Kraków 2015

Maciej Pawlikowski, Edyta Słowioczek
Krakow

TEST RESULTS OF FINE SEDIMENT FRACTIONS FROM THE TELL EL-FARKHA ARCHAEOLOGICAL SITE, NILE DELTA, EGYPT

Abstract: *The Tell el-Farkha site is located immediately to the north of the modern village of Ghazalah and occupies an area of c. 4.5ha. It is marked by three hills: the Eastern Kom, Central Kom and Western Kom. This research will focus on the profile of the layers of sediment. These studies are important because they are innovative and contain information on the history of the site. Research work was conducted on site and produced graphs showing the composition of individual microartefacts within the sediment. Samples were taken from each profile layer then dissolved and sifted to obtain fine fractions. Laboratory work focused on the calculation of the percentage of different microartefacts in each sifted fine fraction. Photographs of selected microartefacts (bones, ceramics, carbon, quartz, and others) were taken using a binocular magnifier at 20x magnification. The examination of this material has provided both new and valuable information concerning the functioning and development of the archaeological site.*
Keywords: *Fine sediment; fractions; Egypt*

Introduction

The Tell el-Farkha archaeological site is located in the eastern Nile Delta, about 120km northeast of Egypt's capital, Cairo. The study area covers

DOI: 10.12797/SAAC.19.2015.19.03

about 4.5km^2 and is situated on three hills north of the village of Ghazalah. The hills are locally known as 'koms' and have been labelled Kom W (Western Kom), Kom C (Central Kom) and Kom E (Eastern Kom). The layout of the site is presented on the map (Pl. 1: 1).

Archaeological research has been conducted at the site since 1998 by an expedition organised in collaboration with the Institute of Archaeology at the Jagiellonian University of Krakow and the Archaeological Museum of Poznań.

The hills (koms) are made of Pleistocene sands (known as the 'sand of Gezira') surrounded by Nile silt. These deposits cover anthropogenic layers that are up to 6m thick.

The goal of this study was to draw attention to the microartefacts that can be found in the fine fractions that remain after excavated material is sifted, which are not usually examined. This material, if processed statistically, can contribute a great deal of information about the site that may otherwise escape the attention of researchers.

Methodology

The study of microartefacts is important, not only because it is innovative, but also because it uncovers information on building functions, the delineation of activity areas and the processes involved in a site's formation (Rosen 1991). This kind of research is not commonly used, however, because of the time required to recover, sort, and identify microartefacts (Sherwood and Ousley 1995). In 2012, a soil profile of the layers of sediment was created at the site that included graphs showing the composition of individual elements in the sediment.

The profile was performed on Kom E in the northernmost wall of the archaeological excavation. Pl. 6: 1 shows the profiled wall.

Macroscopic observations revealed that all the test layers were similar to each other and that it was sometimes not easy to distinguish one profile from another. The most useful profiles to observe were not those that had been cleaned, but those that had been subjected to the natural erosion of the wind for some time. Wind is able to transport the slightest material and this revealed the nature of the deposits that were used as the basis for sampling and subsequent analysis.

The first sample was collected approximately 20cm below the ground, as modern sediments mixed with modern waste lay above it. The first sampling layer is clear sand, with any loamy sediments destroyed by local birds. The second layer of the profile is heavily eroded and the presence of doped brown coal dust creates its darker shade. The third layer contains lighter sediments due to its higher quartz content in both the fine and coarse fractions. The fourth layer is loamy-sandy and grey. The fifth layer is loamy-sandy and doped with coal dust from destroyed bonfires. Layer six also has a pronounced anthropogenic character, which is the cause of the light colour of the layer, which contains loamy minerals next to quartz. Distinct macroscopic pieces of chaff are also present, which makes this layer's colour stand out from the ones above. It is also very light due to the large admixture of sand, in which it is possible to distinguish broken fragments of ceramic vessels without the use of a microscope. The seventh layer is made up of sediment with light, dusty deposits with an admixture of quartz sand. The eighth layer is slightly darker than the previous. This layer ends in a sequence of regular, uncut, horizontal layers consisting of weakly concise powder. This results from the presence of a mixture of anthropogenic and mineral components. The ninth layer is the thickest layer in the profile. It contains evidence of increased human activity at the site during its formation. Within it, a difficult to identify fragment in the shape of an inverted trapezoid was discovered, as well as a damaged part of wall. Layer 10 consists of a brick wall built of dried bricks made from local Nile silt. The 11th layer, like the ninth, contains a trapezoidal construction and the wall. It has an anthropogenic character, as it contains fragments of burnt daub and pottery. It is thinner due to its admixture of dust from wood coals. The 12th layer is composed of darker loamy-sandy sediment with an admixture of anthropogenic material. It has a silt structure and is crossed by two walls built of dried bricks. The 13th layer contains a further part of the brick wall that also appears in layers 12 and 14. The 14th layer is of average thickness and fragments of wall appear in three places. The brown sediment is fine, dusty and lumpy in places. The 15th layer of sediment is the refill of a small recess in the shape of a lens. The material in the recess is anthropogenic. The 16th layer is made up of sandy-dusty sediment and contains the same lens from 15. It has similar, but more loamy and lumpy sediment. The 17th layer is composed of almost horizontal sediment. In the eastern part of the profile, the sediment rises to the top, leaning on the wall fragment that cuts into the 14th layer. This suggests that the genesis of this layer is related to the destruction and backfilling of this brick wall. Layer 18 has origins similar to the layer 17. It is of a dusty-sandy nature and contains a large admixture of what is probably Aeolian quartz sand. The 19th layer is located in the eastern part of the geological profile and is the same as the previous layer, except for the fact that the sandy deposits contain many fragments of burnt daub. A further fragment of wall can also be discerned in this sediment. Layer 20 is the lowest layer in the sequence of hover sediments on the eastern side of the profile. It contains a large amount of daub and many burnt fragments of pottery. Some of the daub fragments most probably come from a brewery. The 21 layer is the oldest anthropogenic layer in this part of the site. It is of a sandy nature and contains a small admixture of loamy minerals. Fragments of burnt daub (a cylindrical brick from a brewery?) are also present. The sediments occur within natural sand under a ceiling of Gezira sand. Some deposits are of Aeolian origin.

During the profiling stage, sediment samples were taken for laboratory tests. A sample was taken from each profile layer (21 layers altogether). The weight of the samples was about 2–3kg, depending on the compactness of the deposits. The samples were then dissolved and sifted to obtain fine fractions of daub, carbon, ceramics, flint, bone, quartz, rock fragments and fish remains. The diverse composition of the sediments meant that some of the samples were easily soluble and offered more in terms of fine elements, whilst other samples were more difficult to dissolve due to high clay content. The sediments provided isolated fragments of bone, quartz, and ceramics and the material obtained was dried, examined, and analysed under a binocular magnifier.

Test results

During research, a soil profile was drawn to show the layers of sediment at the northern wall of Kom E. This drawing is shown on the Pl. 1: 2 with each sample layer marked.

All the material obtained was levigated and wet-sifted through a one-millimetre mesh and then was washed and dried several times. The first stage of laboratory examination focused on the calculation of the percentage of each microartefact in each fine sift fraction. About 500 grains were counted out in each sample and the results were converted to percentages, which are presented in Fig. 1.

Based on the data presented in Fig. 1, diagrams were created (Pls. 2–4), showing the percentage of each element in both the samples and the whole profile.

Photographs of selected microartefacts (bones, ceramics, carbon, quartz and others) were taken using a binocular magnifier at 20x magnification

Sample number	daub [%]	ceramics [%]	carbon [%]	bone [%]	flint [%]	rock fragments [%]	quartz [%]	fish remains [%]	aggregates [%]
1	88.0	2.1	0.0	1.0	0.0	0.0	2.0	0.0	6.9
2	87.9	2.4	1.1	0.0	4.3	5.2	1.1	0.0	0.0
3	83.9	7.7	7.5	0.0	0.0	0.0	0.9	0.0	0.0
4	72.0	2.9	3.1	0.0	0.9	3.0	10.0	8.1	0.0
5	75.4	1.6	0.8	10.4	2.4	0.7	1.5	7.2	0.0
6	66.6	12.2	0.9	1.8	2.7	0.0	14.1	1.7	0.0
7	80.4	5.6	2.8	0.0	0.0	0.0	11.2	0.0	0.0
8	93.9	0.0	1.0	0.0	0.0	1.1	4.0	0.0	0.0
9	71.4	13.8	0.8	0.0	0.9	0.0	12.1	0.0	1.0
10	89.3	1.1	4.3	0.9	0.0	0.0	4.4	0.0	0.0
11	52.7	16.3	12.2	11.3	0.0	5.6	1.9	0.0	0.0
12	32.8	9.1	21.8	9.1	1.1	3.2	2.2	20.7	0.0
13	67.0	0.8	16.9	7.1	0.9	1.8	2.7	2.8	0.0
14	76.2	3.9	7.8	2.9	0.0	0.7	2.7	5.8	0.0
15	69.4	6.9	7.7	3.0	1.5	0.7	4.6	6.2	0.0
16	72.5	3.3	8.4	4.2	1.6	2.5	7.5	0.0	0.0
17	54.0	6.7	1.6	3.2	2.5	5.0	9.3	17.7	0.0
18	3.6	0.0	0.0	0.0	0.0	65.7	27.5	0.0	0.0
19	81.4	0.9	0.0	0.0	0.0	3.6	14.1	0.0	0.0
20	82.2	10.2	2.6	1.3	0.0	2.5	1.2	0.0	0.0
21	66.3	4.2	1.4	0.0	2.8	0.0	25.3	0.0	10.9

Fig. 1. Composition of fine fractions in consecutive layers of the soil profile

(Pls. 6: 2, 3, and 7). Analysis of linear diagrams (Pl. 5) on the variation of particular microartefacts within the profile shows that the lower layers appear to have a larger quantity of fish bones, pieces of natural rock, flint and grains of quartz. In the middle part of the profile, larger quantities of fish bones, coal dust and bones can be observed. Finally, in the upper part of the profile, stones, fish bones, bones and pebbles of quartz are all visible.

This variability in the occurrence of microartefacts within the profile could provide evidence of how the function of this site changed across different periods.

Summary and conclusions

Varying quantities of ceramic fragments appear at random in the profile analysis. This is probably the result of the occasional destruction of clay pottery.

The fluctuating quantity of charcoal micro-fragments in the profile is probably connected to changes in the functioning of the site. The coal is usually dispersed, but there is definite evidence of a campfire in the vicinity of sample 12 at some point in time (Pl. 1: 2).

An increased quantity of bone micro-fragments appears in samples 5 and 11. Unfortunately, it has not been possible to determine to what species they belong. This could have allowed the anomaly to be interpreted in a meaningful way.

The negligible and fairly constant level of micro-fragments of flint suggests that flint tools were probably not made in the excavated area. The micro-fragments present are more likely to be the result of flint tool usage. Some of the fragments are burnt out, which may imply that activities occurred around a fire here. The mineralogical and petrographic nature of the flint fragments suggests that they are either genetically related to limestone from the Nile valley or that they come from other gravel sites genetically related to this limestone.

Fine fragments of rock are concentrated in the lower parts of the profile (sample 18; Pl. 1: 2). Sharp-edged fragments of quartzite and limestone are present here, suggesting that these rocks were processed in the area. Mineralogical studies of stone monuments found at the site suggest that the fragments of quartzite could be associated with the production or use of grain grinders. The pieces of limestone (from the Nile valley) may have come from the production of small pots used for different purposes that were discovered in the graves located in Kom E.

The quartz grain composition in the profile varies, as does the proportion of burnt and natural grains. Although the origin is hard to categorically determine, it can be assumed that they are genetically related to the sands of Gezira, which could have been used for a variety of purposes.

Larger bits of fish bones and bone fragments (discs) were found in samples 4, 5, 12 and 17. Their presence in samples 4, 5 and 12 correlates with a slightly larger quantity of charcoal pieces, which may suggest fish were baked over campfires during the examined time in this area.

Burnt daub fragments are the main component of almost all the tested samples, with only one exception. Their percentage in the samples varies between 32.8% and 93.9%. Only sample 18 has a different main component, which is that of rock fragment (65.7%). Here, daub occupies just 3.6% of the total volume.

The quantity of daub is largest in the lower sections of the profile and decreases in its higher parts. Its concentration in samples 11 and 17 may suggest a specific function related to it in the area at those particular times. Mineralogical studies of the daub fragments show that they consist of Nile silt mixed with straw chaff. The composition of the daub and the presence of straw chaff, as well as the directionality of the straw, suggests that the daub was used in the construction of small buildings. The absence of wood or stick imprints suggests that the silt-and-straw mixture was used directly in the construction of buildings (huts? farm buildings?). The fact that the daub is burnt (which is why it only remains in fine bits) shows that the buildings must have been burnt (and burnt-out). The presence of so many of these microartefacts shows that fires were a frequent occurrence at the site. However, nothing can yet be said about the specific causes of such fires. They may have been caused by hostile invasions, but more mundane causes are also possible, such as accidental fires.

In conclusion, the examination of microartefacts provides much new and valuable information concerning the functioning and development of an archaeological site. The failure to conduct such research may lead to an irretrievable loss of valuable data that could be useful both in the reconstruction of human activity in the region where the site is located and to assess the variability of certain environmental and climatic indicators.

References

Chłodnicki M. and Ciałowicz K. M. 2012. Preface. In M. Chłodnicki *et al*. (eds.), 7.

Chłodnicki M. 2012. History of the research. In M. Chłodnicki *et al*. (eds.), 9–15.

Chłodnicki M., Ciałowicz K. M. and Mączyńska A. (eds.) 2012. *Tell el-Farkha* 1. *Excavations 1998–2011*. Poznań, Krakow.

Pawlikowski M. and Słowioczek E. 2012. Results of the mineralogical examination of the dried bricks from the tombs and mastaba: Tell el-Farkha archaeological excavation site, the Nile Delta, Egypt. *Auxiliary Sciences in Archaeology Preservation of Relics and Environmental Engineering* 11, 1–32.

Pawlikowski M. and Dębowska-Ludwin J. 2011. Bone material and mineralogical processes of its destruction at the site of Tell el-Farkha. *SAAC* 15, 37–47.

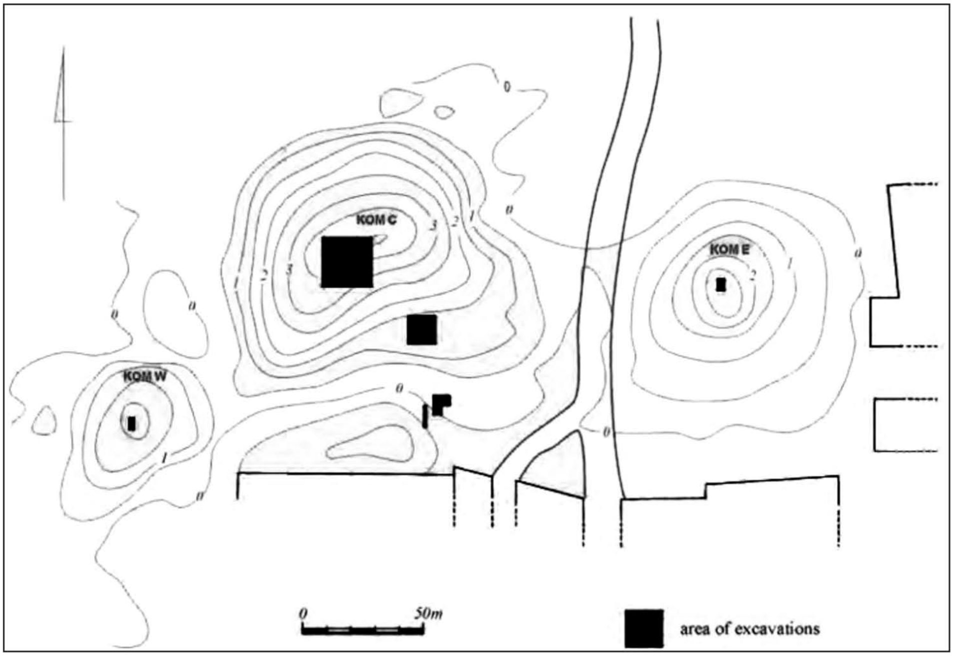
Pawlikowski M. and Wasilewski M. 2010. Geology, sedimentology and mineralogy of the Tell el Farkha site, the Eastern Nile Delta – Egypt. *Auxiliary Sciences in Archaeology Preservation of Relics and Environmental Engineering* 10, 1–22.

Rosen A. M. 1991. Microartifacts and the study of ancient societies. *The Biblical Archaeologist* 54, 97–103.

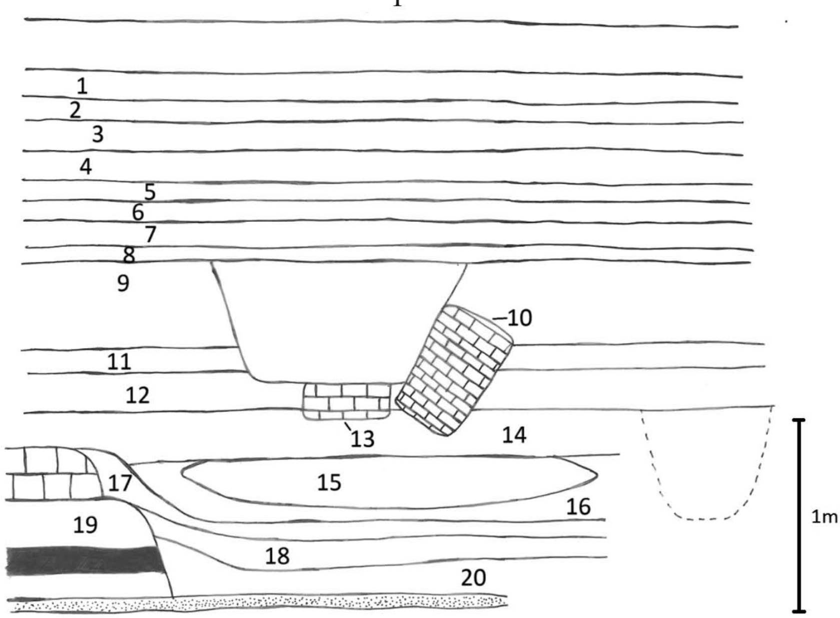
Sherwood S. C. and Ousley S. D. 1995. Quantifying microartifacts using a personal computer. *Geoarchaeology* 10/6, 423–428.

Maciej Pawlikowski
Department of Mineralogy, Petrography and Geochemistry
AGH University of Science and Technology
mpawlik@agh.edu.pl

Edyta Słowioczek
Department of Mineralogy, Petrography and Geochemistry
AGH University of Science and Technology
e.slowioczek@gmail.com

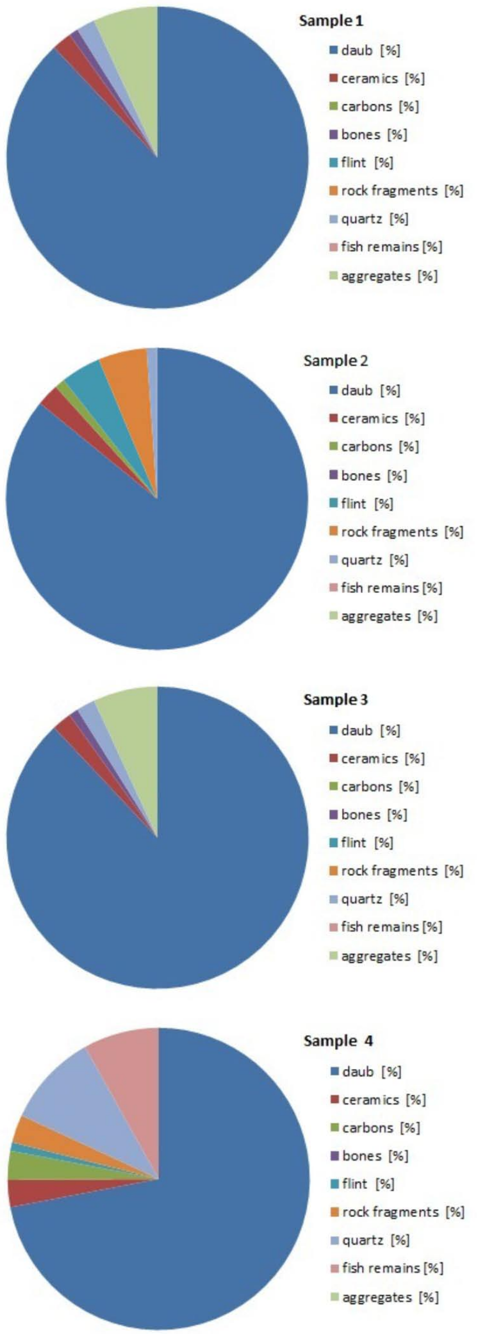


1

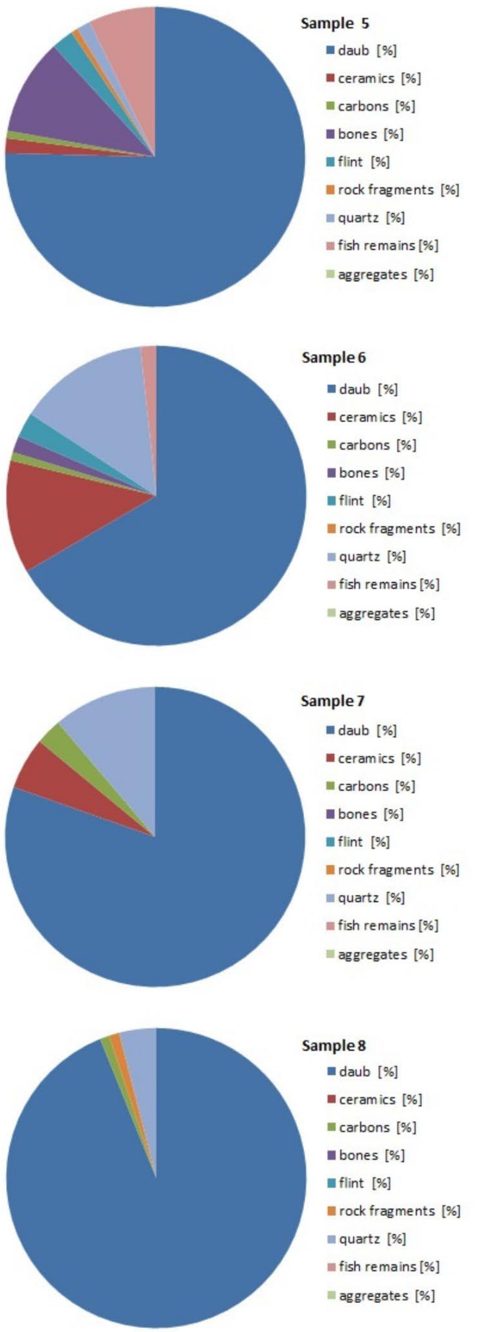


2

Pl. 1. 1 – Map of the Tell el-Farkha site. Reproduced from Chłodnicki 2012, 11; 2 – Soil profile drawing made at Kom E in the northern part of the archaeological excavation (profile N). Drawing by E. Słowioczek

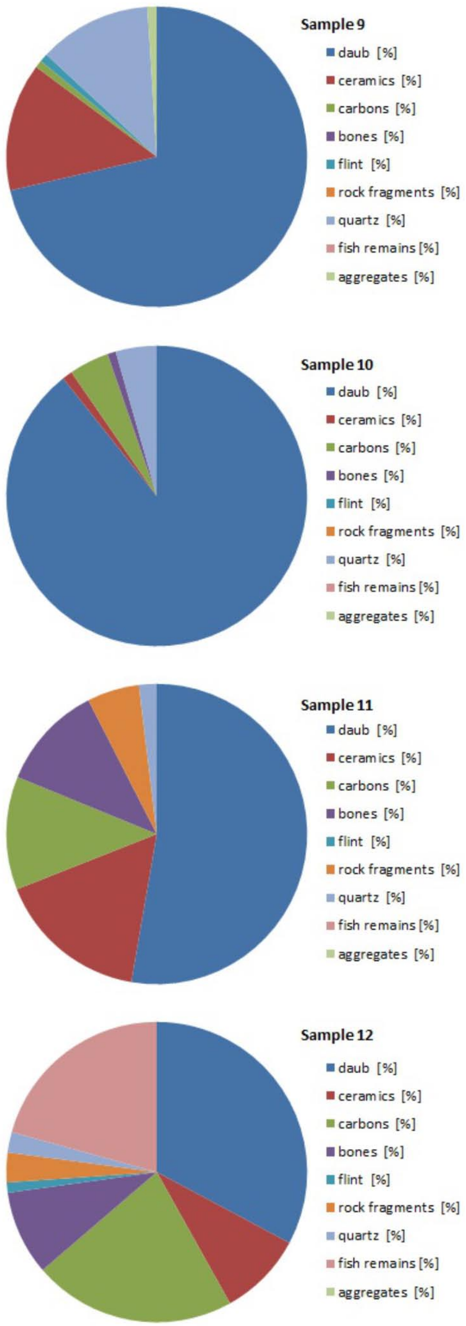


1

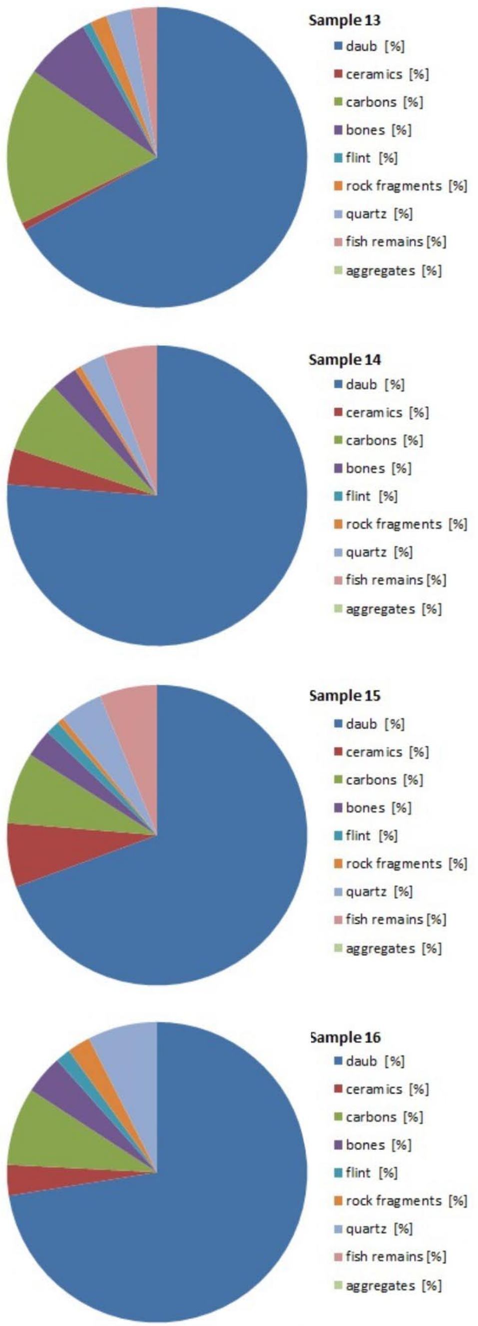


2

Pl. 2. 1 – Pie charts showing the composition percentages of samples 1–4;
2 – Pie charts showing the composition percentages of samples 5–8

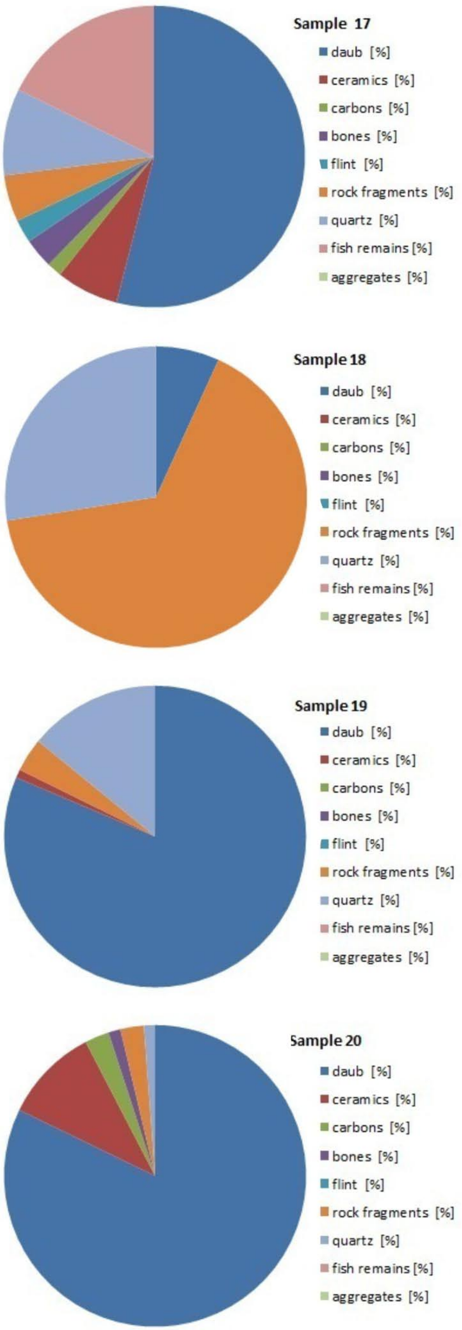


1

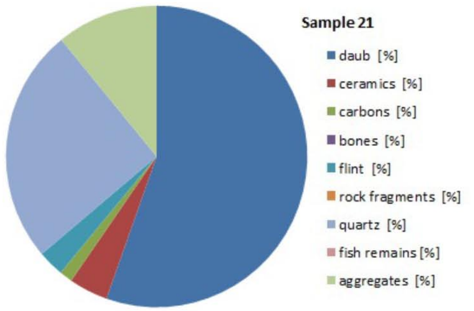


2

Pl. 3. 1 – Pie charts showing the composition percentages of samples 9–12;
2 – Pie charts showing the composition percentages of samples 13–16

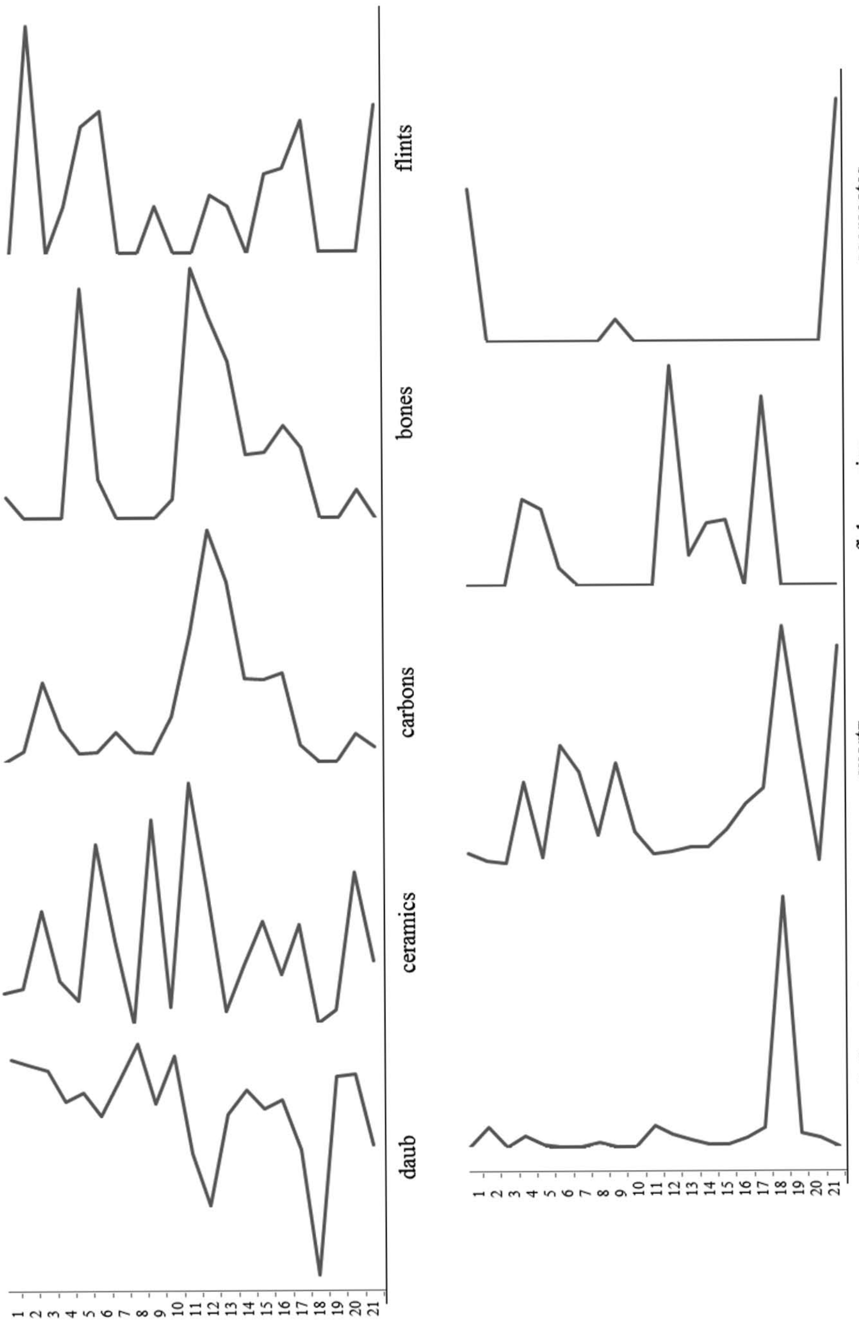


1

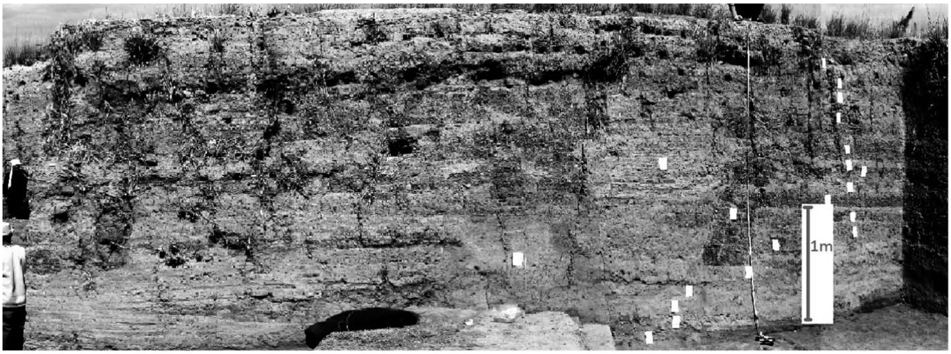


2

Pl. 4. 1 – Pie charts showing the composition percentages of samples 17–20;
2 – Pie chart showing the composition percentages of sample 21



Pl. 5. Linear diagrams showing the varying distribution of fine fractions in subsequent layers of sediment. Drawing by E. Słowioczek



1

2

3

Pl. 6. 1 – The kom wall used to create the soil profile of the layers of sediment. Photo by M. Pawlikowski; 2 – Fragments of fish bones. Binocular magnifier, 20x magnification. Photo by M. Pawlikowski; 3 – Bone fragments. Binocular magnifier, 20x magnification. Photo by M. Pawlikowski

1

2

3

Pl. 7. 1 – Several small grains of natural and burnt quartz. Binocular magnifier, 20x magnification. Photo by M. Pawlikowski; 2 – Daub crumbs with imprints of straw fragments. Crumbs went red when burnt in the presence of oxygen, but grey when oxygen was absent. Binocular magnifier, 20x magnification. Photo by M. Pawlikowski; 3 – Fragment of a ceramic vessel. Binocular magnifier, 20x magnification. Photo by M. Pawlikowski