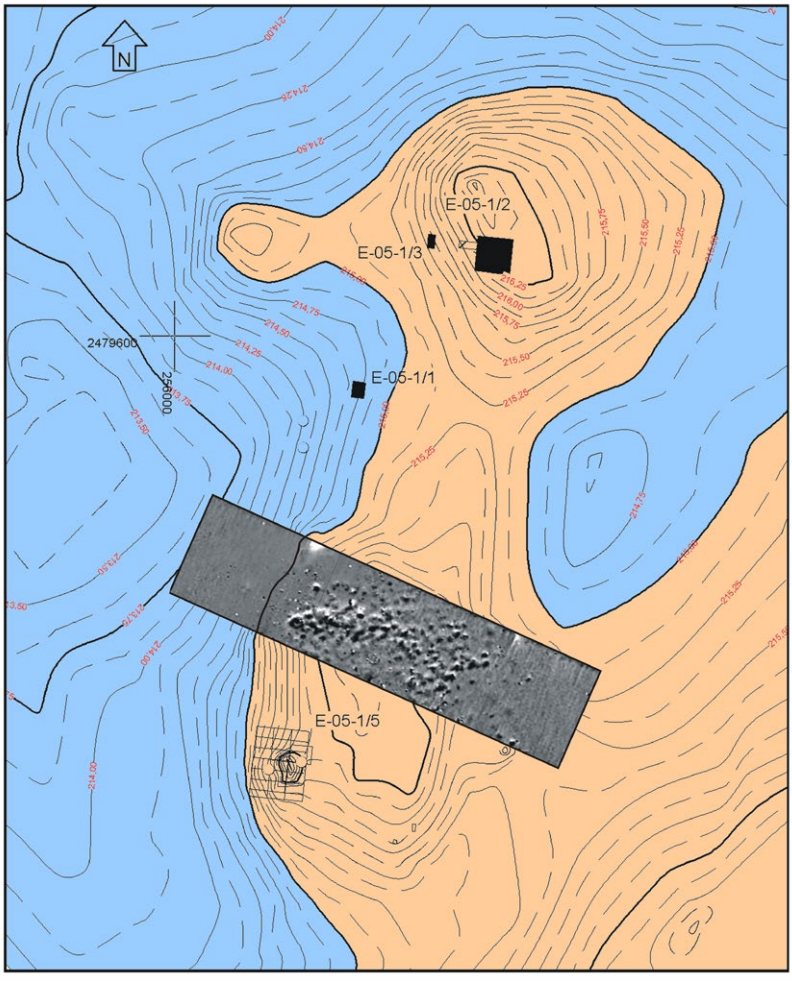

Fig. 9. Magnetic plan and elevation map with east edge of the former lake (blue). Drawn: F. Welc and P. Wiktorowicz.

in the eastern and western part of the tested area (from the direction of the palaeolake) reflects the actual extent of the site (Fig. 8). The situation in the northern part is not as clear, as there we can also observe a slight dispersion of the features. This fragment of the tested area partially comprises a visible depression between both summits of the monadnock. This could perhaps be a natural border between parts of the settlement or between two separate settlements from the same El Nabta / Al Jerar time horizon. We also cannot exclude the possibility that deflation in this part of the site was stronger and hence the distinct dispersion or lack of features (Fig. 8).

The analysis presented above allows us to reach some important conclusions. The multi-phase El Nabta / Al Jerar period settlement was located on a local elevation, which in the period of high lake water levels would have been a peninsula (Fig. 9). The concentration of most settlement remains in the flood-free land level by the lake suggests that people appeared around the reservoir during the rainy period, e.g., the summer monsoon. As mentioned above, the basal sediments of the lake are mainly thin layers of sandy silts interlaced with coarse windblown sands, which allows us to classify this palaeolake as a sandy playa. This indicates that during rainfall, the lake was filled with water, while in the winter season the reservoir would partly or completely dry up. In the El Nabta / Al Jerar period therefore this forced seasonal migration of people that lasted from summer to autumn. In winter, most likely, people migrated south or towards the Nile Valley, but this theory needs to be supported by additional specialized research and analysis, particularly of the playa deposits preserved at Bargat El-Shab.

CONCLUSIONS

The geophysical survey conducted at Site E-05-1 which took advantage of the enhanced magnetization of features in the ground (utility pits and hearths) allowed us to recognize the structure of Holocene settlement within the site and define its actual scope. The correlation of the magnetic and topographic map enabled us to specify the maximum reach of the palaeolake and the actual shape of the site during the climatic optimum of the El Nabta / Al Jerar phase of the early Holocene. We were able to determine its eastern and western reach and the internal zones of feature dispersion (southern summit and depression between two summits of the monadnock). Although random, the image obtained thanks to the geophysical survey considerably differs from the situation observed on the surface of the site. The artefactual material registered on the surface is scattered over an area which is significantly larger than the actual extent of the site. This is most likely the result of post-depositional processes. On the surface of the site, there is a lack of distinct traces of features in ground, which appear under a relatively homogeneous layer of silty sand at a depth ranging from a few to several dozens of centimeters. The excavation work conducted within several trenches in various parts of the Site (E-05-1/2, E-05-1/4, E-05-1/5) allowed us to register features in ground with a very uniform chronology. The absolute dating performed for most of them enable us to associate all with the late Early Holocene represented by the El Nabta / Al Jerar settlement phase. We can presume that the concentration of features visible on the magnetic map (in this part also the features registered in trench E-05-1/4) represent the same time horizon. Their mutual relations are most likely the effect of multiple, probably seasonal, occupation of this location. Verification of this thesis, knowledge of the actual chronology, functions and mutual relationships

of features in ground will be possible once we conduct regular excavations in the area that was surveyed using geophysical methods, as was possible in trench E-05-1/2 at the northern end of the settlement.

ACKNOWLEDGEMENTS

The research was sponsored by the Polish National Science Centre (grant NCN No. 2015/17/B/HS3/01315).

REFERENCES

Armstrong, A., Quinton, J. and Maher, B. 2012. Thermal enhancement of natural magnetism as a tool for tracing eroded soil. *Earth Surface Processes and Landforms* 37: 14–20.

Aspinall, A., Gaffney, C. F. and Schmidt, A. 2008. *Magnetometry for Archaeologists*. New York, Toronto, Plymouth Altamira Press, Lanham.

Bobrowski, P. 2019. Berget el Sheb, Western Desert, Egypt. In M. Chłodnicki and P. L. Polkowski (eds), *Gdy Sahara była zielona. Polskie badania nad prahistorią Afryki Północnej (When Sahara was Green. Polish archaeological research on the prehistory of North Africa)*, 119–124. Poznań.

Bobrowski, P., Jórdeczka, M., Mańka, D., Królik, H., Schild, R. and Wendorf, F. 2010. The Combined Prehistoric Expedition in Nubia 2003–2008. *Gdańsk Archaeological Museum African Reports* 6: 15–30.

Bobrowski, P., Jórdeczka, M., Lityńska-Zając, M. and Osypińska, M. 2020. The Early Holocene archaeological evidence (site E-05-1) in Bargat El-Shab (Western Desert Egypt). *Archaeologia Polona* 58: 195–220.

Evans, M. E. and Heller, F. 2004. *Environmental Magnetism*. Amsterdam.

Fassbinder, J. W. E. 2005. Methodische Untersuchungen zur Magnetometerprospektion von Viereckschanzen. In P. Neumann-Eisele (ed.), *Rätselhafte, Viereckschanzen, der Kelten, Bauwerke*, 11–22. Kelheim, Museumsheft 8.

Fassbinder, J. W. E. 2015. Seeing beneath the farmland, steppe and desert soil: magnetic prospecting and soil magnetism. *Journal of Archaeological Science* 56: 85–95.

Fassbinder, J. W. E. 2017. Magnetometry for archaeology. In S. Gilbert and S. Allan (eds), *Encyclopedia of Geoarchaeology*. Springer.

Fassbinder, J. W. E., Narr, D., Linck, R., Deller, T. and Becker, F. 2011. Prospektion am römischen Kastell Großprüfening. *Das archäologische Jahr in Bayern* 2010: 92–95.

Herwanger, J. H., Maurer, A. G., Green, J. and Leckebusch, J. 2000. 3-D inversions of magnetic gradiometer data in archaeological prospecting: Possibilities and limitations. *Geophysics* 65(3): 849–860.

Issawi, B. 1971. Geology of Darb El-Arbain, Western Desert, Egypt. *Annals of the Geological Survey of Egypt* 1: 53–92.

Klitzsch, E. 1983. Paleozoic formations and a carboniferous glaciation from the Gilf Kebir-Abu Ras area in southwestern Egypt. *Journal of African Earth Sciences* 1: 17–19.

Maher, B. 2011. The magnetic properties of Quaternary aeolian dusts and sediments, and their Quaternary palaeoclimatic significance. *Aeolian Res* 3: 87–144.

Osman, R. 1999. Geological interpretation of the main geomorphic units in Egypt. In B. Issawi, M. El Hinnawi, M. Francis and A. Mazhar (eds), *The Phanerozaic Geology of Egypt, A Geodynamic Approach*, 7–54. Cairo, The Egyptian Geological Survey Special Publication No. 76.

Schild, R. and Wendorf, F. 2013. Early and middle Holocene paleoclimates in south western desert of Egypt – The world before unification. *Studia Quaternaria* 30(2): 125–133.

Sherbini, M. I., Kora, El. M. and Issai, G. H. 1989. Mineralogy and geochemistry of the Late Cretaceous-Early Tertiary sediments in southwestern Egypt. *Journal Univrsity of Kuwait (Sci.)* 16: 365–364.

Welc, F., Nebelsick, L. D. and Wach. D. 2019. The first Neolithic roundel discovered in Poland reinterpreted with the application of the geophysical Amplitude Data Comparison (ADC) method. *Archeological Prospection* 26(4): 283–297.

Wendorf, F., Schild, R. and Associates. 2001. *Holocene settlement of the Egyptian Sahara. Vol. 1: The Archaeology of the Nabta Playa*. New York, Boston, Dordrecht, London, Moscow.