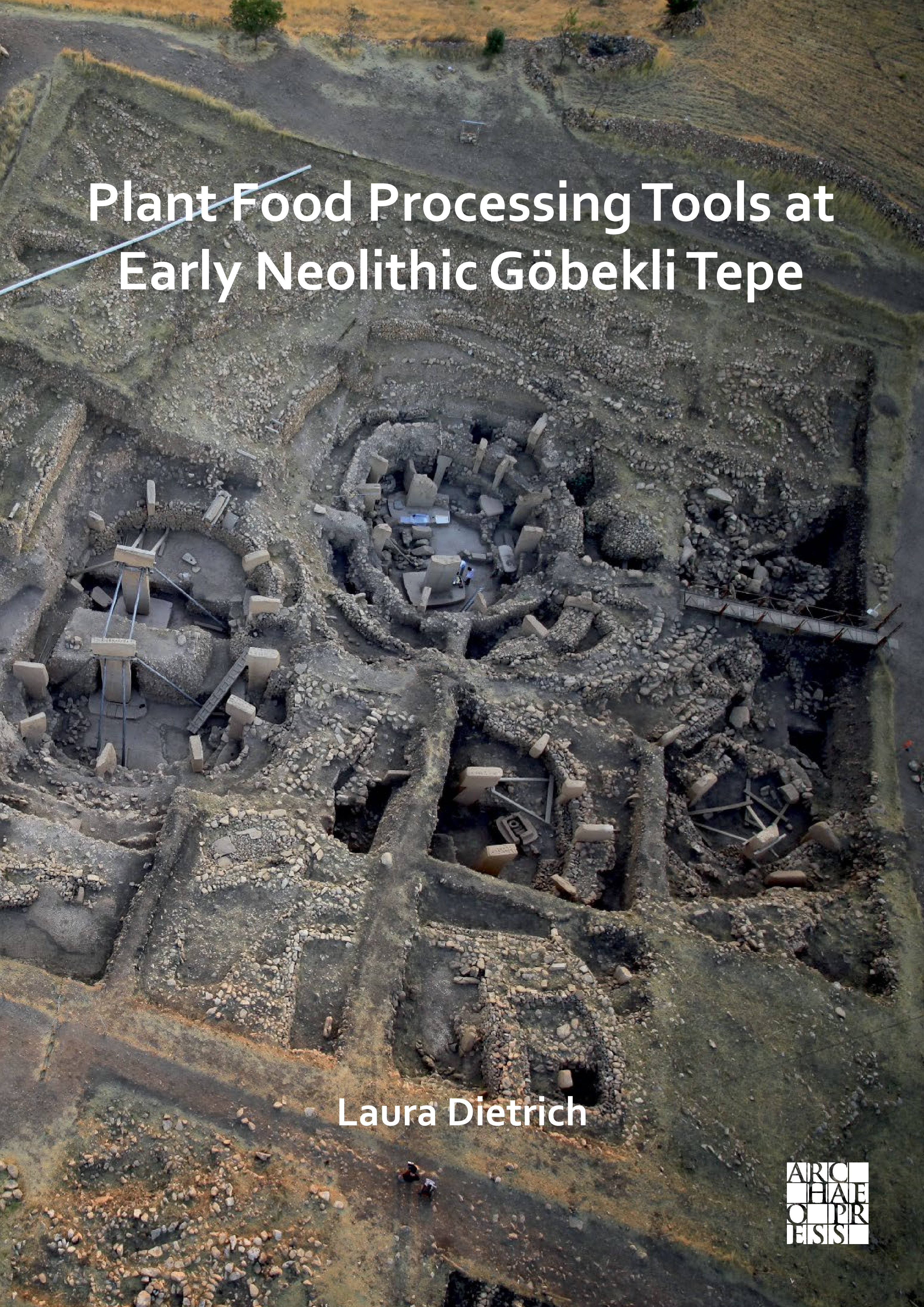
Plant Food Processing Tools at Early Neolithic Göbekli Tepe



Laura Dietrich

Plant Food Processing Tools at Early Neolithic Göbekli Tepe

Laura Dietrich

Archaeopress Archaeology

Archaeopress Publishing Ltd
Summertown Pavilion
18-24 Middle Way
Summertown
Oxford OX2 7LG

www.archaeopress.com

ISBN 978-1-80327-092-0
ISBN 978-1-80327-093-7 (e-Pdf)

Cover: The archaeological site of Göbekli Tepe. Main excavation area with four monumental circular buildings and adjacent rectangular buildings (©German Archaeological Institute, Photo Erhan Kücük). D-DAI-IST-GT11-EK-0385.

Published with the support of the Gerda Henkel Foundation, Düsseldorf

Contents

List of Figures

List of Tables

Appendices

Chapter 1

Highlights of the Study

The topic

Since 2007 I had the opportunity to participate in the excavations at the Early Neolithic site of Göbekli Tepe lead by Prof. Dr. Klaus Schmidt. Since 2016 I have been analyzing the finds presented here.

The main aim of my study was to reconstruct plant food processing at Göbekli Tepe (9600-8000 BC) with an emphasis on cereals, legumes and herbs as food sources, on grinding and pounding tools for their processing, the tools implied in the consumption of meals and beverages.

The core of the analysis is constituted by grinding and pounding tools (GPT) and stone containers. Their corpus amounts to more than 7.000 objects, constituting thus the largest collection published by now from the Neolithic of Northern Mesopotamia (figures 1.1-1.2).

Excavation work and sampling was funded by the German Research foundation (165831460). Experimental work was funded by the Gerda Henkel Foundation (Grant number n/a), the German Archaeological Institute (Grant number n/a) and the Stadtmuseum Berlin Foundation (Grant number n/a).

Overview of the methods

Functional analyses are the focus of this study. They were conducted partly using classical methods of use-wear analysis like macroscopical and microscopical optical analyses. The use of tactile analyses on the other hand is new. Also new are methods to differentiate between products of cereal processing and meals made of cereals, and quantification methods of wear. Shape and surface deformations are primarily analyzed and used as parameters for the functional interpretation; contextual information was used in addition.

Experimental programs, which were designed to follow the characteristics of the finds, were carried out to secure the analysis. The reference collection is held in Museum Village Düppel, Berlin.

Optical and chemical analyses on residues, particularly phytoliths, sediments and samples from surfaces and walls of grinding stones and stone vessels were carried out as part of the project. They support the arguments presented here but are not the basis of the functional interpretation.

Specific content and structure

The core of this study is the analyses of the handstones, pestles, netherstones and stone containers from Göbekli Tepe presented in chapters 4-7. A short overview on the architecture and stratigraphy, necessary for the understanding of the contextual discussion is presented in chapter 2.

Next to find analysis, another important pillar of the work is chapter 3 which presents the methods and experiments in detail.

The study concludes with a discussion in chapter 8 of the results and of their impact on the interpretation of the site and the wider regions it is situated in from the new points of view generated by the research. All relevant data are presented in the attached tables and images, both as text and as plates.

FIGURE 1.1. The "stone garden" next to the excavation areas at Göbekli Tepe (©German Archaeological Institute, Photo Mehmet Gülebak). D-DAI-IST-GT16-MG-0070.

FIGURE 1.2. The "stone garden" next to the excavation areas at Göbekli Tepe, 3D (1) and detail (2) (©German Archaeological Institute, Photos Laura Dietrich and Hajo Höhler-Brockmann, 3d Laura Dietrich). DAI-IST-GT17-LD/HHB-0268-0269.

Highlights of the study

Surprisingly, the impressive amount of GPT as integral part of the find inventory of Göbekli Tepe was not analyzed until now and has played no role in the much discussed and partly speculative interpretation of the site. The main explanation for this research gap is the previous focus of the research on other topics, including the monumental architecture and its symbolism. The special character of the site, its unusually large size, expressively male imagery, hunters and hunt as basis of the subsistence dominated the discourse on Göbekli Tepe. This image changes to some degree with the present study, which brings into attention an almost unknown economic and social dimension of the site.

A second explanation for the research gap at Göbekli Tepe lies in the character of the objects analyzed here. Grinding stones, for different reasons, are usually neglected in archaeological analysis. This study lists and describes several thousands of GPT and stone containers, including metrical data and photographic illustration of a selection of finds, constituting the most comprehensive study for Anatolia and the Northern Levant by now. It underlines the importance of the GPT and stone containers in the interpretation of an archaeological site. Certainly, numerous studies at other sites will follow and the data presented here can then be used for comparison to investigate foodways in the wider region.

The functional analysis, which is the core of the study, shows that GPT were widely used at Göbekli Tepe, predominantly for processing cereals to coarse flour, most probably for the production of porridge-like meals in large stone containers. Cereals and especially fluid meals made of them seem to have played an important role in the subsistence at the site. At the same time, bread-like products were produced, but the number of tools with specific wear markers is significantly smaller both concerning active and passive parts of the grinding gear. The use-wear analysis methods to differentiate products of cereals and to measure intensity use were developed especially for this study.

The processing of legumes to paste seems to have played an important role in the economy of the site, too. The consumption of legumes has to be investigated through further studies in the region. Generally, studies on foodways should concentrate more on the tools used for preparation and consumption than exclusively on preserved macrorests, which for some sites, between them Göbekli Tepe, are largely missing or do not offer sufficient information on the extent of certain food habits.

Context analyses help to reconstruct the loci of the processing of plant food, which clearly are oriented around the well-known monumental buildings of Göbekli Tepe, on terraces and the roofs of the so-far not much discussed rectangular buildings. Possibly, large-scale food production can be linked to activities which center in the partly contemporary monumental buildings, including specific social practices like commensality and feasting, especially when the large quantities of processed food are taken into account.

Chapter 2

The Site
with Oliver Dietrich and Jens Notroff

Overview of the site's architecture (Laura Dietrich and Oliver Dietrich)

Göbekli Tepe is situated high on the Germuş mountain range at ca. 770m asl., offering a wide view over the Harran plain to the south. The mound of reddish soil with a height of about 15m has a diameter of around 300m and is characterized by several hilltops divided by depressions. It is surrounded by a limestone plateau, which today mostly shows no sediment cover and very scarce vegetation. This must also have been the case during the Neolithic, as numerous quarry sites, cupholes and petroglyphs on the limestone surfaces suggest (Schmidt 2009).
Excavations were begun in 1995 as a cooperation of the Şanlıurfa Museum under the direction of Adnan Mısır and the Istanbul Department of the German Archaeological Institute under the direction of Harald Hauptmann with Klaus Schmidt as principal investigator. He later became the head of the project and excavated at Göbekli Tepe until his untimely death in 2014. There is an ample literature on the site comprising excavation reports and synthetic studies (e.g. O. Dietrich 2011; O. Dietrich *et al.* 2013; O. Dietrich and Schmidt 2010; O. Dietrich and Schmidt in print; Kromer and Schmidt 1998; Pustovoytov 2002, 2006; Pustovoytov and Taubald 2003; Pustovoytov *et al.* 2007; Schmidt 2000, 2008, 2011); of special importance are the monographic summary on work done until 2007 by the excavator (Schmidt 2012) and the monograph on the architecture of the site by D. Kurapkat (2015). Here I present only the core information necessary to contextualize the discussed group of finds. My analysis concentrates on the trenches in the main excavation area in the southeastern depression and on the southwestern hilltop (for details on the excavations, architecture and stratigraphy compare FIGURES 2.1 and 2.2). A selection of finds from the (incompletely) excavated northwestern trenches was analyzed, too. Thus the description below concerns particularly these areas of the site.

Two types of buildings have been identified at Göbekli Tepe:

1. Round to oval limestone buildings with inner diameters of 10-20 m, which include T-shaped limestone pillars incorporated into walls conserved to a height of up to 2.5 m (Schmidt 2012). Bench-like structures run along the inner mantles of the walls. The pillars in the walls stand up to 4 m high and are arranged around two bigger central pillars, reaching 5.5 m. Depictions of arms, hands and clothing on some pillars indicate their anthropomorphic character; many pillars show reliefs of wild animals and abstract symbols, depictions of humans are rare (Peters and Schmidt 2004; Schmidt 2012).
   Five such buildings have been excavated in the lower-lying areas of the mound (buildings A-D in the southeastern, building H in the northwestern depression), several more have been detected by georadar (O. Dietrich *et al.* 2012). In buildings C and D, the floor level is formed by the artificially smoothed bedrock. The two central pillars stand in pedestals carved from the bedrock as well. Building B has an artificial 'terrazzo' floor made of burnt lime and limestone chips; in buildings A and H the floors have not been reached yet. The question of whether the monumental buildings were roofed is still hard to answer (Kurapkat 2015; Schmidt 2012), but much speaks in favor of the structures having been partly subterranean with entrances through the roofs (Kurapkat 2012, 2015). During excavations, these structures were identified as belonging to an older layer (III) of site occupation (Schmidt 2000, 2011, 2012) dated to the PPNA (O. Dietrich 2011; O. Dietrich *et. al.* 2013; Pustovoytov 2006).

The buildings are multi-phased and were long-lived (Kurapkat 2015; Piesker 2014). The general tendency, best observed in building C so far, was to consecutively add new circle walls inside the buildings, thus making them ever smaller (Kurapkat 2015; Piesker 2014). Building analysis has highlighted three ring walls for building C (Kurapkat 2015; Piesker 2014). The two outer walls each have three major building phases, the innermost ring has four. Pillars were taken out of the earlier buildings and re-used in the younger phases. The intense construction and rebuilding activities indicate that this building could have been in use not only for several decades, but even centuries (Kurapkat 2015). The large round buildings have been described as monumental due to their size and also in comparison to the second type of architecture known from the site.

2. Larger (up to 29 m^2) and smaller (up to 5 m^2) rectangular buildings with 'terrazzo' floors made of burnt lime and limestone chips. These may have been one-story buildings with entrances through flat roofs (Kurapkat 2012, 2015). Especially the larger buildings feature up to 2 m high T-shaped pillars, which are, however, no longer positioned in the center of the buildings. These larger buildings were also sometimes fitted with benches and platforms.
   During excavations, these buildings were identified as belonging to a partially younger layer which is superimposed on the monumental architecture in some parts of the mound (Kurapkat 2015; Schmidt 2000, 2011, 2012), but has mainly been exposed on the higher-lying areas of the site. This layer (originally labelled as layer II) was attributed to the early and middle PPNB (O. Dietrich 2011; Pustovoytov 2006; Schmidt 2012) and has received less attention so far, aside from reconstructions of the building history (Kurapkat 2015).
   D. Kurapkat has shown that the rectangular buildings were constructed immediately next to each other (Kurapkat 2015). In some cases the buildings even share walls; as a result there are very few stratigraphical superpositions. Kurapkat views most of the buildings as roughly contemporaneous. A chronological depth of the rectangular buildings is indicated, however, by sequences of terrazzo floors within them. Unfortunately, in most cases excavations stopped at the uppermost floor level. Thus only the last phase of use for many of these constructions is known. These last phases of use of individual buildings may not belong to one contemporaneous horizon though.
   Changes in iconography can be detected between the monumental round buildings and the rectangular buildings. Animal depictions are – with few exceptions – absent in the rectangular rooms, while there are some 'arms and hands' motifs. In addition to the animals and symbols depicted in flat relief, Göbekli Tepe's buildings have yielded a series of anthropomorphic and zoomorphic sculptures, which repeat the same types canonically (e.g. wild boar with large fangs, snarling predators: (O. Dietrich and Schmidt in print). What is absent from both building types is evidence for hearths or fireplaces. Cooking activities seem to have taken place outside the buildings, not leaving identifiable remains behind inside the buildings. Another possibility is that erosion or other processes have destroyed the traces of fire.
   Probably the latest construction phases of some of the circular buildings may have been still in use up to the Early PPNB (O. Dietrich 2011; Kurapkat 2015), while others could already have been refilled at this point. This would imply that some of the rectangular buildings could be identified as residential structures contemporary to the late monumental 'special' buildings.

The stratigraphy of monumental building D and considerations on the stratigraphy of the main excavation area (Jens Notroff)

There is evidence for acts of backfilling (or intentional burying) at the end of the use-lives of the monumental buildings (observed during excavations in the lower levels of refill: Schmidt 2012; O. Dietrich and Schmidt in print), which seem to have included the deliberate deposition of material culture, especially sculptures (Becker et al. 2012, L. Dietrich et.al. 2019). Sections through the filling

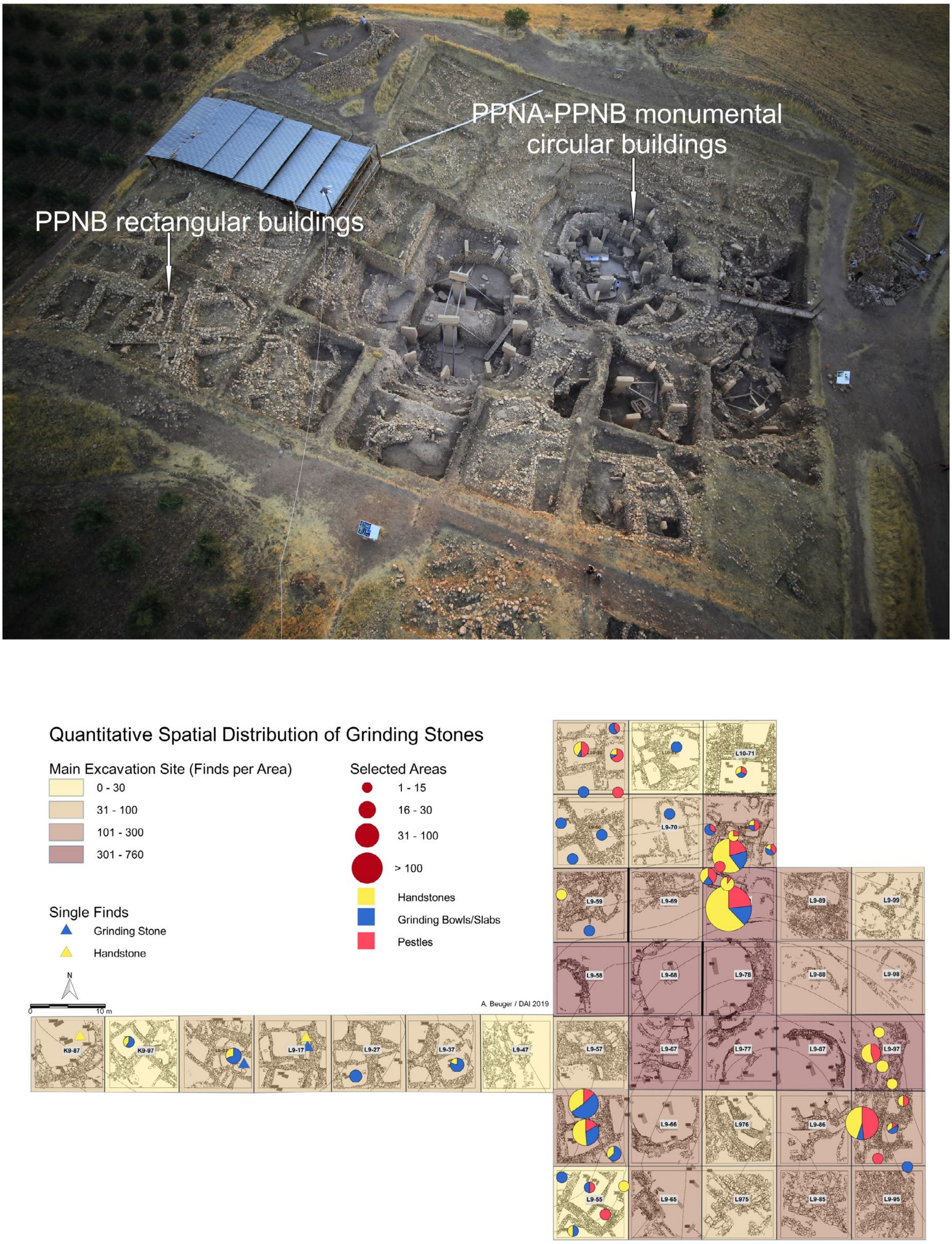


FIGURE 2.1. The archaeological site of Göbekli Tepe. Main excavation area with four monumental circular buildings and adjacent rectangular buildings (©German Archaeological Institute, Photo Erhan Kücük, Graphics André Beuger).

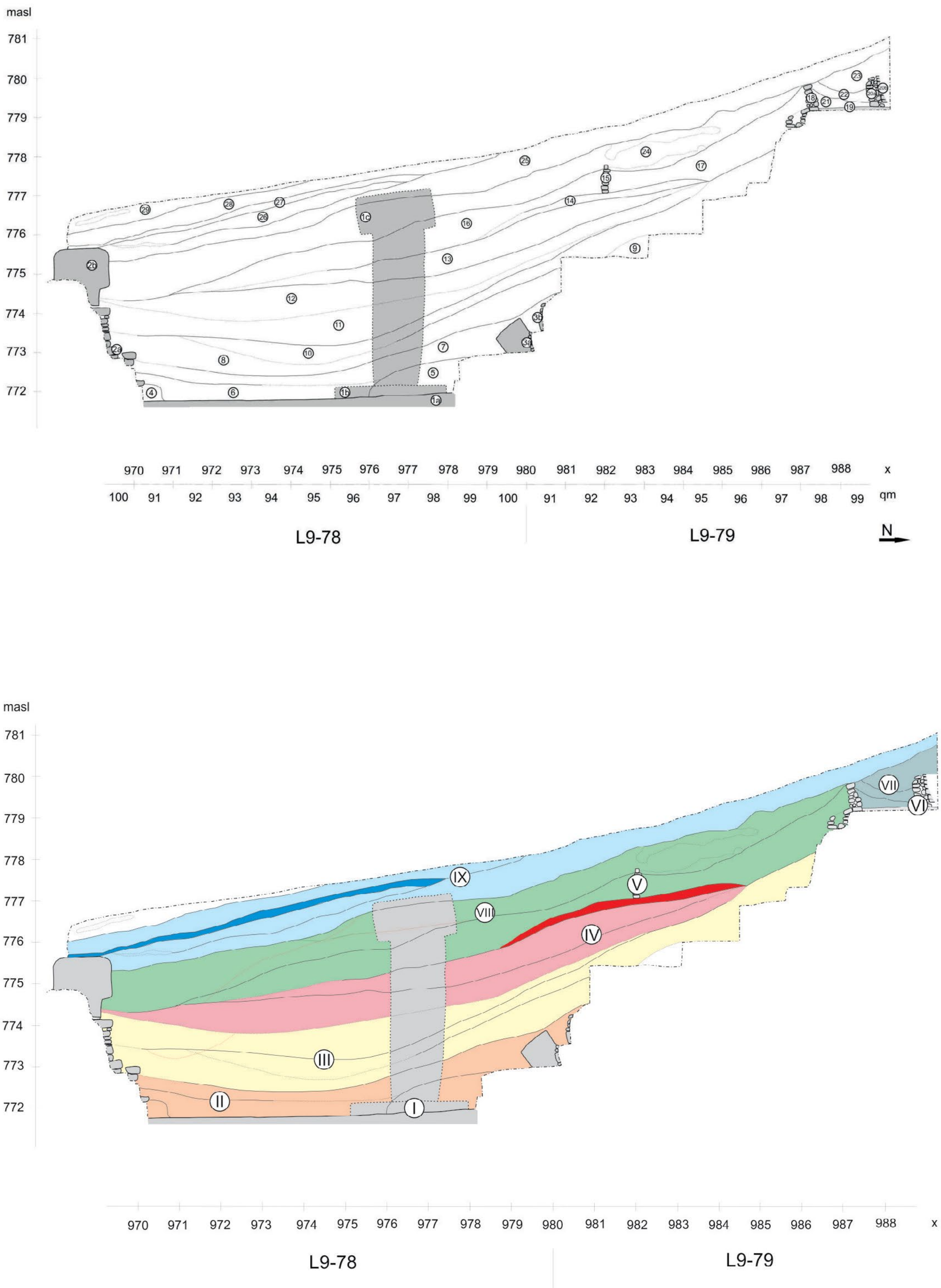


FIGURE 2.2. Stratigraphy of Göbekli Tepe. Eastern profile of area L9-78 in the main excavation area, cutting through building D (©German Archaeological Institute, compilation Jens Notroff).

of building D show a relatively leveled stratum immediately above the floor level (FIGURE 2.2, layer 6), followed by six units that suggest rapid backfilling from the building´s margins towards the center, resulting in heaped sediments at the walls and a lower thickness in the center (FIGURE 2.2, layers 7-11). Two intentionally deposited anthropomorphic limestone heads were discovered near building D´s western central Pillar 31, at the border between units 7 and those below it, further substantiating the case for intentional backfill (Becker *et. al.* 2012; L. Dietrich *et. al.* 2019; Schmidt 2010). The intentional backfilling events were identified as one cause of the bad preservation of charred plant remains (Neef 2003), which would have been too fragile to withstand the large-scale relocation of sediments.

It is still not entirely clear where the material for the refilling originated from. There is one radiocarbon sample of collagen from an animal tooth from the deepest layer (FIGURE 2.2, layer 6) inside building D (KIA-44701, 9800 ±120 14C-BP), resulting in a calibrated age between 9746-8818 cal BC at the 95.4% confidence level (O. Dietrich *et. al.* 2013). This date has a time-span which is in concordance with an earlier measurement made on clay mortar from the ring wall between Pillars 41 and 42 (KIA-44149, 9984 ± 42 14C-BP, 9745-9314 calBC at the 95.4% confidence level) (O. Dietrich *et. al.* 2013), attesting that PPNA materials were part of the sediments used to repair and backfill the building.

The block of probably intentional backfill is followed by bands of sloped rubble layers, which indicate slips of sediment from higher-lying parts of the mound into the lower-lying buildings as a factor in the final sealing of the building (FIGURE 2.2, layers 12-29). Several bands of sediment fill the building up to the top of the walls still preserved today (FIGURE 2.2, layers 12-24). Further strata lie above the top of the walls and cover the central pillars (FIGURE 2.2, layers 25-29). Judging from the height of the probably intentional backfill, we assume that the contours of the buildings and especially the pillars would have been visible for a longer period of time after the abandonment of the monumental buildings; this may have also been the case for some of the higher pillars in the ring wall. Cup marks on the heads of several pillars hint that people continued to engage with the older structures at the site (Schmidt 2012).

A terrace wall encircles the area in which the monumental buildings lie (Kurapkat 2015; Schmidt 2010). One of the functions of this wall could have been the prevention of further sediment slips into the monumental buildings. Younger, or in part contemporary, rectangular buildings deliberately spared the round buildings, forming terraces that lined the depression around them. Access to the circular buildings was possible by a stairway included in the terrace wall. It is thus possible that the wall was built when some of the monumental buildings were still in use, i.e. during the period of overlap between round and rectangular buildings.

Site formation processes included phases of rapid accumulation interchanging with periods of inaction and humus formation, as a pedological analysis revealed (Pustovoytov 2006). One humus layer with a thickness of 20 cm is located at a depth of 1.5 m, superposing layer II above building D in the northern bulk of excavation area L9-68 (Pustovoytov 2006). A radiocarbon date from this layer revealed an age of 8860+/-60 BP, giving a calibrated interval of 8240-7780 cal BC (95.4% probability) for the last PPN activities at Göbekli Tepe (O. Dietrich 2011; Pustovoytov 2006). Layer I is the label for the surface soil. The division into "layers III and II" was based not only on architectural change. There are some spots where "layers II and III" clearly overlap stratigraphically (Kurapkat 2015; Schmidt 2012). An inner division of the architectural phases is in progress (Kinzel and Clare 2020) but the correlation with the building infills seems however not feasible (Notroff in print).

The general distinction between three large stratigraphic 'blocks' (see also FIGURE 2.2. below) therefore can be maintained as a tool for general orientation. These blocks span significant periods of time and, as explained above, incorporate many phases of construction, reconstruction and refilling. Whereas building phases have been analyzed for the large monumental buildings and some of the rectangular structures (Kurapkat 2015; Piesker 2014), work on the stratigraphy continues and will ultimately lead to a much higher resolution of activities at the site. One recent insight regards evidence of the presence of yet another building type: simple C-shaped or oval to round structures, sometimes subdivided by a wall, without other standardized interior fittings. These buildings have been addressed as a fourth layer in some reports (Schmidt 2011); in one excavation area (L9-59) there is a stratigraphic sequence of lower-lying oval structures and superimposed rectangular buildings. The small round buildings may thus be older than, or contemporary to, the monumental structures. As the exact chronology of these structures is still uncertain, I excluded them from the analysis.

Chapter 3

Methods, Experiments and their Results

Methods and experiments

This chapter outlines the principal methods of the analysis applied in this study as well as the comparisons, references and background information on which the interpretation of the results is based. Work on the finds from Göbekli Tepe was carried out starting from the project database combined with the (preliminary) stratigraphical evaluation of the site (chapter 2) as it was presented by Klaus Schmidt (2012), Oliver Dietrich (O. Dietrich, Schmidt in print) and Jens Notroff (O. Dietrich, Schmidt in print). The results will be discussed separately:

Documentation and contextual analyses

Functional studies including use-wear and tactile analyses

Experimental programs

Characterization of the rock textures

Residues analyses and macrorests, carried out either as part of this projects or of the general excavation project.

Documentation and contextual analyses

Documentation. The database of the project (created by Klaus Schmidt, Çiğdem Köksal-Schmidt, Oliver Dietrich, Jens Notroff, Thomas Urban, André Beuger and other members of the research team until 2014) constitutes the basis of this analyses. All finds including grinding and pounding tools (GPT) and vessels were consecutively described during the excavation seasons, with information on the contexts, types and dimensions of the finds. Roughly 80% (own assessment during documentation work) of the GPT and stone vessels were registered compared to the amount of material in the find storage rooms in the excavation house, the stone garden (= on-site open-air depository for larger finds, FIGURES 1.1 and 1.2) and the finds stored in the museum of Şanliurfa. The database contains 10.180 finds (GTP and stone vessels).

The documentation apart from the database included sketches, drawings and, more rarely, photos of the finds as well as descriptions, dimensions and related context information. The database is comprehensive regarding information on find contexts but was not intended to be used in functional studies. Rather, it constitutes a record of finds to form the basis of further studies of single find categories and was intended and used especially for contextual analyses. A detailed re-examination of the existing data including description and measuring of the finds and corrections of older information was performed by me between 2016 and 2019 in Urfa and at Göbekli Tepe. The resulting database is available in the form of tables in the appendices. The documentation includes photographic recording of all finds instead of sketches; the photographic representation of selected finds can be found on the plates.

Contextual analyses

For the stratigraphical description of the site see chapter 2. The contextual analyses comprised chronological/stratigraphical evaluation and observation of spatial patterns in the distribution of the GPT. The grinding stones from the uppermost layer ("layer I" in the older terminology) were classified as undiagnostic for chronological and spatial analysis.

Zones of the room fillings ("layer II")
Zone 1: plough horizon
Zone 2: upper and middle parts of the room filling
Zone 3: lower part of the filling up to 10 cm above the floor
Zone 4: on the floor
Zone 5: niche on the floor
Zone 6: wall
Zone 7: area outside of the rooms

TABLE 3.1. Zones of the filling of the rectangular and apsidal buildings as defined for the statistical purposes of the present study.

All finds from the rectangular and apsidal buildings ("layer II" in the older terminology) were analyzed together without further chronological differentiation (L. Dietrich et. al. 2019; Kurapkat 2015). To facilitate research on the spatial distribution of GPT, the built spaces of "layer II" were subdivided into seven zones (TABLE 3.1). Finds on and immediately above floor levels of the rectangular buildings or on floor levels of niches in the buildings (zones 3-5) are considered in situ; however, the archaeological and the detailed stratigraphical analysis of the "loci" (units) were not finished yet at the moment of this publication. The origins of the sediment depositions have not been analyzed in detail. For all zones, including the infill (zone 2) and spaces between buildings (zone 7), dynamic and secondary formation processes have to be considered. Also, these will have to be analyzed in the future. Zone 6 refers to grinding stones used in secondary contexts as wall stones; zone 1 is the disturbed uppermost part of the buildings´ fillings and the plough horizon.

The finds of the monumental buildings partially represent dislocated material from the rectangular buildings surrounding them. The distribution of the GPT and the vessels in monumental building D was selected as a case study for the older structures, as the other circular buildings are either partly disturbed by post-Neolithic activities (C and H) or incompletely excavated (A and B). The biography of building D is complex (chapter 2). The completely excavated ring wall with 11 pillars in situ and two central pillars very likely represents the last stage of a long building history. Kurapkat observed traces of a second, older ring wall to the south of the inner wall (Kurapkat 2015) and a deep sounding immediately to the north of the building revealed a segment of the same wall (Schmidt 2008). The finds and their contexts mirror the last use-phase of the building.

Given this complex stratigraphy (chapter 2), comprising a partly intentional backfilling of the building (FIGURE 2.2, layers 6-11) and the subsequent complete refill through erosion from higher-lying parts of the mound (FIGURE 2.2, layers 12-24), followed by five further sloped layers that completely covered the building (FIGURE 2.2, layers 25-29), I analyzed the distribution separately for these three zones. The results are presented in the chapters 4, 5, 6 and 7.

Methods of functional analyses

3D-documentation was chosen to perform geometrical analysis of shapes on 100 selected finds (either "representative" types for shapes and wear or completely preserved finds). The analysis of shapes is important for the functional determination as shapes change through use, and for the typological classification and comparison with other sites (for example K. Wright 1992 with her typology of Neolithic grinding stones from Southern Levant).

3D-data were acquired from the surfaces with a Canon Eos M50 camera to perform close-range photogrammetry. Each object was photographed on a turntable spinning 6 x 360° (shooting each 15°) and side-flipped after three rounds (totaling 144 shots per object). 3D-models in normal and high geometrical resolution were prepared with the photogrammetry software RealityCapture (2020) and Photoscan. Through the removal of the color texture the geometry of the surface can be visualized and flat and rough zones can be optically differentiated. Based on the visualization and on tactile analyses (chapter 4) relevant zones with different geometry were further analyzed with the microscope to determine typical wear markers.

On two pieces, one original and one experimental replica, surface topographies were measured and quantified as described in L. Dietrich and Haibt (2020). The aim of this research was to develop a method to calculate use intensity and use-lives based on the data from the experimental program (see below). The topographies of the working faces of Neolithic handstones and replicas were analyzed using the software CloudCompare, which provides a basic but efficient tool to compute the roughness of point clouds (CloudCompare 2019). "Rough" as well as "smooth" zones can be differentiated. The estimation is based on the computation of the best fitting plane and of a "roughness" value which is equal to the distance between each single point and the best fitting plane computed on its nearest neighbors (L. Dietrich and Haibt 2020). Deformations of surfaces of the experimental handstones were investigated by calculating distances from cloud to cloud of different stages of use of the same handstone (see L. Dietrich and Haibt 2020) to detect geometrical changes of the topography and erosion. This investigation is suitable to determine use intensities (L. Dietrich and Haibt 2020; see below results) but also time consuming as each wear stage has to be modelled, then measured, then aligned perfectly. Thus, this method can only be applied on a limited number of pieces. For the present study, the most worn handstone was chosen with the aim to extend the results on the less worn pieces as outlined in L. Dietrich and Haibt (2020) and in the results section.

Optical macro- and microscopic investigations of surface deformations are standard in traceology and functional studies. That surfaces change their shapes as a result of use through grinding or pounding and get "deformed" and that different materials would leave different traces is the main premise in use-wear studies as originally proposed by Semenov (1964). This assumption is also basic to the current functional discussion (summarized by Dubreuil 2002; Dubreuil *et al.* 2015; Marreiros *et al.* 2015). Use-wear analysis has a long tradition in archaeology, and at the moment numerous methodological agendas compete, including the application of high-tech microscopy for the detection of traces on surfaces (summarized in Marreiros *et al.* 2015). Initially, the methodology was based on experimental use, observation and classification of the formation of wear on replicas, which was then compared to archaeological objects (Semenov 1964). In the particular case of the grinding stones, today a solid basis for such studies exists, including a classificatory system for use-wear traces (Adams 2002, 2014; Adams *et al.* 2009), numerous detailed experimental programs as well as the description of methods of observation and documentation (summarized by Dubreuil *et al.* 2015). Still in an early stage is however the application of quantification methods - meaning the measuring of data sets. There are some detailed studies on the formation of polish (Bofill *et al.* 2013) and roughness (Bofill 2012; Bofill *et al.* 2013; Suehrcke 2018; Zupancich *et al.* 2019), for the use of confocal microscopy, photogrammetry and GIS for quantification of use-wear, but most other functional studies are rather descriptive. One of the causes is the heterogenic character of the data to be measured, as several variables, including besides the raw materials and its properties also the worked materials and the motions, can affect the formation of use-wear decisively.

Functional interpretations have been based rather on the premise that different physical alterations of the surface are caused by the choice of worked materials or by different crushing technologies (summarized by Dubreuil *et al.* 2015), than on the assumption that different end products of the same processed materials could be the cause of distinct wear. Also, although the importance of kinetics as a factor in wear formation is well recognized (Dubreuil *et al.* 2015), with a few exceptions (Adams 2002; Stroulia *et al.* 2017) the active use of kinetics, as proposed in the present study, in the quantification of wear is usually neglected.

Macro- and microscopically visible deformations of the working faces, which are essential for the identification of wear were described and classified following the criteria proposed by Adams (*et al.* 2009; Adams 2014), specifically a rough quantification of the linear traces, polish, levelling and

Handstone	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
Find Nr.	Flat Sinuous Rugged Regular Irregular <25% <50% <75% <100%	Gouges Striations Curved Straight Parallel Erratic Concentric, Oblique Perpendicular. Single Multiple Network <25% <50% <75% <100%	Highly reflective Moderately reflective Dull Loose Concentrated Covering <25% <50% <75% <100%	Loose Concentrated Covering	Pits Breakage Loose Concentrated Covering	Rough Smooth Very smooth

TABLE 3.2. Description schema for optical macroscopical and microscopical investigations.

fractures and descriptions of the macro- and microtopography and of their profiles (TABLE 3.2). The microscopical research was carried out with a light stereomicroscope (Bresser) at low (up to 40x) and high (up to 160x) magnifications as described by Adams (2014) and Dubreuil (2002) on 73 selected finds (appendices TABLE 1) and experimentally used replicas (appendices TABLE 3.1b and 3.1.d). Microphotographs were taken with a microcam with Sony® IMX226 Sensor. The spatial distribution was analyzed as described in FIGURE 3.1.

Tactile analyses were carried out on all handstones (TABLE 3.2, chapter 4 and the appendices TABLES 1-10) as they are relevant for the functional determination. For the present study I used a mixed tactile and optical analysis to mark and analyze zones which felt different on the active surface of handstones. The dissemination was made between rough (with high perceptible asperities), smooth (with low perceptible asperities) and very smooth (no perceptible asperities). This is a non-quantifying approach but it allows a detailed optical-tactile analysis of each object. Also, it can be easily applied to large quantities of objects (in this case 1102) and under fieldwork conditions. The analysis can be combined with visual analysis as described in L. Dietrich and Haibt 2020 and in chapter 4.

Surprisingly, haptic criteria and tactile perception of the surface roughness are rarely used in functional studies of artifacts (with the exception of Procopiu *et al.* 2011), although tactile perception is one of the five somatosensory senses of humans, and the human hand "rivals the eye in term of sensitivity" (Abraira and Ginty 2013). Fingertips contain a high number of mechanoreceptors adapted for size, shape, weight, movement, and texture discrimination (Abraira and Ginty 2013). The tactile sensing provides information about hardness, frictional properties and surface topography of objects (Ding *et al.* 2017). Methods of the analysis of the interaction between fingers and surfaces (Skedung *et al.* 2013) as well as of ways of transmitting and encoding of the mechanical information from surface topographies (Abraira and Ginty 2013) have already been described in detail. This information can be used to disseminate leveling through use and studies have shown that human tactile discrimination of surface topographies can extend even to the nanoscale (Skedung *et al.* 2013). Quantification approaches based on the measurement of the vibrations through special devices (Procopiu *et al.* 2011) are a promising possibility, although such devices are not part of the standard archaeological equipment.

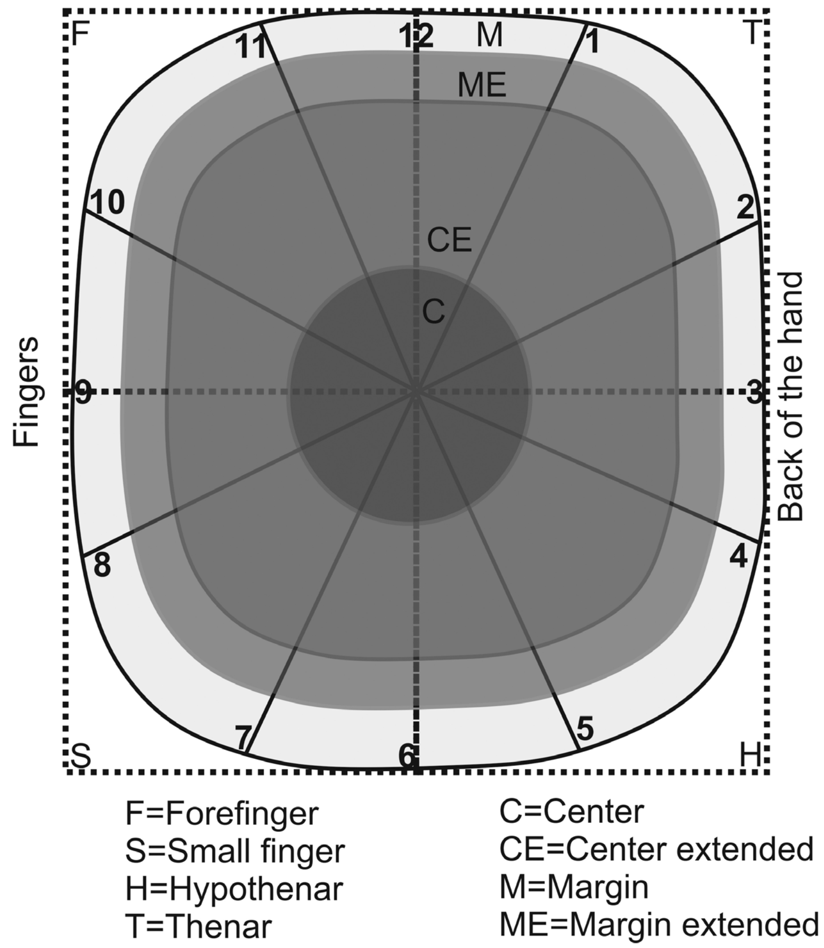


FIGURE 3.1. Schema for the spatial description of wear (©Laura Dietrich).

Experimental programs

Experimental programs are usually carried out to compare wear from original finds and replicas (Adams 2002, 2014; Adams. *et al.* 2009; Dubreuil 2002; Dubreuil *et al.* 2015; Semenov 1964). The main aim in the case of the GPT is the differentiation between processed materials as this equipment is used for crushing a wide variety of food stuffs and minerals (Adams 2002, 2014; Adams *et al.* 2009; Bofill 2012; Dubreuil *et al.* 2015). Reference collections for the use-wear of tools made from basalt have been partially published (Dubreuil 2002) but not for the specific types of implements from Göbekli Tepe. As shapes, motions and weights are crucial parameters in the formation of wear a reference collection had to be established (FIGURE 3.2). Five experimental programs were designed as a basis for functional analyses at Göbekli Tepe. They can be described as explorative; all possibly relevant variables were tested and measured.

Experimental program 1 (EP1) was centered on the different cereal processing technologies and their impact on the working face of the handstones. The replicas were produced respecting the types from Göbekli Tepe (Schäkel 2018; also see chapter 4, types 1 and 2; FIGURE 3.2) from geologically similar basalt lava from Southwestern Germany (density: 3.09g/cm3, porosity: 14,64%, maximum radius of pores 5mm (Grimm 1990; see below). The geological determination was made optically; the scratch hardness was measured physically.

Fine (***EP1a***) and coarse flour (***EP1b***) were chosen as end products as they are attested in charred food remains in southwest Asian Neolithic sites, e.g. at Çatalhöyük (Fuller and Gónzales Carretero

FIGURE 3.2. Replicas of handstones and pestles from Göbekli Tepe used in the experimental program (©Laura Dietrich).

2018). I worked with Einkorn as its exploitation is attested through a few charred macrorests (Neef 2003) and phytolith samples (L. Dietrich *et al.* 2019) at Göbekli Tepe. Several participants took part in the experiments; no particular strategy was followed by the choice of the participants.

I worked with already dehusked Einkorn with 70% whole grains as dehusking was done at Göbekli Tepe separately in special hollowed bowls through pounding (see chapter 6). As an experimental study (Eitam *et al.* 2015) using ancient dehusking technology in Epipaleolithic mortars has shown that dehusking with wooden pestles would result in whole and broken grains in proportions of 50%, we simulated the process by pounding the grains superficially (with 2-3 vertical moves) before grinding them.

All relevant data for the experimental program are presented in TABLES 3.3-3.5, including material and products, participants, working times, and quantities. A quantity of 500g of raw Einkorn was established as fixed working unit (WU). Working times on the other side are non-controllable variables because they depend on the physical condition of the participants, environmental or other external factors; they were measured but not used in calculations. Protocols comprise information on participants, products, working times, environment and weather conditions, position of the body during work as well as on the handling of the handstones and the performed motions, both as descriptions and drawings. In addition, video material was produced. Each participant had to accomplish one task, either the production of fine or of coarse flour. Flour was considered fine when the particles were fine pored, almost white colored, predominantly smaller than 0.5mm and

Event	Grains in kg	Working Units per event	WU total
1	2	4	4
2	4	8	12
3	8	16	28
4	16	32	60
5	32	64	124

TABLE 3.3. Overview on the experimental work with handstone L10 for the production of coarse flour (own work; average of 31 working hours).

Event	Grains in kg	Working Unit per Event	WU total
1	0,5	1	1
2	1	2	3
3	2	4	7
4	4	8	15
5	8	16	31

TABLE 3.4. Overview on the experimental work with handstone L10 for the production of fine flour (own work, average of 16 working hours).

Handstone	Working unit Nr.	Material	Participant	Working time	Motion	Product	Weight of the final product
L1	1	Einkorn 500 g	2	0:50 min	P	Fine flour	488 g
L1	2	Einkorn 500 g	3	1:13 min	P	Fine flour	486 g
L1	3	Einkorn 500 g	2	0:45 min	P	Fine flour	448 g
L2	1	Einkorn 500 g	4	1:02 min	P and C	Fine flour	474 g
L2	2	Einkorn 500 g	2	0:40 min	P	Fine flour	449 g
L3*	1	Einkorn 200 g	5	1:03 min	B	Fine flour	198 g
L15*	1	Einkorn 500 g	6 and 7	0:39 min	B and C	Coarse flour	489 g
L15	2	Einkorn 500g	1	0:40 min	C	Coarse flour	490 g
L10	1	Einkorn 500g	1	0:45 min	C	Coarse flour	487 g
L14	1	Einkorn 500g	10	0:43 min	C	Coarse flour	488 g
L14*	2	Einkorn 500g	11	0:38 min	B and C	Coarse flour	473 g
L14	3	Einkorn 500g	1	0:35 min	C	Coarse flour	491 g

TABLE 3.5. Overview on the additional experimental work with different participants.

a light granulation was palpable. This flour was sticky when water was added, dough could be formed. Coarse flour was obtained by crushing the grains superficially in coarse particles up to 2mm; the flour was yellowish and not sticky when combined with water. Four sieves with different mesh sizes (3mm, 2 mm, 1 mm and 0,5mm) were used to separate the product, which was classified after at least 75% from the quantity have meet the described criteria.

Grinding motions and body position were freely chosen, and the participants were asked to describe the motions applied, their changes and the effects of work on the body. The product was collected with the hand and then weighed to quantify possible loss or gain of material, including stone particles. The replicas and their shapes, weights and surface modifications were analyzed in certain intervals. TABLES 3.3-3.5 show the results of 155 working units (WU) for the production of fine (37 units) and coarse (129 units) flour with a total of 11 participants, resulting in the production of 40kg fine and coarse flour. A connection between pendular motions and fine flour, and between circular motions and coarse flour could be clearly observed. The choice of the motion was made by the participants without prompting and was influenced primarily by the tasks to be fulfilled and

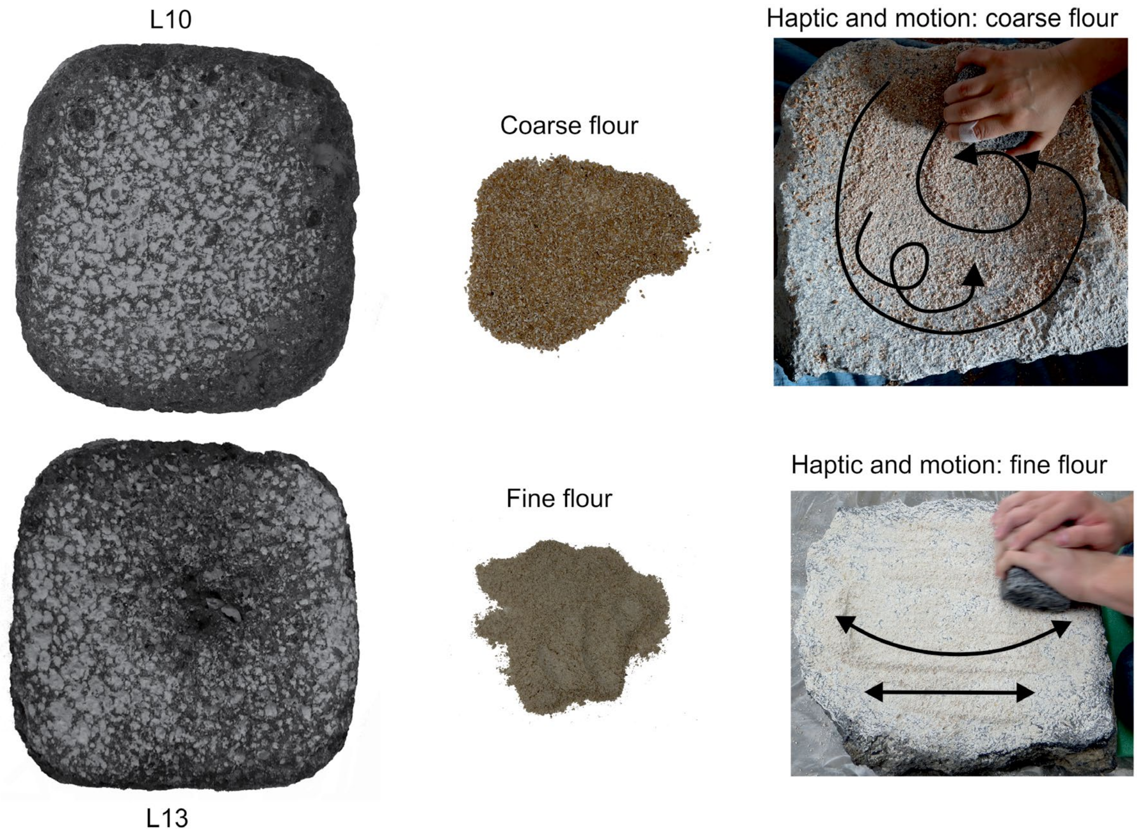


FIGURE 3.3. Production of coarse and fine flour and spreading pattern of the flour after 5min of grinding (coarse: above, fine: below) (©Laura Dietrich).

not by physical condition, body position or other factors. Most probably, the efficiency of each kind of motion in combination with the specific tool shape are the main causes for this phenomenon. The shape of the handstones means that pendulum-like motions collect the grains in the center of the stone, the main forces work on the margins (L. Dietrich *et al.* 2019, S Movie 1; FIGURE 3.3 below). The motion is thus very fluid but strong at the same time without exhausting the working arm. The grains are first spread on the margins and finely crushed, then collected in the middle and crushed again coarsely. Circular and spiral motions work with soft, uniformly distributed pressure from above and the movement of grains takes place exactly inverse: they are spread from the center to the margins of the netherstone (L. Dietrich *et al.* 2019 S Movie 2; FIGURE 3.3 below), then crushed softly. Learning processes or mutual influence as causes of the choice cannot be excluded. Flat bidirectional motions were also applied but only in a minority of cases. They were predominant on short netherstones of up to 20cm (TABLE 3.5. marked with *), indicating shape and size of the netherstones as variables to be considered in the formation of the use-wear on handstones. However, flat bidirectional motions can be considered as a minor factor in wear formation on the Göbekli Tepe tool assemblage, where most netherstones are between 30cm and 70cm long (chapter 6). Body positions (genuflecting or sitting) had no measurable influence on wear formation. The existence of the two kinds of motions, pendular and circular, is clearly attested by the formation of the work faces on the netherstones. Both oval and rectangular-elongated work faces were observed (chapter 6).

Handstones L13 and L10 were chosen for a direct comparison between wear resulting from the production of fine flour with pendular motions and the production of coarse flour with circular and spiral motions in order to identify specific wear markers (FIGURE 3.3). All experiments were performed by me (TABLES 3.3 and 3.4). Also, the progression of wear was macroscopically and

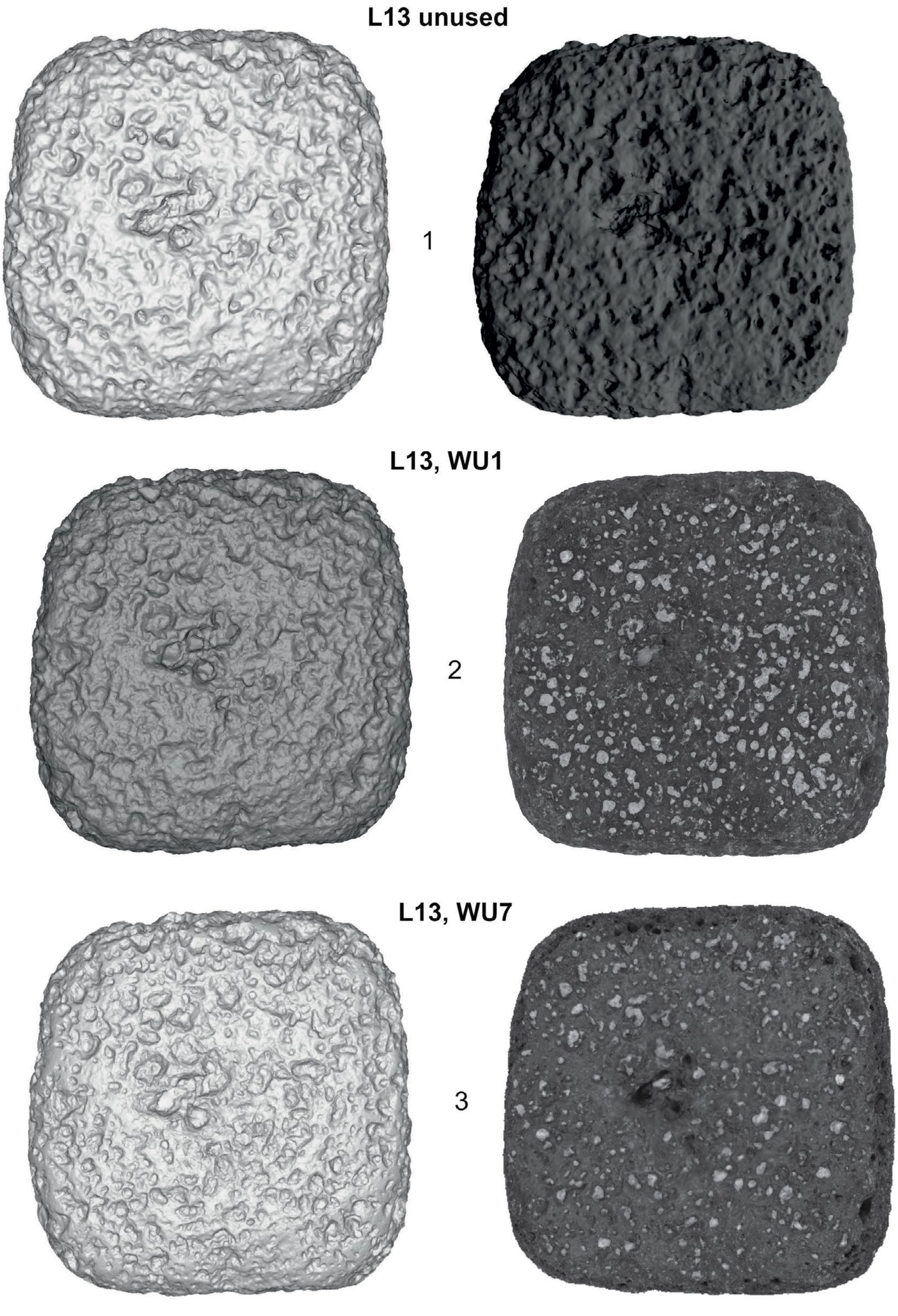


FIGURE 3.4. 3D-models of L13 (©Laura Dietrich).

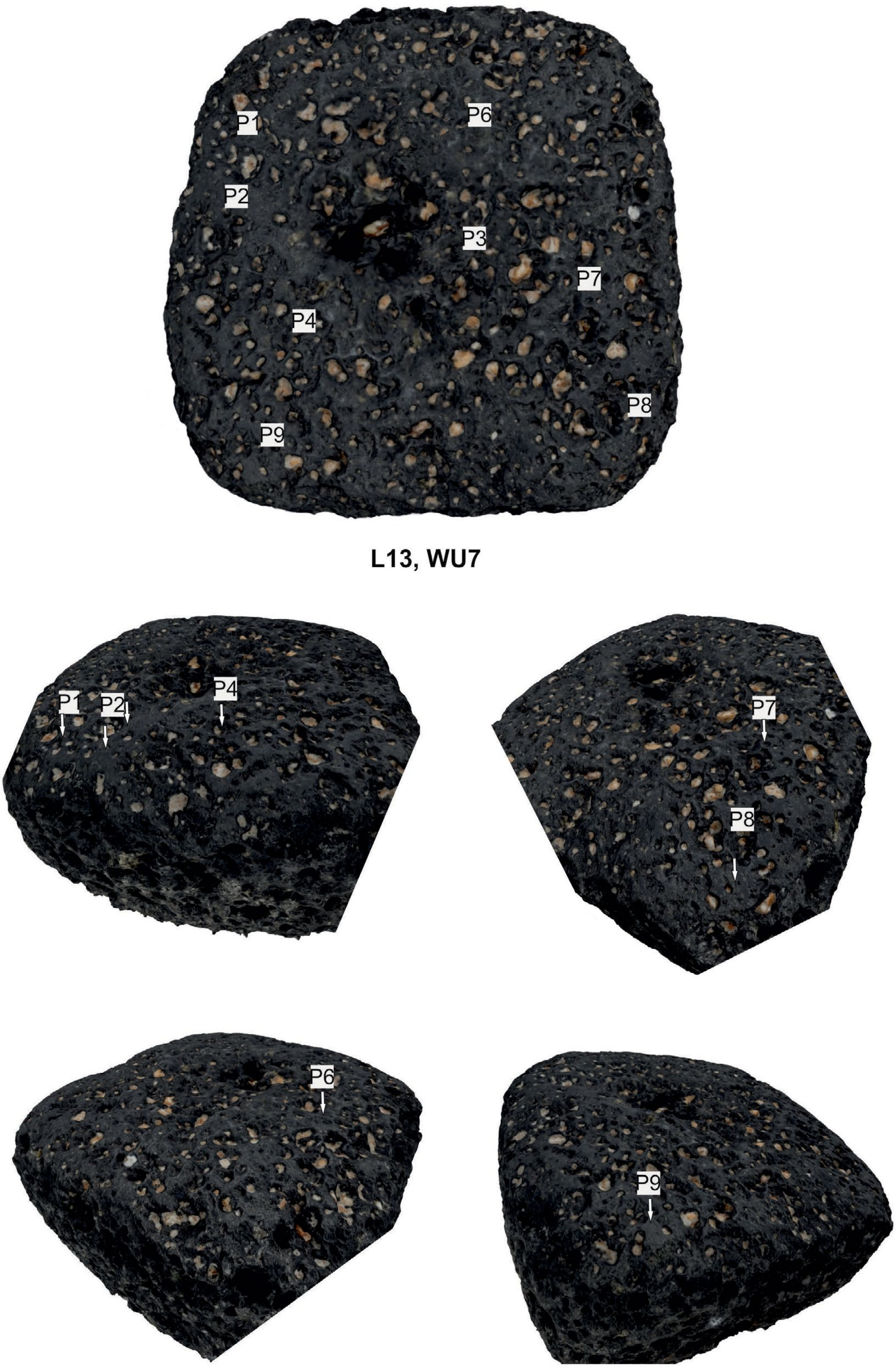


FIGURE 3.5. 3D-model of L13 with the microscopically analyzed spots marked (©Laura Dietrich).

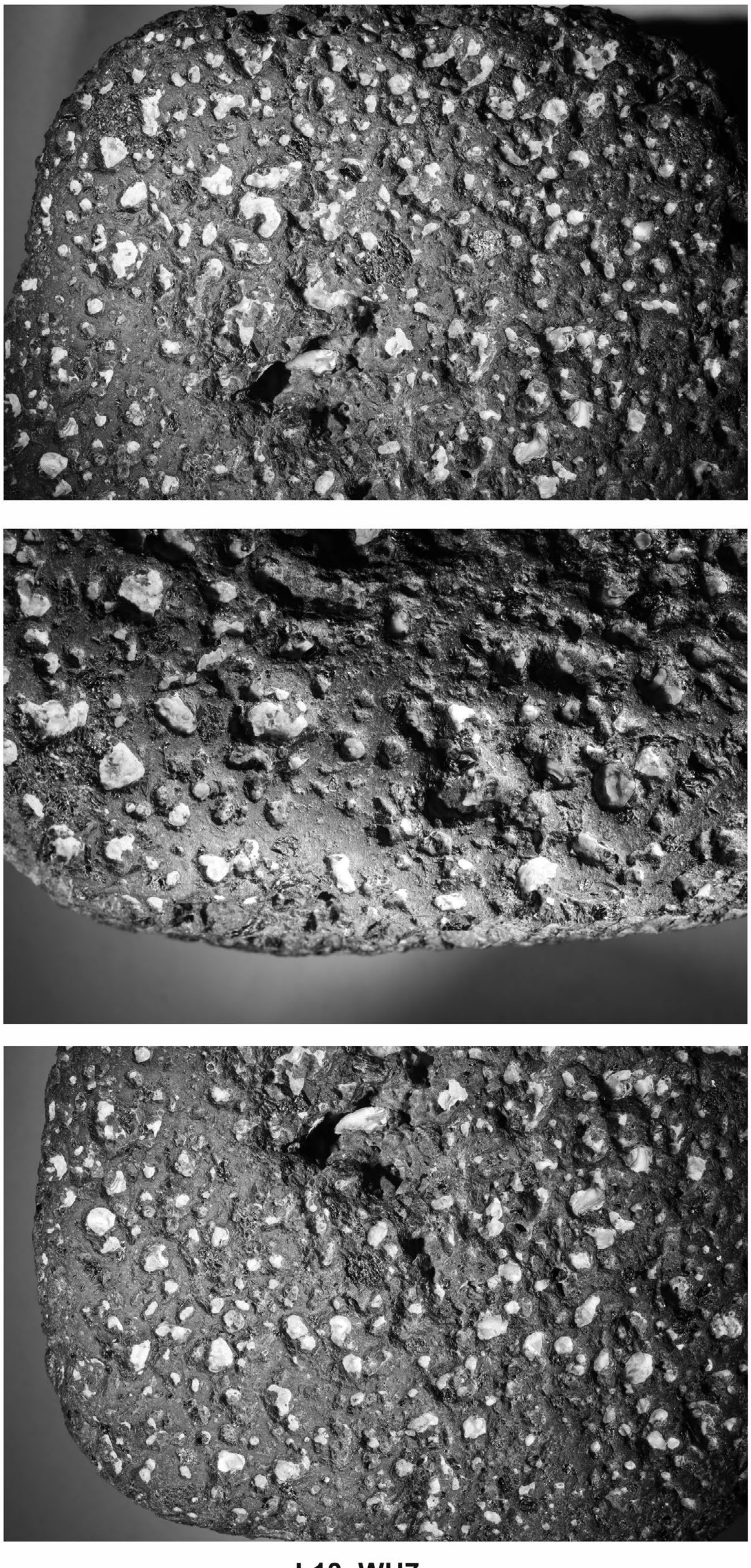


FIGURE 3.6. Macrophotos of L13 (working face) (©Laura Dietrich).

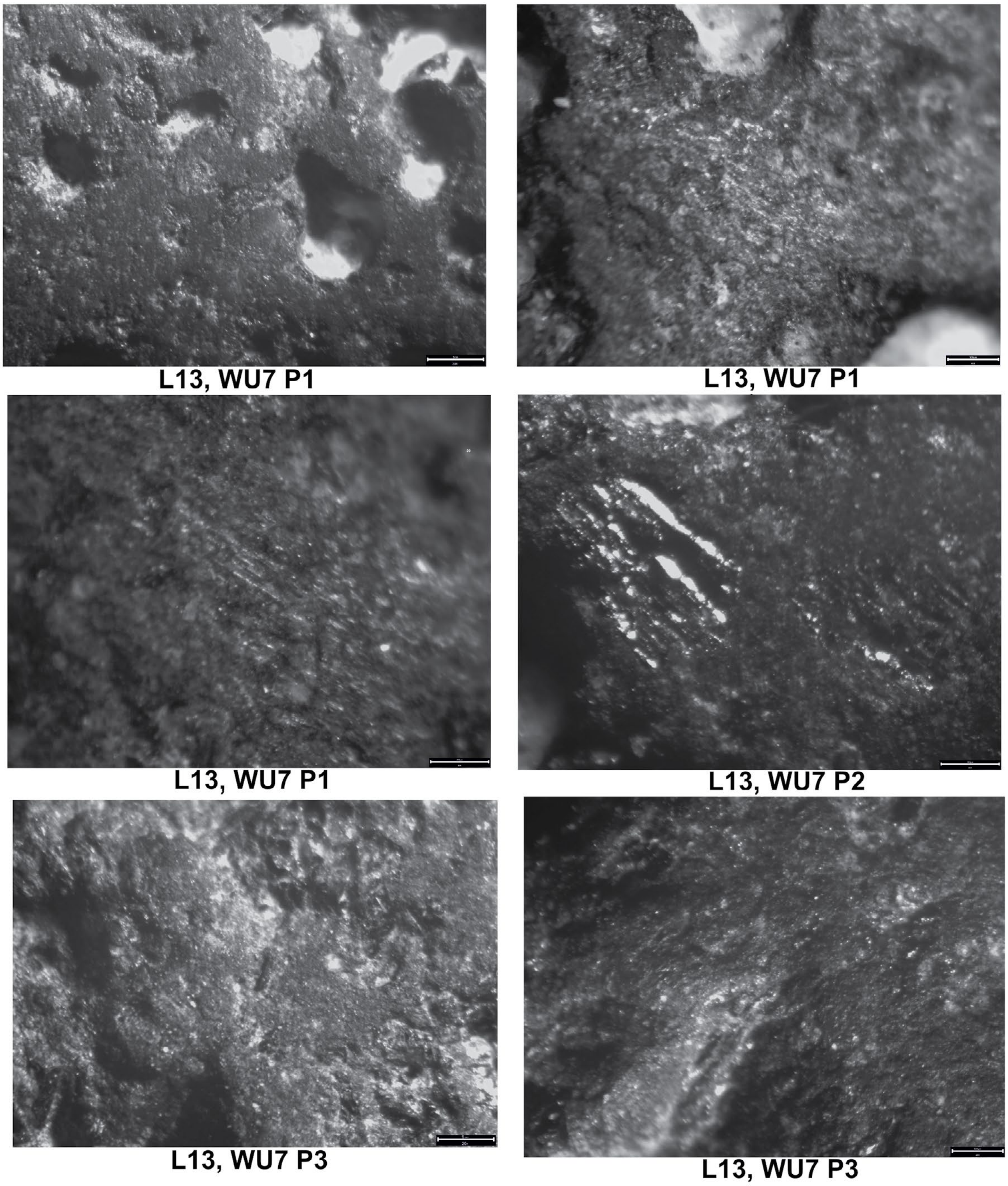


FIGURE 3.7. Microphotos of L13 (working face) (©Laura Dietrich).

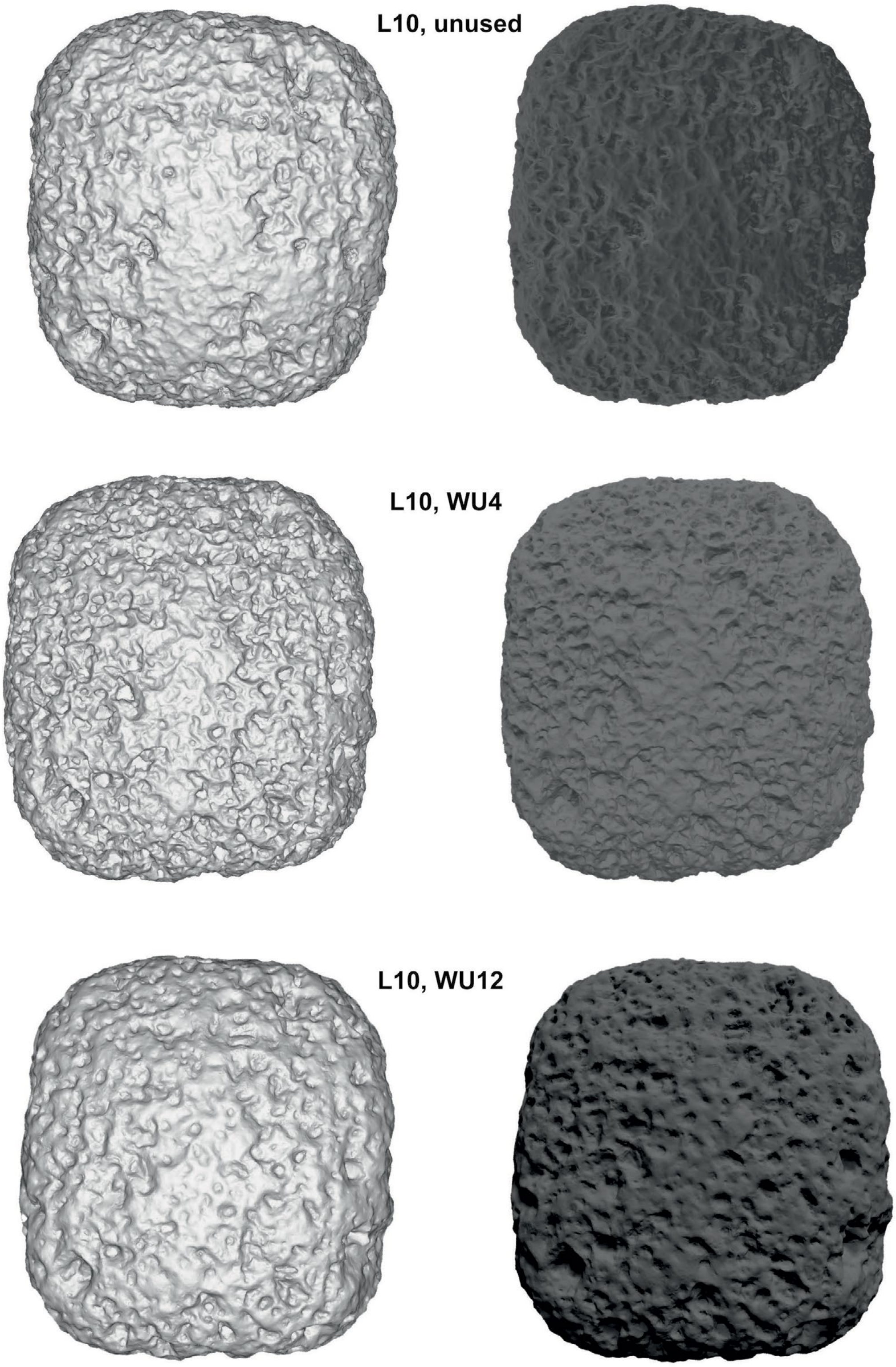


FIGURE 3.8. 3D-models of L10 (©Laura Dietrich).

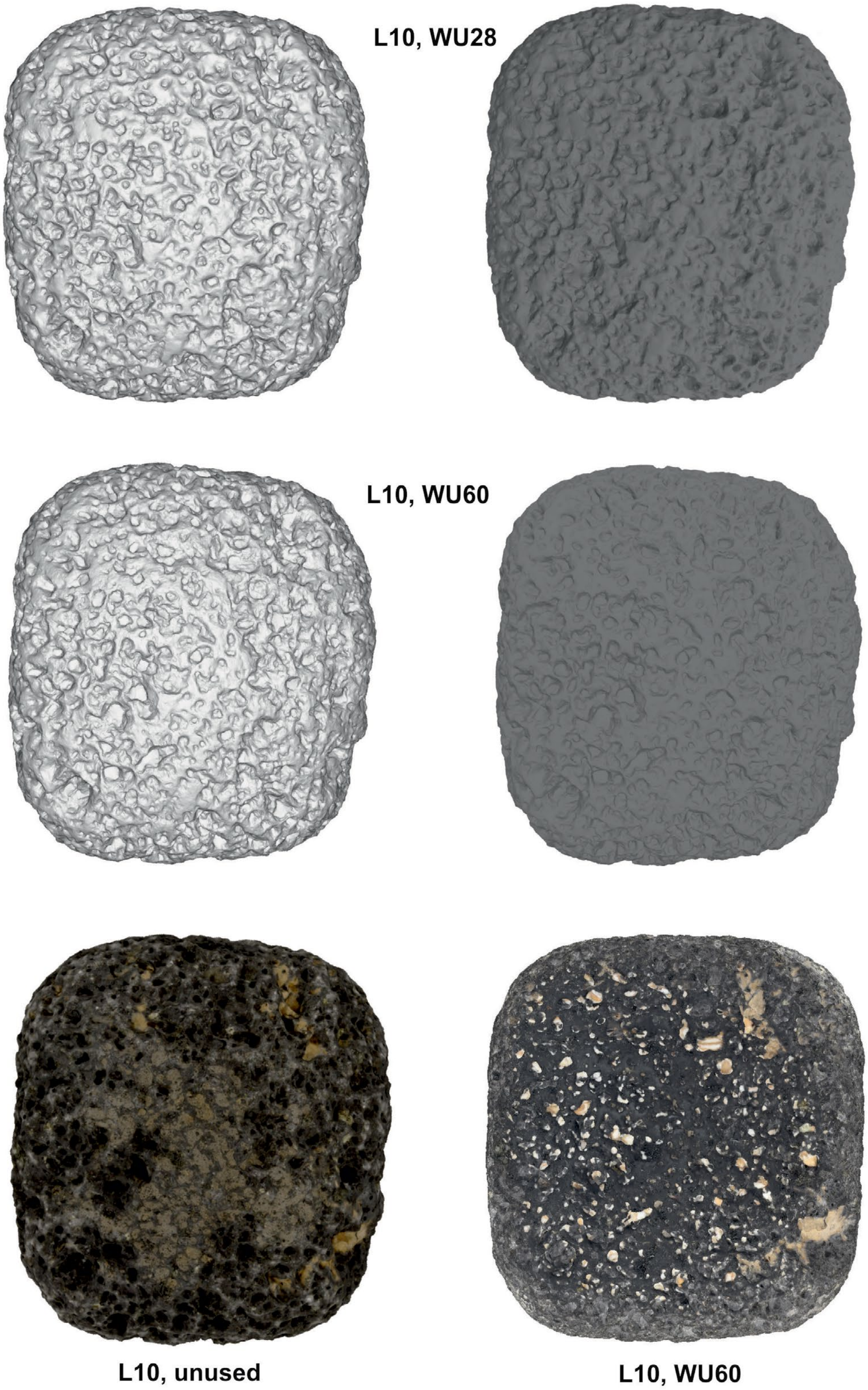


FIGURE 3.9. 3D-models of L10 (©Laura Dietrich).

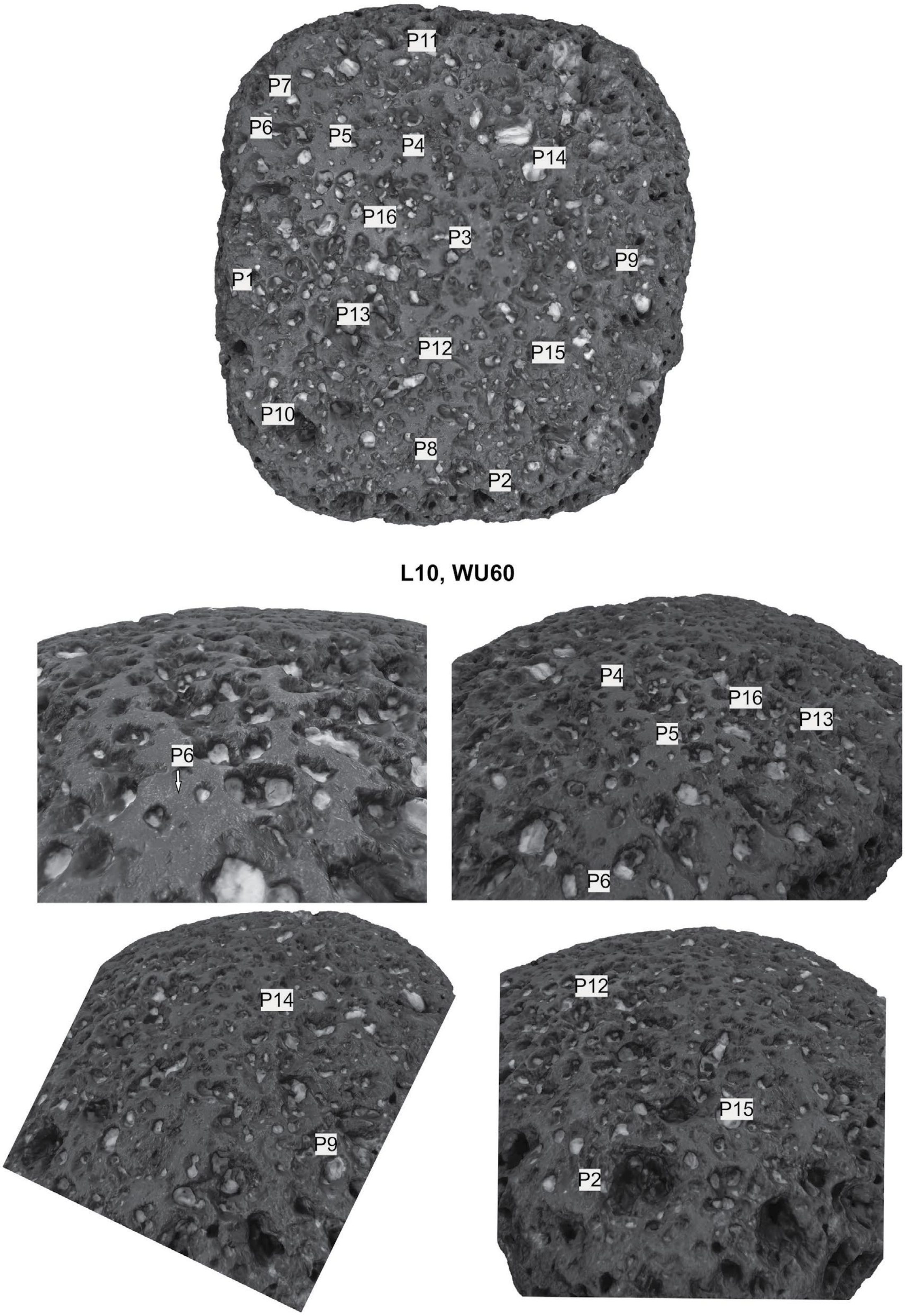


FIGURE 3.10. 3D-model of L10 with the microscopically analyzed spots marked (©Laura Dietrich).

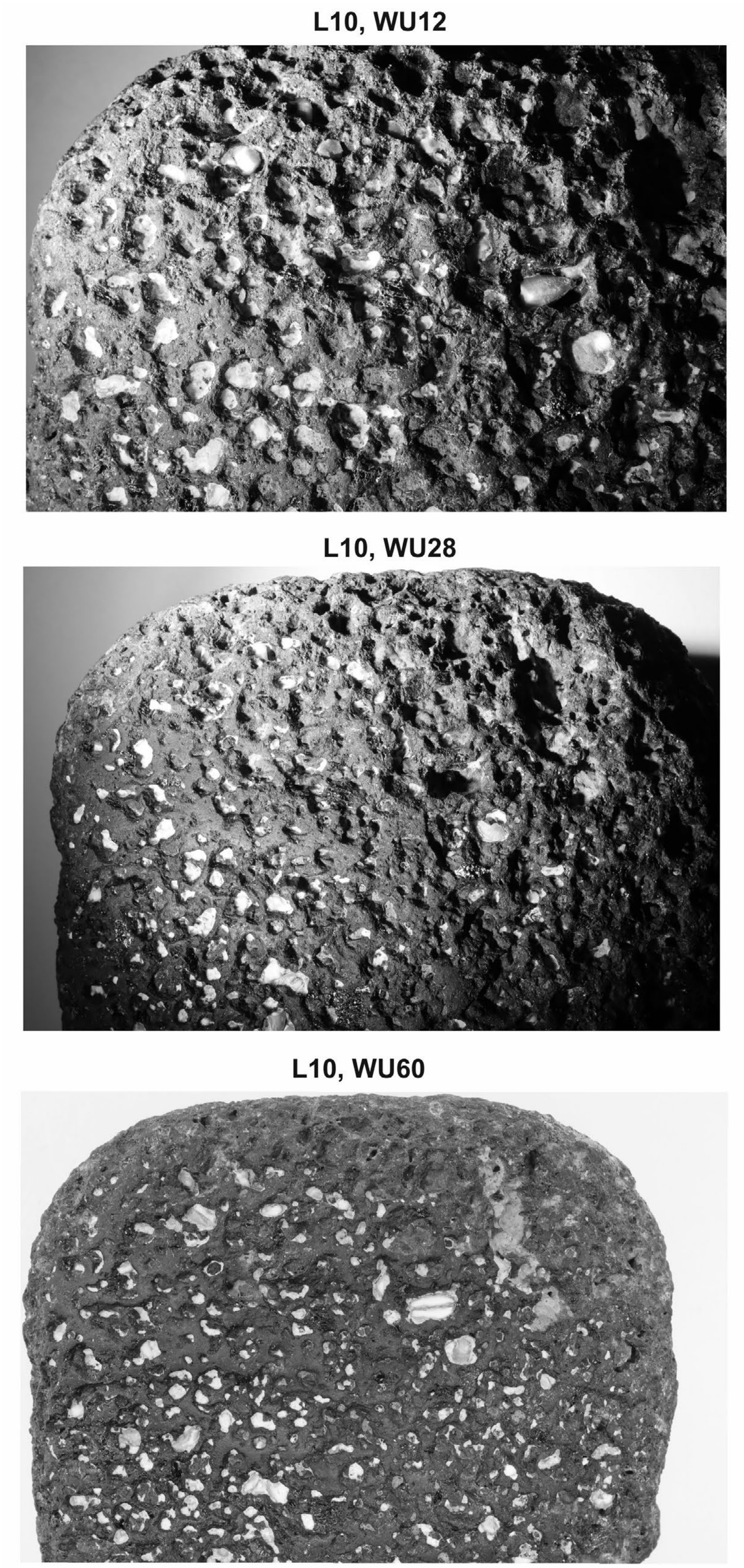


FIGURE 3.11. Macrophotos of L10 (working face) (©Laura Dietrich).

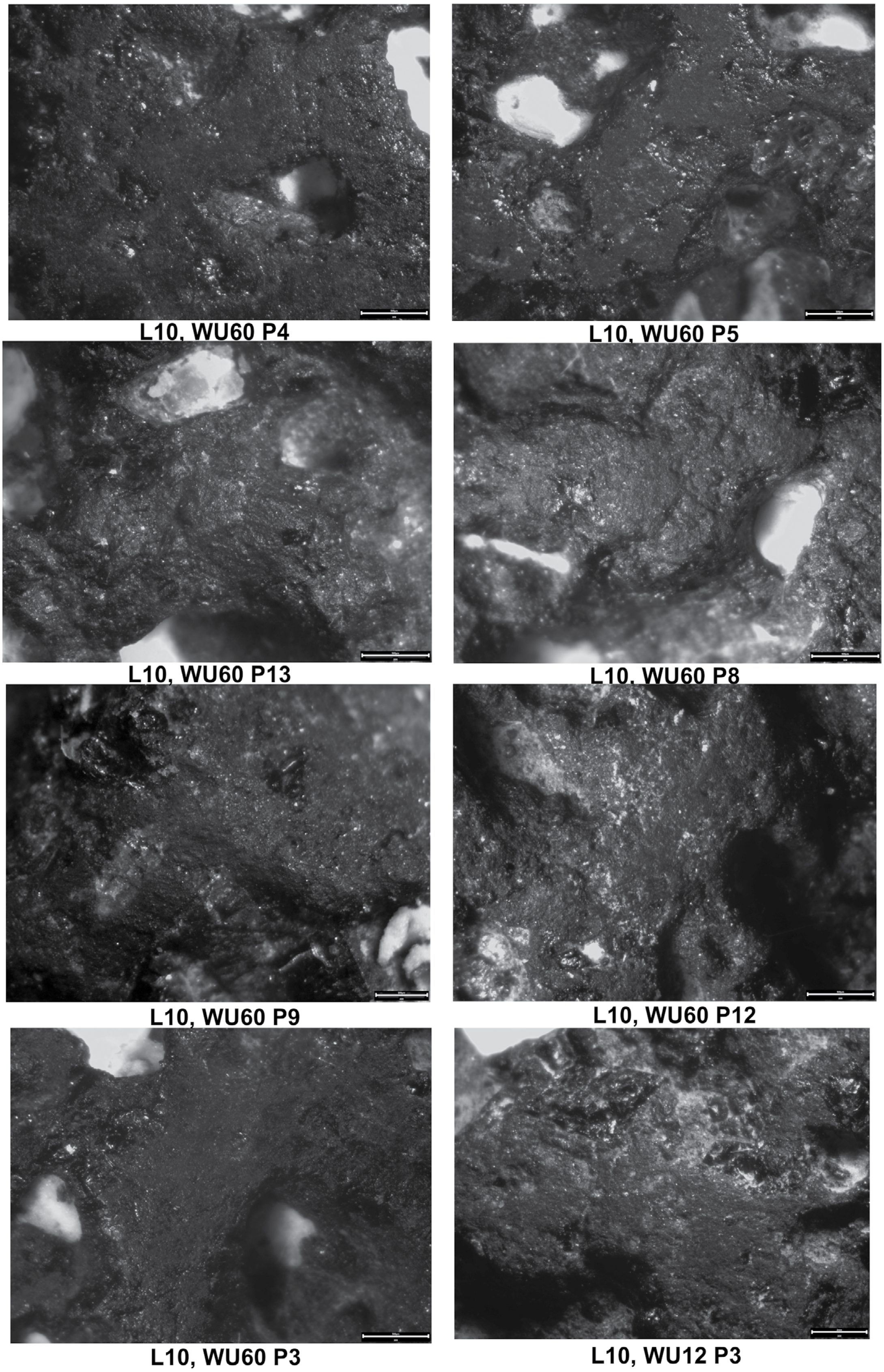


FIGURE 3.12 Microphotos of L10 (working face) (©Laura Dietrich).

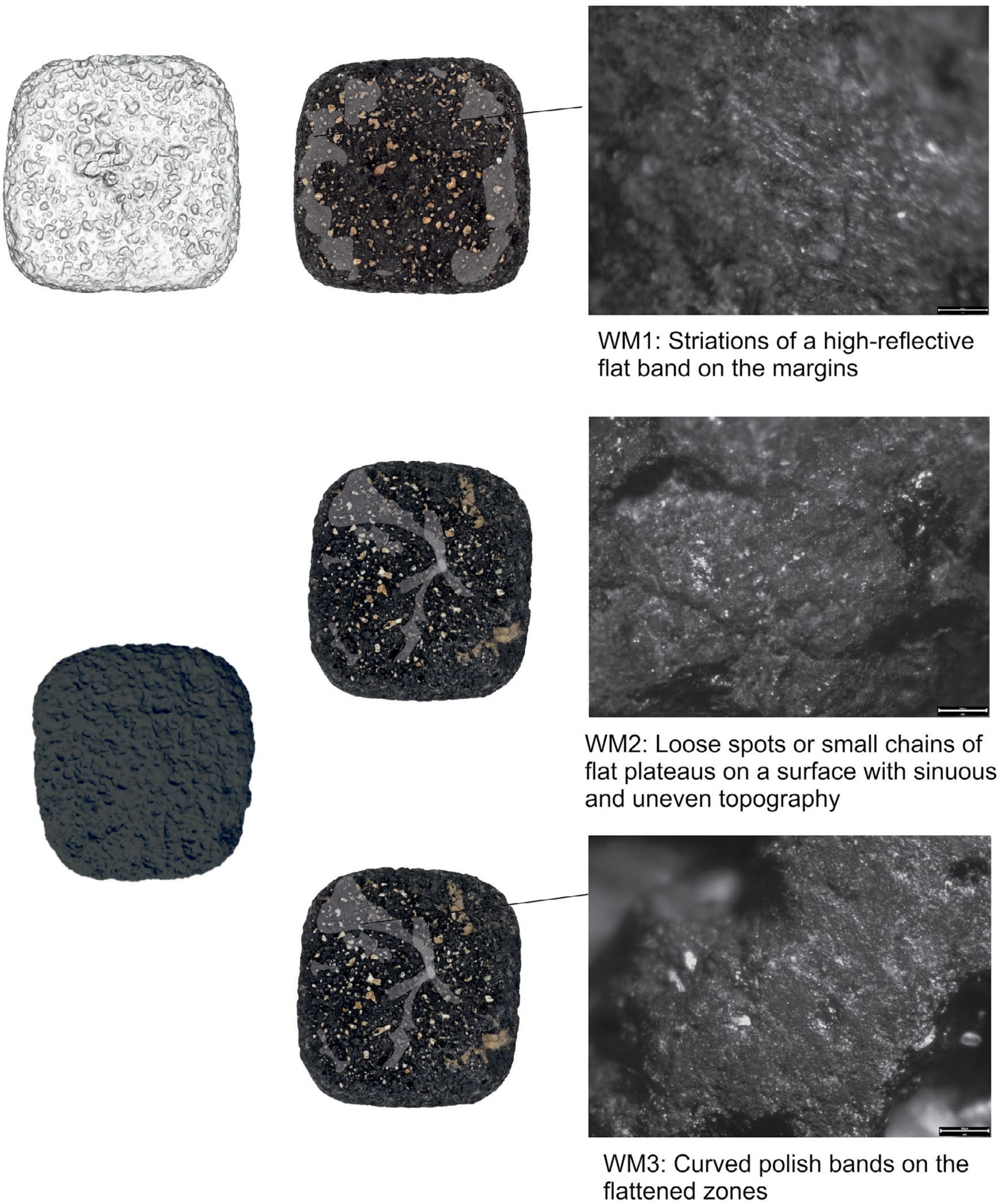


FIGURE 3.13. Wear-markers (WM) 1, 2 and 3 formed during EP1 (©Laura Dietrich).

microscopically investigated and documented in the appendices TABLES 3.1a-3.1d and FIGURES 3.4-3.13. For each stage of work (event) (measured as described in TABLES 3.3 and 3.4) the object was 3D-modeled to observe the transformation of the shapes.

EP1a: Handstone L13. The deformations on the margins and center of replica L13 after performing one, three, seven, 15 and 31 WU were observed. The most easily visible wear marker is a flat zone which forms as a result of higher pressure on the margins (FIGURES 3.4-3.7; 4.11, 4-12, 4.15, 4.17; database with images on the progress of wear in preparation). Small, loose zones with flat profiles formed immediately after one WU on the edges and on the margins through the breakage of the highest peaks of the high topography and their subsequent flattening through grinding of stone on stone. A small part of the surface, especially on the corners, broke away. The corners were the highest eroded parts of the handstones, showing elongated flat zones. Most probably the explanation for this erosion pattern is the specific form of the handstone, its pillow-shape, which leaves the corners exposed to the highest pressure. Flat zones were also observed in the middle of the handstone but they were smaller and largely disconnected. The more grains were ground (WU2-7, then WU8-15 and WU16-31), the more zones became flat and very smooth on the edges and margins; also, on some of them reflective polish formed (FIGURES 3.6; 4.15). After seven WU, the margins and edges were covered by a relatively connected, irregular wear band, marked in FIGURE 4.12 with blue color on the surface and detected through tactile investigations. The band became wider after 15 and 31 WU. The center was partially flattened but these zones felt less smooth when touched with the fingers. Also, they were less shiny and show another use-pattern (appendices TABLES 3.1a-b).

The mixed flat, sinuous, and rugged topography changed to flat and regular already after three WU (FIGURES 3.4-3.7; appendices TABLE 3.1a). Simultaneously, new small "unused" surfaces occurred through the erosion of the high topography. It was obvious that the density of the linear traces grows with the volume of work. Interestingly, the parallel traces changed to mostly erratic at the end of work even if the motion remained the same. Observations at high magnifications (40x-100x) revealed the existence of parallel, moderate to highly reflective striations already after one WU (FIGURE 4.15/9). They were covering most of the surface in a network-like manner at the end of work (FIGURE 4.15/10-11). These striations do not occur in the center of the handstone, and also not on the handstones used for the production of coarse flour (FIGURE 4.15/5-8). Thus, they can be defined as a wear marker (WM) 1 for the production of fine flour in combination with the appearance of a flat zone surrounding the margins (FIGURES 3.7; 3.13; 4.12). The experiments indicate their formation through moving the handstone on a very thin layer of flour with high pressure and by incidental contact with the netherstone.

The center of the handstone changed its topography more slowly. The topography here was mixed, flat, sinuous, and rugged, and it felt partially rough; it remained structurally largely unchanged after seven WU, even if the surfaces were partially eroded (FIGURE 4.14/10). At the end of work, the erosion and the flattening of the surface were predominant on the backside of the handstone's surface (FIGURE 4.12. marked with red color); the frontside's topography changed less. Gouges and pits formed also in the center, but with far reduced density compared to the margins. Also, the gouges showed an erratic orientation from the first work unit onwards. Moderately reflective polish was observed mainly on the gouges and on the high topography. Striations were not observed.

EP1b: Handstone L10. The deformations on the margins and center of replica L13 after performing four, 12, 28 and 60 WU were observed (appendices TABLES 3.1c-d). The surface deformation does not present a flattened topography on the margins and has no striation patterns (FIGURES 3.8-3.12; 4.14/5-8, 11-12). The experiments show that the production of coarse flour does not require high pressure. A thick layer of whole grains and coarse crushed grains constantly remained between the active and passive tool and there was nearly no direct contact between the stones.

WM1	Connected highly reflective striations covering chains of plateaus on the margins on handstones (types 1 and 2).
WM2	Connected chains of flattened spots with sinuous or flat profiles in center and center-extended on handstones.
WM3	Moderate reflective curbed or round gouges on handstones.
WM4	Scar marks.
WM5	Red residues (ochre).
WM6	Breakage on the margins of depression E6 (short boulders).
WM7	Scar marks on the margins of the hollowed boulders (HB).
WM8	Triangular scar marks.
WM9	Black residues (bitumen?).
WM10	Moderate reflective, blackish polish.
WM11	Highly reflective, blackish polish.

TABLE 3.6. Wear-markers defined on originals and replicas.

The disposition of wear is different from L13 (FIGURE 4.16). Smooth chains of sinuous profile formed radially beginning in the center as observed after 12WU (FIGURES 3.8, 3.9, 3.13); after 28 WU these zones became visibly flatter as shown in appendices TABLE 3.1c and after 60 WU they had regularly flat profiles and a moderate polish. In the zones corresponding with the place where the forefinger rests – i.e. where the pressure is higher - the chain is more developed, but, obviously, the deformation is concentrated more in the center and center-extended. The combination between small spots or chains of flat plateaus and sinuous and uneven topography can be defined as WM 2.

The strikingly weak presence of flattened zones on the backside of the handstone is an important difference from handstone L13 as well as the absence of the flattened band surrounding the margins.

Microscopic analyses (FIGURES 3.10, 3.12 reveal the mixed formation of flat plateaus and sinuous and irregular single peaks in the chains (TABLE 3.1d). Long and short erratic gouges, either straight or curved and curved polish formation are typical use wear and appear on all flat plateaus, either in the center or on the margin-extended zone (FIGURES 3.10-3.13). Curved gouges and polish formation were not observed for handstone L13 so this can be defined as WM 3.

Other wear markers observed on the original finds (TABLE 3.6) did not occur during EP1.

Experimental program 2 (EP2) comprising the production of handstones will not be described here in detail as this constitutes the topic of a MA thesis (Nils Schäkel, Freie Universität Berlin). The core of the program was the production of replicas of handstones of the most frequent type found at Göbekli Tepe (type 1, chapter 4) by pecking with basalt or quartz tools.

Experimental program 3 (EP3) was designed to analyze the haptic and handling of pestles on short boulders with specific depressions (mortars) in order to determine their possible functions. Also the efficiency of the most frequent type of pestle (chapter 5, type 1) for the processing of different food stuffs was tested. The functional studies are based in this case on shape and efficiency determinations as for 90% of the pestles from Göbekli Tepe the working faces are missing. The program consists of four small experiments:

In *experiment 3a* (of four working units of 30min each), lentils were wet ground to paste with pestle P1. Wet grinding is attested ethnographically (footage archive of Wilderness Films India Ltd on Youtube) and is very effective in comparison with dry grinding as lentils are small, hard and slippery (compare the results in chapter 5). A hand full of lentils was put in the depression, and water was added progressively (another possibility is to grind previously soaked lentils). This work is not challenging at all. Quite rapidly a paste (which can be eaten raw or boiled) forms. Lentils are not well attested between the few macrorests at Göbekli Tepe (Neef 2003) but were widely used in the region during the Neolithic (Scheibner 2015: 112, Tab. 2.4). Also wicken was probably consumed as sediment analyses suggests (L. Dietrich *et al.* 2020a, and chapter 7). Although it is still not entirely clear how pulses were consumed, use-wear analyses at other Neolithic sites suggest their processing through grinding (Bofill 2012; Dubreuil 2002). WM 2 formed on the bottom both of the active and passive tool parts. In this stage of work (short time experiments) it would be difficult to differentiate between the wet processing of legumes and the dry processing of cereals. EP3a was thus designed as long-time experiment (work in progress).

In *experiment 3b* (of two working units of 30min each) mustard seeds were pounded and ground to fine particles (dry grinding) and to a paste (wet grinding) with pestle P2. Mustard is attested at Göbekli Tepe in sediment samples (L. Dietrich *et al.* 2020a) and at other contemporary sites from the region. At Jerf el Ahmar two lumps ("cakes") made of mustard seeds were found, attesting crushing (Willcox and Stordeur 2012). As expected, wet grinding was much more effective than dry grinding (compare the results in chapter 5). EP3b was designed as long-time experiment (work in progress).

In *experiment 3c* (two working units of 30min each) herbs (mugwort) were pounded with pestle P3 on short boulders with depressions in fresh and dried condition. Artemisia vulgaris is attested at Göbekli Tepe (L. Dietrich *et al.* 2020a) and can be used as aromatic herb or main ingredient for liquid meals, it can be cooked as vegetable or it can be used as a bitter flavoring agent for beer. The pounding work was overall very difficult because of the hardness of the plant. Probably, cutting tools were used or the plant was consumed whole as condiment in porridges or beer (L. Dietrich *et al.* 2020a).

In *experiment 3d* (one working unit of 30min) tubers from phragmites have been pounded to fine flour with pestle P4 on a netherstone of type 1 (large boulder, see chapter 6). The use of fine ground tubers containing starch in combination with cereals for the preparation of bread-like products has been indicated by large quantities of charred food remains in some Epipalaeolithic sites (Arranz-Oetagui *et al.* 2018) but is not evidenced at Göbekli Tepe. Thus, experiment 4 was completely explorative and will be continued as a long-time experiment.

Experimental program 4 (EP4) was designed to observe the long-time deformation both of handstones of and netherstones by pendular and circular motions. As the wear processes on basalt can take very long, even decades (Hayden 1987), salt blocks were chosen to simulate the wear using sand as grinding material. In all cases the initial working faces were straight and flat. The use of salt blocks to analyze the configuration of the working faces by grinding stones for both active and passive parts has been previously tested in archaeological use-wear research (Stroulia *et al.* 2017).

In experiment *EP4a* a handstone of type 1 was moved exclusively with pendular motions on one of the netherstones and in experiment *E4b* another handstone of the same type was moved exclusively with circular motions for 22 WU of 30min each. The progression of the deformation was photographically and photogrammetrically documented in different stages of use, the results are discussed in chapters 4 and 6 as they are closely linked to the shape of the original finds.

Experimental program 5 (EP5) had the aim to test the suitability of large stone troughs for cooking, as previous studies interpreted these implements as vats for the fermentation of beer (O. Dietrich *et al.* 2012). Measuring of the functional capacity is an additional approach to functional studies on artefacts.

Together with a small team we tested the possibility of using large troughs as tools for cooking porridge and brewing beer with heating stones as both possibilities were indicated by chemical analyses (L. Dietrich *et al.* 2020a). Two experiments were performed with a replica of a trough following the shape of ST6 (chapter 7). In comparison to the original the replica was smaller, with a capacity of 30l. This is the lowest limit of the capacities of the preserved stone troughs from Göbekli Tepe (chapter 7).

For practical reasons we combined the experiments by using malted Einkorn to boil porridge in a first step; this was then separated into grains and liquid and subsequently fermented to beer. No other ingredients were added, and the Einkorn malt was not previously soaked but only coarsely ground. Malting includes wet treatment which possibly weakens resistance during thermal processing and shortens the cooking time. As previous soaking with similar effects can be presumed for prehistoric operational chains, we did not consider this difference to essentially affect our experiment and results. Beer can be made in various ways and with various ingredients (Narziß *et al.* 2017). Hayden (*et al.* 2013) as well as Rosenstock and Scheibner (2018) have described the processes in detail based on prehistoric and ethnographic evidence. We chose the simplest procedure, which includes (previous) malting of Einkorn, its coarse crushing, heating in water, mashing, lautering and fermenting without added yeast and hops. The ratio of 1:5 of malt and water was chosen in accordance with modern standards of beer brewing. Of course, in the case of porridge, the quantity of water is variable; however, it could be observed that by using this method of cooking, more water in relation to grains would avoid loss due to adhesion to the cooking stones. The whole process of cooking to porridge/beer was perceived as easy to perform and practicable with a small team of 2-4 people even with inexperienced participants. It takes one work day (8 hours) to coarsely grind 4kg of malt and to boil it to porridge in 20l of water, and another 5 days until the leftover liquid (11l) will ferment to a beer-like beverage with a low concentration of alcohol of 2%. The heating stones of limestone or basalt were transferred with wooden spoons; other tools like the aforementioned onager scapulae would have also worked. A total of 33 basalt and 96 limestone heating units were used experimentally, but around 10 constantly reheated stones would have sufficed. Extrapolating the data, it would need 78 heating units for a container of 70l and 182 heating units for the largest container of 165l in the same period of time; much less during higher outdoor temperatures. 9.4kg of Einkorn malt or cereals could have been cooked in a 70l trough or 22kg in the 165l trough. As the experiments showed, cooking at higher temperatures (up to 90°C) can be easily achieved by introducing more heating units. All cooking stones were heavily burnt. The heating treatment leaves obvious traces on limestone, which immediately becomes uniformly black. Traces on basalt are much less visible. The latter can thus be easily overlooked during excavations, especially when other fire traces or fire installations are largely absent in the archaeological record, as is the case at Göbekli Tepe. However, a solid crust of burned Einkorn immediately formed on the stone surface (Heiss 2020) and remained stuck even after further immersing in water. The surface of the stone trough showed no deformation after three heating events with a duration of 2:30 hours each. However, some of the factors impacting the vessels from archaeological contexts could not be simulated in the experiments: constant heating and cooling events over a long period of time, heating in wet weather conditions, and post-depositional effects like dislocation as part of erosion processes.

The temperature was maintained by adding or removing heating units and constantly checking with a thermometer; traditional brewers would have either used the reflective properties of the water (Hayden *et al.* 2013) or counted the heating units or tested with a finger. Lautering resulted in 11l of wort. Thus, through the cooking process with heating stones and liquid absorption approximately one third of the liquid was lost. Extrapolating for larger troughs, quantities of 25l respectively 60l of beer could be calculated.

Characterization of rock textures

Geological determinations are important in functional studies because the formation of wear depends partly on the characteristics of the rocks of them the tools are made (Adams *et al.* 2009). At Göbekli Tepe, extensive geological analyses have not been carried out. Thus a description of the materials was made exclusively as part of the grinding stone project.

With few exceptions (of lime) all Neolithic grinding stones are made of more or less coarse pored basalt lavas and rhyolites of hardness 7-8 Mohs, visually of the same types with the basalt outcrops from the basalt field near to the site (survey: Devrim Sönmez 2015). There are no petrographic studies; the determination of both tools and outcrops was made macroscopically. Several samples (photographs) were determined by two geologists: Dr. Angela Ehling, Bundesanstalt für Geowissenschaften und Rohstoffe, Berlin and Karl-Heinz Schumacher, Geographisches Institut Aachen, regarding their properties (porosity and hardness). They guided me to a source of similar basalt lavas from Western Germany to produce the replicas.

Residue analyses and macrorests

Phytolith analyses (Julia Meister) were conducted both on sediment and directly on four grinding stones. The results of the phytolith analyses are published (L. Dietrich *et al.* 2019). The phytoliths attest the massive presence of Pooids, including Triticum sp. and Hordeum sp. at the site, both in the sediment samples and in samples taken directly from the surface of the grinding stones (see chapter 4). Their concentrations are higher in wet-brushed stone surface samples, most probably because the sediment extracted from the pores of the grinding stones contains old phytolith assemblages, and on the working faces of the grinding stones (L. Dietrich *et al.* 2019). Thus there is a high possibility that, at least partly, phytolith residues represent the use and not post-depositional contamination, although they are not a secure indicator for food.

Starch analyses (Marco Ulbrich) were performed optically and chemically to determine the presence of starch granules and polymers on three samples: two scratch samples from the bottom of ST 6 and one sample from its content (chapter 7). Both the optical and the chemical examination through gas-chromatography (L. Dietrich *et al.* 2020a) show that starch is not preserved in these samples.

Biomarker analyses (Patrick McGovern, Gretchen R. Hall, W. Christian Petersen, Martin Zarnkow, Mathias Hutzler, Fritz Jacob, Jasmine Herzog, in L. Dietrich *et al.* 2020a) were conducted on sediment samples through Fourier Transform Ion Cyclotron Resonance Mass Spectrometry and Gas Chromatography-Mass Spectrometry (GC-MS). The results are presented in L. Dietrich *et al.* 2020a and in chapter 7.

Macrorests as indicators of possible food sources

Archaeobotanical and archaeozoological studies were previously carried out at the site. Like stated before (L. Dietrich *et al.* 2019; Neef 2003) the preservation of charred botanical rests is not good at the site in the contexts analyzed. Previous analysis of macrobotanical remains by R. Neef indicate the presence of wild einkorn (Triticum cf. boeticum/urartu), wild barley (Hordeum cf. spontaneum) and possibly wild wheat/rye (Triticum/Secale), lentils (lens) as well as almonds (Prunus sp.) and pistachio (Pistacia sp.) at Göbekli Tepe (Neef 2003), the same study points out that only a conspicuously low amount of carbonized plant remains has been recovered, both in handpicked and in flotation samples. The poor preservation was explained by the large-scale relocation of the sediments the samples were taken from (see below), which would have had a negative impact on the fragile plant remains (Neef 2003). They therefore cannot be used to estimate the intensity of plant processing on site. Also, there is no direct evidence for their processing through grinding as known from other sites (for example: Gónzales Carretero *et al.* 2017; Willcox and Stordeur 2012).

As for the animal bones, gazelle and aurochs were found in large quantities (Lang et al. 2013) attesting the extensive consumption of hunted animals at the site, as expected for the period and region. The processing of meat with pounding and grinding stones is ethnographically attested (Adams *et al.* 2002) and assumed for several Epipalaeolithic and Neolithic sites of the region (Bofill *et al.* 2012; Dubreuil 2002).

Chapter 4

Handstones

Summary

Handstones appear in variable shapes and sizes at the site but the largest part is standardized: one-handed, palm-sized, oval to subrectangular with an average weight of approximately 800 g (FIGURE 4.1). As functional and experimental studies show, most handstones at Göbekli Tepe were used for the processing of cereals either to coarse or to fine flour, although coarse flour prevails. The processing of ochre is rare and limited to specific types and early contexts. The processing of other foodstuff like meat and drupes with handstones is attested only for a few artefacts. This chapter presents the find analysis in detail with an emphasis on the classification into "types" and optical and haptic investigation of shapes and surfaces. Also, contextual data are discussed.

Database

3357 handstones are recorded in the project database (1995-2014) with specifications on find contexts, dimensions and with sketches. Of them, 1102 were re-documented. The analytical methods applied are quantified in TABLE 4.1.

Classification of shapes (used stage)

Previous classification systems of handstones are based either on shapes (Mazurowski 1997), on shapes and sections (Wright 1992; Bofill 2015), or on a combination of both to account for functional and stylistic significance (Davis 1982). In some classification systems, the shapes and modification of surfaces were linked to kinetics (Adams 2002; Bofill 2015; Mazurowski 1997; Nierlé 2008). Other systems have stressed the chronological significance of some features, like lentil-shaped sections of handstones as a later PPNB feature, resulting from prolonged bidirectional instead of circular abrasion (Shea 2013).

The concept of "functional types" (Steward 1954) seems suitable for the classification of the active parts of the grinding gear. Thus, the following shape variables were chosen and used to define "types": shape in topview, sections, size and weight. All variables are determining for the kinetics and deformation through use. The major difficulty is to distinguish between production and wear types. Although this differentiation cannot be clearly made in each case, data of the experimental program (EP4) were used to complete this information. Shapes define the handling, while sections, sizes and weights are determining factors for motions and thus surface transformations during work processes. Handling and motions define the degree of efficiency and productivity. The outlines are not the main defining variables for types, different from formerly proposed typologies. A total of ten types of handstones can be differentiated, within the sample of 1169 finds which were analyzed regarding form and use-wear (FIGURE 4.2, TABLE 4.2).

Manufacture and classification of shapes (unused stage)

The actual shape of some types is a result both of preform and change through use. Types 1, 2, 6, 7 and 8 have different sections. Handstones of these types can be used with one hand. Types 1 and 2 are most frequent at Göbekli Tepe and give the most complete information on the *chaîne opératoire* and the changes in form occurring during use. The blanks lying today on the basalt field are considerably thicker and heavier than the artefacts found on site (TABLE 4.3). Most of the blanks have natural oval to round shapes with similar lengths compared to the artefacts or are longer (TABLE 4.3 and personal observation on the basalt field). The differences are more obvious

Own documentation (handling, kinetic, tactile, macroscopical, shape analyses, size).	1169/1102 (tactile)
Photogrammetry	100
Microscopic analyses (10x-160x magnification)	73
Phytoliths	10
Find contexts	3328
Analysis based on database and old documentation	3328

TABLE 4.1. Documentation of the handstones.

in the center, which is sometimes nearly double as thick as the margins, resulting in a pronounced convex section.

First, the basalt blanks were reduced by pecking to the actual tool form as pecking traces on some artefacts (nr. 96_003151) indicate. Preform nr. 97_000291, which is naturally rounded, shows scars and pecking negatives on the surface. In this case the future working face was levelled and the center of the blank was reduced in order to produce a handstone of type 1. Levelling of the working face was necessary to increase the grinding surface and to secure a better handling of the handstones. However, the degree of the reduction and the initial convexity cannot be determined in individual cases. The database does not include enough pieces to calculate the "standardization" of the naturally occurring blanks. Experiments with the blanks observed on the field have shown that grinding with objects of a thickness bigger than 5cm and with convex working faces would be difficult. Thus, it can be concluded that most probably the original (unused) forms were not thicker than 5cm, and that the initial shapes would have had a relatively symmetrical cross-section. A maximum of wear reduction of 1.5cm can thus to be assumed considering the actual medium thickness of the used objects (see below). However, the reduction is not calculable for single objects and is only given as a general orientation here. The presence of oval handstones of similar shapes

FIGURE 4.1. Handstones from Göbekli Tepe (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0001.

Type 1 PLATES 4.1-4.8	Oval to subrectangular in topview; square or oval sections and almost symmetrically high sides; one-handed, medium sized, palm large, permitting handling with the fingers spread around the handstones both with circular-oval as with bidirectional-pendulum-like motions; weights up to 955 g in used stage. 484 finds redocumented; from project database a total number of 718 finds emerges but some finds could not be verified.
Type 2 PLATES 4.8-4.13	Oval to subrectangular in topview; wedge-shaped in section with asymmetrically high sides; one-handed, medium-sized, palm-large, permitting handling with the fingers spread around the handstones both with circular-oval as with bidirectional-pendulum-like motions; weights up to 866 g. 255 finds redocumented; from project database a total number of 301 finds emerges but some finds could not be verified.
Type 3	Elongated subrectangular in topview, pillow- to wedge-shaped sections; two-handed, small sized, permitting handling with the fingers opposite to the thumbs on the long sides with bidirectional-pendulum-like motions; weights up to 685 g. 4 finds redocumented; from project database a total number of 9 finds emerges but some finds could not be verified.
Type 4	Broad and oval in topview and in section; two-handed, large-sized, permitting handling with both palms on one side and all fingers pointing forward holding the stone; weights up to 2390 g. 17 finds redocumented; from project database a total number of 19 finds emerges but some finds could not be verified.
Type 5 PLATE 4.14	Small, round, ball-shaped; one-handed, small sized, permitting handling in clasped hand with circular, short bidirectional or vertical motions; weights up to 294 g. 5 finds re-documented.
Type 6 PLATE 4.14	Elongated-ovaloid in topview, D-shaped to triangular in section; two-handed, medium-sized permitting handling with both palms on one side and all fingers pointing forward holding the stone; 123 finds redocumented; from project database a total number of 175 finds emerges but some finds could not be verified.
Type 7	Oval in topview, round in section; One-handed, permitting handling with the fingers spread around the handstones with circular motions (but the working area is small); weights up to 1367g. 18 finds redocumented; from project database a total number of 27 finds emerges but some finds could not be verified.
Type 8	Oval in topview, lentil-shaped in section; one-handed, permitting handling with the fingers spread around the handstones with circular motions (but the working area is small). 16 finds re-documented; from project database a total number of 21 finds emerges but some finds could not be verified.
Type 9 PLATE 4.14	Irregular shape and section. 24 finds.
Type 10 PLATE 4.12-4.14	Broad-oval in topview, flat-oval in section; two-handed, large-sized, permitting handling with both palms on one side and all fingers pointing forward holding the stone; weights up to 4096g. 53 finds redocumented.
Not classifiable due to object preservation	127 finds
Preforms, roughouts, miniatures	43 finds

TABLE 4.2. Typology of the handstones from Göbekli Tepe (compare FIGURES 4.1 and 4.2).

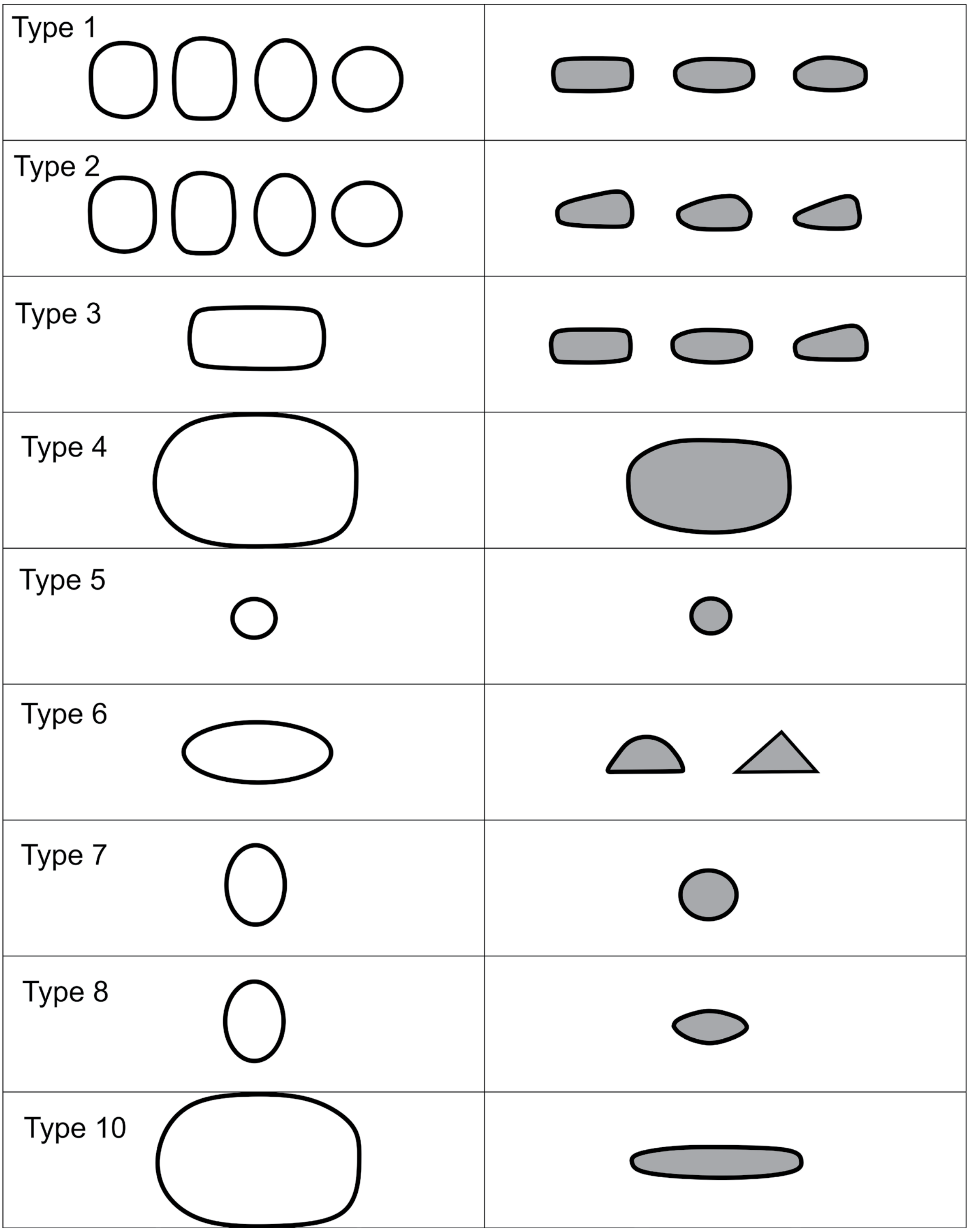


FIGURE 4.2. Typology of the handstones from Göbekli Tepe. Schematic depiction of shapes (white) and profiles (grey) (©Laura Dietrich).

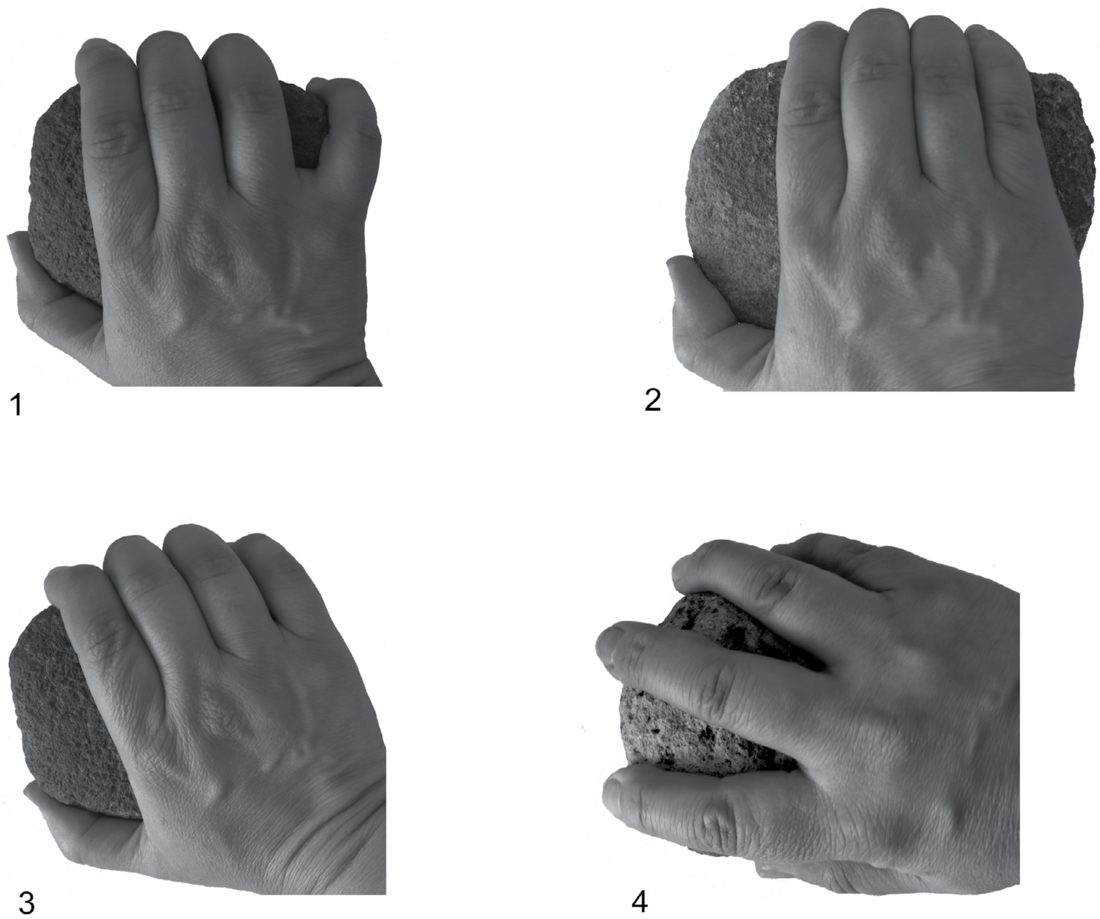


FIGURE 4.3. Handling the originals: examples of haptic possibilities (©German Archaeological Institute, Photo Laura Dietrich).

as the naturally occurring blanks suggests that the manufacturing process in this case comprised only the reduction of the center.

Another question is if the initial manufacturing included shaping of the corners or also of the sides for subrectangular handstones and to what degree this specific shape, which does not occur naturally, was changed through use. Some finds (e.g. nr. 98_002662) show shaping of the corners and the narrow sides while others show complete shaping with levelling of the small sides (nr. 18_000139, 00_000028). Pecking traces were observed on nr. 96_003151. Obviously, this specific subrectangular shape was intended, most probably because it provides a better haptic and a larger working face both for grinding with circular-oval and bidirectional motions (chapter 3 EP1). As observed during EP1 (chapter 3) and by testing with the originals, this specific shape can be handled best by putting all four fingers on one of the longer lateral sides and placing the thumb slightly curved on the corner (FIGURE 4.3/1) with the hand perpendicular on the longer sides while for oval shapes the hand rests in an oblique position (FIGURE 4.3/3).

Thus, most probably the initial unused shape of these handstones was subrectangular with a relatively flat working face. The other face (where the hand rests) could have been slightly convex, like the preserved objects show (in case they are not used on both faces or sintered).

It remains questionable to what degree the corners were formed (rounded) through wear during grinding and how much they changed in comparison to the initial shape. EP 1 (chapter 3) proofs slight erosion of the corners by grinding with bidirectional-pendular motions, but the experimental grinding was carried out on a netherstone with an only slightly deepened depression. Bidirectional-pendular grinding with salt blocks in a deeper depression (chapter 6: depression E4) led to substantial erosion of the handstones surface, but would not contribute essentially to the

FIGURE 4.4. Boulder in the basalt field (©Laura Dietrich).

FIGURE 4.5. Boulders in the basalt field (©Laura Dietrich).

FIGURE 4.6. Possible fragments from the production process from the excavations (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0004.

rounding of corners as EP5 showed (FIGURE 4.7 right). With circular and oval motions the rounding is more pronounced but the form remains subrectangular with contoured corners. Thus, it can be concluded that despite of erosion and some breakage at the corners the shape in top-view did not essentially change. Most probably, the manufacture included complete shaping and levelling of the working face, and the initial shape was similar but thicker. A certain degree of functional standardization in the manufacture can be supposed.

As for type 2, the estimation of its initial shape is more difficult. EP 5 with salt blocks has indicated how the progression of the deformation resulting from bidirectional motions is evolving. For flat netherstones, the side pressed with the back of the hand (T and H, see chapter 3) would flatten much faster than the opposite side, that becomes a "facet" (FIGURE 4.7 left). Working in an already deepened boulder would lead to exactly the opposite deformation (FIGURE 4.7 right). In this case the highest pressure is put on the front side which permanently gets in contact with the front wall of the netherstone's depression. Here, the profile becomes triangular or rounded. However, in both cases one of the sides is more worn than the other. Both facetted and triangular-rounded or trapezoidal profiles are attested at Göbekli Tepe (FIGURE 4.7 below). However, not all handstones with triangular-rounded or trapezoidal profiles also show flattening of the surface on the thinner side, implying the possibility that some of these handstone shapes are not a result of wear, but of initial shaping. The latter could have been easily achieved by shortening of the already existing triangular blanks (TABLE 4.3) without further transformations. The transformation of the shapes between original and worn pieces cannot be followed in each case for the handstones of type 2.

A last question regards the possibility of manufacturing handstones of types 1 and 2 from larger, irregular boulders or from broken netherstones. There is a large selection of up to head-sized, irregular boulders on the basalt field (FIGURES 4.4, 4.5, 4.8) as well as a broad spectrum of possible fragments from the production process (FIGURE 4.6). The experiments (EP2) indicate that manufacturing would not take more than 1.5 hours, which is not very much taken into account the

FIGURE 4.7. Original handstones and comparison between wear progression on salt blocks after 18 respectively 22 WU and profiles of the handstones at Göbekli Tepe (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich). D-DAI-IST-GT18-LD-0005-0007.

FIGURE 4.8. Blanks for handstones of type 6 (© German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0008.

general effort invested in buildings and other technical processes at Göbekli Tepe. Although there is no direct evidence for this technological chain, these possibilities have to be considered.
There is limited information on the production of other handstone types. Clearly, the round handstones of type 5 were preformed through pecking as all of them have similar dimensions. The shape was not further transformed through grinding. Both of the large types 4 and 10 seem to represent natural boulders of similar shapes as those still lying today on the basalt field. Also in the case of type 6, which represents a more heterogenic group of longer and shorter handstones with D-shaped and triangular profiles, the use of unshaped cobbles as blanks has to be considered (FIGURE 4.8). In this specific case the initial shape and its transformation cannot be followed in detail as the cobbles have irregular shapes. Usually, one of the surfaces would be flattened through use but its initial shape and the degree of deformation cannot be estimated anymore.

Year/ Survey Area	Measurements	Description
2016 Area 14 N	2509 g 16/11/8 cm	Oval blank.
2016 Area 15 N	747 g 10/6 cm	Blank with a flat surface and triangular section.
2016 Area 12 M	1333 g 12/9,5/8 cm	Oval blank.
2016 Area 10 O	374 g 7,5/7,5/5 cm	Small round blank.
2016 Area 13 M	735 g 12,5/7/6 cm	Long oval blank.
2016 Area 12 M	1059 g 9,5/9/7 cm	Oval irregular blank with two flattened sides.
2016 Area 9K	926 g 9,5/8/7 cm	Oval irregular blank with one flattened side.

TABLE 4.3. Blanks collected during the survey of the basalt field (survey and data Devrim Sönmez).

Surface (SF) (as defined) and quantity	Tactile and macroscopic appearance	Microscopic wear markers (10x-160x)	Tribological mechanism
NF 1	The high topography is uneven irregular with sinuous and rugged peaks and it feels predominantly rugged with separated loose smooth spots. The low topography is uneven irregular and more or less porous.	High and low topography: sinuous and uneven irregular.	Natural erosion caused by natural erosion (not traceable).
NF 2	Both high and low topographies have extended surfaces of sinuous profiles with small flat spots. Uneven irregular high topography is loose and separated.	High and low topography: sinuous and uneven irregular.	Natural erosion caused by natural erosion (different from 1, not traceable).
SF 1 on 232 objects	The surface is a regular mixture between sinuous and flat high topography both with small plateaus and sinuous peaks and it feels predominantly smooth with several very smooth spots which are in all examples erratic and loose on the entire surface. The low topography is sinuous and uneven and it feels smooth and rough especially near or in the natural occurring pores. Objects with more pores have more uneven spots. The surface is usually dull to slightly reflective, the polish is loose and covers the surface. (Fig. 4.10)	High topography: flat (plateaus), sinuous (peaks) and uneven profiles, flat and sinuous areas predominate. Low topography: pores, uneven. Linear traces: loose short and long, straight and curved gouges. Polish: dull to moderately reflective on the high topography. Levelling: loose on the high topography (small spots of plateaus) Fractures: pits. WM2, WM3	Abrasive wear is documented by the presence of flattened and rounded topography and by linear traces. It was caused by circular/oval/spiral motions with soft pressure causing friction between the handstones, the netherstones and an interpolated loose, middle hard, nonfatty mass (as experimented in EP1) permitting direct contact between the stones. Tribochemical wear is attested by the presence of moderately reflective polish representing chemical interactions between the stone surfaces and the ground material. Adhesive wear can be reconstructed like resulting from EP1. Particles of cereal mass remained both on the high topography and in the pores.
SF 2 on 251 objects	The surface in the center and the extended center is similar to surface 1. The surface on the margins and margin extended has an irregular extension (0.3 to 1.4 cm) and a predominantly flat high topography which is also very smooth. This surface is moderately to high reflective. (Fig. 4.10)	High topography: flat (plateaus), sinuous (peaks) and uneven profiles, flat and sinuous predominate in center and extended center; flat (plateau and chains of plateaus) on the margin and margin extended. Low topography: pores, uneven; Linear traces: gouges in the center and center extended; gouges and long striations on the margin and margin extended. Polish: dull to moderately reflective on the high topography in the center and extended center; moderate to high reflective on the margin and extended margin. Levelling: loose on the high topography (small spots of plateaus) in the center and extended center; covering and connected on the margin and extended margin. Fractures: pits WM1, WM2, WM3	Abrasive wear is documented both in the center (like described by SF1) and on the margins where it was caused by the friction resulting from hard pressure and bidirectional motions between two stone surfaces. Tribochemical wear is attested by the presence of moderate and highly reflective polish representing friction and mixtures of fine stones and grain particles (EP1). Adhesive wear as described for SF1.
SF 3 on 99 objects	Flat high topography on the entire surface, very smooth and moderately to highly reflective.	High topography: flat (plateau and chains of plateaus). Low topography: pores, uneven. Linear traces: gouges, loose. Polish: moderately to highly reflective. Levelling: covered and connected on the margin and extended margin. Fractures: pits, scar marks WM4, WM5	Abrasive wear is attested by the presence of flattened topography and linear traces. Tribochemical wear is attested by the presence of polish. Fatigue wear is attested by the presence of scar marks. Adhesive wear is attested by the presence of ochre residues.

Surface (SF) (as defined) and quantity	Tactile and macroscopic appearance	Microscopic wear markers (10x-160x)	Tribological mechanism
SF 4 on 54 objects	The surface on the margin and extended margin is similar to surface 1 and the surface in the center and extended center to surface 3.	High topography: flat (plateaus), sinuous (peaks) and uneven profiles, flat and sinuous predominate on the margin and extended margin; flat (plateau and chains of plateaus) in the center and extended center. Low topography: pores, uneven; Linear traces: erratic gouges Polish: dull to moderately reflective Levelling: loose on the high topography (small spots of plateaus) on the margin and extended margin; covered and connected in the center and center extended. Fractures: pits	Abrasive wear is attested by the presence of the gouges. Tribochemical wear is documented by the presence of polish.
SF 5 on 84 objects	Surfaces with loose flattened high topography, sinuous and uneven topography.	High topography: flat (plateaus), sinuous (peaks) and uneven profiles Low topography: pores, uneven; Linear traces: erratic gouges Polish: dull to moderate reflective Levelling: loose, irregular on the high topography and on the low topography Fractures: pits, scar marks WM4, WM5	Abrasive wear is attested by the presence of flattened topography and linear traces. Tribochemical wear is attested by the presence of polish. Fatigue wear is attested by the presence of scar marks. Adhesive wear is attested by the presence of ochre residues.
SF 6 on 2 objects	The surface from the center to extended margin is similar to surface 1. On the margins pits and breakages are visible attesting pecking.	Not analyzed.	Not analyzed.
Handside	The surface is covered with a dark highly reflective polish.	Not analyzed.	Tribochemical wear is attested by the presence of polish.
Sintered, varia: on 290 objects	-	Not analyzed.	Not analyzed.

TABLE 4.4. Natural surfaces and surface deformations on handstones.

Surface deformations

Tactile and optical investigations were conducted as described in chapter 3 on 1102 handstones, the results can be found in appendices TABLES 1-10. The results of the microscopical analyses performed on 73 handstones can be found in appendices TABLES 1-10, for the methodology and terminology see chapter 3. The examination of the natural surface of the basalt is the first step in order to define deformations. The tactile and macroscopical analyses distinguish between two natural surfaces and six types of surface deformations (SF 1-6) which are combined with microscopical investigations in TABLE 4.4 (see below FIGURES 4.9-4-10, 4.14-4.15; PLATES 4.16-4.17). The table contains also a description of the tribological traces involved in the formation of wear based on EP1 (chapter 3) and on the classification of Adams et al. (2009).

For the formation of wear a new quantification method was applied, based on the 3D-modelling of roughness in the open access software CloudCompare (Dietrich and Haibt 2020). The main questions were how SF1 and SF2 develop, and if the active use-times of the handstones can be deduced based on the measurement of the flat zone on the margins (SF2), as its extensions differ. Handstone nr. 18_000139 and experimental handstone L13 (chapter 3, EP1) were chosen for a direct comparison (FIGURE 4.11). Handstone nr. 18_000139 has the widest flat band (0.6cm to 1.4cm) observed.

Handstone L13 was used as described in chapter 3, EP1 exclusively for the production of fine flour with pendular motions. First, an extension rhythm of flattening of the working face by comparing

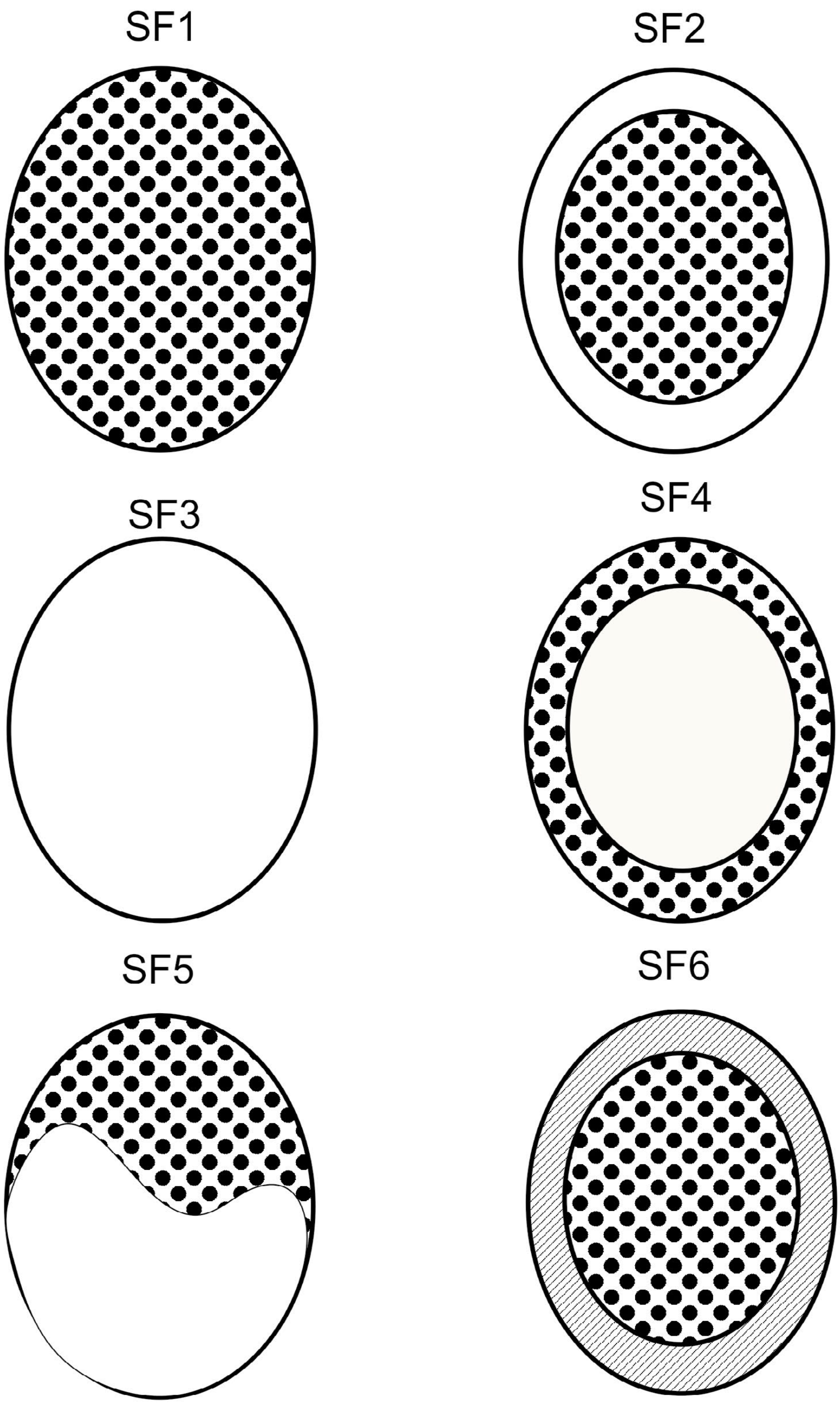


FIGURE. 4.9. Schematic depiction with the classification of the surface deformations (©Laura Dietrich).

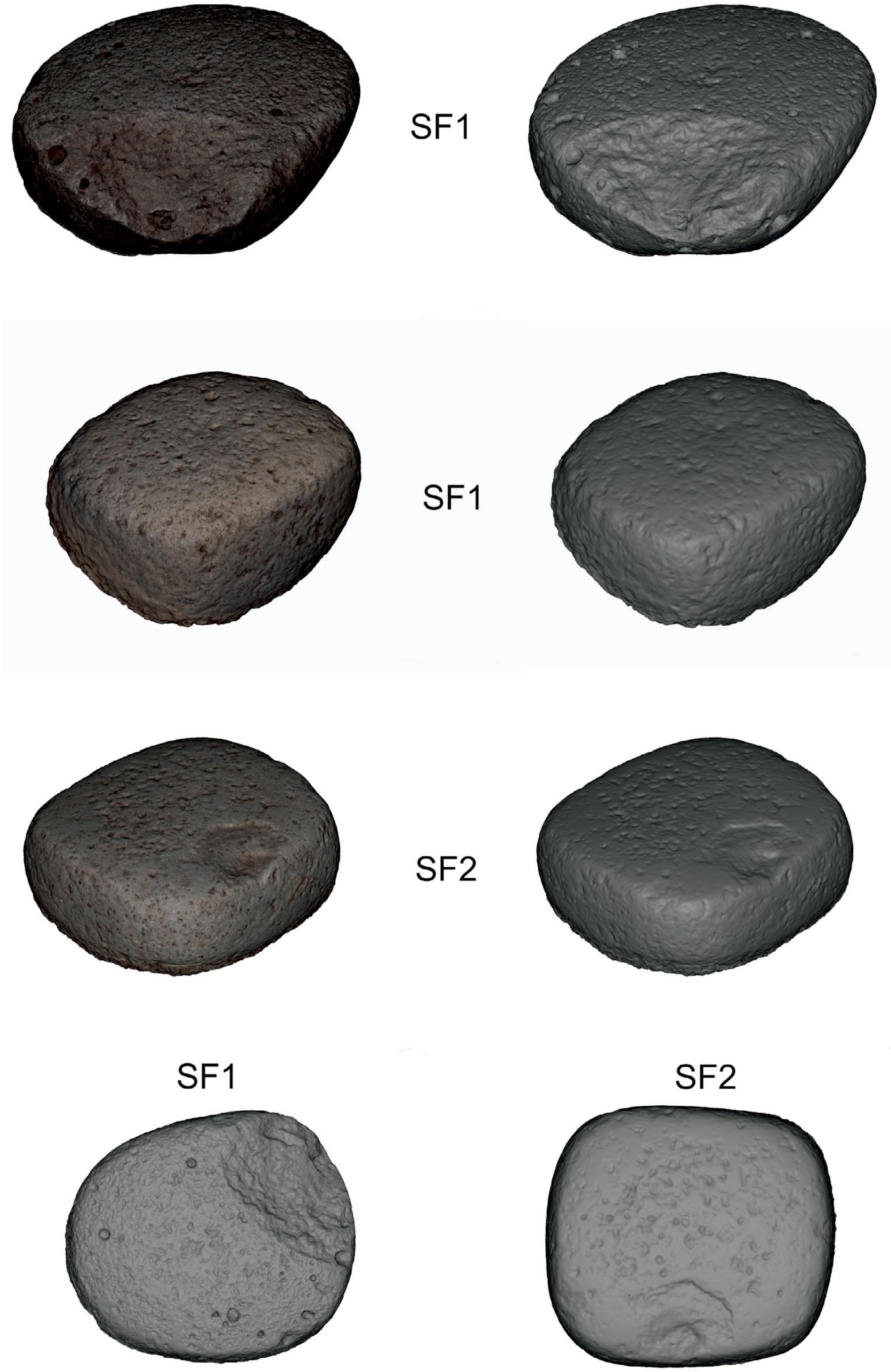


FIGURE 4.10. 3D-Meshes without color texture with surfaces of type 1 and 2 (©German Archaeological Institute, Photos and 3D-models Hajo Höhler-Brockmann). D-DAI-IST-GT17-HHB-0009-0013.

FIGURE 4.11. Handstone 18_000139 and experimental handstone L13 (©German Archaeological Institute and Laura Dietrich, Photos and 3D-models Laura Dietrich and Max Haibt). D-DAI-IST-GT17-HHB-0014 (left above).

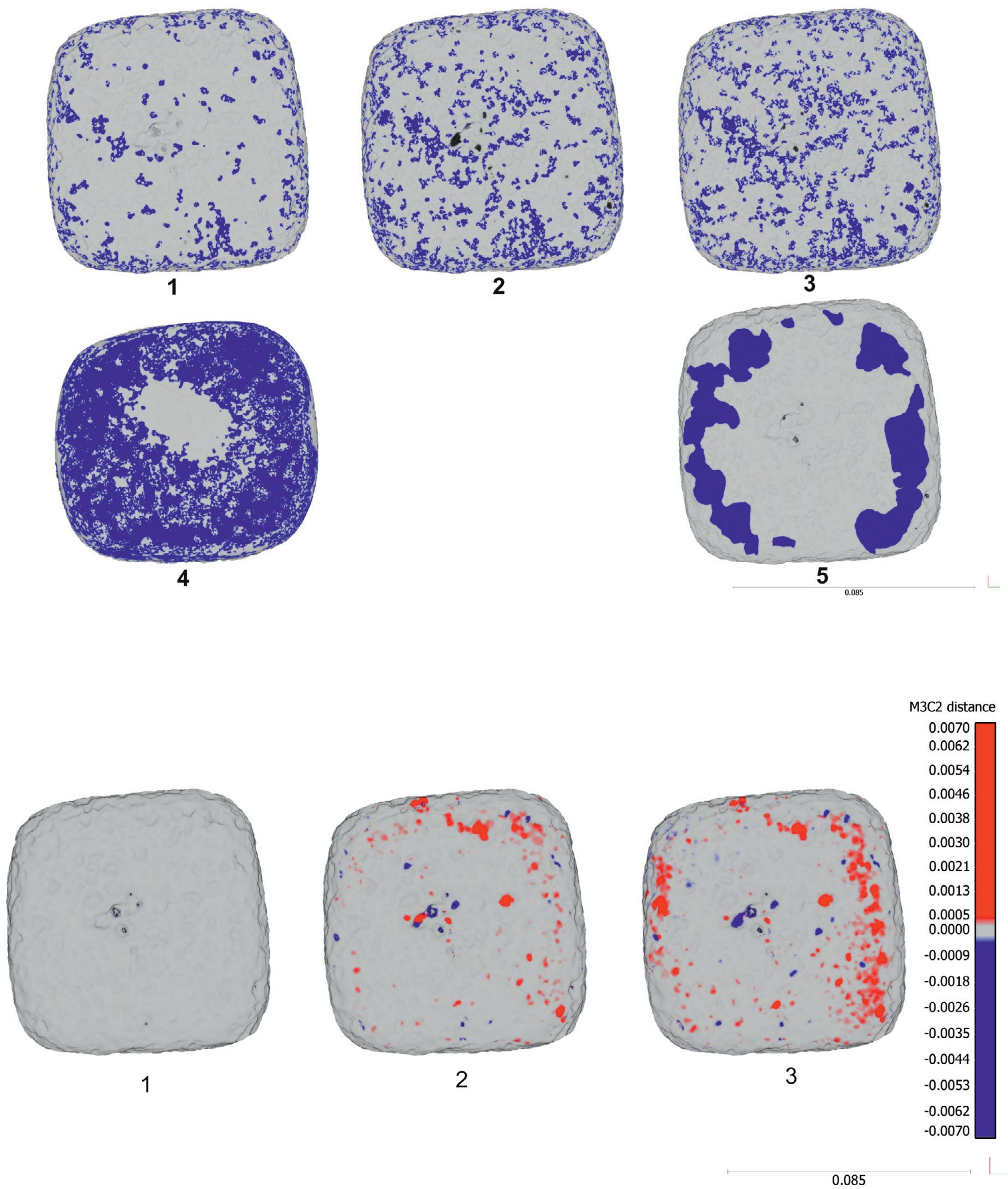


FIGURE 4.12. Above: surface roughness modeled in CloudCompare and cleaned by SOR: 1-3, of the replica L13 after 1WU (1), 3WU (2) and 7WU (3); of the Neolithic handstone18_000139. Flatter surface of the margins and edges of the Neolithic (5) and experimental (6) handstone as it was felt. Below: distance modeling in CloudCompare on replica L13 in different working stages. 1: modeling of the surface after one WU; 2: modeling of the distance between the surfaces after one and three a WU (red: erosion of the high topography; blue: grains intrusions); 3. modeling of the distance between the surfaces after three and seven WU (red: erosion of the high topography; blue: grain intrusions). Experimental work and documentation Laura Dietrich, modeling Max Haibt (©Laura Dietrich). (©Laura Dietrich, experimental work and documentation Laura Dietrich, modeling Max Haibt; tactile and optical analyses Laura Dietrich).

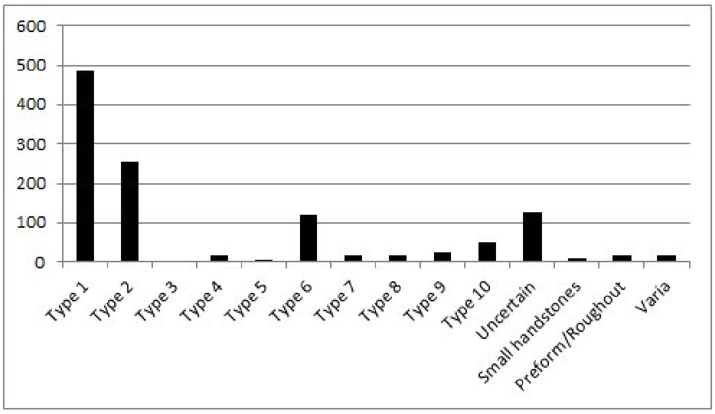


FIGURE 4.13. Spatial distribution of the types (©Laura Dietrich).

the "rough" and "flat" zones as they were detected by CloudCompare measuring the roughness as a geometrical characteristic of each point of the surface was calculated (FIGURE 4.12). Connected areas of smooth points detected with this algorithm were considered to represent the growing flat zone (FIGURE 4.12/5) which was previously detected through tactile and optical analyses. All numerical data can be found in Dietrich and Haibt 2020. A larger flat zone formed immediately after one WU (constituting 10% of the working face; FIGURE 4.12/1) and continued to grow up to 15% of the working face after three WU (FIGURE 4.12/2). Then, after another four WU, the flat areas decreased in comparison with the previous stage trough the breakage of some small flat zones directly on the edge, but continued to remain generally larger than at the beginning of the work (13% of the total working area; FIGURE 4.12/3). Simultaneously, the margins and the edges became perceptibly smoother and visibly shinier. Obviously, the flatness, including the area on the margin and edges (FIGURE 4.12/5) is growing, but not linear. Further data sets must be produced to understand the progression of the flattening better. However, assuming a growth of 1.959% per working unit, as would be calculated for a linear extension, a lower limit of 29 WU for the formation of the preserved surface of the Neolithic handstone with a proportion of 57% flat versus 43% rough surface (FIGURE 4.12/4), assuming its exclusive use with pendular motions for the production of fine flour was calculated, and also confirmed during EP1. This calculation would not work for multifunctional handstones, including those used to produce coarse flour. The calculation is confirmed by simply measuring the width extension of the flatter zones on the margins and edges after each working unit and comparing it with the flatter zone of the Neolithic handstone (FIGURE 4.12/4: marked with intense, continuous blue on the margins and 5: marked with blue).

These quantitative methods allow the determination of a lower limit of WU based on the width and grow of this area but fail - despite of modeling attempts - to reconstruct the complete use-live of the handstone analyzed. However, all other handstones display wear bands under 0.5cm width indicating rather short uses to produce fine flour. It remains questionable if the calculated amount of 29WU necessary for a formation of wider wear bands starting with 0.6cm and up to 1.4cm could be declared as upper limit for the formation of thinner zones. Also, there are some other factors affecting the progress and proportion of flattening, like the initial convexity of the surface or mixed use-ways including the processing of coarse flour with circular motions, which would deform the surface through extensive flattening both of margins and center. More data sets are necessary to analyze all options (work in progress).

Shape and surface deformation: wear markers as basis for functional interpretations

This section analyzes the linkage between shape and surface deformation and microscopical wear markers as the basis of the functional interpretation. As shown above, type 1 with relatively symmetrical profiles of different grades of convexities is most frequent, making up for almost half

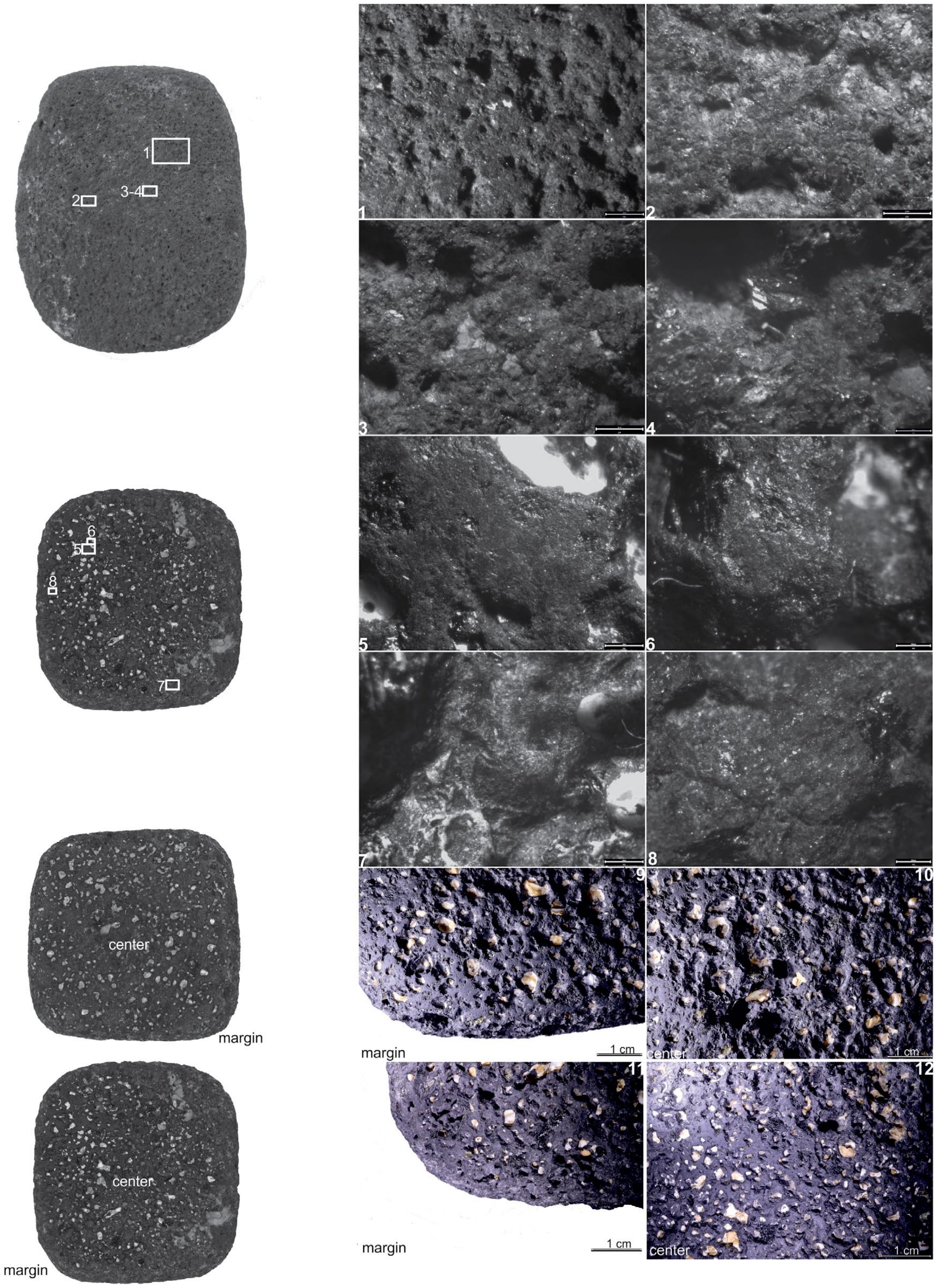


FIGURE 4.14. Above: Microwear from replica L10 (5-8) used to grind coarse flour and from the Neolithic handstone 00_000034 (1-4). Note the similar topography on the center and margins and the wear-marker for coarse flour: erratic short gouges on flattened and sinuous topography. Below: Macrotopography from both replicas L13 (9-10) and L10 (11-12) showing different wear-markers for fine and coarse flour (©German Archaeological Institute and Laura Dietrich, microscopical analyses Laura Dietrich, different magnifications). D-DAI-IST-GT19-LD-0015-0019.

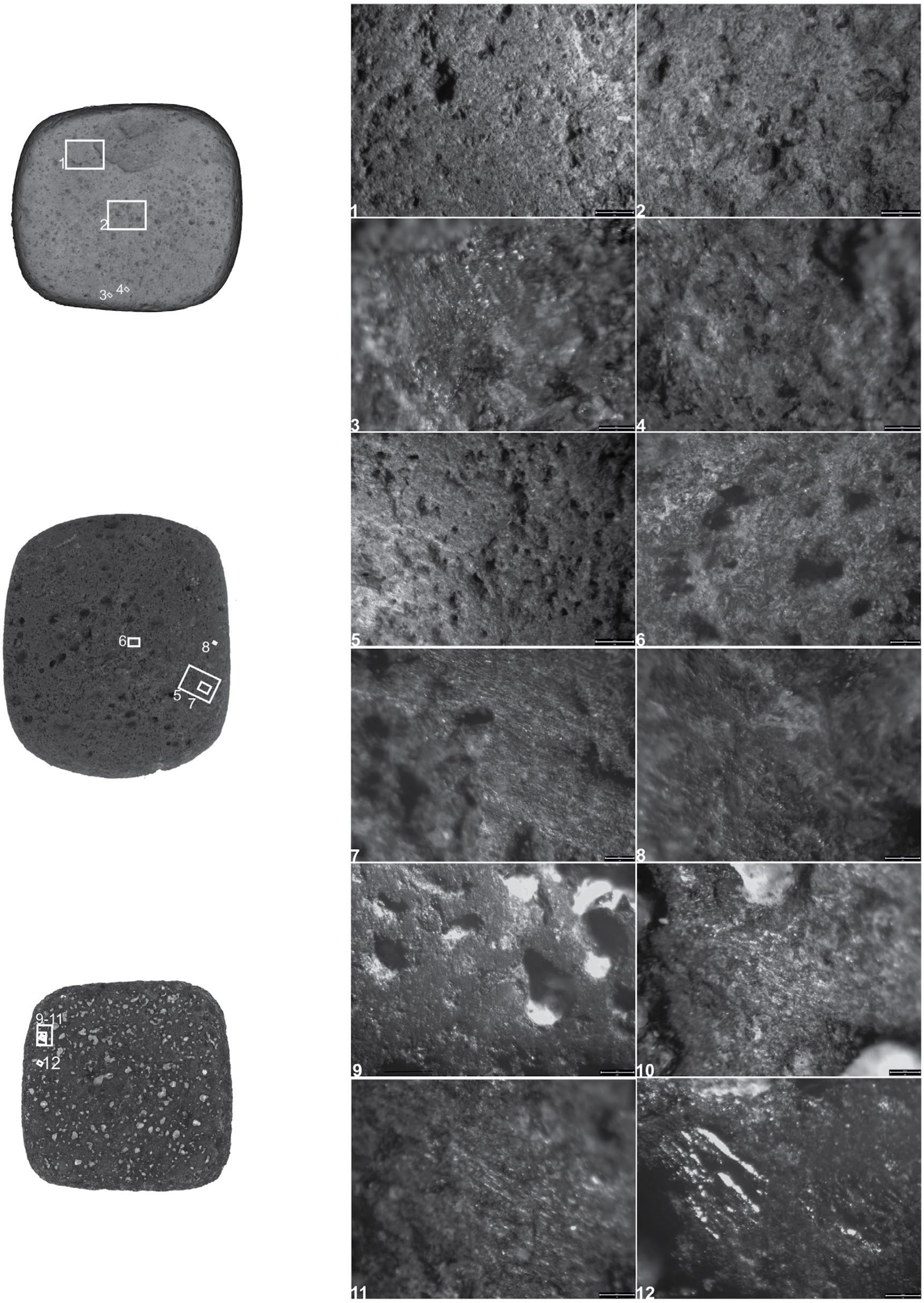


FIGURE 4.15. Microwear from replica L13 (9-12) used to grind fine flour and from the Neolithic handstones 18_000139 (1-4) and 00_000028 (5-8). Note the typical wear-marker for fine flour: thin striations on flattened high topography on the margins (Nr. 3-5, 7-12) visible at different magnifications both on the Neolithic handstones and on the replica. They are not present in the center (2, 6), where short erratic gouges dominate (©German Archaeological Institute and Laura Dietrich, microscopical analyses Laura Dietrich at different magnifications, Photos Laura Dietrich). D-DAI-IST-GT19-LD-0020-0029.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain /not used
102	134	49	19	12	0	57	91

TABLE 4.5. Distribution of the surface deformations on handstones of type 1.

of the analyzed objects (42%) followed by type 2 with almost a quarter of the finds (22%). All other types are present in rations of 10% or less (FIGURE 4.13).

Type 1

464 handstones could be redocumented, 37 of them are completely preserved. They were all used, as surface deformations show. They have an average weight of 691g with a maximum of 1266g and a minimum of 235g. The average length is 10.97cm with a maximum of 14cm and a minimum of 7.2cm, but most values (28 of 37 objects) are between 9cm and 12cm, thus palm-sized. The average thickness in the center is 3.6cm with most values either in the range of 3-3.9cm (16) or of 4-4.9cm (14). Only four examples are thicker (5cm and 6cm). EP1 has shown that a thickness greater than 6cm would limit the possibilities of both circular-oval and pendular motions, and in general of applying soft pressure because of the increased weight. Thicker handstones would on the other hand work more effectively with bidirectional motions with hard pressure. The most frequent surface deformations are SF1 combined with the wear markers WM2 (center to center extended and margin extended, FIGURE 4.14/1-8; 11-12) and WM3 and SF2 combined with the wear markers WM1, WM2 (margins) and WM3 (appendices TABLES 1-10, TABLE 4.5, FIGURE 4.15) hinting at a combined use through circular-oval and pendular motions for the processing of cereals. However, all flat bands are thin and the profiles symmetrical. Although only the last use stage can be analyzed, the uniform deformation suggests that circular and oval motions were predominant (FIGURE 4.16: reconstruction) while pendular motions were carried out only occasionally (FIGURE 4.17: reconstruction). The use-live of the handstones cannot be calculated, neither on the original nor on the experimental objects. As can be reconstructed from EP1 and EP5 the initial thickness could have been between 4-5.9cm meaning an average erosion of around 1cm with a maximum of 2cm. However, this is just an estimation based on the handling comfort and does not take individual erosion and accidental breakages into account. The attempt to reconstruct complete use biographies fails in the case of these handstones.

Summing up, the reconstruction of the function of handstones of type 1 as tools mainly for processing cereals to coarse flour, and occasionally to fine flour is very probable. The proposed wear-scheme with the combination between shape and surface deformation and the experimental results is shown in FIGURES 4.16 and 4. 17. In addition, the presence of WM 5 on four examples attests the occasional processing of ochre. WM 4 is present only on two handstones. Long-term experiments will show whether SF3 and 4 are highly used stages of SF1 or results of grinding other materials.

Type 2

256 finds could be re-documented of a total of 301 finds. 32 of them are completely preserved. They have a medium weight of 629g with a maximum of 1567g and a minimum of 279g (the latter object was most probably a failed tool; its surface is unused). Due to its specific shape the weight variation is broader than in type 1. Most objects are used, as surface deformations show. The average length is 10.5cm with a maximum of 15.8cm and a minimum of 6cm, but most values (24) lie between 9cm and 12cm. Thus, this type is also palm-sized.

Type 2 is wedge-shaped. The average thickness at the thicker side is 4.4cm but the thinner side is more variable, between 1cm and 3cm. Possibly this variation mirrors manufacturing processes and not wear as already discussed above. Type 2 can be held better with the fingers on the thick side.

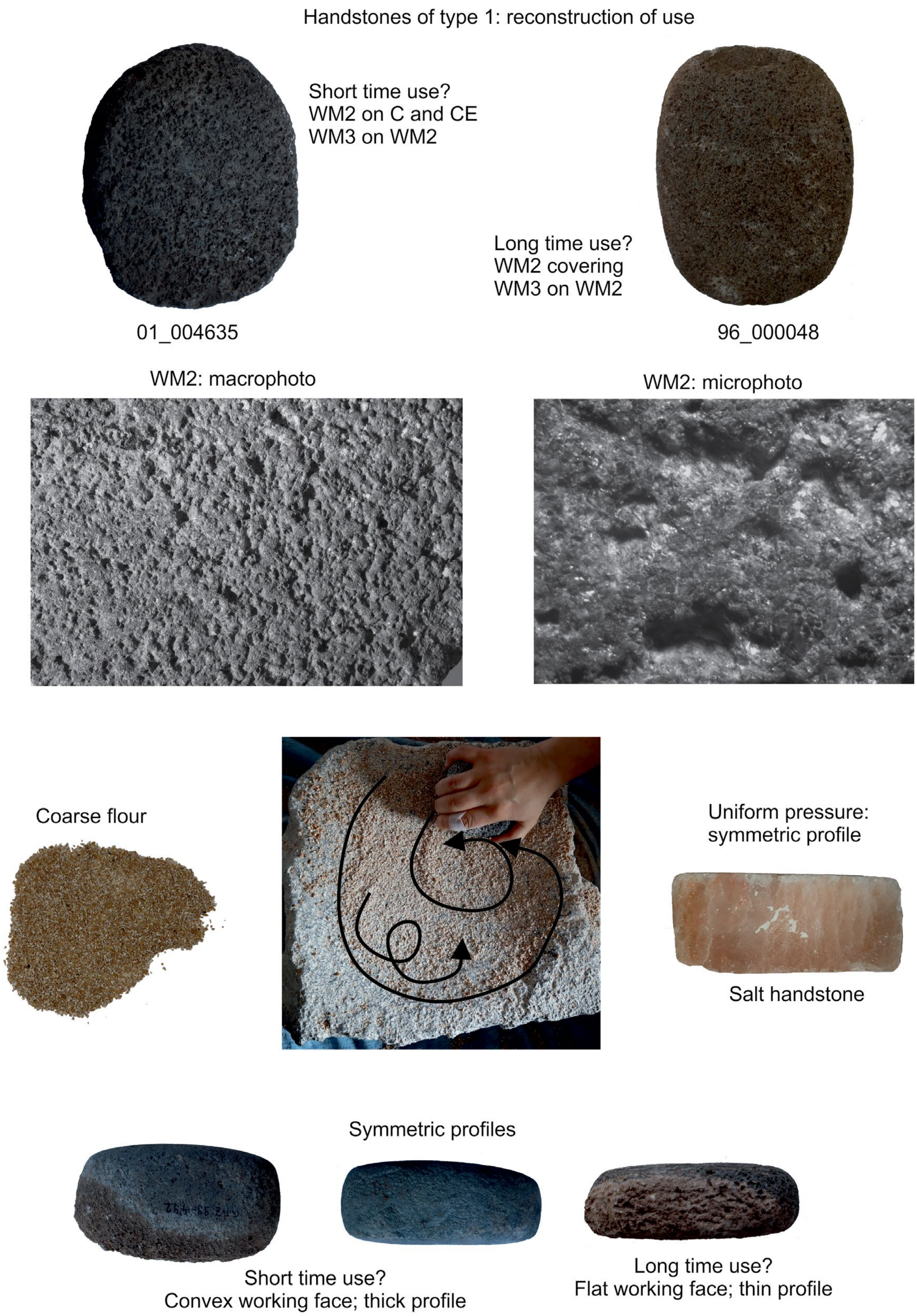


FIGURE 4.16. Reconstruction of use for handstones of type 1: processing of cereals to coarse flour (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

FIGURE 4.17. Reconstruction of use for handstones of type 1: processing of cereals to fine flour (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich and Hajo Höhler-Brockmann).

FIGURE 4.18. Reconstruction of use for handstones of type 2: processing of cereals to fine flour (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

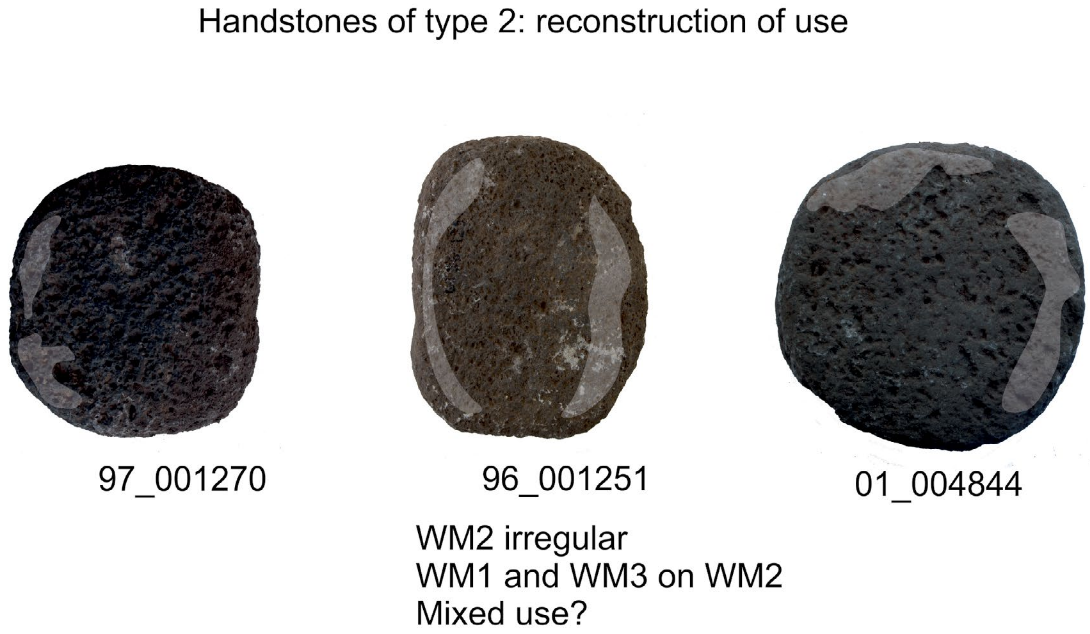


FIGURE 4.19. Reconstruction of use for handstones of type 2: mixed use for coarse and fine flour (©German Archaeological Institute and Laura Dietrich Photos Laura Dietrich).

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	Uncertain not used
62	82	17	10	18	1	41	27

TABLE 4.6. Distribution of the surface deformations on handstones of type 2.

SF1, in combination with WM3 (appendices TABLE 2, TABLE 4.6) appears on 24% of the analyzed handstones indicating the processing of cereals to coarse flour with circular motions. The most frequent surface is SF2, detected on approximately one third of the objects in combination with WM1 (appendices TABLE 2), indicating pendular motions carried out to process cereals to fine flour (FIGURE 4.18). Although both EP1 and EP5 clearly indicate a similar deformation of the profile through long-time use (chapter 3), the real use-time for the processing to fine flour cannot be estimated as, like stated above, the original shape may have been already asymmetrical. Also, despite quantification approaches (EP1, chapter 3) the modeling of the reduction of thickness (FIGURES 4.7, 4.12) cannot provide an estimate of the respective use-lives. WM 4 and WM 5 are attested only rarely, each on two objects in combination with SF5. In addition, SF 5 can possibly represent mixed use for fine and coarse flour (FIGURE 4.19). More than one third of the objects cannot be classified due to bad preservation.

Type 3

Type 3 is rarely attested with a total of nine pieces. Handling experiments with original pieces indicate that holding with two hands, perpendicular on the long sides, would be most effective from a haptic point of view for handstones of this shape. However, handling with one hand with the fingers placed on the long sides would also work, allowing a transversal or even a circular motion on plain netherstones. However, the presence of SF2 (TABLE 4.7) rather indicates pendular motions. In comparison to other two-handed handstones (types 4 and 10), handstones of type 3 are light and can be easily moved with pendular motions. The lengths of the preserved objects fit with the width of the deformations of netherstones of type E4 indicating most probably the processing of grains to fine flour, but microscopical analyses have not been conducted.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
0	2	0	0	1	0	0	0

TABLE 4.7. Distribution of the surface deformations on handstones of type 3.

Type 4

Type 4 comprises large, oval boulders used as two-handed handstones. 17 finds could be redocumented. The completely preserved handstones have weights between 2kg and 4kg and are up to 25cm long and 11cm wide. Their thickness measures between 6.5cm and 10cm. These handstones can only be moved with two hands either with bidirectional motions or with pendular motions, which would be more difficult. Most probably they were used through bidirectional motions in combination with flat, narrow netherstones that stood oblique (chapter 5, type NB and reconstruction). SF1 and SF4 predominate (TABLE 4.8). The high weight of the handstones would constitute an advantage when used for the processing of cereals to fine flour. However, the possible presence of WM1 on the working faces was not microscopically tested yet.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
5	1	1	4	1	0	2	3

TABLE 4.8. Distribution of the surface deformations on handstones of type 4.

Type 5

Type 5 is rarely represented in the find assemblage but its preservation may have been affected by its specific shape and use. Five complete handstones of 5-6.5cm and weights between 130g-300g were found. All of them have SF5 (TABLE 4.9) and in two cases WM 4 and WM5 were observed on more than one side. These handstones were produced and used as pounders and grinders for ochre. They were likely used by holding the handstone, which has the form of a small ball, with a hand and using vertical pounding and circular grinding motions with one or more of its sides. Most probably, most type 5 handstones were destroyed through use and are not detectable anymore in the archaeological record. Theoretically they can be used in combination with small plates (SP), which have ochre residues (WM 5) and were probably used as lap stones (chapter 5) but unmodified lime slabs or the limestone banks could have been used as well. In one special context a handstone was positioned on a netherstone of type 1 (LB) with a depression of type D5 immediately next to a pillar, together with another set of grinding stones (see below for contextual analysis). However, no ochre was found on the surface of the nethertstone. In this case, the context most probably indicates a deposition after the end of the use-life of the tools.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
0	0	0	0	5	0	0	0

TABLE 4.9. Distribution of the surface deformations on handstones of type 5.

Type 6

123 finds belong to this more heterogeneous category whose common attributes are the D-shaped to triangular sections, meaning a thick center and thinner sides. Most of the objects are broken into small fragments and in several cases (TABLE 4.10) sinter covers the presumed working faces. In these cases, it is not possible to tell if the objects are used handstones or blanks, as the majority of type 6 handstones have been not been produced intentionally but used in their naturally occurring shape. An example for the difficulty of classification is object nr. 98_004657 whose flat side is sintered. Probably, this group consists of ad hoc tools with different degrees of use and unused blanks.

Only two handstones show shaping of the sides consisting of a rough adjustment through flaking in order to assure a more efficient handling. In their case the hand would be put on top with the small finger and thumb on the flaked sides, similar to a computer mouse. The handstone can then be moved either transverse, circular or straight. The specific shape of the profile would make pendular motions more difficult as the center of gravity is low. The characteristics of the shape are mirrored in handling and in the surface deformations. SF1 (circular motions) dominates while SF2 (bidirectional/pendular motion) is rarer. Also, SF5 which would form by transverse motions is represented more frequently than in other types. Three completely preserved examples have lengths between 11cm and 17cm, widths between 8.6cm and 11cm and a thickness between 4cm to 6cm, the smallest has only 5.5cm x 5.6cm x 5.5cm. WM 5 was observed on four handstones but the objects were not analyzed microscopically. A combined, multifunctional use for these ad hoc tools could be taken into consideration but microscopical analyses should be performed to secure this interpretation.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
30	11	12	11	15	1	23	20

TABLE 4.10. Distribution of the surface deformations on handstones of type 6.

Type 7

Handstones with oval sections are in the minority. The shape could represent a preliminary stage of handstones of type 1, at least in some cases. Only one handstone is preserved completely with a length of 12cm, a width of 6.5cm and a thickness of 6 cm. SF1, 3 and 5 are attested (TABLE 4.11).

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
2	0	2	0	4	0	5	5

TABLE 4.11. Distribution of the surface deformations on handstones of type 7.

Type 8

Is similar to type 7 but the margins are thin. The shape could represent in some cases a preliminary stage of handstones of type 1 used with pendular motions. SF 1, 2, 3 and 5 are attested (TABLE 4.12).

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
1	1	3	0	3	0	5	3

TABLE 4.12. Distribution of the surface deformations on handstones of type 8.

Type 9

24 finds possibly used as handstones have irregular shapes and various surfaces (TABLE 4.13).

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
0	3	1	1	5	0	5	9

TABLE 4.13. Distribution of the surface deformations on handstones of type 9.

Type 10

Type 10 is represented by 53 large flat to oval two-handed handstones. Seven artefacts are completely preserved, the smallest measures 15cm x 13.5cm x 4.1cm and the largest 21cm x 13.5cm x 7cm. The two smallest values overlap with the largest handstones of type 1 but type 10 handstones are heavier and difficult to use with one hand. Nevertheless the two objects could be considered as belonging to both categories. Most of the objects classified as type 10 have lengths

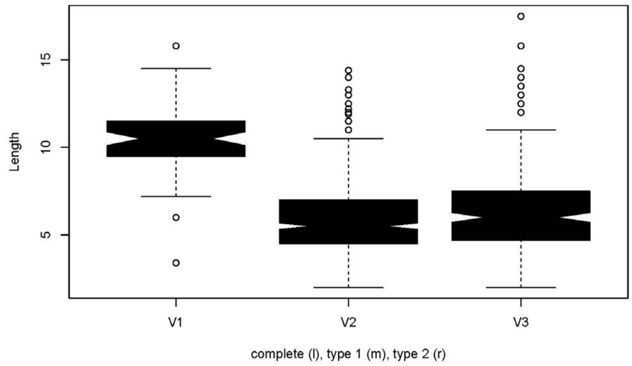


FIGURE 4.20. Notched boxplot with the lengths of the complete and fragmented handstones of types 1 and 2 (©Laura Dietrich).

between 17cm and 21cm and weights between 2049g and 3537g. They are thus clearly meant to be moved with two hands. Handling experiments with the originals has shown that both circular and bidirectional, flat or pendular motions are possible. These broad possibilities are mirrored in the various surface deformations attested (TABLE 4.14), although SF1 is most frequent. A handstone of this type can be used on a flat surface, for example in the first use stages of a long boulder (LB in chapter 6) with circular and bidirectional motions or on a narrow boulder (NB in chapter 6) with bidirectional motions. In one case (nr. 20_00011) the deep deformation E4 on a LB was wide enough (19cm) to allow the use of a handstone of type 10 with bidirectional and pendular motions. Microscopical analyses were not carried out. In one case the presence of WM4 was observed.

SF 1	SF 2	SF 3	SF 4	SF 5	SF 6	sintered	uncertain
13	5	2	2	6	0	10	13

TABLE 4.14. Distribution of the surface deformations on handstones of type 10.

The preservation of the finds

Only 7% of the finds are preserved completely. No signs for intentional fragmentation were observed, a practice known from other Neolithic sites (for example, in the PPNB settlement from Baja pestles were systematically destroyed with an oblique blow, personal communication Martin Ranger), so that most probably the high degree of fragmentation can be explained by a combination of use, erosion and post-depositional processes (see below contextual analysis). The analyses show that all one-handed handstones of types 1 and 2 were predominantly fragmented in their middle part (FIGURE 4.20) based on the average values of the complete (left) and fragmented (right) objects. There are no long-term experiments on wear and use-lives of handstones of basalt but this kind of breakage could be rather indicative for accidents due to mobility of these tools during use (grabbing/putting down/grabbing again/transport) than for a result of prolonged use. Scar marks are missing, which further points in that direction. Grinding - no matter with what kind of motion - does not cause weakening or rupture of the matrix in the middle but rather on the sides and corners, as both EP1 and EP5 show. As they seem not to be related immediately to practical use, breakage patterns will be analyzed experimentally in future research separately from this study.

Contextual analyses

Handstones are small objects in comparison with the netherstones, and also play the role of the active part in the grinding gear. Experimental research and ethnographic evidence show that handstones are worn down much faster than netherstones and are more frequently discarded and replaced (Hayden 1987; Wright 1993). The fragmentation could indicate a relatively large incidence

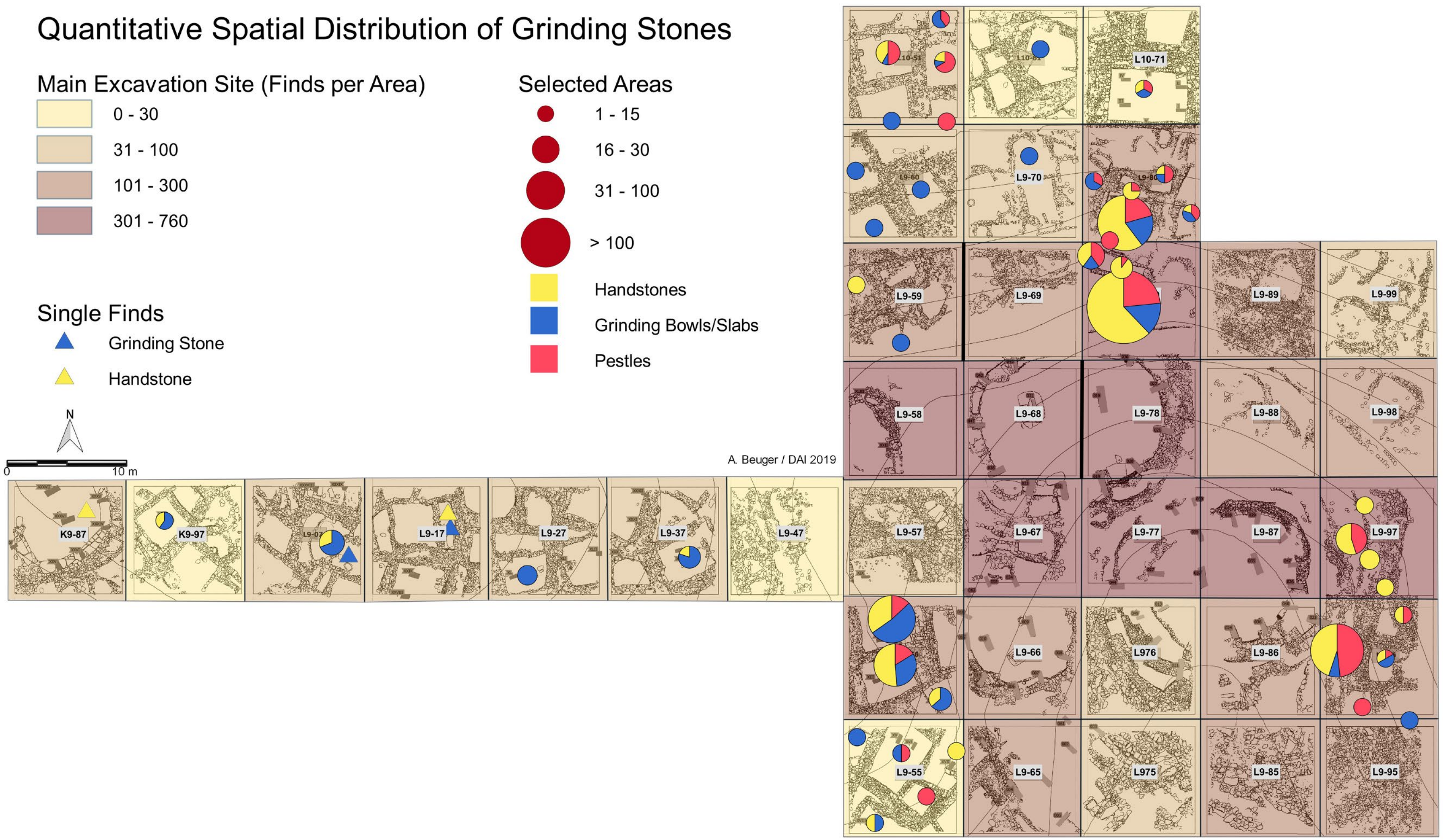


FIGURE 4.21. Distribution of grinding stones (©German Archaeological Institute and Laura Dietrich, map Laura Dietrich and André Beuger). The phytolith analyses of grinding stone surfaces were performed on the single finds marked with triangles.

Buildings and supposed chronological position	Number of handstones
Rectangular buildings (PPNB)	472
Monumental buildings (PPNA-PPNB)	1400
Round structures (PPNA-PPNB, uncertain)	258

TABLE 4.15. Chronological distribution of the analyzed finds

Handstones: disposition in the room fillings	Quantity
Zone 1	176
Zone 2	105
Zone 3	41
Zone 4 and 5	8
Zone 6	6
Zone 7	136

TABLE 4.16. The distribution of the handstones in the rectangular buildings and outside (except the fills of the monumental buildings).

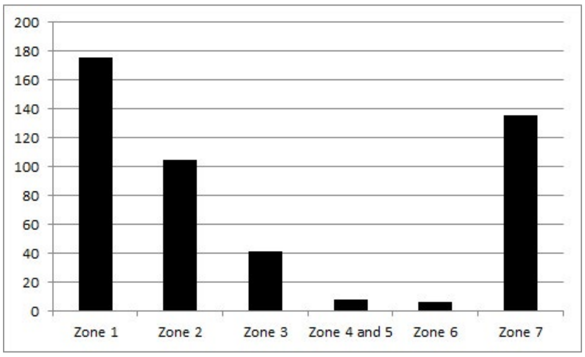


FIGURE 4.22. The distribution of the handstones in the rectangular buildings (©Laura Dietrich).

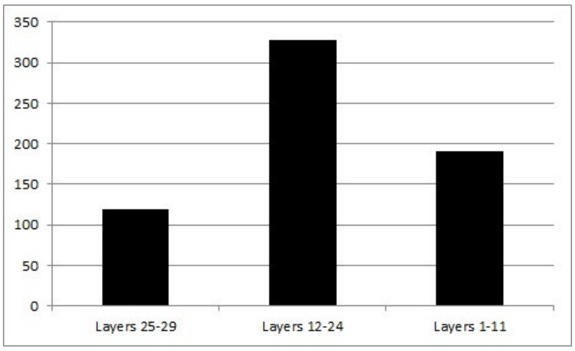


FIGURE 4.23. The distribution of the handstones in the monumental buildings (©Laura Dietrich).

of tools broken by accident, in addition to post-depositional factors. Broken handstones cannot be repaired or reused, as the fragments are too small.

Discard practices and formation of room fills have not been studied in detail yet at Göbekli Tepe. For the present study rectangular buildings and monumental buildings were analyzed separately. The small round buildings of a so far uncertain chronological position have not been taken into account for the contextual analysis. The main excavation area is the focus of the analyses as the north-western area has not been studied extensively yet. The spatial distribution can be seen in TABLES 3.1, 4.16 and FIGURES 4.21-4.23. In addition to handstones, contextual information on the netherstones and pestles was added for comparison.

For a better understanding all components of the grinding sets are discussed together here (see also chapters 5 and 6). Generally, rectangular and apsidal buildings contain up to 15 grinding stones within their preserved fills, with up to four handstones, pestles and netherstones on the floor levels (zones 3-5; FIGURE 4.22, TABLES 4.16, 4.17). Almost half of all the grinding stones discovered inside buildings come from the uppermost filling and the plough horizon (zone 1) with proportions varying for different types of artifacts: around one third of the handstones and netherstones and more than half of the pestles. A further quarter of grinding equipment was found within zones 2 and 3 (upper and middle parts of the building fillings), the proportions of netherstones were the highest here. Only 3% of the total number of grinding tools were found on floor levels (zones 4 and 5), with more netherstones than handstones and pestles. 10% of the grinding tools stem from the filling immediately above the floor (zone 3). While these general observations – a low percentage of in situ finds and differences in the stratigraphical distribution of different object categories – hold true for all buildings, the composition and thickness of fillings differ, which could imply heterogeneous formation/refilling processes. A sample of buildings (7-9, 25, 16 and 38) with well-preserved fillings from different parts of the main excavation area is thus discussed in detail here to check the distribution pattern and further contextualize the grinding equipment (TABLE 4.17).

Grinding stones in buildings	Handstones	Netherstones	Pestles
L10-51*			
Building 25**	5	1	6
Building 27**	0	3	2
Building 28**	2	1	6
Building 24**	0	1	0
Building 29**	0	0	2
L10-61*			
Building 36**	0	1	0
L10-71*			
Building 38**	1	1	1
L9-80*			
Building 17**	0	2	1
Building 18**	3	0	1
Building 19**	1	1	2
Building 20**	1	2	2
Building 16**	38	12	13
Building 96**	0	0	1
L9-79*			
Building 12**	6	3	6
Building 13**	9	0	1
Area in front of complex 16	69	16	26
L9-70*			
Building 50**	0	0	0
Building 47**	0	1	0
L9-60*			
Building 44**	0	1	0
Building 43**	0	3	0
Building 45**	0	2	0
L9-59*			
Building 55**	1	0	0
Building 59 and 60**	0	3	0
L9-56*			
Building 9**	16	24	6
Building 7**	4	7	0
Building 8**	19	12	6
L9-55*			
Building 2**	0	1	0
Building 3**	0	1	1
Building 5**	1	0	0
Building 4**	0	0	1
Building 1**	1	1	0
L9-97*			
Locus 8**	1	0	0
Locus 9**	8	0	0
Locus 33**	5	0	0
Locus 2.4**	11	0	9
L9-96*			
Building 84**	0	2	0
Building 81**	2	3	1
Building 80**	2	0	2
Building 83**	0	0	1
Area on the terrace	26	4	28
L9-37*			
Building 115**	2	8	0
L9-27*			
Building 120**	0	8	0
L9-07*			
Building 134**	4	9	0
K9-97*			
Building 147**	2	3	0

TABLE 4.17. Distribution of grinding stones in a selection of buildings in the main excavation area.

FIGURE 4.24. Rectangular buildings with grinding equipment (©German Archaeological Institute, Photos Klaus Schmidt). DAI-IST-GT99-KS-N02-15; DAI-IST-GT99-KS-D1401; DAI-IST-GT01-KS-N16-12; DAI-IST-GT98-KS-D980004;

Building 9 lies on the southwestern slope above Building B (FIGURE 4.24B, 4.25). The building measures 5.80m x 3.60m with walls preserved up to a height of 2m and has four pillars. The stratigraphical analysis revealed evidence of four rebuilding phases and relatively fast refilling after the end of use (Kurakpat 2005). 46 grinding stones were found within the building fill. Only three complete handstones of type 1 and a completely preserved stone platter (chapter 7) were found on the floor, the plate in front of two of the pillars. Fragments of netherstones and pestles were found in the fill above the floor. Most of the grinding stones, all of them fragmented, come from the middle and the uppermost part of the building fill, which includes roof collapse and wall erosion. Two adjacent buildings are described here mostly to illustrate the agglutinating style of buildings, although both have only been partly excavated so far. Building 8, which shares a common wall with Building 9, has a similar shape and size, but (at the current incomplete state of excavations) only one pillar. Most grinding stones again come from the middle and upper part of the filling, too. One complete handstone was found on the floor next to the pillar. This hints at a similar situation as observed in Building 9. The adjacent building to the south, Building 7, has a common wall with Building 8. One complete handstone was found on its floor. A similar general distribution of grinding tools within the infill zones was noticeable in buildings on the southwestern hilltop (TABLE 4.17), where the wall-by-wall rectangular architecture from the main excavation area continues. However, more netherstones were found directly on the floor. In

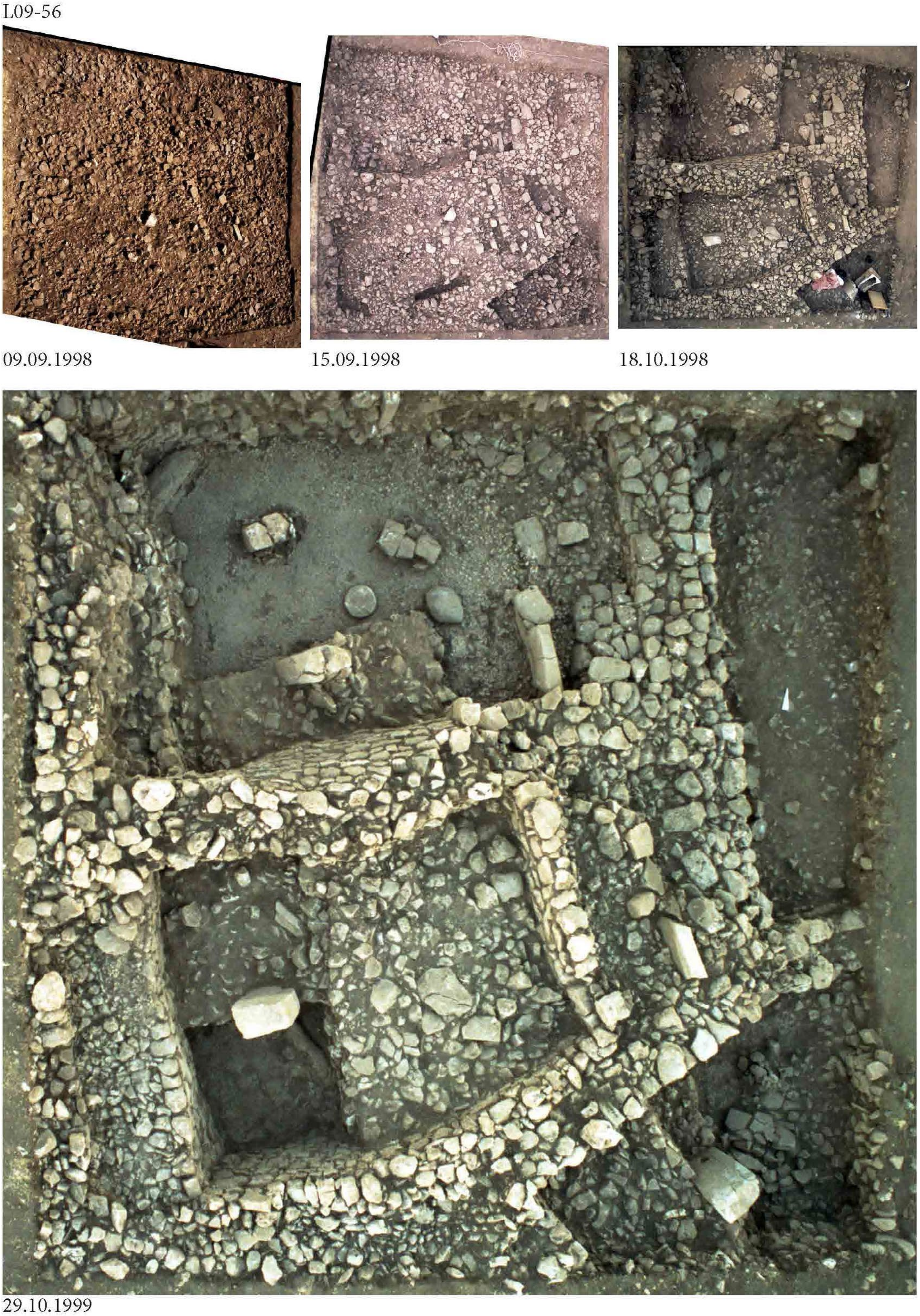


FIGURE 4.25. Area L9-56 and Building 9 in different stages of excavation (©German Archaeological Institute, Photos Klaus Schmidt). D-DAI-IST-GT98-KS-N03-007A, D-DAI-IST-GT98-KS-N05- 007A, D-DAI-IST-GT98-KS-N12-0004, D-DAI-IST-GT99-KS-N6-0006.

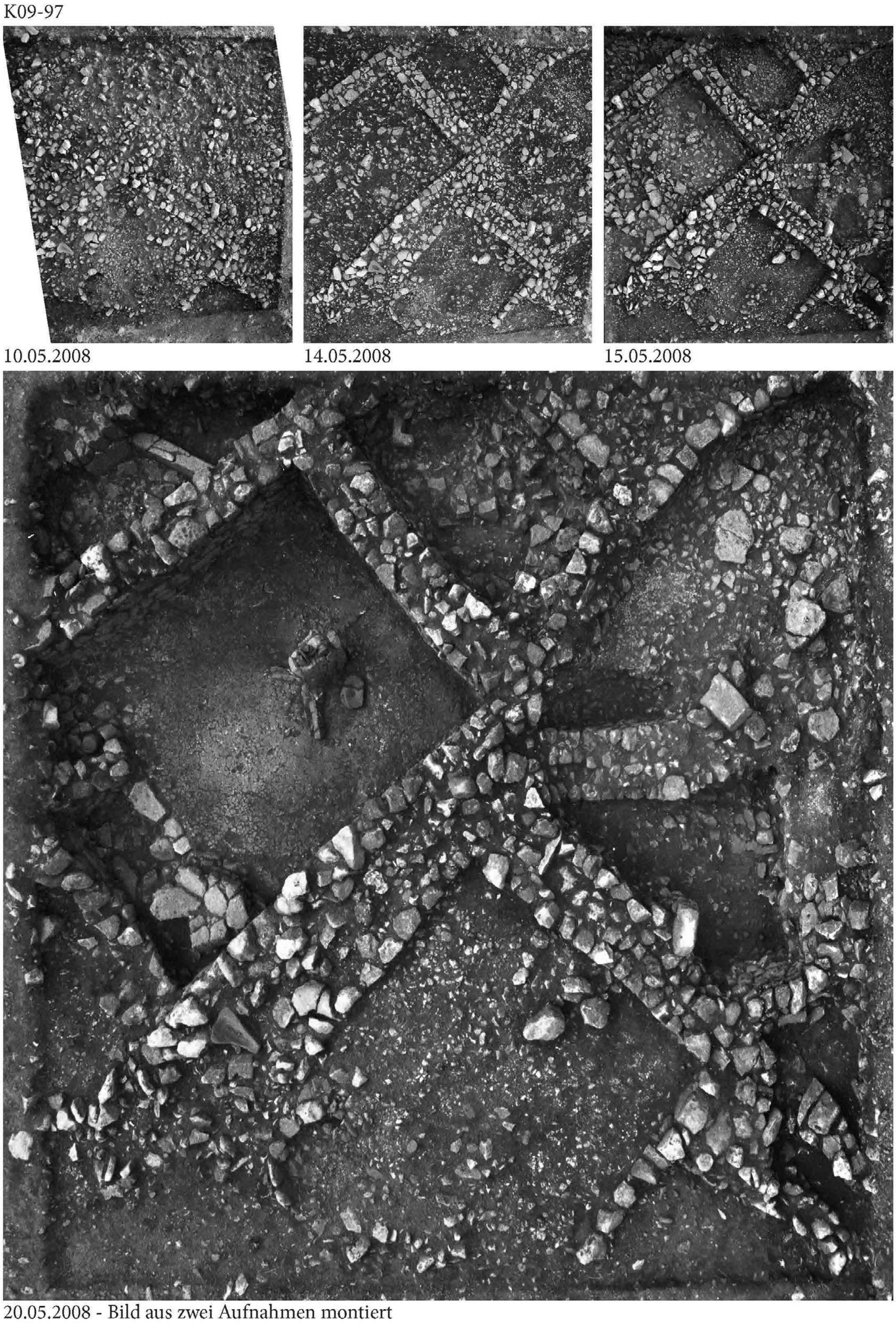


FIGURE 4.26. Area K9-97 with Building 147 (old number 5) (©German Archaeological Institute, Photos Klaus Schmidt). D-DAI-IST-GT08-KS-N07-0004, D-DAI-IST-GT08-KS-N07-0004, D-DAI-IST-GT08-KS-N11-0005, D-DAI-IST-GT08-KS-N12-0006.

FIGURE 4.27. Area L9-07 with Building 134 (old number 17) (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT12-KS-3364.

FIGURE 4.28. Handstones under a large limestone boulder in front of the pillar in building 134 (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT12-KS-2798.

FIGURE 4.29. Sets of grinding stones at the pillar in area L9-27 (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT12-KS.

Buildings 147 and 134, for example, complete handstones and netherstones were discovered on the floors next to the pillars (FIGURES 4.26-27), while other grinding stones are concentrated in the middle and upper parts of the filling. The exact position of the handstones was not documented in each case, but in building 134, for example, the situation with two handstones under a large limestone boulder (FIGURE 4.28) could be interpreted as a post-use depositional act, while in area L9-27, Room 119 sets of handstones and netherstones at the pillars could actually represent in situ finds describing activity areas in this room (FIGURE 4.29). However, these are exceptions and most handstones as well as the find position of some netherstones (chapter 5) suggest rather a displacement from the roofs into the inner fill.

Building 25 lies high on the northwestern slope to the northwest of Building D in a cluster of apparently contemporaneously used buildings (Kurapkat 2005) (FIGURE 4.24A). It is only slightly rectangular with dimensions of 4.20m x 3.60m and walls preserved up to 1m height. All 12 grinding stones, except a large boulder, were found in the middle and upper parts of the fill within roof collapse and wall erosion. The netherstone was found on the floor near a wall protrusion made of worked stones, a construction which sometimes replaces pillars in Göbekli Tepe´s buildings (Kurapkat 2005) while handstones are missing from the assemblage. Most of the buildings on the northern slope show the same distribution, although their fillings are not similarly well preserved.

Two buildings seem to deviate from the pattern observed so far. Building 16 lies north of Building D. It has four pillars, walls preserved up to a height of 2m, measures 3.8m x 3.6m and is again part of a cluster of partially contemporary, partially later constructed smaller, up to 2m long, buildings (Kurapkat 2005) (FIGURE 4.24C). 63 grinding stones were found inside the building, together with the small adjacent buildings the number of finds rises to more than 100. The fill shows consecutive layers of erosion and collapse. Grinding stones were found both in the middle and lower parts of the fill; a concentration was observed in the last 50cm of fill above the floor. A netherstone and

FIGURE 4.30. “Fallen” grinding stones in area L9-27 (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT12-KS-PXL-8664.

a stone vessel were found on the floor next to one of the pillars. Almost all types of handstones as well as some blanks for the production of handstones were present. It seems that this building had a special function either regarding grinding or the production of grinding stones, maybe a workshop. In any case, the massive presence of grinding stones within the last 50cm of sediments above floor level possibly indicates the long-term specialized use of the building.

Building 16 is one of the largest completely excavated. But the size and amount of infill do not account for the amount of grinding equipment recovered, as a comparison with the even larger Building 38, the so-called leopard-pillar building (O. Dietrich and Schmidt in print; Kurapkat 2015; Schmidt 2012), shows. Building 38 is situated on the highest point of the northern slope to the north of Building 16, has four freestanding pillars and two more that are incorporated into the walls (FIGURE 4.24D). Two of the freestanding pillars have reliefs of jumping leopards. The building measures 6.6m x 4.4m, its walls are still up to 2.10m high. It shows several successive rebuilding phases, which have already been analyzed in detail elsewhere (Kurapkat 2015). There are only three grinding stones in the uppermost fill from this large and long-used building, most probably displaced. The lack of grinding stones may be explained by the special function of the building, indicated by its decorated pillars which are among the very few examples from the rectangular buildings that show images in the fashion of the older pillars from the monumental buildings (O. Dietrich and Schmidt in print; Kurapkat 2015; Schmidt 2012).

To sum up, although many rectangular buildings show similarities, there are deviations, both with significantly higher and lower numbers of finds. Many buildings are on the same stratigraphical level but have multiple floor levels. In numerous cases, excavations have stopped at the uppermost floor level. Establishing the contemporaneity of floor levels between several buildings is difficult, which hinders estimating the overall number of grinding stones used at the site at a given moment. Further, building interiors are not the only, and possibly not even the most important, locations for grinding cereals. Outside the buildings a large quantity of grinding stones, especially handstones and pestles, were found in the open areas (zone 7) between the square buildings and the circular buildings (FIGURE 4.21). The distribution analysis within buildings shows that most grinding stones were in the upper layers of infill, in some cases above roof collapse, and indicates that grinding and processing of cereals most probably took place on the roofs in addition to the outside areas. Especially light hollowed netherstones (chapter 5) are of interest as they were found 'fallen' in four cases, lying upside down in the upper fills, indicating that they had most probably originally been placed on flat roofs (example in FIGURE 4.30). The stereotype finds of complete grinding stones (especially handstones) on floor level, specially positioned next to the pillars could, in contrast, represent the intentional deposition of these stones at the moment a building was abandoned, as other in situ finds are conspicuously scarce on floor levels. Göbekli Tepe has produced clear evidence of the intentional deposition of other items of material culture, especially of sculptures and relief fragments (Becker et al. 2012; L. Dietrich et al. 2019). The majority of the handstones from the rectangular buildings have SF1 and SF2 and the wear markers WM1-3 attesting massive processing of cereals to coarse and fine flour.

If the rooftops and open spaces on the terraces around the low-lying hollow with the monumental buildings (Kurapkat 2015) may be assumed to be loci for grinding, then this setting could hint at a connection between the work performed and the monumental buildings. Maybe the grinding was done for actions inside or to commemorate these buildings or associated beliefs. The lower-lying hollow with the monumental buildings was accessible via stairs incorporated into the terrace wall, as already pointed out (Kurapkat 2015). Of course, this scenario remains hypothetical at the moment.

The distribution of handstones in monumental Building D (FIGURE 2.2, 4.23) was selected as a case study, as the other circular buildings are either partly disturbed by post-Neolithic activities (C and H) or incompletely excavated (A and B). The biography of Building D is complex, as already explained in chapter 2. The completely excavated ring wall with 11 pillars in situ and two central pillars very likely represents the last stage of a long building history. Kurapkat observed traces of a second, older ring wall to the south of the inner wall (Kurapkat 2015) and a deep sounding immediately to the north of the building revealed a likely segment of the same wall (Schmidt 2013).

In chapter 2 the case was made for a partly intentional backfilling of the building (FIGURE 2.2, layers 6-11) and the subsequent complete refill through erosion from higher-lying parts of the mound (FIGURE 2.2, layer 12-24), followed by five further sloped layers that completely covered the building (FIGURE 2.2, layers 26-29). The two uppermost of these layers were disturbed by ploughing. The distribution was analyzed separately for these three zones. Most grinding stones with percentages between 70% (handstones) and 82% (netherstones) lie in the erosion layers (FIGURE. 2.2, layers 12-29) above the actual filling (FIGURE 2.2, layers 1-11). The uppermost filling (FIGURE 2.2, layers 25-29) contained significantly less handstones and pestles than the erosion levels below (12-24) but the percentages are inverse for netherstones. These layers likely represent dislocated sediments and objects from the surrounding terraces. Maybe from these layers larger objects were picked and reused or discarded.

Only between 18% (netherstones) and 30% (handstones) of the finds lay inside the building´s walls, as they are preserved today (FIGURE 2.2, layers 6-11), and only 6% (netherstones) to 13% (handstones) were found in the block of probably intentionally infilled sediments (FIGURE 2.2, layers 6-10) above the bedrock on which the building was founded. As mentioned, this particular part of the filling seems to be intentional infill following the last stage of the building´s use-life. All 81 handstones and 13 netherstones from layers 6-10 were fragmentary, with the exception of one complete handstone of type 2, found immediately above the floor (Layer 6), which had ochre on its surface (of surface type S5) (FIGURE 4.31). Three more handstone fragments from here (Layer 1) show traces of ochre. Surfaces with ochre and irregular use-wear seem thus to be associated with the use of the monumental buildings. Both surfaces SF1 and SF2, as well as SF5 and WM1, WM

4 and 5 on handstones from the inner filling were attested. Processing of ochre and, in a smaller scale than outside, the processing of cereals are thus both attestable for this monumental building, while evidence for ochre is missing so far from the rectangular buildings. This is interesting, as finds of ochre had already been made in Building D. Both central pillars of Building D stand in sockets within pedestals cut from the bedrock. In each one of the sockets, sediments mixed with ochre and a fragment of a netherstone and a pestle with WM5 were discovered. A fragmented plate with ochre stood in front of Pillar 18, the eastern central pillar (chapter 6). No traces of pigments have been observed on the pillars so far, but the insights gained from the study of grinding stones imply that analytical methods should be used to detect such traces in the future. Use of red, white and black pigments is, e.g., attested in contemporary burials from Körtik Tepe (Erdal 2015).

FIGURE 4.31. Handstone 18_000358 found on the floor next to pillar 18 in monumental Building D (©German Archaeological Institute, Photos Laura Dietrich). D-DAI-IST-GT18-LD-0030.

PLATE 4.1. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

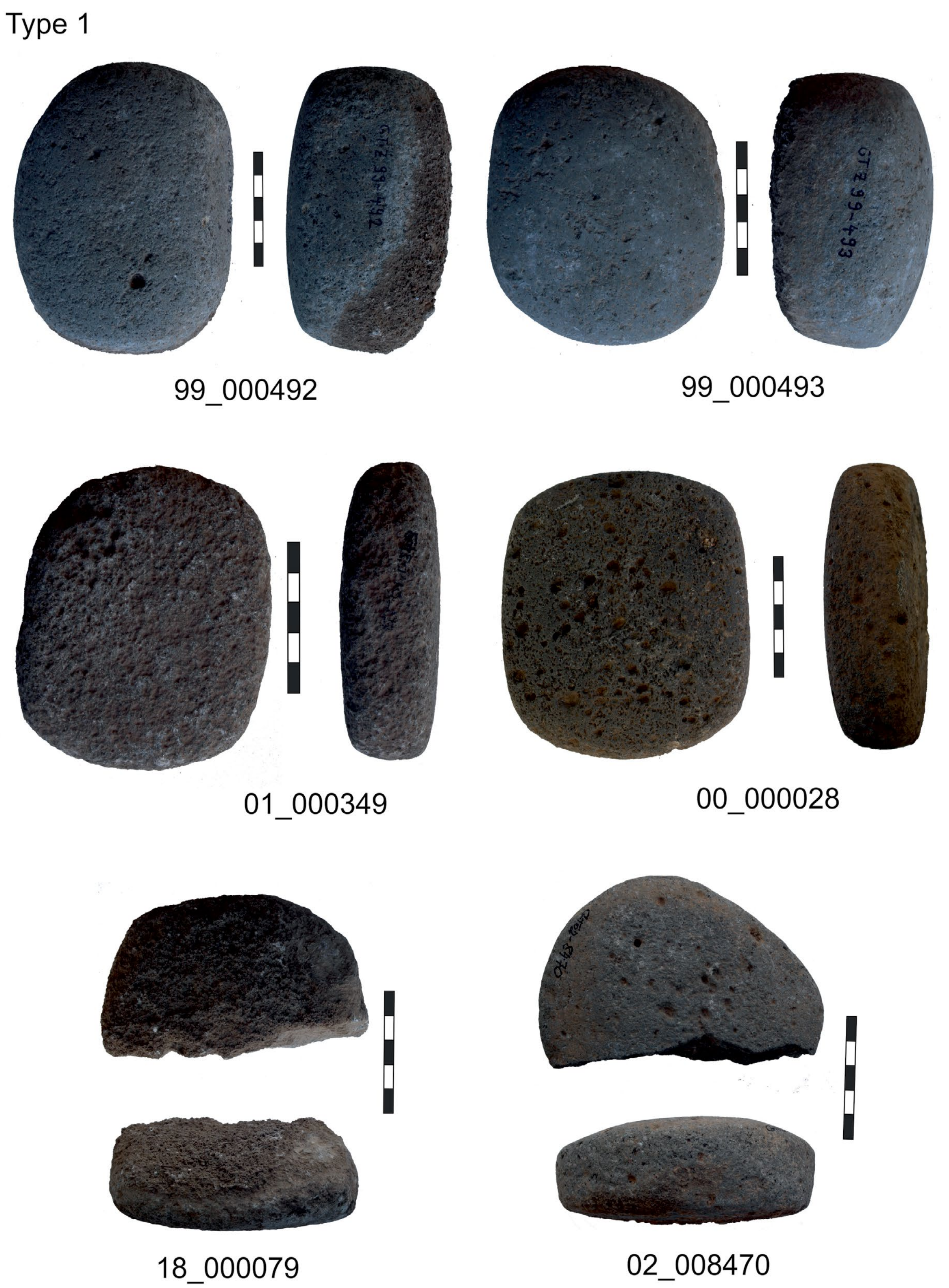


PLATE 4.2. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

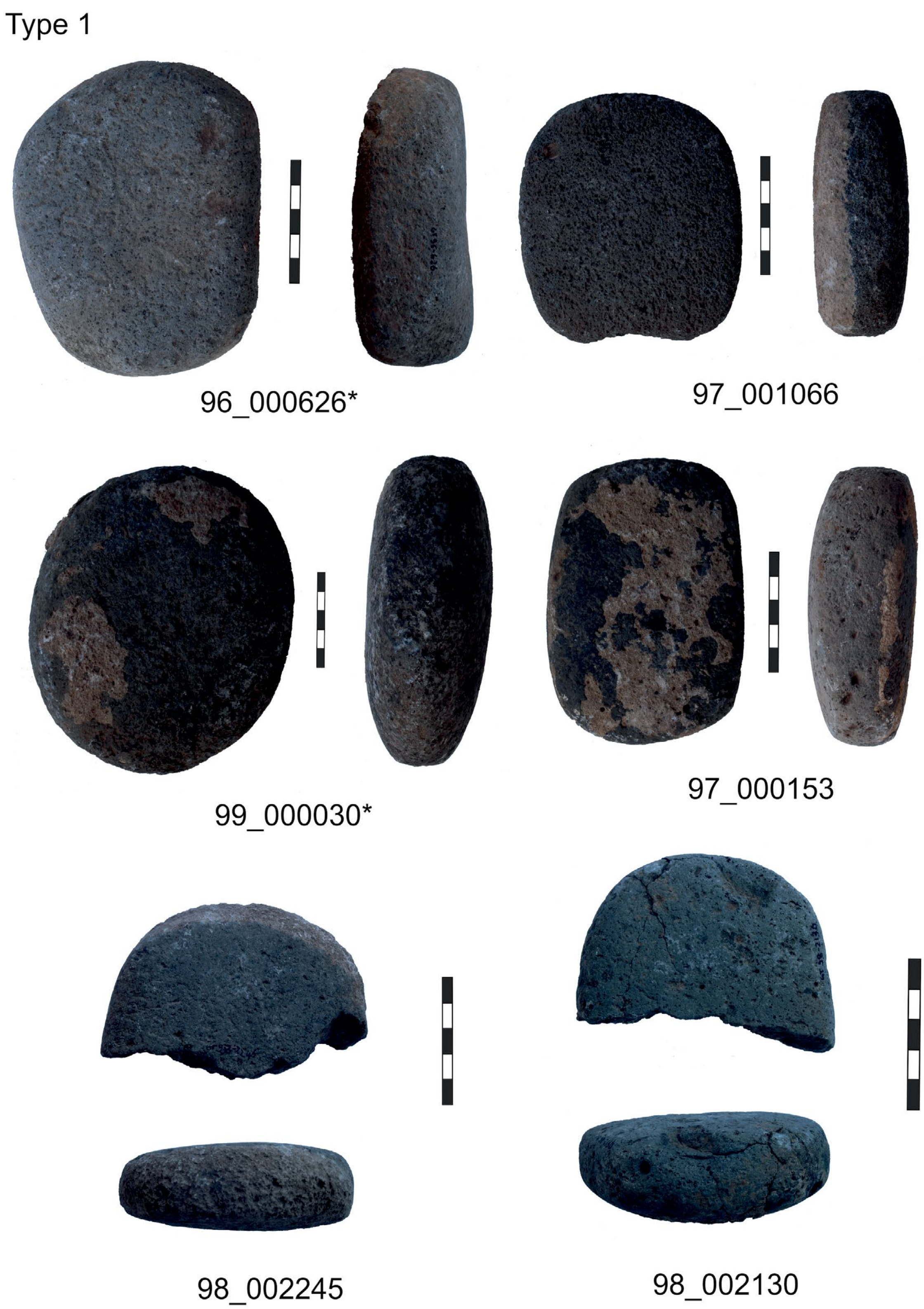


PLATE 4.3. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

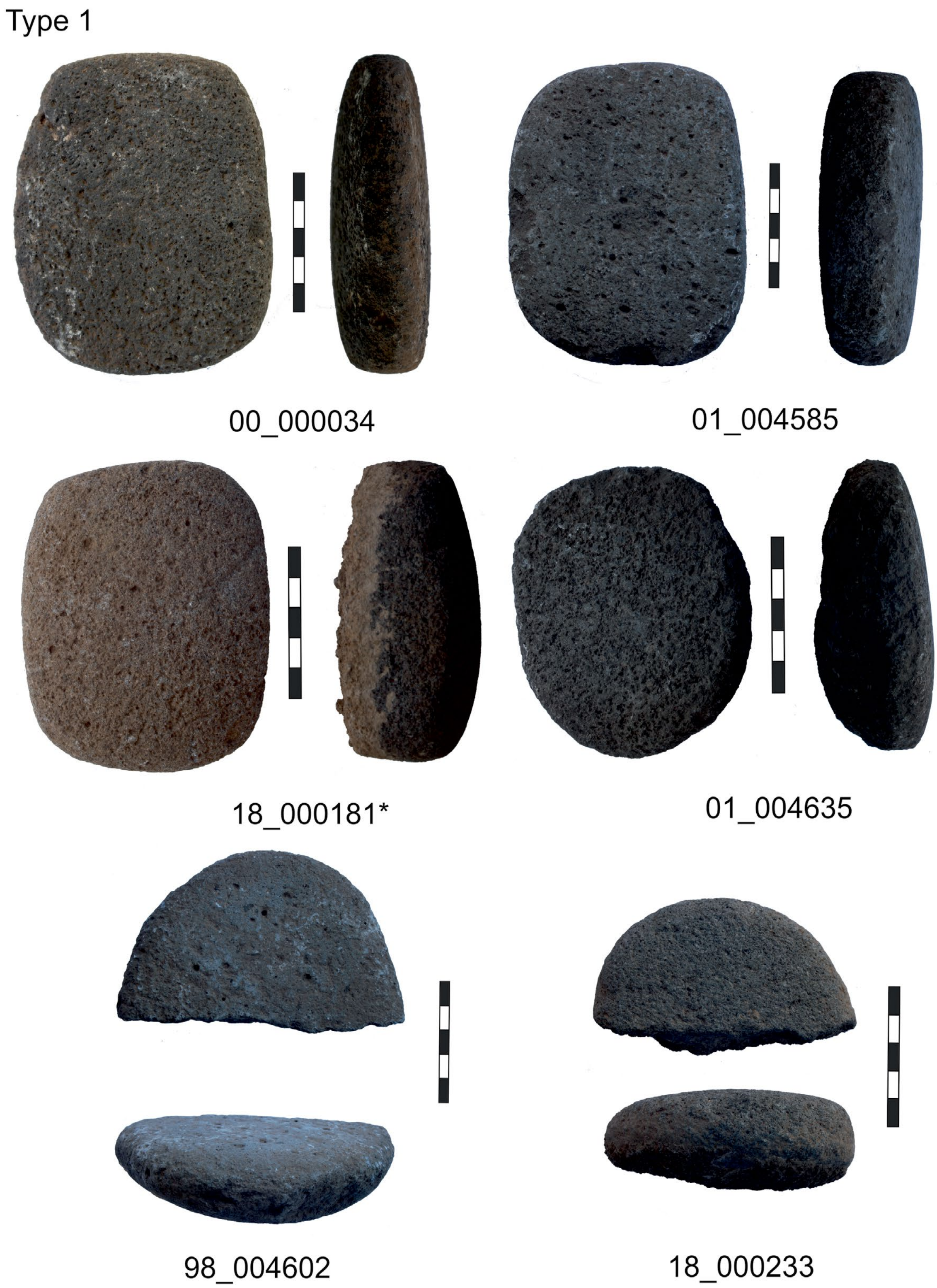


PLATE 4.4. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

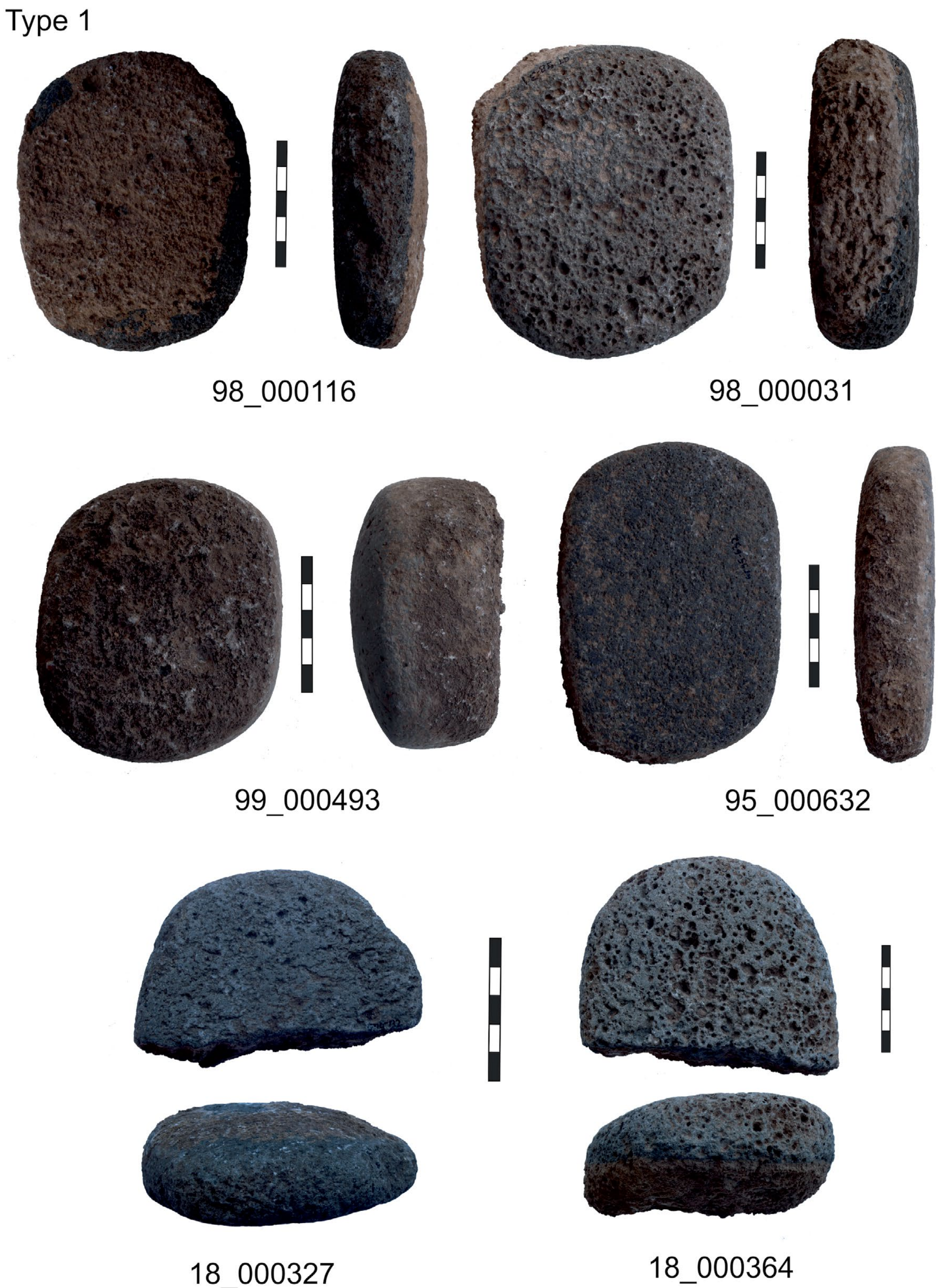


PLATE 4.5. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

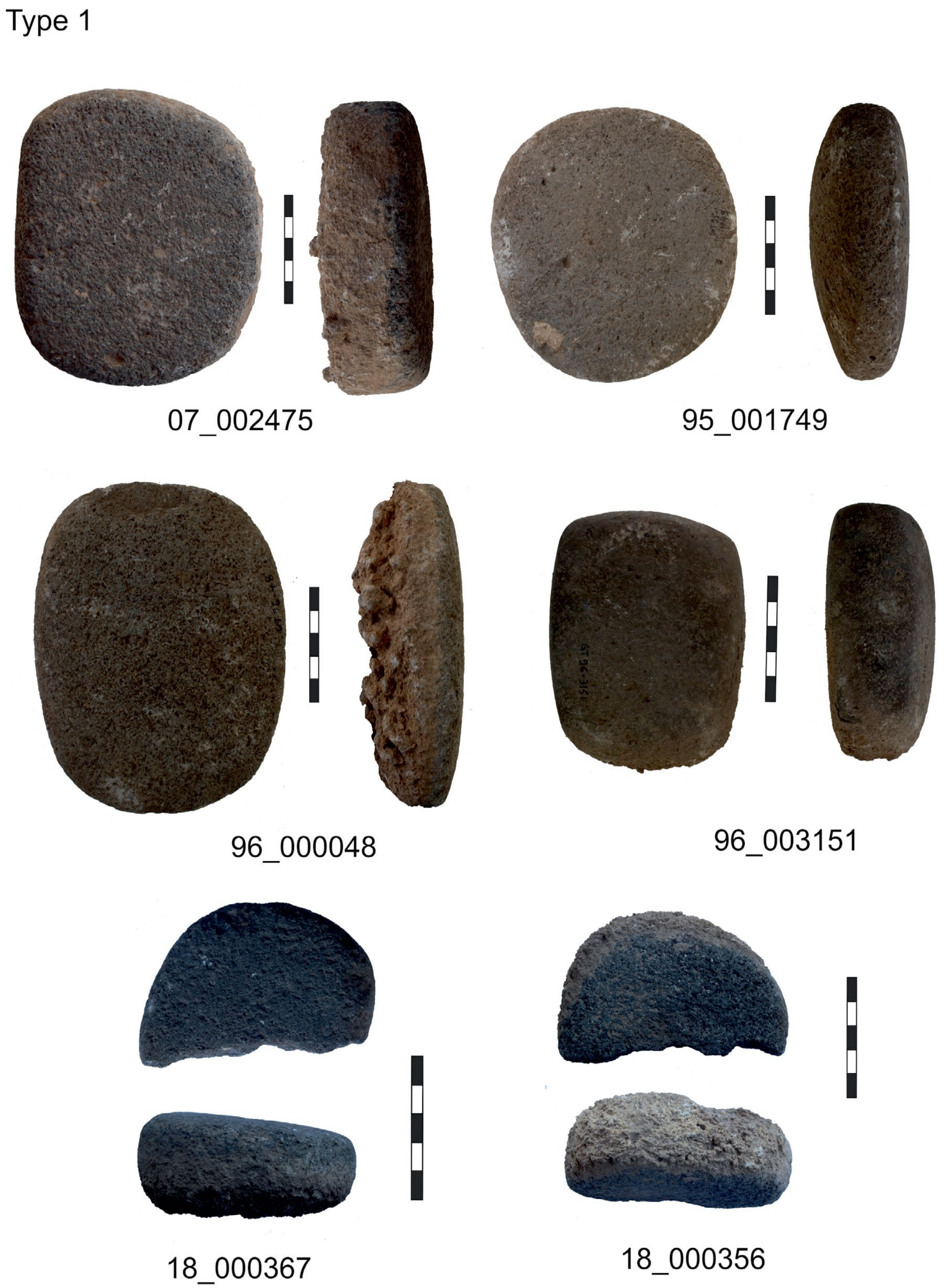


PLATE 4.6. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

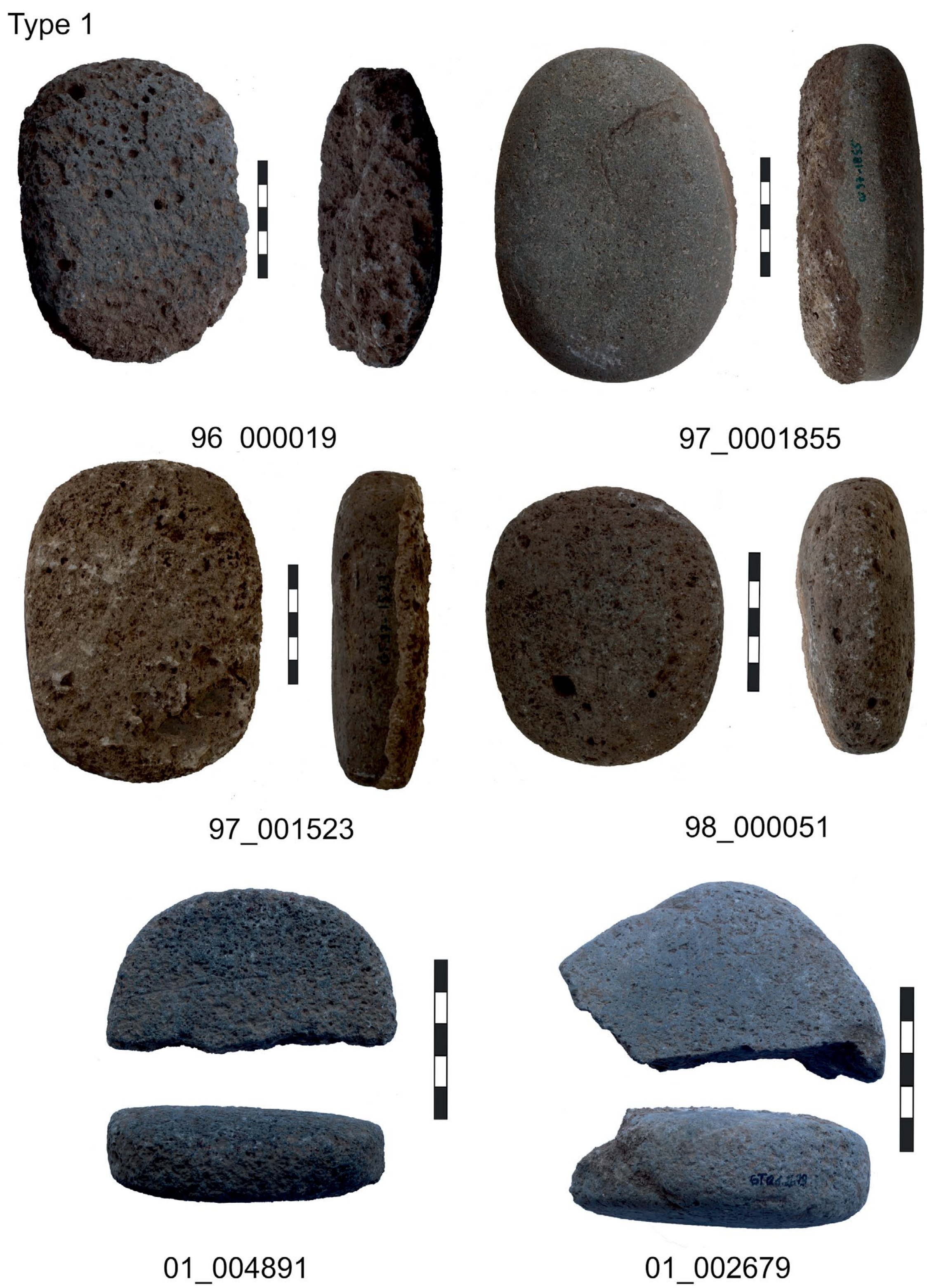


PLATE 4.7. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

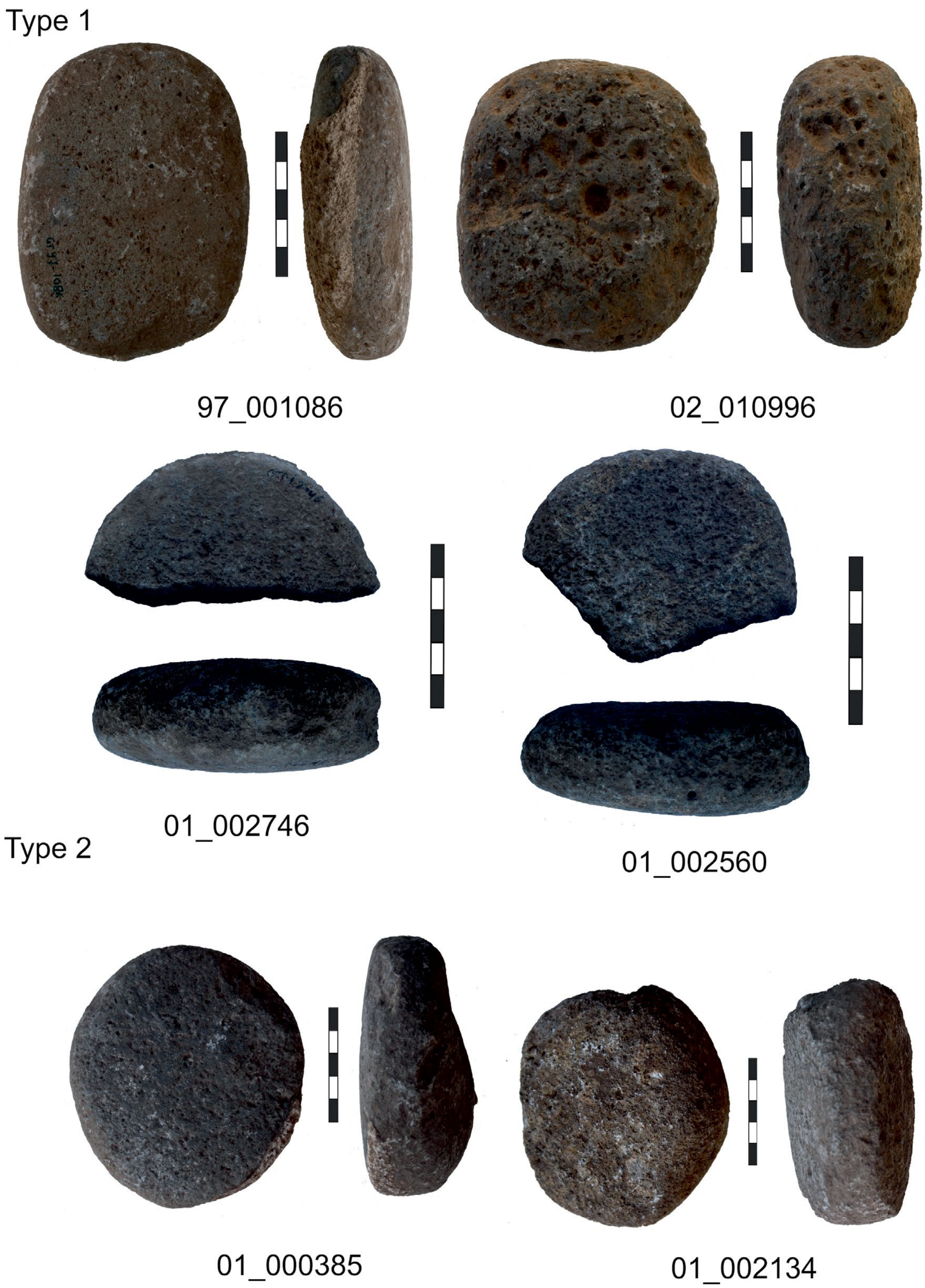


PLATE 4.8. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

PLATE 4.9. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

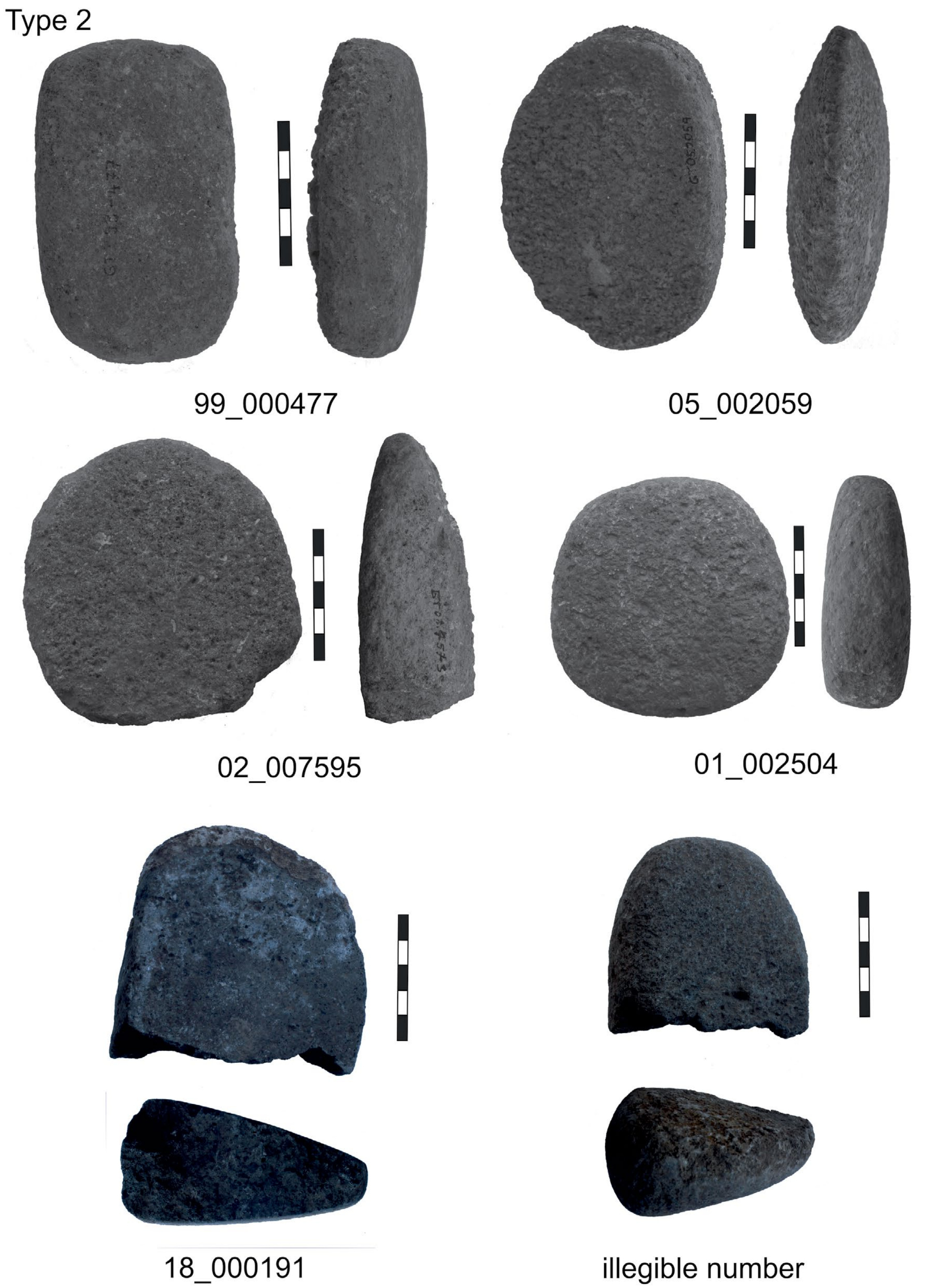


PLATE 4.10. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

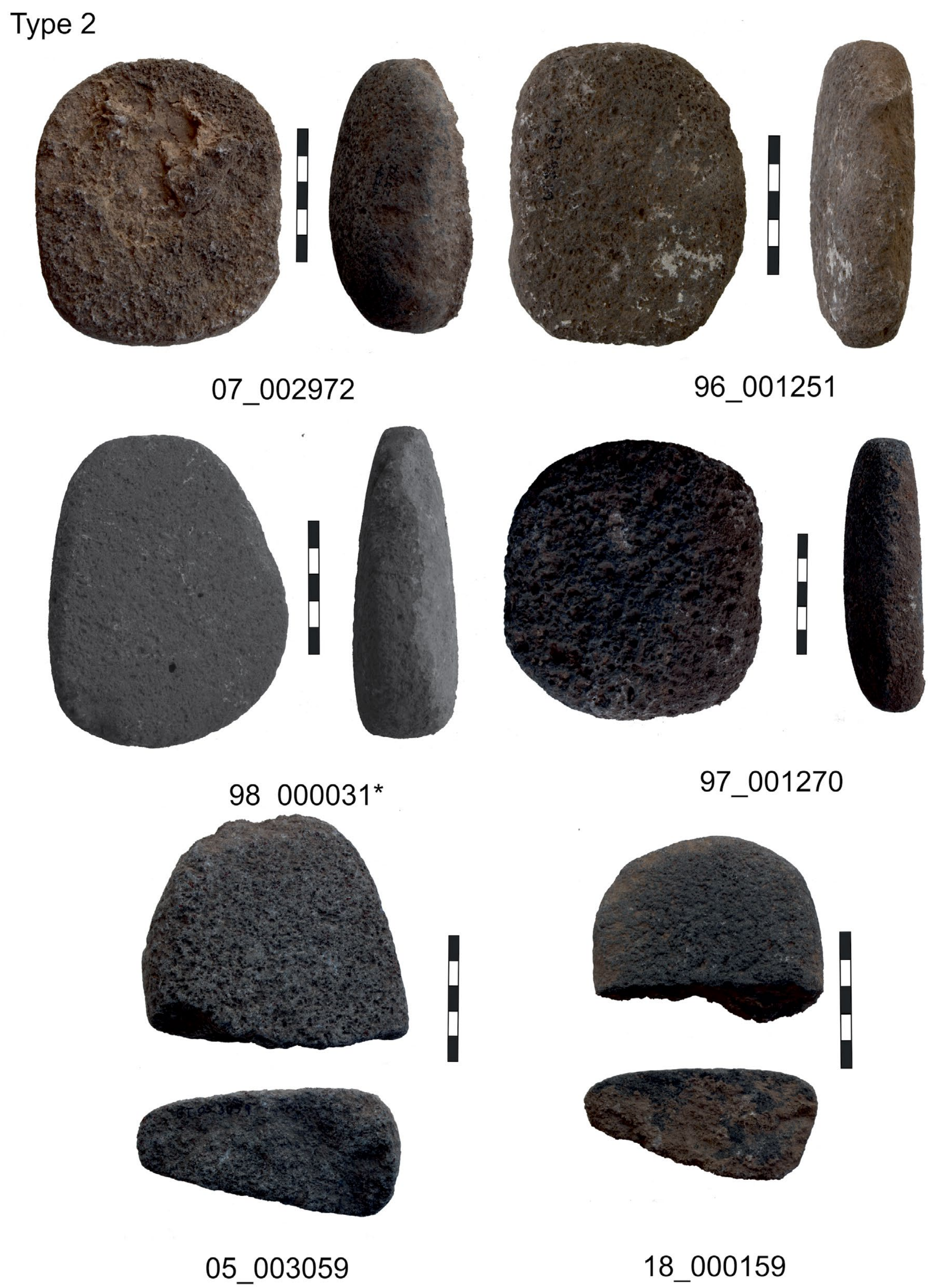


PLATE 4.11. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

Type 10

98_004670

Type 2

05_003059 18_000159 98_004390

PLATE 4.12. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

Type 10

96_000020

Type 2

18_000229 18_000325

PLATE 4.13. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

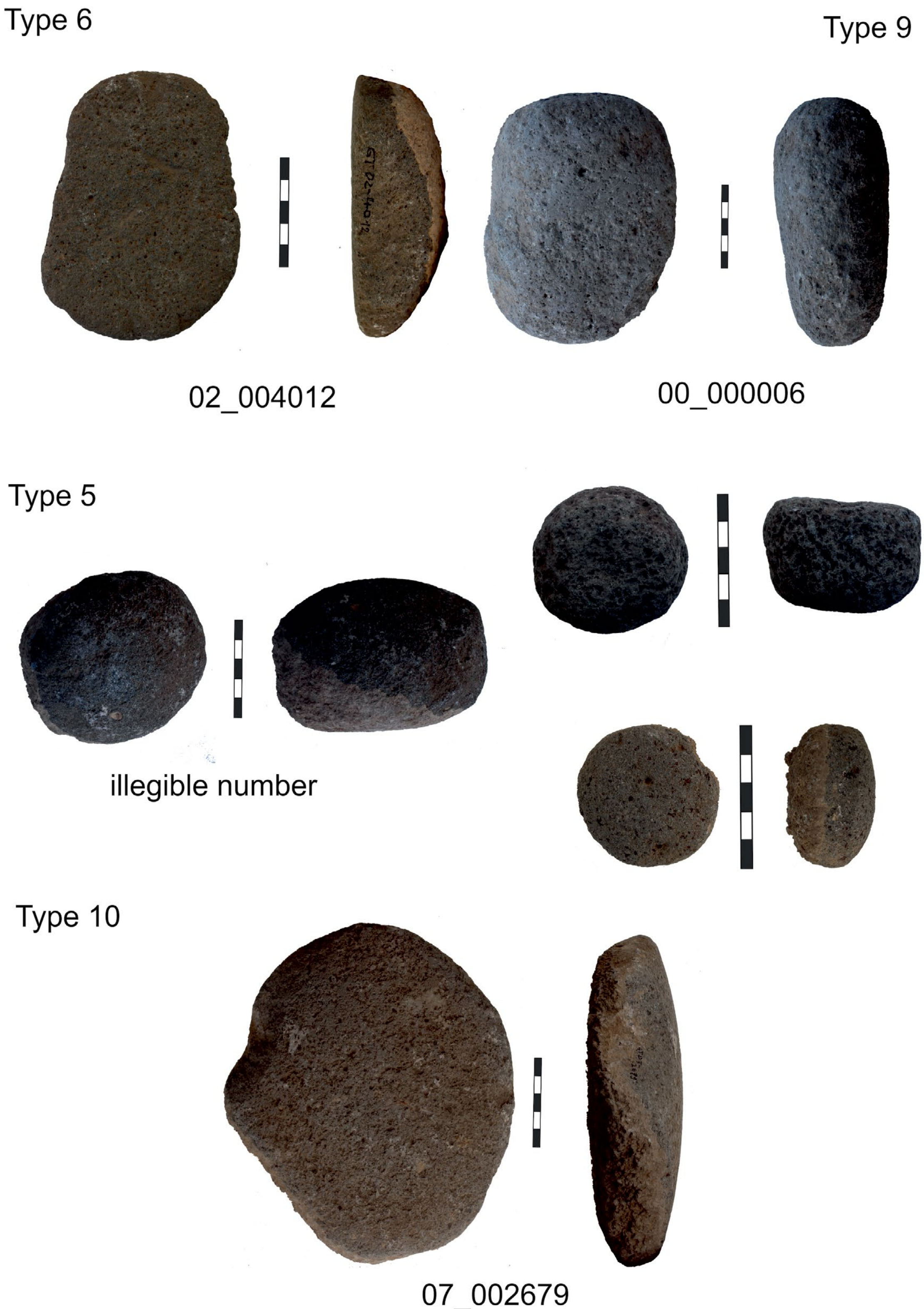


PLATE 4.14. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

PLATE 4.15. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

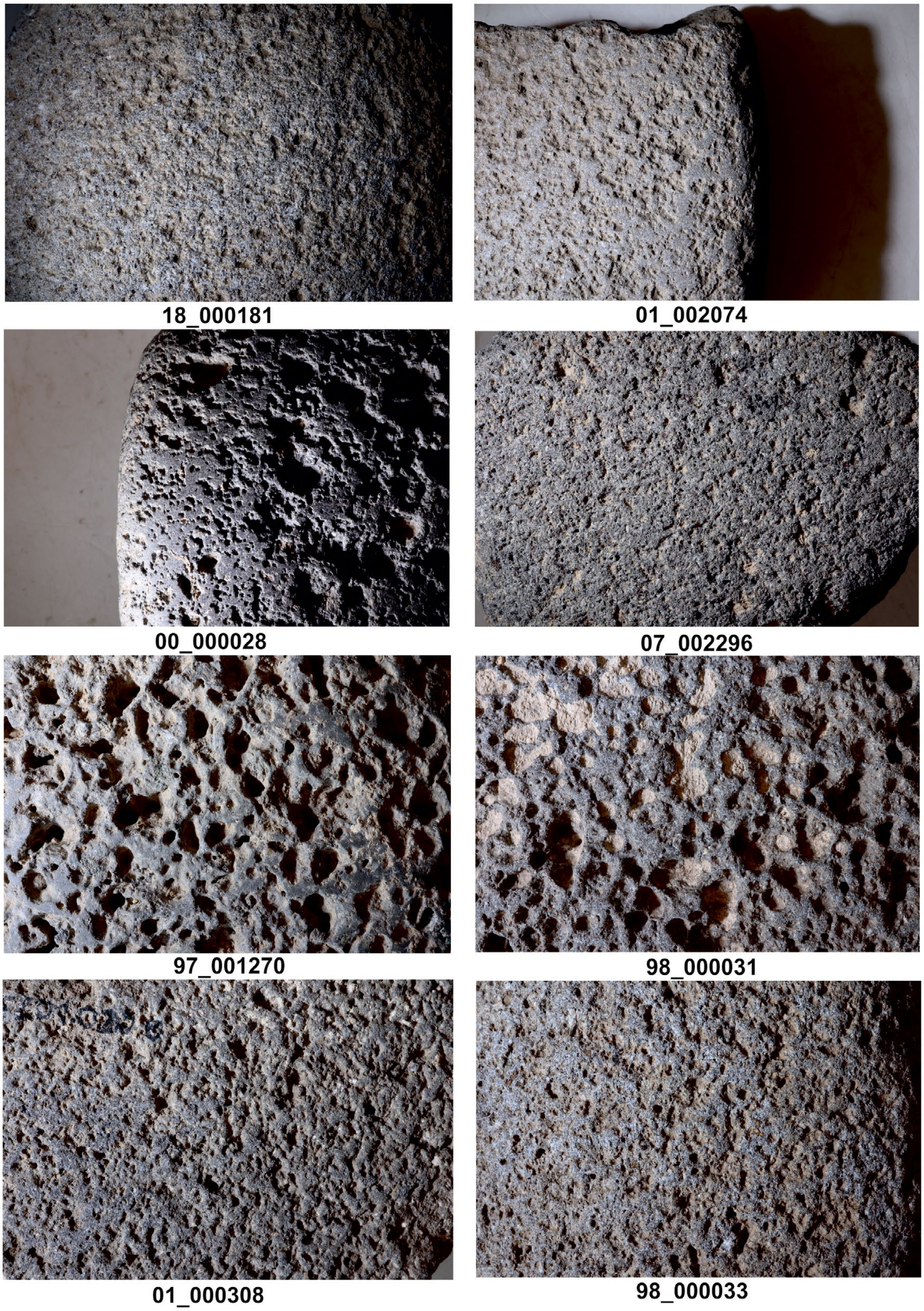


PLATE 4.16. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

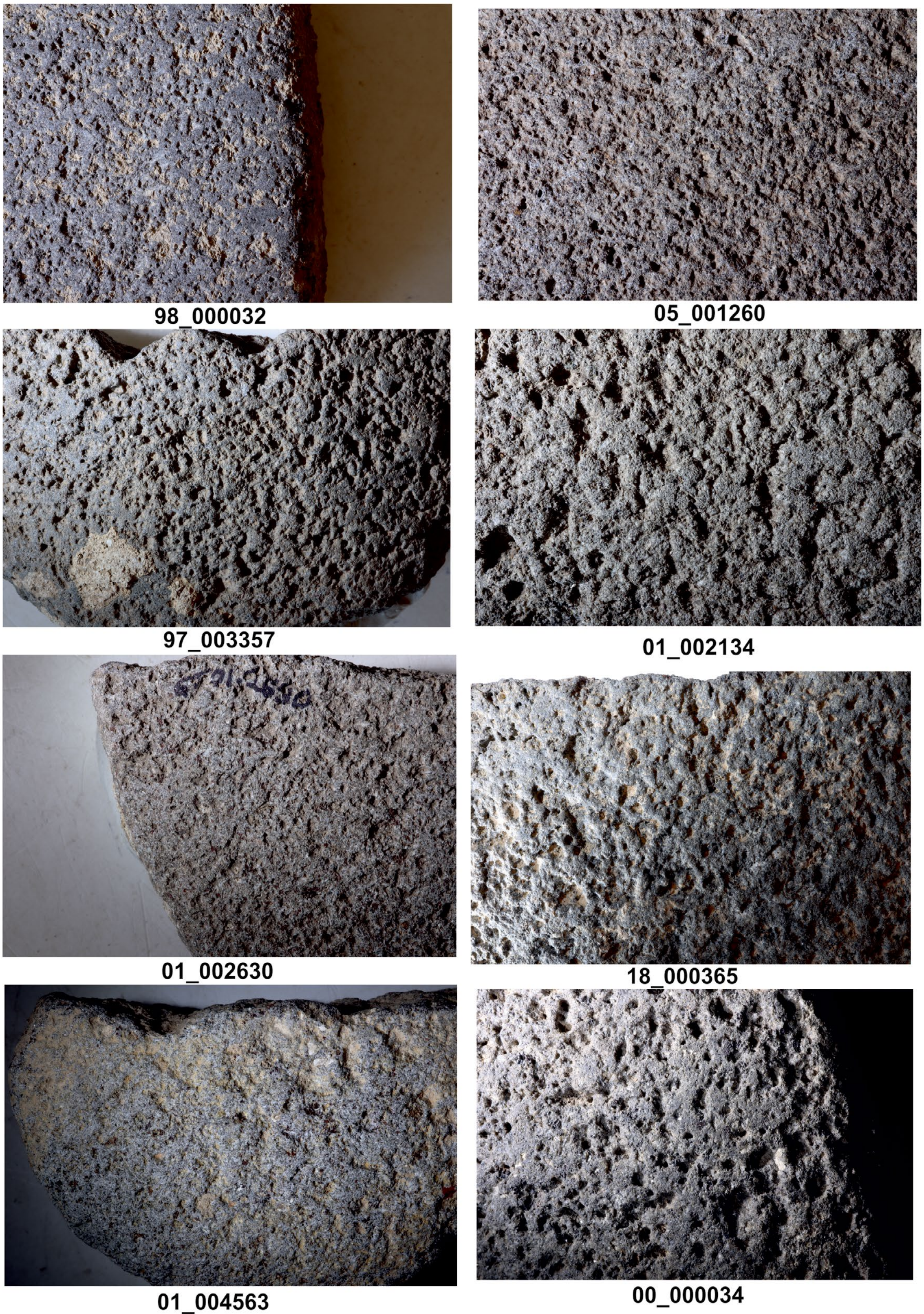


PLATE 4.17. Handstones (©German Archaeological Institute, Photos Laura Dietrich)

Chapter 5

Pestles

Summary

With 1955 objects, pestles appear at Göbekli Tepe in similar numbers as netherstones but are less numerous than handstones (the ratio is 1:1,7). They were used with grinding bowls and mortars, especially through circular, but also with vertical bi-directional motions, overall more as grinding than as pounding tools.
The pestles from Göbekli Tepe redocumented between 2017-2019 are fragmented and only a few have preserved working faces. Their function was reconstructed by experiments and by comparison with the netherstones with which they were used as a set. Completely preserved finds are stored in the Urfa Museum. There was no possibility to access them for analysis. Therefore, the current chapter offers a formal and contextual analysis of the finds. Only 4% of the finds, in numbers 87, could be used for formal analysis. The observed trends regarding preferences for forms are thus not statistically significant. Simple conical or cylindrical tools (n=74) predominate, more sophisticated shapes are rare (pear-shaped or with a ridge, n=12); larger artefacts between 10cm-25 cm are more frequent than smaller ones between 5cm-9cm.
The function of pestles at Göbekli Tepe can only partly be elucidated. Netherstones that have been used with pestles show traces of cereal, legume and probably dried meat processing. The high number of fragmented pestles is evidence for their intensive use. A part of the fragments has been reused as pounders to powder minerals or was reworked into axes.

Introduction

Pestles are defined as cylindrical, conical or pear-shaped tools made from middle to coarsely porous basalt with one or two working faces. Modern western pestles are small, bar-shaped tools with one bigger end and usually used to pound, crush or rub herbs or spices in a mortar. Modern pestles are much smaller than their mortars and can be moved freely in them; they are mostly used to pound and crush with vertical or slightly oblique motions. They are further used to mix pounded substances using bi-directional or circle-like motions. Neolithic pestles are large and heavy implements. A use similar to modern pestles is only possible in large netherstones. For Göbekli Tepe, characteristic working faces in large boulders attest this type of use (chapter 6). In mortars (short boulders) with a pre-formed depression (chapter 6) options were restricted to pounding using vertical moves or grinding through circular or semi-circular motions. A special and very effective way of using pestles is grinding with water through a circular motion in which only the shaft of the pestle is moved while the bottom remains on the same spot (chapter 3 EP4). As pestles are only slightly smaller than the depressions in mortars, bi-directional grinding moves are impossible (chapter 6). Pestles were also used in L-shaped boulders in a similar way as in dedicated mortars (chapter 6).
Although they can be used with several kinds of netherstones, pestles are usually defined as a part of a two-piece toolset with a mortar (short boulder) (e.g. Mazurowski 1997: 49-55; Shea 2013: 266) and despite the multiple possible motions and ways of use they have usually been labelled as pounding implements (Wright 1992). Ethnographical evidence shows that pestles of similar shape to the ones discussed here were regularly used to process cereals through circular and vertical motions to coarse flour (Cappers et al. 2016: 590, fig. 872 and 873) or cereal and legumes to fine flour with circular grinding moves (WildfilmsIndia). For making fine flour, pestles made from wood and powered by foot are very effective (Cappers et al. 2016: 576-579, fig. 850-858). Very long wooden pestles are also the prime tools for dehusking cereals (Cappers et al. 2016: 574-575, fig. 848-849).

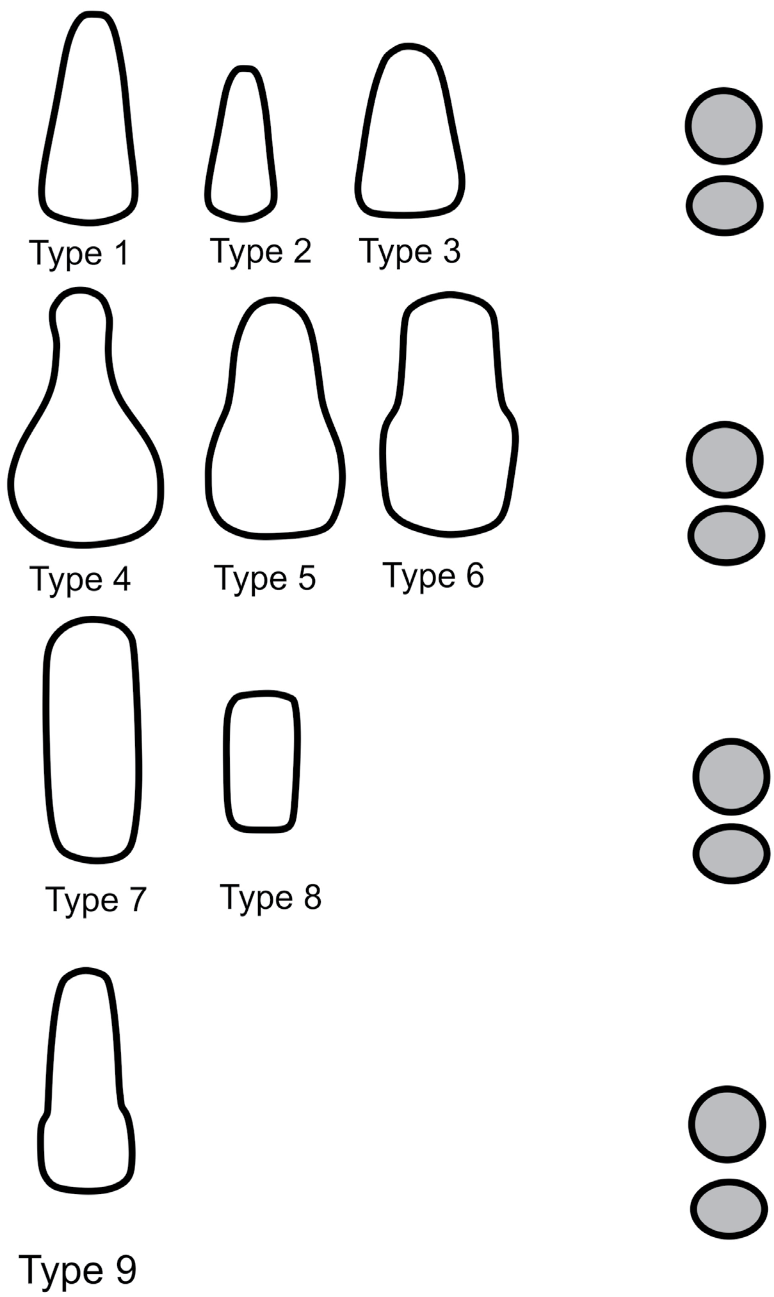


FIGURE 5.1. Types of pestles from Göbekli Tepe (©Laura Dietrich).

Pestles in general can also be used on a wider range of materials beyond cereals, like other grasses with seeds, herbs, nuts, minerals or tubers (Adams 2002).
Pestles appear frequently in Epipalaeolithic and Neolithic assemblages of the southern Levant (Wright 1992; Rosenberg 2004). Starting from the PPNB and during the PN their numbers decrease constantly, they are replaced by grinding stones (Rosenberg 2004). Use-wear traces on Natufian and Neolithic finds so far hint at their role in processing cereals, herbs, minerals, animal skins (Dubreuil 2002) and meat (Rosenberg 2004).

Database

The project database comprises 1955[1] pestles, mostly from the main excavation area in the southeastern depression. The database also had entries on a selection of pestles from the northwestern areas. The datasets consist of context information, measurements (length, width, thickness; weights are mostly missing) and a sketch. Due to the bad preservation of the available finds, my own documentation focused on handstones and netherstones. All available pestles were photographically documented and macroscopically examined regarding forms, breakages and other traces; measurements and contexts were largely taken from the database, as random checks proofed them to be correct and weights are not of paramount importance because of the fragmented state of the material.

Classification of shapes (used stage)

The main attributes for a formal classification of pestles are the form of the body and the size. The following nine types can be differentiated (FIGURE 5.1).

Type 1

Cone-shaped large pestles (appendices TABLE 19, FIGURES 5.1, 5.2): The slightly rounded, broader end is the working face. 22 pestles can be matched to type 1 (appendices TABLE 19), 11 of them are complete. Pestles of type 1 are 10cm-25cm long (average: 16.3cm), have a diameter between 4cm-7,5cm and weigh 812g-1564g. Their cross-section is round to oval. As this is the simplest form with the broadest spectrum of possible uses, and as the majority of the documented fragments have a conical form (but cannot be assigned to this type because the characteristic lower part with the working face is missing) we can assume that this was the most frequent type at Göbekli Tepe.
The find contexts of type 1 pestles are not very informative. 15 artefacts are from the plow horizon or surface finds. One pestle comes from the floor of room 9 in area L9-56. Inside this room, a total of five pestles was found in different positions/depths in the filling, between them another one of type 1. From area L9-56, and here especially from rooms 7-10, 28 pestles are known, which makes this area the one with the highest find density of pestles in "layer II" (see below).
Pestles of type 1 are relatively light-weighted and their shape makes them easy to hold. Theoretically they could be used as well for pounding (dehusking or crushing) with vertical motions as for crushing with bi-directional or circular motions. Their working faces fit well into the mortars (short boulders) respectively into depression D6. Photos of well-preserved artefacts show convex working faces with flat plateaus at the transition to the body/handle but also covering a few centimeters of the body. This indicates that these pestles were used with circular (rotary) motions in narrow depressions (D6), probably in a position in which only the shaft of the pestle is moved while the bottom remains on the same spot (see E4). The specific shape of these pestles would constitute an advantage for this type of rotary moves. However, this statement is only valid for the few completely preserved items.
Regarding further wear traces, pestles nr. 95_000819 (FIGURE 5.5), nr. 96_002803 and nr. 97_001924 show bulbar scars and flaking at their lower ends which were caused by hitting hard surfaces. Most pestles of type 1 have no use-wear traces on the sides. Pestle nr. 10_000309 (FIGURE 5.3) however has two areas with reddish ochre-traces on the body but not on the working face. Both areas with ochre also show intensive bulbar scars, which superpose the original surface. Areas with intensive bulbar scars are known at least in one more case (nr. 95_000033). They indicate a secondary use as hammers. It has to be stressed though that traces of ochre are not characteristic for this group of pestles, at least not on the fragments that can clearly be identified as belonging to type 1.
Some pestles were reworked into axes, even if they would have been still useable in their first function. Nr. 97_001372 was re-worked at its proximal end. It seems that someone tried to prepare

[1] For ten more artefacts (Nr. 801) this classification remains insecure.

FIGURE 5.2. Pestle nr. 97_000651(©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT97-KS-5926.

FIGURE 5.3. Pestle nr. 10_000309 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT10-NB-0113.

FIGURE 5.4. Pestle nr. 98_000169 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0215-0216.

FIGURE 5.5. Pestle nr. 95_000819 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0217.

FIGURE 5.6. Pestle nr. 99_000302 (© German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0218.

a flat surface, then the piece was discarded. This type of blow is a characteristic step in making axes from pestles and appears also in pestles of type 2 and 7. Types 1, 2, 3 and 7 were made from a finely pored and harder basalt, which makes them suitable for reworking through grinding. Pestle nr. 98_000169 (FIGURE 5.4) was reworked with heavy direct blows on its entire surface, one side was already formed as an axe blade, while the other side was in the process of flattening when the piece was abandoned, maybe because a too big flake broke off. The cases of clear reworking pose the question of whether this was a regular practice reducing the number of surviving pestles. This will have to be answered in the frame of a study on the axes from Göbekli Tepe.

Type 2

***Cone-shaped, small pestles*:** Type 2 (appendices TABLE 20) is similar in shape to type 1 but considerably smaller. The eleven artefacts of this type are made from a finely pored basalt and measure between 5.5cm-9cm (average: 7.4cm), the working faces are 2-3cm wide. For two pestles the weights are known: 48g and 105g. Contexts do not reveal information on possible functions. Of the eleven type 2 pestles, seven are surface finds. One is from the upper infill (zone 2) of room 4 in area L9-96, one was found roughly in the middle part of the infill of room 13.

Pestles of type 2 have similar convex working faces as those of type 1. They were likely also used in mortars or narrow grinding bowls, but ongoing experiments show that their lengths and weights are too small for effective cereal processing. They are very similar to modern pestles and could well have been used for crushing herbs or spices. An exception is nr. 09_000542. This pestle has pecking marks on its body and deep bulbar scars on the working face, it has likely been used in the way of a hammer stone.

FIGURE 5.7. Pestle nr. 11_000028 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT11-NB-3543

FIGURE 5.8. Pestle nr. 11_000031 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT11-NB-3502; D-DAI-IST-GT11-NB-3546.

FIGURE 5.9. Pestle nr. 98_000510 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0219.

Similar to type 1, type 2 pestles were used as raw material for axes or chisels. Nr. 99_000149 was reworked in the lower part, two flaking negatives are clearly visible. While this pestle was intact when reworking started, nr. 99_000302 was already broken (FIGURE 5.6). Several irregular bulbar scars are visible in the lower part of this fragment as well as a vertical blow that broke of a large flake from one lateral side and flattened it.

Type 3

Cone-shaped squat pestles: A total of 18 pestles represents this type (appendices TABLE 21), 15 of them are complete. Their shape is considerably squatter than that of type 1, the body bents sharply towards the working face, which in most cases is flat, more rarely slightly convex (FIGURE 5.7). The pestles have lengths between 8cm-13cm and diameters up to 7.5cm, their mean weight (n=7) is 416g. Pestles of this shape cannot be used for rotating motions in an oblique position but are well-suited for bi-directional or vertical motions. They could also be used to apply vertical pressure, maybe in combination with rotating the pestle. Their general shape theoretically also allows their use as a handstone, the hand resting either on the proximal end or on the side of the tool. A use for cereal processing is possible, and indeed pestle nr. 11_000031 (FIGURE 5.8) has a convex working face which shows characteristic plateaus with convex profiles.
Three pestles of type 3 were found in rooms in area L10-51: Nr. 99_000078 on the floor of room 28, nr. Nr. 99_000254 on the floor of room 27 and nr. 99_000510 in the upper fill of room 25. The latter two were complete. Another complete pestle (nr. 98_000652) was found in the wall of a room; nr. 00_000011 is from the middle of the infill in building B.
Similar to the other two types discussed so far, pestles of type 3 were re-worked into axes. One lateral side and the working face of pestle nr. 98_000510 (FIGURE 5.9) were re-shaped, but the axe semi-product then abandoned, probably due to the very coarsely-pored basalt. However, the

FIGURE 5.10. Pestle nr. 09_000145 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT09-NB-0189

FIGURE 5.11. Pestle nr. 10_000311 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT10-NB-0121

flattened lateral side shows traces of wear, an area with very flat plateaus and dull polish. As the area with wear marks measures only 4cm x 3cm a secondary use as a broad handstone is excluded. Dull polish results often from contact with organic materials and sometimes pestles are used as abraders to shape bone implements in southern Levantine sites (pers. observation from Mushash 163, Jordan). Further microscopic study of such cases is needed to strengthen this interpretation for Göbekli Tepe.

Type 4

Pear-shaped pestles with a small curved neck: There are two massive artefacts of this type from Göbekli Tepe showing a very thin and curved upper and a nearly round lower part with a convex working face. They measure 17.5cm respectively 23,1cm in length and 10cm / 13cm in diameter and weigh more than 4kg (appendices TABLE 22). The form is not common in the southwest Asian Neolithic, weight and shape make their production complicated. The easiest way to maneuver them is standing on a surface and with semicircular motions without lifting the working face completely. Considering the weight, vertical crushing motions would only make sense for very hard materials like minerals or rocks. Another possible use would be in construction, e.g. to level floors. Nr. 09_000145 (FIGURE 5.10) has white calcareous material of unknown provenance on its surface below the sinter layer, which could hint at working limestone (terrazzo floors?). Future chemical analysis on terrazzo floor materials from Göbekli Tepe should include this pestle to test this possibility. The heavy weight renders these pestles not useless in cereal processing, however, the only possible product would be fine flour and they could only be combined with the deep and large grinding bowls of type 1.

Type 5

Pear-shaped pestles with a solid neck: This shape is a combination of attributes of types 1 and 4, with a massive and pronounced lower part and a flowing transition between body and handle. The working faces are flat (FIGURE 5.11) or convex (FIGURE 5.12). Seven pestles of this shape were identified (appendices TABLE 23), all of them complete. They are between 10cm-18cm in length and have diameters between 5cm-8.4cm. For only one pestle the weight is known, 624g. Two complete type 5 pestles were found in room 9 in area L9-56, one in the upper fill (nr. 98_001951, zone 1), the other one on the floor (nr. 00_000020, zone 4). Another pestle is from the middle infill of room 25 (nr. 99_000476).
Judging from the shape, pestles of type 5 could be used either with bi-directional or with rotating motions in narrow mortars or grinding bowls. Nr. 01_000353 (FIGURE 5.12) has long bulbar scars of unknown provenance on the lower body.

FIGURE 5.12. Pestle nr. 01_000353 (© German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT01-KS-6764

FIGURE 5.13. Pestle nr. 95_001743 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0220.

FIGURE 5.14. Pestle nr. 12_000579 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT12-NB-1108

FIGURE 5.15. Pestle nr. 12_000009 (©German Archaeological Institute, Photo Nico Becker). D-DAI-IST-GT12-NB-3935

Type 6

***Cone-shaped pestles*:** Type 6 is a variant of type 5. The lower part is pronounced and separated from the upper part by a ridge (FIGURE 5.13, appendices TABLE 24). Only two pestles of this type were identified, they are both 20cm long and have diameters of 7cm and 9cm. One is a surface find, the other one is from an unclear context within the filling of building A. Pestle nr. 95_000149 (FIGURE 5.13) has bulbar scars and chip marks on the lower part and the working face, which hints at direct, hard blows.

Type 7

Cylindrical long pestles: Together with types 1 and 3, type 7 is the most common pestle shape at Göbekli Tepe, 19 finds are known (FIGURE 5.14; appendices TABLE 25). Pestles of type 7 have two similarly large working faces and a straight to slightly arched body. The ten complete pestles are between 10cm-20cm long (average 13.5cm) and measure 5cm-6cm in diameter. The weights vary widely between 550g-1602g.

Cylindrical long pestles were found in the rectangular buildings (nr. 02_005941, 99_000079, 99_000454, 98_004412), in the monumental buildings (nr. 02_000483) and the deep soundings (nr. 11_000574, 12_000009; 12_000579). Several come from the upper and middle filling levels of three adjacent rooms (16, 17, 20) in area L9-80. One damaged type 7 pestle (nr. 99_000079) was found on the floor of building 29 (area L10-71) together with a type 3 pestle (nr. 99_000078).

Different from the other pestle types those of type 7 regularly have bulbar scars and chip marks on the working faces (nr. 12_000009, 12_000579, 95_000245; 99_000454; 98_000466; 98_004417, 97_002478, 95_000267, 95_000245) (FIGURES 5.15, 5.16). Most completely preserved pestles have those traces on both ends (FIGURES 5.15 and 5.16). The chipping is either irregular (for pieces made of coarsely pored basalt, e.g. FIGURE 5.15) or a steep ridge on the pestles´ proximal end is formed (for pestles made from finely pored basalt). Both trace patterns result from heavy blows on hard materials. Ethnographic evidence suggests cylindrical pestles as tools for dehusking cereals or crushing of grains or other food stuff of a middle hardness (Cappers *et al*. 2016). Another possible

FIGURE 5.16. Pestle nr. 95_000945 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0221.

FIGURE 5.17. Pestle nr. 97_000270 (©German Archaeological Institute, Photo Laura Dietrich). D-DAI-IST-GT18-LD-0222.

FIGURE 5.18. Upper left: Pestle nr. 98-169, in the process of re-working into an axe through knapping (Photo Laura Dietrich). Upper right: Axe of a similar shape with knapped blade and pecked body. Lower left: Axe with pecked body. Lower right: Axe with ground blade (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT18-LD-0223; D-DAI-IST-GT97-KS-6469; D-DAI-IST-GT96-KS-6386.

use for this pestle shape would be the processing of dried meat in mortars (Adams 2002). As traces of ochre were not observed on this pestle type, other possible functions have to be considered. The general shape, with a long body and a working face that is too small for grinding speaks in favor of a utilization with pounding motions. Only very few type 7 pestles have a slightly convex working face (e.g. nr. 11_000574), which could hint at a mixed use that included circular grinding motions. Most have straight working faces (e.g., nr. 97_002400).

Type 8

Squat cylindrical pestles: Only six pestles can be attributed to this type (appendices TABLE 26). They are a smaller variant of type 7 but made of finely pored basalt (FIGURE 5.17). They are 5cm-8cm long, have diameters between 3cm-5cm and weights of 83g-250g. Contrary to type 7, type 8 pestles have no scars from hitting hard materials on their ends. Their low weight makes a similar function further improbable. Their working faces have some flattened areas, which are, however, unevenly distributed. They could have been used to crush herbs or spices, similar to modern pestles.

Type 9

Pestles with a conical neck and quadratic flange: There is just one example of this type from Göbekli Tepe (appendices TABLE 27). It is 14.8cm long, has a diameter of 5.8cm and a weight of 686g. The pestle has a plain working face and its lower part is divided by a flange from the conical upper part. It comes from the plough horizon in area L9-95.

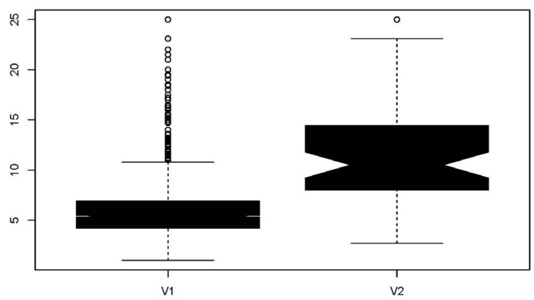


FIGURE 5.19. Notched boxplot showing the distribution of lengths for pestle fragments (V1) and complete pestles (V2) (©Laura Dietrich).

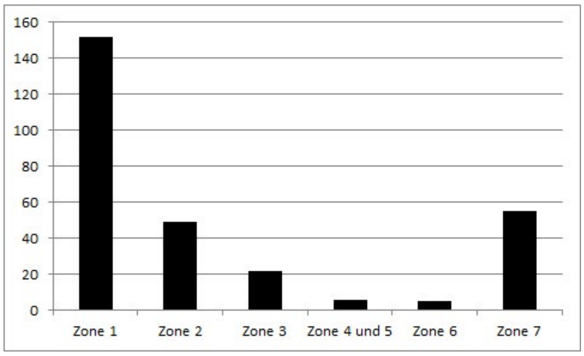


FIGURE 5.20. Pestles: Distribution in the fillings of the rectangular buildings (©Laura Dietrich).

Manufacture

The main techniques in making a pestle are pecking and flaking (FIGURE 5.18). Ongoing experiments by Nils Schäkel at the Düppel Village Museum begin to throw some light on the manufacturing processes of the pestle types used at Göbekli Tepe. Making a simple pestle of conical or cylindrical shape takes about 1.5 hours, just like the time needed for the production of a handstone. Pestles were in a first step roughly formed by pecking, further shaping was done by knapping, which makes the process similar to the manufacture of axes (FIGURE 5.18: upper left and right). Axes were then finished by grinding to smooth the surfaces and sharpen the cutting edge, however, there is no evidence for grinding of pestles made of coarse basalt.

The preservation of finds

The high degree of fragmentation of the pestles from Göbekli Tepe has already been pointed out. The high number of forms and shapes makes an analysis of fragmentation patterns much more difficult than for example for the handstones. A boxplot graph (FIGURE 5.19) of all fragments (left) and all completely preserved pestles (right) shows that the average length of fragments is considerably less than the average length of complete pestles. Therefore, most pestle fragments likely represent a third or less of the original complete artefact. Very small pestles were included in this analysis, but as they occur in very low numbers, they do not influence the results very much.
It is hard to state to what degree the fragmentation was caused by use-related events or post-use / post-depositional processes. However, the absence of the working face is remarkable for many pestles. This type of breakage is likely related to intense use, as the working face represents the most solid / resistant part of the pestle types discussed here which makes incidental breakage in this area improbable. In any case, the preservation of larger pestle fragments or damaged pestles is clearly biased by the practice of re-working them into axes.

Contextual analysis

Data on the distribution of 289 pestles from the rectangular buildings was available for contextual analysis (FIGURE 5.20). In many aspects their distribution pattern is similar to that of the handstones, however, there are also some differences.
The main difference is the occurrence of pestles on the surface and in the plough horizon. 52% of the pestles come from these zones but only 37% of the handstones (TABLE 5.1). This could partially be due to a bias during find documentation, as handstones – also those from unclear contexts - were preferentially documented for the analysis of use-wear. If we look at the percentual distribution from zones 2-7, they are similar for pestles and handstones (chapter 4). About one third (36%) comes from the upper part of the filling, a little more (40%) is from the terraces surrounding the monumental round buildings. Only 16% of the pestles were found in the middle part of building fillings and 4% on floor levels.

Pestles: distribution in the building fillings	Quantity
Zone 1	152
Zone 2	49
Zone 3	22
Zone 4 and 5	6
Zone 6	5
Zone 7	55

TABLE 5.1. Distribution in the fillings of the rectangular buildings.

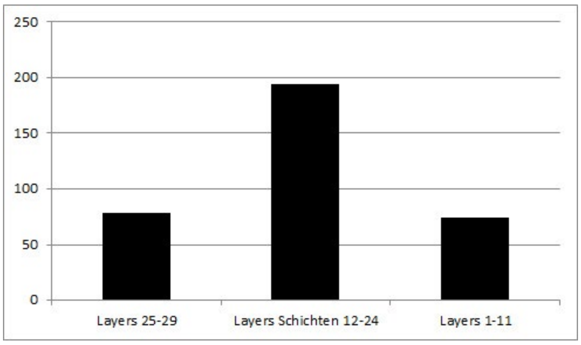


FIGURE 5.21. Distribution of pestles in building D (©Laura Dietrich).

A series of buildings was chosen as case studies to determine the exact distribution patterns of pestles in single complexes: building 9, 16, 25, 38 and building D.

Building 9. Only six pestles were found in building 9, another six come from building 8, immediately next to it. Complete pestles of type 1 (nr. 00_000021) and 5 (nr. 00_000020) were found on the floor, pestle fragments and another complete pestle (type 2) come from the upper filling. From the excavation area in which the building is situated, L9-56, also pestles of type 3 and 7 are known.

Building 16. There are 13 pestles from this building (description in chapter 4) all of them preserved as small fragments that render a classification impossible. Most (eight fragments) come from zone 3, the rest from zone 2. Building 16 is part of a conglomerate of single-room buildings (buildings 17, 18, 19, 20, 96, 12 and 13). A total of 27 pestles comes from these rooms, all but two type 7 pestles fragmentary. Their absolute numbers are thus much smaller than those of handstones from the same area (chapter 4).

Building 25. Six pestles were found in this building, all in the middle or upper infill. Two pestles are complete (nr. 99_000510 of type 3 and nr. 99_000476 of type 5).

Building 38. There is only one pestle (nr. 97_002834) in the richly decorated `leopards-pillar-building"; it was found on the floor.

The distribution pattern thus appears similarly dynamic as that of the handstones and further proofs the use of pestles together with grinding stones or for dehusking in the same activity areas. Netherstones of type 3 for dehusking were installed on roofs and partly also those of type 2 predominantly used for grinding. The general shape of mortars (netherstones of type 5), which were exclusively used with pestles, makes an installation on rooftops improbable (chapter 6). A use on floors inside buildings or on the terraces is more likely. Different from handstones (chapter 4), intentional depositions of pestles are not known. The single exception could be a complete pestle found between two large stone slabs and pillar fragments together with a large number of flint cores in room 133 / area L9-07. As only a small portion of this room has been excavated, the meaning of this assemblage remains diffuse.

Building D. 346 pestles were recorded from building D and analyzed for their positions within the infill (FIGURE 5.21). They were mainly found in layers 12-24 (56%), very similar to the handstones. The remaining pestles come to nearly equal parts from the uppermost layers 25-29 (21%) and the lowest layers 1-11 (23%). However, only ten pestles come from the floor levels of the building, none is complete or had a preserved working face.

Chapter 6

The Netherstones[1]

Summary

This chapter discusses food practices by analyzing the lower component of the grinding gear in a combined archaeological and experimental program. 2078 objects have been analyzed. Massive, bulky netherstones with relatively stable bases and thin, light plates were used most. The people at Göbekli Tepe focused in their choice of blanks both on the principle of sustainability over long periods and mobility.

All objects are heavily used. The working faces´ deformations are the decisive factor to support this interpretation. In addition to the traces on the objects themselves, the function of the netherstones was evaluated based on the results of the analysis of handstones and pestles, which are the active parts and produce the deformations. The integrated analysis shows that most netherstones at Göbekli Tepe were used for the processing of cereals to coarse flour for porridge-like meals. Previous to grinding the cereals were dehusked separately in intentionally hollowed grinding bowls. Fewer netherstones were used to process fine flour for bread. Porridge-like meals seem to prevail with 4:1 over bread-like products, but this quantification is only based on the preserved working faces. Most probably, the grinding work was not as tiring as the traditional grinding for bread-like products is - probably excepting higher workloads for special events. Single biographies of the netherstones suggest multiple users and multiple use-ways over generations and changes of social and economic roles during that period. In addition to context analyses, stratigraphies of use have to be considered as a new and important method of analysis.

One specific group of netherstones (“mortars”) was intentionally manufactured and shows traces for the processing of legumes to paste and possibly also of seeds.

The processing of herbs, roots, tubers and meat is not securely attested through use-wear on the netherstones analysed.

Roofs were preferred as locations for dehusking and grinding activities, pounding took place within rooms or outside.

Introduction

Crushing tools for the processing of vegetal, animal and mineral materials are used in sets comprising active and passive components. All active tools, including grinders, polishers, abraders or pestles can be generally labeled as “handstones”, but the term is used especially for grinders. “Netherstone” designates all passive, lower parts of the sets, comprising flat plates or grinding basins as well as mortars (Adams 2002). Generally speaking, the netherstones are boulders with deformations caused by the removal of stone matrix through contact with handstones on one working face, and a base which stands on the ground, sometimes fixed by stones, sunk into house floors, into clay installations or into the soil. The processing of stuffs includes crushing and pulverizing to fine or coarser particles or to pastes through grinding, i.e. moving the active piece horizontally, and/or pounding, i.e. by moving the active piece vertically.

[1] The lower part of the grinding stones, following the terminology of Adams (2002).

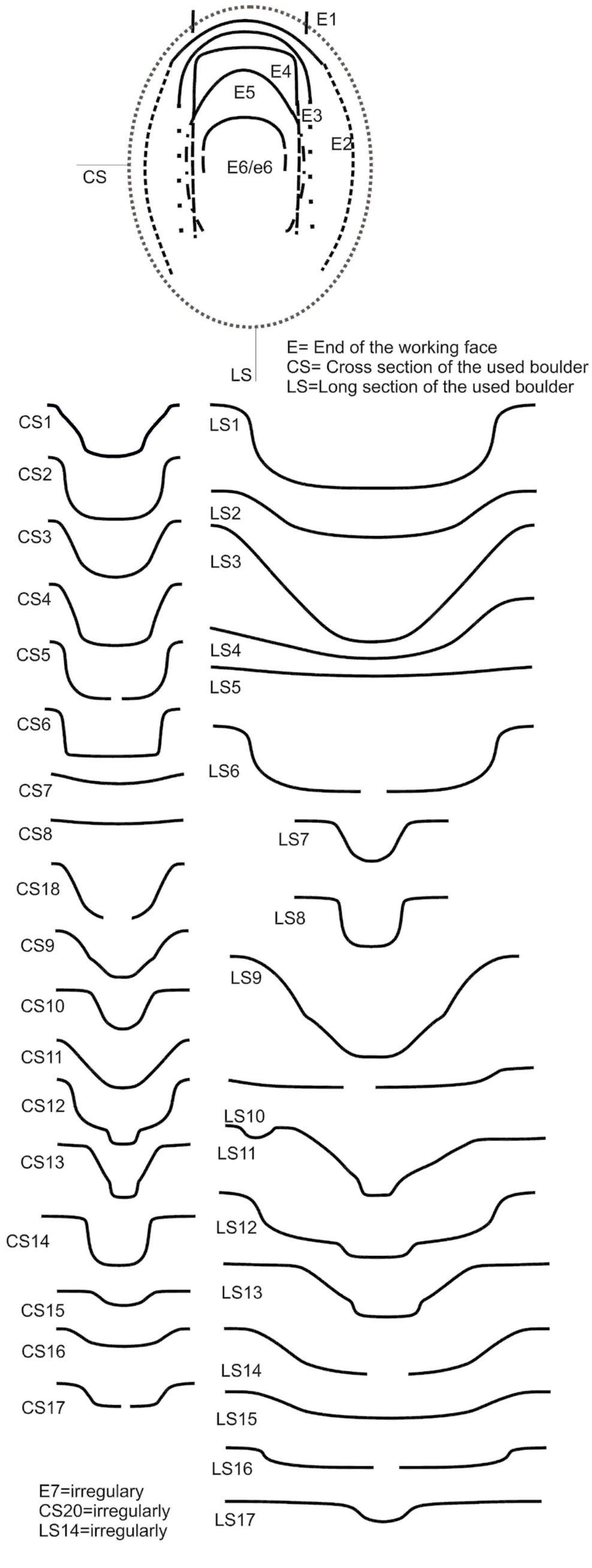


FIGURE 6.1. Typology of the deformations of the working faces of netherstones including the terminology used (©Laura Dietrich).

Database

The project database comprises 2078 netherstones, mainly from the main excavation area in the southeastern depression. The database also had a selection of objects from the northwestern areas. The datasets consist of context information, measurements (length, width, thickness; weights are mostly missing) and a sketch. Most netherstones are kept in the so-called "stone garden", a depository for large finds next to the site; only 100 finds (mostly small fragments) were brought to the excavation house. My own documentation focused on photography and analysis of the surface deformation (FIGURE 6.1) as the sketches were not exact. All netherstones were photographically documented and macroscopically examined regarding forms, deformation shapes, breakages and other traces; all were measured again. The contexts were largely taken from the database but the biggest problem was the recontextualisation of the finds, as the inventory numbers, the only link to the context database, written with acrylic paint on the objects, were partially erased. Of all netherstones, for 344 objects both contexts and types could be reconstructed (appendices TABLES 11-18). However, all other objects have also been included in the formal and functional analysis. There are no great variations in shape or functions so that the consequences of the missing contexts for the interpretational potential are limited.

Choosing the tools

The choice of the boulders used as passive parts of the grinding gear is essential as shape and manufacture determine motions and body position during grinding or pounding. Furthermore, ethnographic examples show how important the choice of the boulders can be not only for the performed work but also for the social dynamic of the groups using them, as grinding stones are a central part of the house inventories, thus being used over a very long time and sometimes even passed on through generations (Adams 2002; Hayden 1987; Nixon-Darcus 2014). Only a few studies have addressed these points, and of course the results cannot simply be transferred to Neolithic societies. However, all indicate that the choice of the future tools is entangled with social and economic aspects such as access to quarries, quality of the raw material and the economic value of the products; both non-specialists of single households as well as specialists are attested as makers (Hayden 1987). With some exceptions (like the well-worked tripods of southwestern and central America: Adams 2002), the boulders are specifically chosen to be adapted easily to the local practices of crushing food stuffs. Thus, their analyses can contribute to the determination of these foodstuffs in cases where there is no possibility to deduce them from other sources.

Boulder shape	Amount
Type 1. Long flattened boulders (LB), oval to subrectangular and irregular in top-view with flat or rounded, relatively stable base	128
Type 2. Irregular bulky boulders (IB) oval to subrectangular and irregular in top view with massive, instable or worked bases	29
Type 3. Hollowed boulders (HB) of all shapes	11
Type 4. L-shaped massive boulders (LsB)	5
Type 5. Small flat plates (SP)	4
Type 6. Short boulders (SB), oval to round and irregular in top view (mortars)	51
Type 7. Thin plates (P)	66
Type 8. Narrow boulders (NB)	12
Undefined LB/IB	495
Undefined LB/SB	1
Undefined (fragmented or not analyzed personally)	1443

TABLE 6.1. Boulder shapes at Göbekli Tepe.

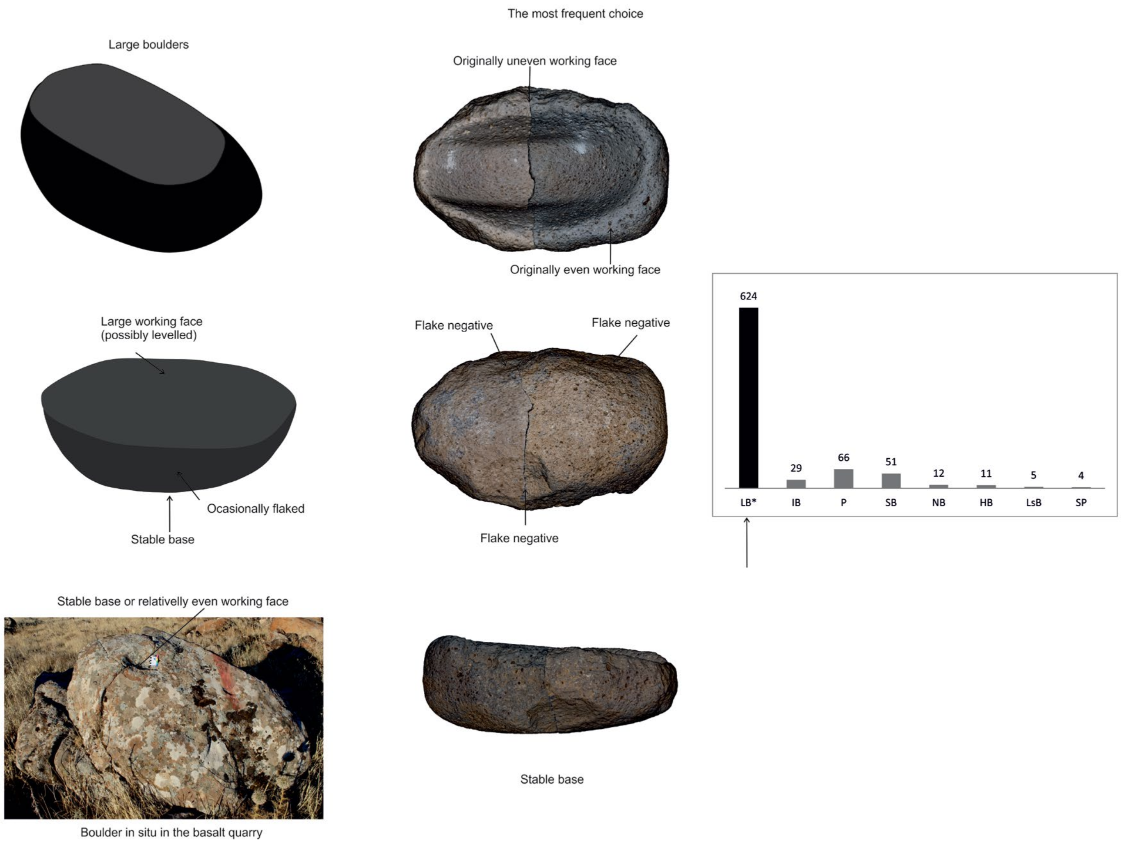


FIGURE 6.2. The most frequent netherstone type at Göbekli Tepe: long flattened boulders (LB), oval to subrectangular and irregular in top-view with a flat or rounded, relatively stable base (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich and Hajo Höhler-Brockmann, 3D-models Hajo Höhler-Brockmann and Laura Dietrich).

At Göbekli Tepe, the basalt quarry lies in the immediate vicinity of the site. Boulders of different sizes and shapes mostly of coarsely pored basalt can be found on the surface (FIGURE 4.4). Thus, the Neolithic users had a wide choice of blanks for their tools. The analysis of the original boulder shapes used for tools shows that large, bulky boulders (LB) with a relatively stable natural base were preferred (FIGURE 6.2; appendices TABLE 11, type 1). They are oval-irregular to subrectangular in top-view and have lengths between 30cm and 60cm, widths between 20cm and 40 cm, thicknesses between 15cm and 25cm and weights between 15kg and 40kg. Large boulders could have been transported to the site using stakes in a 20min walk; this kind of transport is known from traditional societies in Africa (Nixon-Darcus 2014; Nixon-Darcus and d' Andrea 2017). Raw material transport would thus not pose a big problem at Göbekli Tepe. The boulders offer wide working faces allowing the use of a large variety of active tools of different sizes and shapes; and a considerable thickness. Thus, the raw form choice at Göbekli Tepe seems to have been practically oriented: multifunctional netherstones usuable for a long period of time were preferred. The ethnographic and archaeological record attests various positions netherstones had in houses: horizontal, oblique or sunken into the ground. All position are attested at Göbekli Tepe, too (see above) but obviously the horizontal placement directly on the ground dominates. The find contexts of the grinding stones show the heavy influence of post-depositional factors including erosion of sediments and consecutive displacement (L. Dietrich *et. al.* 2019). Only a few large boulders were found *in situ*, sitting loosely on terrazzo floors of the rectangular rooms. In most cases, complete and fragmented grinding stones were found in the middle and upper parts of the room fills and often in reverse position, suggesting an original placement on roofs (L. Dietrich *et. al.* 2019). Likely the shape of the base was conditioned by that location: on roofs, a stable base was necessary as grinding stones could not be fixed in the ground. Only a small number of boulders (IB: TABLE 6.1 nr. 2) have an irregular base and are bulkier. These were regularly shaped at their lateral sides to make them more stable on the ground.

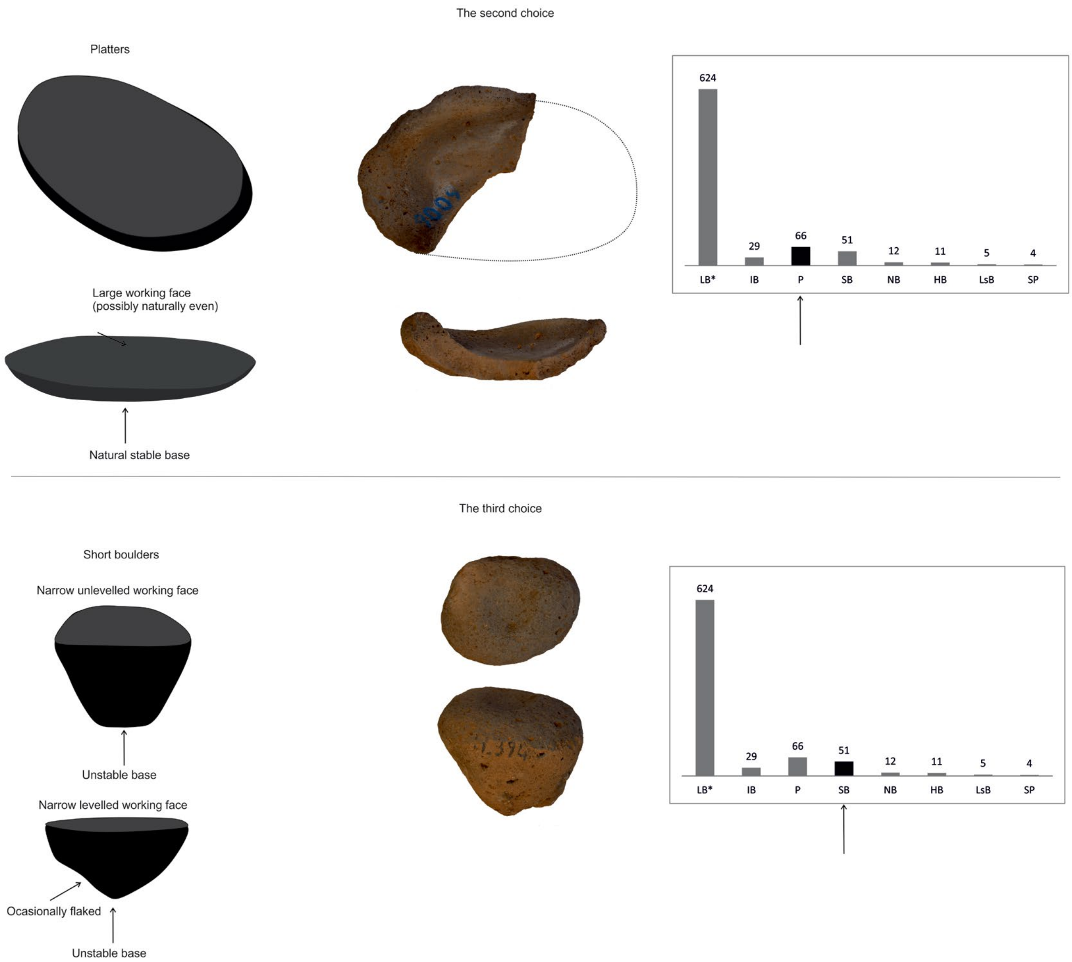


FIGURE 6.3. The second and third netherstone types: thin platters and short boulders (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

Regarding raw material choice, second at Göbekli Tepe come large, thin plates (P; FIGURE 6.3 above; TABLE 6.1 Nr. 7; appendices TABLE 17). These implements have a similarly large working faces as the boulders but are much thinner and lighter. They are not thicker than 10cm, the average is 7cm-8cm; they weigh up to 15kg. Thus, the advantage is their greater mobility; the disadvantage is a much shorter potential period of use. Plates were stable because of their overall form or were fixed in place with pebbles. Some finds of grinding sets of plates and handstones placed directly in front of the pillars suggest a role within offering acts (Schmidt 2008; chapter 4 and below).

The third group of attested blanks are short, thick boulders (SB; FIGURE 6.3 below; TABLE 6.1 Nr. 6; appendices TABLE 16) of 25cm-35cm diameter with instable bases. After longer use, netherstones of this shape have often been referred to as boulder mortars (Adams 2002; Shea 2013; Wright 1992). Most of them have a roughly round, oval, or triangular irregular shape in top view and a massive trapezoidal-shaped or triangular base in sideview. Almost all examples known have an instable base, which is narrow at the bottom. Netherstones of this shape have to be either sunk in the ground or supported with a consistent layer of stones in order to be used. Their find contexts are not very informative. A few were found in different parts of the fills and several in the plough horizon, some were probably fixed into floors; one netherstone was found in situ fixed with pebbles. Shape and contexts suggest a placement in floors, different from the other types mentioned.

There are four more shapes of basalt blanks present at Göbekli Tepe which occur sporadically: narrow boulders (NB), massive L-shaped boulders (LsB) as well as hollowed boulders (HB) and small flat plates (SP) (FIGURES 6.4 and 6.5; TABLE 6.1; appendices TABLES 12-15, 18). The narrow boulders

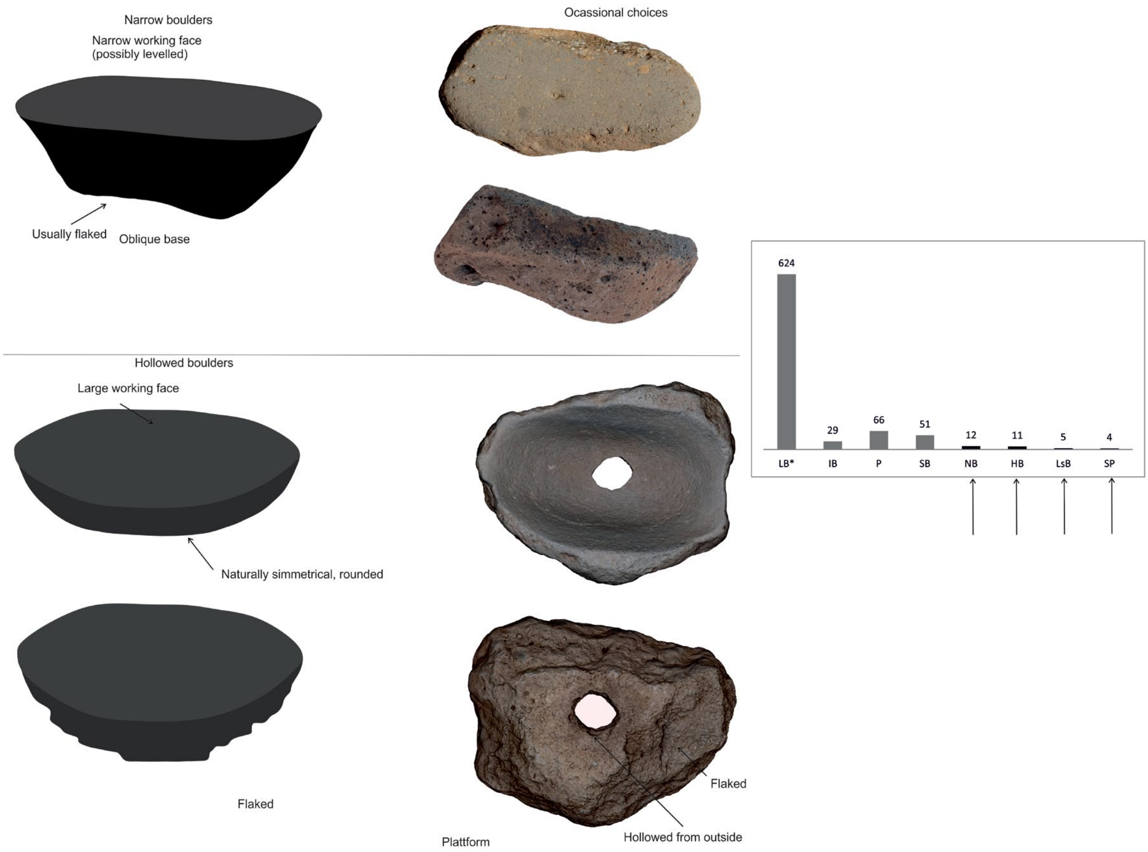


FIGURE 6.4. Narrow boulders and hollowed boulder (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

(FIGURE 6.4 above) have a up to 20cm wide working face. In several finished tools both the lateral sides and the base were flaked but not the middle part, suggesting an oblique position during use. Usually, this kind of manufacture of the base implies that the front side (towards the user's body) is raised and sits on additional stones while the backside is put directly on the ground during use (this is the traditional way to grind in Ethiopia: see Nixon-Darcus 2014). The hollowed boulders (FIGURE 6.4 below) are actually a heterogeneous category of boulders of all shapes, which have either a symmetrically shaped, rounded base or a flat base in common. Their base is intentionally hollowed from the outside and these boulders were manufactured for special uses (see below). The intention behind this form was to secure balance and stability by placing the boulder on a container, as experiments with the original objects indicate. The L-shaped boulders (FIGURE 6.7 above) are the largest in the assemblage. Their working face reaches 60cm in length and almost 40cm in width, the thickness 30cm. All known examples weigh more than 20kg. As the name suggests, these massive boulders were flaked in the form of a reverse "L" with the long base on the ground. In this position, the boulder stands very stable without further support, and the working face is slightly inclined towards the user. In addition to large boulders, also small boulders (FIGURE 6.5 below) were occasionally used. They are flat, only a few centimeters thick and have lengths up to 20cm and widths up to 13cm.

Using the netherstones

Ethnographic observations (Adams 2002; Hayden 1987; Nixon Darcus 2014; Nixon Darcus and d' Andrea 2017), paleopathological research (Molleson 1994; Macintosch *et al.* 2017; Sládek 2018),

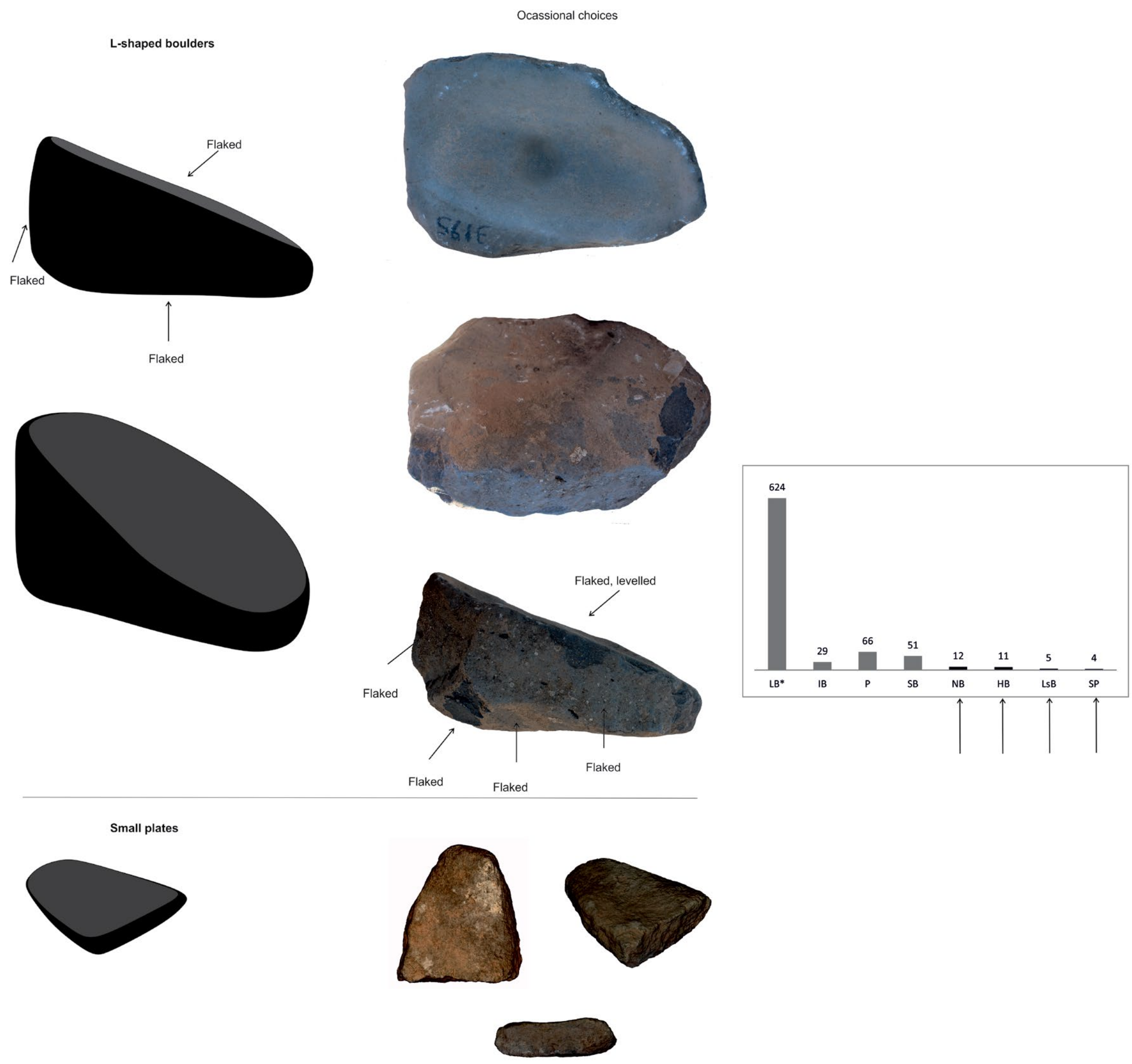


FIGURE 6.5. L-shaped boulder and small boulders (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

ancient depictions (Lang 2016) and experimental studies (chapter 3 and ongoing) show that there are many ways to use a netherstone, and the body positions may vary substantially: kneeling, sitting on heels or toes, or standing are all possible, while work is done with one or two hands. In archaeological contexts, this kind of information is only partially deducible from direct evidence (for example at Neolithic Abu Hureyra through paleopathological research) but has to be reconstructed, as motions and the body position are essential for the formation of wear. Both variables determine the shape of working faces and their deformations. Thus, experiments can produce valuable information on food practices here.

As stated in chapters 3 and 4, experimental programs designed on handstones and the comparison with the originals have shown that at Göbekli Tepe most handstones were used with wide circular, oval and spiral motions to produce coarse flour. During work (EP1, FIGURE 4.16), a tendency to use the entire working face of the netherstones is predominant. The grains are spread in a thick layer on the entire surface and are softly crushed; both the center of the netherstone and the walls are used in this process. The resulting working face is wide, nearly reaching the borders of the stone. Abrasion of the stone matrix is extremely low; it was reduced not even by 0,5mm after more than 40 working hours. However, the analysis of the motions carried out suggests that the main force is applied to the center of the stone and the wide working faces would in time become gradually narrower. The process is accelerated when the working face in the center gets deepened, making

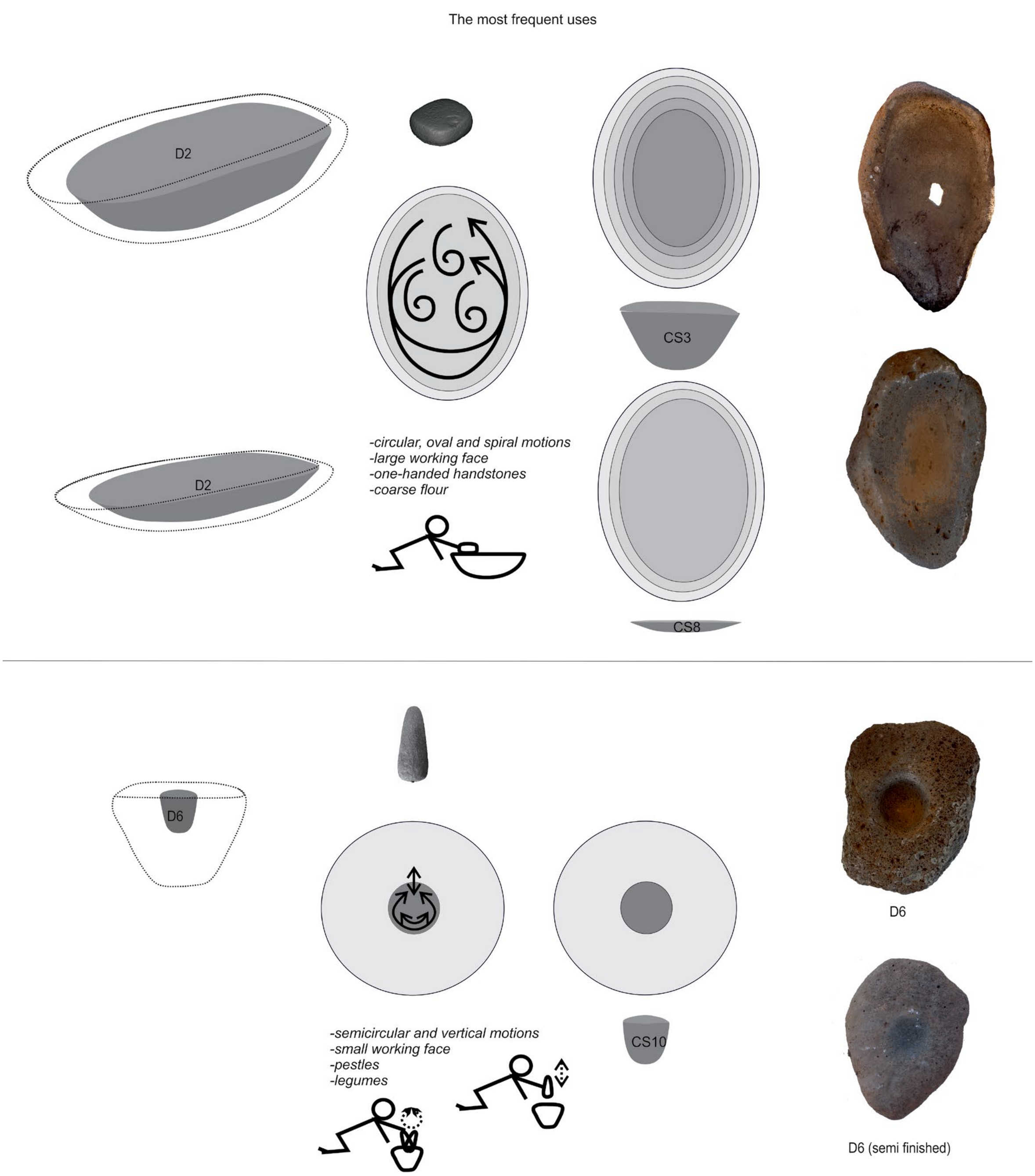


FIGURE 6.6. The most frequent uses of boulders: oval-large deformation D2 (above) and small-circular depression D6 (below). (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

Buildings and supposed chronological position	Number of netherstones
Rectangular buildings PPNB	495
Monumental round buildings PPNA-PPNB	831
Round buildings PPNA-PPNB	98
Deep soundings unclear	85

TABLE 6.2. Contexts of the netherstones.

it more difficult to produce equal abrasion on the whole stone matrix, even if, at the beginning, the whole surface was intended for use. Theoretically, in one of the last use stages, the center would be significantly deepened and the lateral walls would be nearly oblique. EP 1 shows the formation of this kind of working face by using handstones with oval motions and soft pressure. This deformation (FIGURE 6.6 above: D2; TABLE 6.2) is most frequent at Göbekli Tepe and appears on 50% of the classifiable objects (Nr=185).

Deformation 2 (D2) can appear both on large boulders and on plates (FIGURE 6.6 above: D2). Combing the results of all experimental programs, it can be deduced that this deformation was caused by carrying out oval, circular and spiral motions to produce coarse flour from cereal grains. This observation is confirmed by the macroscopical and microscopical analyses of the surfaces of 20 objects (appendices TABLES 11-18). Most objects show surfaces with a mixture of flat and sinuous profiles covered with erratic straight and curved gouges, resulting from the production of coarse flour from cereals as also observed on handstones (L. Dietrich and Haibt 2020). The lateral sides of D2 are predominantly characterized through flat profiles, a dull polish and numerous striations caused by the friction of stone on stone. The distribution of these flattened zones further hints at predominant circular motions.

Several more netherstones (appendices TABLES 11-18) additionally show spots with different wear traces on the bottom part of D2. The spots are flat with a high density of erratic striations and of a moderate to high reflective polish. The wear pattern is similar to those formed by the dry processing of mustard seeds and lentils as observed by Dubreuil (2002). A clear differentiation between wear markers resulting from the dry processing of these two food stuffs cannot be made, however, at the moment, as they have similar characteristics. Finds at the contemporary site of Jerf el Ahmar (Willcox and Stordeur 2012) attest the processing of mustard seeds to fine flour of which "cakes" were produced. In the so-called "kitchen" of Jerf el Ahmar two seed cakes of finely ground mustard seeds were found on a netherstone with deformation D2 (Willcox 2002). Mustard is possibly attested through residue analyses in sediment samples from Göbekli Tepe (L. Dietrich *et al.* 2020a). Therefore, we can assume that the wear markers are indicators for the processing of mustard seeds or legumes. On flat surfaces this requires short bidirectional motions under high pressure to avoid spreading the small, slippery particles. These motions are not basic for the formation of pattern D2 but they are part of its formation process.

In conclusion deformation D2 was formed mostly through circular and oval motions carried out for the processing of cereals. In addition, most likely also mustard seeds and/or lentils were processed on netherstones with deformation D2. The preparation of mixed food is also possible, but this has not been experimentally tested yet. Grinding stones with surface D2 would act in this case as surfaces for mixing or forming food.

Small depressions (FIGURE 6.6 below) are also very frequent deformations (D6). Typical for the short boulders (SB) is a round depression of 8cm-10cm diameter and 5cm-6cm depth. The preserved working surfaces represent the last stage of use, but, different from other categories, there are hints that in most cases the surface depression was intentionally manufactured in this shape, producing "mortars". This is suggested by the regularly disposed scar-negatives directly on the margins of the depression. A few examples have only incipient depressions, possibly formed through wear.

The use of such "mortars" has been extensively studied ethnographically. Cereals, nuts, drupes, legumes seeds, herbs, meat, clay and pigments are processed with them (Adams 2002 with further bibliography). Accordingly, the implements labelled collectively as "mortars" have very different shapes and sizes and are used in very different ways. There are large vat mortars made of stone (Eitam 2015) or wood which are used in standing position for dehusking or flour production (WildfilmsIndia) as well as small mortars similar to the objects used in modern kitchens. EP3 has

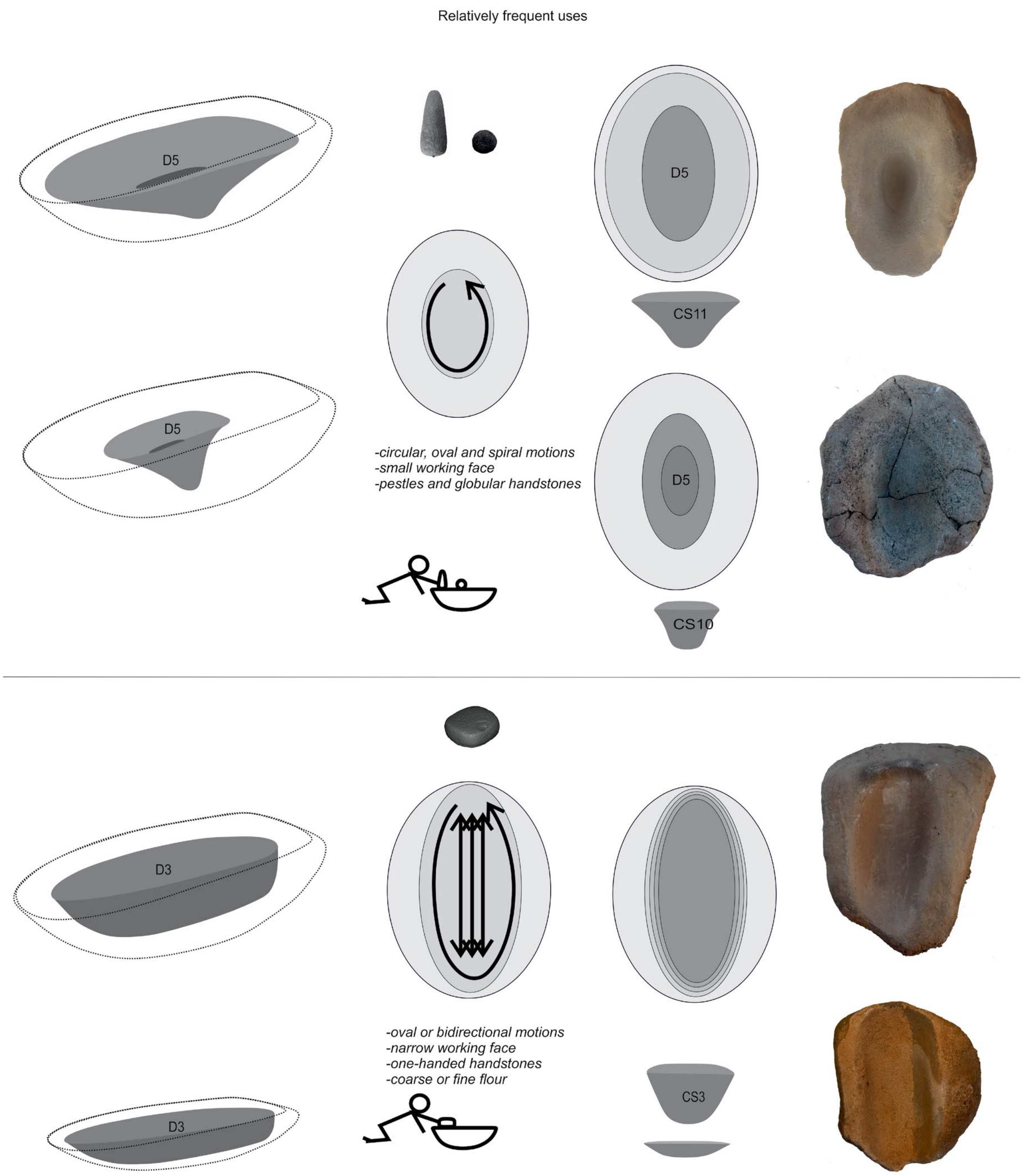


FIGURE 6.7. Relatively frequent uses of boulders: narrow deformation D5 (above) and narrow-oval deformation D3 (below). (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

shown that the mortars in Göbekli Tepe can only be used sitting or kneeling either with circular motions or with vertical motions. Due to the form of the work depression, small loose particles are retained in order to be processed. The best results have been achieved by wet grinding with a circular motion in which only the shaft of the pestle is moved while the bottom remains immobile (FIGURE 6.6 below). In 30min, a quantity of 500g of lentils could be ground to a "fine paste" which then can be boiled to soup or steamed to a bread-like product (like Minapa Kudumulu), roasted or eaten raw. Wear zones with convex profiles formed, no striations were observed on the bottoms. Conversely, the walls had striations and on the margins abrasion through breakage appeared. Such wear-markers have been observed on the objects Nr. 19_000031s, 405, 408, 70, 11394. One side of all

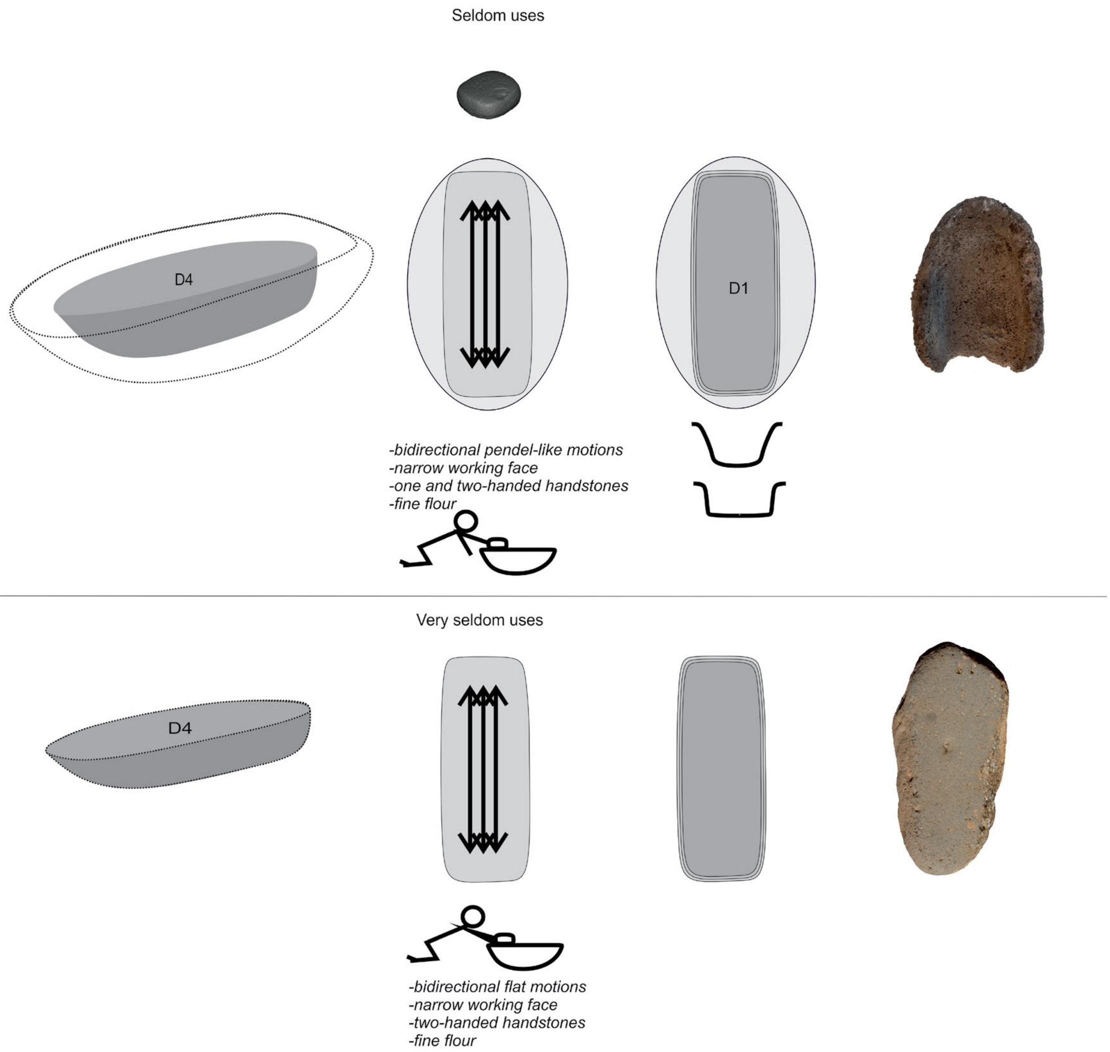


FIGURE 6.8. Rare uses of boulders: subrectangular deformations (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

mortars is heavier worn; probably this represents the side in front of the working person, where the applied pressure is higher, or the position in which the pestles were put after work. As for the pestles, they have to be made to fit well into the depression. Pestles of type 1 (long-conical), 6 (conical) and 7 (cylindrical) (chapter 5) have working ends with diameters from 4cm to 8cm and match the diameters of the depressions D6 well by leaving 1-2 cm space for the materials to be processed. Cereals can be ground to paste and processed in a similar way. It is not clear yet how well the wear-patterns from lentils/legumes and cereals can be differentiated from each other, especially when resulting from wet grinding.

On two mortars (Nr. 12202 and 12262) long, parallel striations on the margins, walls and bottoms were observed. They indicate vertical pounding motions. On the bottom of Nr. 12262 scar negatives were visible. EP 3c and 3d have shown that reed and herbs have to be heavily pounded. Possibly, the wear patterns indicate the processing of such materials, but long-term experiments have to be done to secure this observation. Ethnographic examples attest the processing of acorns to fine flour through vertical pounding motions exactly targeted at the mortar´s depression (Adams 2002; Orgone Archive). The processing of meat and fish (Shrott 1996) has also been documented. Until now those food stuffs have not been clearly attested through use-wear analyses at Göbekli Tepe, but this may only be a temporary impression as most working faces are sintered or show modern

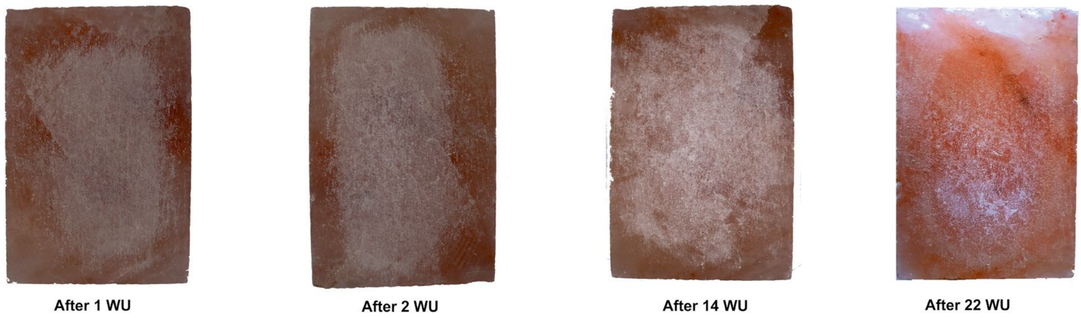


FIGURE 6.9. EP4a showing the deformation of the salt netherstone in different use stages (©Laura Dietrich, Photos Laura Dietrich).

abrasion induced by find handling. Summing up, deformations of type D6 likely are indicators for the processing of legume-like food stuffs and possibly cereals.

Deformations of type D5 (FIGURE 6.7 above: D5) are fairly frequent. They are characterized by a wide opening and a narrow bottom. While the upper, broader area of D5 could have been produced by a handstone, the middle and the bottom are clearly formed by pestles or ball-shaped handstones (chapter 4). The motion can be easily recognized as long-oval, carried out by moving the pestle, not only its shaft, on the working face. The wear is characterized by a mixture of flat and sinuous profiles covered with erratic straight and curved gouges. Thus, the processing of cereals to coarse flour can be considered as most important formation factor for D5. Possibly, the use of pestles as tools for the production of coarse flour instead of handstones represents a deliberate technical choice (by some social units?) as the broad surface of the boulders would have allowed the use of handstones, too.

In the case of two netherstones (Nr. 19_0000024s and 8357) flat plateaus, striations and scar negatives were observed on the bottom of the depression D5. Both objects were found directly next to central pillars in rectangular rooms, Nr. 8357 was associated with a ball-shaped handstone with traces of ochre (chapter 4). All handstones of this type have ochre pigment on their surfaces. Possibly, the two netherstones were used for the (presumably symbolically important) processing of ochre in a last step of their biography and deposited in front of the pillars, which possibly could have been painted.

Both the deformations D3 (FIGURE 6.7 below: D3) and D4 (FIGURE 6.8: D4) are elongated with regular lateral sides, but differ in oval (D3) or subrectangular (D4) endings. EP 4b has shown that D3 forms through long-oval motions. EP4a has shown that subrectangular endings (D4) form during grinding with bidirectional and pendular motions, which were carried out for the production of fine flour. The motion can be executed one-handed or with two hands. However, if the handstone has dull, worn corners the deformation may form with oval endings as EP4a shows for different use stages (FIGURE 6.9).

Thus, the differentiation between the formation of D3 and D4 cannot be made with certainty. EP4 shows that processing through long-oval motions with one-handed handstones forms a wider depression than through bidirectional and pedular motions. However, if the handstones are two-handed (which is rarer, see chapter 4) the depression would have a similar width (for example FIGURE 6.8). Depressions formed unambiguously through the processing of fine flour are very rare (4 exemplars). Ambiguous deformations caused either by the processing through long-oval or through bidirectional-pendular motions are more frequent but do not constitute the most numerous group. Also, handstones which indicate the processing of fine flour through pendular

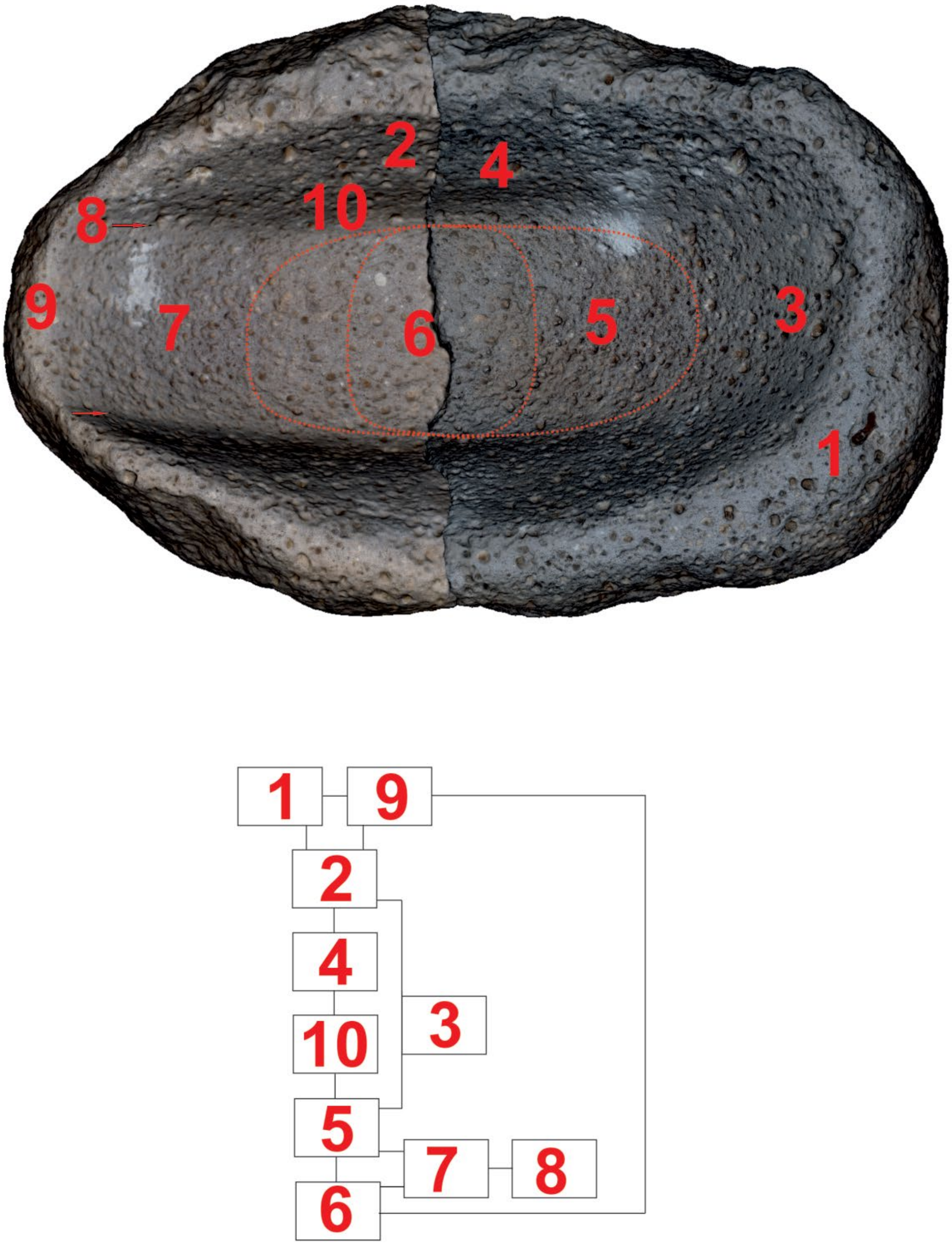


FIGURE 6.10. Netherstone Nr. 18_000053 and its stratigraphy of wear (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich and Hajo Höhler-Brockmann; 3D-model N. Schäkel). D-DAI-IST-GT17-LD/HHB-0224.

motions are rarer (chapter 4). Therefore, I consider this activity of minor importance at Göbekli Tepe as both active and passive parts of the grinding set indicate.

Finally, deformation type 1 (D1) describes even wear on the whole flat surface. This deformation type is very rare.

The life of netherstone 18_000053

(FIGURE 6.10) Objects can be seen as the sum of events determining continuities or changes in their use-lifes and functions; they have biographies like human beings (Appadurai 1998; Joy 2009; Hodder 2012; Lidström-Holmberg 1998; Hahn 2014; Harding 2016). This is not a new finding in use-wear research (see for example Dubreuil and Nadel 2009 for grinding stones) but is rather often ignored in the functional interpretation of such tools. Mostly, interpretations are limited to finding "older" manufacturing and "younger" use traces, or to analyze the sum of all wear traces as a whole with the main aim to reconstruct the functions of one specific object and its role in the human living environment, but not to contemplate the roles of the manufacturer and users in the life of that object. It is exactly this what this section wants to explore by trying to reconstruct both active and passive aspects of the live of a netherstone, with a focus on food practices. Each biography has a chronological structure which, in the specific case of use-wear, can be visualized best by translating it into a matrix (FIGURE 6.10); the upper boxes are the incipient and the lower boxes the later and last events.

Netherstone Nr. 18_000053 (FIGURE 6.10) was originally a large vesicular basalt boulder (55cm x 36cm x 16cm) in the basalt field near the site before it was chosen as raw material. It has a similar color and porosity as the boulders lying on the field today. The start of its life as a tool cannot be established exactly, not even by calculating the duration of use from the end downwards. The netherstone ended up abandoned in one of the latest buildings from Göbekli Tepe: a likely MPPNB rectangular building (building Nr. 3) with two pillars situated on the slope east of monumental Building A and southeast of monumental Building B. Ethnographic information attests wear rates of several decades (15 to 30 years and in some cases 100 years) for flat metates made of vesicular basalt and used on a daily basis (Hayden 1987), but they are thinner (approximately half the thickness of the implement from Göbekli Tepe) and are worn more intensively through the use with two-handed manos and hard pressure. Thus, a minimal wear duration of 60 and a possible duration of up to 200 years can be estimated for netherstone 18_000053 assuming daily use; it would amount to more than 200 years in the case of an occasional use (as could be possible at Göbekli Tepe, see L. Dietrich *et al.* 2019). These calculations cannot consider periods of hiatus and cannot appreciate the intensity of use. Thus, even if a fine dating matrix would exist for the site, the "birthday" of this tool can only roughly be established in the PPNB.

The first steps in the use-life of a grinding stone would be the initial formation of the surface: its levelling through pecking, and the making of the base in order to fix it on or in the ground. It needs a relatively even surface both for grinding with circular-oval or with bidirectional motions. These actions are partly visible on netherstone 18_000053. Zone 1 is a thin bordure probably representing an unused rest of the oldest working face. It has no traces of pecking but, usually, this manufacturing step affects predominantly the central zones. Thus, the oldest event - the making of the working face - cannot be pinpointed anymore; it disappeared. Zone 1 is rough but it has some moderately reflective polish, which however does not have to be a result of wear but can also result from post-depositional processes including abrasion / movement (Kamminska *et al.* 1993; Levi-Sala 1993, 1996). It cannot be established securely if the adjustment of the base through the removal of two lateral and a horizontal flake (zone 11) was contemporary to the manufacturing of the surface, but it is likely. It had the aim to make the nethestone stable with the aid of stones placed on both lateral sides, although it also would have stood slightly oblique (see below). The discard position in the middle of the preserved fill of the room between collapse fragments indicates a placement on a rooftop in the latest life-phase but this says nothing about the original position.

Zone 2 is a mixture of older events indicating most likely the processing of coarse flour of cereals with oval, circular and/or spiral motions with one-handed handstones. Zone 2 is a depression of type D2 and lies upon a "step" (zone 4) in the walls. The working face is not preserved anymore, but on the walls parallel formations of straight running plateaus are visible. This is a marker for circular, oval and spiral motions which were executed with the handstone's base parallel to the netherstone. The plateau formations were the results of friction of stone on stone by moving the handstones against the walls of the netherstone as soon as the working face began to deepen. Another characteristic attesting this kind of kinetics is the shape of the depression in top-view, which is oval-squat with asymmetrical bordures at the lateral sides and (originally) thick bordures on the front and back walls as the reconstruction shows. This shape is similar to that observed in EP4a. Wear-markers hinting at the processed material are not preserved, so that the functional interpretation is based only on the kinetics. Zone 4 is an interruption in the life course of the netherstone. As of that moment, the processing with circular-oval motions stopped and the users changed to pendular motions which they maintained until the tool was discarded. Zone 10 is a younger deformation of type D4 comprising the sum of grinding events below the step (Zone 4). Zones 3 and 7, which are worn zones on the front and back walls, belong chronologically to this younger phase. They clearly cut the older depression so that the wear traces have to be assessed together with zone 10. Zones 3 and 7 are extensively covered by vertical formations of plateaus attesting heavy friction with the handstones during pendular motions. This is also indicated by similar wear markers on the handstones (L. Dietrich and Haibt 2020).

Zones 6 and 8 are the youngest wear events detectable on the netherstone. Zone 6 has wear-markers like erratic gouges and zones of convex and flat profiles, typical for the processing of cereals (L. Dietrich and Haibt 2020). Zone 8 is a wavy line of plateaus attesting a hard breakage of the stone matrix caused by the lateral sides of a one-handed handstone. These specific lines form during pendular motions while bidirectional flat motions would form straight lines. The depression has a sharp angle on its left side attesting the (predominant) use in this stage by right-handed users.

Summarizing all observations, it can be said that the netherstone had probably one of the longest lives of all tools from Göbekli Tepe. It began its biography as a grinding stone for the production of coarse flour made of cereals. Most probably, this period of time was the longest in its life. EP4 shows that circular-oval and bidirectional motions cause different rates of wear, as the pressure by circular motions is much lower. Thus, a lot more use events are hidden behind the formation of depression 2 even if it has a similar depth as depression 10. Then the life course of the netherstone changed and it began to be used for the production of fine flour respectively bread. The production of bread seems to have been occasional at Göbekli Tepe (chapter 4 and L. Dietrich and Haibt 2020); therefore this netherstone may have changed its social setting and meaning while changing its function, too. In this case only the wear and not the context offers information as the find context mirrors only its afterlife. The netherstone was abandoned when the stone matrix was destroyed almost completely. Only 3cm of bottom thickness have been left. Although the netherstone was still functional, the depression was so deep that the grinding position would not have been comfortable anymore as was observed by practical testing. Probably through its impressive size and oval shape it was not discarded or reused as construction material (which is rather rare at Göbekli Tepe anyway) but abandoned together with the building where it stood.

Reusing the tools

As shown above, grinding stones have been used for generations and therefore were "re-used" at different times and by different users. However, this section refers explicitly to the reuse through reshaping and change of pupose.

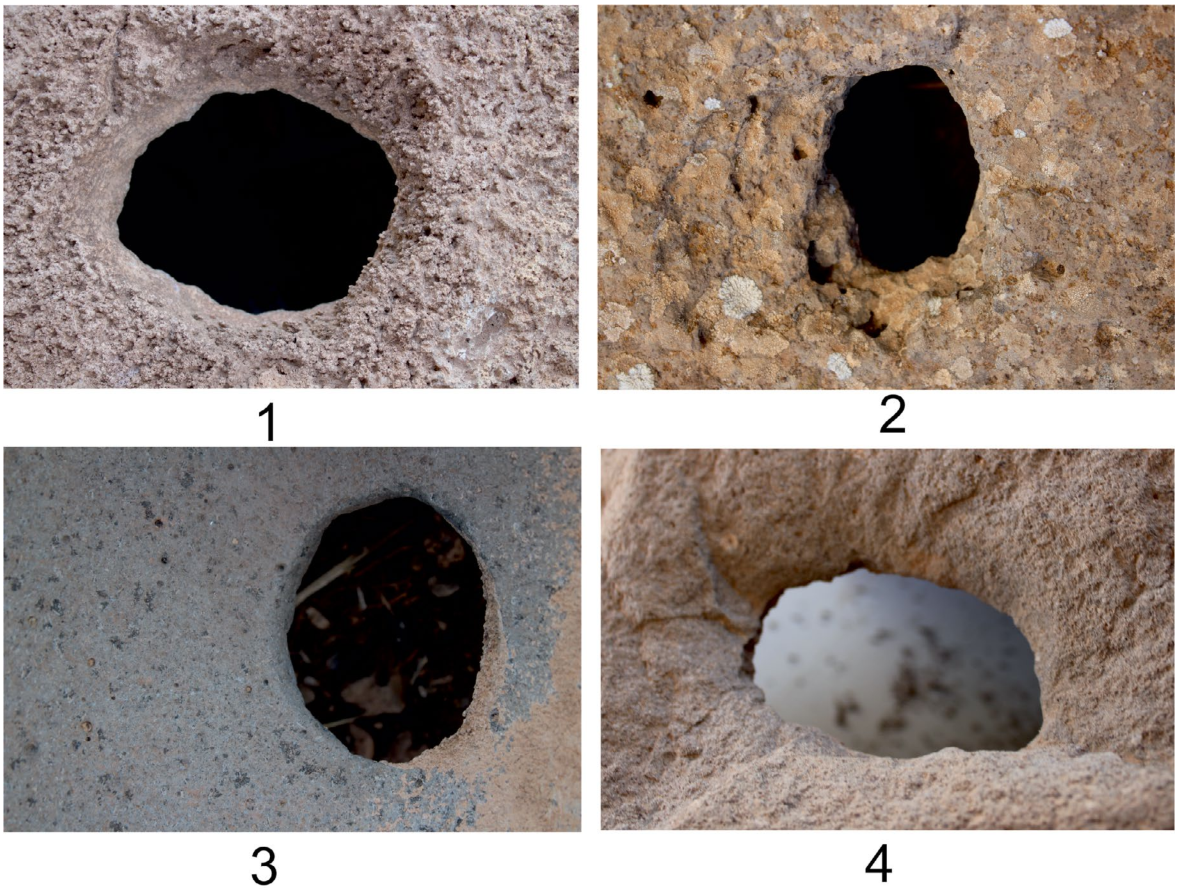


FIGURE 6.11. Holes made from the outside in hollowed boulders with typical scar negatives (©German Archaeological Institute, Photos Laura Dietrich). D-DAI-IST-GT19-LD-0225-0228.

Hollowed boulders (HB) have various surface deformations: mostly D2 (FIGURE 6.4) but also D3 and D4 have been attested. Thus, these grinding stones have been used for various grinding activities either with circular or pendular motions. Their common element is the hollowed base. Clearly, this is not a marker for the end of their use-life through breakage as scar marks indicate that the holes have been made intentionally from the outside (FIGURE 6.11).

Also, in one case the base was entirely transformed: it was flaked at the exterior until a small flat platform surrounding the hole formed (FIGURE 6.12). Most probably the grinding stone was destined to be placed on a further container (reconstruction in FIGURE 6.13). The activity fitting with this kind of tool is dehusking of grains through pounding: the husked grains are beaten with vertical, strong stokes and fall through the hole without husks. Scar negatives are absent from the inner surface but, during dehusking, a thick layer of grains and husk would form between the active part and the surface of the netherstones. Also, dehusking is usually done with wooden tools (Cappers *et al.* 2016) which leave only scarce wear traces behind. All hollowed bowls have a stable base, either flat or rounded. Also, in most cases they have been found in reverse positions in the upper layers of the room fills (FIGURE 4.30). Most probably, they were initially placed on roofs to take advantage of the wind carrying away the husks to assist winnowing. There are no indications that the hollowed boulders were specifically produced only for the purpose of dehusking grains. Instead, they represent reused grinding stones. Their relatively low quantity may suggest that in addition tools of organic materials have been used for dehusking. Wooden mortars are ethnographically attested (Cappers *et al.* 2016); they may have been also used at Göbekli Tepe for dehusking.

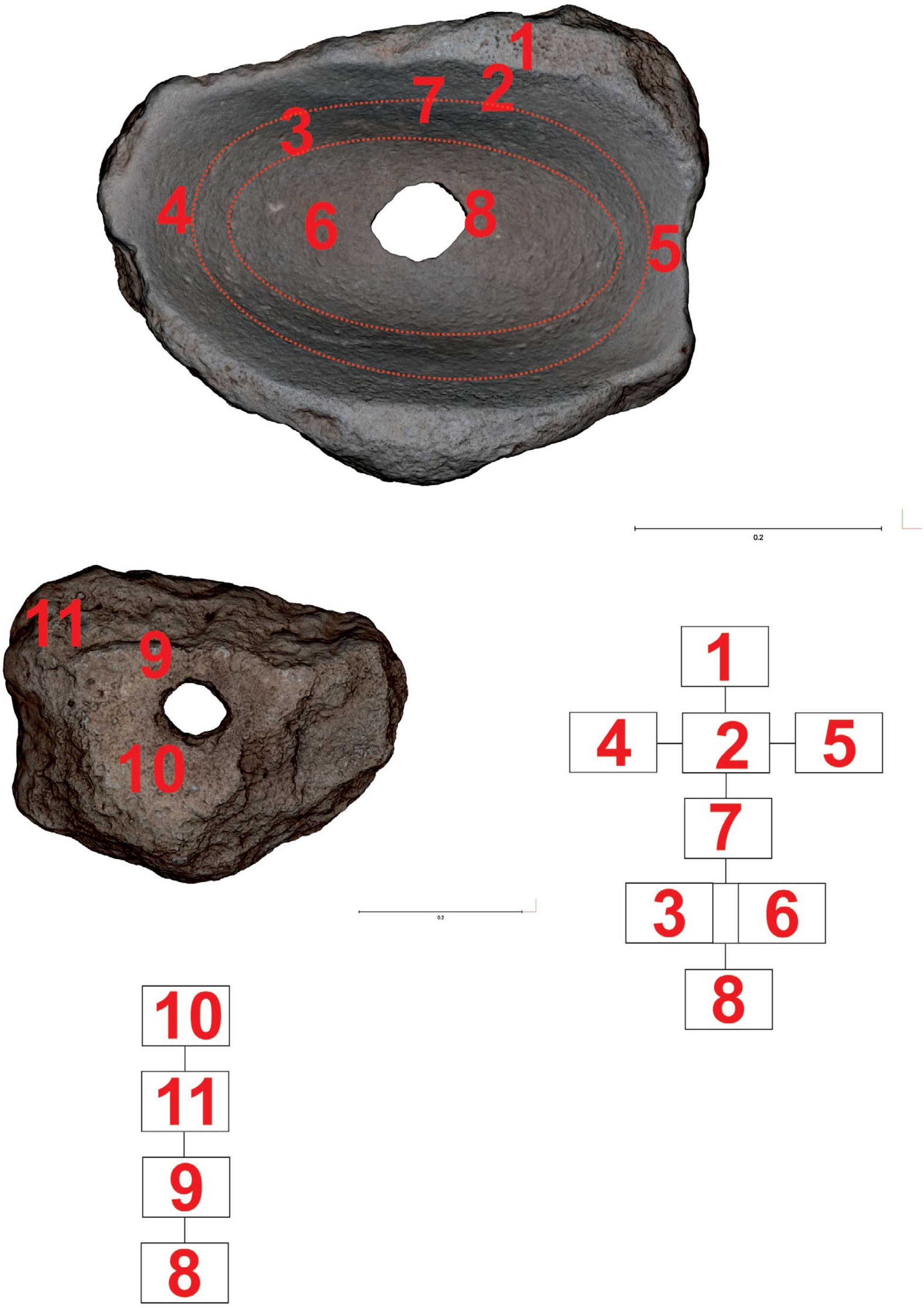


FIGURE 6.12. Hollowed boulder nr. 18_000025 with use-wear stratigraphy (©German Archaeological Institute and Laura Dietrich, Photos and 3D-models Laura Dietrich and Hajo Höhler Brockmann). D-DAI-IST-GT17-LD/HHB-0229.

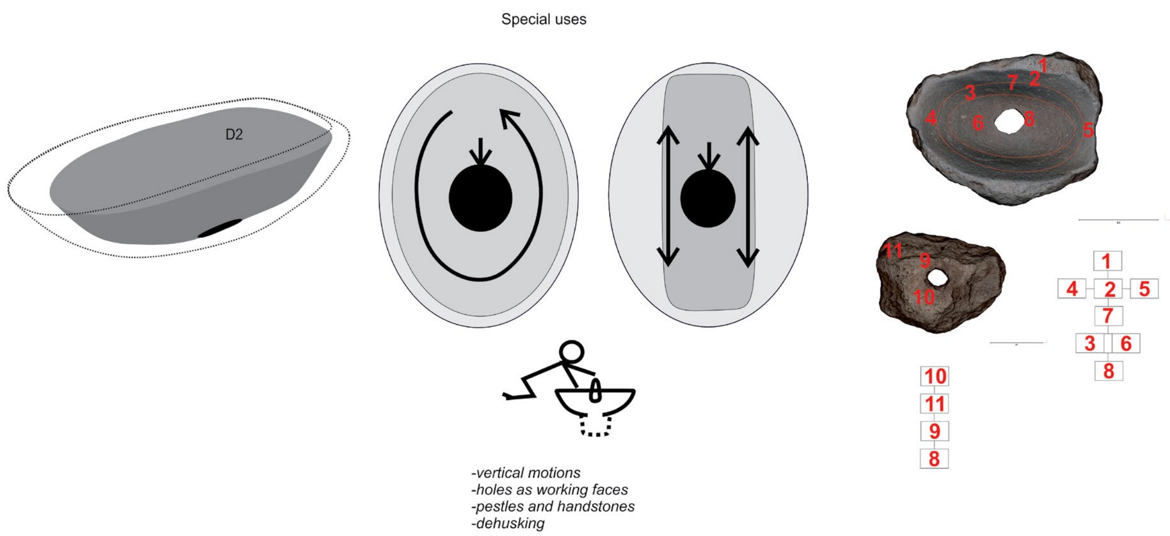


FIGURE 6.13. Reconstruction of use of the hollowed boulders (©German Archaeological Institute and Laura Dietrich, Photos and 3D-models Hajo Höhler Brockmann and Laura Dietrich).

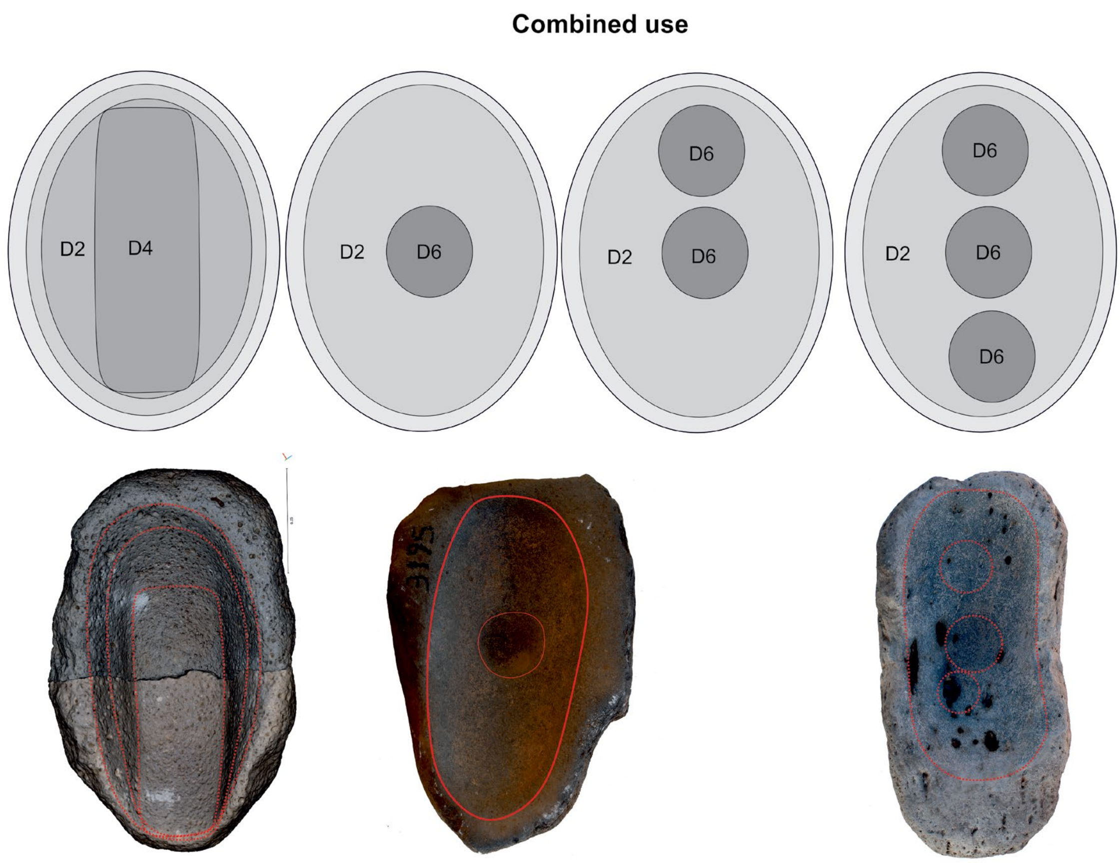


FIGURE 6.14. L-shaped boulders and their deformations (©German Archaeological Institute and Laura Dietrich, Photos Laura Dietrich).

Also, in the case of the L-shaped boulders, which also present multiple deformations, systematic re-use of grinding stones would be possible. In the last step of their biography all of them present a combination between a large deformation of type D2 and up to three small deformations of type D6 (FIGURE 6.14). However, the interpretation of re-use is not secure in this case, as they could have been made specifically in this form. The conspicuous similarities in boulder shapes, the characteristics of the production and the deformations could speak in favor of that possibility.

The users

Previous archaeological analyses related to the users of grinding stones have mainly focused on raw material procurement, the functional role of certain designs, or their cultural meanings for the users (e.g. Adams 2002; Hayden 1987; Lidström-Holmberg 1996 with bibliography; Wright 1992, 2005), and were based on contextual information, especially from mortuary contexts. Conclusions on identities, gendered work or physical characteristics of the users were drawn (e.g. Bickle 2020; Molleson 1994; Sadvari *et al.* 2015, Sládek *et al.* 2018). Also, several combined ethno-archaeological studies were undertaken to determine the social, cultural and economic impact of grinding stones on their users (Nixon-Darcus 2014; Shoemaker *et al.* 2017; Shoemaker and Davies 2019).

It is clear that there are considerable regional, cultural, and chronological differences in the interactions between people and these tools; the results of the cited studies will thus not be repeated here. Instead, this short passage will sum up observations related to the situation at Göbekli Tepe. Physical characteristics of the users related to the activity of grinding cannot be taken into consideration, as paleopathological studies, like those done for contemporary Abu Hureyra (Molleson 1994) or in other regions for the Neolithic (Macintosh *et al.* 2017; Sládek *et al.* 2018) are not available. The analysis of the design and of the wear markers as described above in combination with the reconstruction through experimental programs suggest a broad spectrum of use with predominantly "easy" activities like coarse grinding probably implying a lower degree of body stress than assumed for other Neolithic sites (Molleson 1994; Macintosh *et al.* 2017; Sládek *et al.* 2018). This hypothesis is solely based on the (reconstructed) way of grinding and does not take the amount of time spent carrying out grinding into account, which was most probably considerable judging from the high degree of wear of the netherstones.

Grinding stone users at Göbekli Tepe preferred light pressure motions executed with one hand, either sitting or kneeling. The experiments and practical trials with original finds have shown that kneeling with the legs stretched and the toes vertical on the ground, as it was reconstructed for Neolithic Abu Hureyra (Molleson 1994) and is also ethnographically widely attested (Nixon-Darcus 2014), was not necessary in most cases. This grinding position is very tiring as the whole body has to work; pressure has to be applied with both hands simultaneously. Instead of this, the people at Göbekli Tepe most probably sat in front of the netherstones, which stood directly on the ground, and moved one hand on their surface while the other hand could have been used to spread more grain or gather the flour. The active parts were designed to be most effective using smaller effort (L. Dietrich *et al.* 2019 and chapter 4). Accordingly, most of the netherstones were designed to allow a comfortable position for grinding, either through their heights (LB), orientation and position of the working face (LB) or through the fashioning of special depressions on the working faces (D6 on SB). So, judging from the design of the grinding stones, bone pathologies as those observed at Abu Hureyra with deformations of the toes and back bones (Molleson 1994) would probably not result from grinding at Göbekli Tepe.

EP4a and 4b have shown that both circular-oval and bidirectional motions lead to asymmetrical deformations with the corner corresponding to the point where the forefinger rests on the handstone being more worn than the rest of the working surface because of the higher pressure applied. Thus, theoretically, the netherstone used by a right-handed user would show more wear on the left side of the depression, and conversely on the right side by a left-handed user, both

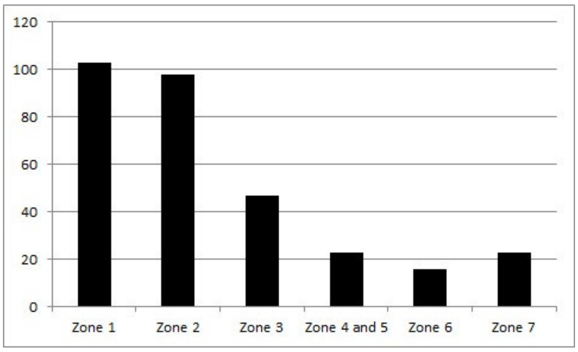


FIGURE 6.15. Distribution of netherstones within the infills of the rectangular rooms (©Laura Dietrich).

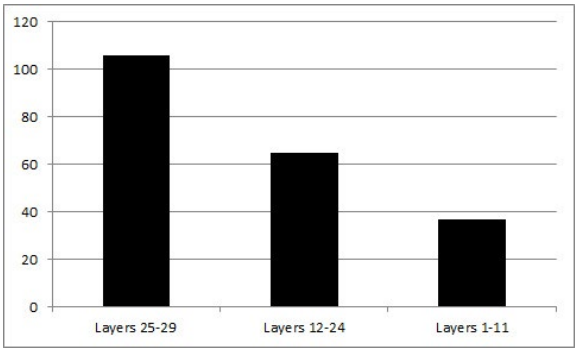


FIGURE 6.16. Distribution of netherstones inside the filling of Building D (©Laura Dietrich).

if circular or bidirectional pendulum-like motions are used. This hint at the handedness of the grinding stone users however gives information only about the last users of each stone. The statistical analysis of the determinable finds shows a dominance of 80% over 20% for right-handed users.

Contextual analysis

The distribution of netherstones is similar to that of handstones and pestles (chapters 4 and 5). Most (55%) of them come from the infill of the monumental round buildings, about one third is from the rectangular buildings. 6% each come from the small round buildings that cannot be clearly dated within the PPN yet and from the deep soundings.

Of the 495 netherstones found inside rectangular buildings, 310 could be analyzed more closely for their microcontexts (FIGURE 6.15). For the upper stratigraphical levels a similar image emerges as the one observed for handstones and pestles. Most (65%) of the netherstones come from this level, which may be subdivided in the plough horizon and the upper room infills. The middle and lower building fillings however show marked differences. From both stratigraphical positions come 13% of the netherstones, but only 2% of handstones and pestles were found on floor levels. An explanation clearly lies in the nature of the finds studied here – they are heavy and hard to move. Many netherstones were fixed on the floors with smaller stones, they were fixed room furnishings similar to the large limestone troughs, which does not exclude an occasional mobility. This may also be the explanation for their multifunctional use compared to handstones with use-wear often specific to just one function. There was one netherstone per house and it was used for different tasks by different persons, while handstones seem to have been more individual tools.

There are less netherstones than handstones and pestles on the terraces (7% to 29% and 19%). This underlines the connection of netherstones with certain building units, they generally remained inside buildings or were at least taken back inside when used in another place. However, used netherstones are also a valuable raw material source, from which handstones and pestles can be made. Considering post-depositional factors, large netherstones are more likely to be removed from agriculturally used areas as they hinder plowing (chapter 4), their mass makes it also more likely that they fell down the slope into the upper fillings of the monumental round buildings later than lighter artefact categories, and only in the moment when rectangular buildings finally collapsed. Accordingly, most netherstones were found high in the monumental buildings´ fillings (51%), different from handstones and pestles, which mostly come from the middle of the infill. 31% of the netherstones are from zones 2-3/layers 9-13 in Building D (FIGURE 6.16), while more than 50% of handstones and pestles come from this region. It is however important to point out that find recording for the present study concentrated on the more informative handstones and pestles, which may have led to some bias.

The relatively small amount of netherstones (18%) within the intentional filling levels in Building D shows that their use is connected to this building type even less than it is the case for handstones and pestles. Thirteen netherstones come from levels 1-7, i.e. the bedrock floor and the lowest levels of infill of the building. All of them are rather small fragments, which further limits the possibility of a connection to the actual use of the building.

PLATE 6.1. Netherstones (©German Archaeological Institute, Photos Hajo Höhler-Brockmann)

Type 1

20_000023

20_000028

20_000030

20_000018

PLATE 6.2. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

Type 1

PLATE 6.3. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

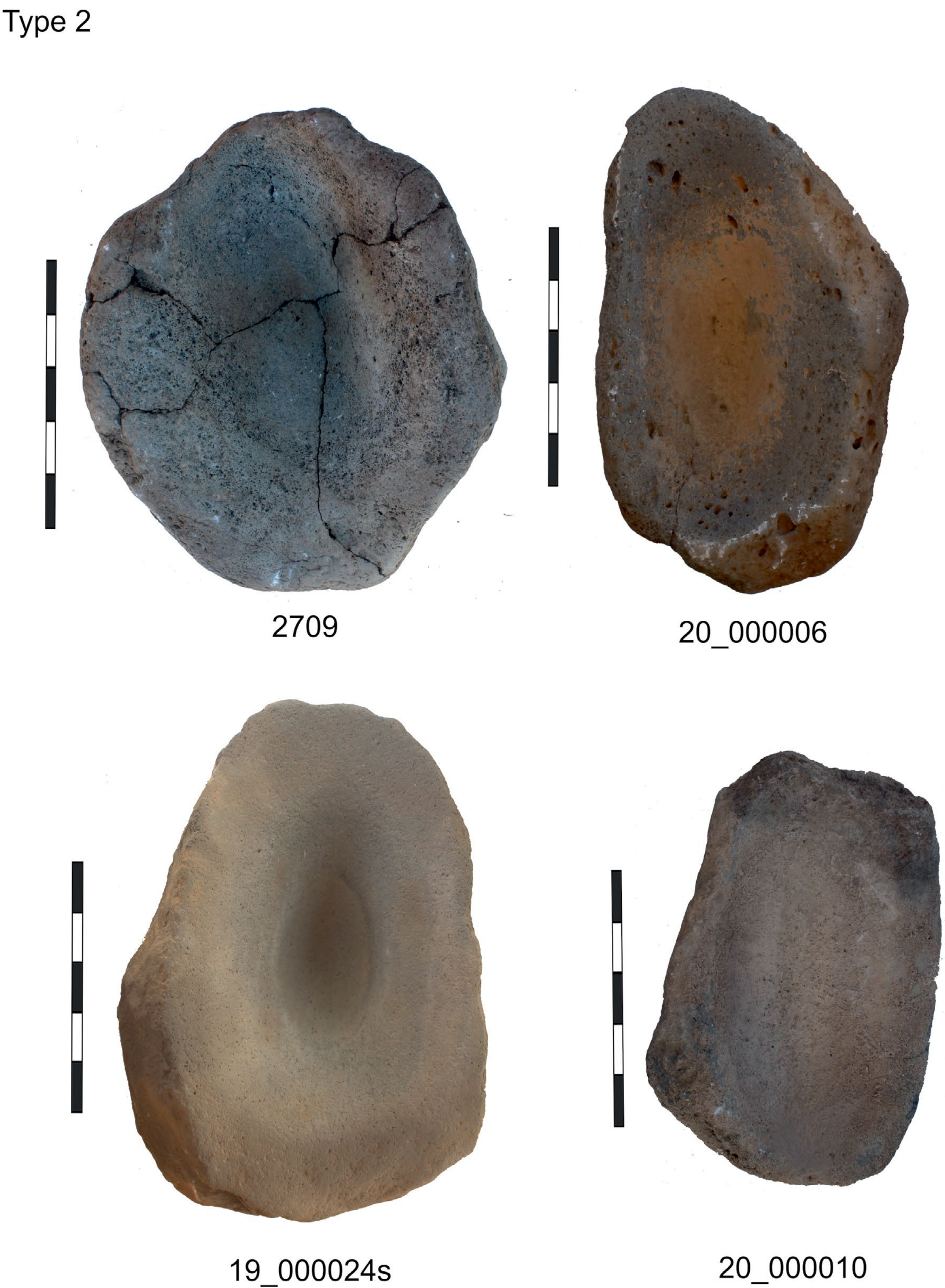


PLATE 6.4. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

Type 3

55

7055

18_000014*

18_000025*

PLATE 6.5. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

PLATE 6.6. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

Type 6

PLATE 6.7. Netherstones (©German Archaeological Institute, Photos Laura Dietrich)

Chapter 7

Stone Containers and Platters

Summary

This chapter analyses the containers of stone (+630) from the site. Large stone troughs were known through previous publications but the +420 fragments of small to middle sized limestone containers and the +80 fragments of "greenstone" vessels are presented in detail in this study. Their large number underlines the importance of fireproof containers at the site.

Use-wear and residue analyses hint at the function of cooking vessels for the large stone troughs for porridge-like meals of cereals and probably legumes. Possibly, the small and middle-sized vessels served as recipients to consume these meals. Wet cooking and the practices linked with preparation and consumption seem to have played an important role in the economy and daily life at the site. The function of the greenstone vessels cannot be reconstructed anymore as they have been heavily used as raw material for beads and other objects.

Introduction

Starting from the Epipalaeolithic but especially during the Early Neolithic of the Near East, a wide range of stone vessels appear in site inventories (Wright 2000). Presumably, recipients of organic materials had been used before, but the new containers are fireproof in addition. Recent research has emphasized the existence of diverse Neolithic foodways and regional traditions in food processing (Fuller and Gónzalez Carretero 2018; Gónzalez Carretero *et al.* 2017; Haaland 2007; Wright 2000). There is strong evidence for the presence of porridge-like products at some Neolithic sites (González Carretero *et al.* 2017, analyses on charred food remains) and there is an ongoing discussion on early beer (O. Dietrich *et al.* 2012; Hayden *et al.* 2013; Heiss *et al.* 2020; Liu *et al.* 2018; Rosenstock and Scheibner 2018) for its production. So far, this potential diversity of early cereal processing (boiling, baking, brewing) has not been systematically linked to these stone vessels. Rather, the appearance of dedicated cooking containers has been pinpointed to Late Neolithic pottery vessels that are directly heatable over a fire (Haaland 2007).

The current state of research does not allow a detailed overview of Neolithic stone containers per site or region. Though there is a more systematical approach to this category than in the case of the grinding stones, no complete PPN assemblage has been published so far. While there are several supra-regional studies on ground stone assemblages and stone vessels for the Southern Levant (Rosenberg 2008; Shea 2013; Wright 1993, 2000), few reports of sites with assemblages containing stone vessels have been published from Northern Mesopotamia (for example Jerf el Ahmar: Willcox and Stordeur 2012; Nemrik: Mazurowski 1997; Tell Abr´3: Yartah 2013; more generally Kozlowski and Aurenche 2004; Siğin 2008).

Both coarse and carefully finished vessels are attested since the PPNA in Northern Mesopotamia. Middle-sized, open limestone bowls approximately 20cm-30cm in diameter, with heights of up to 15cm, and different rim shapes as well as platters of up to 1m in diameter occur frequently.Similarly sized thin-walled and often richly decorated containers made of a soft 'greenstone' have also been reported from early Neolithic sites in that area (Benz *et al.* 2017; L. Dietrich *et al.* 2020b; Gündem and Dağlı 2018; Köksal-Schmidt and Schmidt 2007; Özkaya and Coşkun 2011, 2013; Rosenberg 2011). Another object group are the large PPNA and PPNB limestone troughs, sometimes with volumes above 150l (O. Dietrich *et al.* 2012; Hayden *et al.* 2013; Willcox and Stordeur 2012; Yartah 2013).

Platters and symmetrical bowls have been discussed as dishware for the orchestrated presentation and consumption of foodstuffs within households when nuclear families and the private realm

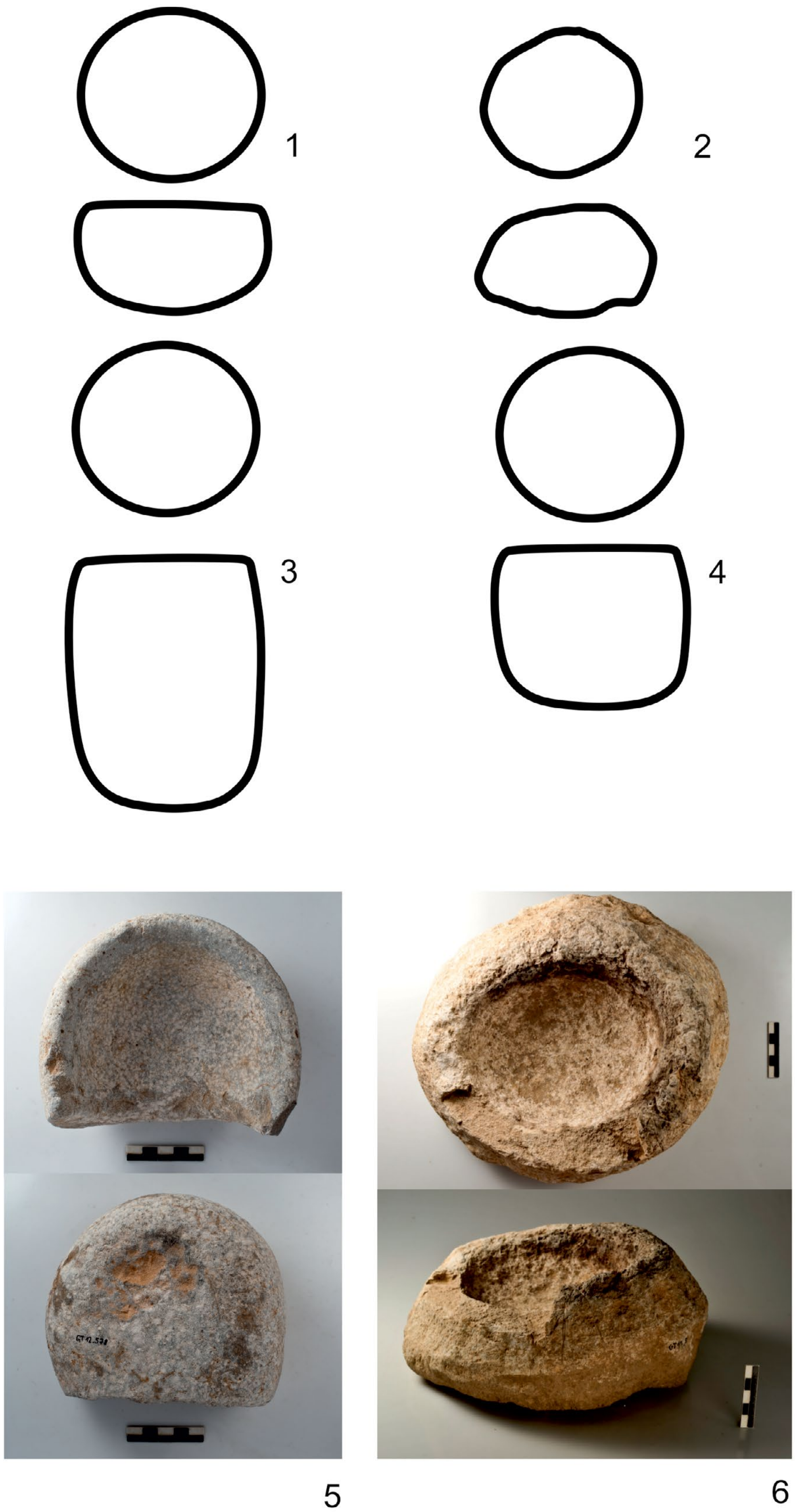


FIGURE 7.1. Stone vessels from Göbekli Tepe: shapes (©German Archaeological Institute and Laura Dietrich, Photos Nico Becker). D-DAI-IST-GT12-NB-1111, 1113; D-DAI-IST-GT11-NB-8783, 8792;

Shape	Description
Shape 1	Globular bowl with regular concave base and wide opening
Shape 2	Bowl with unworked base and rough walls
Shape 3	Deep U-shaped bowl with regular worked base
Shape 4	Flat U-shaped bowl with regular worked base

TABLE 7.1. Small and medium-sized vessels from Göbekli Tepe: description of shapes.

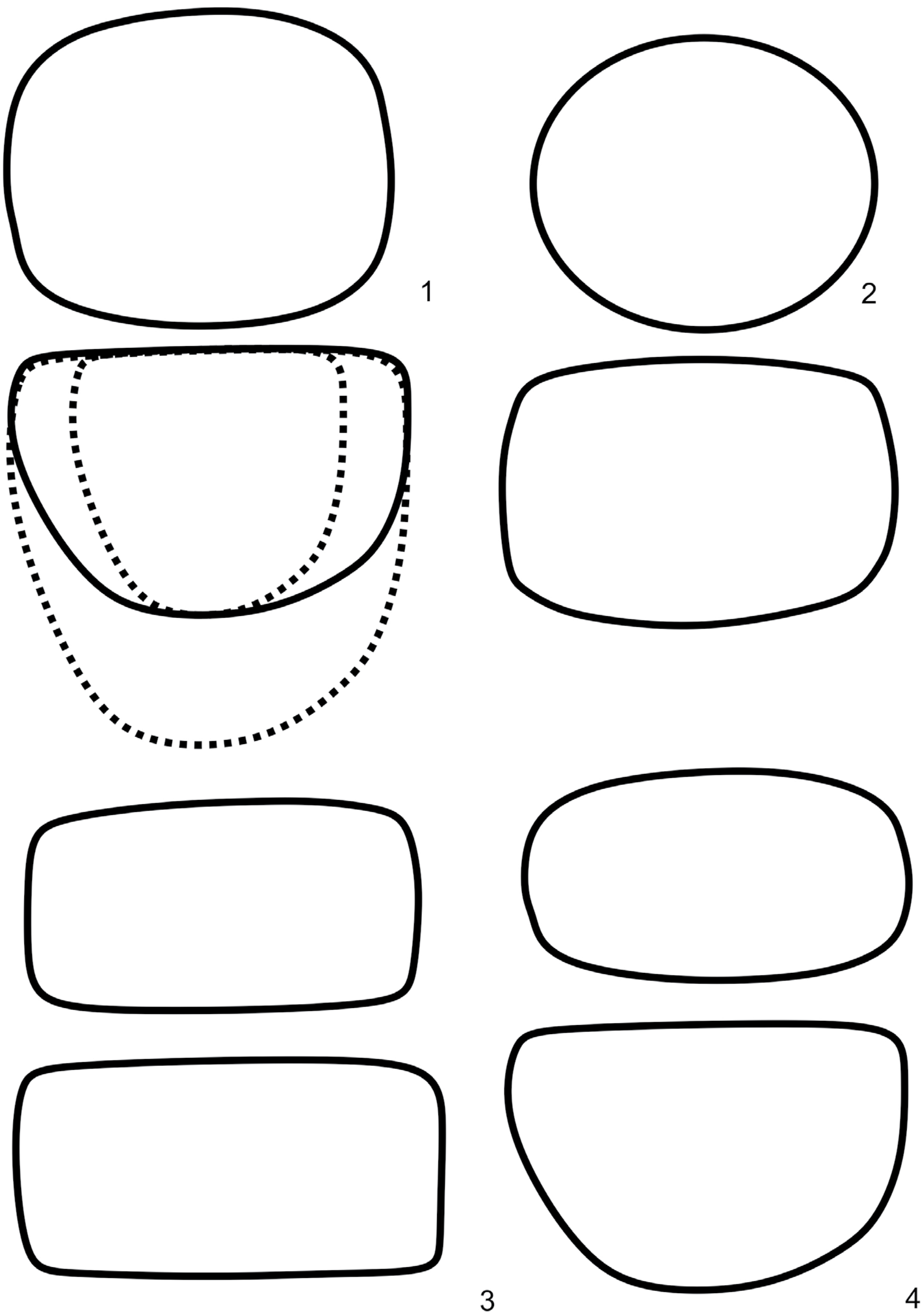


FIGURE 7.2. Stone troughs from Göbekli Tepe: shapes (©Laura Dietrich).

FIGURE 7.3. Stone troughs from Göbekli Tepe (Table 7.2 for contexts; ©German Archaeological Institute, Photos Nico Becker (1-3) and Oliver Dietrich (4). D-DAI-IST-GT11-NB-9313; D-DAI-IST-GT11-NB-9348; D-DAI-IST-GT10-NB-4458; D-DAI-IST-GT10-OD-4240.

became more important during the transition to a fully sedentary agricultural lifestyle (Rosenberg 2008). For the Neolithic site of Çatalhöyük, it has been suggested that organic containers were used for boiling food (Atalay and Hasdorf 2006). Stone containers have only rarely been linked to the preparation of soaked or heated meals. Large containers in Neolithic houses have been proposed for the storage of water or foodstuffs including cereals (Bartl 2004; Stordeur 2015; Willcox and Stordeur 2012; Yartah 2013). In the case of the limestone troughs, an interpretation as tools used for the preparation of beer due to the presence of charred cereals in their fills and associations with burnt stones at some sites has been put forward (Haaland 2007; Hayden *et al.* 2013). The presence of oxalate on the walls of such containers at Göbekli Tepe has been discussed as tentative evidence for beer (O. Dietrich *et al.* 2012), though oxalate can also be produced when grains regularly come into contact with water, or in certain plants (Zarnkow *et al.* 2006). For the fermentation process, modified starch particles in Late Natufian mortars have been used as evidence for beer (Eitam 2019; Liu *et al.* 2018, 2019).

Limestone containers: database and shape analysis

The database records 349 fragments with a wall thickness of up to 6cm (appendices TABLE 29), which were documented as sketches. The degree of fragmentation is high. Four shapes could be reconstructed: shapes 1, 3 and 4 belong to bowls with evenly thick walls, shape 2 is represented by a single piece with irregularly shaped walls (TABLE 7.1, FIGURE 7.1). As most finds are small rim fragments, many cannot be attributed to shape 1, 3 or 4. The complete specimens of shapes 1 and 4 have 20cm-25 cm in diameter and are up to 15cm high. Their capacities do not exceed 5l. The vessels show traces of pecking as well as scars, striking negatives and scratches associated with their production but no use-wear traces. The thickness of their walls is relatively even; however, their surface is not polished. Attention was focused on shape and properties, not on the general appearance.

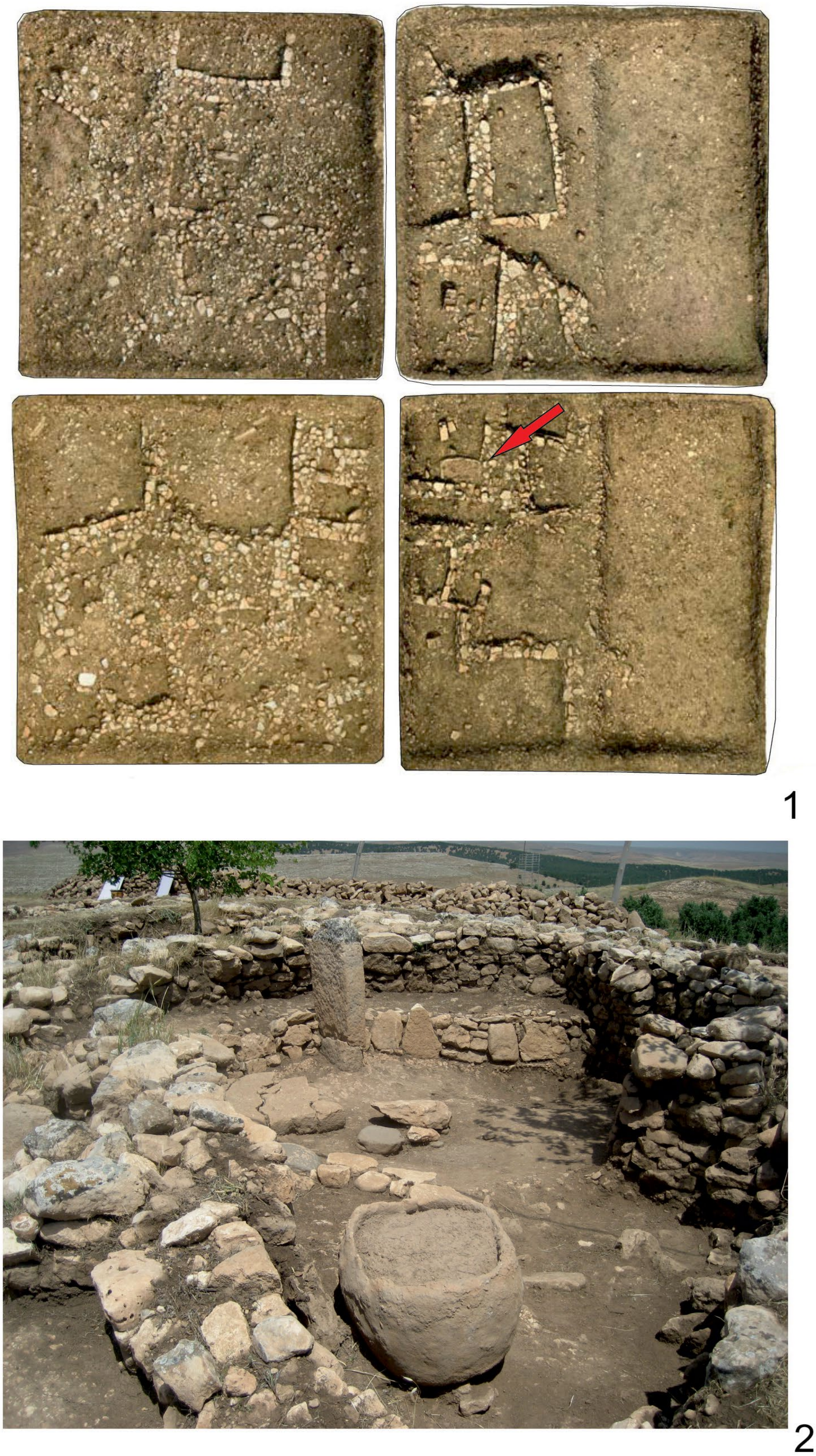


FIGURE 7.4. Stone troughs in situ at Göbekli Tepe (©German Archaeological Institute, photos Thomas Urban (1) and Oliver Dietrich (2).

Trough	Shape and Size Length/Width/Thickness/Volume	Description and context
ST1. L10-61, Locus 27	Oval shape with convex bottom 0.60m x 0.40m x 0.40m; 38l.	Building 33 (only partially excavated); the size of the room is unknown.
ST2. L09-79, Locus 63.1 Nr. GT04-10072, Inv.: GT04-24	Oval-irregular shape with flat bottom 0.35m x 0.60m x 0.20m; 35l.	Placed outside of the built area, from or near to the terrace wall north of Building D.
ST3. L09-70, Locus 4 (FIGURE 7.3.1).	Almost round shape with flat bottom 0.60m x 0.55 m x 0.60 m; 70l.	Building 50 (approximately 4m x 4m, walls not entirely excavated).
ST4. L09-69, Locus 31 (FIGURE 7.3.2).	Oval shape with convex bottom 0.73m x 0.52m x 0.60m; 62l.	Building 61 (approximately 4m x 4m, the walls are not good preserved). The vessel was surrounded by ash; it was placed on the terrazzo floor. Traces of fire are visible on its bottom.
ST5. L09-07, Locus 13 (FIGURE 7.3.3; 7.4.2).	Oval shape with convex bottom 0.70 m x 0.60 m x 0.42 m; 83l.	Building 134 (at least 5m x 4m, walls end in profile). The vessel was placed on a small pedestal above the terrazzo-floor, in a niche made of stones. „Dark sediment“ and small stones are mentioned near the vessel.
ST6. K10-79 Locus 29 (FIGURE 7.3.4; 7.4.1).	Rectangular with flat bottom 0.63m x 1.12 cm, ~0.60 cm; 165l.	Building 5 (6m x 4m) The building was not excavated to the floor level. The vessel content was excavated. It consisted of sediment and lots of fist-sized stones, some with traces of fire. An onager scapula was found on the vessel bottom.
ST7. L09-55, Loc7.3+Loc34	Oval with thick flat bottom 50x50x30cm	Building 7, Loc. 34 (only partially excavated) ST 7 was placed in a niche made of stones.

TABLE 7.2. In situ limestone troughs at Göbekli Tepe.

89 fragments belong to large troughs with walls up to 13cm thick (FIGURES 7.2-7.4, appendices TABLE 28). Six stone troughs (ST in TABLE 7.2) were found completely preserved in situ (FIGURES 7.3, 7.4), one was in situ but fragmentary. They have diameters between 0.6m and 1.12m and capacities between 30l and 165l and were fixed parts of the furnishing of the rectangular and apsidal rooms. All preserved troughs are of different shapes, ranging from round-oval to rectangular in top view (FIGURE 7.2). Bottom and wall curvatures are diverse, too. Stone troughs were produced from big blocks of limestone through flaking, carving and shaping, probably with hammers or hard cobbles. ST3 was carved and smoothed with circular motions up to its bottom while the bottom regions of ST3 and ST6 were flaked with hard tools with cutting edges, possibly axes/chisels, at angles of almost 90° to their walls. ST2 was carved irregularly with vertical strokes and circular motions. The interior was then smoothed while the exterior remained irregular with flaking traces and scar negatives. Only in one case (ST5) was the exterior smoothed like the interior. In another case (ST2) the trough was deepened into a limestone boulder, the exterior surface showing no further treatment. A certain intention to produce symmetrical shapes is visible for most of the complete troughs; the walls are nearly regularly thick and the rims rounded.

Most of the fragments of troughs belong to shape 1 and show different wall curvatures. Their size cannot be reconstructed. 25% of the fragments have straight stable bottoms with walls rising at a sharp angle and belong to shapes 2 and 3 (based on databases's sketches). More effort was necessary to carve them, but their volume is larger. Troughs of shapes 1 and 4 would be unstable on plain floors. Beneath ST3 and ST5 stones were placed to ensure a stable position. The find contexts (see below) suggest that the stone troughs were freestanding. The treatment of the interior was most probably related to their use: smoothing increased the impermeability of the walls.

Vessels/ Troughs/	Topography /Levelling	Linear traces	Polish	Burning traces	Fractures	Tactile	Markers
ST3. L09-70, Locus 4 Trough in situ	Flat irregular. Levelling connected, covering.	Striations, circular and erratic.	No.	No.	Scar negatives on the rims.	Smooth.	Unspecific.
ST4. L09-69, Locus 31 Trough in situ	Flat irregular. Levelling connected, covering.	Striations, circular and erratic.	No.	On the bottom.	Scar negatives on the rims.	Smooth.	Unspecific.
ST6. K10-79 Locus 29 Trough in situ	Rugged and flat irregular.	Striations, erratic and concentrated on the bottom.	No.	No.	Scar negatives on the rims.	Rough.	Unspecific.
20_001 (8359?) Vessel	Rugged and flat irregular on the walls. Flat irregular and sinuous irregular on the bottom. Levelling concentrated on the HT, covering the HT.	Striations on the walls, circular and erratic. Striation on the bottom on the HT, erratic.	Dull and slightly reflective on the bottom.	No.	Scar negatives on the rims.	Smooth on the bottom, rough on the walls.	Of coarse flour.
20_002 Vessel	Rugged and sinuous irregular.	Striations, circular and erratic.	No.	No.	Scar negatives on the rims.	Smooth and rough mixed.	Unspecific.
GT10_K1058_ Loc23_9912 Trough	Rugged and sinuous irregular.	Striations, circular and erratic.	No.	No.	Scar negative.		
19_000008 Platter	Flat regular, levelling covering the surface.	Striations long, parallel and short, erratic.	Slightly reflective surface, highly reflective bands.	No, but Bitumen traces.	Scar negatives in the center of the plate.	Very smooth.	Unspecific.
GT08-67 Platter	Flat regular, levelling covering the surface.	Striations long, parallel and short, erratic.	Slightly reflective surface, highly reflective bands.		Scar negatives in the center of the plate.	Very smooth.	Unspecific.
1872	Flat and sinuous irregular.	Striations, circular and erratic.	No.	No.	Scar negatives on the rims.	Smooth.	Unspecific.
2921	Flat and sinuous irregular.	Striations, circular and erratic.	No.	No.	Scar negatives on the rims.	Smooth.	Unspecific.
Experimental trough before use	Rough irregular.	Traces of sawing and scars from the manufacture with modern tools.	No.	No.	Scars from the manufacture with modern tools.	Rough.	Unspecific.
Experimental trough after use	Rough irregular.	Traces of sawing and scars from the manufacture with modern tools.	No.	No.	Scars from the manufacture with modern tools.	Rough.	Unspecific, identical with the preceding.

TABLE 7.3. Macroscopical and microscopical analyses on troughs, vessels, and platters from Göbekli Tepe.

Functional analyses of the limestone containers

Optical macroscopical and microscopical analyses of physical deformation and residue analyses (L. Dietrich *et al.* 2020a) were performed on surfaces of stone vessels and platters and on surface samples from ST3, ST4, ST5, ST6 and ST7 to determine their function. Use-wear analyses were performed optically (macroscopical) and through tactile analyses on the walls and bottoms of the stone vessels, troughs and platters (TABLE 7.3).

The fragments of troughs and vessels are kept in the so-called 'stone garden' on site, complete troughs are still *in situ* but (re-)filled with sediments for protection. Most of the fragments are either sintered or covered with blackish deposits probably caused by post-depositional processes, as they are observed on all lithic finds from the site. A selection of ten fragments of troughs, and vessel walls as well as platters were examined macro- and microscopically (TABLE 7.3). The vessels show no traces which can be interpreted beyond doubt as use-wear. Long scratches as well as scar negatives were observed, which may have occurred during production. Bottoms were only poorly preserved as fragments and show no particular use-wear. The troughs show similar traces which can be attributed to their production and not to their use. Erratic scratches were observed on the bottom of ST6. The absence of use-wear traces speaks against an active use as grinders or mortars, as some ethnographic observations could suggest (Cappers *et al.* 2016). Only one exception was noticed: fragment ST7 has an unusually thick bottom covered with several moderately to highly reflective smooth zones with an irregular flat topography. They do not appear on the walls. This use-wear pattern has similarities with patterns observed on grinding stones. The preform for a vessel probably broke accidentally during fashioning and was then used as a grinding plate.

Residue analyses were performed on sediment and deposits of the stone troughs walls trough Fourier Transform Ion Cyclotron Resonance Mass Spectrometry and gas chromatography (L. Dietrich *et al.* 2020a). They attest the presence of heated cereals in the stone troughs. In addition other chemical components hint at the possible presence of mustard, tree resins, Artemisia and possible legumes (Wicken). All this could have been components of semi-solid porridge meals made of cereals. Mustard seeds are attested in the 'kitchen' of PPN Jerf el Ahmar (Willcox and Stordeur 2012 and chapter 6) which is very similar to Göbekli Tepe (see below) and the use of wicken is widely attested in the region (Scheibner 2016).

Most probably, the presence of burning traces and burnt stones can be linked to the boiling of meals with the aid of heated stones. Burnt stones were noticed in the filling of ST6; ST4 was surrounded by ashes and had fire traces on its bottom. This is of importance as in other sites large troughs were also associated both with traces of fire and burnt stones, reducing the possibility of a random association. At Jerf el Ahmar, three large troughs were placed in a corner of a room together with platters, grinding stones and a vessel as well as charred emmer remains and seed cakes (Willcox and Stordeur 2012). A cluster of burnt stones was found on the floor. At PPN Tell Abr' 3, five troughs were found in an approximately 8m-large circular building with central pillars (Yartah 2013). Charred cereals were found in several troughs and on the building floor. One of the troughs held an onager scapula (Yartah 2013); a situation also encountered in ST6 from Göbekli Tepe (O. Dietrich *et al.* 2012). Burned stone balls were found in the vicinity of the Tell Abr` troughs (Yartah 2013). As proposed for Çatalhöyük (Atalay und Hasdorf 2006) and Jerf Ahmar, they could have served as heating stones. Stone balls were not discovered at Göbekli Tepe, but a re-evaluation of finds from the troughs revealed the presence of several burnt basalt stones. Two of them were handstone fragments, probably reused as heating stones as their uniform black coloration implies. Ongoing experiments (Ullmann, in preparation) have revealed the uniformity of burning/coloring as one of the characteristics of intentional multiple heating. The experiments also highlight the difficulties of recognizing intentional fire traces on basalt. A rough find screening during excavations may lead to false negative results; only microscopic analysis allows clear identification. It is possible that burnt basalt stones were removed as debris at Göbekli Tepe. The contexts and analogies hint at a cooking function for the troughs which is also suggested by the experiments (chapter 3, EP5) carried out in replicas of stone troughs.

Find contexts of the stone vessels and troughs	Quantity
Rectangular and apsidal buildings, upper part of the fills.	56
Rectangular and apsidal buildings, lower part of the fills.	13
Rectangular and apsidal buildings, floors.	10
Monumental buildings, upper part of the fills.	153
Monumental buildings, lower part of the fills.	1
Monumental buildings, floors.	1
Terraces.	15
Uncertain.	64
Surface finds.	105

TABLE 7.4. Find contexts of the stone vessels and troughs from Göbekli Tepe.

FIGURE 7.5. Stone vessels in situ at Göbekli Tepe (©German Archaeological Institute, Photos Laura Dietrich). D-DAI-IST-GT18-LD-0257.

Contextual analyses of limestone containers

There is a clear contextual connection between the rectangular and apsidal buildings and the assemblage of grinding stones and stone vessels (appendices TABLE 29 and TABLE 7.4), suggesting a functional connection. The distribution of all grinding stones (chapters 4-6) suggests dynamic deposition processes and frequent relocation in and out of the buildings. Most were originally placed on the flat roofs of the buildings, occasionally falling with the collapse of the roof into the middle and upper fills of rooms. Later they were dislocated through erosion towards the lower slope and became part of the middle and upper fills of the monumental buildings. The distribution of the stone vessel fragments follows the same patterns (appendices TABLE 29 and TABLE 7.4).
Only three examples were found directly on the floor in room 134 in area L9-07, in two cases upside down under a niche wall in an obviously nonfunctional position (FIGURES 7.5 and 7.6).
The large troughs still standing *in situ* (FIGURES 7.3, 7.4, 7.6, 7.7) were – with one exception (ST2 found on a terrace next to grinding gear) – placed on floors in large rectangular and apsidal

FIGURE 7.6. Stone trough and stone vessel in situ at Göbekli Tepe (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT08-KS-N07-07.

buildings, either directly at a wall or in one of the corners (FIGURE 7.6). For most buildings, only the last use-phase is known, as the excavations usually stopped at the first floor level. However, one larger profile has revealed a dense succession of terrazzo floors in room 61, which contains ST4 (L. Dietrich *et al.* 2020a; FIGURE 7.7). The vessel was already in place in the earliest use-phase and then used over a long period of time. The large troughs are fixed containers within the rooms. They were only removed when they broke, as the distribution of fragments suggests. The fragments of troughs were found either on the terraces (34 fragments) or in the upper part of the fills of the monumental buildings (46 fragments), eroded from the terraces above. This disposal behavior is different from grinding stones or smaller vessels, which occasionally were left at the places where they broke or where they fell from above. The bulkiness of the troughs in comparison to smaller objects is surely part of the reason, but concepts of cleanliness would also have to be analyzed for Göbekli Tepe (Dietrich 2016 for the methodology).

Stone platters

111 round platters (appendices TABLE 30) were found. They have diameters between 20cm and 40cm and a thickness of up to 10cm with a median around 7cm. Five shapes could be defined (TABLE 7.5, FIGURE 7.8). All platters were shaped by flaking and then finely pecked. Then either only the upper surface or the entire surface was smoothed and polished with a soft organic material, possibly animal skin. The surface deformations on two platters could be analyzed by low magnification microscopy (TABLE 7.3). They show triangular scar marks in the center of the platter, caused by heavy pounding with a sharp object and long, thin striations. Platter nr. 19_00008 was found together with an ensemble of grinding stones (handstone nr.19_00005 and netherstone nr. 18_000032) directly in the depression full with ochre under pillar 18 in monumental building D (FIGURE 7.9). Both handstone and the netherstone have ochre (WM5) on their surface and wear traces from its processing to powder but no ochre was observed on the platter. Instead of this, bitumen traces were noticed. Obviously, the deposition of this ensemble has a special meaning beyond daily use. Although the find underlines the linkage between these three categories of objects, it also reflects change of their functions in certain situations as both handstones and netherstones are predominantly associated with the processing of food stuffs at Göbekli Tepe (chapters 4 and 6). Thus, this find is likely not indicative for the function of the platters at the site. It remains questionable how the traces of bitumen can be interpreted. They do not overlap with the scar negatives in the center. Possible several functions before and after the deposition are reflected in the surface deformation of this object.
Complete platters were found both on the floors of the monumental buildings and on those of the rectangular and apsidal rooms (FIGURE 7.10, TABLE 7.6). Their position in the monumental buildings in some cases suggests intentional depositions, like in building D and a role with a likely cultic background. Most remarkable is a cache discovered in Building C, which contained a boar sculpture and several vessels (Schmidt 2008). One platter was intentionally perforated and put over a vessel of shape 2, presumably destined to capture its contents (FIGURE 7.10).

Shape	Description
Shape 1	Platters with a defined rim and a deepened center. Walls and the bottom are straight.
Shape 2	Platters of shape 2 have walls and bottoms similar to shape 1 but the surface is straight and the rims are not defined.
Shape 3	Platters of shape 3 have curved walls and a straight center.
Shape 4	Platters of shape 4 have curved walls and a deepened center.
Shape 5	Perforated platter with a massive base.

TABLE 7.5. Platters from Göbekli Tepe: shape description.

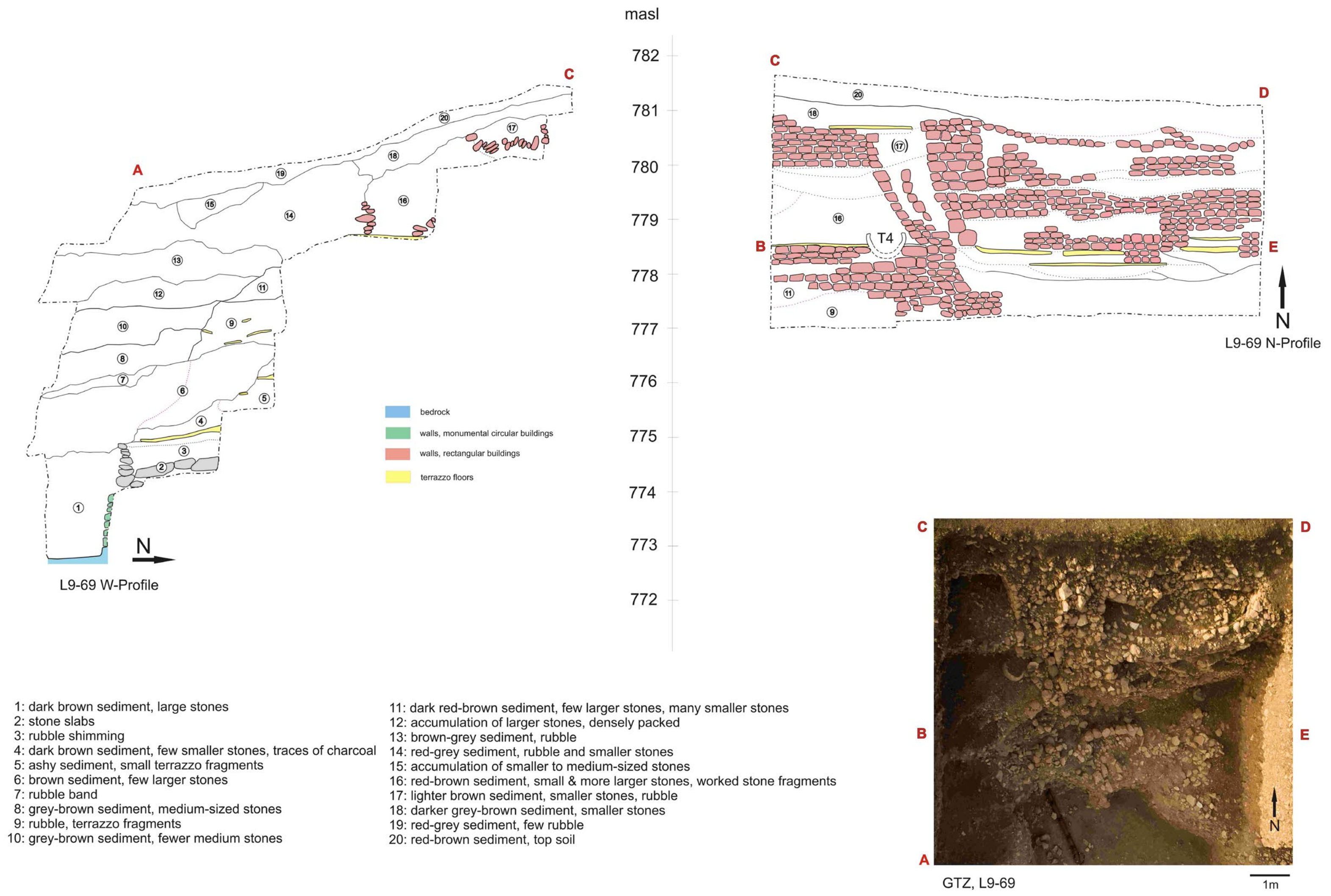


FIGURE 7.7. Stone trough ST4 in situ at Göbekli Tepe (©German Archaeological Institute, Photo Thomas Urban and Oliver Dietrich, compilation Jens Notroff)

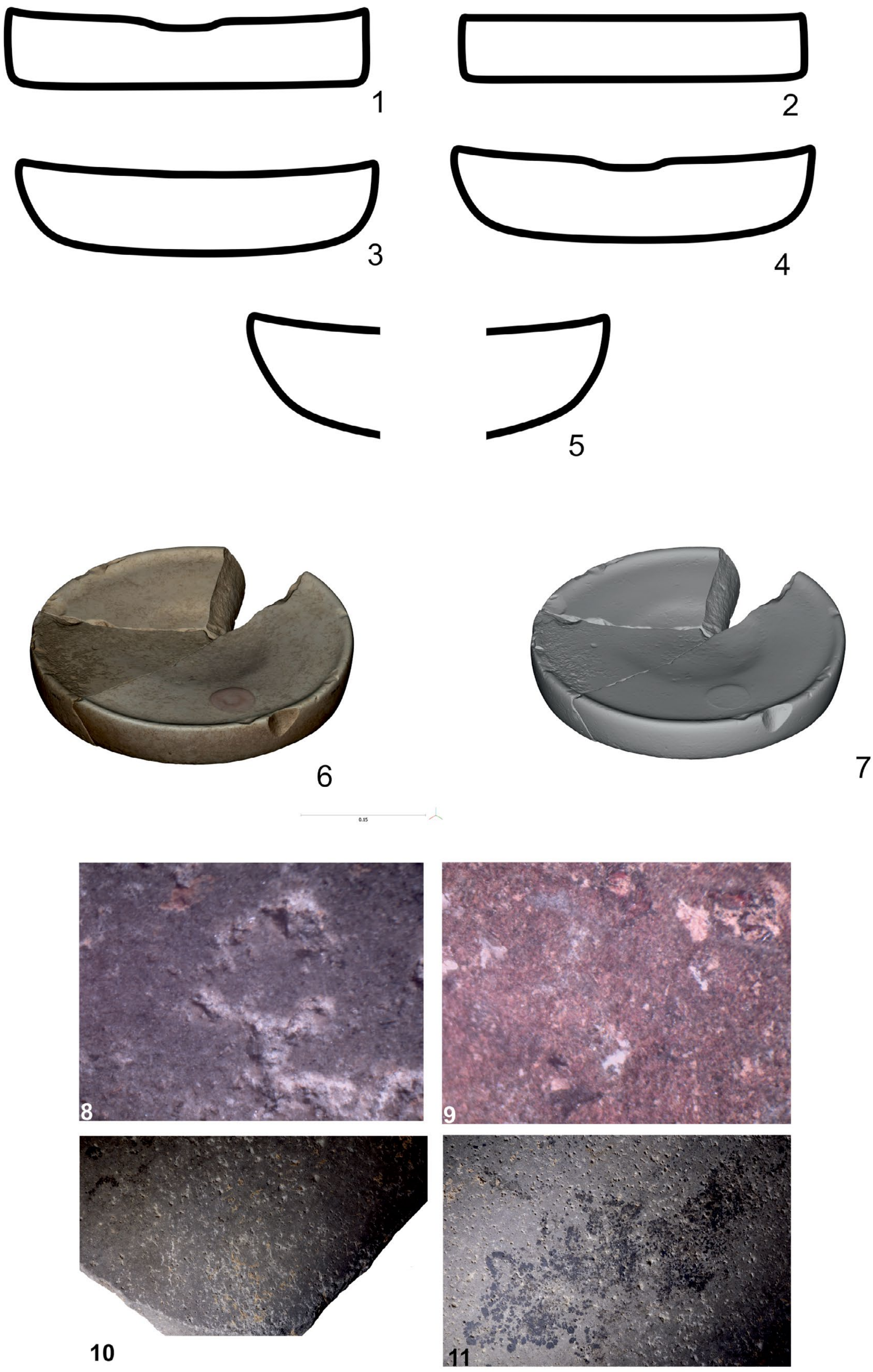


FIGURE 7.8. Stone platters from Göbekli Tepe (©German Archaeological Institute, Photos Laura Dietrich and Hajo-Höhler Brockmmann, 3D-models Hajo Höhler-Brockmann). D-DAI-IST-GT17-HHB-0258-0259; D-DAI-IST-GT19-LD-0260-0263).

FIGURE 7.9. Ensemble of handstone, fragmented netherstone and platter from below pillar 18 in monumental building D (©German Archaeological Institute, Photos Laura Dietrich). D-DAI-IST-GT19-LD-0264-0266.

FIGURE 7.10. Deposition of platters and stone vessels in monumental building C, at one of the central pillars (©German Archaeological Institute, Photo Klaus Schmidt). D-DAI-IST-GT08-KS-6430.

Greenstone vessels

Decorated stone vessels have been found at Early Neolithic sites throughout Northern / Upper Mesopotamia (Aurenche and Kozłowski 1999; Benz et al. 2017; Köksal-Schmidt and Schmidt 2007; Rosenberg 1999, 2011; Sığın 2008). The small, thin-walled and often decorated bowls have sometimes been summarized under the term 'vessels of the Hallan Çemi type' (Köksal-Schmidt and Schmidt 2007), after the site where some of the first such discoveries were made (Aurenche and Kozłowski 1999; Rosenberg 1999; 2011, Rosenberg and Davis 1992). In a paper discussing craft specialization during the Early Neolithic, Köksal-Schmidt and Schmidt (2007) have highlighted one of the roles of these vessels: as a medium to display a complex symbolic system. They have further pointed out a large number of such finds from Göbekli Tepe and discussed a selection of bowls made of a green-blackish rock variety, decorated with incisions. Although such vessels were already mentioned in the first preliminary report on Göbekli Tepe (Beile-Bohn *et al.* 1998), and although their number has continually risen through further excavations, they have not been the topic of a dedicated study until recently (L. Dietrich *et al.* 2020b). 83 greenstone vessels could be documented.

No complete stone vessel has been found at Göbekli Tepe yet; the largest surviving fragments measure about 10 cm in length. They are made of dark gray to dark green stone varieties, identified tentatively as Nephrite, Serpentinite or Basaltoid during excavations. Stone of a brown color is rare. The material is relatively soft, not more than 5 on the Mohs scale. Some fragments (appendices TABLE 28, especially Nr. 9; Nr. 18; Nr. 19) show numerous scratches on the inside, hinting at their manufacturing from blocks that were hollowed out. Flint and basalt borers have been identified as important tools for Neolithic stone bowl production (Schmidt 1997). In a subsequent step, stone vessels were ground and polished – in most cases on the inner and outer surfaces. Then, decorations

Find contexts of platters	Quantity
Rectangular and apsidal buildings, upper part of the fills.	7
Rectangular and apsidal buildings, lower part of the fills.	5
Rectangular and apsidal buildings, floors.	4
Monumental buildings, fills.	33
Monumental buildings, floors.	7
Terraces.	1
Uncertain/Early contexts.	45
Surface finds.	5

TABLE 7.6. Find contexts of the platters from Göbekli Tepe.

were applied to some (see below). Incisions are the exclusive style of decoration observed; the most likely tools used are sharp flint blades. V-shaped profiles between incisions (see appendices TABLE 28, e.g. Nr. 9) are evidence for several repetitive cutting motions, steadily deepening and smoothing the grooves.

Greenstone vessels - shapes

Because of intense fragmentation, shapes can be reconstructed only for a few vessels (FIGURE 7.11, appendices TABLE 28). Nr. 8 is the fragment of a small straight-sided bowl, as well as Nr. 9 and possibly Nr. 79. Nr. 1; Nr. 2; Nr. 10; Nr. 14; Nr. 15; Nr. 28; Nr. 26; Nr. 33; Nr. 39; Nr. 41; Nr. 56 and Nr. 82 are parts of globular bowls, while Nr. 18 and Nr. 34 are fragments of a pear-shaped jar and Nr. 27 is from a dome-shaped bowl. Globular forms seem to predominate; however, poor preservation is a major setback for typological analysis (PLATES 7.1-7.9).

The few identifiable forms fit well with the range of vessel shapes already known from other sites in the Upper Euphrates / Tigris region (for a summary: Benz *et al.* 2017). Straight-sided and globular bowls seem to be among the standard types also in Körtik Tepe (Benz *et al.* 2017; Köksal-Schmidt and Schmidt 2007; Özkaya and Coşkün 2011). This site in the Turkish Tigris region is of paramount importance for the study of stone vessels, since they have been found there in large numbers and in a good state of preservation within burial contexts. What is present at Körtik Tepe, but missing entirely from Göbekli Tepe as of yet, is one single peculiar vessel shape: high beakers (Özkaya and Coşkün 2011: 118, Fig. 19). Of course, such vessels could still be hiding within the large number of non-reconstructable fragments. Further analogues for the vessels from Göbekli Tepe can be found at Hasankeyf Höyük (Miyake 2013: 44/1, 2- globular bowl and high beaker), Hallan Çemi (Rosenberg and Davis 1992: 14, Figs. 7-8 globular, straight-sided, dome-shaped and pear-shaped bowls and high beakers; Aurenche and Kozłowski 1999: 221 Pl. 3-1/1, 3, 5, 6- globular, straight-sided and dome-shaped bowls), Nemrik (Aurenche and Kozłowski 1999: 221 Pl. 3-1/4, 7-globular and dome-shaped bowls), Çayönü (Aurenche and Kozłowski 1999: 221 Pl. 3-1/2, 11- pear-shaped bowl; Özdoğan 2011: 267, Fig. 68), Jerf el Ahmar (Jamous and Stordeur 1999; Stordeur 2015, Fig. 3.1-globular bowl), Tell Abr' 3 (Yartah 2013: Figs. 34/1-3; 87/2a, b; 96/2, 3; 157, 173-globular bowl; 179/3; 182/5), Tell Qaramel (Benz 2017: Fig. 4/1) as well as other sites from the region (Gündem and Dağlı 2018; Sığın 2008).

Some of the vessels from these sites are linked to special contexts, such as the Körtik Tepe graves (Lichter 2007; Özkaya and Coşkün 2011), or to caches / depositions (in Tell Abr 3: Yartah 2013), but they also appear in well-preserved building contexts (Yartah 2013). In most cases, however, the vessel assemblages have not been published completely and data regarding fragmentation or at least the ratio of fragmented to well-preserved vessels are missing. By the known numbers, it seems that small straight-sided or round bowls and pear-shaped jars are the most common forms in all sites mentioned. However, the large corpus of fragmented material might still hold further surprises, as highlighted by an intricately worked cattle-shaped vessel from Tell Abr´ 3 (Yartah 2013: 103, Fig. 87/1a, 152).

FIGURE 7.11. Shape of the greenstone vessels (©German Archaeological Institute, Photos Klaus Schmidt and Nico Becker). D-DAI-IST-GT10-NB-0129; D-DAI-IST-GT99-KS-0511; D-DAI-IST-GT12-NB-1070; D-DAI-IST-GT11-NB-6787.

Greenstone vessels- decoration

Most vessel fragments from Göbekli Tepe are decorated (62 items, appendices TABLE 28). The small fragments determined as undecorated could originally have belonged to vessels with smaller decorated areas (for example Özkaya and Coşkün 2011: 117, Fig. 15). There are, however, genuine undecorated vessels known from other sites such as Körtik Tepe (Özkaya and Coşkün 2011: 117, Fig. 15).

Ornaments are preserved only in small parts. They are in most cases geometric; several are zoomorphic. The geometric decorations consist of single or combined triangles (Nr. 1; Nr. 2; Nr. 6; Nr. 7; Nr. 10; Nr. 14, Nr. 24; Nr. 25; Nr. 26; Nr. 30; Nr. 39; Nr. 41; Nr. 70; Nr. 75; Nr. 77; Nr. 82; Nr. 83), herring bone motifs (Nr. 5; Nr. 9; Nr. 19; Nr. 23) or zig-zag lines (Nr. 4; Nr. 11; Nr. 14; Nr. 18; Nr. 29; Nr. 32; Nr. 83). Bands made of simple, short parallel lines appear more rarely (Nr. 23), but single circles or wavy bands appear also (Nr. 26). Rims are sometimes decorated with short vertical lines (Nr. 20). Simple geometric designs, sometimes applied to large parts of the vessel surface, generally seem to dominate the repertoire of stone vessel decorations (Benz 2017: Fig. 4/1-2, 5/1-2; Özkaya and Coskün 2011: 118, Fig. 17 - 19; Schmidt and Köksal Schmidt 2007, 101; Cat. Nr. 153-155, 158, 102, 146-149; Yartah 2013: 51/1-2). As Benz (2017) observed, both supra-regionally standardized designs as well as local variations and adaptations seem to exist. Among the more complex decorations, the so-called sun-motif, a composition of circles with radiating bands (Benz *et al.* 2017), can be observed at Göbekli Tepe (Nr. 16; possibly also Nr. 17). Two fragments show horned quadruped animals, likely gazelles (Nr. 3 and especially Nr. 14). Gazelles are the main hunted species at Göbekli Tepe (Lang *et al.* 2013) but they do not figure prominently in the iconography represented on the site's T-pillars discovered so far (Peters and Schmidt 2004). Three vessel fragments (Nr. 25, possible also Nr. 56 and Nr. 21) show snakes, which are a species frequently depicted at the site (Peters and Schmidt 2004). It is possible that the wavy lines between the herring bone motif on fragment Nr. 9 also refer to snakes, heads and tails not preserved in this case. Another fragment probably represents a plant, maybe a thistle[1] (Nr. 71), but this image lacks any known analogue so far. To sum up, there seems to be a range of decorations and motifs on vessels at Göbekli Tepe but most prominent are geometric motifs covering wide areas of the vessel surface, including bases (Nr. 9).

The imagery on vessels and other items of material culture from Göbekli Tepe has been interpreted as part of a supra-regional symbolic system that served the transmission and communication of cultural knowledge and traditions (Benz 2017; Benz and Bauer 2013; Morenz and Schmidt 2009; Schmidt 2012). Even if much of the decoration on vessels is 'geometric and non-figurative' (Köksal-Schmidt and Schmidt 2007), standardization of decorations could hint at 'coded corporate identities' (Benz 2017), especially since some compositions seem to regularly repeat at certain sites (Benz 2017: 140-141, Figs. 3-5). The exceptional naturalistic depiction of a hunter with a spear on one vessel from Tell Abr´3 may hint at some relation of decorative elements to narration, possibly even mythological stories (Yartah 2013: Fig. 96/3). With the current state of research, however, the highly fragmented state of the Göbekli Tepe material prevents any interpretation from going much further.

Functional analyses of the greenstone vessels

Stone vessels were not exclusively symbolic objects, but actually functional and used to hold contents. They were made and decorated with care; most are polished. It was proposed that they were made according to supra-regional standards, not only regarding form, but also size and volume (Hayden *et al.* 2012). Hayden *et al.* (2012) gives a range of 9cm-12cm as maximum diameter and 8-9 cm for height; a sample of published finds (Köksal-Schmidt and Schmidt 2007: Nr. 139-160,

[1] The depiction is also to some degree reminiscent of jimsonweed seed pods. Jimsonweed is a psychoactive plant, but although prehistoric use in Eurasia has been claimed for it (Guerra-Doce 2015, 754, 770), there is ongoing debate whether the plant is native to Europe or to America.

300-305), however, shows a wider range between 8cm-16cm, with heights of up to 15cm. Since the walls of the vessels from Göbekli Tepe have a thickness of max. 2cm, they would have been rather light and easy to hold or carry. Find contexts at the site are not very informative (see below), thus possible functions can only be inferred from comparisons to other sites.

Neolithic stone vessels have been interpreted as prestige dinnerware used in feasting (Hayden *et al.* 2012). Chemical analysis from two of the Körtik Tepe vessels seem to hint at wine (McGovern 2009). This would fit the general interpretation of activities at Göbekli Tepe, which include feasting, more precisely 'work feasts' that may have included alcohol consumption as one mode of gathering the necessary workforces for the monumental round buildings' construction (O. Dietrich *et al.* 2012). There is tentative evidence for beer (O. Dietrich *et al.* 2012 and above), more of such large vessels are known from the other areas at the site and fragments also feature in the larger buildings' infill. The question of whether delicate smaller stone vessels were used for scooping contents of such large vessels remains open, although there are corresponding holes in the rim of some vessels (Nr. 83; Özkaya and Coşkün 2011: Fig. 15, 18, 19; Yartah 2013: 112 Fig. 96; Figs. 87/2a, 134/3, 157, 173, 182/6), which could have held an attached string (which, of course, could also have served to hang vessels or to fix some kind of lid to them).

Furthermore, there is evidence for repairs: holes were drilled into fragments to reconnect them (Benz 2017: Fig. 4/2a). Interestingly, one of the Göbekli Tepe fragments (Nr. 19) shows an attempt to make such a hole, which may constitute an attempt at repairing it before the owner decided to transform the fragment into a shaft straightener. Vessels repaired in that way still could have been used as containers, but probably not for liquids. In any case, these repairs underline the high value of the used raw materials. The afterlife of vessel fragments actually becomes the most interesting part of the finds.

Fragments of stone vessels were not simply discarded at Göbekli Tepe. They remained valuable and were kept and transformed. In at least 20 cases, traces of later use, re-use or repair indicate long object-biographies for vessel fragments (TABLE 28). The most frequent traces are saw marks or polishing at the edges of sherds. Cutting and sawing of sherds could have had the aim of straightening the edges ahead of repair, or to cut the sherd into roughouts for other objects. As not all breaking edges were worked, the second hypothesis seems more likely. One category of objects that could be made from sherds are beads. Göbekli Tepe has produced a wide range of stone beads, among them complex forms like spacer beads, but also simple disc- or cylinder-shapes (Köksal-Schmidt and Schmidt 2007). Several of the vessel sherds (Nr. 13, Nr. 17 Nr. 19, Nr. 29, Nr. 42, Nr. 56, Nr. 58, Nr. 59, Nr. 76, Nr. 79) were reworked with a broad groove into what are often called 'shaft-straighteners' (Köksal-Schmidt and Schmidt 2007). Similar hand-held objects, however, have also been interpreted as abraders for the production of beads (Foreman 1978; Kenoyer *et al.* 1991; Roux and Matarasso 1999; Wright *et al.* 2008). Microscopic analyses in the near future will help to decide whether this interpretation holds true for the Göbekli Tepe finds too. At least for material from other Neolithic sites, such as Mushash in Jordan, remains of a whitish abrasive could be identified within the grooves (pers. observation). In any case, the irregular polish noted in these grooves speaks strongly against an interpretation as shaft straighteners. As does the fact that the sherds are considerably small and never appear in pairs – as certainly would be expected in the case of shaft straighteners (Bolus 2012). Therefore, for the grooved sherds from Göbekli Tepe we propose a more probable function as abraders used in the production of beads.

Fabrication of beads from parts of meaningful vessels could also have had important social connotations. At Körtik Tepe for instance, at some gravesites there was evidence for deliberate destruction of stone vessels by blows directed at the bottoms of these vessels; fragments were then dispersed over the body of the deceased (Benz *et al.* 2017; Lichter 2007). However, not all fragments were left in the grave. Benz *et al.* (2017) have argued that the missing fragments could have been taken as 'souvenirs.' From Demirköy, there is a pendant made from a vessel fragment, which could have served as a medium to commemorate a specific event at which the vessel was broken (Köksal-Schmidt and Schmidt 2007). The production of beads from vessel fragments at a highly symbolic site like Göbekli Tepe would fit well in such a model. Stone vessels were also used to store beads, as finds from Hasankeyf Höyük (Miyake 2013) and from Körtik Tepe (Özkaya and Coşkun 2013) show.

Contextual analyses of the "greenstone vessels"

Most vessel fragments are surface finds or come from the upper parts of room infills, often from wall debris (TABLE 28). Only one sherd (Nr. 45) was discovered inside a rectangular building immediately above the floor level. Additional sherds come from fill layers of the monumental round buildings, but there too from the upper parts of infills not related to actual activities in the course of the buildings' use (Nr. 42, fill of Building B; Nr. 47, Nr. 44, and Nr. 51, Nr. 81, Nr. 75 and Nr. 76 from the fill of Building D; Nr. 46, from the fill of Building C; Nr. 33, infill above Building C). Only one sherd (Nr. 28) is known from layers within Building D that likely represent intentional backfilling events during the early PPNB.

The greenstone vessels at Göbekli Tepe are highly fragmented and the fragments were possibly kept to be reworked into beads or other implements. There are only two exceptions to this rule: vessel fragments too large and retaining too much of the original vessel´s curvature to be used as raw material (Nr. 8 and Nr. 9). But in general, it should be kept in mind that by analyzing the spatial distribution of 'greenstone' vessel fragments at Göbekli Tepe, we are most likely not tracing the actual use of vessels at the site, but in fact the distribution of raw material meant for reuse. There is no clear evidence at the moment for such a reuse of fragmented vessels coming from the monumental buildings though, as the sherds from the monumental buildings' fills do not show related traces.

PLATE 7.1. Stone vessels (©German Archaeological Institute, 1-3, Photos Nico Becker, 4. Photos Klaus Schmidt)

PLATE 7.2. Stone vessels (©German Archaeological Institute, Photos Nico Becker)

PLATE 7.3. Stone vessels (©German Archaeological Institute, 1-2 Photos Klaus Schmidt, 3-4 Photos Nico Becker)

PLATE 7.4. Stone vessels (©German Archaeological Institute, 1-2, 4 Photos Klaus Schmidt, 3, 5-6 Photos Nico Becker)

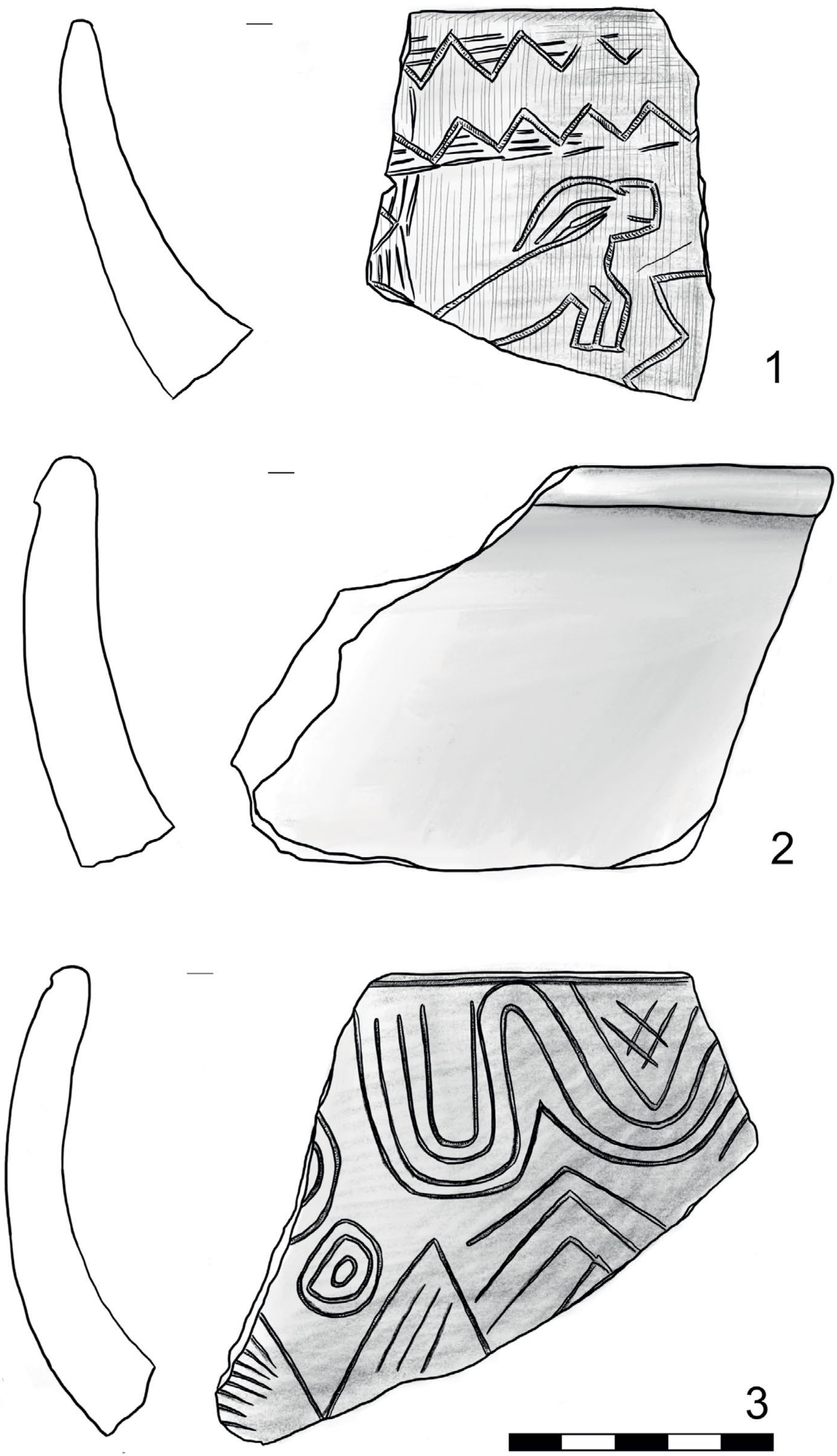


PLATE 7.5. Stone vessels (©German Archaeological Institute, drawings Jens Notroff)

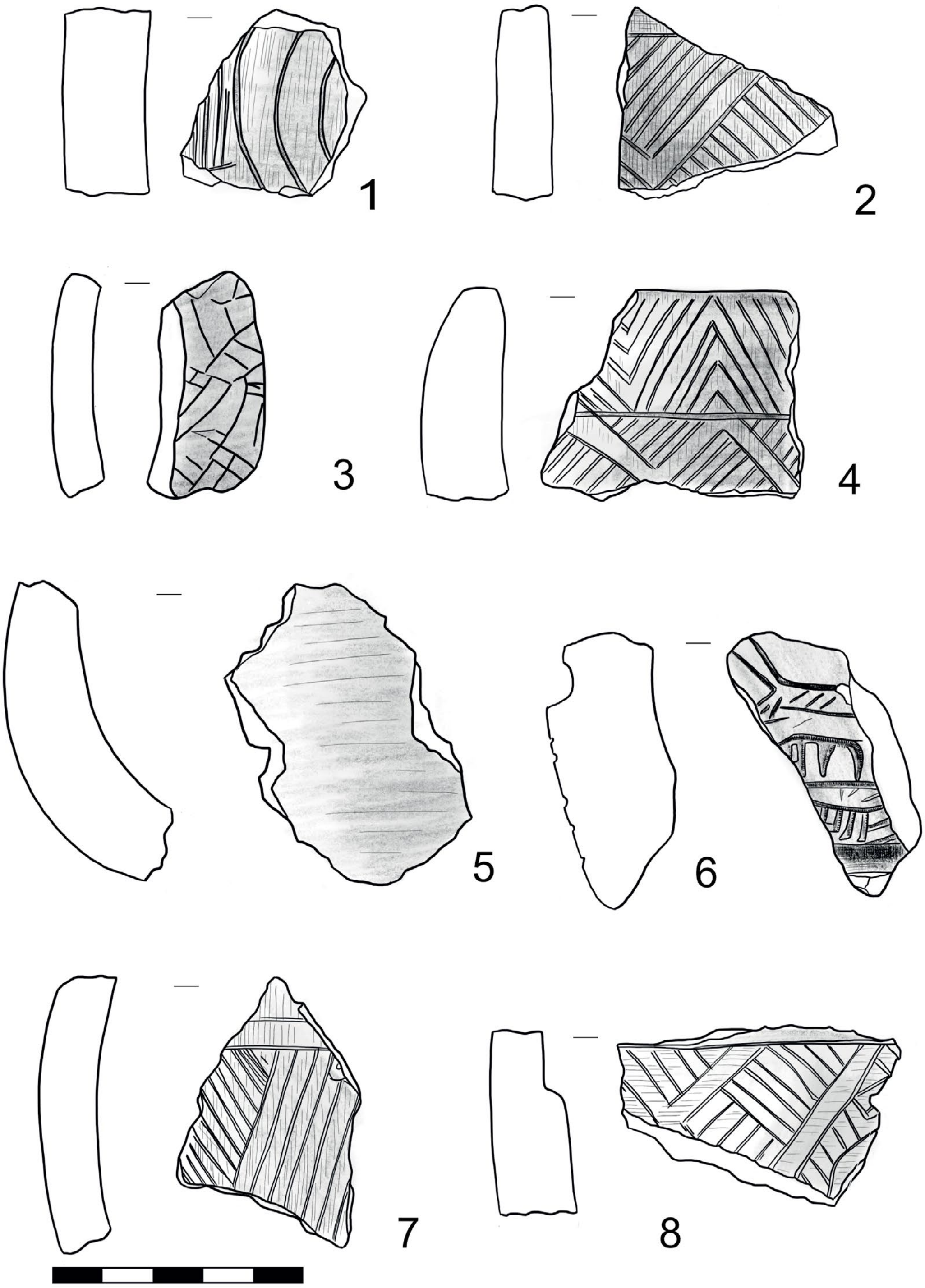


PLATE 7.6. Stone vessels (©German Archaeological Institute, drawings Jens Notroff)

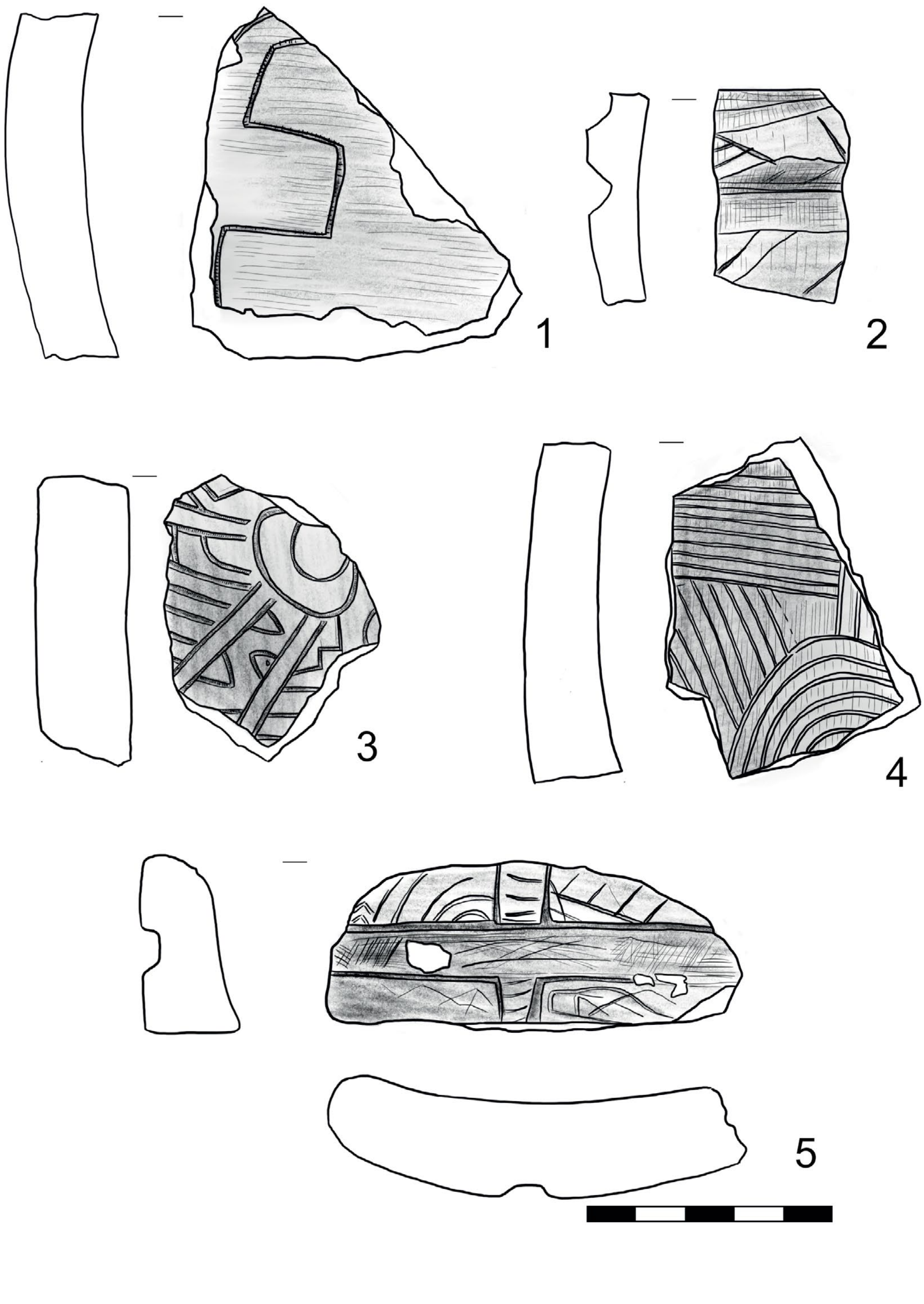


PLATE 7.7. Stone vessels (©German Archaeological Institute, drawings Jens Notroff)

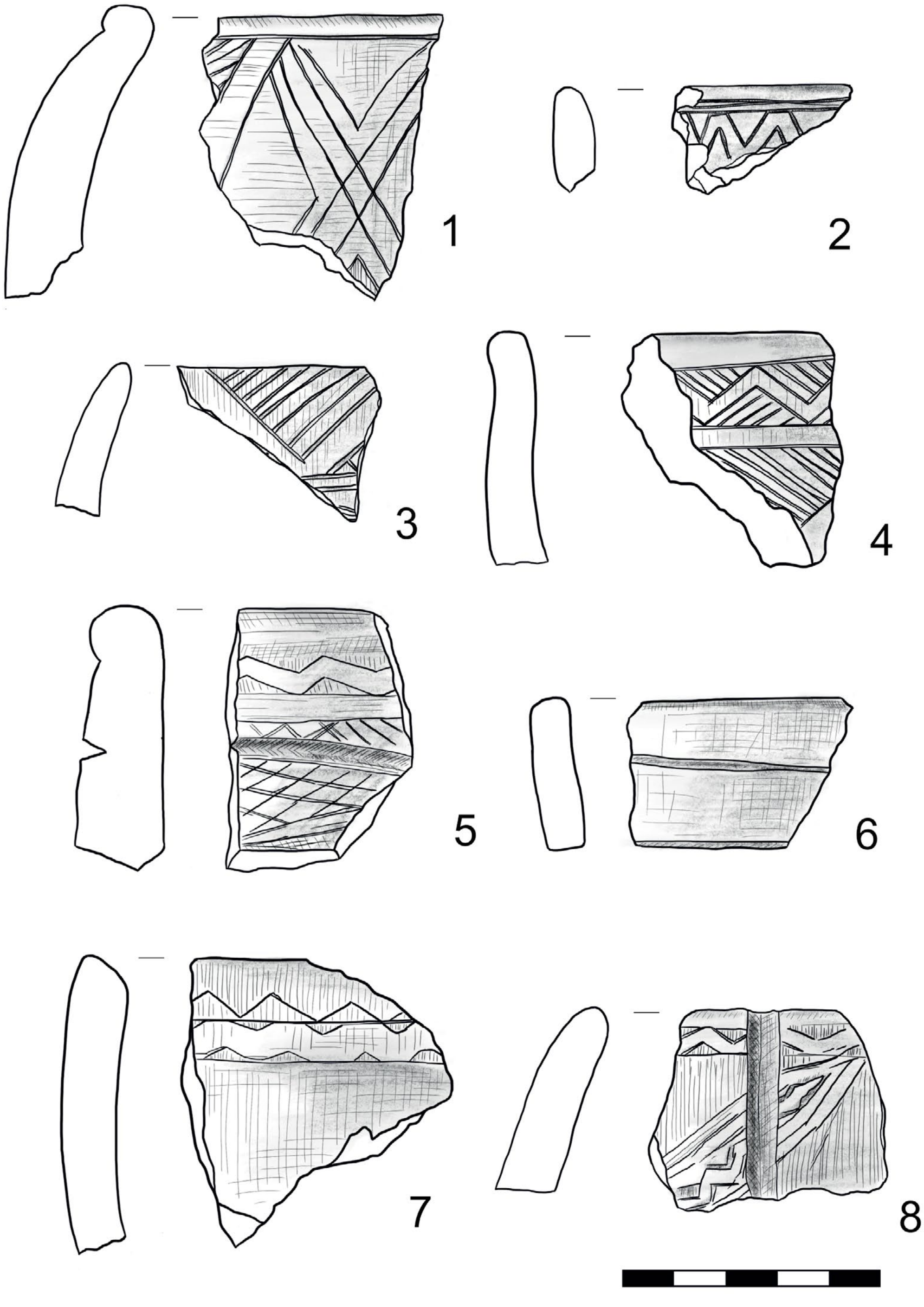


PLATE 7.8. Stone vessels (©German Archaeological Institute, drawings Jens Notroff)

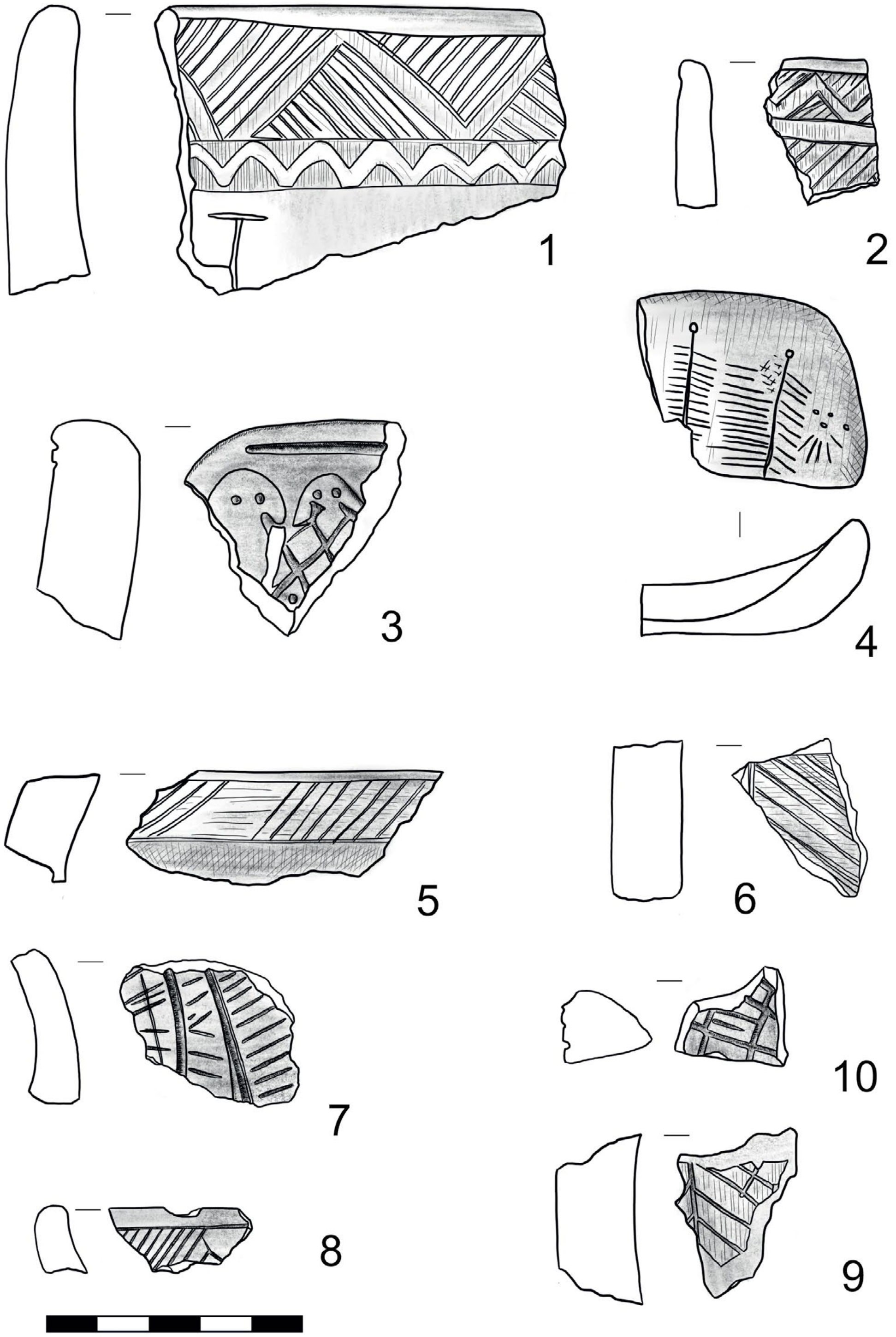


PLATE 7.9. Stone vessels (©German Archaeological Institute, drawings Jens Notroff)

Chapter 8

Discussion of the Results of the Analysis

Why this topic?

Very likely, grinding and pounding tools (GPT) will become a highly popular category of finds in the archaeological research over the next decade(s) and they will certainly surpass their previous status as one of many “small finds”, “ground stone industry” or “other finds” (that, in the fortunate cases in which they were included in the analysis at all, which often is not the case). This change is caused by several factors: the increasing interest in food archaeology in general, and in the role of plants within the nutrition in particular, and thus indirectly in the tools related to their processing, the impact of the material culture turn on archaeology with its focus on objects, and the emergence of the digital humanities which includes data collection from all finds and accessibility of databases, and the consolidation of interdisciplinarily oriented scientific archaeology. Shortly, archaeology sees a re-emergence of artifact studies with a new methodological toolkit. GPT stand directly at the confluence of all these: they are associated with the production of plant food, they are common and numerous in every site and usually heavily used, thus offering wide possibilities of use-wear analysis, which can be combined with residue analyses.

But these are not the only reasons for the increasing importance of the GPT in the archaeological discourse. It becomes increasingly clear how these objects, which are universal food processors and crushers, have transformed daily life, human adaptation to the environment and its manipulation and have decisively contributed to the formation of modern food habits, among others. A world without bread, porridge, other bakery stuff or beer, legume stews, coffee or minced meat for example would be unimaginable today, but all these have to be processed with the aid of the GPT. And they are not the only ones.

There is a wide ethnographic record (with a focus of research on Mesoamerica and Africa) attesting the processing of all kinds of herbs, seeds, tubers, spices, drupes, nuts, fruits, legumes, berries, tobacco, meat and fish and different types of minerals and pigments as well as of cereals to different products (Adams 1988, 1989, 2002; Dubreuil *et al.* 2015; Ertug-Yaras 2002; Haaland 2007; Hamon, Le Gall 2013; Hayden 1987; Hersh 1981, Horsfall 1987, Lyons 2007, Nixon-Darcus 2014; Nixon-Darcus and D’Andrea 2017; Robitaille 2016; Searcy 2005; Schrott 1996; Schoemaker *et al.* 2017; Teklu 2012; Wright 1994; all with further literature). It is thus clear that the association between GPT and cereals so often employed by archaeologists without further analysis is a modern assumption, and the functional interpretation has to be done independently by taking into account a broad spectrum of variables. On the other side, cereal food is one of the main components of the modern human diet. Its integration into the subsistence strategy during the late Epipalaeolithic (c. 12500-9600 cal BC) and Pre-Pottery Neolithic (PPN, c. 9600-7000 cal BC) has been recognized as a very long and complex process involving the selection and utilization of plants, strategies of exploitation of plants and land, the development of cultivation, and ways of processing, storing and consumption of plants (Arranz-Otaegui *et al.* 2016; Asouti and Fuller 2013; Bar-Yosef and Belfer-Cohen 1989; Colledge 2002; Fuller *et al.* 2012; Harris 2002; Nesbitt 2002; Vigne 2015; Weide *et al.* 2018; Willcox 2005, 2008; Zeder 2011). Clearly, the establishment of agricultural economies at the end of the later part of the Pre-Pottery Neolithic (PPNB, c. 8800-7000 cal BC), comprising the deliberate, large-scale cultivation of domesticated cereals and other domesticated plants (Akkermans 2004; Asouti 2013; Bar-Yosef and Meadow 1995; Byrd 2005; Kuijt and Goring-Morris 2002), was predated by a longer period of experimentation and technological modifications that led to the development of a specialized tool kit for plant food processing (Dubreuil 2002, 2004, 2008, 2009; Dubreuil and Nadel 2015; Wright 1991, 1992, 1994, 2000, 2005).

The different processes for fragmenting cereals include de-hulling, pearling, polishing or grinding to fine flour and are also ethnographically attested (Cappers et al. 2016). The aim of all these techniques is to enhance the digestibility of cereals, lower their cooking time and raise their dietary energy (Piperno 2004). The consumption of cereals in fragmented and dehusked form is generally predominant over their consume as whole grains already from the beginning of their use (Arranz-Otaegui *et al.* 2018). The evolution of the GPT is closely related with the beginning of a cereal-rich diet. Therefore, GPTs have to be analyzed from two equally important points of view: their function as general crushers, and their use for the processing of cereals in the Neolithic. Most probably, also the legumes should be included in this research but their early processing through grinding/pounding is not clearly attested in the archaeological record except through use-wear analyses (Bofill *et al.* 2012; Dubreuil 2002).

Recent investigations have highlighted the area between the upper reaches of Euphrates and Tigris as one region where the transition to food-producing subsistence took place early during the Epipalaeolithic and the Pre-Pottery Neolithic. The distribution areas of the wild forms of einkorn, emmer wheat, barley and other 'Neolithic founder crops' overlap here and DNA fingerprinting has pinpointed the transition of two wild wheat variants to domesticated crops to this part of the Fertile Crescent (Abbo *et al.* 2017; Heun *et al.* 1994; Lev-Yadun *et al.* 2000; Özkan *et al.* 2002; Weiss and Zohary 2011).

Systematic early plant use has been found at a variety of sites, like Cafer Höyük (de Moulins 1997), Çayönü (van Zeist W and de Roller 2003), Hallan Çemi (Starkovich and Stiner 2009), Jerf el Ahmar (Willcox and Stordeur 2012), and Körtik Tepe (Benz *et al.* 2018; Rössner *et al*. 2018). Some of these sites have produced large quantities, in some cases several hundreds, of items for plant food processing (handstones, large grinding bowls and slabs as well as mortars and pestles) (Bofill 2015; Davis 1982; Mazurowski 1997; Nierlé 2008). From this point of view, Göbekli Tepe would have been an exception, with its very few macrorests of cereals discovered by now (Neef 2003). This would be odd, given the deep integration of the site into the cultural and economic landscape as evidenced by other find categories (Schmidt 2005). The apparent absence of cereal evidence was thus another reason for this research and for one important research question: the hypothetic role played by a central site in the adoption and spread of foodways and practices related to the processing of plant food and especially of cereals.

The third reason regards the addition of a fully new, unknown facet of research in the interpretation of Göbekli Tepe to provide new arguments regarding the subsistence of the builders and the likelihood of feasting, which so far have concentrated very much on hunting and the animal bones (Lang *et al.* 2013; Peters and Schmidt 2004; Peters *et al.* 2014; von den Driesch and Peters 1999; Pöllath *et al.* 2018).

The late excavator of the site, Klaus Schmidt, however proposed that the necessity to supply food for extensive construction activities could have contributed to a need for reliable food sources, accelerating the process of domestication (Schmidt 2012).

It was thus clear that in one way or another, detailed analysis of the grinding tools from Göbekli Tepe possibly had the potential to add valuable information about 1) plant food processing, 2) early use of cereals 3) grinding technologies and 4) social and economic practices related to this unusual large site with its "special buildings". In this study, stone vessels as portable containers for meals and stone troughs were analyzed in addition in order to outline food practices at the site more clearly.

FIGURE 8.1. Göbekli Tepe and graphical reconstruction of the PPNB-Settlement (©German Archaeological Institute, Graphics Jens Notroff, Photo Nico Becker). D-DAI-IST-GT10-NB5687.

Göbekli Tepe, the finds and their contexts

The largest part of the analyzed finds comes from the PPNB rectangular and apsidal buildings (FIGURE 8.1). Architectural analysis (Kurapkat 2015) propose a contemporaneity of most buildings, or better their excavated last floor levels, but this has yet to be confirmed through radiocarbon dating. The rhythm of production, use, and discard of finds related to specific stratigraphical layers of these buildings cannot be calculated at the moment, the same is true for the rhythm in which the buildings were used. The present study has to be understood as a starting point for investigations in this direction while further analyses have to concentrate more on phenomena of infill formation of rooms and the practises of discard. Finds from the PPNB buildings were evaluated together while further stratigraphical studies on fills will help to find finer chronological differentiation between PPNB phases of use.

Judging from the composition of the find assemblage, it can be assumed that most PPNB buildings, with some notable exceptions, were initially equipped with stationary troughs, vessels and sets of GPT. The GPT were used on roofs and, more rarely, directly on the floor, while stone troughs have been interpreted as fixed cooking installations in the buildings. The contexts are discussed in detail in chapters 4-6.

It is important to emphasize that most results of the functional analysis ***are related directly to the PPNB buildings and compared to chronologically similar finds and contexts*** from the region. The monumental and richly decorated ‘special buildings’ were not the loci for food processing or the use of GPT. Large quantities of finds from the upper parts of their fills have been relocated through different processes which cannot be entirely reconstructed at the moment. The most probable explanation is the formation of the upper part of the fills through erosion from the slope (L. Dietrich *et al.* 2019; O. Dietrich and Schmidt in preparation) with the finds most probably originating in the PPNB buildings.

Thus, adding these finds to the PPNB inventories makes the Göbekli Tepe assemblage the largest collection of GPT and stone vessels known from the Levant and Northern Mesopotamia from one single site by now. Comparisons regarding find numbers from other (partly) contemporary sites are sometimes hard to make, as often the total quantity of grinding equipment is not clear from the reports, and while plans show the total area exposed, the amount of sediments excavated is not mentioned. Davis (1982) described 1173 complete or fragmented handstones and pestles and 480 netherstones (7 whole) for Çayönü. At the PPNA site Jerf el Ahmar, 413 handstones, pestles and netherstones were found (Bofill 2015), and a total of 1349 of such objects at Nemrik (Mazurowski 1997). Wright´s (2014) sample of contextualized material from Çatalhöyük includes 1129 querns / slabs, 26 blanks and 168 handstones. PPNB assemblages from the Southern Levant do not exceed 500 grinding stones per site, and even Late PPNB assemblages have no more than 1000 grinding stones (Wright 1993). There are, however, several factors affecting the distribution and density of grinding stones, like the number of inhabitants of the sites, access to raw materials for their production, the impact of curative technologies on their frequencies, environmental conditions, and culinary preferences. Also, processes of site formation and post-depositional factors impact on the circulation of objects, affecting each comparison between relative and/or absolute frequencies. It is impossible to define the number of grinding stones being used *at the same time*. However, the better preserved and extensively excavated rectangular buildings at Göbekli Tepe have produced an average number of 2 grinding stones/m^3, which at the actual state of research appears to be very high for the time and region. Monumental building D has an average of 2.45 grinding stones/m^3 but only few GPT can be associated with the real use of the buildings. All GPT found on its floor or under the pillars were used for the processing of ochre (WM 5). No trough was found in situ in the monumental buildings. Platters are present only in possible ritual arrangements as described in chapter 6. The lower part of the fill of the monumental building D has been reconstructed as intentionally backfill with mixed finds (L. Dietrich *et al.* 2019).

Functional studies at Göbekli Tepe and beyond

Functional studies on Epipaleolithic and Neolithic GPT have been made in several sites (Bofill and Taha 2013; Bofill *et al.* 2013, Bofill 2015; Dubreuil 2002, 2004; Dubreuil and Grossman 2009; Dubreuil and Plisson 2010;), the methodology used is diverse (chapters 3 and 4). The studies indicate the processing of cereals, legumes and meat with GPT at the sites analyzed as well as the emergence of cereal processing towards the End of the Epipalaeolithic and in the PPNA (Dubreuil 2002, 2004; Rosenberg and Nadel 2017). The use-wear analyses carried out are too few to differentiate regional tendencies such as food practices or technological choices, and for Northern Mesopotamia there are no chronologically early data. New studies however propose for example the processing of tubers with GPT (Pedersen *et al.* 2016), hinting at the existence of regional specific foodways which are visible in wear on GPT.

For the PPNB there are only a few functional studies. At Tell Halula (Bofill 2015), which geographically belongs to Northern Mesopotamia, but is later than Göbekli Tepe, the processing of legumes, fruits and hides is attested in addition to cereals, which are dominant. Similar results have been published for the partially contemporary Tell Aswad, lying further to the south (Bofill *et al.* 2013).

At the PPNB sites of Tell Halula and Tell Aswad the processing of cereals is predominant, but legumes, fruits and hides are also evidenced (Bofill *et al.* 2013). Thus, use-wear research and functional studies are just at the beginning in this region and an inter-site comparison is hard to make. The present study fills an important gap both regionally and chronologically.

Another observation, already discussed in chapters 3 and 4, concerns the wide variance in methodology which can have serious consequences for the interpretation of wear. Despite of progress made lately in use-wear analyses in general (Marreiros *et al.* 2015) and in the research on grinding stones in particular (Adams *et al.* 2009; Adams 2014; Dubreuil *et al.* 2015), there is no common methodological approach to use-wear studies on GPT and no common proxy for comparison. Light microscopy was used in all cited sites for the study of surface deformations, especially at low magnification, but the location of the investigated areas is not in each case clear, although it is of crucial importance for the interpretation of wear patterns (chapters 4 and 5). Shapes and their successive deformation are investigated to a lesser degree, although they have to be included in the analysis. Few studies present shapes or they are reduced to sketches and drawings. Especially for the analysis of depressions in netherstones simple sketches are disadvantageous. Also, when using an experimental reference collection data on all variables (especially motion and handling) have to be given to make a wider methodological comparison possible.

The present study avoids ambiguities by clearly ***linking information on shapes and surface deformations to experimental investigations of motion and handling, both of active and passive parts of GPT, in a coherent system***. In addition to optical investigation, digital visualization of surface geometries and tactile analyses were used together, which is a new approach in this field of study. The use of simple optical macroscopy (also carried out by Dubreuil 2002), tactile investigations and photogrammetry is feasible for large quantities of finds and produces relatively low costs. The present study uses a relatively affordable light microscope and camera, a commercial software for 3D-modelling (but there are several free software options) and an open access software for quantitative analyses of shape geometries. Future investigations should show if this methodology can be extended to other categories of objects. It has the advantage of transparently using a large quantity of variables while at the same time not losing sight of time and money invested. Also, most of the work can be done by a single person.

The problem of wear quantification was only partially approached by analyzing flattening extensions (chapter 4) but a common methodology has to be developed (see discussion on current approaches in chapter 4).

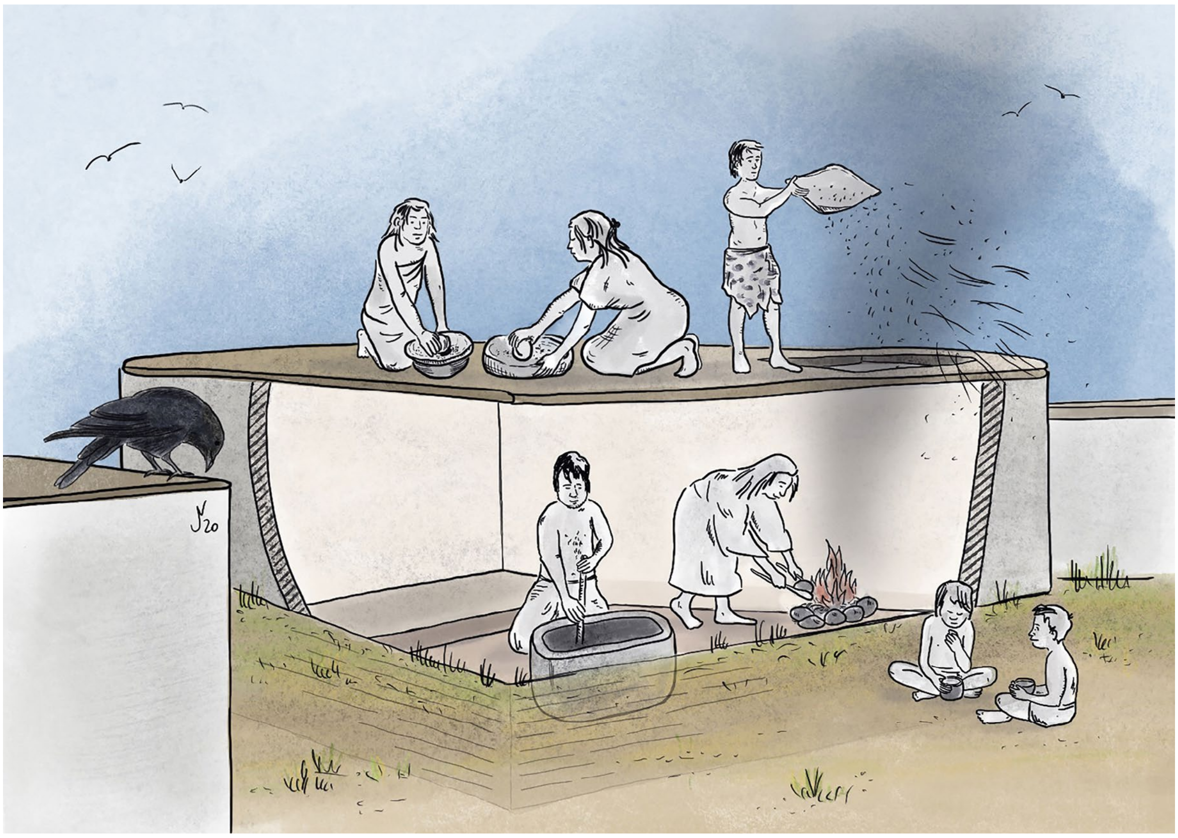


FIGURE 8.2. Processing cereals at Göbekli Tepe: reconstruction (©Laura Dietrich, reconstruction drawing Jens Notroff).

Another approach followed here was to make all data accessible, both in form of metrical information and images for each find. Ideally, a similar approach would be applied at more sites as now immense technical possibilities of data acquisition and presentation are given. Openly accessible databases can be easily used for other studies and compared with each other to secure results. For this reason, details of the data recording techniques have been provided here, also with a view to a possible future standardization of terminology.

Processing cereals at Göbekli Tepe

The processing of cereals was the main activity carried out with GPT at Göbekli Tepe and constitutes one of the most important and completely new aspect of subsistence at the site (FIGURE 8.2). It was an intense work implying coarse and fine crushing of large quantities of grains, followed by their preparation in large stone troughs to porridge-like dishes by heating a mixture of water and coarse flour with stones. This conclusion is the result of an integrated research method consisting of quantitative use-wear analyses, experimental studies, research on plant remains (phytoliths) and chemical analyses of sediment samples from the stone troughs. The numerous medium-sized stone vessels would have been used as tableware for this kind of meals.

Not entirely clear at the moment is the form of consumption, simply as porridge or in a fermented form as a beverage, as was proposed before based on tentative chemical evidence for beer (O. Dietrich *et al.* 2012). A combination of both is also possible. The analyses clearly indicate the processing of large masses of crushed cereals, their preparation through heating but not fermentation; also, malt was not identified between the few macrorests. The preparation of porridges is securely attested, while beer needs more evidence in the future.

Studies on subsistence attest wide cereal exploitation in the region at the time (see above for literature) but meals and foodways have not been studied yet. Usually, preserved macrorests in

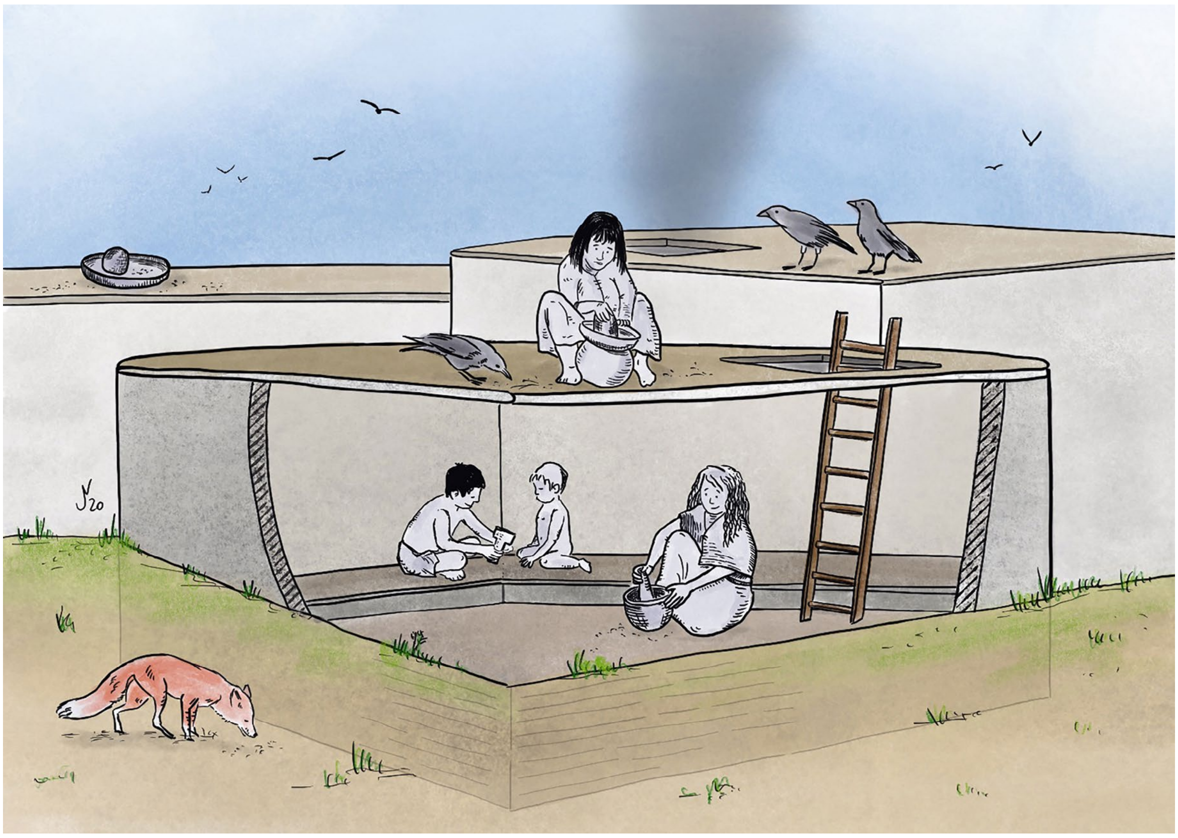


FIGURE 8.3. Processing legumes at Göbekli Tepe: reconstruction (©Laura Dietrich, reconstruction drawing Jens Notroff).

sites are analyzed mainly to investigate diet, but grains often burnt accidentally, for example in silo installations (see Jerf el Ahmar: Willcox and Stordeur 2012) before they could be prepared to meals. Also, they rarely show the exact extent of the consumption as such finds are a negative selection of the remains. A more exact method is the analysis of crusts and other charred macrorests as it has been done for Çatal Höyük (Gonzáles Carretero *et al.* 2017; Fuller and Gónzales Carretero 2018), which attest the coexistence of porridge-like and bread-like meals in the Late Neolithic. The analyses at Göbekli Tepe indicate earlier diversification of cereal products, at the latest in the PPNB, possibly with considerable impact on economic, social and generally daily life (see below). Also, they indicate more exactly the real extent of the consumption and the porridge/bread-ratio, as food crusts, like the macrorests, represent a negative and arbitrary selection of evidence.

Further analyses indicate dehusking on roofs as part of the chaîne opératoire, while phytolith analyses attest the presence of cell segments belonging to the stems and straws. This hints at both dehusking and threshing done directly at the site. However, interactions between persons and landscapes including cultivation and harvesting activities have to be investigated in more detail in the future. To summarize, there is strong evidence for large-scale processing of cereals at the site, but storage facilities have yet to be identified, if present at all.

Processing legumes at Göbekli Tepe

There were only few charred lentils discovered at Göbekli Tepe (Neef 2003) so that it is difficult to evaluate the real extent of their consumption (FIGURE 8.3); other legumes are absent from the macrorests so far identified. There are several Epipaleolithic and Early Neolithic (PPNA-PPNB) sites with macrorests of lenses, bitter vetch and peas; during the PPNB they appear in the majority of excavated sites in varying quantities (Zohary *et al.* 2013; summarized by Scheibner 2016: 112, Table 2.4). All these plants belong to the so-called founder crops (Weiss and Zohary 2011; Zohary *et al.* 2013) but, in comparison with cereals, grow more irregularly and in small populations (Abbo *et al.* 2008). This has led some researchers to the opinion that they had a smaller contribution to the diet of hunter-gatherers (e.g. Abbo *et al.* 2008). However, legumes appear in many PPNB sites, sometimes even in small “hoards” (Zohary *et al.* 2013) so that they were most probably associated with food production right from the start together with cereals (Weiss and Zohary 2011). Chemical analyses from the stone troughs of Göbekli Tepe suggest the presence of wicken and of possible composite meals made of cereals and legumes. It could have been a good possibility to add taste and plant protein to meals (Abbo *et al.* 2008) by combining legumes with cereal porridges, even in smaller quantities.

Similar to cereals, legumes can be consumed whole or crushed, soaked, dry, germinated, baked or boiled, although when they are harvested green they do not need to be crushed. Also, they have to be dehulled and can be sometimes polished, which can be achieved with GPT (Cappers *et al.* 2016). When they are dry, the cooking time rises so that previous grinding can be advantageous. Use-wear analysts propose dry grinding of legumes as cause for certain wear markers on Neolithic grinding stones (Bofill *et al.* 2013; Dubreuil 2002). Another possibility, which has been tested in this study, is wet grinding of already dehusked lentils, for which short boulders with round depressions (mortars) and pestles were used. This is a very efficient and fast process as was described in detail in chapter 3 (EP3), that practically results in a lentil soup/stew that can be mixed with other ingredients before cooking. The specific shape of the most frequent types of pestles (chapter 5) is a strong hint for this kind of use - through grinding instead of pounding - but the wear cannot be differentiated unambiguously from wear left by cereals experimentally processed in the same way in (still ongoing) long term experiments. In addition to this problem, too few original working faces from pestles were preserved, and others were not available for research.

To summarize, there is macrobotanical and chemical evidence for the consumption of legumes, and several functional traits of the GPT hint at their use for the processing of legumes, but further evidence is required to estimate their contribution to the diet at the site.

Other plants (drupes, nuts, tubers, herbs).

Archaeobotanical analyses revealed the existence of almonds and pistachio rests, and chemical analyses hint at the use of herbs (mugword) at Göbekli Tepe. Tubers are not attested.

Next to acorns, almonds and pistachio were widely used and are documented at almost every Epipaleolithic and Neolithic site of the Near East (summarized by Scheibner 2016: 107). Acorn and some species of almonds have to be pounded, roasted, soaked or boiled because of the toxic substances they contain but it is not known if the fruit of plants from Göbekli Tepe or other sites (Willcox *et al.* 2008) were toxic. Pistachio can be crushed/coarsely ground to obtain oil (Willcox *et al.* 2008). To now, there is no unambiguous evidence to support such processing with GPT at the site, even if the consumption is clearly attested. The experimental results for tubers and herbs were not conclusive. The use of herbs is probable, but Artemisia can be added to meals or beverages without being pounded. The use of tubers as it is documented at other sites (Arranz-Otanguei *et al.* 2018) cannot be confirmed by analyses on sediment samples (starch) or through use-wear. Here further analyses are needed. The processing of minerals, specifically ochre, in attested only in small scale and in special contexts (FIGURE 8.4).

Foodways at Göbekli Tepe and beyond

Presently, the following image can be reconstructed, which fits well with the state of the research within the region on one hand, and on the other hands brings new insights into the site’s character and its foodways as well as for the methodology of use-wear research.

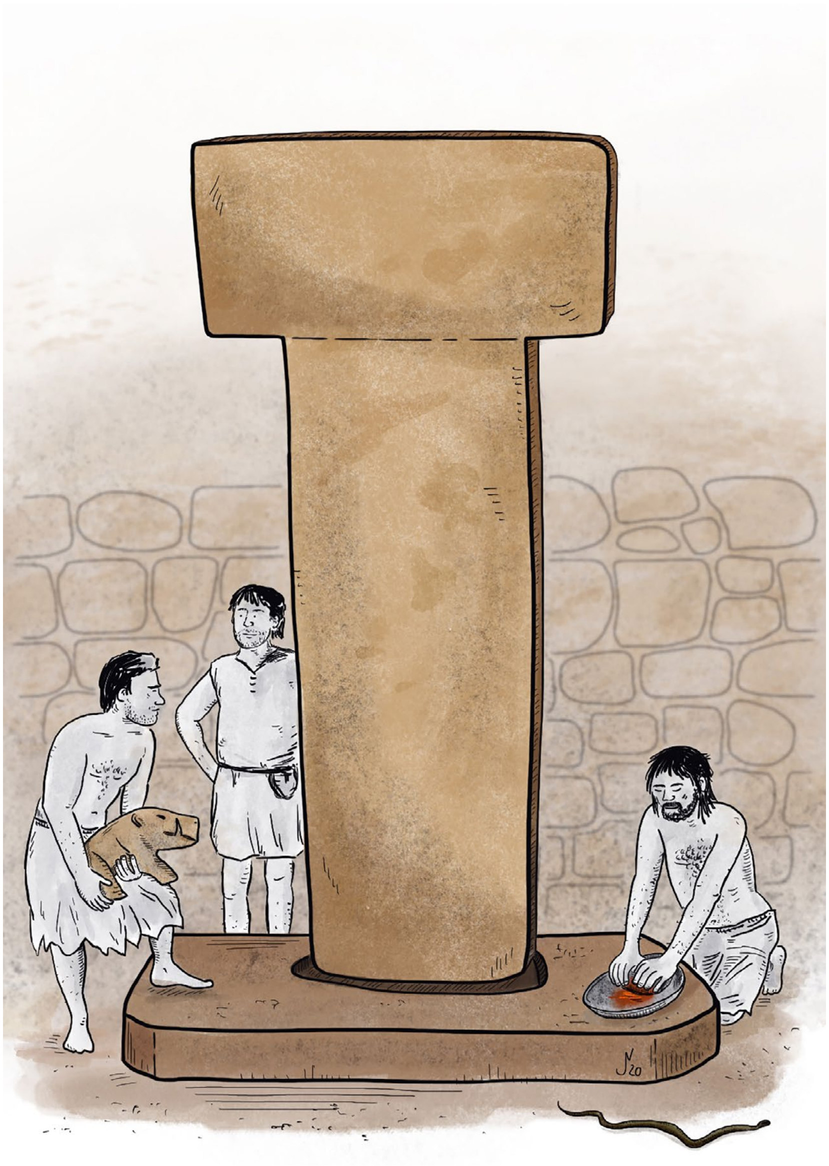


FIGURE 8.4. Processing ochre at Göbekli Tepe: reconstruction (©Laura Dietrich, reconstruction drawing Jens Notroff).

The people at Göbekli Tepe preferred porridges made of cereals, possibly mixed occasionally with legumes, and cooked in large limestone troughs. It is not entirely certain if the porridges were left to ferment to obtain beer but there is tentative evidence to support this assumption. They also occasionally made bread. In a first step, the cooks worked on roofs to grind and pound plants, and then transported the products to the ground floor of buildings to process them to finished meals in a second step. The transport was either done with stone vessels or with vessels made from organic materials, stone vessels were also used as dinnerware.

Use-wear analysis on handstones has produced evidence for large-scale processing of cereals, whose presence at the site is substantiated by phytolith data in the absence of charred plant remains (L. Dietrich *et al.* 2019; L. Dietrich and Haibt 2020). This and the unusual size of the troughs (up to 165l) and of the vessel assemblage has to be interpreted within the context of a special site like Göbekli Tepe. There is an evolution in the use of the stone containers from the older (monumental round buildings) to the partially younger (rectangular and apsidal building) structures. The assemblage of stone containers associated with the monumental buildings was composed of finely made limestone platters, middle-sized stone vessels and thin-walled, decorated 'greenstone vessels'. A lot of work was invested in their production. Although some of these vessels might also be linked to food, some contexts clearly indicate a displaying or offering role within cultic acts (Schmidt 2008). Evidence from the grinding stones and the phytolith samples attest the processing of cereals too, (L. Dietrich *et al.* 2019); however, the grinding stones found together with the platters in the monumental buildings bear traces of processing ochre. Some of the objects, including grinding stones, pestles and platters were deposited either directly at the pillars or in the sockets holding them in an ochre layer.

The assemblage in the rectangular and apsidal buildings is different. Stone troughs appear as fixed furniture in rooms and the middle-sized vessels become frequent and have more diverse shapes. The workload implied in their production was high, even more so in the case of the large stone troughs. However, most of them were no longer finished (smoothed and polished). Diversity and quantity replace quality and display. Platters are still attested but their role in cooking is not clear; use-wear suggests pounding. The fine, decorated 'greenstone' vessels are only attested as secondary 'raw material' to produce beads and abraders in these contexts.

There is thus good evidence for different activities in different, partly contemporary areas of the site. The rectangular buildings can be identified as the loci for extensive cereal food production far beyond the needs of a small group of people, while there is no evidence for food processing at all in the monumental buildings. No storage facilities could be identified so far. The reason for specialized devices for cooking large quantities of cereals in the absence of storage has to be sought in the social dimensions of food at Göbekli Tepe. The construction of the monumental architecture would have necessitated a workforce of hundreds of people even by conservative estimates (Notroff *et al.* 2014). One model to explain cooperation in small-scale communities, which we may suspect for Early Neolithic semi-sedentary hunter-gatherers, involves ritualized work feasts (for Göbekli Tepe: O. Dietrich *et al*. 2012; L. Dietrich *et al.* 2019, 2020 with bibliography). The evidence for large cooking devices presented here fits this model.

There is no comprehensive study of the GPT in Upper Mesopotamia. In most sites, PPNA and PPNB assemblages cannot be differentiated based on published information. The largest assemblages from Göbekli Tepe, Nemrik (Mazurowski 1997), (Çayönü (Davis 1982) and Jerf el Ahmar (Bofill 2015) show the dominance of kits with one-handed handstones and pestles used with circular and oval motions (reconstructed in FIGURE 8.5). There seem to exist some regional differences, for example kits with bidirectional motion seem to dominate in Jerf el Ahmar (Bofill 2015). Overall broad diversity in processing meals made of cereals and pulses, in the chaîne opératoire and in the spectrum of the kitchen tools are most probably the most important aspects of the epoch. Preparation is sequenced into several actions, each carried out with specific tools of different shapes: dehusking, crushing and cooking (boiling and baking) and possibly fermentation.

There is tentative evidence that dehusking was done separately previous to processing to flour either in intentionally perforated netherstones or in large netherstones with multiple depressions, probably with (stone?) pestles by pounding. Such pieces are also attested at other sites in Upper Mesopotamia (Mazurowski 1997: Pl. XL/3; Nierlé 2008: 546-547), and in the Southern Levant (Mithen *et al.* 2005, Wright 2000: Fig. 6). Similar to Göbekli Tepe, at Wadi Feynan (Mithen *et al.* 2005), possibly also at Jerf el Ahmar (Stordeur 2016: Fig. 68) such devices were placed on roof tops next to other sets of GPT used for further steps of the processing process.

Dehusking of cereals was in most cases followed by grinding which seems to prevail over pounding both with sets composed of handstones and pestles. Kits with one-handed handstones appear widely (at Jerf el Ahmar: Bofill 2015, IV.4.2; at Tell Qaramel: Mazurowski 2012: Pl. 135A; at Nemrik and Jarmo: Mazurowski 1997: P. I, XL; at Mureybet: Nierlé 2008: Fig. 1 and Fig. 9; at Çayönü: Davis 1982: Fig. 3.7; at Tell Abr' 3: Yartah 2013: Fig. 58) indicating the prevalence of circular and oval grinding with handstones, which has been interpreted as indicative of processing cereals to coarse flour (L. Dietrich and Haibt 2020).What was published by now indicates that the use of pestles for

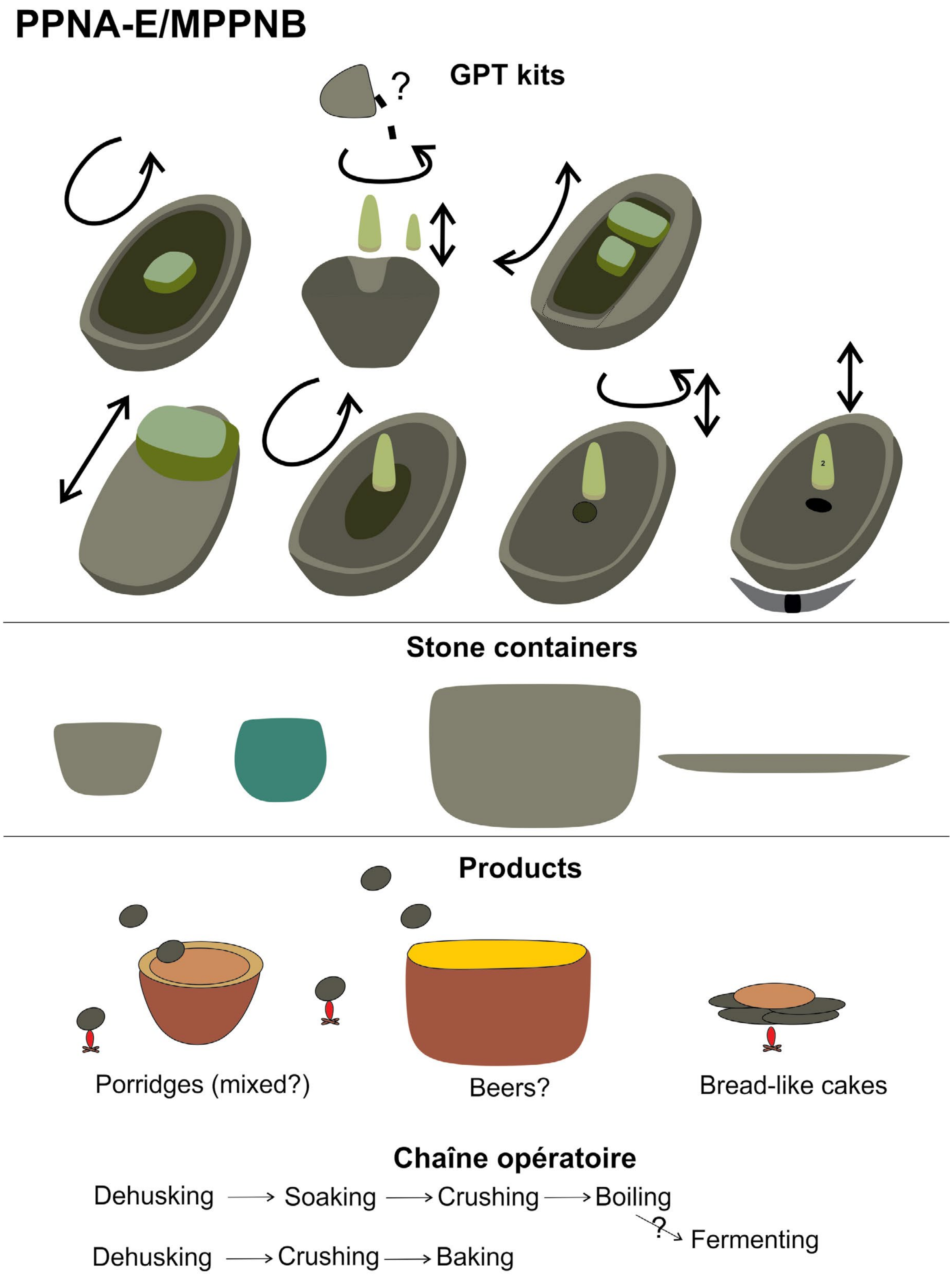


FIGURE 8.5. Reconstruction of the grinding and pounding tool kits and cereal products for the PPNA and Early/Middle PPNB (drawing Laura Dietrich)

grinding with oval motions is characteristic for Upper Mesopotamia. Kits with pestles are well-attested at Nemrik (Mazurowski 1997), very rarely at Çayönü (Davis 1982), Mureybet (Nierlé 2008) or Tell Qaramel (Mazurowski 2012) and completely missing at Jerf el Ahmar (Bofill 2015). Post-use factors including re-use of netherstones in wall construction, known from different sites, erosion and fragmentation or other factors can seriously affect the preservation of GPT assemblages, but the actual state of the art indicates rather that the explanation of (micro)regional variations in shapes and working face deformations point at variation in the cooking process, possibly also at different products. The presence of some devices with pestles has been interpreted as indication for processing trough wet grinding as cooking technique with a depression made probably intentionally to hold liquids, while others (with netherstones with oval deformations) rather indicates dry grinding. At Göbekli Tepe, kits with pestles were used for wet respectively wet and dry grinding of cereal and pulses. At Jerf el Ahmar, use-wear analysis were interpreted as indicating the processing of unspecified vegetal materials (fruits, seeds, etc.: Bofill 2015). Pounding was also proposed for kits with pestles (Mazurowski 1997).

Chemical analyses of sediments have indicated cooking of cereal porridges, possibly mixed with pulses and herbs in large stone troughs with capacities between 30 and 160 l at Göbekli Tepe as one next step in cooking meals, another one could have been fermenting to beers (L. Dietrich *et al.* 2020a). Similar cooking installations seem to have existed at Jerf el Ahmar and Tell Abr` 3 (discussions in Haaland 2007, Hayden *et al.* 2013 and L. Dietrich *et al.* 2020a). Beyond the social, economic and ritual aspects of cooking large amounts of food, which have been discussed in several other places (O. Dietrich *et al.* 2012, L. Dietrich *et al.* 2019, L. Dietrich *et al.* 2020a, Hayden *et al.* 2013), the integrated study at Göbekli Tepe gives an overview over the complexity of the chaîne opératoire of cooking cereal meals in the PPNA, with dehusking in separate devices, coarse crushing of grains in separate devices, boiling with heating stones in stone troughs, possibly mixing of foodstuffs according to "recipes" and adding condiments to change the taste. From Jerf el Ahmar charred food remains of crushed cereals and mustard are known and have been interpreted as cakes (Willcox and Stordeur 2012). They could, however, also represent charred porridge rests. Soaking can be postulated as an additional step as possibly suggested by the large assemblages of stone vessels in all sites.

Summing up, there is evidence that the processing of cereals and possible also of legumes during the PPNA is a complex process including several distinct steps, possibly with sets of instructions regarding the components of the meals, possibly structured as a revolution of taste in the cuisine. GPT are the central tools during this period, which sees the exploitation of cereals becoming overall more intense.

However, this observation is particularly valid for several sites, whose common denominator is the presence of so-called special, communal, public or monumental buildings. All these sites contain several hundreds of GPT. Göbekli Tepe has the largest collection of GPT, and also the largest number of special buildings. It seems that a relationship between the number of the "communal" buildings and the amount of GPT and stone vessels exists even if there is no direct locality connection. Not all contexts are well-published, and it is difficult to examine the relationship between the intra-site distribution of GPT and their original contexts in regard to the architectural structures and activity areas, but at Göbekli Tepe (L. Dietrich *et al.* 2019) and Jerf el Ahmar (Stordeur 2016; Willcox and Stordeur 2012); the majority of the GPT and the stone troughs come from the buildings surrounding the communal buildings and not or only in a small number directly from them. However, activities related with the GPT were clearly concentrated in the immediate proximity of the "special" buildings: the so-called "kitchen" of Jerf el Ahmar (Willcox and Stordeur 2012) and a similar structure from Göbekli Tepe (L. Dietrich *et al.* 2020a) as well as building 16 with almost 100 grinding stones from Göbekli Tepe (L. Dietrich *et al.* 2019) are good examples. At Tell Abr' (Yartah 2013) and Gusir Höyük (Karul 2011) assemblages composed of GPT and stone troughs very similar to the "kitchen" structures from Jerf el Ahmar and Göbekli Tepe were found inside of the so-called "communal buildings". Here more research is needed; possibly, there is a functional relationship between GPT, communal buildings and the consumption of cereals (and pulses?) as has been proposed (Asouti and Fuller 2013), or such sites are nodal points in the spread of cereal consumption (see also Asouti and Fuller 2013; Watkins 2010).

Chapter 9

Plants and Landscapes in the art of Göbekli Tepe (Excursus)

This excursus treats the meaning of rare depiction of plants within the rich imagery known from Göbekli Tepe.

Motifs pertaining to landscapes or plants are scarce in the Epipalaeolithic and PPN imagery of the Levant; the PPN iconography is focussed on animals, but also on humans and abstract depictions (Benz and Bauer 2013; Köksal-Schmidt and Schmidt 2007). At Göbekli Tepe, on pillar 43 there is one possible representation of plants within a man-made landscape (FIGURES 9.1 and 9.2).

The imagery depicted on its head consists of two superseding friezes displaying geometric shapes that frame three rectangular ('handbag-shaped') objects (buildings?). Each object is topped by an animal. Further down, the pillar head reveals additional animal representations, as well as two H-symbols. A closer look at the lower geometric frieze reveals that the motifs, which at first glance look like antithetically arranged triangles, actually consist of two rows of opposite, tassel-shaped objects that partly overlap at the sides. They are separated by a row of small rectangles forming a central, connecting feature. Probably for reasons of lack of space, the upper geometric frieze consists of one row of tassel-shaped objects only, and the rectangles here are missing as well.

Noticeably, the lower frieze has an asymmetrical arrangement, in other words the bottom tassel-shaped motifs are significantly longer than the upper ones. They are reminiscent of a row of sheaves. Even though stylised, the representation nonetheless evokes the anatomy of sweet grass (Poaceae) with short seed-bearing ears and long, thin stems. Sweet grass, which includes cereals and reeds, is traditionally not only used as nutrient but also as building material, especially in roof covering (Cappers *et al.* 2016). A traditional way of harvesting sweet grass worldwide is to make bundles before cutting the base a few centimetres above the ground, using sickles or knives. The bundles are then bound together with individual stalks into larger sheaves (Cappers *et al.* 2016: 334 figs. 472-478). Instead of immediately removing the sheaves, they are usually arranged as stooks that are left standing on end in the field. The sheaves are bound together for reasons of stability and protection from pests, whilst the stooks allow for adequate ventilation and drying from below. Once dry, the sheaves further facilitate manipulation as well as the transport to the threshing floor or construction site. Owing to the length and the impermeability of their stalks, not only reed but also einkorn and rye prove particularly suitable for roof covers (Cappers *et al.* 2016).

Phytolith analyses (L. Dietrich *et al.* 2019) have demonstrated significantly higher proportions of the cereals' middle and upper parts in comparison to the lower stems. This could point to this specific practice of harvesting on the one hand, and to the targeted transport of certain plant parts to the site on the other.

To which extent this conjectured assessment on the conceivable plant representations is liable to affect the overall interpretation of the image composition on the head of pillar 43 remains hypothetical. If indeed a stook field is represented, the composition due to the pillar's geometry at first gives the impression of being two-dimensional, but through the addition of the upper row, a three-dimensional effect is achieved, in particular if the handbag-shaped motifs represent built structures, regardless of whether these might be portrayals of the monumental buildings themselves. Nonetheless, rendering the latter somewhere between section and side view on the pillar head amidst a landscape given in cross-section seems at least coherent and technically comprehensible. It remains all the same uncertain how the birds (looking for food in the stook fields?) and the other animals would fit in with this landscape. After all, secondary processing of the images cannot be excluded, and the H-shapes further recall the abstract dimensions of the Göbekli Tepe imagery (Schmidt 2012). Lastly, it should be stressed that representing landscapes or animals in their natural environment does not appear to have been the main interest of the artists at Göbekli Tepe. As a rule, the images are restricted to the animals, and although they could reveal interactions between the animals, the environment has largely been omitted.

FIGURE 9.1. Pillar 43 from Göbekli Tepe (©Oliver Dietrich)

FIGURE 9.2. Pillar 43 from Göbekli Tepe (Reconstruction Oliver Dietrich)

Appendices

Table 1: Handstones of type 1 (n=466)*

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	95_000342	1	5.5	8.2	4.5	324	S1	1	1	sintered
2	89	95_000626	1	11.5	9	4	997	S1	1	1	2 WM4
3	89	95_000632	1	12.5	8	2.5	673	S1	1	1	2
4	89	95_000835	1	7	8	4	329	S1	1	1	sintered
5	89	95_001278	1	2	8.2	4.3	152	S1	1	no data	uncertain
6	89	95_001461	1	7	4	3.5	142	S2	1	1	uncertain
7	89	95_001749	1	11	9.5	3	647	S1	5	no data	2
8	89	96_000017	1	9	8	3.5	633	S1	1	1	2
9	89	96_000019	1	11	6.5	2	792	S1	1	1	2
10	89	96_000021	1	4	7.5	4	198	S1	1	1	uncertain
11	89	96_000048	1	13.3	10	3	928	S1	5	no data	1 WM2 and WM3 (M to C)
12	89	96_000272	1	6	8	3.5	292	J09-83	1	1	1
13	89	96_000801	1	5	8	3.5	210	J09-28	1	2	5
14	89	96_001035	1	11	9	4	955	L9-65	4	1	3
15	89	96_001743	1	4.5	9	3.4	217	J09-83	15	3	sintered
16	89	96_001800	1	7	5	2.8	151	L9-75	9	1	2
17	89	96_001946	1	3.5	6.5	3.5	119	L9-75	9	2	uncertain
18	89	96_001972	1	7	6.3	4	368	L9-75	9	3	1 WM2 and WM3 (M to C)
19	89	96_002461	1	5	3	3	95	L9-65	5	1	2
20	89	96_002841	1	5	6	2.5	100	J09-83	no data	no data	uncertain
21	89	96_003151	1	9.5	7	3.8	576	N8	no data	no data	sintered
22	89	97_000145	1	8	6.8	3.5	364	L10-71	1	1	1
23	89	97_000146	1	6.5	10	4.5	451	L10-71	1	1	5
24	89	97_000153	1	11.5	8	3.5	700	L10-71	no data	no data	sintered
25	89	97_000154	1	6	8	3.3	264	L10-71	no data	no data	1
26	89	97_000214	1	8	6.5	3	276	L10-71	1	1	sintered
27	89	97_000224	1	6	6.5	3	120	L9-75	29	1	uncertain
28	89	97_000272	1	5	8	3.3	214	L09-55	1	1	2
29	89	97_000383	1	7	9.5	3.4	371	L09-55	1	1	2
30	89	97_000604	1	4	8	4.8	251	L10-71	1	1	uncertain
31	89	97_000802	1	5	8.5	3.5	232	L9-65	3	1	2
32	89	97_001086	1	10	7.2	3	486	L9-65	21	1	5 WM2 and WM3 (C and CE)
33	89	97_001270	1	11	10	4.5	898	L09-55	8	3	1 WM2 and WM3 (M to C)
34	89	97_001379	1	8	5	4.7	401	OF	10		sintered
35	89	97_001393	1	6	4	3.4	180	L09-55	5	2	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
36	89	97_001523	1	12.5	9	3.5	801	L10-51	no data	no data	sintered
37	89	97_001855	1	13	9.5	4	1059	L9-65	13	1	2
38	89	97_002022	1	7.5	9.5	2.5	356	L10-78	1	1	1
39	89	97_002714	1	4	7.5	4.3	187	L10-78	1	4	uncertain
40	89	97_002898	1	4.3	6	3	96	L9-65	27	3	uncertain
41	89	97_003257	1	6	7	4	343	no data	5	no data	2
42	89	98_000031	1	12.5	10	3.5	1020	no data	no data	no data	2 WM1 (M), WM2 and WM3 (ME, C and CE)
43	89	98_000032	1	10	9	3	638	no data	no data	no data	2
44	89	98_000033	1	11	7	2	574	no data	no data	no data	2
45	89	98_000051	1	9.5	8	3	509	OF	17	no data	2
46	89	98_000058	1	6	8.5	2.8	261	OF	6	no data	1
47	89	98_000171	1	10	9.5	3	829	OF	no data	no data	1 WM2 and WM3 (M to C)
48	89	98_000373	1	5	8.5	2.5	291	L09-56	1	1	2
49	89	98_000471	1	5	7	4.5	308	L9-80	1	1	sintered
50	89	98_000619	1	11.5	8.5	3.5	829	L09-56	2	1	4
51	89	98_000916	1	9.5	5.5	3.5	369	L9-76	1	2	uncertain
52	89	98_001026	1	4	8	3.3	194	L09-56	38	1	3
53	89	98_001047	1	4.5	5	3.2	166	OF	40		2
54	89	98_001296	1	4	2.5	3.5	72	L9-76	1	2	uncertain
55	89	98_001524	1	7	13	3.5	256	L9-76	2	5	1
56	89	98_001525	1	9.5	8	3	829	L9-76	2	5	1
57	89	98_001645	1	7.5	3.5	4	212	L10-51	1	1	1
58	89	98_001803	1	5	9	4.5	291	L9-66	12	1	5
59	89	98_002049	1	7.5	6	3.5	415	L09-56	52	1	1
60	89	98_002050	1	5	5	4	168	L09-56	52	1	2
61	89	98_002086	1	7	5	3.5	256	L9-80	19	1	2
62	89	98_002130	1	5	8	3	255	L09-56	52	1	3
63	89	98_002228	1	5.5	9	4.5	321	L09-56	2	1	4
64	89	98_002245	1	6.5	9.5	3.5	362	L9-66	1	2	2
65	89	98_002405	1	7.5	5.5	3.5	256	OF	10	no data	3
66	89	98_002410	1	5	4	4	155	OF	1	no data	uncertain
67	89	98_002574	1	6	5.5	3.8	264	L09-56	24	1	sintered
68	89	98_002585	1	4.6	4.5	4.3	166	L9-66	17	1	uncertain
69	89	98_003033	1	5	6.5	3.8	168	L9-66	3	3	2
70	89	98_003146	1	5	8	5	361	L09-56	29		sintered
71	89	98_003153	1	7	6	3	256	L9-66	3	6	uncertain
72	89	98_004032	1	3.8	8	3.4	156	L9-66	3	5	2
73	89	98_004410	1	8	6	3	318	L9-80	10	4	sintered
74	89	98_004602	1	7	11	3.7	401	OF	5	no data	1
75	89	98_004672	1	10	7.5	4	436	OF	1	no data	1
76	89	99_000288	1	8.5	9	3.4	484	OF	1	no data	2
77	89	99_000295	1	14	11.5	5	1250	OF	1	no data	2

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
78	89	99_000492	1	12.2	9.1	6.7	1266	L09-56	38	6	sintered
79	89	99_000493	1	10	8.5	5.6	819	L09-56	38	7	sintered
80	89	99_000500	1	10	9	4.5	629	L09-56	135		3
81	89	00_000028	1	11.5	9.5	3	730	L09-56	24	13	2 WM1 on M and ME WM2 on C and CE
82	89	00_000029	1	11.5	9.5	3.5	831	L09-56	24	13	3
83	89	00_000034	1	11	9	3	577	L09-56	24	13	2 WM1 on M and ME WM2 and WM3 on C and CE
84	89	01_000004	1	9	8	2.8	306	L9-77	1	1	1
85	89	01_000013	1	6	9.2	2.9	286	L9-77	1	1	uncertain
86	89	01_000044	1	4	8.7	3.5	196	L9-77	1	2	1
87	89	01_000048	1	6	8.5	4.2	283	L9-77	1	2	sintered
88	89	01_000055	1	9	6.5	3.7	305	L9-77	1	2	1
89	89	01_000115	1	9.2	9.7	3.2	536	L9-78	no data	no data	4
90	89	01_000121	1	7	10	3.6	310	L9-78	no data	no data	2
91	89	01_000185	1	5	9	3.1	251	L9-78	1	2	2
92	89	01_000207	1	4.5	8.5	3.7	168	L9-79	1	1	3
93	89	01_000210	1	4.5	5.5	3.4	110	L9-79	1	1	2
94	89	01_000228	1	5.5	4	3	133	L9-87	2	1	2
95	89	01_000229	1	4.5	4	3.3	93	L9-87	2	1	1
96	89	01_000235	1	5	7	4.3	253	L9-87	2	1	2
97	89	01_000284	1	4	5	3.5	160	L9-87	1	1	2
98	89	01_000304	1	6	6.8	4.8	238	L9-87	1	1	1
99	89	01_000328	1	6	4	4	167	L9-87	11	1	1
100	89	01_000341	1	8	4.6	3.4	100	L9-79	1	1	uncertain
101	89	01_000343	1	5	9.5	3.5	236	L9-79	1	1	sintered
102	89	01_000344	1	5	6	4	153	L9-79	1	1	uncertain
103	89	01_000349	1	8.6	6.5	2	235	OF	no data	no data	1 WM2 and WM3 (M to C)
104	89	01_000396	1	3.8	4.5	3.3	63	L9-78	1	1	uncertain
105	89	01_000425	1	4.4	8.6	3.8	181	L9-85	1	2	1
106	89	01_000458	1	6	5.7	3.2	102	L9-79	1	1	1
107	89	01_000462	1	7	3.5	3.5	151	L9-79	1	1	2
108	89	01_000467	1	5	5.5	2.7	86	L9-79	1	1	1
109	89	01_002001	1	8.5	5.5	3.8	312	L9-79	6	2	sintered
110	89	01_002010	1	3	7	4	108	L9-77	no data	no data	uncertain
111	89	01_002017	1	7.2	7.4	3.3	263	L9-79	1	1	4
112	89	01_002026	1	6.3	5.7	3.1	172	L9-79	6	2	1
113	89	01_002027	1	8.5	6.5	4.2	267	L9-79	6	2	1
114	89	01_002042	1	6.8	4.3	3.9	120	L9-85	1	3	sintered
115	89	01_002046	1	6.4	8	4	291	L9-85	1	3	uncertain
116	89	01_002096	1	5	5	3.3	115	L9-87	2	2	2
117	89	01_002112	1	4.9	9.1	4	205	L9-01	6	1	1
118	89	01_002135	1	6.1	5.9	3.7	196	L9-85	1	4	2
119	89	01_002136	1	8.7	7.1	3.5	317	L9-85	1	4	2
120	89	01_002139	1	6	6.3	3.3	200	L9-85	1	4	2
121	89	01_002140	1	5.3	7.5	4	221	L9-85	1	4	1
122	89	01_002215	1	7	5	3.4	218	L9-86	1	2	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
123	89	01_002223	1	4.2	2.8	3.1	41	L9-86	1	2	uncertain
124	89	01_002266	1	8	11.5	5	649	L9-79	7	1	4
125	89	01_002334	1	3.1	6.7	3.6	100	L9-77	6	1	uncertain
126	89	01_002419	1	3.5	6	3.5	108	no data	no data	no data	uncertain
127	89	01_002435	1	4	8	3.1	197	L9-79	23	3	2 WM 1 (M), WM 2 and WM3 (ME, C and CE)
128	89	01_002532	1	5.1	3.6	3.3	80	L9-78	1	4	uncertain
129	89	01_002545	1	5	3.3	3.5	115	L9-78	4	4	2
130	89	01_002560	1	6	8	2.8	212	L9-77	8	2	1 WM2 and WM3 (M to C)
131	89	01_002586	1	3.7	6.4	3.4	105	L9-85	2	1	uncertain
132	89	01_002657	1	8	3.5	3.5	262	L9-77	8	3	3
133	89	01_002665	1	4.5	8	3.5	252	L9-77	8	3	3
134	89	01_002679	1	5.5	9.5	3.5	291	L9-86	1	3	3
135	89	01_002682	1	6.5	5.5	3.5	258	L9-86	1	3	3
136	89	01_002706	1	7	4.5	4	215	L9-77	9	2	3
137	89	01_002707	1	4.5	8	4.5	192	L9-77	9	2	1
138	89	01_002709	1	7.5	4.5	5	250	L9-77	9	2	1
139	89	01_002725	1	5	7.5	4.5	214	L9-79	8	2	3
140	89	01_002746	1	4	8.5	3.2	169	L9-87	11	6	2
141	89	01_002747	1	3.5	7	3.8	169	L9-87	11	6	2
142	89	01_002767	1	4.5	7	3.5	188	L9-79	14	1	2
143	89	01_002780	1	3.5	4.5	3.2	74	L9-79	8	1	uncertain
144	89	01_002923	1	4.4	11	5.5	392	L9-79	15	2	3
145	89	01_002926	1	4	8.5	4	220	L9-79	15	2	sintered
146	89	01_002952	1	4.5	4.5	3	95	L9-77	12	1	uncertain
147	89	01_002958	1	3	8	3.3	138	L9-77	11	2	1
148	89	01_002961	1	5	4.5	4	196	L9-78	17	1	1
149	89	01_004108	1	6.3	5.6	3	211	L9-87	18	5	4
150	89	01_004119	1	5.5	9.5	3.5	224	L9-78	4	6	uncertain
151	89	01_004145	1	4.5	9	3.9	227	L9-79	23	1	1
152	89	01_004207	1	3.5	9	4	329	L9-79	23	2	sintered
153	89	01_004480	1	5	6.5	4	223	L9-79	23	2	2
154	89	01_004483	1	7	10	5	580	L9-79	23	2	1
155	89	01_004485	1	5	8	4	259	L9-79	23	2	3
156	89	01_004496	1	6.5	3.5	2.7	117	L9-80	61	2	sintered
157	89	01_004563	1	5	8	3.5	260	L9-80	67	3	1 WM2 and WM3 (C and CE)
158	89	01_004572	1	11	7.5	4.5	685	L9-79	26	1	2
159	89	01_004581	1	6.5	3.5	4	196	L9-79	26	1	3
160	89	01_004585	1	14.4	11	3.5	895	L9-77	12	8	2
161	89	01_004610	1	3	7	3.9	137	L9-80	61	6	2
162	89	01_004635	1	9	7	3.5	308	L9-77	12	7	1 WM2 and WM3 (M to C)
163	89	01_004641	1	7	5	3	254	L9-77	12	7	3
164	89	01_004676	1	7.5	5.5	3.5	244	L9-79	29	1	1
165	89	01_004722	1	5.5	10	4	323	L9-79	34	1	2
166	89	01_004732	1	3	6	3.2	72	L9-79	34	1	uncertain
167	89	01_004743	1	5	7	4.2	249	L9-79	29	1	sintered
168	89	01_004871	1	5.5	9	4	399	L9-80	61	8	3

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
169	89	01_004881	1	6.5	4	3	187	L9-77	13	9	1
170	89	01_004891	1	4.7	8.5	2.5	175	L9-78	4	7	4
171	89	01_004944	1	8	4	4	241	L9-78	4	7	2
172	89	01_009230a	1	6	5	3	109	OF	no data	no data	uncertain
173	89	01_009246a	1	6	7.5	4.5	294	OF	no data	no data	2
174	89	01_009274a	1	5	8	3.8	209	OF	no data	no data	3
175	89	01_009601a	1	8	6.5	4	363	OF	no data	no data	4
176	89	01_009617a	1	13	8	4	925	L10-51	25	6	2 WM1 (M), WM2 and WM3 (ME, C and CE) WM4 (C)
177	89	01_009629a	1	10	8	3	400	OF	no data	no data	1
178	89	01_009637a	1	6	3.5	4	138	OF	no data	no data	uncertain
179	89	01_009679a	1	10	8	5	531	OF	no data	no data	3
180	89	01_009682a	1	5.5	8	4.5	270	OF	no data	no data	1
181	89	01_009695a	1	8	8	4	451	OF	no data	no data	2
182	89	02_000055	1	6.7	8.5	3.6	391	L09-78	26	1	2
183	89	02_000137	1	5.5	6	3	214	L9-78	no data	no data	sintered
184	89	02_000138	1	6	9	4.5	275	L9-78	no data	no data	sintered
185	89	02_000243	1	6.2	9.5	4.2	313	L09-87	22	2	2
186	89	02_000260	1	5.5	7	3.6	205	L09-87	22	3	5
187	89	02_000263	1	7	7	4	253	L09-87	22	3	1
188	89	02_000311	1	3	6.5	2.6	71	L09-87	22	1	uncertain
189	89	02_000416	1	6.5	4	3	126	L09-87	22	1	1
190	89	02_000417	1	5.3	4.1	4.7	162.2	L09-87	22	1	5
191	89	02_000418	1	5	8	2.8	206	L09-87	22	1	2 WM1 (M), WM2 and WM3 (C and CE)
192	89	02_000431	1	3	4.2	3.5	84	L09-87	22	1	1
193	89	02_000504	1	12.50	11.5	4	1133	L9-65	no data	no data	2 WM1 (M), WM2 and WM3 (C and CE)
194	89	02_000918	1	5.5	8	3	205	L9-78	22	3	2
195	89	02_001793	1	5	8	3.5	252	L9-87	22	2	4
196	89	02_002075	1	5	2.5	3.5	95	L09-87	23	1	uncertain
197	89	02_002900	1	4	8.3	3.3	128	L09-77	38	4	sintered
198	89	02_003420	1	4.5	6	3	143	L9-78	41	1	2
199	89	02_003659	1	6	8.5	3.9	311	L09-79	43	1	4 Polish bands, not specific WM11 (C)
200	89	02_003693	1	4.5	7	4	214	L09-67	1	1	1
201	89	02_003810	1	5	6.3	3.4	149	L09-77	24	no data	2
202	89	02_004011	1	8.5	8	3.5	429	L09-77	44	1	2

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
203	89	18_000503	1	5	7	4.5	233	L09-58	207	1	2
205	89	02_004752	1	3.9	8.5	4.2	195	L09-67	2	1	2
206	89	02_004770	1	6	5	3.4	141	L09-68	1	1	2
207	89	02_004812	1	4.3	6.4	3.6	118	L09-78	42	3	1 on both sides
208	89	02_006251	1	6.1	7.4	4.9	319	L09-68	1	1	1
209	89	02_007090	1	8	9.5	4.5	350	L09-78	41	2	sintered
210	89	02_007093	1	5.4	4.2	4.3	167	L09-78	41	2	1
211	89	02_007282	1	4.5	4.5	4	101	L09-67	2	1	2
212	89	02_007500	1	4.5	4.5	4.4	155	L09-67	2	1	uncertain
213	89	02_008152	1	5.5	11	4.3	425	L09-77	44	3	5
214	89	02_008470	1	6.5	11	4	512	L09-78	42	1	2 WM1 (M and E), WM2 and WM3 (C and CE)
215	89	02_008678	1	2.8	7	2.2	57	L09-77	46	1	uncertain
216	89	02_008682	1	7	6	2.9	170	L09-87	22	2	1
217	89	02_009001	1	5.5	2.5	3.3	88	L9-78	38	1	uncertain
218	89	02_009053	1	3.5	7	3.5	135	L9-77	44	2	3
219	89	02_010140	1	10.5	7.5	3	564	L9-78	44	1	3 WM11 (C)
220	89	02_010142	1	5.5	2.5	2	205	L9-78	44	1	uncertain
221	89	02_010724	1	6	7	3.8	188	L09-85	53	1	2
222	89	02_010996	1	9.7	8.7	4.5	620	L09-87	35	2	uncertain
223	89	02_011154	1	3	5	3.7	109	L09-79	44	1	1
224	89	02_011155	1	5	6	3.3	167	L09-79	44	1	sintered
225	89	02_011579	1	6.32	2.7	3.1	75.4	L09-78	44	3	uncertain
226	89	02_011919	1	6.7	9	2.9	330	L09-79	45	6	5 WM2 and WM3 (C and CE)
227	89	02_012279	1	5.5	8.5	4.5	279	L09-67	2	1	3
228	89	02_012600	1	5.6	8.8	3.2	240	L09-87	27	1	3
229	89	02_012769	1	5.2	4.6	3.9	143.3	L09-85	40	2	2
230	89	02_013312	1	6.7	5.5	4.4	220	L09-67	2	2	2
231	89	02_014144	1	4	5	3	113	L9-67	6	1	uncertain
232	89	02_014217	1	5	6	3.8	156	L9-87	45	1	1
233	89	02_014657	1	4.5	7.5	3	193	L9-67	2	7	sintered
234	89	02_015292	1	4.9	4.5	3.7	99	L09-67	6	3	uncertain
235	89	02_015853	1	5	8	4.5	180	L09-79	49	2	sintered
236	89	02_016025	1	5	6.5	3.6	190	L09-78	45	1	uncertain
237	89	02_016189	1	7.8	4.5	3.3	154	L09-67	2	8	3
238	89	02_016218	1	5.4	7.5	3.9	186.1	L09-67	6	3	2
239	89	02_016468	1	6.5	4.5	2.8	133.2	L09-80	14	10	2 WM1 (M), WM2 and WM3 (C and CE)
240	89	02_016520	1	5.5	7	4.4	227	L09-80	14	10	sintered
241	89	02_016811	1	3	6	3.4	96.2	L09-78	50	2	uncertain
242	89	02_017935	1	4.9	9.3	4	210	L09-68	5	2	2
243	89	02_018118	1	4.5	9.6	4	210	L09-78	49	2	2
244	89	02_018291	1	6.7	11	3.8	456	L09-67	16	1	2
245	89	02_019257	1	5	6	3.2	99	L9-78	50	2	sintered
246	89	02_020466	1	7.5	6.8	3.8	280	L09-67	16	2	sintered
247	89	02_020469	1	10.4	7.5	4.5	393	L09-79	50	1	5
248	89	02_020796	1	5.8	5.6	3.3	151	L09-87	48	3	sintered
249	89	02_021852	1	7	3.7	3.7	123.2	L09-78	59	2	2

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
250	89	02_021853	1	5.3	6	3.6	124	L09-78	59	2	1
251	89	02_022144	1	3	6	3.4	103.5	L09-67	34	1	uncertain
252	89	02_022308	1	3	5.8	2.5	64	L09-68	5	3	uncertain
253	89	02_022339	1	4	7	3.2	119	L9-79	53	4	uncertain
254	89	02_022705	1	4	7	3.3	133.8	L09-68	5	2	2
255	89	02_023653	1	5.5	9.5	3.3	219	L09-68	5	3	sintered
256	89	05_001478	1	7	9	4.5	353	L09-68	no data	no data	2
257	89	05_001514	1	7	7.5	3.2	344	no data	no data	no data	1
258	89	05_001536	1	8	13	4.8	577	L9-97	2	2	sintered
259	89	05_001586	1	3.6	7.8	3.7	139	L9-97	7	6	sintered
260	89	05_001593	1	3	5.5	2.9	76	L9-97	2	2	2
261	89	05_001607	1	7	5	3	133	L9-86	69	1	2
262	89	05_001617	1	6.5	6	3.9	182	L9-89	12	2	3
263	89	05_001628	1	5.6	4.2	3.9	100	L9-97	2	1	1
264	89	05_001675	1	5.3	3.6	4.3	127	L9-96	3	0	uncertain
265	89	05_001683	1	5	8	3.6	206	L9-88	15	4	sintered
266	89	05_002023	1	3.3	7.6	3.3	106	L9-97	2	1	uncertain
267	89	05_002060	1	6	9	4	269	L9-95	1	1	3
268	89	05_002064	1	3	3	3	32	L9-95	1	1	uncertain
269	89	05_002068	1	4	7	4	136	L9-88	16	1	sintered
270	89	05_002072	1	5	8.5	4.5	190.9	L9-97	2	3	sintered
271	89	05_002080	1	5.8	7.6	3.4	187	L9-97	2	3	sintered
272	89	05_002083	1	3.4	7.7	2.6	84	L9-97	2	3	3
273	89	05_002084	1	4	3.1	3	79	L9-97	2	3	uncertain
274	89	05_002106	1	8.5	11.5	3	606	L9-95	5	2	sintered
275	89	05_003009	1	4	6.4	4.2	137	L09-88	16	2	1
276	89	05_003061	1	2.5	9.1	3.9	140	L09-97	7	1	uncertain
277	89	05_003090	1	8	7.3	2.5	261	L09-89	10	2	2
278	89	05_004005	1	5	7	4.5	242	L9-87	15	2	5
279	89	05_004046	1	3.3	3.3	3.9	58	L9-95	1	1	uncertain
280	89	05_004084	1	4.6	8	3.7	210	L9-97	17	6	2
281	89	05_004101	1	5.7	8.1	3.4	248	L09-68	8	3	2
282	89	05_004118	1	3.3	5.7	3.8	101.5	L9-97	7	2	uncertain
283	89	05_004119	1	4.5	7	2	85	L9-97	7	2	5
284	89	05_005001	1	4	7	3.5	136	L9-97	17	1	4
285	89	05_005053	1	7	5.5	4	344	L9-96	3	6	4
286	89	07_000069	1	7	7	4.2	294	L09-85		3	1
287	89	07_000118	1	3.5	8	4.1	156	L09-58	1	3	uncertain
288	89	07_000143	1	6.1	3.5	4.6	158	L09-58	7	4	uncertain
289	89	07_000151	1	5	7.9	5.3	257	L09-07	1	1	3
290	89	07_000187	1	6.7	8	3.5	184	L09-57	4	2	uncertain
291	89	07_000218	1	5	8	4.7	119	L09-58	7	1	4
292	89	07_000221	1	4.5	5	2.2	105	L09-68	104	2	2
293	89	07_000245	1	6.3	9.1	5.1	350	L09-58	7	2	1
294	89	07_000248	1	3.3	2.9	4.2	59	L09-97	47	1	uncertain
295	89	07_000283	1	5	6	2.9	138	L09-68	105	3	1
296	89	07_000306	1	5.5	7	3	140	L09-58	4	15	1
297	89	07_000331	1	4.2	7	4.4	173	L09-69	8	1	3
298	89	07_000335	1	4.7	3	3.5	100	L09-76	86	1	3
299	89	07_000394	1	9.5	6.7	3.2	300	L09-69	14	3	2
300	89	07_000419	1	7.1	6	3.6	179	L09-69	14	9	1
301	89	07_000436	1	3	6	3.3	107	L09-69	2	4	uncertain
302	89	07_000557	1	8	4.4	3.6	175	L09-68	104	14	2
303	89	07_000583	1	5.6	8.2	4	251	L09-70	1	3	sintered
304	89	07_000623	1	8	8.5	4.5	530	L09-58	4	9	3
305	89	07_000632	1	5.3	8.5	3.3	242	L09-75	58	1	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
306	89	07_000640	1	5.9	7.5	4.1	218	K09-87	1	2	uncertain
307	89	07_000641	1	7	7	2.8	283	K09-87	1	2	1
308	89	07_000681	1	5.5	6.8	3.2	207	L09-97	45	1	uncertain
309	89	07_000682	1	3.2	7.5	3.8	165	L09-97	45	1	1
310	89	07_000932	1	5	8.5	3.3	189.5	L09-69	3	2	2
311	89	07_001004	1	8	7.5	3.5	385	L9-66		2	3
312	89	07_001011	1	5	9	2.7	212	L09-58	3	1	3
313	89	07_001028	1	4.5	8	3.7	217	L09-58	2	3	sintered
314	89	07_001123	1	8.5	5.9	4	255	L09-69	3	1	uncertain
315	89	07_001145	1	8.4	7.5	4.8	490	L09-76	81	3	1
316	89	07_001146	1	8	6.5	3.7	322	L09-57	4	3	2
317	89	07_001165	1	4.5	8.5	3	154.2	K09-97	1	1	2
318	89	07_001173	1	5.5	7	4.1	200	L09-58	3	4	3
319	89	07_001209	1	4.6	7.5	3.1	140.1	L09-58	4	1	1
320	89	07_001227	1	3.9	8.5	3.2	152.7	K09-77	1	2	1
321	89	07_001274	1	5.5	9.2	4.2	334	L09-97	9	1	2
322	89	07_002073	1	6	8	2.8	231	L9-96	31	7	1
323	89	07_002096	1	4.5	8	3.2	218	L09-95	1	1	sintered
324	89	07_002257	1	5.7	4.8	3.1	128.7	L09-67	81	1	uncertain
325	89	07_002308	1	5.7	4.9	3.4	113.1	L09-68	8	4	uncertain
326	89	07_002378	1	6.3	10	3	262	L09-69	1	1	sintered
327	89	07_002392	1	5	9.3	3.1	194.7	L09-67	0	no data	1
328	89	07_002455	1	6.7	4.5	4.5	138	L09-88	13	1	uncertain
329	89	07_002475	1	12.5	10.9	4.5	1122	L09-99	6	1	2
330	89	07_002481	1	6.5	9	3.2	275	L09-68	no data	no data	sintered
331	89	07_002526	1	3.4	6	3.6	101.2	L09-98	1	2	uncertain
332	89	07_002532	1	6.5	6.3	3.8	203	L09-89	6	1	3
333	89	07_002608	1	3.7	7.1	3.4	124.8	L09-88	3	2	uncertain
334	89	07_002617	1	4.6	8.2	2.7	133.2	L09-89	1	2	uncertain
335	89	07_002673	1	6.1	7.6	4.3	262	L09-98	1	2	sintered
336	89	07_002678	1	4.3	8.8	4	205	L09-70	1	1	3
337	89	07_002689	1	7.3	11.1	5.1	696	L09-70	1	1	sintered
338	89	07_002693	1	4.3	6.8	4.4	163.5	L09-98	10	1	uncertain
339	89	07_002747	1	7.1	6.3	4.3	229	L09-88	7	1	uncertain
340	89	07_002863	1	3.5	6	3.5	114	L09-69	1	1	uncertain
341	89	07_002912	1	5.9	9.7	3.6	281	L9-67	82	2	sintered
342	89	07_002959	1	3.3	7.9	4	154.1	L09-98	1	3	2
343	89	07_002975	1	3.3	7.2	3.8	122.8	L09-88	13	1	uncertain
344	89	07_003100	1	11.9	10.7	4.5	598	L09-98	7	1	4
345	89	07_003112	1	7.8	6.5	3.2	277	L09-88	13	1	1
346	89	07_003129	1	4.1	7.9	4.3	179	L09-97	1	1	1
347	89	07_003137	1	5.8	5.1	3.2	111.5	L09-99	4	1	uncertain
348	89	07_003202	1	5.1	8.7	4.1	248	L09-97	1	1	3
349	89	18_000002	1	5.5	11.5	5	546	L09-47	3	1	2
350	89	18_000003	1	5.5	7	3	196	L09-47	3	1	1
351	89	18_000005	1	3	7.7	4	150	L09-60	31	1	3
352	89	18_000006	1	4	7	4	175	L09-78	90	1	3
353	89	18_000008	1	3	3	3.5	61	L09-78	90	1	3
354	89	18_000009	1	5	7	4	224	L09-68	711	2	2
355	89	18_000010	1	4	4.5	4	117	L09-68	711	2	2
356	89	18_000012	1	9	8	4	398	L09-78	91	3	2 WM5
357	89	18_000013	1				124	L09-68	317	5	2
358	89	18_000014	1	6.5	3	3.7	131	L09-78	107	9	2
359	89	18_000020	1	7.5	8.3	3.4	378	L09-87	318	4	3

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
360	89	18_000024	1	8	7	3.3	380	L09-68	317	7	2
361	89	18_000026	1	5	4		57	L09-66	711	8	uncertain
362	89	18_000027	1	3	6	3.3	89	L09-66	72	1	uncertain
363	89	18_000028	1	3	3.5	3	54	L09-66	72	1	Uncertain WM2 and WM3 (C and CE)
364	89	18_000050	1	7	4.5	4	164	L09-59	29	11	2
365	89	18_000062	1	12	9.5	5	1014	L09-56	155	2	4
366	89	18_000068	1	5	8	4	212	K09-87	9	4	1 WM2 and WM3 (M to C)
367	89	18_000069	1	10.5	8	5.5	565	L09-56	156	1	uncertain
368	89	18_000071	1	5.7	8.5	3	230	L09-69	3	4	2
369	89	18_000072	1	4.4	7.5	4.3	243	L09-69	3	4	2
370	89	18_000074	1	5	9	3.5	227	L09-69	160	1	2
371	89	18_000075	1	5.5	7.5	3.3	235	L09-69	160	1	2
372	89	18_000076	1	6	7	2.5	121	L09-69	111	1	uncertain
373	89	18_000077	1	3.5	6	3.8	110	L09-58	205	1	uncertain
374	89	18_000079	1	6	7	4	345	L09-55	48	1	sintered
375	89	18_000080	1	4.5	6	5	289	L09-69	160	1	2
376	89	18_000082	1	7.4	4.5	3.5	216	L09-59	66	1	2
377	89	18_000084	1	11.5	8.5	3.5	563	L09-69	163	2	2 WM1 (M), WM2 and WM3 (C and CE) WM 5 (C)
378	89	18_000088	1	8	7	3.5	156	L09-59	19	3	2
379	89	18_000089	1	7	4.5	3.5	121	L09-69	19	4	2
380	89	18_000090	1	3.5	6.5	2.6	123	L09-69	19	4	2
381	89	18_000091	1	7	4.5	5	296	L09-69	19	4	1 WM2 and WM3 (M to C)
382	89	18_000093	1	5	5	3.7	156	L09-59	195	1	2
383	89	18_000094	1	5	9.9	3	177	L09-69	65	10	2
384	89	18_000095	1	4.5	5	4.4	175	L09-69	65	10	1 WM2 and WM3 (M to C)
385	89	18_000097	1	3.5	4	3.7	128	L09-68	791	1	uncertain
386	89	18_000099	1	4.3	7.5	4.3	243	L09-69	3	4	1 WM2 and WM3 (M to C)
387	89	18_000100	1	5.5	8.5	3	230	L09-69	3	4	sintered
388	89	18_000102	1	4.5	5	4.4	250	K09-87	102	1	sintered
389	89	18_000104	1	5	7.5	4	212	K09-87	9	4	1 WM2 and WM3 (M to C)
390	89	18_000108	1	5	8.5	4	324	L09-37	6	1	2
391	89	18_000109	1	4	7	3.7	181	L09-69	20	6	1 WM2 and WM3 (M to C)
392	89	18_000111	1	2.5	8	2.8	222	L09-87	144	3	uncertain
393	89	18_000116	1	6.6	8	3.3	212	L09-56	167	4	1 WM2 and WM3 (M to C)

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
394	89	18_000117	1	4.5	8.5	4.5	255	L09-59	52	5	1 WM 2 and WM3 (ME, CE)
395	89	18_000119	1	4	6	3.5	126	L09-97	83	1	2
396	89	18_000122	1	4	6	3.5	126	L09-58	151	1	1
397	890	18_000122	1	2.5	8	2.8	222	L09-58	151	1	1
398	89	18_000133	1	11	8.5	3.5	662	K09-97	13	2	1 WM2 and WM3 (ME, C, CE)
399	89	18_000134	1	5	7.5	3.2	235	L09-17	12	5	1
400	89	18_000135	1	7.5	5	4.2	268	L09-07	5	3	uncertain
401	89	18_000136	1	5	9	3.4	181	L09-07	5	3	1 WM2 and WM3 (ME, C, CE))
402	89	18_000139	1	8.5	8	3	553	L09-56	172	1	2 WM1 (M), WM2 and WM3 (C and CE)
403	89	18_000141	1	5	9	5	247	K09-87	30	4	1
404	89	18_000142	1	4.5	7	4.5	235	L09-37	18	1	2
405	89	18_000143	1	9	7	3.5	360	L09-37	9	1	1 WM2 and WM3 (ME, C, CE)
406	89	18_000144	1	4.5	7	3.7	201	L09-07	5	5	4 WM3 (C)
407	89	18_000146	1	6	12	4	406	L09-17	24	1	1 WM2 and WM3 (M to C)
408	89	18_000148	1	4.5	8	3.5	166	L09-37	18	1	1 WM2 and WM3 (M to C)
409	89	18_000150	1	8	7	2.5	302	L09-68	711	8	2 WM1 (M), WM2 and WM3 (C and CE)
410	89	18_000157a	1	4	6	4.2	172	L09-66	121	5	uncertain
411	89	18_000158	1	4.5	5	3.7	152	L09-66	124	1	uncertain
412	89	18_000160	1	6.5	9	3.5	328	K09-87	1	2	2
413	89	18_000163	1	5.5	8	4	268	L09-17	1	3	5
414	89	18_000166	1	3	5	3.6	90	L09-68	320	9	uncertain
415	89	18_000167	1	4	5	3	80	L09-68	320	9	uncertain
416	89	18_000169	1	5.5	5.5	3	150	L09-68	301	2	2
417	89	18_000175	1	6.5	8.5	3.5	582	L09-07	53	1	2 WM1 (M), WM2 and WM3 (C and CE)
418	89	18_000176	1	6	8	3.8		L09-07	53	1	4
419	89	18_000184	1	5	6	3	153	L09-65	92	no data	Uncertain WM2
420	89	18_000188	1	6	5.5	3.2	168	L09-58	180	1	1 WM2 and WM3 (ME to C)
421	89	18_000193	1	5	8	3.8	233	L09-07	1	2	sintered
422	89	18_000206	1	5	7	3	146	L09-58	27	1	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
423	89	18_000211	1	6	7	3.5	250	L09-46	1	1	uncertain
424	89	18_000212	1	5.5	7.5	3.5	217	L09-86	138	4	1
425	89	18_000213	1	8.5	8.5	2.7	339	L09-58	181	7	4
426	89	18_000215	1	6.5	4	3.8	162	L09-97	82	21	2
427	89	18_000217	1	6	8.5	3	261	L09-65	108	no data	3 WM5 (macro)
428	89	18_000222	1	4.2	6	4.4	184	L09-59	66	6	uncertain
429	89	18_000223	1	7	9	4	412	L09-69	93	1	2
430	89	18_000227	1	5.5	7.5	3.8	241	L09-67	85	2	2
431	89	18_000232	1	4	8.5	3.5	166	L09-69	24	7	2
432	89	18_000233	1	4.5	9	3	212	K09-87	9	5	1 WM2 and WM3 (ME to C)
433	89	18_000234	1	3	6.5	3.5	128	L09-69	24	2	2
434	89	18_000235	1	4.5	7	3.7	173	L09-75	no data	no data	1
435	89	18_000242	1	5	7.5	4	209	L09-97	70	11	1
436	89	18_000244	1	5	6	4	195	L09-97	70	3	sintered
437	89	18_000246	1	4.7	7	4.5	381	L09-69	146	3	3 WM5 (macro)
438	89	18_000253	1	2	6	4	126	L09-69	54	1	1
439	89	18_000326	1	4.5	8.5	4	219	L09-69	66	3	sintered
440	89	18_000327	1	5.5	9.5	3.5	328	L09-58	169	4	1 WM2 and WM3 (ME to C)
441	89	18_000330	1	5	7	4.5	237	L09-74	20	1	2
442	89	18_000332	1	5.5	8	3.5	237	L09-70	28	1	sintered
443	89	18_000341	1	5	3.5	3.5	78	L09-68	713	5	uncertain
444	89	18_000343	1	4	7.5	4	173	L09-78	116	6	1
445	89	18_000344	1	6	9	3	230	L09-59	65	3	2
446	89	18_000348	1	5	8	3.5	253	L09-69	19	1	1
447	89	18_000352	1	7	8.5	3.5	197	L09-87	117	2	3
448	89	18_000355	1	10	6.5	6	346	L09-58	19	1	uncertain
449	89	18_000356	1	5	9	3	302	L09-46	32	1	2
450	89	18_000358	1	4	7.5	4	134	L09-78	113	1	2 WM5 (macro)
451	89	18_000359	1	7.5	6.5	3.5	207	L09-68	713	2	3 WM 4 (macro)
452	89	18_000363	1	3.5	7.5	3.5	151	L09-07	7	3	3
453	89	18_000364	1	8	11	4	689	L09-46	17	1	2
454	89	18_000367	1	4.5	7	3.3	221	L09-69	19	2	2
455	89	18_000476	1	6.5	4.5	3.8	218	L09-58	110	5	3
456	89	18_000478	1	6.5	6.5	3.5	296	L09-60	19	1	2
457	89	18_000483	1	4.2	9	4.3	231	L09-69	54	3	4
458	89	18_000484	1	4	9	4.1	213	L09-87	320	1	sintered
459	89	18_000486	1	4.5	9.5	3.1	226	L09-68	781	5	2
460	89	18_000487	1	3.5	7	3.1	141	L09-68	781	5	2
461	89	18_000488	1	3.5	6	2.8	135	L09-68	317	6	2
462	89	18_000489	1	4.5	5.5	3.3	135	L09-78	116	7	3
463	89	18_000490	1	4	6.5	4	138	L09-78	116	7	uncertain
464	89	18_000491	1	2.5	7	4	118	L09-97	58	5	1
465	89	18_000502	1	3.5	8	4	174	L09-68	108	6	1
**	89	19_000005						L09-77	310	1	5 WM5 (macro)

* 19 objects are missing from this list due to ambiguities of the older documentation.

**not included in the statistical analysis.

No data = surface find or context unclear, or empty line (no additional information needed).

Table 2: Handstones of type 2 (n=246)

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	95_000182	2	6.5	8	4	299	S1	1	1	sintered
2	89	95_000325	2	5	6.5	4	213	no data	no data	no data	1
3	89	95_000341	2	6	8.5	3.7	330	S1	1	1	3
4	89	96_000016	2	4.6	7.5	4	249	S1	1	1	sintered
5	89	96_000040	2	6	8	3	185	no data	no data	no data	1
6	89	96_000108	2	3.7	7	3.4	163	L9-65	1	1	sintered
7	89	96_000194	2	6.2	10	4.3	388	L9-65	1	no data	3
8	89	96_000234	2	6	8	4	297	L9-75	3	no data	2
9	89	96_001251	2	10.5	8	3.4	467	no data	no data	no data	5 WM2 and WM3 (ME, CE)
10	89	96_001952	2	5.5	10.5	3.5	299	L9-65	4	1	sintered
11	89	96_002438	2	5.5	4	3.5	93	J09-84	17	4	uncertain
12	89	96_002676	2	5.5	6.5	3.5	219	L9-65	7	2	2
13	89	97_000002	2	4	8	4	150	L9-65/75	no data	no data	uncertain
14	89	97_000026	2	7	6.5	3.5	218	OF	no data	no data	2
15	89	97_000038	2	13	9.5	4	808	L9-75	no data	no data	2
16	89	97_000193	2	5	9	4.4	256	L9-65	3	1	1
17	89	97_001066	2	10	8.5	4	622	L10-61	1	1	3
18	89	97_002170	2	6.7	8	3.6	388	L10-61	1	1	sintered
19	89	97_003357	2	5	9	3.4	255	OF	1		2
20	89	98_000030	2	10	9	3.5	664	no data	no data	no data	5
21	89	98_000116	2	11	8.5	4	562	L10-61	no data	no data	2 WM1 (M), WM2 and WM3 (C and CE)
22	89	98_000262	2	5	8	3.5	255	L9-65	no data	no data	2
23	89	98_000653	2	7	4	3.5	565	L09-56	20	no data	1
24	89	98_001884	2	11	8	4	617	L9-66	11	1	sintered
25	89	98_002849	2	4	7	4.2	261	L09-56	24	1	2
26	89	98_002867	2	11	5.5	3	322	OF	5	no data	2
27	89	98_003034	2	6	7.5	3.5	237	L9-66	3	3	sintered
28	89	98_003243	2	3.6	5	3.5	322	L9-66	22	6	1
29	89	98_003414	2	6	7	4.8	289	L9-66	22	7	sintered
30	89	98_003574	2	5.5	4.5	3.7	574	L9-80	36	no data	2
31	89	98_004390	2	5	8	4	257	L9-66	35	2	4
32	89	98_004590	2	6	11	6	601	L9-80	1	2	3
33	89	18_000228	2	5.5	11	6	574	L09-17	31	1	natürlich
35	89	99_000477	2	10.5	6.5	3	478	L10-51	25	3	2 WM1 (M), WM2 and WM3 (C and CE)
36	89	01_000212	2	4	8	4.3	216	L9-79	1	1	2
37	89	01_000233	2	7	8.5	4	449	L9-87	2	1	1
38	89	01_000261	2	8.5	8.5	4	408	L9-86/87	no data	no data	sintered
39	89	01_000297	2	5.5	7	4	159	L9-87	1	1	sintered
40	89	01_000308	2	7	10	3	381	L9-87	1	1	1
41	89	01_000385	2	11	10	4	775	L9-78	1	1	3
42	89	01_000408	2	5.5	8	4.2	254	L9-78	1	3	sintered
43	89	01_000416	2	10.5	9	4	626	L9-77	5	1	2
44	89	01_002002	2	4.8	5.3	3.7	130	L9-79	6	2	3
45	89	01_002033	2	5	7	4.5	195	L9-79	6	2	2

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
46	89	01_002051	2	4.4	7.2	4.5	186	L9-85	1	3	1
47	89	01_002074	2	8.5	10	3	454	L9-77	7	1	2
48	89	01_002093	2	10.2	6.8	5.2	468	L9-87	2	2	1
49	89	01_002107	2	5	8	4	203	L9-77	7	1	2
50	89	01_002134	2	10.8	9.7	6.1	873	L9-85	2	1	1
51	89	01_002165	2	7.7	6.9	4.5	326	L9-87	1	2	sintered
52	89	01_002168	2	7.9	5.9	4.3	271	L9-87	1	2	2
53	89	01_002195	2	5.6	8.1	3.2	180	L9-87	11		2
54	89	01_002197	2	7	5	4.5	210	L9-87	11		1
55	89	01_002212	2	6.5	9.3	4.3	362	L9-86	1	2	sintered
56	89	01_002231	2	4.5	7.7	5	220	L9-78	1	3	sintered
57	89	01_002300	2	9.5	6.9	4.6	349	L9-85	1	3	2
58	89	01_002358	2	7.5	10	6.5	718	L9-77	8	1	2
59	89	01_002416	2	6	8.5	3.5	278		19		1
60	89	01_002504	2	9	6	4	382	L9-78	1	5	2 WM1 (M), WM2 and WM3 (ME, C, CE)
61	89	01_002571	2	7	6	3	331	L9-77	8	2	sintered
62	89	01_002630	2	6	9	3	237	L9-87	11	3	2
63	89	01_002656	2	7	6	4	253	L9-77	8	3	3
64	89	01_002743	2	13.5	5	4.5	421	L9-78	4	6	3
65	89	01_002758	2	7	9	5	636	L9-87	2	4	1
66	89	01_002915	2	6	9.4	5	435	L9-78	13	1	3
67	89	01_002921	2	6.5	7	3.5	259	L9-79	15	2	2
68	89	01_004129	2	10	6	4	286	L9-78	4	3	3
69	89	01_004199	2	9	3.5	4.5	188	L9-86	2	1	uncertain
70	89	01_004206	2	7.5	8	2.6	324	L9-79	23	2	1
71	89	01_004573	2	10	9.5	4	571	L9-79	26	1	5
72	89	01_004637	2	5	8.5	4	317	L9-77	12	7	2
73	89	01_004642	2	3.4	8	4.5	151	L9-77	12	7	1
74	89	01_004655	2	5	8.5	2.8	171	L9-77	13	3	2
75	89	01_004711	2	10	7	4	470	L9-80	61	7	sintered
76	89	01_004833	2	7	8	4.5	387	L9-79	34	1	2 WM1 (M), WM2 and WM3 (ME to C) Polish bands not specific (C, CE)
77	89	01_004844	2	9	9	3	566	OF	5		5 WM2 and WM3 (CE)
78	89	01_004899	2	10	5	4	260	L9-77	24	1	3
79	89	01_009252a	2	6	7.5	3.3	205	OF	no data	no data	1
80	89	01_009296a	2	8.5	8	3.5	478	OF	no data	no data	1
81	89	01_009610a	2	4	6.5	5.5	210	OF	no data	no data	uncertain
82	89	01_009676a	2	6.5	7	4.2	324	OF	no data	no data	1
83	89	01_009678a	2	8	9	4	305	OF	no data	no data	sintered
84	89	02_000013	2	14	8	6.5	1567	L09-78	22	3	4
85	89	02_000015	2	6	7.5	3.2	222	L09-78	22	3	2 WM2 (M to C)
86	89	02_000261	2	4.50	7.5	3.5	196	L09-87	22	3	sintered
87	89	02_000262	2	5	7	5	227	L09-87	22	3	5
88	89	02_000330	2	4	10.4	4.4	226	L09-78	22	1	uncertain
89	89	02_000481	2	4.5	8	3.5	130.1	L09-87	17	3	2
90	89	02_001029	2	4.5	8	3.8	214	L09-78	27	1	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
91	89	02_001236a	2	5.5	7.5	4	216	L09-79	41	2	2
92	89	02_002077	2	8.5	8.1	3.4	356	L09-87	23	1	sintered
93	89	02_003314	2	3.5	3	3.3	52	L09-78	35	2	uncertain
94	89	02_003369	2	5.2	7	4.4	155	L09-79	43	2	5
95	89	02_003414	2	3.5	6.5	3.8	120	L9-78	41	1	3
96	89	02_003418	2	5	7	3.5	124	L9-78	41	1	2
97	89	02_003449	2	5.5	9	4	303	L9-67	2	1	1
98	89	02_003492	2	7.5	5	4	181	no data	no data	no data	1
99	89	02_003930	2	5	8.5	4.2	274	L09-67	2	1	sintered
100	89	02_003932	2	6.2	8.5	3.5	280	L09-67	2	1	5
101	89	02_003933	2	7	11.4	3.4	375	L09-67	2	1	2
102	89	02_005574	2	8	10.5	4.2	620	L09-85	36	2	sintered
103	89	02_006259	2	11	9.3	3.5	640	L09-77	46	1	sintered
104	89	02_007595	2	6	7	3.7	174	L09-85	39	2	5 WM2 and WM3 (ME, CE)
105	89	02_008662	2	7	7.7	3.4	257	L09-67	2	1	2 on two sides
106	89	02_008688	2	4	7.5	4.7	300	L09-87	24	2	2
107	89	02_008698	2	6.5	6.5	3	364	L09-67	2	1	1
108	89	02_009898	2	5	8.7	3.7	230	L9-67	2	1	3
109	89	02_009899	2	4.5	7.5	4.5	257	L9-67	2	1	2
110	89	02_009900	2	8.5	7.5	3.5	325	L9-67	2	1	1
111	89	02_010017	2	3	7.5	4.5	320	L9-79	44	2	1
112	89	02_010143	2	8	6	3.5	217	L9-78	44	1	2 WM1 (M), WM2 and WM3 (ME, C and CE)
113	89	02_011775	2	6.3	8.4	3.4	355	L09-87	28	1	2 WM1 (M), WM2 and WM3 (ME, C and CE)
114	89	02_012365	2	4	5	4.5	85	L09-78	44	1	uncertain
115	89	02_013307	2	6.2	7.4	3.9	320	L09-67	2	2	sintered
116	89	02_013311	2	3.5	8.2	2.7	104	L09-67	2	2	sintered
117	89	02_016178	2	7.5	8	4.4	373	L09-68	5	1	1
118	89	02_016216	2	4	9.5	4.2	180	L09-67	6	3	2
119	89	02_016467	2	8.6	6.6	3.5	335	L09-80	14	10	1 WM2 and WM3 (M to C)
120	89	02_017609	2	4.9	7.4	4.1	196.2	L09-67	13	2	4
121	89	02_020571	2	6.5	8.5	4.1	370	L09-68	5	1	sintered
122	89	02_020692	2	9.3	6.7	4.7	390	L09-67	13	3	2
123	89	02_021217	2	6.5	3.5	2	370	L9-79	50	2	2 WM1 (M), WM2 and WM3 (C and CE)
124	89	04_000534	2	7.5	9	3.5	414	L9-69	1	1	1 on two sides
125	89	05_000120	2	10.5	8	4	551	OF	no data	no data	2
126	89	05_000142	2	12.5	9.5	3	607	OF	no data	no data	2 WM1 (M), WM2 and WM3 (C and CE)
127	89	05_001260	2	14.5	11	4.5	1022	L9-76	no data	no data	2
128	89	05_001482	2	8	8.5	4	384	L9-64	no data	no data	4

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
129	89	05_001600	2	5.2	9	5	269	L9-97	9	2	2
130	89	05_001614	2	3	7.5	3.6	127	L9-97	7	3	sintered
131	89	05_001694	2	6.5	4.6	3.7	139	L9-97	9	1	1
132	89	05_001697	2	5	8.5	3.5	190	L9-89	19	2	1
133	89	05_002025	2	5.5	8.5	5	257	L9-97	13	1	sintered
134	89	05_002030	2	5.4	7.7	4.5	245	L9-95	11	1	sintered
135	89	05_002033	2	5.9	11.9	2.5	215	L9-88	14	4	sintered
136	89	05_002059	2	12	8	4	436	L9-95	1	1	sintered
137	89	05_002061	2	10.5	8	4.5	612	L9-95	1	1	2
138	89	05_003010	2	2	3.5	3.2	57	L09-88	16	2	uncertain
139	89	05_003026	2	5	6	4	128	L09-68	8	1	1
140	89	05_003028	2	3.5	7.7	3	110	L09-68	8	1	3
141	89	05_003059	2	7.5	8.5	4	377	L09-97	7	1	2 WM1 (M), WM2 and WM3 (C and CE)
142	89	05_003069	2	3	4	2.7	54	L09-96	33	2	uncertain
143	89	05_004007	2	3.3	6.4	3.9	114	OF	15		1
144	89	05_004009	2	3.8	8.7	4.2	142	OF	15		2
145	89	05_004018	2	8.5	4.5	3.3	222	L9-89	10	4	2
146	89	05_004020	2	8.2	9	4.6	361	L9-89	10	4	2
147	89	05_004033	2	3.5	6.5	2.5	74	L9-96	19	1	3
148	89	05_004069	2	7.7	8.5	3.2	253	L09-68	8	2	sintered
149	89	05_004103	2	3.5	8	3.3	130	L09-68	8	3	1
150	89	05_005006	2	5.5	8.4	4	274	L9-89	23	1	sintered
151	89	05_005010	2	4.2	6	4.2	173	L9-95	1	1	1
152	89	05_005045	2	3.2	7.7	4.3	158	L9-89	12	3	1
153	89	05_005103	2	5.5	7.5	4.2	287	L9-88	14	3	4
154	89	07_000100	2	6.2	7	2.7	154	L09-69	14	1	5 WM4 (macro)
155	89	07_000119	2	4	8	4.2	150	L09-69	16	1	sintered
156	89	07_000144	2	4.5	9	4.6	150	L09-58	7	4	uncertain
157	89	07_000150	2	11	7	4.5	629	L09-07	1	1	1 and 4/ two sides WM2 and WM3 (M to C) on SF1
158	89	07_000160	2	5.7	9	2.8	222	L09-76	85	1	1
159	89	07_000249	2	5.4	7.5	4.5	208	L09-68	103	4	4
160	89	07_000251	2	7	4.5	4.7	199	L09-68	103	9	1
161	89	07_000393	2	5	7.4	4.1	264	L09-68	104	6	2 WM1 (M), WM2 and WM3 (C and CE)
162	89	07_000437	2	6.5	8	4	240	L09-69	2	4	sintered
163	89	07_000506	2	4.5	8	4	190	L09-17	1	2	sintered
164	89	07_000520	2	5.6	5.3	4.3	189	L09-59	2	1	uncertain
165	89	07_000699	2	2.5	7.5	4.8	143.6	L09-69	3	3	uncertain
166	89	07_000826	2	4	6.5	3.7	138.3	L09-76	82	3	uncertain
167	89	07_000852	2	4	8.5	3.3	208	L09-17	1	2	3
168	89	07_000908	2	4.5	9.5	4.5	186	L09-75	57	3	1
169	89	07_000933	2	6.5	7.6	4.5	272	L09-76	83	1	1
170	89	07_000972	2	4.5	6.7	3.2	137.2	L09-58	3	6	5
171	89	07_001016	2	4.9	6.1	4.1	152.6	L09-58	3	1	1
172	89	07_001130	2	6.9	9.9	3.5	402	L09-69	2	5	5
173	89	07_002184	2	4.5	6.2	3.2	120.8	L09-68	8	5	2
174	89	07_002253	2	7.4	8.6	4.3	312	L09-98	1	5	uncertain
175	89	07_002272	2	8.5	5	3.9	221	L09-88	7	1	uncertain

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
176	89	07_002296	2	6.3	8.7	3.5	291	L09-88	13	1	2
177	89	07_002404	2	5.3	7.4	4.8	269	L09-96	44		1
178	89	07_002554	2	6.3	7.5	4.8	366	L09-98	1	1	3
179	89	07_002555	2	5.2	9.2	3.8	226	L09-98	1	1	1
180	89	07_002588	2	5.5	9	4.6	230	L09-69	1	1	uncertain
181	89	07_002672	2	5	7.5	3.7	171	L09-98	1	2	5
182	89	07_002694	2	3.6	8	4	129.6	L09-98	10	1	uncertain
183	89	07_002738	2	3.5	7.3	3.6	100.2	L09-97	1	4	uncertain
184	89	07_002972	2	10.3	8.8	4.3	567	L09-88	13	1	sintered
185	89	07_003134	2	2.5	6.5	4.6	114.2	L09-97	1	1	uncertain
186	89	07_003219	2	5.2	7.7	4.5	196.9	L09-98	1	7	2
187	89	11_000572	2	15.8	9.5	4.3	1028	L09-88	47	3	2
188	89	18_000001	2	4.5	10	4.5		L09-47	3	no data	1
189	89	18_000011	2	4	5.5	2.8	112	L09-68	711	2	5 WM5 (macro)
190	89	18_000015	2	5.5	8.5	3.5	242	L09-68	327	3	1
191	89	18_000021	2	5.2	9.2	3.8	101	L09-97	82	12	2
192	890	18_000021b	2	5.3	7.4	4.8	101	L09-97	82	12	uncertain
193	89	18_000022	2	8.5	5	3.9	221	L09-76	318	8	2
194	89	18_000025	2	6.5	6	3.5	57	L09-68	708	4	2
195	89	18_000030	2	6	4.5	5	236	L09-46	19	5	2
196	89	18_000031	2	3	5	3.5	236	L09-87	322	6	1 WM2 and WM3 (ME to C)
197	89	18_000032	2	5.5	10	4.7	392	L09-46	32	6	uncertain
198	89	18_000048	2	5	8.5	4	287	L09-59	29	5	sintered
199	89	18_000049	2	4	8	3.7	181	L09-59	29	11	2
200	89	18_000051	2	12	7	4.5	541	L09-69	163	9	4
201	89	18_000057	2	5	8	4	283	L09-59	29	5	sintered
202	89	18_000059	2	5	8.5	3.3	191	L09-59	10	1	2
203	89	18_000060	2	9	7.5	4.5	606	L09-59	10	1	1 WM2 and WM3 (M to C)
204	89	18_000061	2	10	8	4	499	L09-56	155	2	1
205	89	18_000066	2	5	8	5	261	K09-87	1	4	sintered
206	89	18_000067	2	6	6	5.5	353	K09-87	1	4	2
207	89	18_000070	2	3.5	8	4.2	141	L09-56	156	1	sintered
208	89	18_000081	2	4	8	4.5	181	L09-59	29	4	1
209	89	18_000083	2	5	4.3	4	155	L09-59	66	1	2
210	89	18_000086	2	4.5	6.5	3.7	109	L09-59	196	1	2
211	89	18_000106	2	9	8	4.2	418	L09-56	157	10	sintered
212	89	18_000107	2	5	7.5	3.5	196	L09-69	91	1	2
213	89	18_000114	2	5.5	8	3.4	298	L09-27	19	2	6 WM2 and WM3 (C)
214	89	18_000115	2	8.5	6	4.5	279	K09-87	9	4	uncertain WM 2
215	89	18_000118	2	4	7	2.9	101	L09-59	52	1	1
216	89	18_000137	2	7	10.5	2.7	364	K09-97	3	6	1
217	89	18_000140	2	7	8	4.5	425	L09-87	29	1	2
218	89	18_000145	2	6.9	9.5	3.5	301	L09-87	9	3	2
219	89	18_000155	2	9	8	4.2	418	L09-59	69	10	2 WM1 (M), WM2 and WM3 (C and CE)

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
220	89	18_000159	2	5	8	4	264	L08-59	37	5	2 WM1 (M), WM2 and WM3 (C and CE)
221	89	18_000161	2	4.5	4.5	4.8	166	K09-87	1	2	uncertain
222	89	18_000162	2	4.5	4.5	4	131	K09-87	1	2	uncertain
223	89	18_000165	2	9	7	4	414	L09-37	29	1	4
224	89	18_000168	2	7.5	6.7	2.5	117	L09-68	8	4	uncertain
225	89	18_000170	2	6.5	9	4.3	353	L09-68	301	2	2
226	89	18_000171	2	5.7	5.3	7	233	L09-17	1	3	1
227	89	18_000187b	2	3.6	7.5	3.5	98	L09-58	180	1	5
228	89	18_000190	2	9	8	3	417	L09-47	3		2
229	89	18_000191	2	4	6.5	3.5	406	L09-37	1	7	2
230	89	18_000192	2	5.7	6.5	3.2	205	L09-47	1	3	1 WM2 and WM3
231	89	18_000210	2	8	5	3.5	159	L09-68	301	7	2
232	89	18_000214	2	5	7.5	5	258	L09-58	181	7	2
233	89	18_000221	2	4.5	9	4.2	325	L09-66	325	4	2
234	89	18_000236	2	4	7	4	152	L09-95	30	1	1
235	89	18_000245	2	6	7	4	236	L09-88	44	1	2
236	89	18_000325	2	8	10.5	5	580	L09-69	66	3	5 WM2 and WM3 (CE, C)
237	89	18_000331	2	6	3	4.3	114	L09-58	181	1	1
238	89	18_000335	2	3.5	7	3.7	163	L09-68	327	3	2
239	89	18_000342	2	7	7.5	4.7	296	L09-97	55	4	1
240	89	18_000353	2	4	6.5	3.5	125	L09-58	19	1	1
241	89	18_000357	2	6	8	4	303	L09-68	368	5	5 WM5 (macro)
242	89	18_000361	2	8.5	8.5	4	585	L09-78	1	2	5 WM4 (macro)
243	89	18_000480	2	6	7	5.4	330	L09-68	774	3	4
244	89	18_000481	2	3.5	9	4	254	L09-69	54	3	1
245	89	18_000113	2	6	9.5	4.7	404	L09-68	106	1	uncertain

*10 objects are missing from this list due to ambiguities of the older documentation.

Table 3: Handstones of type 3 (n=3)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	18_000029	3	7	6.5	6	454	L09-46	19	5	2 and 5
2	89	18_000052	3	13.5	7.5	3	685	L09-56	156	1	2
3	89	18_000056	3	11	7	3.5	629	L09-55	45	1	1 WM2 and WM3 (ME to C)

*1 object is missing from this list due to ambiguities of the older documentation.

Table 4: Handstones of type 4 (n=16)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
1	89	95_000339	4	6	8	7	520	S1	1	1	uncertain
2	89	97_001053	4	14	13	7	1354	L9-75	32	2	4
3	89	01_002199	4	5.9	10.7	6.6	526	L9-87	11		uncertain
4	89	01_002320	4	16.5	12.5	5.5	1089	L9-87	2	2	4
5	89	01_10202 /1295	4	23	17	9	4	no data	no data	no data	1
6	89	02_012274	4	7.8	7.2	7.1	436	L09-67	2	1	1
7	89	02_019633	4	3.3	5.9	3.9	94.9	L09-78	50	1	uncertain
8	89	02_022716	4	4.5	6.5	4	185	L09-68	5	2	2
9	89	02_023537	4	6	6.5	3	251	L9-67	42	2	5
10	89	02_10202 /1294	4	25	17	10	4	no data	no data	no data	1
11	89	05_001585	4	14.1	11.5	8.8	2132	L9-96	2	1	3
12	89	05_004011	4	9.6	9.4	8.6	1216	OF	15	no data	1
13	89	05_005011	4	4.9	7.7	5.1	256	L9-95	1	1	sintered
14	89	07_003032	4	8.3	13	6.2	983	L09-70	1	1	sintered
15	89	18_000180	4	14.1	11.5	8.9	2390	K09-97	13	2	4
16	89	18_000250	4	3	8	6	354	L09-17	34	1	1

*1 object is missing from this list due to ambiguities of the older documentation.

Table 5: Handstones of Type 5 (n=5)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	97_000010	5	6	4	4	238	L9-6575	no data	no data	5
2	89	07_003115	5	6.4	5.7	5	294	L09-88	13	1	5
3	89	18_000092	5	6	4	4	229	L09-59	37	8	5 WM4 and WM5
4	89	18_000101	5	6.4	4.5	5	300	L09-84	no data	no data	5 WM4 and WM5
5	89	18_000229	5	5	4.5	5	130	L09-27	31	1	5

Table 6: Handstones of Type 6 (n=120)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
1	89	97_000195	6	4	8.5	4	243	L9-65	3	1	sintered
2	89	97_002966	6	5.5	6	4.5	257	L9-65	6	no data	5
3	89	01_000307	6	4.8	9	5.8	402	L9-87	1	1	sintered
4	89	01_000260	6	6.6	6	4	384	L9-86/87	no data	no data	1
5	89	02_000545	6	18	11	4.5	1418	L9-87	22	1	sintered
6	89	05_001572	6	4.3	5.8	5.5	137.7	L9-86	65	3	sintered
7	89	07_000296	6	3.2	6.4	3.5	149	L09-76	81	5	uncertain
8	89	05_004010	6	5.5	9	5.5	363	OF	15	no data	1
9	89	05_004081	6	6.5	7	5.8	257	L9-97	17	6	uncertain
10	89	95_000828	6	8	7.5	4.5	443	S1	1	1	5
11	89	97_003021	6	8.5	7.5	4.5	389	L9-75	48	4	5
12	89	98_004033	6	5.5	8.3	5	386	L9-66	3	5	sintered
13	89	98_004345	6	7	7	6	433	L9-66	38	1	sintered
14	89	98_004673	6	19	9.5	4.5	1418	OF	1	no data	4
15	89	07_000107	6	4.5	6.2	4.6	284	L09-68	no data	no data	sintered

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
16	89	07_000123	6	4.4	8	4.6	317	L09-69	16	1	5 WM5 (macro)
17	89	07_000159	6	8.5	7	5.5	305	L09-68	103	5	1
18	89	07_000224	6	6.7	8.5	5.1	278	L09-68	104	1	3
19	89	07_000236	6	4	4.5	4.5	80	L09-58	4	2	uncertain
20	89	07_000237	6	5	7	6.4	265	L09-58	4	2	uncertain
21	89	02_018294	6	5.2	8.5	4	340	L09-67	16	1	2
22	89	07_002510	6	5.1	5.5	3.9	140.2	L09-97	1	1	uncertain
23	89	07_002812	6	4.5	6.3	4.4	213	L09-79	no data	no data	3
24	89	07_002854	6	4.7	7	4.4	146	L09-98	1	5	5
25	89	07_002920	6	3.4	8.5	4.7	156.2	L09-70	1	1	uncertain
26	89	07_002928	6	6.8	6.5	6.8	503	L09-89	6	1	3
27	89	05_002003	6	4.5	7	5.8	216	L9-86	65	8	6
28	89	05_002054	6	4	6	7.8	151.8	L9-95	1	1	1
29	89	05_003038	6	10.2	8.7	6.3	1068	L09-68	8	2	3
30	89	05_004073	6	8.8	6.7	6.4	462	L9-89	17	2	sintered
31	89	05_004089	6	4.9	6.3	5.4	175.5	L9-88	16	2	sintered
32	89	05_005057	6	5.1	4.5	5.2	209	L9-88	14	7	5
33	89	05_005077	6	5.4	7.3	5.5	252	L9-95	3	1	1
34	89	05_005078	6	3	8	5	124	L9-95	3	1	uncertain
35	89	07_000792	6	6.3	8.7	4.9	344	L09-07	1	2	sintered
36	89	07_001025	6	8.7	8.2	4.9	440	L09-69	3	2	sintered
37	89	01_000270	6	8	9	4.5	555	L9-77	5	1	1
38	89	01_000293	6	4.2	6.4	4.9	174	L9-79	6	2	uncertain
39	89	01_000330	6	7.2	7.8	6	433	L9-87	11	1	1
40	89	01_000354	6	3.5	8.2	4.5	233	OF	no data	no data	1
41	89	01_000421	6	9.3	8.2	5	505	L9-85	1	2	1
42	89	01_002041	6	6.2	7.4	6.8	284	L9-85	1	3	5
43	89	01_002123	6	6	9	6	399	L9-87	2	2	1
44	89	01_002163	6	7.3	8.4	5.7	547	L9-87	2	2	5
45	89	01_002217	6	6.6	8.1	5.5	369	L9-86	1	2	1
46	89	01_002628	6	6	10.5	5.5	550	L9-87	11	3	2
47	89	01_002764	6	6	10.5	3.5	330	L9-87	2	4	sintered
48	89	01_002800	6	7	7.5	5	349	L9-78	4	1	2
49	89	01_004149	6	3.7	7	5.5	147	L9-79	35	3	2
50	89	01_004170	6	7.5	7	6	568	L9-86	2	1	1
51	89	01_004197	6	6.5	8.5	5.5	316	L9-86	2	1	2
52	89	01_004486	6	5.5	6	4	155	L9-79	23	2	3
53	89	01_004539	6	6.5	8.5	5	287	L9-79	23	3	3
54	89	01_004598	6	5.5	7.5	5.2	337	L9-77	12	8	3
55	89	01_004638	6	7	8	4	309	L9-77	12	7	2
56	89	01_004758	6	6.5	7.5	4	283	L9-77	13	6	2
57	89	01_004777	6	9.5	8	4	518	L9-78	4	6	3
58	89	01_004869	6	6	8.5	5.5	381	L9-80	61	8	1
59	89	07_000515	6	6	8.5	5.5	412	L09-17	1	2	1
60	89	07_000307	6	7	6.7	4.1	202	L09-58	4	15	5
61	89	07_000443	6	3.5	4.5	3.4	96	L09-69	10	11	uncertain
62	89	07_000456	6	6.3	7.5	4.4	284.	L09-58	7	1	sintered
63	89	07_000461	6	8.1	7.8	5.1	528	L09-60	1	2	sintered
64	89	02_001778	6	7	10	7.2	768	L9-79	39	1	sintered
65	89	02_003055	6	6	7.5	6.4	348	L9-78	35	2	5
66	89	02_003486	6	8	7.5	5.5	369	L9-87	22	2	4
67	89	02_009039	6	5.5	4.5	4.2	151	L9-87	24	1	1
68	89	02_009897	6	5.5	7	4.5	238	L9-67	2	1	5
69	89	02_013308	6	7.4	6.3	4.5	240	L09-67	2	2	4
70	89	02_014411	6	9	9.5	5	655	L9-87	36	1	sintered
71	89	02_015640	6	7.2	5.8	4.7	240	L09-80	14	11	2

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
72	89	02_016215	6	5	6	5.5	250	L09-67	6	3	1
73	89	02_020572	6	8.2	6.6	5.3	500	L09-68	5	1	5
74	89	02_021403	6	11.9	8.7	6.8	980	L09-68	5	2	sintered
75	89	02_021682	6	4	7.5	3.9	137.8	L09-86	39	2	uncertain
76	89	18_000004	6	4.5	7	4.5	186	L09-47	3	1	4
77	89	18_000007	6	5	5.5	5.5	188	L09-78	90	1	4
78	89	18_000016	6	4	6.5	4	128	L09-58	181	4	2
79	89	18_000017	6	4	8	5.5	229	L09-56	167	2	1
80	89	18_000018	6	3.5	5	5.5	165	L09-77	315	1	1
81	89	18_000019	6	4	7	6	247	L09-85	97	3	uncertain
82	89	18_000482	6	5.5	6.5	5.5	205	L09-69	54	3	1
83	89	18_000500	6	6	7.5	5	289	L09-67	97	1	1
84	89	18_000501	6	5	7	4	174	L09-58	207	1	sintered
85	89	01_009622a	6	6	6	5	190	OF	no data	no data	uncertain
86	89	01_009632a	6	8	8.5	5	526	OF	no data	no data	1
87	89	01_010181a	6	5	6.5	5	265	L09-66	45	1	1
88	890	18_000224	6	4.5	8.5	4.7	219	L09-59	66	8	1
89	890	18_000226	6	4.5	7.5	4.2	310	L09-59	65	9	sintered
90	890	18_000230	6	7	7.5	6	363	L09-58	34	1	sintered
91	890	18_000238	6	5	7	5.5	284	L09-69	123	1	uncertain
92	890	18_000239	6	9.5	7	4.5	600	L09-69	123	1	3 WM5 (macro)
93	890	18_000242	6	5	7.5	4	209	L09-97	70	11	1
94	890	18_000243	6	5	7.5	4	209	L09-97	70	11	uncertain
95	890	18_000246	6	4.7	7	4.5	381	L09-69	146	3	3 WM5 (macro)
96	890	18_000346	6	5.5	9	5.5	512	L09-94	18	3	1
97	890	18_000347	6	5.5	6.5	4.5	256	L09-94	18	3	4
98	890	18_000354	6	4	6.5	4.5	134	L09-58	19	1	uncertain
99	890	18_000477	6	7	6	4.5	219	L09-58	110	5	uncertain
100	890	18_000501	6	5	7	4	174	L09-58	207	1	sintered
101	890	18_000017	6	4	8	5.5	229	L09-56	167	2	5
102	890	18_000051	6	12	7	4.5	541	L09-69	163	9	4
103	89	18_000154	6	4	8	4.7	280	L09-66	121	2	3
104	89	18_000205	6	5.5	5.6	5.5	277	L09-56	118	5	uncertain
105	89	18_000216	6	5.5	11	4	389	L09-65	108	no data	4
106	89	18_000333	6	5	4	3.4	101	L09-68	325	4	1
107	89	18_000345	6	6	7.5	5.2	345	L09-66	132	2	4
108	89	18_000346	6	5.5	9.9	5.5	512	L09-94	18	3	1
109	89	18_000347	6	5.5	6.5	4.5	256	L09-94	18	3	4
110	89	18_000360	6	4.5	6.5	4	167	L09-89	90	5	2
111	89	18_000365	6	7	7.5	5.5	407	L09-75	60	2	1
112	89	18_000218	6	7	6.5	5	423	L09-65	108		4
113	89	18_000224	6	4.5	8.5	4.7	219	L09-59	66	8	1
114	89	18_000225	6	5.5	7.5	5.5	310	L09-67	84	7	5
115	89	18_000226	6	4.5	7.5	4.2	200	L09-59	65	8	sintered
116	89	18_000230	6	7	7.5	6	363	L09-58	34	1	sintered
117	89	18_000238	6	5	7	5.5	284	L09-69	123	1	uncertain
118	89	18_000239	6	9.5	7	4.5	600	L09-69	123	1	3 WM5 (macro)
119	89	18_000243	6	5	7.5	4	209	L09-97	70	11	uncertain
120	89	18_000249	6	4.5	5.5	5	168	K09-87	9	5	uncertain
121	89	02_004012	6	11.5	8.5	4	544	L09-77	44	1	2
122	89	98_004642	6	17.5	11	6	980	OF	1		1
123	89	18_000078	6	12	9	4.5	890	L9-69	160	1	5

Table 7: Handstones of Type 7 (n=18)

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	97_003255	7	12	9.5	6	1367	no data	no data	no data	3
2	89	01_000226	7	9.3	7.5	8.1	743	L9-87	2	1	sintered
3	89	01_000379	7	4	9	4.7	225	L9-78	no data	no data	uncertain
4	89	01_000423	7	7.5	6	4.5	275	L9-85	1	2	1
5	89	01_010180a	7	5	7	5.3	238	L09-66	45	1	5
6	89	02_001302	7	9.5	7.5	5.5	698	L9-87	17	3	sintered
7	89	02_020811	7	3	8.5	5	173	L09-68	5	2	uncertain
8	89	05_002038	7	7	7	5.6	410	L9-89	11	2	sintered
9	89	05_005002	7	3.1	7.6	5.2	210	L9-97	17	1	uncertain
10	89	05_005013	7	9.8	4.5	2.3	210	L9-95	1	1	5 WM5 (macro)
11	89	07_000511	7	5.8	6.6	5.9	300	L09-17	1	2	5
12	89	07_002261	7	6.3	8.7	5.6	465	L09-98	5	1	3
13	89	07_002287	7	8.7	9.1	6.4	775	L09-89	1	4	1
14	89	07_002458	7	7	6	4.9	361	L09-88	13	1	sintered
15	89	07_002584	7	7.5	8	5.1	424	L09-97	1	3	uncertain
16	89	07_002813	7	8.9	4.8	5.8	308	L09-79	no data	no data	uncertain
17	89	18_000073	7	6	8.5	6.5	635	L09-69	20	5	sintered
18	89	18_000499	7	4.5	9	5	208	L09-59	198	4	5

Table 8: Handstones of type 8 (n=16)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
1	89	97_001119	8	4	10	4.7	484	L10-61	1	1	2
2	89	98_000018	8	8	9	4	448	OF	no data	no data	5
3	89	00_000031	8	5.5	7	4	295	L9-80	14	9	sintered
4	89	01_000391	8	7.5	9.5	5	376	L9-78	1	1	3
5	89	01_000446	8	5.5	9.5	4.7	295	L9-80	no data	no data	sintered
6	89	01_002025	8	6	7	4.8	259	L9-79	6	2	1
7	89	02_000067	8	5	7	4.2	200	L09-87	17	3	sintered
8	89	02_008457	8	6	8	5.5	361	L09-84			sintered
9	89	02_022348	8	5	8.5	4	193	L9-67	19	3	5
10	89	05_001689	8	5.2	8.2	4	141	L9-97	14	1	3
11	89	05_003053	8	5.7	8	5.4	309	L09-97	14	1	5
12	89	07_000186	8	5	8	4.5	209	L09-57	4	2	sintered
13	89	07_000385	8	3.2	6.5	3.9	96.7	no data	no data	no data	uncertain
14	89	07_000674	8	6	7	3.7	266	L09-77	56	1	3
15	89	07_000744	8	3.7	6	4.6	138.2	L09-58	4	1	uncertain
16	89	18_000328	8	4	7	4.5	150	L09-78	116	no data	uncertain

Table 9: Handstones of type 9 (n=25)

Nr.	Type code	Find Nr.	Type	Length	Width	Thickness	Weigth	Area	Locus	Spit	SF/WM
1	89	00_000006	9	13	10.5	6	1665	L09-56	24	11	5
2	89	01_000070	9	7	7	4	339	L9-87	1	2	5
3	89	01_002032	9	6.5	10	5.9	381	L9-79	6	2	5 WM5 (macro)
4	89	01_009273a	9	10.5	7.5	2.5	341	OF	no data	no data	3
5	89	01_009650a	9	7.5	5.5	3.7	250	OF	no data	no data	uncertain
6	89	02_005873	9	7.9	5.6	4.9	325	L09-87	43	1	uncertain
7	89	02_010977	9	14.8	8.6	4.1	880	L09-79	49	1	sintered
8	89	02_011578	9	5	8	5	247	L09-78	44	3	uncertain
9	89	02_012732	9	3.2	7	6	231	L09-85	44	1	uncertain
10	89	02_014665	9	9	6	3.5	484	L9-67	2	7	5
11	89	02_017939	9	7	10.4	5.4	590	L09-68	5	2	sintered
12	89	02_018295	9	8	4.5	6	295	L09-67	16	1	sintered
13	89	05_005021	9	6	9	3.1	250	L9-95	2	1	2
14	89	07_000103	9	4	7	4.5	137	L09-69	14	11	uncertain
15	89	07_000368	9	12.2	12.3	3.8	926	L09-70	1	2	sintered
16	89	07_002435	9	8.3	8.3	2	392	L09-88	8	1	uncertain
17	89	07_002477	9	6.7	5.5	5.3	251	L09-99	6	1	uncertain
18	89	07_002698	9	4.5	7.6	5.4	225	L09-97	1	4	uncertain
19	89	07_002724	9	8.7	5.7	6.2	392	L09-98	4	1	uncertain
20	89	07_002925	9	9.4	7.7	6.1	563	L09-89	1	5	sintered
21	89	18_000087	9	10.5	4	3	184	L09-59	19	3	2
22	89	18_000121	9	9	6	3.5	563	L09-07	37	1	4 WM2 and WM3 (C and CE)
23	89	18_000185	9	4	8	3.1	140	L09-68	327	1	2
24	89	18_000219	9	7	6	6	345	L09-68	325	6	5
25	89	18_000220	9	4	7.6	6	367	L09-68	325	6	5

Table 10: Handstones of type 10 (n=53)

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
1	89	95_000023	10	21	13.5	7	2650	no data	no data	no data	sintered
2	89	95_000631	10	15.5	11	5	1679	S1	21	1	5 WM 4 (macro)
3	89	95_001257	10	8	6	3	588	S1	21	1	3
4	89	96_000020	10	10	6	2	1318	S1	1	1	1
5	89	96_000177	10	8	10	4	425	L9-75 + L9-65	2	no data	sintered
6	89	96_000724	10	7	11	7.5	458	J08-28	3	1	uncertain
7	89	97_000330	10	6	8.2	5.5	323	L9-75	29	3	uncertain
8	89	97_000380	10	8.5	8	5.3	479	L09-55	1	1	uncertain
9	89	97_001380	10	12	7.5	4.5	606	OF	no data	no data	2
10	89	97_003254	10	8	14	3.2	484	no data	no data	no data	sintered
11	89	98_000126	10	17	16	6	3537	L9-75	no data	no data	sintered
12	89	98_004670	10	20	15	5	2245	OF	no data	no data	1

Nr.	Typecode	Find Nr.	Type	Length	Width	Thickness	Weight	Area	Locus	Spit	SF/WM
13	89	99_000321	10	20.9	12.7	5.7	2241	OF	no data	no data	sintered
14	89	99_000396	10	15	13.5	4.1	1408	L9-80	24	8	5
15	89	01_000263	10	18.5	13	4.5	2240	L9-86/87	no data	no data	5
16	89	01_000274	10	9.5	12.5	5.7	1044	L9-77	2	no data	1
17	89	01_000288	10	8	6.5	6.2	484	L9-87	1	1	1
18	89	01_000427	10	6.2	10.5	4.9	538	L9-77	5	1	5
20	89	01_002133	10	10.2	7.8	5.7	643	L9-85	1	4	5
21	89	01_002142	10	6.6	6.4	4.7	247	L9-85	1	4	uncertain
22	89	01_002172	10	8.6	14.5	5.2	1137	L9-87	1	2	1
23	89	01_002191	10	10	10	6.2	949	L9-87	11		sintered
24	89	01_002196	10	8.8	11.4	6.2	793	L9-87	11		1
25	89	01_002305	10	4	6	4.7	173	L9-78	1	3	uncertain
26	89	01_002331	10	4	6	4.8	130	L9-77	6	1	1
28	89	01_010210	10	21	17	5	4096	no data	no data	no data	1
29	89	01_010211	10	20	16	6	2908	no data	no data	no data	2
30	89	02_007091	10	8.2	7.2	5.6	375	L09-78	41	2	sintered
31	89	02_008462	10	12.6	8.4	4.2	598	L09-79	44	1	1
32	89	02_008471	10	8	8.5	4.5	508	L09-78	42	1	sintered
33	89	02_010149	10	6	5	4.5	249	L9-80	24	14	uncertain
34	89	02_014912	10	6.5	10	5	447	L9-87	55	1	4
35	89	02_016005	10	7.4	4.5	4.2	250	L09-78	44	7	2
36	89	02_016418	10	9.8	9.9	4	659	L09-67	2	8	3
37	89	02_016733	10	9.2	5.9	5.7	390	L09-85	53	2	1
38	89	02_017940	10	9.3	7.8	4.8	360	L09-86	34	2	5
39	89	02_018298	10	7.4	5.4	4.7	240	L09-67	16	1	uncertain
40	89	02_019957	10	8.8	7.9	4.2	350	L09-87	55	2	1
41	89	05_002028	10	5	4	5.4	177.4	L9-86	65	4	1
42	89	05_003072	10	5.3	3.3	4.7	132	L09-97	17	4	uncertain
43	89	05_005025	10	3.5	5.2	4.4	112	L9-95	2	1	uncertain
44	89	07_000272	10	4	6	5	153	L09-69	16	1	uncertain
45	89	07_000498	10	10.4	5.9	4.8	359	L09-58	4	2	uncertain
46	89	07_000615	10	11.3	11.8	3.6	858	L09-70	1	3	1
47	89	07_000822	10	12.1	8.3	4.2	629	L09-76	81	4	1
48	89	07_000911	10	14.3	12.7	5.8	1836	L09-58	7	1	sintered
49	89	07_001219	10	11.2	13.9	6.9	1892	L09-58	1	3	sintered
50	89	07_002599	10	6.8	8	5.4	304	L09-88	7	1	uncertain
51	89	07_002679	10	17.5	15.5	4.4	2049	L09-70	1	1	4
52	89	07_002687	10	3.9	8.7	4.2	198	L09-70	1	1	uncertain
53	89	07_002844	10	13.7	8.9	5.3	886	L09-98	1	6	2

* 1 object is missing from this list due to ambiguities of the older documentation.

Table 11: Netherstones of type 1/LB (n=128)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88		LB	18_000053	55	36	16	L9-55	50	no data
2	88		LB	19_000040	50	33	26	L09-27	34	no data
3	88	10_000090	LB		18	16.5	10	K10-45	1	1
4	88	11_000099	LB		24	32	20	L09-59	66	11
5	88	11_000169	LB		41	32	20	L09-69	112	no data
6	88	11_000202	LB		22	22	12	L09-88	40	1

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
7	88	11_000208	LB		25	18	14	L09-78	116	4
8	88	12_000005	LB		42	33	22	L09-65	93	1
9	88	12_000023	LB		29.6	19.8	4.9	L09-65	96	1
10	88	12_000109	LB		14.6	14.2	7.1	L09-65	101	1
11	88	12_000114	LB		15.7	13.9	4.6	L09-65	94	4
12	88	12_209	LB		41	20	16	L9-58	182	16
13	88	19_000001s	LB		50	33	19	L9-70 building 49	no data	no data
14	88	19_000018s	LB					L10-51 building 24	no data	no data
15	88	19_000019s	LB					L10-51 building 24	no data	no data
16	88	19_000020s	LB					L10-51 building 24	no data	no data
17	88	19_000021s	LB					L10-51 building 25	no data	no data
18	88	19_000022s	LB					L10-51 building 25	no data	no data
19	88	19_000023s	LB					L10-51 building 25	no data	no data
20	88	19_000032s	LB					K9-97 building 142	no data	no data
21	88	19_000034s	LB					L9-07 building 134	no data	no data
22	88	19_000035s	LB					L9-37 building 115	no data	no data
23	88	19_000036s	LB					L9-37 building 115	no data	no data
24	88	19_000037s	LB					L9-07 building 133	no data	no data
25	88	19_000038s	LB					L9-07 building 139	no data	no data
26	88	19_000041	LB					L9-55 building 8.2	42	no data
27	88	20_00002	LB		49	29.5	19	no data	no data	no data
28	88	20_00003	LB		30	33	22	no data	no data	no data
29	88	20_00004	LB		53	29	20	no data	no data	no data
30	88	20_00007	LB		29	24	17	no data	no data	no data
31	88	20_00012	LB		45	36	14	no data	no data	no data
32	88	20_00018	LB		50	38.5	30	no data	no data	no data
33	88	20_00019	LB		49	37	31	no data	no data	no data
34	88	20_00020	LB		40	37	30	no data	no data	no data
35	88	20_00022	LB		60	36	21	no data	no data	no data
36	88	20_00023	LB		51	41.3	30	no data	no data	no data
37	88	20_00025	LB		31	35	25	no data	no data	no data
38	88	20_00026	LB		32	40	26	no data	no data	no data
39	88	20_00027	LB		61	49	35	no data	no data	no data
40	88	20_00028	LB		45.7	36.5	25	no data	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
41	88	20_00030	LB		46.4	30.3	24	no data	no data	no data
42	88	20_00039	LB		60	37	25	no data	no data	no data
43	88	20_00040	LB		50	30	17	no data	no data	no data
44	88	20_12005*	LB		40	30	22	no data	no data	no data
45	88	20_1244*	LB		30	25	30	no data	no data	no data
46	88	20_1754*	LB		40	11	13	no data	no data	no data
47	88	20_1825*	LB		28.5	26	14	no data	no data	no data
48	88	20_250*	LB		42	25	18	no data	no data	no data
49	88	20_263*	LB		40	33	16	no data	no data	no data
50	88	20_29*	LB		28	27	25	no data	no data	no data
51	88	20_6006*	LB		23	18	11	no data	no data	no data
52	88	20_9094*	LB		26	27	20	no data	no data	no data
53	88	2814	LB		21	24	9	L9-78	41	1
54	88	29	LB		22.5	17	15	no data	no data	no data
55	88	3057	LB		20	12	14	no data	0	no data
56	88	3062	LB		20	13	12	L9-78	73	1
57	88	3202	LB		45	31	20		1	no data
58	88	3216	LB		30	23	12	L9-98	1	5
59	88	3240	LB		59	22	8	L9-99	1	1
60	88	3258	LB		17	16	10	L9-88	1	3
61	88	43	LB		20	7	8	no data	no data	no data
62	88	454	LB		26	17	8	no data	no data	no data
63	88	456	LB		25	25	12	no data	no data	no data
64	88	460	LB		19	20.6	16	no data	no data	no data
65	88	468	LB		12.9	19	13	no data	no data	no data
66	88	477	LB		18.7	17	10	no data	no data	no data
67	88	479	LB		8	12	6	no data	no data	no data
68	88	484	LB		13	10	6	no data	no data	no data
69	88	485	LB		19.5	16	7	no data	no data	no data
70	88	491	LB		21.5	20.7	12	no data	no data	no data
71	88	494	LB		26.4	20	14	no data	no data	no data
72	88	506	LB		21.5	21.5	17	no data	no data	no data
73	88	509	LB		20	15	10	no data	no data	no data
74	88	510	LB		15	11	8	no data	no data	no data
75	88	513	LB		29	24	20	no data	no data	no data
76	88	541	LB		26.5	12.5	9	no data	no data	no data
77	88	544	LB		26	17	9	no data	no data	no data
78	88	547	LB		12	12.5	11	no data	no data	no data
79	88	549	LB		22	15	13	no data	no data	no data
80	88	551	LB		14.7	16	10	no data	no data	no data
81	88	558	LB		14	17	11	no data	no data	no data
82	88	561	LB		12	17	12	no data	no data	no data
83	88	567	LB		19	10	8	no data	no data	no data
84	88	570	LB		18	13	9	no data	no data	no data
85	88	572	LB		15.5	20	13	no data	no data	no data
86	88	579	LB		14	12.5	11	no data	no data	no data
87	88	584	LB		12	17	9	no data	no data	no data
88	88	590	LB		20	22	10	no data	no data	no data
89	88	598	LB		26.5	15	13	no data	no data	no data
90	88	604	LB		11	14	8	no data	no data	no data
91	88	613	LB		21.5	9	7	no data	no data	no data
92	88	615	LB		14	18	12	no data	no data	no data
93	88	616	LB		30	19.5	17	no data	no data	no data
94	88	660	LB		16	16	9.5	no data	no data	no data
95	88	670	LB		28	21	12	no data	no data	no data
96	88	672	LB		23	18	11	no data	no data	no data
97	88	673	LB		27	15	9.5	no data	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
98	88	7059	LB		32	23	15	L09-58	24	1
99	88	7110	LB		30	30	18	L09-59	43	no data
100	88	720	LB		20.5	16	10	no data	no data	no data
101	88	721	LB		17	14	11	no data	no data	no data
102	88	7239	LB		23	13	8	NWS	no data	no data
103	88	724	LB		32	21	13	no data	no data	no data
104	88	7308	LB		20	16	10	NWK	no data	no data
105	88	7323	LB		27	21	16	NWK	no data	no data
106	88	7353	LB		24	11	10	NWK	no data	no data
107	88	7366	LB		30	29	8	NWK	no data	no data
108	88	744	LB		19	17	9.8	no data	no data	no data
109	88	745	LB		17	9	9	no data	no data	no data
110	88	753	LB		21	25	14	no data	no data	no data
111	88	754	LB		17	12	8.5	no data	no data	no data
112	88	755	LB		14	14	9	no data	no data	no data
113	88	758	LB		12	16	9	no data	no data	no data
114	88	771	LB		18	22	13	no data	no data	no data
115	88	8151	LB		45	38	25	L9-27	22	1
116	88	8214	LB		20	25	14	L09-37	1	2
117	88	8220	LB		29	26	15	L09-37	1	2
118	88	8302	LB		21	20	12	L09-07	5	4
119	88	8421	LB		26	26	14	L9-77	67	2
120	88	847	LB		31	14	15	no data	no data	no data
121	88	853	LB		18	12.5	8	no data	no data	no data
122	88	862	LB		35.5	17	11	no data	no data	no data
123	88	8635	LB		20	18	8	L09-27	30	4
124	88	8707	LB		35	25	14	L9-87	144	4
125	88	887	LB		25	25	15	no data	no data	no data
126	88	889	LB		24.5	19	11	no data	no data	no data
127	88	8953	LB		26	20	10	L9-86	107	no data
128	88	9041	LB		20	15	9	L09-68	305	no data

=dimensions not available (finds in situ).

Table 12: Netherstones of type 2 (n=29)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88	11_000188	IB		17.5	13.7	5.5	L09-97	58	2
2	88	11_000215	IB		44	25	20	L09-78	no data	no data
3	88	11_000280	IB		26	23	20	L09-88	47	8
4	88	12282	IB		40	20	18	no data	no data	no data
5	88	1241	IB		15	11	9	no data	no data	no data
6	88	19_000003s	IB		40	26	26	L10-61 building 36	no data	no data
7	88	19_000004s	IB					L10-61 building 30	no data	no data
8	88	19_000010s	IB					L9-60 building 43	no data	no data
9	88	19_000011s	IB					L9-60 building 45	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
10	88	19_000013s	IB					L9-60 building 45	no data	no data
11	88	19_000024s	IB		50	33	26	L10-61 building 33	no data	no data
12	88	19_000026s	IB					K9-97 building 147	no data	no data
13	88	20_00006	IB		50	29	22	no data	no data	no data
14	88	20_00008	IB		40	20	20	no data	no data	no data
15	88	20_00010	IB		36.8	23.6	14.4	no data	no data	no data
16	88	20_00011	IB		44	31	26	no data	no data	no data
17	88	20_00033	IB		42	25.6	23	no data	no data	no data
18	88	2709	IB		34	25	15	L9-87	17	3
19	88	3309	IB		47	42	24	L9-95	7	no data
20	88	490	IB		36	18	14	no data	no data	no data
21	88	496	IB		35	17	12	no data	no data	no data
22	88	633	IB		20.5	14	11	no data	no data	no data
23	88	7343	IB		27	21	10	NWK	no data	no data
24	88	8089	IB		29	18	14	L09-07	5	2
25	88	8417	IB		22	25	14	L9-87	117	2
26	88	851	IB		27	15	9.5	no data	no data	no data
27	88	8612	IB		24	24	15	L09-17	24	4
28	88	8738	IB		19	18	912	L9-87	167	1
29	88	8933	IB		40	17	14	L9-86	92	no data

Table 13: Netherstone of type 3 (n=11)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88		HB	18_000025	48	40	16	K10-58	3	1
2	88	13311	HB		46	29	14	K10-5	1	5
3	88	19_000014s	HB					L9-60 building 44	no data	no data
4	88	19_000025s	HB		43	35	19	L9-27 building 120	no data	no data
5	88	20_00015	HB		48.5	35	20	no data	no data	no data
6	88	20_55*	HB		47	39	18	no data	no data	no data
7	88	500	HB		11	14.5	8	no data	no data	no data
8	88	550	HB		29	23	12	no data	no data	no data
9	88	552	HB		55.5	38.8	20	no data	no data	no data
10	88	7053	HB		45.6	28	16	L09-59	57	no data
11	88	7055	HB		38	26	23	L09-59	37	8

Table 14: Netherstones of type 4 (n=5)

Nr.	Type code	Stonegarden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88	13_000056	LsB		55	27	26	L09-69	164	no data
2	88	13_000316	LsB		59	31	29	K10-24	14	no data
3	88	20_13789*	LsB		44	31	20	no data	no data	no data
4	88	3195	LsB		60	36	20	L9-78	no data	no data
5	88	3214	LsB		44	30	13	L9-99	1	2

Table 15: Netherstones of type 5 (n=4)

Nr.	Type code	Stonegarden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88	10_000697	SP		19	10	5	L09-85	76	2
2	88	11_000211	SP		14	13	10	L09-78	129	3
3	88	19_000042	SP		13,5	12	3,6	K9-87	31	4
4	88	7322	SP		8	4.5	4	NWK	no data	no data

Table 16: Netherstones of type 6 (n=51)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88	11_000394	SB		18	24	18	K10-35	5	3
2	88	12329	SB		25	23	20	no data	no data	no data
3	88	1243	SB		30	24	16	no data	no data	no data
4	88	133	SB	05_000052	29.7	23.4	21.6	no data	no data	no data
5	88	14	SB		18	25	12	no data	no data	no data
6	88	19_000005s	SB		44	31	24	L9-60 building 29	no data	no data
7	88	19_000009s	SB		38	40	16	L9-60 building 29	no data	no data
8	88	19_000012s	SB					L9-60 building 45	no data	no data
9	88	19_000031s	SB		35	30	11	K9-87 building F	no data	no data
10	88	20_00009	SB		35.7	33.9	25	no data	no data	no data
11	88	20_00024	SB		30	28	10	no data	no data	no data
12	88	20_00029	SB		34	32	20	no data	no data	no data
13	88	20_00031	SB		35	33	22	no data	no data	no data
14	88	20_00034	SB		32.7	30.5	23	no data	no data	no data
15	88	20_00035	SB		27.8	26	20	no data	no data	no data
16	88	20_00037	SB		22	25	14	no data	no data	no data
17	88	20_00038	SB		32	33	20	no data	no data	no data
18	88	20_00041	SB		40	27	25	no data	no data	no data
19	88	20_00957	SB		29	26	14	no data	no data	no data
20	88	20_1083*	SB		37	25	17	no data	no data	no data
21	88	12202*	SB		35	33	15	no data	no data	no data
22	88	20_12202*	SB		39	22	14	no data	no data	no data
23	88	20_12262*	SB		32	25	12	no data	no data	no data
24	88	20_1305*	SB		24	18	12	no data	no data	no data
25	88	20_405*	SB		26	28	17	no data	no data	no data
26	88	20_408*	SB		29	30	10	no data	no data	no data
27	88	20_70*	SB		35	30	16	no data	no data	no data
28	88	2049	SB		30	23	12	L9-87	2	3
29	88	2317	SB		18	17	8	L9-87	19	no data
30	88	2950	SB		27	24	13	L09-68	1	2
31	88	3189	SB		35	30	20	no data	no data	no data
32	88	45	SB		31	27	12	no data	no data	no data
33	88	455	SB		26	20	14	no data	no data	no data
34	88	5031	SB		18	29	14	L9-96	8	no data
35	88	5034	SB		20	20	10	L9-96	7	no data
36	88	512	SB		33.7	31.4	18	no data	no data	no data
37	88	538	SB		30.5	30	14	no data	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
38	88	586	SB		14	19	11	no data	no data	no data
39	88	7080	SB		15	13	12	L09-59	29	4
40	88	7095	SB		25	18	22	L09-59	37	8
41	88	718	SB		13	25	10	no data	no data	no data
42	88	7435	SB		47	23	18	building E	no data	no data
43	88	8357	SB		55	30	18	L09-27	31	no data
44	88	849	SB		15	14	9	no data	no data	no data
45	88	852	SB		24	19	13.5	no data	no data	no data
46	88	8547	SB		19	18	12	K9-87	54	3
47	88	876	SB		26	30	14	no data	no data	no data
48	88	894	SB		25	18	12	no data	no data	no data
49	88	8958	SB		27	22	15	L9-86	112	no data
50	88	8992	SB		30	18	18	surface	no data	no data
51	88	9060-9065	SB		17	33	8	surface	no data	no data

Table 17: Netherstones of type 7 (n=66)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88		P	02_010474	13.5	18	6.5	L9-78	43	1
2	88	10_000172	P		20	12	10	K10-45	1	1
3	88	10_000237	P		24	24	11	K09-87	42	1
4	88	10_000264	P		20	18	11	L09-68	935	no data
5	88	10_000338	P		27	30	8	surface	no data	no data
6	88	10_000627	P		30	22	13	K10-69	6	no data
7	88	10_000650	P		24	20	7	K10-55	2	no data
8	88	10_000654	P		22	19	7	K10-78	14	no data
9	88	10_000661	P		27	21	11	K10-70	11	no data
10	88	11_000003	P		25	12	8	L09-80	3	1
11	88	11_000168	P		25	30	11	L09-78	116	3
12	88	110	P		11	9.5	4	no data	no data	no data
13	88	117	P		27	20	8	no data	no data	no data
14	88	12_000024	P		25.3	16.3	10.8	L09-86	335	1
15	88	12_000075	P		22.4	16.6	6.7	surface	no data	no data
16	88	12_000108	P		23.4	20.1	8.2	L09-69	157	1
17	88	12_000110	P		21.3	19.8	8.8	L09-87	316	1
18	88	171	P		17.3	13	5	no data	no data	no data
19	88	187	P		12.5	12.5	9	no data	no data	no data
20	88	19_000002s	P		58	38	15	L10-61 building 36	no data	no data
21	88	19_000006s	P					L9-60 building 29	no data	no data
22	88	19_000007s	P					L9-60 building 29	no data	no data
23	88	19_000008s	P					L9-60 building 43	no data	no data
24	88	19_000027s	P					L9-27 building 134	no data	no data
25	88	19_000028s	P					L9-27 building 134	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
26	88	19_000033s	P		25	32	7	L9-07 building 134	no data	no data
27	88	1905	P		25	17	8	L9-78	1	2
28	88	20	P		17.5	15	9	no data	no data	no data
29	88	20_00013	P		35.7	23.2	14	no data	no data	no data
30	88	20_00021	P		50	31.5	13.15	no data	no data	no data
31	88	20_00036	P		15	30	9.5	no data	no data	no data
32	88	20_12175*	P		30	18	10	no data	no data	no data
33	88	20_12311*	P		31	23	10	no data	no data	no data
34	88	20_13309*	P		48	28	13	no data	no data	no data
35	88	20_13311*	P		49	29	15	no data	no data	no data
36	88	20_9009*	P		32	40	28	no data	no data	no data
37	88	20_9060*	P		25	20	8.5	no data	no data	no data
38	88	2007	P		18	15	12	L09-59	29	4
39	88	2104	P		12	14	6	L9-77	5	1
40	88	2167	P	05_000025	14	9.1	7	no data	no data	
41	88	2291	P		20.4	22.7	8	L9-79	15	1
42	88	231	P		17	10	9	no data	no data	no data
43	88	258	P		18.7	10.4	7	no data	no data	no data
44	88	2624	P		17	17.5	8	L9-80	61	8
45	88	2895	P		17	16	5	L09-68	1	2
46	88	3009	P		17	23	7	no data	no data	no data
47	88	3032	P		25	22	8	no data	no data	no data
48	88	3268	P		26	19	6	L9-96	1	1
49	88	483	P		14.7	8.5	5	no data	no data	no data
50	88	493	P		6.5	15	5	no data	no data	no data
51	88	516	P		8	21	7	no data	no data	no data
52	88	557	P		15	9	6	no data	no data	no data
53	88	574	P		6.5	12	5	no data	no data	no data
54	88	591	P		8	11	8	no data	no data	no data
55	88	7307	P		20	14	12	NWK	no data	no data
56	88	7338	P		23	22	14	NWK	no data	no data
57	88	7369	P		25	14	11	NWK	no data	no data
58	88	7466	P		22	18	6	building E	no data	no data
59	88	8244	P		36	21	15	L9-69	21	1
60	88	8268	P		19	12	11	L9-69	24	6
61	88	8319	P		18	28	11	L09-27	19	no data
62	88	8340	P		23	19	8	L09-27	26	1
63	88	8624	P		20	13	8	L09-17	36	1
64	88	8751	P		24	20	5	L9-87	147	5
65	88	886	P		29.5	20	8	no data	no data	no data
66	88	890	P		18	20	5	no data	no data	no data

Table 18: Netherstones of type 8 (n=12)

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
1	88	11_000205	NB		15	24	15	L09-78	116	4
2	88	11_000217	NB		34	24	11	L09-78	114	3
3	88	17	NB		20.5	18	15	no data	no data	no data
4	88	20_00005	NB		28	32	18	no data	no data	no data
5	88	20_12209*	NB		23	18	11	no data	no data	no data
6	88	20_124*	NB		23	25	22	no data	no data	no data
7	88	20_1267*	NB		16	23	18	no data	no data	no data

Nr.	Type code	Stone Garden Nr.	Type	Find Nr.	Length	Width	Thickness	Area	Locus	Spit
8	88	20_163*	NB		40	30	20	no data	no data	no data
9	88	502	NB		25	12.5	16	no data	no data	no data
10	88	545	NB		20	8	12	no data	no data	no data
11	88	7226	NB		27	20	15	NWK	no data	no data
12	88	9031	NB		36	27	16	L9-87	315	no data

Table 19. Pestles of type 1 (n=20)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus
1	80	00_000021	1	12.9	6.6	L09-56	24
2	80	01_000138	1	18.5	10.5	L9-79	1
3	80	01_000160	1	8.8	4	surface	no data
4	80	01_009217	1	6	4	surface	no data
5	80	05_001496	1	15	6.5	L9-64	no data
6	80	05_001512	1	21.5	6.8	surface	no data
7	80	07_002474	1	17.5	6.8	L09-99	6
8	80	10_000309 /10_000069	1	15.6	6.5	L09-48	19
9	80	11_000030	1	17	7.3	no data	no data
10	80	12_000009	1	7	5	no data	no data
11	80	13_000924	1	8	4.5	no data	no data
12	80	13_000945	1	10	6	no data	no data
13	80	95_000819	1	10	4	S1	1
14	80	95_001783	1	10.5	4	surface	no data
15	80	97_000651	1	25	7.5	no data	no data
16	80	97_001372	1	18	6	surface	no data
17	80	98_000375	1	8	5	L09-56	1
18	80	98_003026	1	6	4	L09-56	24
19	80	98_004653	1	8	5	surface	no data
20	80	98_004656	1	10	4	surface	no data
21	80	98_000169	1	15	6	surface	no data
22	80	96_002803	1	11	5.5	surface	no data

Table 20. Pestles of type 2 (n=11)

Nr.	Type code	Find Nr.	Type	Length	Width /Diameter	Area	Locus	Spit
1	80	04_000215 /04_000004	2	8	3	L9-98	1	1
2	80	05_001649	2	5.5	2.3	L9-95	2	1
3	80	05_001803	2	7.4	3.1	L09-59	1	1
4	80	07_001854	2	8	4	L9-96	4	3
5	80	96_002999	2	10.5	2.	L9-75	10	no data
6	80	97_002480	2	6.	2.5	OF	no data	no data
7	80	98_001279 /98_000012	2	8	3.5	OF	no data	no data
8	80	98_002395	2	8	3	OF	no data	no data
9	80	99_000149	2	7.5	2.5	OF	no data	no data
10	80	99_000162	2	9	4	L10-51	13	4
11	80	09_000542	2	8	5	OF	no data	no data
12	80	99_000302	2	6	3	OF	no data	no data

Table 21: Pestles of type 3 (n=18)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	00_000011	3	6	4.8	L9-66	48	7
2	80	01_004724	3	7.4	3.4	L9-79	34	1
3	80	02_008683	3	8.8	4.8	L09-87	22	2
4	80	04_000468 /04_000005	3	12	7.5	L9-70	1	1
5	80	05_001517	3	12.4	6.3	surface	no data	no data
6	80	07_001829	3	9.5	6.4	L9-96	38	1
7	80	11_000028 /11_000028	3	9.5	6.5	surface	no data	no data
8	80	11_000029 /11_000029	3	10.7	6.9	surface	no data	no data
9	80	11_000031 /11_000031	3	13	6.5	surface	no data	no data
10	80	11_000396	3	8.8	6	K10-35	1	8
11	80	97_000388	3	10.5	7.5	L09-55	1	1
12	80	98_000028	3	7	3	surface	no data	no data
13	80	98_000134	3	8	4	L10-61	no data	no data
14	80	98_000642	3	9	5	L09-56	22	no data
15	80	98_000652	3	6	3	L09-56	32	no data
16	80	99_000078	3	5.5	3	L10-51	9	5
17	80	99_000254	3	10.5	6	L10-51	13	6
18	80	99_000510	3	10.5	6	L10-51	25	2

Table 22: Pestles of type 4 (n=2)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	09_000145	4	23.1	13	K10-58	10	no data
2	80	04_000537 /04_000006	4	17.5	10	surface	1	no data

Table 23: Pestles of type 5 (n=7)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	02_000256	5	13	6	L9-79	39	2
2	80	98_001951	5	10	5	L09-56	38	1
3	80	01_000353	5	18.4	10.8	surface	no data	no data
4	80	00_000020	5	12.6	8.4	L09-56	38	13
5	80	99_000476	5	10	6	L10-51	25	3
6	80	10_000311 /10_000071	5	11.5	6.8	L09-46	19	no data
7	80	10_000312 /10_000078	5	2.7	2.3	L10-08	1	1

Table 24: Pestles of type 6 (n=2)

Nr.	Type code	Find Nr.	Type	Length	Width	Area	Locus	Spit
1	80	97_002263	6	16	7.5	L9-65	26	1
2	80	95_001743	6	20	9	OF	no data	no data

Table 25: Pestles of type 7 (n=18)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	01_002052	7	5.4	2.7	L9-85	1	3
2	80	02_000483	7	6.3	2.9	L09-87	23	1
3	80	02_005941	7	9.6	3.7	L09-80	11	9
4	80	05_001518	7	16	10	surface	no data	no data
5	80	11_000574	7	14	5.4	L09-88	47	3
6	80	12_000009	7	15.4	5.6	L9-59	77	1
7	80	12_000571	7	12	6	no data	no data	no data
8	80	12_000579	7	20	6.9	L9-58	185	no data
9	80	95_000245	7	11	5	no data	15	no data
10	80	95_000267	7	10	4	no data	8	no data
11	80	97_002478	7	15	4.5	surface	no data	no data
12	80	98_000466	7	10	5	L9-80	1	1
13	80	98_003412	7	7	4	L09-56	47	1
14	80	98_004412	7	8	4	L9-80	10	4
15	80	98_004417	7	12	5	L09-56	no data	no data
16	80	99_000079	7	5	2.5	L10-51	9	5
17	80	99_000127	7	6	4.5	L10-51	no data	no data
18	80	99_000454	7	13.5	6.4	L9-80	14	7
19	80	97_002400	7	13.5	6	L10-61	1	1

Table 26: Pestles of type 8 (n=6)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	05_001641	8	5.5	3.3	L9-96	2	1
2	80	06_000059	8	8	5	L9-69	16	1
3	80	05_001802	8	8.7	4.4	L09-68	30	7
4	80	97_000390	8	6	2.5	L09-55	1	1
5	80	97_000882	8	8	3	L10-61	1	1
6	80	98_003410	8	8	3	L9-80	14	3
7	80	97_000270	8	6	2	L9-55	1	1

Table 27: Pestles of type 9 (n=1)

Nr.	Type code	Find Nr.	Type	Length	Width/ Diameter	Area	Locus	Spit
1	80	05_001642	9	14.8	5.8	L9-95	1	1

Table 28: "Greenstone vessels" (n=83)

No.	Find Number	Plate/Fig.	Description	Context	Context Details
1	GT 01-009249	Plate 7.4.2; 7.6.7	Body sherd, possibly of a globular bowl, decorated with a geometric pattern.	surface find	no data

No.	Find Number	Plate/Fig.	Description	Context	Context Details
2	GT 01-009664	Plate 7.4.1; 7.8.3	Body sherd of a globular bowl, decorated with a geometric pattern, one straight edge shows traces of sawing.	surface find	no data
3	GT 01-009669	Plate 7.4.5; 7.6.6	Body sherd, decorated with an animal motif and a geometric pattern, one edge smoothed, traces of a groove with u-profile (incompletely preserved).	surface find	no data
4	GT 02-019378	Plate 7.6.3	Body sherd, with one straight edge, probably sawn.	surface find	no data
5	GT 01-0XXX01		Body sherd, decorated with a geometric pattern.	surface find	no data
6	GT 02-005188	Plate 7.1.4; 7.6.8	Body sherd, decorated with a geometric pattern, with one straight sawn edge and another one with sawing traces; a part of the backside was cut off.	surface find	no data
7	GT 02-022461	Plate 7.9.6	Body sherd, decorated with a geometric pattern, two straight sawn edges.	surface find	no data
8	GT 10-000054		One third of a straight-sided bowl, undecorated.	surface find	no data
9	GT 10-000310	Plate 7. 1.1	Base and body of a straight-sided bowl, decorated with a geometric pattern.	L09-85 Loc. 74.1	In the upper (Neolithic) layers of the excavation area, no architectural context.
10	GT 11-000033/11-5	Plate 7. 2.5; Plate 7.9.1	Rim sherd of a globular bowl, decorated with a geometric pattern.	K10-35 Loc. 1.4	Plough horizon.
11	GT 11-000272	Plate 7.2.4	Body sherd, decorated with a geometric pattern, with two smoothed edges.	surface find	no data
12	GT 11-000274/278	Plate 7.3.4; 7.7.1	Body sherd, decorated with a geometric pattern, with one straight sawn edge.	surface find	no data
13	GT 11-000448	Plate 7.2.1	Body sherd, decorated with a geometric pattern, with a groove of irregular profile deepened into the middle of the sherd. The groove shows irregular polish as well as scratches.	K10-44 Loc. 1.2	Plough horizon.
14	GT 11-000046	Plate 7.2.3; 7.5.1	Rim sherd, probably of a globular vessel, decorated with a geometric pattern and a gazelle, with numerous scratches on the inside.	L09-69 Loc. 113.1	North of Building D, probably Layer III.
15	GT 11-000502	Plate 7.4.4	Rim sherd, probably of a globular bowl, undecorated.	L09-58 Loc. 159.1	From a deep sounding, chronological position to be evaluated.
16	GT 12-000506	Plate 7.3.3; 7.7.3	Rim sherd, decorated with the ‘sun motif’.	surface find	no data
17	GT 12-000508	Plate 7.2.2; 7.7.5	Rim sherd, decorated with a geometric pattern, with a u-profiled groove deepened into the middle of the sherd. The groove shows perpendicular scratches at both ends, further scratches with different alignments are spread on the sherd. Sawing traces are visible at one edge, but the cut was not finished.	surface find	no data
18	GT 12-000551	Plate 7.1.2	Rim sherd, of a pear-shaped vessel, decorated with a geometric pattern.	surface find	no data
19	GT 12-000562	Plate 7.1.3	Body sherd, decorated with a geometric pattern, a groove with a v-shaped profile deepened into the middle of the sherd and one lateral unfinished hole (possibly an earlier repair attempt). The groove shows irregular polish and scratches.	surface find	no data
20	GT 13-000416		Rim sherd, decorated with a geometric pattern.	surface find	no data
21	GT 13-000661	Plate 7.9.3	Rim sherd (or plaquette?), decorated with a geometric pattern and snake motifs.	surface find	no data

No.	Find Number	Plate/Fig.	Description	Context	Context Details
22	GT 15-000587	Plate 7.4.6	Rim sherd, decorated with an animal motif.	surface find	no data
23	GT 97-003207	Plate 7.9.4	Rim sherd decorated with a geometric pattern, one straight sawn edge.	surface find	no data
24	GT 98-000464	Plate 7.9.7	Body sherd, decorated with a geometric pattern.	surface find	no data
25	GT 98-000465	Plate 7.3.2	Body sherd, decorated with a geometric pattern and a snake.	surface find	no data
26	GT 99-000511/99-59	Plate 7.3.1; 7.5.3	Body sherd of a globular bowl, decorated with a geometric pattern, with one straight sawn edge.	surface find	no data
27	GT 03-000680	Plate 7.5.2	Rim sherd of a dome-shaped vessel, with one straight sawn edge; edges are partially smoothed by grinding.	L09-79 Loc. 58	Fallen from the excavation area's profile.
28	GT 03-001265	Plate7.6.5	Body sherd of an undecorated globular bowl.	L09-68 Loc. 17.3	Infill of Building D (intentional backfilling).
29	GT 04-000021	Plate 7.8.5	Rim sherd of a decorated bowl with three straight sawn edges. A groove with a v-shaped profile deepened into the middle of the sherd.	surface find	no data
30	GT 04-000227	Plate 7.9.2	Rim sherd decorated with a geometric pattern, with one sawn edge.	surface find	no data
31	GT 04-000289	Plate 7.9.5	Rim sherd, decorated with a geometric pattern.	surface find	no data
32	GT 11-000417		Rim sherd, decorated with a geometric pattern.	L09-69 Loc. 89.1	Collapse and debris layer.
33	GT 02-000255		Base of a globular vessel, undecorated.	L09-77 Loc. 35.1	Infill above Building C.
34	GT 97-002872	Plate 7.9.8	Rim sherd of a pear-shaped bowl, decorated with a geometric pattern.	surface find	no data
35	GT 01-004467		Probable vessel fragment, with groove.	surface find	no data
36	GT 99-000015		Body sherd, decorated with a geometric pattern.	surface find	no data
37	GT 99-000008		Rim sherd, decorated with a geometric pattern.	surface find	no data
38	GT 02-002192		Rim sherd, decorated with a geometric pattern.	L09-79 Loc. 41.2	Open space north of Building D.
39	GT 02-011238	Plate 7.8.7	Rim sherd of a globular bowl, decorated with a geometric pattern.	surface find	no data
40	GT 01-002690/1-34	Plate 7.9.10	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
41	GT 02-007508	Plate 7.8.1	Rim sherd of a globular bowl, decorated with a geometric pattern.	L09-85 Loc. 39.2	Within stone collapse high in the area´s stratigraphy.
42	GT 00-000416		Body sherd with a groove.	L09-66 Loc. 70.2	Infill of Building B.
43	GT 01-004788		Body sherd.	L09-85 Loc. 25.3	High in the area´s stratigraphy, Neolithic layer without architecture.
44	GT 01-010146		Fragment of a vessel, undecorated, burnt.	L09-78 Loc. 17.2	Infill of Building D.
45	GT 02-005980		Body sherd.	L09-80 Loc. 11.9	Room 17, infill immediately above terrazzo floor.

No.	Find Number	Plate/Fig.	Description	Context	Context Details
46	GT 05-000726		Body (?) sherd, decorated with a geometric pattern.	L09-77 Loc. 60.3	Infill of Building C.
47	GT 06-000010		Decorated fragment of a vessel.	L09-68 Loc. 23.1	Infill of Building D.
48	GT 06-000020		Decorated fragment of a vessel.	L09-07 Loc. 1.2	Plough horizon.
49	GT 07-000735		Decorated fragment of a vessel.	L09-98	Plough horizon.
50	GT 07-001221		Fragment of a vessel, with sawn edges.	L09-58 Loc. 3.7	Within stone collapse high in the area´s stratigraphy.
51	GT 07-001471		Decorated fragment of a vessel.	L09-68 Loc. 13.3	Infill of Building D.
52	GT-07-001622		Decorated fragment of a vessel.	L09-59 Loc. 1.1	Plough horizon.
53	GT 07-002936		Decorated fragment of a vessel.	L09-60 Loc. 1.1	Plough horizon.
54	GT 96-000634		Undecorated fragment of a vessel.	J08-83 Loc. 1.1	Plough horizon.
55	GT 96-001038		Undecorated fragment of a vessel.	surface find	no data
56	GT 02-22447	Plate 8.8	Rim sherd from a globular bowl, decorated with a geometric pattern and possibly with a snake; a groove with a v-shaped profile was deepened into the middle of the sherd.	surface find	no data
57	GT 96-001445		Decorated fragment of a vessel, burnt.	surface find	no data
58	GT 96-001489		Decorated fragment of a vessel, with groove.	L09-65 Loc. 4.1	High within the area´s stratigraphy.
59	GT 96-002097		Decorated fragment of a vessel, with groove, burnt.	surface find	no data
60	GT 96-002804		Fragment of a vessel, burnt.	surface find	no data
61	GT 97-003223		Fragment of a vessel.	surface find	no data
62	GT 98-000148		Fragment of a vessel.	surface find	no data
63	GT 98-000179		Fragment of a vessel.	surface find	no data
64	GT 98-000611		Fragment of a vessel.	L09-56 Loc. 2.1	Within stone collapse, high in the area´s stratigraphy.
65	GT 98-000680		Fragment of a vessel, decorated with a geometric pattern.	L09-76 Loc. 1.1	Plough horizon.
66	GT 98-001267		Rim sherd, with one sawn edge.	L10-51 Loc. 6.1	Room 6, upper part of infill.
67	GT 98-003401		Fragment of a vessel.	L09-80 Loc. 22.2	Within stone collapse, high in the area´s stratigraphy.
68	GT 98-004619		Decorated fragment of a vessel.	L09-80 Loc. 2.4	Within stone collapse, high in the area´s stratigraphy.

No.	Find Number	Plate/Fig.	Description	Context	Context Details
69	GT 99-000015		Decorated fragment of a vessel.	surface find	no data
70	GT 01-002448	Plate 7.8.2	Rim sherd of a vessel, decorated with a geometric pattern.	surface find	no data
71	GT 15-000274	Plate 7.4.3	Body sherd of a vessel, decorated with a thistle (?) and a geometric pattern (zig-zag line).	K10-13/23 Loc. 166.5	In a deep sounding, chronological position to be evaluated.
72	no number	Beile-Bohn et al. 1998, Fig. 26/2	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
73	no number	Beile-Bohn et al. 1998, Fig. 26/3	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
74	no number	Beile-Bohn et al. 1998, Fig. 26/4	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
75	GT 03-001801	Plate 7.6.2	Fragment of a vessel, decorated with a geometric pattern.	L9-68 Loc. 25.2	Infill of Building D, upper part.
76	GT 09-000153	Plate 7.7.2	Body sherd decorated with a geometric pattern and two grooves with v-shaped profiles, deepened into the middle and one side of the sherd.	L0-68 Loc. 333.1	Infill of Building D, middle part.
77	09	Plate 7.6.4	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
78	GT 01-004087	Plate 7.6.1	Fragment of a vessel, decorated with a geometric pattern.	surface find	no data
79	GT 01-004167	Plate 7.8.6	Rim sherd, possibly from a straight-sided bowl, with two straight sawn and one groove deepened into the middle of the sherd.	surface find	no data
80	GT 05-001774	Pl. 7.7.4	Fragment of a vessel, decorated with a geometric pattern.	L9-88 Loc. 25.2	Found during cleaning at the terrace wall.
81	GT 03-002201	Plate 7.9.9	Rim sherd, decorated with a geometric pattern, with numerous scratches on the inside.	L9-68 Loc. 16.3	Infill of Building D, upper part.
82	GT 09-000101	Plate 7.8.4	Rim sherd of a globular bowl, decorated with a geometric pattern.	surface find	no data
83	GT13.24	Uludağ 2017, 155	Rim sherd of a globular bowl with two holes, decorated with a geometric pattern.	L9-58 Loc. 205.1	In a deep sounding, chronological position to be evaluated.

Table 29: Limestone containers (n=411)

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
95_001029	5	6.5	3		S1	1	1
95_001140	10	9	3.2		S1	1	1
95_001283	10	8	3.3		surface	surface	surface
95_001778	12	8	3.2		S1	surface	surface
96_000008	6	4	2		S1	1	1
96_001078	20	20	3		L9-75	6	1
96_001079	16	12	3.2		L9-75	6	1
96_001138	8	7	3		L9-75	9	2
96_001250	12	9	7		J9-83	13	3
96_001744	5	5	2.1		surface	surface	surface
96_001967	12	12.5	3.2		L9-65	3	1
96_002367	6	6	3.2		L9-65	3	1
96_002550	8	4	3.1		L9-65	6	1
96_002597	15	10	5		J9-84	16	7
96_002648	25	15	4		J9-84	16	5
96_002649	17.5	17.5	2		J9-84	16	5
96_002677	5	6	3.2		L9-65	7	2
96_002680	15	13.5	3.1		L9-65	7	2
96_002894	9	11	2		L9-75	18	1
96_003001	20	15	3.5		L9-75	10	no data
96_003003	25	22	4.5		L9-75	10	no data
96_003004	40	40	7		L9-75	9	3
97_000021	12	16	6		L9-6575	surface	surface
97_000133	11	4	2		L9-75	29	1
97_000139	25	14	5		L9-75	22	no data
97_000176	17.5	10	2.5		L09-55	1	1
97_000179	8	9	2		L9-65/75	surface	surface
97_000182	25	10	5		L9-65/75	surface	surface
97_000192	12	12	3.2		L9-65	3	1
97_000267	4	4	1.2		surface	surface	surface
97_000268	5.5	3	2		L9-55	1	1
97_000293	3	4.5	1.2		L9-65	15	1
97_000331	14	15	3		L9-75	29	3
97_000521	13.5	10	4		L9-55	1	1
97_000578	8	7	1.2		surface	surface	surface
97_000581	22	20	4		L10-71	1	1
97_000596	5	9	1.2		surface	surface	surface
97_000704	6	8	2		L9-55	1	1
97_000739	24	15	4		L10-61	1	1
97_000743	16	12	3.9		L9-75	32	1
97_000744	25	20	5		L9-75	32	1
97_000774	8	8	2.3		L9-55	6	2
97_001055	24	16	4		L9-75	32	2
97_001149	7	5	1.2		L10-61	1	1
97_001150	13	9	2		L10-61	1	1
97_001219	24	16	4		L9-55	5	3
97_001374	20	7	6		surface	surface	surface
97_001685	22	15	3		L9-55	3	2
97_002411	12	9	2.1		L10-78	1	3
97_002581	8	6	2		L10-78	surface	surface
97_003226	7	6	1.1		surface	surface	surface
97_003451	17	14	6		L9-75	39	1
98_000104	12	9	2.3		surface	surface	surface
98_000107	24	10	3		surface	surface	surface
98_000118	18	9	3		L10-61	surface	surface

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
98_000178	4	4	1		surface	surface	surface
98_000205	18	9	2	25	surface	surface	surface
98_000209	8	8	3	150	surface	surface	surface
98_000216	10	7	2		surface	surface	surface
98_000659	15	9	2		L9-56	27	1
98_000841	24	14	4		L9-66	2	1
98_000942	8	7	3.5		L9-56	30	1
98_002457	25	17.5	3.2		L9-66	3	4
98_002657	9	6	2		L9-66	15	1
98_002665	18	15	3.3		L9-56	27	2
98_002666	10	10	2.4		L9-56	27	2
98_002668	12	10	3		L9-56	27	2
98_002866	6	6	3		surface	surface	surface
98_002885	6	5.5	2		L9-66	22	1
98_003154	7	4	3		L9-66	3	6
98_003394	9	10.5	3		L9-80	14	3
98_004309	8	10	2		L9-66	38	3
98_004349	10	12	2		L9-66	38	1
98_004630	10	8	2.5		L09-56	1	1
98_004631	12	16	2.9		L09-56	1	1
98_004634	16	11	2.3		surface	surface	surface
98_004643	21	12	4		surface	surface	surface
98_004647	16	7	3		surface	surface	surface
98_004661	18	13.5	3		surface	surface	surface
98_004668	18	15	3		surface	surface	surface
98_004676	11	11	3		surface	surface	surface
99_000012	15	10	3		surface	surface	surface
99_000070	2.5	4	1.5		L10-51	25	2
99_000154	8	12	4		L10-51	6	4
99_000211	15	10	3		L10-51	13	5
99_000291	13	12	4		surface	surface	surface
99_000292	14	10.8	6.4		surface	surface	surface
99_000326	16	11.4	5.5		surface	surface	surface
99_000393	21	11.7	6.5		L9-76	5	8
99_000398	13.4	10.2	2.3		L10-51	9	6
99_000455	142	11.7	6.8		L9-80	11	6
99_000456	13.7	11.5	4		L9-80	11	6
99_000504	9	10.5	3		L09-56	24	9
99_000559	20	18.2	7.6		L9-76	5	9
00_000001	7.8	7.2	3		L9-66	18	
00_000002	6.3	6.9	3.9		L9-66	46	2
00_000003	5.7	5.4	1.8		L9-66	46	2
00_000007	7.5	4.5	3.3		L9-66	48	8
00_000017	13	6	2.5		L9-66	40	2
00_000104	8.8	12.4	3		L9-76	39	no data
01_000123	9	10	3.2		L9-78	surface	surface
01_000124	12.4	10.8	8		L9-78	surface	surface
01_000183	14	3.2	2.1		L9-78	1	2
01_000237	20	21.6	1.2		L9-87	2	1
01_000286	13.6	11.5	2.9		L9-77	surface	surface
01_000390	8.9	6.6	2.3		L9-77	5	1
01_000393	12.3	10.9	5.9		L9-77	5	1
01_000464	8.5	10.1	4.2		L9-77	3	1
01_002024	12.7	12.7	4.5		L9-77	7	1
01_002031	10.6	7.6	3.7		L9-79	6	2
01_002056	13.1	10.4	3.4		L9-87	2	2
01_002072	15	19	3.7		L9-79	7	1
01_002094	9.2	7.1	3.3		L9-87	2	2

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
01_002230	9.8	12.8	3.7		L9-78	1	3
01_002274	8.6	10.7	3.7		L9-78	1	4
01_002317	17	10	5.6		L9-87	2	2
01_002325	8.7	7.2	3.8		L9-85	1	3
01_002388	9.5	11.1	4.8		L9-80	61	2
01_002427	9.9	10.5	3.4		L9-77	3	1
01_002428	9.3	13.8	4.6		L9-77	3	1
01_002436	5.6	8.2	3.8		L9-77	3	1
01_002460	14.5	5.5	3.3		L9-79	26	1
01_002574	13	9.5	3.4		L9-77	8	2
01_002587	3.4	5.6	3.3		L9-85	2	1
01_002686	11.6	8.9	5.1		L9-86	1	3
01_002703	12	12	3.6		L9-77	9	2
01_002802	18	7.5	3.3		L9-78	4	1
01_002854	18.4	5.2	3.2		L9-78	4	2
01_002878	21	12.5	9		L9-87	18	2
01_002900	15	7	3.1		L9-79	15	1
01_002909	17	8	3		L9-79	15	2
01_002924	18	21	7.5		L9-79	15	2
01_002972	14	11.5	8		L9-79	35	3
01_002973	14	9.5	2.2		L9-79	35	5
01_002977	14	8.5	8		L9-77	1	2
01_002989	15	16	5		L9-87	8	2
01_002997	8.3	9.6	4.1		L9-79	15	1
01_002998	13.7	10.2	4.9		L9-79	15	1
01_004017	5.6	3	3.4		L9-79	15	2
01_004133	13.2	15.5	9.6		L9-78	17	1
01_004136	7.1	13.2	4.2		L9-78	4	3
01_004138	15.5	15	8.7		L9-78	4	6
01_004161	14	13.6	4		L9-78	13	1
01_004175	10.5	8.4	3.6		L9-86	2	1
01_004430	15	13	5		L9-78	21	1
01_004443	4	5	1.2		L9-86	2	1
01_004571	28.5	15	4		L9-79	26	1
01_004587	15.5	4	3.3		L9-78	17	1
01_004595	22	13	6		L9-77	12	8
01_004700	15	16	5		L9-77	13	5
01_004840	16.5	22.5	9		L9-77	13	7
01_004856	19	15.5	7		L9-80	61	7
01_004889	21	11.5	6.5		L9-78	4	7
01_004916	15	16.5	3.3		L9-77	25	1
02_000012	15	17	5		L9-78	22	3
02_000023	12.3	13.8	4.5		L9-79	39	1
02_000326	15	15.4	7.6		L9-78	22	1
02_000348	18.5	15.5	8.5		L9-77	35	2
02_000349	12.4	8	5.1		L9-77	35	2
02_000350	19.5	18	10		L9-77	35	2
02_000353	14	12.5	6.1		L9-87	17	3
02_000354	21	13.5	9.9		L9-87	17	3
02_000355	14	15.5	7.7		L9-87	17	3
02_000421	17.2	10.6	6.5		L9-87	22	1
02_000475	11	7.3	4.7		L9-87	22	1
02_000478	24.5	15	8.6		L9-77	35	2
02_000612	14.2	10.4	4.9		L9-87	55	1
02_000689	15.3	11.2	4.6		L9-78	50	1
02_002172	15.3	9	6.2		L9-76	41	2
02_002737	16.5	15.5	6		L9-78	36	1
02_004055	12	6	5		L9-67	2	1

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
02_004056	16	9	6		L9-67	2	1
02_004067	11	11.5	4		L9-68	1	1
02_004215	18	15	6.5		L9-78	41	1
02_004269	12.8	6.5	4.8		L9-68	1	1
02_005418	11.8	10.8	5.3		L9-78	41	2
02_005422	13.1	11.9	7		L9-77	50	1
02_005773	11	9.9	4.7		L9-67	2	3
02_006258	18	13.3	4.8		L9-77	46	1
02_007496	12	12	3.8		L9-67	2	1
02_007497	18	15	5.5		L9-67	2	1
02_008002	12	12.3	4.8		surface	surface	surface
02_008012	17.4	10.5	7.1		L9-87	23	1
02_008173	10.7	7.3	4.5		L9-87	23	1
02_008658	15.7	10.4	6.6		L9-78	42	2
02_008667	17.4	9.7	8.2		L9-87	24	2
02_008668	16.8	13.5	5.3		L9-87	24	2
02_008687	15.7	9.5	4.2		L9-87	22	2
02_011576	9	9.3	3.1		L9-78	44	3
02_013935	11.2	7.7	4.5		L9-78	49	2
02_015618	7.7	6.5	2.1		L9-80	14	11
02_015854	11	10	5.4		L9-79	49	2
02_016176	16.4	14.6	9.8		L9-68	5	1
02_016177	18.5	17.2	7.2		L9-68	5	1
02_016821	14.1	11.3	5		L9-78	50	2
02_017668	14.3	10.8	6.5		L9-85	60	1
02_019507	10.4	12.2	4.3		L9-87	69	3
02_019651	20	18	5		L9-78	59	1
02_020062	11.4	10.8	7.8		L9-87	49	2
02_020358	22	13	8		L9-78	49	2
02_020575	7.1	7	2.9		L9-67	19	1
02_021055	10.5	8.5	5		L9-87	48	2
02_021202	8.8	10.8	10.5		L9-79	50	1
02_021399	13.3	10	7		L9-68	5	2
02_021854	15	11.3	3.6		L9-78	59	2
02_021855	17.4	9.4	5.5		L9-78	59	2
02_022048	20	12	6		L9-87	64	1
02_022460	8	5	1.2		surface	surface	surface
02_022720	12.5	9	5.5		L9-68	5	2
02_023017	13.3	9.4	5.1		L9-67	16	no data
02-000245	23	19	6		L9-79	28	1
03_000394	16	10.3	4.3		L9-67	55	surface
03_000395	14.3	12.9	6		L9-67	55	surface
03_000669	20	14	7.5		L9-67	55	surface
03_000901	9.2	9.6	3.2		L9-86	62	surface
03_001081	22	13	7		L9-86	62	2
05_000157	5.1	3.5	1.8		surface	surface	surface
05_000632	5.5	4.4	5.2		L9-79	62	1
05_000635	19	12.3	7.4		L9-79	62	1
05_001098	13.4	12.7	7.9		L9-68	21	4
05_001495	13	15.5	6		L9-64	surface	surface
05_001531	20.5	15.1	6.5		surface	surface	surface
05_002020	10	7.3	3.5		L9-88	14	5
05_002037	13.8	12.4	6.3		L9-88	14	4
05_002040	24	25	7.2		L9-88	14	5
05_002050	13.3	20	6.9		L9-95	1	1
05_003022	9.3	15.2	6.2		L9-68	8	1
05_003048	11.2	8.5	4.2		L9-89	18	2
05_003075	13.8	20	7.4		L9-97	17	4

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
05_004087	6.7	8.5	3.4		L9-88	16	2
05_005027	6.5	5.8	5		L9-95	2	1
05_005046	11.2	12.2	2.8		L9-89	12	3
05_005049	15.5	18	5.6		L9-96	3	6
05_005067	17	16.5	7.8		L9-68	8	4
05_005083	11.6	11.8	9		L9-95	3	1
06_000100	6	5	2		L9-57	17	no data
07_000050	1.9	1.9	0.8		L9-60	21	1
07_000086	12.9	9.4	6.5		L9-68	103	2
07_000088	10	6.5	3.8		L9-69	7	3
07_000121	16	11.5	8.8		L9-69	16	1
07_000128	17	9.5	3		L9-69	16	1
07_000132	11	8.4	3.2		L9-58	7	1
07_000178	17	14.7	5.7		L9-59	4	1
07_000259	13.4	9.8	4.5		L9-69	2	9
07_000287	13.5	10.6	5.8		L9-69	14	7
07_000576	18	8.2	5.6		L9-59	4	1
07_000590	15.5	9.7	6.3		L9-70	2	1
07_000597	20	8.1	8.7		L9-17	1	2
07_000722	16	9.4	5.6		L9-69	16	1
07_000790	12.5	10.2	5.8		L9-07	1	2
07_000925	10.5	4.9	4		L9-58	4	7
07_001036	11.8	8.2	4.2		L9-69	4	4
07_001059	15	14.4	4.4		L9-57	1	2
07_001126	23.5	12.5	4.5		L9-69	3	1
07_001137	12.3	16.5	4.3		L9-69	4	1
07_001139	14.1	9.2	4.4		L9-75	56	1
07_001178	10.3	16	8.4		L9-58	3	4
07_001187	13.8	8.6	3.8		L9-57	2	3
07_001516	14.2	10.1	3.6		L9-68	35	1
07_001517	10.4	9.4	3.3		L9-68	35	1
07_001521	19.5	17.5	7.6		L9-96	33	4
07_001526	9.1	6.9	3.8		L9-68	13	3
07_001547	14	10.3	3.9		L9-68	13	3
07_001575	13.9	9.7	3.9		L9-68	13	3
07_001669	11.5	9.9	7.3		L9-96	13	3
07_001679	14.4	9.5	4.1		L9-68	30	2
07_001684	5.1	3.6	3.2		L9-96	50	2
07_001809	13	12.9	5.6		L9-68	13	3
07_001859	5.5	4.8	3.8		L9-68	8	3
07_001867	15.1	14.8	5.4		L9-97	surface	surface
07_001868	3.5	3.6	2		surface	surface	surface
07_001877	12.8	11	2.8		L9-88	22	1
07_001998	17	12	10.8		L9-68	5	2
07_002092	17.8	13.3	4.9		L9-98	1	1
07_002203	18	10.3	5		L9-68	8	5
07_002260	13.6	12.9	12.4		L9-98	5	1
07_002276	8.7	6.3	4.7		L9-70	1	1
07_002413	5.5	9.1	4.5		L9-67	65	2
07_002414	13.5	13	7.3		L9-67	65	2
07_002470	9.4	6.6	4.7		L9-98	1	5
07_002479	10.1	13.9	4		L9-68	surface	surface
07_002535	8.2	5.8	7.5		L9-89	6	1
07_002539	13.4	5.4	5.6		L9-67	81	1
07_002816	13.2	7.3	4.9		L9-87	surface	surface
07_002819	11	13.5	4.6		L9-87	surface	surface
07_002820	26.7	17.5	11.3		L9-98	1	1
07_002821	20.6	20.3	6.5		L9-98	1	1

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
07_002822	16.4	15.1	4.9		L9-98	1	1
07_002824	12.2	16.7	7.8		L9-87	surface	surface
07_002825	11.5	10.4	5.1		L9-87	surface	surface
07_002856	6.8	3.8	2.8		L9-98	1	5
07_002949	20	11.5	5.2		L9-98	1	3
07_002964	14.5	14.5	4.8		L9-89	1	6
07_003035	12.9	8	5.9		L9-70	1	1
09_000146	15	12	5		L9-68	327	10
09_000148	8.5	7.3	5.8		K10-78	3	28
11_000499	2.7	2.2	1.4		L9-69	123	1
	17	16	5	1856	L9-78	1	1
	16	8	7	1880	L9-78	surface	surface
	19	23	5	1893	L9-87	5	
	16	5	10	1917	L9-79	7	1
	20	7	6	1936	L9-78	1	3
	13	13	5	1939	L9-77	1	3
	30	13	6	1944	L9-77	3	1
	27	17	6	1971	L9-78	1	2
	17	5	4	1984	L9-87	2	2
	12	18	5	1988	L9-77	3	1
	20	26	6	2000	L9-85	1	3
	14	16	3	2003	L9-85	1	4
	20	21	5	2004	L9-85	1	4
	18	30	7	2028	L9-87	6	
	14	23	7	2029	L9-87	6	
	18	18	4	2039	L9-87	2	2
	26	23	9	2046	L9-87	2	3
	15	12	4	2054	L9-85	1	4
	20	16	5	2065	L9-77	5	1
	15	12	5	2078	L9-78	1	4
	18	16	7	2080	L9-78	1	4
	23	28	6	2081	L9-78	1	4
	20	24	7	2096	L9-85	1	4
	28	17	5	2116	L9-87	2	3
	20	20	6	2732	L9-77	35	1
	41	17	8	2778	L9-68	1	1
	19	24	7	2779	L9-68	1	1
	22	18	9	2783	L9-87	23	1
	18	11	5	2792	L9-77	44	1
	15	18	5	2795	L9-86	22	2
	31	10	6	2838	L9-87	24	2
	20	15	7	2874	L9-87	24	2
	14	12	7	3080	surface	surface	surface
	11	20	7	3084	surface	surface	surface
	22	21	12	3106	L9-96	surface	surface
	15	20	6	3110	L9-68	18	3
	35	20	10	3112	L9-68	18	3
	22	15	6	3115	L9-68	9	
	24	20	6	3116	L9-68	21	2
	35	20	10	3191	surface	surface	surface
	38	24	6	3200	L9-95	surface	surface
	29	23	5	3210	L9-89	7	1
	15	23	8	5039	surface	surface	surface
	16	6	5	5046	surface	surface	surface
	23	10	4	6016	L9-69	surface	surface
	20	15	4.9	6017	L9-69	surface	surface
	21	13	4.5	6020	L9-07	surface	surface
	14	9	5	6021	L9-07	surface	surface

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
	20	18	5.5	6024	L9-68	104	5
	23	12	5.5	6026	L9-46	surface	surface
	12	10	4	6036	L9-68	surface	surface
	13	11	4	6037	L9-68	surface	surface
	10	12	4	6038	L9-68	surface	surface
	18	5	4.3	6041	L9-76	94	1
	14	12	3.4	6043	L9-70	1	3
	12	8	5.9	6054	L9-77	55	9
	20	13	5.5	6065	L9-58	4	11
	12	14	3.4	6066	L9-69	10	11
	16	15	5	6069	L9-76	80	3
	20	10	3	6070	L9-76	80	3
	15	15	5	6071	L9-76	80	3
	13	16	3.3	6072	L9-76	80	3
	15	15	3	6075	L9-76	80	3
	18	15	3.5	6076	L9-76	80	3
	15	16	3.5	6077	L9-76	80	3
	18	14	3.4	6078	L9-76	80	3
	14	12	2.2	6079	L9-58	4	12
	16	14	5	6080	L9-58	4	15
	10	10	5	6082	L9-58	4	15
	16	15	4	6087	L9-76	97	1
	12	14	3.2	6092	L9-76	87	1
	17	12	5.5	6096	L9-76	87	1
	13	11	4	6100	L9-76	87	1
	12	12	4.5	6101	L9-76	87	1
	16	14	5	6102	L9-76	87	1
	14	15	5.5	6105	L9-76	87	1
	14	8	2.3	6111	L9-76	82	1
	14	16	4.2	6112	L9-76	82	1
	6	5	5	6117	surface	surface	surface
	14	12	4.5	6118	surface	surface	surface
	12	14	5	6126	L9-69	16	1
	14	10	4	6127	L9-69	16	1
	17	13	5	6129	L9-69	16	1
	13	10	5.5	6131	L9-69	16	1
	28	25	8	8012	K9-87	9	3
	16	12	6	8221	L9-37	2	1
	17	15	5	8232	L9-58	34	
	18	15	6	8264	L9-69	25	2
	20	23	6	8375	L9-17	36	1
	15	18	6	8636	L9-27	30	4
	20	10	6	8984	surface	surface	surface
	16	10	3	9043	L9-68	302	5
	13	19	2	9044	L9-68	302	5
	8	7	5	9057	surface	surface	surface
	20	5	5	9058	surface	surface	surface
	14	8	5	9059	surface	surface	surface
	15	12	5.5	10_000198	L9-46	1	surface
	17	15	6	11_000098	L9-68	793	1
	19	10	12	11_000159	L9-88	47	7
	19.5	9.6	4.4	11_000183	L9-97	62	3
	33	38	20	11_000190	L9-78	114	2
	21	14	5	11_000204	L9-58	165	2
	27	18	10	11_000239	L9-78	116	3
	38.6	36	10	11_000283	L9-97	77	1
	19	15	7	11_000317	K10-35	1	5
	15	12	9	11_000319	K10-35	15	12

Find Nr.	Length	Width	Thickness	Stone Garden nr.	Area	Locus	Spit
	14	20	12	11_000321	K10-35	5	4
	16	16	6	11_000325	K10-24	1	6
	20	16	6	11_000344	K10-45	7	5
	15	12	8	11_000345	K10-24	3	surface
	18	17	6	11_000347	K10-24	3	surface
	18.1	14.8	5.7	12_000077	surface	surface	surface
	21.9	15.4	5.6	12_000078	surface	surface	surface
Mentioned in excavation reports but not seen.							
					K9-97	1	no data
					K9-97	3	no data
					K9-97	16	no data
					L9-07	1	no data
					L9-07	5	no data
					L9-07	9	2
					L9-07	36	no data
					L9-07	50	no data
					L9-17	1	no data
					L9-17	36	no data
					L9-17	46	no data
					L9-27	22	1
					L9-27	27	2
					L9-27	30	1
					L9-27	30	3
					L9-37	1	1
					L9-56	115	no data
					L9-56	49	no data
					L10-71	2	8
					L9-55	51	no data

Table 30: Platters (n=111)

Find nr.	Inventory nr.	Length	Width	Thickness	Stone Garden Nr.	Area	Locus	Spit
99_000596	99_000021	37	38	6		L9-56	149	surface
01_002066		18	13	2.8		L9-79	7	1
01_002159		13.7	12.3	4.5		L9-87	2	2
01_002200		15.4	15.5	6.4		L9-87	11	2
01_002410		15.2	7.1	5.1		L9-79	8	1
01_004185		3.6	6.4	2		L9-78	4	4
01_004782		8	3.8	4		L9-85	25	3
02_003073		20	12.4	3.6		surface	surface	surface
02_003469		16	10	4		L9-87	23	1
02_003809		9.4	2.6	2.1		L9-77	24	surface
02_005413		8	13	5		L9-68	1	1
02_005413		9.8	5.6	4.2		L9-68	1	1
02_011391		6.2	4	3.6		L9-79	44	3
02_012272		6	5	2		L9-67	2	1
02_012447		6	6	1.5		L9-79	45	2
02_013557		3	2.8	1.5		L9-87	35	1
02_013619		8	11	3		L9-87	46	1
02_013619		17.5	10.5	4.8		L9-87	46	1
02_016466		7.4	4.2	2.3		L9-80	14	10
02_016820		5.6	6.2	2.9		L9-78	50	2
02_020688		5.5	2	2.5		L9-67	13	3
02_000012		10	7	2		L9-78	22	3

Find nr.	Inventory nr.	Length	Width	Thickness	Stone Garden Nr.	Area	Locus	Spit
03_000888		15	10.1	4.6		L9-67	61	1
03_001080		11.6	8.3	2.6		L9-86	62	2
05_000429		5.2	3.8	4.6		L9-68	20	1
05_000696		15.1	8.7	6.4		L9-77	60	2
05_001246		16.5	16	6.5		L9-68	27	1
05_001459		8.5	9	6		L9-68	28	2
05_001467		10	14.5	6		L9-64	surface	surface
05_001476		8	18	8		L9-64	surface	surface
07_000256		10.4	8.3	7.4		L9-59	4	1
07_000292		18.4	11.3	7.9		L9-69	2	7
07_000346		14.1	12.6	5.4		L9-77	56	1
07_000566		5	4	0.4		K9-87	1	2
07_000628		12.3	8.6	5.1		L9-58	4	6
07_000735		3	3	1.5		L9-98		1
07_001013		5	4	3		L9-58	3	1
07_001066		3	3	1		L9-58	3	2
07_001086		10	10.2	4		L9-88	25	2
07_001087		11.2	11.6	3.9		L9-88	25	2
07_001100		14	12	5.1		L9-07	1	1
07_001544		18	9.7	6.8		L9-88	22	3
07_001556		5.5	4.9	2.7		L9-68	30	7
07_001617		10.3	6.6	6.3		L9-97	33	1
07_001658		20.5	15	7.4		L9-68	30	2
07_001690		7	5	4.5		L9-68	8	5
07_001691		8.6	9	4		L9-68	8	5
07_001708		13.8	8.6	9		L9-68	13	2
07_001714		10.8	14.6	4.8		L9-68	13	4
07_001781		11.2	7.5	3.8		L9-95	5	1
07_001910		13	16.5	10		L9-96	12	1
07_002061		20.4	13.3	6.6		L9-97	17	6
07_002101		6.5	4.5	3		L9-68	13	1
07_002163		7.5	7.5	5		L9-88	23	1
07_002363		15	13.5	4.4		L9-89	1	2
07_002380		7.8	7.5	3.1		L9-96	1	1
07_002444		7.4	4.1	4.8		L9-98	1	5
07_002805		10.8	7.5	4.1		L9-79	surface	surface
07_002814		7.5	9.6	6.6		L9-79	surface	surface
07_002815		16.7	18.5	5.9		L9-87	surface	surface
07_002832		13.7	10.4	4.2		L9-99	1	3
07_002919		4.5	8.5	5.1		L9-70	1	1
07_002949		16.5	10	10		L9-98	1	3
11_000172	11_000036	26	24	7		L9-67	89	surface
11_000173	11_000037	19	18	3.1		L9-67	90	surface
19_000008*		24.5	17.7	6.2		L9-78	93	no data
		13	20	6	1861	L9-87	1	2
		16	11	10	1872	L9-87	1	1
		22	20	13	1874	L9-87	1	1
		20	16	8	1924	L9-77	3	1
		16	17	6	1975	L9-85	1	3
		28	25	7	1983	L9-87	2	2
		24	20	8	1992	L9-85	1	4
		17	14	3	2058	L9-85	1	4
		16	17	12	2875	L9-87	24	2
		14	20	7	2888	L9-68	1	2
		14	15	5	2890	L9-68	1	2
		16	13	12	3083	L9-68	5	2
		26	26	7	5006	L9-97	39	1
		16	16	7	5009	L9-88	14	2

Find nr.	Inventory nr.	Length	Width	Thickness	Stone Garden Nr.	Area	Locus	Spit
		27	38	9	5024	L9-85	63	1
		27	16	14	5027	L9-89	10	2
		20	17	10	5028	L9-88	15	4
		12	20	8	8087	L9-07	5	2
		26	14	6	8098	L9-07	5	2
		16	20	10	8149	L9-27	15	surface
		14	10	8	8322	L9-27	17	3
		24	20	9	8348	L9-27	30	3
		28	20	12	8359	L9-27	33	1
		15	25	12	8380	L9-17	surface	surface
		29	17	10	10_000077	surface	surface	surface
		38	38	7	10_000298	L9-69	56	surface
		23	17	6.5	10_000449	K10-89	1	4
		33	15	7	10_000458	surface	surface	surface
		30	20	19	10_000495	K10-80	22	1
		19	14	6	10_000508	K10-80	5	1
		23	13	8.5	10_000515	surface	surface	surface
		26	16	8	10_000596	L9-77	312	surface
		13	6	9	11_000010	L9-79	9	1
		22.7	18.4	5.7	11_000113	L9-68	793	1
		17	14	6	11_000180	L9-88	40	1
		23	15	7	11_000244	L9-78	129	1
		15	13	10	11_000338	K10-35	1	6
		16	7	8	11_000343	K10-34	14	6
		16	14	14	11_000356	K10-25	49	no data
		21	6	13	13_000152	L9-97	84	4
		13	11	14	13_000169	L9-69	165	1
*mentioned in excavation reports but not seen.	L9-87	132	C					
	L9-87	135	C					
08_00067						L9-87	138	C
*still in situ						K9-87	61	F

Table 31a: Macroscopical description of handstone L13

Handstone / WU/Area	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
L13 WU1 E and M	Flat areas on T and H.	Not observed.	Slightly reflective on T and H. Loose.	Loose on the HT. Separated.	Breakage of the HT, on the corners (T and H)	Smooth.
L13 WU1 ME	Flat areas on T and H, small flat spots at F and S.	Not observed.	Dull.	Loose on the HT. Separated.	Breakage of the HT, on the corners (T and H).	Smooth and rough.
L13 WU1 C and CE	Sinuous and rugged areas predominate, some flat spots.	Not observed.	Dull	Loose on the HT Separated.	On the HT.	Smooth and rough.
L13 WU2-3 E and M	Small chains of flat plateaus on T and H.	Slightly visible Parallel and vertical on the edge (WM1).	Moderately reflective. Loose	Covering the HT Closed.	Breakage of the HT, on the corners (T and H).	Very smooth.

Handstone / WU/Area	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
L13 WU2-3 ME	Flat areas predominate, especially on T and H. Chains of plateaus are combined with sinuous topography.	Not observed.	Slightly reflective Loose.	Covering the HT Separated.	On the corners (HT and LT).	Smooth.
L13 WU2-3 C and CE	Sinuous and rugged areas predominate, some flat spots.	Not observed	Dull	Loose on the HT Separated.	Breakage of the HT, on the corners (T and H).	Smooth and rough.
L13 WU4-7; 8-31 E and M	Flat areas predominate, especially on H and T; long chains of plateaus (SF2).	Slightly visible Parallel and vertical on the edge (WM1).	Highly reflective Loose.	Covering the HT Closed.	On the corners (HT and LT).	Very smooth.
L13 WU4-7; 8-31 ME	Flat areas predominate, especially on H and T; long chains of plateaus (SF2).	Slightly visible	Highly reflective Loose	Covering the HT Separated	On the HT	Very smooth.
L13 WU4-7; 8-31 C and CE	Flat areas combined with sinuous and rugged areas, which predominate.	Not observed	Dull	Loose on the HT Separated	On the HT	Smooth and rough.

Table 31b: Microscopical description of handstone L13

Handstone/ WU/ Area	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
L13 WU1 P1 10x-20x	Flat regular <25% Sinuous Rugged (WM2).	Gouges <25% Long Loose Parallel and vertical on the edge, vertical on the corners (WM1).	Loose On the gouges Moderately reflective.	Covering the HT.	Pits Dislocated particles Fractures of the HT. <25%	Smooth.
L13 WU1 P1 40x-60x	Flat regular.	Striations <50% Long Loose Parallel and erratic.	Concentrated on the striations Moderate to highly reflective.	Covering the HT.	Pits. <25%.	Smooth.
L13 WU1 P1 80x-100x	Flat regular.	Striations and gouges <75% Loose.	Covering Moderate to highly reflective.	Covering.	Pits <25%.	Not measured.
L13 WU2-3 P1 10x-20x	Flat regular <50%.	Gouges <25% Loose Long, short parallel and vertical on the edge, vertical on the corners Erratic.	Concentrated On the gouges Moderately reflective.	Covering the HAT.	Pits Dislocated particles <25%.	Very smooth.
L13 WU2-3 P1 40x-60x	Flat regular.	Striations <75% Long Covering Parallel and erratic.	Concentrate on the striations and loose on the HT Moderate to highly reflective.	Covering.	Pits <25%.	Very smooth.

Handstone/ WU/ Area	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
L13 WU2-3 P1 80x-100x	Flat regular.	Striations and gouges <75%.	Covering Moderate to highly reflective.	Covering.	Pits <25%.	Very smooth.
L13 WU4-7; 8-31 P1 10x-20x	Flat regular <75% Rugged (breakage).	Gouges and pits <50% Covering Parallel and vertical on the edge, vertical on the corners Erratic.	Loose On the gouges and on the HT Moderately and highly reflective	Covering.	Pits Dislocated particles <25%.	Very smooth.
L13 WU4-7; 8-31 P1 40x-60x	Flat regular.	Striations Long Covering Parallel and erratic.	Loose On the gouges and on the HT Moderately and highly reflective.	Covering.	Pits<25%.	Very smooth.
L13 WU4-7; 8-31 P1 80x-100x	Flat regular.	Striations and gouges Covering.	Covering Moderate to highly reflective.	Covering.	Pits <25%.	Not measured
L13 WU1 P3 10x-20x	Flat regular <25% Sinuous Rugged.	Gouges <25% Loose Short Erratic.	Loose On the gouges Moderate reflective.	Loose on the HT.	Pits Dislocated particles Fractures of the HT <25%.	Smooth Rough.
L13 WU1 P3 40x-60x	Flat irregular Sinuous.	Gouges <25%.	Loose on the HT.	Loose on the HT.	Dislocated particles Fractures of the HT <25%.	Smooth Rough.
L13 WU1 P3 80x-100x	Sinuous irregular Rugged.	Not observed.	Loose on the HT and LT.	Loose on the HAT.	Dislocated particles <25%.	Not measured.
L13 WU2-3 P3 10x-20x	Flat Regular <25% Sinuous Rugged.	Gouges <25% Loose Short Erratic.	Loose on the gouges Moderate reflective.	Loose on the HT.	Dislocated particles Fractures of the HT.	Smooth Rough.
L13 WU2-3 P3 40x-60x	Flat irregular Sinuous.	Not observed.	Loose on the HT.	Loose on the HT	Pits Dislocated particles Fractures of the HT <25%.	Smooth Rough.
L13 WU2-3 P3 80x-100x	Sinuous irregular Rugged.	Not observed.	Loose on the HT and LT.	Loose on the HT.	Pits <25%.	Not measured.
L13 WU4-7; 8-31 P3 10x-20x	Flat regular <25% Sinuous Rugged.	Gouges <25% Loose Short Erratic.	Loose On the gouges Moderate reflective.	Loose on the HT.	Pits Dislocated particles Fractures of the HT.	Smooth Rough.
L13 WU4-7; 8-31 P3 40x-60x	Flat irregular Sinuous.	Not observed.	Loose on the HT Moderate reflective.	Loose on the HT.	Pits Dislocated particles Fractures of the HT.	Smooth Rough.
L13 WU4-7; 8-31 P3 80x-100x	Sinuous irregular Rugged.	Not observed.	Loose on the HT and LT.	Loose on the HT.	Not observed.	Not measured.

Table 31c: Macroscopical description of handstone L10

Handstone /WU /Area	Topography	Linear traces	Polish	Levelling	Fractures	Tactile investigations
L10 M and ME WU1-28; 29-60	Flat topography: chains of plateaus and sinuous topography (single peaks). Rugged profile in F and S, sinuous and rugged in T and H (single peaks), chains are not connected and are spread radially. The profiles become flatter after 60WU in 10-11, 7-8 and 9.	Not observable.	Slightly reflective (WU 1-28), high reflective in 10-11 (WU60).	Loose on the HT (1-28) than connected in chains and covering the HT in F.	Fractures of the HT between 29-60WU.	Very smooth on the chains in F, smooth on the remaining chains, smooth and rough on the remaining area.
L10 E WU1-28; 29-60	Rugged.	Not observable.	Not observable.	Not observable.	Not observable.	Rough.
L10 C and CE WU1-28; 29-60	The flattening evolves radially around the center; it is pronounced in 10, 11, 7, 8 and 4. Flat topography: chains of plateaus, and sinuous topography (single peaks).	Not observable	Medium reflective on the HT.	Loose on the HT (1-28) then connected in small chains radially around C.	Fractures of the HT between 29-60WU.	Smooth to very smooth on the flattened area, rough and smooth on the rest of the surface.
L10 T WU1-28; 29-60	Mixture between sinuous (single peaks) and rugged after 60WU. Small loose flat plateaus; no difference between C and M.	Not observable	Dull; slightly reflective after 60WU.	Loose, separated, on single peaks on the HT; no connected areas after 60WU.	Not observed.	Smooth on single peaks, and rough.
L10 H WU1-28; 29-60	Mixture between sinuous (single peaks) and rugged after 60WU. One small chain of flat plateaus at 4 in C and CE.	Not observable	Dull	Connected on the chain, loosely separated on single peaks after 60WU.	Not observed.	Smooth on the chain and on single peaks, and rough.
L10 S WU1-28; 29-60	Mixture between sinuous on the HT and rugged in the LT; chains in C and CE and on M at 6-7 and 8.	Not observable	Slightly reflective, then moderate reflective on the chains.	Connected on the chains, loose, separated on single peaks.	Not observed.	Smooth on chains and single peaks and rough.
L10 F WU1-28; 29-60	Four chains of flat plateaus at 9, 10-11 and 12 on M-CE. Flat and sinuous topography predominates.	Not observable	Slightly reflective, then high reflective on the chains.	Connected on the chains, flat spots between the chains. Loose, separated on single peaks.	Not observed.	Very smooth on chains. Smooth and rough in the LT.

Table 31d: Microscopical description of handstone L10

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU1-4 P3 10x-20x	Flat irregular. Sinuous irregular.	Gouges <50%. Long. Short. Erratic.	Loose, moderately reflective on the HT.	Covering the HT.	Pits.	Smooth.
L10 WU1-4 P3 40x-60x	Flat irregular. Sinuous irregular.	Gouges<70%. Erratic.	Loose, moderately reflective on the HT.	Loose on the HT.	Pits.	Smooth.
L10 WU1-4 P3 80x-100x	Flat, Sinuous (HT), uneven (LT), regular and irregular.	Gouges.	Loose, moderately reflective on the HT.	Loose on the HT.	Pits.	Not measured.
L10 WU1-4 P4 10x-20x	Sinuous irregular.	Gouges. Short. Erratic.	Loose, moderately reflective on the HT.	Loose on the HT.	Pits.	Smooth.
L10 WU1-4 P4 40x-60x	Sinuous irregular.	Gouges.	Loose, moderately reflective on the HT.	Loose on the HT.	Pits.	Smooth.
L10 WU1-4 P4 80x-100x	Sinuous irregular Rugged	Gouges.	Loose, moderately reflective on the HT.	Loose on the HT.	Cracks	Not measured.
L10 WU1-4 P1 10x-20x	Sinuous irregular. Rugged.	Gouges.	Loose, moderately reflective on the HT.	Loose on the HT.	Pits	Smooth.
L10 WU1-4 P1 40x-60x	Flat irregular. Uneven irregular.	Not observed.	Concentrated. Moderately reflective on the HT.	Loose on the HT.	Pits.	Smooth.
L10 WU1-4 P1 80x-100x	Flat irregular (dirt layer); uneven (original surface, HT and LT)	Gouges. Erratic.	Loose, moderately nn the HT.	Loose on the HT	Pits.	Not measured.
L10 WU1-4 P2 10x-20x	Sinuous irregular. Rugged irregular.	Not observed.	Loose, moderately nn the HT.	Loose on the HT.	Pits.	Smooth and rough.
L10 WU1-4 P2 40x-60x	Sinuous irregular, Rugged irregular.	Gouges. Erratic.	Loose, moderately nn the HT.	Loose on the HT.	Pits.	Smooth and rough.
L10 WU1-4 P2 80x-100x	Sinous irregular. Rugged irregular.	Gouges. Erratic.	Loose, moderately On the HT.	Loose on the HT	Not observed.	Not measured.
L10 WU5-12 P3 10x-20x	Flat regular. Sinuous irregular.	Striations. Long. Transverse and erratic. Gouges. Short. Transverse and erratic.	Loose, moderately reflective.	Covering the HT	Pits.	Smooth.
L10 WU5-12 P3 40x-60x	Flat regular.	Polish bands. Transverse and curved loose.	High reflective on the bands; moderately reflective on the HT	Covering the HT.	Pits.	Smooth.
L10 WU5-12 P3 80x-100x	Flat regular.	Polish bands and gouges. Transverse and curved loose.	High reflective on the bands; moderately reflective on the HT.	Covering the HT.	Pits.	Smooth.

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU5-12 P4 10x-20x	Flat regular. Sinuous irregular.	Striations. Short. Erratic. Gouges. Short. Erratic, transverse polish bands.	Loose on the HT, high reflective.	Covering the HT.	Pits.	Smooth.
L10 WU5-12 P4 40x-60x	Flat regular.	Gouges. Short, long. Erratic, transverse polish bands.	Concentrated on the HT, high reflective.	Covering the HT.	Pits.	Smooth.
L10 WU5-12 P4 80x-100x.	Flat regular.	Polish bands transverse.	Polish bands on the HT and in the LT, concentrated, high reflective.	Covering the HT.	Pits.	Smooth.
L10 WU5-12 P2 10x-20x.	Sinuous irregular. Rugged irregular.	Not observed.	Dull and slightly reflective	Loose on the HT.	Pits.	Smooth and rough.
L10 WU5-12 P2 40x-60x	Sinuous irregular. Rugged irregular.	Not observed.	Very small polish zones, white and slightly reflective on the HT.	Concentrated on the HT.	Not observed.	Smooth.
L10 WU5-12 P2 80x-100x.	Sinuous irregular. Rugged irregular.	Short gouges on the HT.	Very small polish zones, white and slightly reflective on the HAT.	Concentrated on the HT.	Not observed.	Not measured.
L10 WU5-12 P1 10x-20x	Flat irregular. Sinuous irregular. Rugged irregular.	Short gouges on the HT.	Very small polish zones, white and slightly reflective on the HT consisting of organic rests.	Concentrated on the HT.	Pits.	Smooth and rough
L10 WU5-12 P1 40x-60x	Flat irregular. Sinuous irregular. Rugged irregular.	Short gouges on the HT.	Very small polish zones, white and slightly reflective on the HT consisting of organic rests.	Concentrated on the HT.	Pits.	Smooth and rough.
L10 WU5-12 P1 80x-100x	Flat irregular. Sinuous irregular. Rugged irregular.	Not observed.	Very small polish zones, white and slightly reflective on the HT.	Covering.	Not observed.	Not measured.
L10 WU13-28, 29-60 P3 10x-20x	Flat regular.	Striations. Curved. Loose, connected. Gouges. Short. Erratic.	Slightly reflective, concentrated on the HT as curved polish bands and dull.	Covering the HT.	Pits.	Smooth.
L10 WU13-28, 29-60 P3 40x-60x	Flat regular.	Striations. Curved. Parallel, connected.	Slightly reflective, concentrated on the HT as curved polish bands and dull.	Covering the HT.	Pits.	Smooth

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU13-28, 29-60 P3 80x-100x	Flat regular.	Not observed.	Closed, curved, small and narrow polish bands on the HT.	Covering the HT.	Fractures, loose particles.	Not measured.
L10 WU13-28, 29-60 P5 pl1 10x-20x	Flat regular.	Striations, Connected, loose. Curved. Gouges. Short.	Moderately reflective, connected and covering HT; short erratic polish bands.	Connected, covering the HT.	Loose particles.	Very smooth
L10 WU13-28, 29-60 P5 pe1 10x-20x	Flat regular on top, sinuous irregular and rough on other highs; rough on the slopes.	Not observed.	Loose closed, slightly reflective.	Loose connected.	Not observed.	Smooth and rough.
L10 WU13-28, 29-60 P5 pl1 40x-60x	Flat regular.	Striations. Curved. Connected and loose . Polish striations. Curved. Gouges. Short.	Loose connected, slightly reflective.	Connected, covering the HT.	Grooves and pits <25%.	Very smooth
L10 WU13-28, 29-60 P5 pe1 40x-60x	Flat and sinuous irregular on the highest point and rough on the slopes.	Striations. Curved. Loose.	Circular polish bands around the highest point of displaced shiny particles.	Concentrated on the HT. Separated.	Breakage Parallel, concentrated.	Smooth and rough
L10 WU13-28, 29-60 P5 V4 40x-60x	Rugged irregular (natural lamellar structure).	Not observed.	Not observed.	Not observed.	Not observed.	Rough.
L10 WU13-28, 29-60 P5 V3 40x-60x	Rugged irregular.	Not observed.	Concentrated, moderately reflective, concentrated on the border.	Not observed.	Not observed.	Rough.
L10 WU13-28, 29-60 P5 V1 40x-60x	The valley is filled with hard organic rests. Its margins are rugged irregular.	Not observed.	Not observed.	Not observed.	Not observed.	Not observed.
L10 WU13-28, 29-60 P5 80x-100x	Flat regular. Rugged irregular.	Striations. Connected, loose. Curved.	Moderately reflective, connected, covering the HT.	Covering, connected.	Displaced particles covering the HT.	Very smooth.
L10 WU13-28, 29-60 P5 pe1 80x-100x	Flat regular on top, sinuous irregular and rough on other highs; rough on the slopes.	Striations. Short.	Loose on the HT. Moderately reflective.	Concentrated on the HT.	Displaced particles covering the HT.	Not measured.
L10 WU13-28, 29-60 P4 pl1 10x-20x	Flat regular. Sinuous irregular.	Striations. Long.	Polished bands of displaced particles. Curved. Moderately reflective.	Covering, connected.	Displaced particles on the HT.	Very smooth.
L10 WU13-28, 29-60 P4 pl1 40x-60x	Flat regular. Sinuous irregular.	Not observed.	Polished bands of displaced particles. Curved. Moderately reflective.	Covering, connected.	Displaced particles on the HT.	Very smooth.

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU13-28, 29-60 P4 pl1 80x-100x	Flat regular. Rugged irregular.	Striations. Curved.	Polished bands of displaced particles. Curved and straight. Moderately reflective.	Loose.	Displaced particles covering the HT.	Not measured.
L10 WU13-28, 29-60 P4 pl2 10x-20x	Flat regular. Rugged irregular.	Striations. Short. Curved.	Polished bands of displaced particles. Curved and straight. Moderately reflective.	Loose.	Displaced particles covering the HT.	Very smooth.
L10 WU13-28, 29-60 P4 pl2 40x-60x	Flat regular. Rugged irregular.	Striations. Short. Curved.	Polished bands of displaced particles. Curved and straight. Moderately reflective.	Loose.	Displaced particles covering the HT.	Very smooth.
L10 WU13-28, 29-60 P4 pl2 80x-100x	Flat regular. Rugged irregular.	Not observed.	Not observed.	Not observed.	Not observed.	Not measured.
L10 WU13-28, 29-60 P4 V3 10x-20x	Rugged irregular.	Not observed.	Not observed.	Not observed.	Not observed.	Not measured.
L10 WU13-28, 29-60 P4 pl3 10x-20x	Flat regular. Rugged irregular.	Striations. Straigh.t Loose, connected.	In the striations and loose on the HT. High and moderately reflective.	Covering the HT.	Displaced particles.	Very smooth.
L10 WU13-28, 29-60 P4 pl3 40x-60x	Flat regular. Rugged irregular.	Striations. Gouges. Straight, circular.	In the striations and loose on the HT. High and moderately reflective	Covering the HT.	Displaced particles.	Very smooth.
L10 WU13-28, 29-60 P4 pl3 80x-100x	Flat regular. Rugged irregular.	Striations. Gouges. Straight, circular.	In the striations and loose on the HT. High and moderately reflective.	Covering the HT.	Displaced particles.	Not measured.
L10 WU13-28, 29-60 P4 Pe1 10x-20x	Sinuous irregular.	Gouges. Short. Erratic.	Not observed.	Loose, separated on the HT.	Displaced particles, loose.	Smooth and rough.
L10 WU13-28, 29-60 P4 Pe1 40x-60x	Sinuous irregular with a small flat plateau on top.	Not observed.	Not observed.	Concentrated on the top.	Displaced particles covering irregular.	Smooth.
L10 WU13-28, 29-60 P4 Pe1 80x-100x	Sinuous irregular with a small flat plateau on top.	Not observed.	Not observed.	Concentrated on the top.	Displaced particles covering irregular	Not measured.
L10 WU13-28, 29-60 P4 pe2 10x-20x	Sinuous irregular.	Not observed.	Not observed.	Loose separated on the HT.	Displaced particles, loose	Smooth and rough.
L10 WU13-28, 29-60 P4 pe2 40x-60x	Sinuous irregular with a small flat plateau on top.	Not observed.	Not observed.	Concentrated on the top.	Displaced particles covering irregular	Smooth.

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU13-28, 29-60 P4 pe2 80x-100x	Sinuous irregular with a small flat plateau on top.	Not observed.	Not observed.	Concentrated on the top.	Displaced particles covering irregular.	Not measured.
L10 WU13-28, 29-60 P6 pl1 10x-20x	Sinuous regular and flat.	Polished bands. Straight and curved. Erratic, network. Gouges. Erratic.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Covering the HT.	Displaced particles.	Very smooth.
L10 WU13-28, 29-60 P6 pl1 40x-60x	Sinuous regular. Flat regular.	Polished bands. Straight and curved. Erratic, network. Gouges. Erratic.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Covering the HT.	Displaced particles.	Very smooth.
L10 WU13-28, 29-60 P6 pl1 80x-100x	Sinuous regular. Flat regular.	Polished bands. Straight and curved.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Covering the HT.	Displaced particles.	Not measured.
L10 WU13-28, 29-60 P6 pe1 10x-20x	Sinuous irregular with small flat plateaus on top.	Not observed.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Loose, concentrated on the top.	Not observed.	Smooth.
L10 WU13-28, 29-60 P6 pe1 40x-60x	Sinuous irregular with small flat plateaus on top.	Gouges. Short. Straight, curved.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Loose, concentrated on the top.	Displaced particles.	Smooth.
L10 WU13-28, 29-60 P6pe1 80x-100x	Sinuous irregular and rough.	Gouges Straight, curved.	Polish loose, connected, concentrated on the HT. Moderately reflective.	Loose, concentrated on the top.	Displaced particles.	Not measured.
L10 WU13-28, 29-60 P6 pe2 10x-20x	Sinuous irregular with small flat plateaus on top.	Gouges. Erratic. Straight, curved. Polish bands.	Polish loose, connected, on top and on the margins. Moderately reflective.	Loose, concentrated on the top.	Displaced particles.	Smooth.
L10 WU13-28, 29-60 P6 pe2 40x-60x	Sinuous irregular with small flat plateaus on top.	Gouges. Network. Polish bands. Striations. Erratic. Curved.	Polish loose, connected, on top and on the margins towards LT.	Loose, concentrated on the top.	Displaced particles.	Smooth.
L10 WU13-28, 29-60 P6 pe2 80x-100x	Sinuous regular and small flat spots on top.	Gouges. Network. Polish bands. Striations. Erratic. Curved.	Polish loose, connected, on top and on the margins towards LT. Moderately reflective.	Loose, concentrated on the top of the peak.	Displaced particles.	Not measured.

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 WU13-28, 29-60 P7 pe1 10x-20x	Sinuous irregular.	Gouges. Straight, curved. Erratic, transverse on the corner. Striations, connected.	Polish loose, connected on top. Moderately reflective.	Loose.	Displaced particles.	Smooth.
L10 WU13-28, 29-60 P7 pe1 40x-60x	Sinuous irregular.	Gouges. Long. Erratic, loose. Striations (on the lamellar structure).	Polish loose, connected on top. Moderately reflective.	Loose.	Displaced particles.	Smooth.
L10 WU13-28, 29-60 P7 pe1 80x-100x	Sinuous irregular.	Gouges. Long, curved. Erratic, loose. Striations (on the lamellar structure).	Polish loose, connected on top. Moderately reflective.	Loose.	Displaced particles.	Not measured.
L10 WU13-28, 29-60 P12 pe1+pe2 10x-20x	Flat irregular. Sinuous irregular.	Gouges Short, curved and straight. Erratic, loose. Polish bands. Network.	Network of polish bands. Moderately reflective.	Covering the HT.	Displaced particles loose and concentrated on the margins. Breakage.	Smooth.
L10 WU13-28, 29-60 P12 pe1+pe2 40x-60x	Flat irregular. Sinuous irregular. Rugged irregular.	Gouges. Long, curved. Loose.	Network of polish bands. Moderately reflective.	Covering the HT	Displaced particles loose and concentrated on the margins. Breakage.	Smooth
L10 WU13-28, 29-60 P12 pe1+pe2 80x-100x	Flat regular on top. Flat irregular and sinuous on the margins.	Not observed.	Polish spots, loose. High and moderately reflective.	Covering the HT.	Displaced particles.	Not measured.
L10 WU13-28, 29-60 P12 pe3 10x-20x	Rugged regular. Flat irregular.	Striations. Long, curved. Loose.	Not observed.	Loose on the margins.	Displaced particles.	Rough and smooth.
L10 WU13-28, 29-60 P12pe3 40x-60x	Flat regular and irregular. Sinuous irregular. Rugged.	Not observed.	Polish spots, loose. High reflective.	Irregular on the HT.	Displaced particles loose on the entire surface	Rough and smooth.
L10 WU13-28, 29-60 P12 pe3 80x-100x	Sinuous irregular.	Not observed.	Polish spots, loose. High reflective.	Irregular on the HT.	Not observed.	Not measured.
L10 WU13-28, 29-60 P12 pe4 10x-20x	Rugged regular.	Not observed	Loose, moderaltely reflective and dull.	Loose.	Displaced particles, loose, covering and breakage.	Rough and smooth.
L10 WU13-28, 29-60 P12 pe4 40x-60x	Rugged regular.	Not observed	Loose, moderaltely reflective and dull.	Loose.	Breakage.	Rough and smooth
L10 WU13-28, 29-60 P12 pe4 80x-100x	Rugged regular.	Not observed	Loose, moderately reflective.	Loose.	Dislocated particles, erratic covering.	Not measured.
L10 P8 pe1 10x-20x	Flat regular and irregular.	Gouges. Long. Erratic.	Loose, covering, dull to moderately reflective.	Loose and connected, covering.	Dislocated particles erratic covering.	Smooth

Handstone	Topography (WM2)	Linear traces	Polish	Levelling	Fractures/ Loose particles	Tactile investigations
L10 P8 pe1 40x-60x	Flat irregular.	Not observed.	Loose, covering, dull to moderately reflective.	Loose.	Dislocated particles erratic covering.	Smooth.
L10 P8 pe1 80x-100x	Flat irregular.	Not observed.	Loose, moderately reflective.	Loose.	Dislocated particles erratic covering.	Not measured.
L10 P8 pe2 10x-20x	Flat irregular.	Not observed.	Loose and connected, covering, dull to moderately reflective.	Loose and connected, covering	Discolated particles, erratic covering.	Smooth.
L10 P1 pe1 10x-20x	Sinuous irregular. Rugged irregular. Flat irregular.	Not observed.	Dull.	Loose.	Breakage.	Smooth and rough.
L10 P1 pe1 40x-60x	Sinuous irregular. Rugged irregular. Flat irregular.	Striations, erratic.	Dull.	Loose, separated	Breakage	Smooth and rough.
L10 P1 pe1 80x-100x	Mixture between sinuous irregular and uneven with some flat spots on top.	Curved schratches <25%.	Dull.	Loose, separated.	Unleveled HT oder breakage.	Not measured.

Bibliography

Abbo, S., A. Gopher, and S. Lev-Yadun 2017. The domestication of crop plants, in B. Thomas, G.G. Murray and D.J. Murphy (eds.), *Encyclopedia of applied plant sciences* (vol. 3): 50-54. Waltham MA: Academic Press.

Abraira, V.E. and D.D. Ginty 2013. The sensory neurons of touch. *Neuron* 79: 618-639.

Adams, J.L. 1988. Use-wear analysis of handstones used to grind corn and process hides. *Journal of Field Archaeology* 15: 307-315.

Adams, J.L. 1989. Methods for improving ground stone analysis: experiments in mano wear patterns, in D. Amick and R. Maudlin (eds.), *Experiments in Lithic Technology* (BAR International Series 528): 259-276. Oxford: British Archaeological Reports.

Adams, J.L. 1999. Refocusing the role of food-grinding tools as correlates for subsistence strategies in the US Southwest. *American Antiquity* 64: 475-498.

Adams, J.L. 2002. *Ground stone analysis: a technological approach*. Salt Lake City: The University of Utah Press.

Adams, J.L. 2014. Ground stone use-wear analysis: a review of terminology and experimental methods. *Journal of Archaeological Science* 48: 129-138.

Adams, J.L., S. Delgado, L. Dubreuil, C. Hamon, H. Plisson and R. Risch 2009. Functional analysis of macro-lithic artifacts, in F Sternke, L. J. Costa, and L. Eigeland (eds.), *Non-flint raw material use in prehistory: old prejudices and new directions*: 43-66. Oxford: Archaeopress.

Akkermans, P.M.M.G. 2004. Hunter-gatherer continuity: the transition from the Epipalaeolithic to the Neolithic in Syria, in O. Aurenche, M. Le Mière, P. Sanlaville (eds.) *From the river to the sea - the Palaeolithic and Neolithic on the Euphrates and in the Northern Levant: Studies in Honour of Lorraine Copeland* (BAR International Series 1263): 281-293. Oxford: Archaeopress.

Appadurai, A. 1998. *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press.

Arranz-Otaegui, A., S. Colledge, L. Zapata, L.C. Teira-Mayolini and J.J. Ibañez 2016. Regional diversity on the timing for the initial appearance of cereal cultivation and domestication in southwest Asia. *Proceedings of the National Academy of Sciences of the United States of America* 113(49): 14001-14006.

Arranz-Otaegui, A., L. Gónzales-Carretero, M.N. Ramsey, D.Q. Fuller and T. Richter 2018. Archaeobotanical evidence reveals the origins of bread 14,400 years ago in northeastern Jordan. *Proceedings of the National Academy of Sciences of the United States of America* 115(31): 7925-7930.

Asouti, E. and D. Q. Fuller 2013. A contextual approach to the emergence of agriculture in southwest Asia. *Current Anthropology* 54: 299-345.

Atalay, S. and C. Hastorf 2006. Food, meals, and daily Activities: food habitus at Neolithic Çatalhöyük. *American Antiquity* 71: 283-319.

Aurenche, O. and S.K. Kozłowski 1999. *La naissance du Néolithique au Proche-Orient*. Paris: Biblis.

Bar-Yosef, O. and A. Belfer-Cohen 1989 The Origins of Sedentism and Farming Communities in the Levant. *Journal of World Prehistory* 3(4): 447-498.

Bar-Yosef, O. and R.H. Meadow 1995. Origins of agriculture in the Near East, in T.D Price and A.B. Gebauer (eds) *Last hunters, first farmers*: 39-94. Santa Fe, New Mexico: School of American Research Press.

Bartl, K. 2004. Vorratshaltung. *Die spätepipaläolithische und frühneolithische Entwicklung im westlichen Vorderasien*. Berlin: ex oriente.

Becker, N., O. Dietrich, T. Götzelt, Ç. Köksal-Schmidt, J. Notroff and K. Schmidt 2012. Materialien zur Deutung der zentralen Pfeilerpaare des Göbekli Tepe und weiterer Orte des obermesopotamischen Frühneolithikums. *Zeitschrift für Orient-Archäologie* 5: 14-43.

Beile-Bohn, M., Ch. Gerber, M. Morsch and K. Schmidt 1998. Neolithische Forschungen in Obermesopotamien. Gürcütepe und Göbekli Tepe, *Istanbuler Mitteilungen* 48: 5-78.

Benedict, P. 1980. Survey Work in Southeastern Anatolia, in: H. Çambel and R. J. Braidwood (eds.), İstanbul *ve Chicago* Üniversiteleri *karma projesi güneydoğu anadolu tarihöncesi araştırmaları – The Joint Istanbul – Chicago Universities Prehistoric Research in Southeastern Anatolia*: 150-191. Istanbul: Edebiyat Fakültesi Basımevi.

Benz, M. 2017, Changing medialities. Symbols of Neolithic corporate identities, in M Benz,– H.G.K. Gebel and T. Watkins (eds.) *Neolithic Corporate Identities* (Studies in Early Near Eastern Production, Subsistence, and Environment 20): 135-156. Berlin): ex oriente

Benz, M. and J. Bauer 2013. Symbols of power – symbols of crisis? A psycho-social approach to Early Neolithic symbol system. *Neo-Lithics* 2/13: 11-24

Benz M., K. Deckers, C. Rössner, A. Alexandrovskiy, K. Pustovoytov, M. Scheeres, M. Fecher, A. Coşkun, S. Riehl, K. Alt, V. Özkaya 2015. Prelude to village life. Environmental data and building traditions of the Epipalaeolithic settlement at Körtik Tepe, Southeastern Turkey. *Paléorient* 41 (2): 9-30.

Benz, M., K. Alt, Y. Erdal, F. Şahin and V. Özkaya 2017. Re-presenting the past. Evidence from daily practices and rituals at Körtik Tepe, in I. Hodder (ed.), *Religion, history and place in the origin of settled life*: 137-161. Boulder: University Press of Colorado.

Bickle, P. 2020. Thinking Gender Differently: New Approaches to Identity Difference in the Central European Neolithic. *Cambridge Archaeological Journal*, 30(2): 201-218.

Bofill, M. 2012. Quantitative analysis of use-wear patterns: a functional approach to study grinding stone tools, in F. Borrell, M. Bouso García,–A. Gómez Bach, C. Tornero Dacasa, V. Campos (eds) *Broadening Horizonts 3. Conference of young researchers working in the Ancient Near East*: 63-84. Bellaterra: Universitat Autònoma de Barcelona. Servei de Publicacions.

Bofill, M. 2015. Inicio y consolidación de las prácticas agrícolas durante el neolítico en el levante mediterráneo (septentrional y central)el proceso de molienda y trituración a partir del análisis funcional del instrumental macrolítico. Unpublished PhD dissertation, Universitat Barcelona 2015.

Bofill, M., H. Procopiou, R. Vargiolu, H. Zahouani 2013. Use-wear analysis of Near Eastern prehistoric grinding stones, in P.C. Anderson, C. Cheval and A. Durand (eds.), *Regards croisés sur les outils liés au travail des végétaux. An interdisciplinary focus on plant-working tools.* Actes des XXXIIIe Rencontres internationales d'archéologie et d'histoire d'Antibes, 23-25 octobre 2012: 219-236. Antibes: APDCA.

Bolus, M. 2012. Schleifsteine mit Rille (Pfeilschaftglätter), in H. Floss (ed.) *Steinartefakte. Vom Altpaläolithikum bis in die Neuzeit*: 525 – 534. Tübingen: Kerns.

Byrd, B. 2005. Reassessing the emergence of village life in the Near East. *Journal of Archaeological Research* 13: 231-290.

Cappers, R.T.J., R. Neef, R.M. Bekker, F. Fantone, Y. Okur 2016. *Digital atlas of traditional agricultural practices and food processing* (Groningen Archaeological Studies, Band 30) 2016. Groningen: Barkhuis.

CloudCompare (version 2.10.2) [GPL software]. (2019). Retrieved from http://www.cloudcompare.org/

Colledge, S. 2002. Identifying pre-domestication cultivation in the archaeobotanical record using multivariate analysis: presenting the case for quantification, in R. Cappers and S. Bottema (eds.) *The dawn of farming in the Near East*: 141-151. Berlin: ex oriente.

Davis, MK 1982. The Çayönü ground stone, in L.S. Braidwood, R.J. Braidwood (eds.) *Prehistoric village archaeology in southeastern Turkey. The eighth millennium B.C. site at* Çayönü*: its chipped and ground stone industries and faunal remains* (BAR International Series 138): 73-174. Oxford: Archaeopress.

Dietrich, L. 2016. Purity and holy dumps of garbage: organising rubbish disposal in the Middle and Late Bronze Age of the Carpathian Basin, in D. Sosna, D. and L. Brunclíková (eds), *Archaeologies of waste: encounters with the unwanted*: 23-04. Oxford: Oxbow

Dietrich, L. and M. Haibt 2020. Bread and porridge at Early Neolithic Göbekli Tepe: a new method to recognize products of cereal processing using quantitative functional analyses on grinding stones. *Journal of Archaeological Science Reports* 33 (102525). https://doi.org/10.1016/j.jasrep.2020.102525

Dietrich, L., J. Meister, O. Dietrich, J. Notroff, J. Kiep, J. Heeb, A. Beuger and B. Schütt 2019. Cereal processing at Early Neolithic Göbekli Tepe, southeastern Turkey, *PLoS ONE* 14, 5: e0215214. https://doi.org/10.1371/journal.pone.0215214.

Dietrich, L., E. Götting-Martin, J. Hertzog, P. Schmitt-Kopplin, P. E. McGovern, G. R. Hall, W. C. Petersen, M. Zarnkow, M. Hutzler, F. Jacob, C. Ullman, J. Notroff, M. Ulbrich, E. Flöter, J. Heeb, J. Meister, O. Dietrich 2020a. Investigating the function of Pre-Pottery Neolithic stone troughs from Göbekli Tepe – An integrated approach. *Journal of Archaeological Science: Reports* 34 (102618). https://doi.org/10.1016/j.jasrep.2020.102618

Dietrich, L., O. Dietrich and J. Notroff 2020b. Life and afterlife of Neolithic "greenstone" vessels from Göbekli Tepe, in: A. Ahrens, D. Rokitta-Krumnow, F. Bloch and C. Bührig (eds.) *Drawing the threads together: Studies on archaeology in honour of Karin Bartl* (marru 10): 499-524. Münster: Zaphon.

Dietrich, O. 2011. Radiocarbon dating the first temples of mankind. Comments on 14C-Dates from Göbekli Tepe, *Zeitschrift für Orient-Archäologie* 4: 12-25.

Dietrich, O. and L. Dietrich, L. 2019. Cult and feasting as incentives for cooperative action among hunter-gatherers at early Neolithic Göbekli Tepe, in R. Dunbar and K. Hockings (eds.) *Alcohol and humans: A long and social affair*: 93-114. Oxford: Oxford University Press.

Dietrich, O. and K. Schmidt 2010. A radiocarbon date from the wall plaster of Enclosure D of Göbekli Tepe. *Neo-Lithics* 2/10: 82-83.

Dietrich, O. and K. Schmidt in print: Göbekli Tepe. The imagery of the monumental buildings. Istanbul.

Dietrich, O., M. Heun, J. Notroff, K. Schmidt, M. Zarnkow 2012. The role of cult and feasting in the emergence of Neolithic communities. New evidence from Göbekli Tepe, south-eastern Turkey, *Antiquity* 86: 674-695.

Dietrich, O., Ç. Köksal-Schmidt, J. Notroff, K. Schmidt 2013. Establishing a radiocarbon sequence for Göbekli Tepe. State of research and new data, *Neo-Lithics* 1/13: 36–41.

Ding, S., Y. Pan, M. Tong and X. Zhao 2017. Tactile perception of roughness and hardness to discriminate materials by friction-induced vibration. *Sensors* (Basel) 17, e2748. doi:10.3390/s17122748

Driesch, A. von den and J. Peters 1999. Vorläufiger Bericht über die archäozoologischen Untersuchungen am Göbekli Tepe und am Gürcütepe bei Urfa, Türkei. *Istanbuler Mitteilungen* 49: 23-39.

Dubreuil, L. 2002. *Etude fonctionnelle des outils debroyage natoufiens: nouvelles perspectives surl´emergence de l'agriculture au Proche-Orient*. Unpublished PhD dissertation, Université de Bordeaux 1.

Dubreuil, L. 2004. Long-term trends in Natufian subsistence: A use-wear analysis of ground stone tools. *Journal of Archaeological Science* 31: 1613–1629.

Dubreuil, L. 2008. Mortar versus grinding-slabs function in the context of the Neolithization process in the Near East, in L. Longo and N. Skakun N. (eds.), *"Prehistoric Technology" 40 years later: Functional analysis and the Russian legacy* (British Archaeological Reports British Series, Band 1783): 169–177. Verona: BAR Publishing.

Dubreuil L. 2009. Functional analysis of grinding tools from the Natufian site of Mallaha: toward an understanding of assemblage evolution in the Levant. *The Arkeotek Journal* 1. http://www.thearkeotekjournal.org/tdm/Arkeotek/fr/archives/2009/1Dubreuil.xml

Dubreuil, L. and L. Grosman 2009. Ochre and hide-working at a Natufian burial place. *Antiquity* 83: 935–954.

Dubreuil, L. and D. Nadel 2015. The development of plant food processing in the Levant: insights from use-wear analysis of Early Epipalaeolithic ground stone tools, in de la Torre, I. and S. Hirata (eds.), *Percussive technology in human evolution: a comparative approach in fossil and living primates*. Philosophical Transactions of the Royal Society B: Biological Sciences, 370(1682): 20140357. doi:10.1098/rstb.2014.0357.

Dubreuil, L., D. Savage, S. Delgado, H. Plisson, B. Stephenson and I. de la Torre 2015. Current analytical frameworks for studies of use-wear on ground stone tools, in J.M. Marreiros, J.F. Gibaja Bao and N. Ferreira Bicho (eds.) *Use-wear and residue analysis in archaeology*: 105–158. Berlin: Springer.

Eitam, D. 2019 '... Yo-ho-ho, and a bottle of [beer]!' (R.L. Stevenson) no beer but rather cereal-food. Commentary: Liu et al. 2018. *Journal of Archaeological Science*: *Reports* 28. https://doi.org/10.1016/j.jasrep.2019.101913.

Eitam, D., M. Kislev, A. Kaarty and O. Bar-Yosef 2015. Experimental barley flour production in 12,500-year-old rock-cut mortars in Southwestern Asia, *PLoSONE* 2015, 10(7): e0133306. doi:10.1371/journal.pone.0133306

Erdal, YS. 2015. Bone or flesh: defleshing and post-depositional treatments at Körtik Tepe (southeastern Anatolia, PPNA period). *European Journal of Archaeology* 18: 4-32.

Ertug-Yaras, F. 2002. Pounders and grinders in a modern central Anatolian village, in P. Hara and R. Treuil (eds.) *Moudre et broyer: I Méthods. L'interprétation fonctionnelle de l'outillage de moutre et de broyage dans la Prehistiore et l'Antiquité*: 211–225. Paris: Éditions du CTHS.

Foreman, R. 1978. Disc beads: production by primitive techniques. *Bead Journal* 3: 17–22.

Fuller, D.Q. and L. Gónzalez Carretero 2018. The archaeology of Neolithic cooking traditions: Archaeobotanical approaches to baking, boiling and fermenting. *Archaeology International* 2: 109–121.

Fuller, D.Q., E. Asouti and M.D. Purugganan 2012. Cultivation as slow evolutionary entanglement: comparative data on rate and sequence of domestication. *Vegetation History and Archaeobotany* 21: 131-145.

Gónzalez Carretero, L., M. Wollstonecroft and D.Q. Fuller 2017. A methodological approach to the study of archaeological cereal meals: a case study at Çatalhöyük East (Turkey). *Vegetation History and Archaeobotany* 26: 415–432.

Grimm, W.D. 1990. *Bildatlas wichtiger Denkmalgesteine der Bundesrepublik Deutschland*. München: Lipp.

Gündem, C.Y and M. Dağlı 2018. Three early Neolithic stone vessels from the Mardin museum. *Hitit University Journal of Social Sciences Institute* 11: 1837-1845.

Haaland, R. 2007. Porridge and pot, bread and oven: food ways and symbolism in Africa and the Near East from the Neolithic to the present. *Cambridge Archaeological Journal* 17: 165-182. doi:10.1017/S0959774307000236.

Hahn, H.P. 2014. *Materielle Kultur. Eine Einführung*. Berlin: Reimer.

Hamon, C. and V. Le Gall 2013. Millet and sauce: The uses and functions of querns among the Minyanka (Mali). *Journal of Anthropological Archaeology* 32: 109–121.

Harding, A. 2016. Introduction: Biographies of Things. *Distant Worlds Journal* 1: 5-10.

Harris DR. 2002. Development of agro-pastoral economy in the Fertile Crescent during the Pre-Pottery Neolithic period, in R.T.J. Cappers and S. Bottema (eds.) *The dawn of farming in the Near East*: 67-84. Berlin: ex oriente.

Hayden, B. 1987. Past to present uses of stone tools and their effects on assemblage characteristics in the Maya Highlands, in Hayden, B. (ed.), *Lithic studies among the contemporary Highland Maya*: 160–234. Tucson: University of Arizona Press.

Hayden, B., N. Canuel and J. Shanse 2013. What was brewing in the Natufian? An archaeological assessment of brewing technology in the Epipaleolithic. *Journal of Archaeological Method and Theory* 20: 102-150.

Heiss, A.G., M.B. Azorín, F. Antolín, L. Kubiak-Martens, E. Marinova, E.K. Arendt et al. 2020. Mashes to Mashes, Crust to Crust. Presenting a novel microstructural marker for malting in the archaeological record. *PLoS ONE* 15(5): e0231696. https://doi.org/10.1371/journal.pone.0231696

Hersch, T. L. 1981. Grinding Stones and Food Processing Techniques of the Neolithic Societies of Turkey and Greece: Statistical, Experimental and Ethnographic Approaches to Archaeological Problem-solving. Unpublished Ph. D. Dissertation, Columbia University.

Heun, M., R. Schäfer-Pregl, D. Klawan, R. Castagna, M Accerbi, B. Borghi, et al. 1997. Site of einkorn wheat domestication identified by DNA fingerprinting. *Science* 278: 1312-1314.

Hodder, I. 2012. *Entangled: An Archaeology of the Relationships between Humans and Things*. Hoboken: Wiley-Blackwell.

Horsfall, G. A. 1987. Design theory and grinding stones, in Hayden, B. (ed.), *Lithic studies among the contemporary Highland Maya*: 160–234. Tucson: University of Arizona Press.

Jamous, B. and D. Stordeur 1999. Jerf el-Ahmar, un site mureybetien du Moyen Euphrate Syrien, horizon PPNA-Xe millénaire a.J.C, in: G. del Olmo Lete and J. J. Montero Fenollós (eds.) *Archaeology of the Upper Syran Euphrates: The Tushrin Damm Area* (Aula orientalis / Supplementa 15): 57–69. Barcelona: AUSA.

Joy, J. 2009. Reinvigorating object biography: reproducing the drama of object lives. *World Archaeology* 41 (4): 540-556.

Kamminska, J., E. Mycielska-Dowgiallo and K. Szymczak 1993. Postdepositional changes on surfaces of flint artifacts as observed under a scanning electron microscope, in P.C. Anderson, S. Beyries, M. Otte and H. Plisson (eds.), *Traces et Fonctions: Les Gestes Retrouvés*. Actes Du Colloque International de Liège 8-10 Décembre 1990: 467–475. Liège: Centre de Recherches Archeologiques du CNRS.

Karul, N. 2011. Gusir Höyük, in M. Özdoğan, N. Başgelen and P. Kuniholm (eds.), *The Neolithic in Turkey 1. The Tigris Basin* :1-17. Istanbul: Archaeology & Art Publications.

Karul, N., G. Kozbe and A. Yavuzkır (ed). 2017. Şanliurfa *Müzesi. Arkeolojik eser kataloğu*. Şanlıurfa: Kültür ve Turizm Bakanlığı Kültür Varlıkları ve Müzeler Genel Müdürlüğü.

Kenoyer, J.M., M. Vidale and K. Bhan 1991. Contemporary stone beadmaking in Khambat, India: patterns of craft specialization and organization of production as reflected in the archaeological record. *World Archaeology* 23: 44–63.

Kinzel, M. and L. Clare 2020. Monumental – compared to what? A perspective from Göbekli Tepe, in A. Gebauer, L Sorensen, A Teather and A de Valera (eds), *Monumentalizing Life in the Neolithic: Narratives of Change and Continuity*: 31-50. Oxford: Oxbow Books.

Köksal-Schmidt, Ç. and K. Schmidt 2007. Perlen, Steingefäße, Zeichentäfelchen – handwerkliche Spezialisierung und steinzeitliches Symbolsystem, in: Badisches Landesmuseum Karlsruhe (ed.) *Vor 12,000 Jahren in Anatolien – Die ältesten Monumente der Menschheit*: 97-109. Stuttgart: Theiss.

Kozlowski, S.K. and O. Aurenche 2004. *Territories, boundaries and cultures in the Neolithic Near East* (BAR International Band 1362): Oxford, Lyon: British Archaeological Reports Oxford.

Kromer, B. and K. Schmidt 1998. Two radiocarbon dates from Göbekli Tepe, South Eastern Turkey. *Neo-Lithics* 3/98: 8-9.

Kuijt, I. and A. Goring-Morris 2002. Foraging, farming, and social complexity in the Pre-Pottery Neolithic of the Southern Levant: a review and synthesis. *Journal of World Prehistory* 16: 361-440.

Kurapkat, D. 2015. Frühneolithische Sonderbauten auf dem Göbekli Tepe in Obermesopotamien und vergleichbare Bauten in Vorderasien. Unpublished PhD Dissertation, Technische Universität Berlin.

Lang, C., J. Peters, N. Pöllath and K. Schmidt 2013. Grupe G. Gazelle behaviour and human presence at early Neolithic Göbekli Tepe, south-east Anatolia. *World Archaeology* 45(3): 410-429.

Lang, E. 2016. Maids at the grindstone: A comparative study of New Kingdom Egypt grain grinders. *Journal of Lithic Studies* 3 (3): 279-289.

Lev-Yadun, S., A. Gopher and S. Abbo 2000. The cradle of agriculture. Science 288: 1602-1603.

Levi-Sala, I. 1993. Use-wear traces: processes of development and post-depositional alterations, in P.C. Anderson, S. Beyries, M. Otte and H. Plisson (eds.), Traces et Fonctions: Les Gestes Retrouvés. Actes Du Colloque International de Liège 8-10 Décembre 1990: 401–416. Liège: Centre de Recherches Archeologiques du CNRS.

Levi-Sala, I. 1996. A Study of Microscopic Polish on Flint Implements (British Archaeological Report International Series 629). Oxford: BAR Publishing.

Lichter, C. 2007 „Steingefäß", in Badisches Landesmuseum Karlsruhe (ed.) *Vor 12,000 Jahren in Anatolien – Die ältesten Monumente der Menschheit:* 304. Stuttgart: Theiss.

Lidström-Holmberg, C. 1998. Prehistoric grinding tools as prehistorical traces of the past. *Current Swedisch Archaeology* 6: 123-142.

Liu, L., J. Wang, D. Rosenberg, H. Zhao, G. Lengyel and D. Nadel 2018. Fermented beverage and food storage in 13,000 y-old stone mortars at Raqefet Cave, Israel: investigating Natufian ritual feasting. *Journal of Archaeological Science: Reports* 21: 783-793 https://doi.org/10.1016/j.jasrep.2018.08.008

Liu, L., J. Wang, D. Rosenberg, H. Zhao, G. Lengyel and D. Nadel 2019. Response to comments on archaeological reconstruction of 13,000-y old Natufian beer making at Raqefet Cave, Israel. *Journal of Archaeological Science*: *Reports* 28: 101914. https://doi.org/10.1016/j.jasrep.2019.101914.

McGovern, P. E. 2009. *Uncorking the past: the quest for wine, beer, and other alcoholic beverages*. Berkeley: University of California Press.

Macintosh, A., R. Pinhasi and J.T.Stock 2017. Prehistoric women's manual labor exceeded that of athletes through the first 5500 years of farming in Central Europe. *Science Advances* 3 (11): eaao3893. DOI: 10.1126/sciadv.aao3893.

Marreiros, J., N. Mazzucco, J. Bao Gibaja and N. Ferreira Bicho 2015. Macro and Micro Evidences from the past: the state of the art of archeological use-wear studies, in J.M. Marreiros, J.F. Gibaja Bao and N. Ferreira Bicho (eds.) *Use-wear and residue analysis in archaeology*: 5–26. Berlin: Springer.

Mazurowski, R. 1997. *Ground and pecked stone industry in the Pre-Pottery Neolithic of Northern Iraq* (Nemrik 9 Volume 3). Warsaw: Warsaw University Press.

Mithen, S., Finlayson, B., and Shaffrey, R. (2005). Sexual symbolism in the Early Neolithic of the southern Levant: Pestles and mortars from WF16. *Documenta Praehistorica* 32: 103-110.

Miyake, Y. 2013. Dicle'nin ilk köyü. *Arkeoatlas Dergisi* 2013/01: 40-47.

Molleson, T. 1994. The Eloquent Bones of Abu Hureyra. *Scientific American* 271 (2): 70-75.

Morenz, L. D. and K. Schmidt 2009. Große Reliefpfeiler und kleine Zeichentäfelchen. Ein frühneolithisches Zeichensystem in Obermesopotamien, in: P. Andrássy, J. Budka and F. Kammerzell (eds.), *Non-Textual Marking Systems, Writing and Pseudo Script from Prehistory to Modern Times* (Lingua Aegyptia – Studia monographica 8): 13-31. Göttingen: Widmaier

Moulins, D. de 1997. *Agricultural changes at Euphrates and steppe sites in the mid-8th to 6th millennium BC* (BAR International Series 683). Oxford: Bar Publishing.

Narziß, L. W. Back, M. Gastl and M. Zarnkow 2017. *Abriß der Bierbrauerei*. Weinheim: Wiley-VCH.
Neef, R. 2003. Overlooking the steppe-forest: a preliminary report on the botanical remains from Early Neolithic Göbekli Tepe (southeastern Turkey), *Neo-Lithics* 2/03: 13-16.
Nesbitt M. 2002. When and where did domesticated cereals first occur in southwest Asia? in R.T.J. Cappers and S. Bottema (eds.) *The dawn of farming in the Near East*: 113-132. Berlin: ex oriente.
Nierlé, M. 2008. L'outillage de mouture et de broyage, in J.J. Ibáñez (ed.) *Le site néolithique de tell Mureybet (Syrie du Nord)* (BAR, International Series 1843), 539-568. Oxford: Archaeopress.
Nixon-Darcus, L. 2014. The cultural context of food grinding equipment in Northern Ethiopia: an ethnoarchaeological approach. M.A. Thesis, Simon Fraser University.
Nixon-Darcus, L. and A.C D'Andrea. 2017. Necessary for Life: Studies of Ancient and Modern Grinding Stones in Highland Ethiopia. *African Archaeological Review* 34: 1-31. 10.1007/s10437-017-9252-4.
Notroff, J., O. Dietrich and K. Schmidt 2014. Building Monuments – Creating Communities. Early monumental architecture at Pre-Pottery Neolithic Göbekli Tepe, in J. Osborne (ed.) *Approaching Monumentality in the Archaeological Record*: 83-105. Albany: SUNY Press.
Orgone Archive on Youtube: A/V Geeks, https://www.youtube.com/watch?v=x4-F5N63Cdo (last seen at 24.01.2021)
Özdoğan, A. E. 2011 Çayönü, in: M. Özdoğan – N. Başgelen – P. Kuniholm (eds.), The Tigris Basin. *The Neolithic in Turkey. New Excavations and New Research 1* (Istanbul), 185-269.
Özdoğan, M. 2010. Transition from round plan to rectangular. Reconsidering the evidence of Çayönü, in D. Gheorghiu (ed.) *Neolithic and Chalcolithic archaeology in Eurasia. Building techniques and spatial organization* (BAR International Series 2097): 29-34. Oxford: BAR Publishing.
Özdoğan, M. 2017. The archaeology of early farming in southeast Turkey, in Y. Enzel and O. Bar-Yosef (eds) *Quaternary of the Levant*: 723-731. Cambridge: Cambridge University Press.
Özkan, H., A. Brandolini, R. Schäfer-Pregl and F. Salamini 2002. AFLP analysis of a collection of tetraploid wheats indicates the origin of emmer and hard wheat domestication in Southeast Turkey. *Molecular Biology and Evolution* 19: 1797-1801.
Özkaya, V. and A. Coşkun 2011. Körtik Tepe, in M. Özdoğan, N. Başgelen, and P. Kuniholm (eds.), *The Tigris Basin. The Neolithic in Turkey. New Excavations and New Research 1.* Archaeology and Arts Publications (Istanbul) 89-127.
Özkaya, V. and A Coşkun 2013. Körtik Tepe kazıları / The excavations at Körtik Tepe, in Kultür Varlıkları ve Müzeler Genel Müdürlüğü – Diyarbakır Müze Müdürlüğü (Ed.), *Ilısu Barajı ve Hes Projesi arkeolojik kazıları 2004-2008*: 1-38. Diyarbakır: T.C. Kültür ve Turizm Bakanlığı Yayınları.
Pedersen, P., T. Richter and A. Arranz-Otaegui 2016. Preliminary analysis of the Late Natufian ground stone from Shubayqa 1, Jordan. *Journal of Lithic Studies* 3(3): 379-402.
Peters, J. and K. Schmidt 2004. Animals in the symbolic world of Pre-pottery Neolithic Göbekli Tepe, south-eastern Turkey: a preliminary assessment. *Anthropozoologica* 39: 179-218.
Peters, J., B.S. Arbuckle and N. Pöllath 2014. Subsistence and beyond: animals in Neolithic Anatolia, in M. Özdoğan, N. Başgelen, P. Kuniholm (eds.). *The Neolithic in Turkey* (6): 135-203. Istanbul: Arkeoloji ve Sanat Yayinlari.
Piesker, K. 2014. Göbekli Tepe – Bauforschung in den Anlagen C und E in den Jahren 2010-2012. *Zeitschrift für Orient-Archäologie* 7: 14-54.
Piperno, D.R., E Weiss, I. Holst and D. Nadel 2004. Processing of wild cereal grains in the Upper Palaeolithic revealed by starch grain analysis. *Nature* 430(7000): 670-673.
Pöllath, N., O. Dietrich, J. Notroff, L. Clare, L. Dietrich, Ç. Köksal-Schmidt et al. 2018. Almost a chest hit: An aurochs humerus with hunting lesion from Göbekli Tepe, south-eastern Tukey, and its implications. *Quarternary International* 495: 30-48.
Procopiou, H., A. Boleti, R. Vargiolu and H. Zahouani 2011. The role of tactile perception during stone-polishing in Aegean prehistory (5th–4th millennium B.C.). *Wear* 271, 2525-2530.
Pustovoytov, K. 2002. 14C dating of pedogenic carbonate coatings on wall stones from Göbekli Tepe (southeastern Turkey). *Neo-Lithics* 2/02: 3-4.
Pustovoytov, K. 2006. Soils and soil sediments at Göbekli Tepe, southeastern Turkey: a preliminary Report. *Geoarchaeology* 21 (7): 699-719.
Pustovoytov, K. and H. Taubald 2003. Stable carbon and oxygene isotope composition of pedogenic carbonate at Göbekli Tepe (southeastern Turkey) and its potential for reconstructing late Quaternary paleoenvironments in Upper Mesopotamia. *Neo-Lithics* 2/03: 25-32.
Pustovoytov K., K. Schmidt and H. Parzinger 2007. Radiocarbon dating of thin pedogenic carbonate laminae from Holocene archaeological sites. *The Holocene* 17 (6): 835-843.

RealityCapture 2020, photogrammetry software by Capturing Reality s.r.o. I Drieňová 3 I 821 01 Bratislava, Slovakia.

Robitaille, J. 2016. The ground stone industry of the Mursi of Maki, Ethiopia: Ethnoarchaeological research on milling and crushing equipment (technique and function). *Journal of Lithic Studies* 3: 429. 10.2218/jls.v3i3.1680.

Rosenberg, D. 2004. The Pestle: Characteristics and Changes of Stone Pounding Implements in the Southern Levant from the Early Epipalaeolithic through the Pottery Neolithic Period. Unpublished Master thesis Tel Aviv University.

Rosenberg, D. 2008. Serving meals making a home: The PPNA limestone vessel industry of the Southern Levant and its importance to the Neolithic Revolution. *Paléorient* 34, 23-32.

Rosenberg, M. 2011. Hallan Çemi, in M. Özdoğan, N. Başgelen and P. Kuniholm (eds.), *The Tigris Basin. The Neolithic in Turkey. New Excavations and New Research 1*: 61-78. Istanbul: Archaeology and Arts Publications.

Rosenberg, M. and M. Davis 1992. Hallan Çemi Tepesi, an Early Aceramic Neolithic Site in Eastern Anatolia: Some Preliminary Observations Concerning Material Culture. *Anatolica* 18: 1-18.

Rosenstock, E. and A. Scheibner 2018. Fermentierter Brei und vergorenes Malz: Bier in der Vorgeschichte Südwestasiens und Europas. *Mitteilungen der Anthropologischen Gesellschaft in Wien* 147: 31–62.

Rössner, C., K. Deckers, M. Benz, V. Özkaya and S. Riehl 2018. Subsistence strategies and vegetation development at Aceramic Neolithic Körtik Tepe, southeastern Anatolia, Turkey. *Vegetation History and Archaeobotany* 27: 15-29.

Roux, V. and P. Matarasso 1999. Crafts and the evolution of complex societies: new methodologies for modelling the organization of production, a Harappan example, in M.A. Dobres and C.R. Hoffmann (eds), *The Social Dynamics of Technology: Practice, Politics and Worldviews*: 46–70. Washington: Smithsonian Institution Press.

Sadvari, J.W., C. Tsoraki, L. Dogiama and C.J. Knüsel 2015. Reading the bones, reading the stones: an integrated approach to reconstructing activity patterns at Neolithic Çatalhöyük, in I. Hodder and A. Marciniak, *Assembling* Çatalhöyük (Themes in contemporary archaeology 1): 59-74. New York: Routledge.

Schäkel, N. 2018. Experimentelle Herstellung von Reibsteinen nach Vorbildern archäologischer Originalfunde des präkeramischen Neolithikums Anatoliens. Vorstellung eines experimentalarchäologischen Projektes am Museumsdorf Düppel. *Journal – Archäologie, Geschichte, Naturkunde Düppel 2018*: 65-72.

Scheibner, A. 2016. *Prähistorische Ernährung in Vorderasien und Europa: eine kulturgeschichtliche Synthese auf der Basis ausgewählter Quellen*. Rahden: VML Vlg. Marie Leidorf

Schmidt, K. 2000. »Zuerst kam der Tempel, dann die Stadt « Vorläufiger Bericht zu den Grabungen am Göbekli Tepe und am Gürcütepe 1995–1999. *Istanbuler Mitteilungen* 50: 5–41.

Schmidt, K. 2008. *Sie bauten die ersten Tempel. Das rätselhafte Heiligtum der Steinzeitjäger*. München: C. H. Beck.

Schmidt, K. 2011. Göbekli Tepe: A Neolithic site in southeastern Anatolia, in S. R. Steadman and G. McMahon (eds.) *The Oxford Handbook of Ancient Anatolia. 10,000-323 B.C.E*: 918-933. Oxford: Oxford University Press.

Schmidt, K. 2012. *Göbekli Tepe. A Stone Age sanctuary in South-Eastern Anatolia*. Berlin: ex oriente.

Schroth, A. 1996. An ethnographic review of grinding, pounding, pulverizing and smoothing with stones. *Pacific Coast Archaeological Society Quarterly* 32 (4): 55-75.

Searcy, M. T. 2011. *The life-giving stone: Ethnoarchaeology of Maya metates*. Tucson: The University of Arizona Press.

Semenov, S.A. 1964. *Prehistoric technology: an experimental study of the oldest tools and artefacts from traces of manufacture and wear*. London: Cory, Adams & Mackay.

Shea, J.J. 2013. Stone tools in the Paleolithic and Neolithic Near East. Cambridge: Cambridge University Press.

Shoemaker, A.C. and M.I.J. Davies 2019. Grinding-stone implements in the eastern African Pastoral Neolithic, Azania. *Archaeological Research in Africa* 54 (2): 203-220.

Shoemaker, A.C., M.I.J. Davies and H.L. Moore, 2017. Back to the Grindstone? The Archaeological Potential of Grinding-Stone Studies in Africa with Reference to Contemporary Grinding Practices in Marakwet, Northwest Kenya. *African Archaeological Review* 34: 415–435.

Sığın, M. 2008. Anadolu'da başlangıcından II. binyıl sonuna kadartaş kaplar. Master Thesis, Konya Selçuk University.

Skedung, L., M. Arvidsson, J. Chung et al. 2013. Feeling Small: Exploring the tactile perception limits. *Scientific Reports* 3: 2617.

Sládek, V., J. Macháček, E.Makajevová, R. Přichystalová and M. Hora 2018. Body mass estimation in skeletal samples using the hybrid approach: the effect of population-specific variations and sexual dimorphism. *Archaeological and Anthropological Sciences* 10: 833-847.

Stahl, A. B. 1989. Plant-food processing: Implications for dietary quality, in D. R. Harris and D. C. Hillman (eds.) *Foraging and farming: The evolution of plant exploitation*: 171–194. London: Routledge.

Starkovich, B.M. and M.C. Stiner 2009. Hallan Çemi Tepesi: High-ranked game exploitation alongside intensive seed processing at the Epipaleolithic-Neolithic transition in southeastern Turkey. *Anthropozoologica* 44: 41-61.

Steward, J.H. 1954. Types of Types. *American Anthropolologist* 56: 54-57.

Stordeur, D. 2015. *Le village de Jerf el Ahmar (Syrie, 9500-8700 av. J.-C.). L'architecture, miroir d'une société néolithique complexe*. Paris: CNRS Éditions.

Stroulia, A., L. Dubreuil, J. Robitaille and K. Nelson 2017. Salt, sand, and saddles: Exploring an intriguing work face configuration among grinding tools. *Ethnoarchaeology* 9: 119-145.

Suehrcke, N.G. 2018. A trial of quantitative mechanical use-wear analysis on grinding stones from the little Sandy Desert. BA Thesis, University of Western Australia.

Teklu, G. 2012. Ethnoarchaeological study of grind stones at Lakia'a in Adwa, Tigray Regional State, Ethiopia. Unpublished MA thesis, Addis Ababa University.

Yartah, T. 2013. Vie quotidienne, vie communautaire et symbolique à Tell´'Abr 3—Syrie du Nord. Données nouvelles et nouvelles réflexions sur L´'horizon PPNA au nord du Levant 10000-9000 BP. Unpublished PhD Thesis, University Lyon.

Vigne, J.D. 2015. Early domestication and farming: what should we know or do for a better understanding? *Anthropozoologica* 50(2): 123-150.

Watkins, T. 2010. New Light on the Neolithic revolution in Southwest Asia. *Antiquity* 84: 621-634.

Weide, A., S. Riehl, M. Zeidi and N.J. Conard 2018. A systematic review of wild grass exploitation in relation to emerging cereal cultivation throughout the Epipalaeolithic and aceramic Neolithic of the Fertile Crescent. *PLoS ONE 13(1)*: e0189811.

Weiss, E., W. Wetterstrom, D. Nadel and O. Bar-Yosef 2004. The broad spectrum revisited: Evidence from plant remains. *Proceedings of the National Academy of Sciences of the United States of America* 101(26): 9551-9555.

Weiss, E. and D. Zohary 2011. The Neolithic southwest Asian founder crops. Their biology and archaeobotany. *Current Anthropology* 52: 237-254.

Wilderness Films India: Footage archive of Wilderness Films India Ltd on Youtube, https://www.youtube.com/watch?v=XOWyP4wFJiE (last seen at 24.01.2021).

Willcox, G. 2005: The distribution, natural habitats and availability of wild cereals in relation to their domestication in the Near East: multiple events, multiple centres. *Vegetation History and Archaeobotany* 14(4): 534-541.

Willcox, G. and D. Stordeur 2012. Large-scale cereal processing before domestication during the tenth millennium calBC in northern Syria. *Antiquity* 86: 99-114.

Willcox, G., S. Fornite and L. Herveux 2008. Early Holocene cultivation before domestication in northern Syria. *Vegetation History and Archaeobotany* 17(3): 313-325.

Wright, K. I. 1992. A classification system for ground stone tools from the prehistoric Levant. *Paléorient* 18(2): 53-81.

Wright, K. I. 1994. Ground stone tools and hunter-gatherer subsistence in southwest Asia: implications for the transition to farming. *American Antiquity* 59: 238-263.

Wright, K. I. 2000. The social origins of cooking and dining in early villages of Western Asia. *Proceedings of the Prehistoric Society* 66: 89-121.

Wright, K. I. 2005. The emergence of cooking in Southwest Asia. *Archaeology International* 2004-2005 (8): 33-37.

Wright, K.I. 2014. Domestication and inequality? Households, corporate groups and food processing tools at Neolithic Çatalhöyük. *Journal of Anthropological Archaeology* 33: 1-33.

Wright, K. I. with contributions by C. Tsoraki and R. Siddall 2013. The ground stone technologies of Catalhoyuk, 1993-2008, in I. Hodder (ed.), *Substantive Technologies from* Çatalhöyük*: reports from*

the 2000-2008 seasons. Çatalhöyük Research Project Series Volume 9 (British Institute at Ankara Monograph, Volume: 48): 365-416. Oxford: Oxbow.
Wright, K. M. 1993. Simulated Use of Experimental Maize Grinding Tools from Southwestern Colorado. *KIVA* 58 (3): 345-355.
Zarnkow, M., E. Spieleder, W. Back, B. Sacher, A Otto and B. Einwag 2006. Interdisziplinäre Untersuchungen zum altorientalischen Bierbrauen in der Siedlung von Tall Bazi/Nordsyrien vor rund 3200 Jahren. *Technikgeschichte* 73: 3-25.
Zeder, M.A. 2011. The Origins of Agriculture in the Near East. *Current Anthropology* 52: 221-235.
Zeist, W. van and G.J. de Roller 2003. The Çayönü archaeobotanical record, in W. van Zeist (ed.) *Reports on archaeobotanical studies in the Old World*: 143-166. Groningen: GIA.
Zohary, D., M. Hopf, and E. Weiss 2013. *Domestication of Plants in the Old World. The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin*. Oxford: Oxford University Press.
Zupancich, A., G. Mutri, I. Caricola et al. 2019. The application of 3D modeling and spatial analysis in the study of groundstones used in wild plants processing. *Archaeological and Anthropological Sciences* 11: 4801–4827.