

Chapter 5

Early and Middle Holocene pottery of north-eastern Africa and the southern Levant

5.1. Lower Egypt

In the middle of the 6th millennium BC, people in Lower Egypt started to use containers made of clay for the first time. Although this new technology had probably appeared from outside, it was adapted to local conditions. Thus far, pottery has only been recorded at four locations with Neolithic occupation, namely on the northern shore of Lake Qarun in the Fayum, at Merimde Beni Salame and Sais, as well as at Wadi Hof. The evidence presented below comes from research conducted at various intervals throughout the 20th century, as well as in the 21st century. The excavation methods employed, on the one hand, and the quality of pottery analysis and publication, on the other, have had an effect on the value of the current research. The pottery from the excavations of G. Caton-Thompson and E. Gardner underwent a typical early 20th-century selection process. Complete or nearly complete vessels, along with diagnostic sherds, were documented and then distributed among various institutions all over the world (see Appendix). Vessel fragments, accounting for most of the pottery existing at settlement sites, were ignored, thus reducing the value of the collected material for future research on the pottery tradition. Importantly, F. Wendorf and R. Schild (1976), while exploring Trench 2 located near the British excavation site at Kom W in the Fayum, did not find any complete vessels, while their collection featured only ceramic fragments with a high percentage of body-sherds. J. Emmitt made an attempt at estimating the missing assemblage on the basis of the CPE excavation data (Emmitt, 2011: 97). In his estimation, 26,847

ceramic fragments from the trench explored by Caton-Thompson and Gardner at Kom W had not been preserved. Moreover, in his opinion, the potential number of ceramic vessels of this site is 821 (Emmitt, 2011: 126).

The pottery collection from the excavations by H. Junker at Merimde Beni Salame is similarly fractional. Moreover, Junker's disrespect for stratigraphy had an immense effect on the research value of the ceramic assemblage. Thanks to the research conducted by J. Eiwanger in the 1980s, our knowledge of the pottery tradition of the Merimde site was thoroughly enriched. Only the explorations currently being conducted at Sais and at Merimde make it possible to analyse ceramic assemblages in compliance with contemporary standards of archaeological research.

Although the el-Omari pottery was excavated during the Second World War and soon thereafter, the results of these excavations were published only in the 1990s, in accordance with contemporary standards. However, it must be remembered that the site itself was explored using methods available in the 1940s and 1950s, sometimes in harsh wartime conditions, which must have impacted the recording and selection of materials. Similarly, the rather long delay between actual exploration, on the one hand, and the publication of results, on the other, could have also detracted from the research value of the ceramics collected at Wadi Hof. Moreover, due to the fact that the area has now been seized by the Egyptian army, it is now impossible to verify the pottery of the el-Omari culture.

5.1.1. *Fayumian pottery*

As the origin of the Fayumian pottery is not clear, the simplicity of the pottery-making process without the need for any special skills or equipment could indicate that the craft was introduced from outside and then developed locally. It is generally accepted that the oldest Neolithic pottery of the Fayumian culture was made of Nile clay. By analysing a sample of Fayumian pottery with a portable X-ray fluorescence (pXRF) spectrometer, Emmitt identified four different materials used in pottery production in the Fayum, originating from different sources (Emmitt, 2017: 149-150; Emmitt *et al.*, 2018). A mixture of materials, namely silts and minerals, which could be both natural and artificial, is the most common type (73%). Moreover, 11% of the analysed materials were made of Nile silts. Another 8% belongs to two different mixtures of Nile silt and marl clays. Although the identification of sources of raw materials used in Fayum was not possible, in the view of Emmitt, the presence of multiple raw material sources indicates movement from outside the Fayum (Emmitt, 2017: 152-153; 243-244; Emmitt *et al.*, 2018). Thus, these analyses are treated by the researchers concerned as an indication of the mobile way of life of the Fayumian people.

The greatest degree of temper variability has been observed in the pottery of the Fayumian culture. Mineral and vegetal inclusions were added to the clay. Accord-

ing to Emmit, sand, quartz, limestone, and bones were also used (Emmit, 2017: 202-204). Moreover, Kom W pottery analyses by Emmitt demonstrated that over 90% of ceramic vessels were tempered with both mineral and organic materials, although pottery with only sand or only chaff is also known (Emmit, 2017: 202).

Fayumian pottery was made of coils joined together by hand. Some examples of pinching and drawing of a lump of clay have also been recorded (Wodzińska, 2010: 29-40; Emmitt, 2011: 110). Vessel walls were usually thick and uneven. According to Caton-Thompson and Gardner, the surface of most vessels was covered with red slip, now obliterated by post-depositional processes (Caton-Thompson & Gardner, 1934: 35). In their estimation, most sherds classified as rough-faced actually belonged to red burnished ware. A small group of pottery was also classified as black-burnished ware and as unburnished slipped and smoothed ware (Table 2). Indeed, Emmit made the same observations concerning surface treatment (Emmit, 2011: 100-102). In addition, he identified pottery that had just been covered with a slip or only burnished (Emmitt, 2017: 200-201). Apart from red and black slip, orange slip has also been recorded.

The uneven surface colouration of most vessels suggest a simple open firing process and its incomplete control, with interrupted access to oxygen. The likely firing temperature is approximately 600°C. According to Emmitt, fire-clouds identified on part of the ceramics indicate that vessels were surrounded with fuel during the firing process (Emmitt, 2011: 107-108). He also suggests the use of dung as fuel. In Emmit's view, pottery production at Kom W was not routinised while vessels were made only when necessary (Emmitt, 2011: 131-132). Kom K is also indicated as a possible place of its production, given the presence of an unfired clay vessel found at the site, vessels that were too large for transport and hearths which could have been used for pottery firing (Emmitt, 2017: 243-244).

Some additional information on the pottery-making process was obtained by a Polish expedition to the region of Qasr el-Sagha, exploring sites QSI/79 and QSV/79, chronologically contemporaneous with the Fayumian culture (Ginter *et al.*, 1980: 114-120; Ginter & Kozłowski 1983: 37-38). These researchers confirmed that most pottery was made of Nile silts tempered with sand and straw. Additionally, they indicated that the clay used for pottery originated from the Hawara Depression. Thanks to more detailed analyses, four groups of ceramic vessels were distinguished. A combination of sand and straw was not always added to clay while in some sherds, the presence of sand temper only was confirmed (variants A2, B2, C1-2). Sherd surface colour was brown to reddish while the dominant group of sherds had smoothed surfaces. No traces of slip were recorded. Although the firing temperature was about 600°C, traces of oxidizing and reducing firing conditions were recorded. Due to poor quality firing, some sherds had split into layers. At sites QSI/79 and QSV/79, sherds made of lake sediments and

lake silts were also found, indicating the use of local raw materials other than Nile silt. Findings from the Qasr el-Sagha region indicate that potters probably had a good understanding of the vessel making process. However, it should be mentioned that this data was obtained by analysing a limited number of sherds discovered during the Polish research expedition.

The number of shapes recorded in Fayumian pottery by Caton-Thompson and Gardner (1934) is rather modest. Open forms prevailed over closed vessels (Table 3). According to P. Rice (1999), the dominance of open forms in societies where pottery was a novelty could be linked to the fact that potters were poorly skilled and vessels were multifunctional. They were treated as utilitarian objects which could be used for different purposes. The most numerous types (e.g. 30 out of 65 from Kom W) of the Fayumian culture are hemispherical, spherical or conical bowls and deep jars with a restricted mouth, resembling hole-mouth jars (groups 1 and 2 by Caton-Thompson & Gardner, 1934: 35) (Figs. 1:1-5; 2:1-2; 3:1-3; 5:1; 11:1-6, 11-12; 12-15). The last group was interpreted by the excavators as cooking or storage jars. The other three distinguished groups are represented by rectangular bowls, vessels on a raised base and vessels on 'knobbed feet' (Figs. 4:1-3; 11:7-10, 13). Similar shapes, namely hemispherical, spherical and conical bowls, vessels on a raised base and deep vessels with a restricted mouth known as hole-mouth jars, were also recorded at Fayumian sites in the region of Qasr el-Sagha (Ginter *et al.*, 1980: 118-119; Ginter & Kozłowski, 1983: 38) (Fig. 5:15).

Emmitt suggests a preference for unrestricted vessels with flaring and straight rims in the Fayumian culture (Table 3) (Emmitt, 2011: 99-100). Approximately 70% of all vessels from Kom W studied by Emmitt are unrestricted forms (Emmitt, 2017: 193). However, in the Upper K Pits, restricted vessels represent 60% of the studied assemblage. Moreover, the research showed that 63% of all recorded rims were round, while pointed rims represented 25% of all rims and only 7% of rims were flat. Emmitt also recorded a high percentage of flat bases. According to him, the high variability of shapes and sizes of Kom W pottery indicates that the occupation of this site was relatively long or that the site was more probably periodically revisited (Emmitt, 2017: 2014). Neolithic pottery is rarely decorated. Indeed, in the Fayumian culture, knobs constitute the only form of decoration.

5.1.2. Merimde pottery

The pXRF analyses of Merimidian pottery indicate that 93% of the sample was made of Nile silt (Emmitt, 2017: 153). However, Emmitt also suggests this assemblage is the most diverse in terms of materials used in pottery production and that the clay may have been obtained from a number of different places (Emmitt, 2017: 155; Emmitt *et al.*, 2018: 429). Interestingly, in the oldest Merimde ceramic assemblages there are no traces of added tempers. At Sais, untempered pottery is the most dominant

group among Neolithic materials from phase I, comparable with Merimde I. Sherds made of clay tempered with straw and sand also occurred, although in a smaller quantity (Wilson *et al.*, 2014: 118-119). Chaff temper was introduced in phase II of Merimde Beni Salame. B. Mortensen linked its usage to improvements in pottery production and a wet climate as it could improve drying and prevent shrinkage of wet unfired vessels in humid conditions (Mortensen, 1992: 174). The use of this temper was also confirmed in the Merimde III phase. During his analyses, Emmitt also identified gravel, sand, quartz, limestone, and shells among tempers of the studied Merimde assemblage (Emmitt, 2017: 219-220). He also suggests that the frequency of using sand and gravel tempers decreased over time.

As regards surface treatment, pottery collections from Merimde I and Sais I are comparable. The surface was covered by red, brown or even black slip, either burnished or smoothed (Eiwanger, 1984: 22-23; Wilson *et al.*, 2014: 118). Burnished surfaces prevail at both sites (Table 2; Merimde I – 62.5%; Sais I – 67.25%). Some changes in surface treatment between the Urschicht phase and phases II-III of Merimde could be observed (Table 2). In phase II, the percentage of burnished ware decreased from 62.5% to 53% while that of smoothed ware grew from 33.7% to 46.7%. In phase III, this ratio remained almost unchanged (Eiwanger, 1992: 19, Abb. 4).

The firing process at the beginning of the Merimde settlement was in open fireplaces and probably similar to that known from the Fayum culture. The emergence of grey-coloured vessel surfaces in phase II and, additionally, black surfaces in phase III could be interpreted as progress in pottery firing, attributable to improved control of firing conditions and oxygen availability during the process. However, it should be stressed that red surfaces, easy to obtain during open firing in the case of Nile clay, are dominant in both younger phases of the Merimde site. Vessel forms in the oldest phase of Merimde seem to be very similar to those of the Fayumian culture. They include hemispherical, spherical and conical bowls, vessels with vertical walls or deep vessels with a restricted mouth (Figs. 1:5-7; 2:3-4; 3:6-8, 11; 16:4-12; 17-19). Open forms prevail among both burnished (43.9%) and smoothed ware (53.3%) (Table 3). Eiwanger distinguished vessels with vertical walls as a separate group, which, in fact, could be classified as open or closed forms, depending on the rim position. In Sais I, closed forms (ca. 40%) prevail over open forms (18.7%). Apart from the shapes known from Merimde, conical bowls with everted and sometimes thickened rims have also been recorded. Additionally, some fragments of broad jars, known from younger phases of Merimde are also known in Sais I (Wilson *et al.*, 2014: 118-121, figs. 113-114).

In phase II of the Merimde settlement, one can notice an increase in the number of closed forms and a decrease in number of open forms in burnished ware (Table 3; Figs. 1:8-10; 2:5-6; 3:9-10, 12-14; 4:4-5; 5:2, 4-5; 6:8-9). In the group

of smoothed ware, open forms (51.8%) continue to prevail over closed forms (31.4%). In the last phases of Merimde, although the domination of closed forms over open forms is still visible in the group of burnished ware, open and closed forms were recorded in similar numbers in smoothed ware (Figs. 1:11-12; 2:7-8; 3:15-16; 4:6-8, 11; 5:3, 6-9; 6:1-2). In younger layers of the Merimde site, new forms of closed vessels appeared in the ceramic assemblage. Newly introduced types include jars with an S-shaped profile (Merimde II, Sais I, Figs. 5:7-8; 16:14; 20:1) or burnished jars with a globular body and a long neck (Merimde III; Figs. 6:1-2, 4, 7; 16:15; 20:3, 6).

The oldest pottery of Merimde was decorated with an incised herringbone pattern. This kind of decoration is present on burnished vessels, either under the rim or in the upper part of the vessel. The area with decoration is not burnished (Fig. 22). The pottery of Merimde II was not decorated, except for knobs identified on a few vessels. In the assemblage of phase III, decorated pottery was recorded, demonstrating different techniques and motifs. Among incised decorations, a variety of horizontal, vertical and diagonal patterns were found. In layer IV (Schicht IV) of Merimde, impressed decorations of round, oval or even crescent-shaped indentations were identified for the first time. From layer IV on, plastic decoration becomes more diversified. Knobs come in various shapes (round, oval or crescent) forming a variety of patterns (Eiwanger, 1992: 35-42) (Figs. 16:4-5; 18:5; 20:9).

Owing to the long occupation sequence at Merimde, its pottery clearly shows the gradual development of potters' know-how, skills, and experience. Although on the basis of stratigraphy Eiwanger noticed a gap in the settlement's occupation between phases I and II and, additionally, some technological changes (i.e. introduction of straw temper, increased vessel wall thickness, greater variety of vessel forms, disappearance of decoration), he also suggested the continuation of pottery production (Eiwanger, 1988: 51). The inhabitants of Merimde II were probably the ancestors of those of Merimde I who had been forced to move by climatic change e.g. to a daughter site at Sais. Eiwanger attributed the differences between phases I and II to factors influencing the site from different directions, namely from the southern Levant in the Urschicht phase, and from the Western Desert in phase II.

5.1.3. *El-Omari pottery*

The pottery assemblage at the site was not made of Nile clay, but of two kinds of local calcareous raw materials present in the vicinity of the wadi. There is also evidence of mixing different kinds of clay, which, in turn, allowed the el-Omari people to produce four kinds of paste used in vessel making. Some sherds made of Nile silt were also recorded (approx. 1%. together with marl sherds). Local potters probably also knew of other raw materials useful for making pottery, but did not use them due to the distance to their sources. The most common temper in

the el-Omari sherds was straw, although sand was also used in some cases. The crushed fibres of papyrus were recorded as well. More detailed pottery analyses showed that potters' understanding of clay was very good. Thus, to obtain a red/reddish-brown colour, which is not natural for calcareous clay, they mixed clay with ochre, which is easily available locally (Debono & Mortensen, 1990: 25; Hamroush & Abu Zied, 1990: 117–127).

El-Omari pottery was made of coils or clay strips by hand. The dominance of burnished vessels covered by slip is clearly visible in the el-Omari assemblage (Table 2). More than two-thirds of all vessels were burnished, while the rest were wet-smoothed. Vessels were fired in simple conditions, but at a relatively high temperature of ca. 800°C, with uncontrolled oxidation. There is a surprising difference between potters' understanding of clay properties (mixing different clays, the addition of ochre), on the one hand, and irregular vessel shaping and poor surface treatment techniques (burnishing), on the other. The addition of red ochre to obtain the red colour typical for vessels made of Nile clay is also puzzling. In this context, the imitations of black-topped vessels mentioned by F. Debono and B. Mortensen (1990: 26) should be noted. However, they could also be interpreted as cooking pots blackened with fire or soot. On a few occasions, the excavators underlined its experimental character which improves over time during the site's existence.

At the site of el-Omari, open forms (41%) prevail over closed forms (29%). Interestingly, the percentage of vertically walled vessels is also high (approx. 30%) (Table 3). Among the most numerous shapes, there are restricted spherical vessels (some with S-shaped profiles) and vessels with vertical walls (groups III and V; Figs. 2:9-11; 3:17; 5:10-14; 21:1-3, 8-9). Conical bowls with flat bases are numerous as well (group VII; Fig. 1:13-15). Vessels with long necks and rims everted outwards, similar to Merimde III bottles, are also present (Fig. 6:3, 5-6). The rather low number of jars with distinguishable necks could indicate an early stage of their production (groups I and II) (Fig. 21:4-6). Some fragments of pottery with a knobbed base, known from the Fayumian culture, were also recorded (Figs. 4:9-10, 12; 21:7). El-Omari pottery is not decorated.

5.1.4. The Neolithic pottery tradition of Lower Egypt - a summary

Pottery making in Lower Egypt in the 6th/5th millenniums BC is not homogenous. Each cultural unit and site represents a unique pottery-making style influenced by many external and internal factors (see Arnold, 1989; Rice, 2005). In the opinion of the author, however, at the foundation of pottery production of all known Neolithic cultural units there lies a single Lower Egyptian pottery tradition. The lack of homogeneity results from changes the pottery tradition underwent through time and space, influenced by many factors (Mączyńska, 2017).

The origin of Lower Egyptian Neolithic pottery is not clear. However, it should be treated as an innovation rather than invention. It was probably introduced from the outside and adapted to local conditions. Clays and tempers originated from local resources, namely widely available Nile clay or other local clays, as well as mostly organic and vegetal tempers. The lack of straw or sand tempers in the oldest Merimde pottery and the dominance of untempered ceramics at Sais is puzzling. The underlying reasons could include many different factors, such as raw material quality, the origin of the pottery-making process, weather, human preferences, or potters' knowledge and experience.

Neolithic people made pottery in very simple ways, by coiling or pinching and drawing. Covering the vessel surface with slip and burnishing was observed at all Neolithic sites. This type of surface treatment prevailed over smoothed and rough ware, although over time the number of smoothed ware vessels also increased (Table 2). Moreover, Eiwanger observed a decrease in burnished ware accompanied by a decline in burnishing quality. It seems probable that this change may have been linked to the increased efficiency of the pottery-making process. Burnishing could have been reduced to an activity which made walls compact and inhibited liquid penetration.

Initially simple open forms – mostly spherical or hemispherical bowls, typical for the Fayumian culture and the first phase of the Merimde site, were made probably as multifunctional utilitarian objects and used for many different activities (processing, cooking, and storage). The presence of fire blackening on the vessels from the Fayum and Merimde (80.7%) suggests that they were used in direct contact with fire – i.e. for food preparation (Emmitt, 2017: 199; 215). Larger vessels of the Fayumian culture may have been used for storage (Emmitt, 2011: 129-135; 2017: 242). This function seems to be confirmed by their location in the storage pits at Kom W and at the Upper K Pits.

At Merimde Beni Salame, the process of vessel shape development towards closed forms is clearly visible over time (Table 3). In red burnished ware, however, closed forms became the dominant shape from phase II on, while in smoothed ware, open forms prevail over closed forms in phase II and are present in similar quantities in phase III. In phase II of the Merimde site, vessels with S-shaped profiles first appeared. Moreover, production of long-necked bottles began in phase III.

It is worth mentioning that in Sais I, contemporaneous with Merimde I, closed vessels prevail over open forms while vessels with short vertical necks appeared earlier than at the Merimde site. The differences between Merimde I and Sais I could be possibly linked to the special function of the Sais site as a fish midden, which could have influenced the forms of vessels used there. At the el-Omari site, open forms prevail over closed forms, although the number of vessels with vertical walls was fairly high.

The changes in surface treatment and vessel forms at Merimde Beni Salame were probably linked to their function and to local demand. The application of slip and burnishing reduce permeability and porosity and make the vessels useful for long-term storage, especially of liquids (Rice, 2005: 231). Vessels with smoothed walls have reduced permeability but will, nonetheless, remain porous. This feature is desired in case of short-term storage (e.g. water). Additionally, porosity is also required during cooking, to reduce thermal stress. Greater demand for smoothed vessels in phases II and III, most of which are open vessels, could have resulted from their function as vessels for cooking, serving, or short-term storage. Burnished closed forms were probably used mostly for long-term storage of liquids, which influenced their life-span. Cooking and serving vessels were used more frequently and thus broke more often. Their life-span was, therefore, shorter and, for this reason, they were probably produced in greater numbers than storage jars.

The firing process at Neolithic sites took place in open hearths where vessels could be surrounded by fuel. The firing temperature was at least 600°C, which is sufficient to produce a solid vessel. However, at the el-Omari site temperatures as high as 800°C have been suggested. In Neolithic pottery production, the skills of el-Omari potters deserve special attention, first of all, because of the relatively high temperature needed for firing calcareous clays, and also due to the use of ochre added to clay in order to obtain red colouration. We are, however, unable to establish whether potters wanted to imitate Nile clay vessels or simply responded to a special demand for red vessels in el-Omari society.

Once introduced, the new technology was quickly adapted to local conditions and became common and widespread in Lower Egypt. After the adaptation of pottery production to local conditions, potters determined its further development by their own choice of raw materials, tempers and firing conditions. Undoubtedly, pottery production was also influenced by the demands of ceramic vessel users. Although in the beginning people used very simple vessel shapes for a wide range of activities, over time vessel forms became more differentiated and their function became more restricted. Moreover, we can observe an increase in the significance of relationships between vessel shapes, surface treatment and function in the Neolithic pottery-making process. One of the stages of development of Neolithic pottery production is the introduction of vessel decoration. The herringbone pattern known from Merimde Beni Salame (Fig. 22) and Sais was probably introduced at the beginning of the adaptation of a new technology and could be linked to external influences. However, in the later period, the emergence of other decoration patterns could be linked to users' demand for this feature of ceramic vessels or even its symbolic meaning.

5.2. Eastern Sahara

Pottery emerged in North Africa in the 10th millennium BC. Although the current state of research does not make it possible to determine whether there existed one or more centres of pottery invention, the prevailing view assumes multiregional origins of pottery (Close, 1995; Jesse, 2003; 2010; Tassie, 2014: 80-82). After its invention, the pottery technology spread quickly within a 4,000 km strip in the southern Sahara and the northern Sahel. The oldest clay vessel fragments in southern Egypt were recorded at sites dated as far back as 9,000 cal. BC, linked to Early Holocene occupation. While early pottery is a rather rare finding, it does confirm that herders who appeared in the desert in the Early Holocene humid phase had mastered the skill of making clay vessels. Over time, pottery spread to an increasingly large territory, covering nearly the entire Western Desert, reaching as far as the Farafra Oasis. Ceramic vessels have also been recorded in the Eastern Desert. However, even at Middle Holocene sites, ceramic sherds are uncommon and, in some areas, no pottery traces have been recorded at all, despite the presence of other remains of human occupation.

5.2.1. Nabta Playa-Bir Kiseiba

Pottery recorded at Early Neolithic sites in the Nabta Playa-Bir Kiseiba area is the oldest known pottery in Egypt. Although its quantity is rather small, researchers are of the opinion that it is fairly advanced technologically (Nelson, 2001; Gatto, 2002; Zedeño, 2002; Jórdeczka *et al.*, 2011). In the absence of any older examples of pottery making in this area, ceramics from Nabta Playa-Bir Kiseiba is considered as an innovation adapted from outside.

The earliest evidence of pottery was recorded at sites dated to the El Adam phase (e.g. sites E-75-9, E-77-7, E-06-1). Pottery was made using a local raw material available at the edge of the playa. Local granite and mica or sand were added to the paste as tempers. According to K. Nelson and E. Khalifa, the limited variability in pottery tempers in a given area with a wide availability of different tempering materials reflects an informed choice made by pottery makers (Nelson & Khalifa, 2010: 135). Vessels were made of coils, although traces of a combination of padding and coiling have also been found. Wall thicknesses range from 4.5 mm to 10 mm. Vessel surfaces are smoothed, while the most common surface colours are grey and black, although reddish fragments have also been found. Due to the small size and quantity of sherds, vessel forms are difficult to reconstruct. Probably, they were deep open spherical vessels with slightly incurving rims (Jórdeczka *et al.*, 2011: 101-104). A particular feature of the pottery of the El Adam phase is a decoration of closely packed horizontal or vertical impressions all over the vessel's surface (Gatto, 2002; Nelson, 2002; Jórdeczka *et al.*, 2011: 104). Such decorations were probably made using a pottery disk with a notched rim (Jórdeczka *et al.*, 2011: 106-107, figs. 10-12).

Pottery was still very rare at the sites of the next El Ghorab phase, and does not differ from that of the previous phase in terms of fabric. M.C. Gatto identified the stem and leaf pattern, as well as the wolftooth pattern (Gatto, 2002: 72). As the same patterns were used to decorate eggshell bottles in the previous El Adam phase, their use on pottery in the younger phase may indicate the same function for these two types of containers (Gatto, 2002: 72). During this period, vessel rims began to be decorated with deep oval punctuation (Wendorf & Schild, 2001: 654).

Pottery becomes more plentiful at the sites of the El Nabta phase. Granite is still used as temper while the prevailing form seems to be a large, deep spherical vessel with incurving rims. However, El Nabta pottery decoration shows greater variability, with such patterns as dotted wavy lines, spaced zigzags, stem and leaf, as well as fishnets (Nelson, 2001: 535; Gatto, 2002: 73).

During the next El Jerar phase, ceramic vessels were still made of local clay tempered with granite and granodiorite. Surface colours range from yellowish red to reddish brown. As regards forms, two main vessel types were recorded, namely a large vessel with a wide mouth and almost straight walls, and a spherical bowl with incurving rims (Nelson, 2001: 536). According to Gatto, El Jerar pottery differs more clearly from that known from the previous phases (Gatto, 2002: 73-74). For the first time, decorations in the form of dotted zigzags impressed across the entire surface were made only using the rocker-stamp technique.

In terms of fabric and surface treatment, Middle Neolithic El Ghanam pottery from the Nabta Playa-Bir Kiseiba area is reminiscent of pottery from Early Neolithic phases. Recorded forms include, first of all, deep vessels with straight walls and flat and thick rims. However, according to Wendorf and Schild, vessels are bigger and have thicker walls (Wendorf & Schild, 2001: 663). While the rocker-stamp technique was used to decorate vessels, unlike in the Early Neolithic period, decoration patterns are spaced and random and do not cover the entire surface. Towards the end of the Middle Neolithic there appeared pottery with roughly smoothed external surfaces. In the view of Wendorf and Schild, despite the differences between the Early and Middle Neolithic pottery of Nabta Playa, certain common features of both assemblages suggest the existence of strong cultural links between groups occupying this area in both periods (Wendorf & Schild, 2001: 665).

Late Neolithic El Baqar pottery shows far greater differences in terms of fabric, surface treatment, shape and decoration when compared with Middle Neolithic pottery (Nelson & Khalifa, 2010: 138). Although the paste is mostly fine, clays could come from different locations (alluvial clay, Nile clay). Sand or ash were used as tempers, while fibre/dung was identified on a few occasions. In a few sherds, plant seeds were also found. Moreover, untempered sherds have also been recorded. While sherd surfaces were mostly smoothed or burnished, plain and unburnished

surfaces have also been documented. Some vessels also had blackened interiors. Vessels with black tops were common as well, while red or reddish-brown slip and self-slip have been recorded. The period in question saw progress in the firing technique, ensuring higher temperatures and oxygen flow control. Late Neolithic forms include simple bowls and slender jars with conical bases. Thus far, no rocker-stamp impressions have been found on vessels from this phase. The similarity of some of Late Neolithic pottery to Badarian pottery (black topped and red slip pottery) has been suggested (Wendorf & Schild, 2001: 666). In the estimation of Nelson and Khalifa, changes in pottery production between the Middle and the Late Neolithic period in the Nabta Playa-Bir Kiseiba area reflect broader social, economic and cultural changes that occurred in the Western Desert in the Middle Holocene (Nelson & Khalifa, 2010: 139-140). The desertification process and increased mobility of human groups were conducive to interactions between people, including potters from different communities. Consequently, pottery became far less diverse in many ways and began to exhibit some common features over a large area (e.g. A-group, Badarian, Tasian assemblages).

The Final Neolithic El Ansam pottery of the Nabta Playa-Bir Kiseiba area displays only partial affinity to the previous period. It was made of two types of clay, namely yellow primary clay mined from Cretaceous bedrock and red primary clay, or fine alluvial clay. In addition, Gatto identified shale ware (Gatto, 2010; 2013). Vessel forms are more diversified: thus, incurving deep bowls, shouldered bowls, spherical jars and jars with flaring rims have been distinguished. As a result of explorations of the Final Neolithic cemetery at Gebel Ramlah, other new vessel forms were recorded in graves, including spouted bowls, bowls with flat bases and beakers. Particularly remarkable are caliciform beakers and deep bowls with small flat bases (Gatto, 2010: 152-153). Richly decorated pottery also emerged in this period. Apart from rim tops decorated with milled impressions or notches, vessel walls are decorated with incised geometric patterns or rocker-stamp plain zigzags. Wendorf and Schild, as well as Gatto (2010), also suggest the presence of rippling on some vessels made of alluvial clay (Wendorf & Schild, 2001: 666). Many features of Final Neolithic pottery production imply relationships between people occupying the Nabta Playa-Bir Kiseiba area and those from Nubia and Upper Egypt (Badarian, A-Group, and Nubian Neolithic) (Gatto, 2010: 156). Climatic changes, reduced access to water sources, as well as pastoralism and the high level of mobility of human groups, fostered the exchange of ideas and patterns among them.

5.2.2. *Gilf Kebir and Jebel Ouenat*

Both decorated and undecorated ceramic materials have been recorded in the Gilf Kebir-Jebel Ouenat region. The earliest occupation (Gilf A) is known from Gilf Kebir, where two localities, namely Wadi el-Akhdar and Wadi el-Bakht, are par-

ticularly worthy of attention. At site 83/33 in Wadi el-Akhdar, sherds with packed dotted zigzags and incised wavy lines were recorded. While pottery with the first of these decoration patterns, tempered with organic temper, seems to be linked to the Middle Holocene occupation, the chronology of incised wavy-line pottery is far more puzzling (Riemer & Jesse, 2006: 68). Despite the successful identification of two C14 dates – for one decorated sherd and one undecorated piece believed to be a fragment of a decorated vessel – the large time gap between these dates has rendered chronology determination difficult. The first of the two dates is $5,338 \pm 71$ BC, whereas the other is much older, i.e. $8,310 \pm 61$ BC (Gehlen *et al.*, 2002: 105). In the view of H. Riemer and F. Jesse, assuming that the fragments did not come from the same vessel, the incised wavy line pottery from Gilf Kebir could be dated to the second part of the 6th millennium BC (Riemer & Jesse, 2006: 68). However, the question of the presence of the oldest pottery associated with the Gilf A cultural unit, remains unanswered (Gehlen *et al.*, 2002: 105; Jesse, 2003).

The sites of the subsequent Gilf B cultural unit in Wadi el-Akhdar, dated to 6,500-4,300 BC, are fairly abundant in undecorated pottery (e.g. sites 80/7-1; 82/21). According to B. Gehlen *et al.*, it has many common features, such as undecorated walls, notches on rims, an average wall thickness of 8 mm, simple surface treatment and poor firing (Gehlen *et al.*, 2002: 105). At site 80/7-1, numerous sherds of a fairly large vessel with a mouth diameter of 37 cm were found. In Wadi el-Bakht, similar undecorated pottery is known from only two sites, one located in the foreland and the other one on the plateau (site 82/21). Similar sherds are also known from two sites located at the exit of Wadi Maftuh and at the upper end of the northern branch of this wadi (Wadi Maftuh Plateau 00/72 and 00/73) (Linstädter, 1999; 2003; Linstädter & Kröplin, 2004: 768).

Gilf B occupation has also been recorded at Wadi Sura. According to Riemer, given that 98% of all recorded sherds and 97% of all vessels are linked to Khartoum-style pottery, this area was occupied mainly in the Gilf B phase (Riemer, 2013: 39). In the first part of the Gilf B phase, only mineral temper was used, while the second part of this phase also features plant-tempered pottery (Riemer *et al.*, 2017: 20).

Pottery is an important element of archaeological assemblages from Gilf C sites dated to between approximately 4,300 and 3,500 BC, both in Wadi el-Akhdar and in Wadi el-Bakht. All sherds are thin-walled, well-fired and contain mineral temper. Incised and impressed decoration in the form of bands under the rim is a particular feature of this period, with comb impressions and herringbone patterns being the most common. Researchers reassembled three vessels and successfully reconstructed their shape, i.e. hole-mouth jars with pointed bases (Schön, 1996: 118-119; Gehlen *et al.*, 2002: 107; Linstädter, 2003: 137; Linstädter & Kröplin, 2004: 770).

Already towards the end of the Gilf C unit, human occupation was probably restricted to Wadi el-Bakht, due to the progressing aridification of the eastern Sahara. At Wadi Sura, only 2% of all sherds could be dated to this phase. The sites are extremely small and transitory (Riemer *et al.*, 2017: 18). Likewise, traces of human activity between 3,300-2,700 BC (Gilf D unit) are rather scarce in the Gilf Kebri area. Although pottery is present at the sites from this period, it is fragile, organically tempered and covered with impressions (Gehlen *et al.*, 2002: 107).

5.2.3. *The Great Sand Sea*

REGENFELD AREA

In the Regenfeld area, Early and Middle Holocene sites have been recorded mostly at the edge of the playa basin. Undecorated pottery is known from site Regenfeld 96/1 dated to the Middle Holocene (Riemer, 2000: 26, fig. 6; Gehlen *et al.*, 2002: 102). Nine sherds tempered with very coarse angular quartz grains were found. Two of them were rim fragments and probably came from bowls.

ABU MINQAR/LOBO

Middle Holocene pottery was identified at site Lobo 81/55, located on the eastern margins of the Great Sand Sea. F. Klees (1989) mentioned the presence of some sherds of light brown handmade pottery with organic temper, found together with ostrich eggshell fragments and beads, grinding stones and lithics. In the opinions of Kless and R. Kuper, there is a high degree of similarity between the pottery from Lobo and that of the Fayumian culture (Kless, 1989: 231; Kuper, 2002: 9).

GLASS AREA

Pottery has been identified at sites situated in the Desert Glass Area located on the western margin of the Great Sand Sea. The greatest collection comes from the so-called 'Willmann's Camp' (B.O.S. site Glass Area 81/61), where two types of pottery (undecorated and decorated) were recorded (Gehlen *et al.*, 2002: 96; Riemer & Jesse, 2006: 67). They were made of the same fabric tempered with straw, quartz and, in a few cases, organic fibre and shale. Additionally, undecorated pottery was tempered with a mineral filler not used in decorated vessels (Riemer & Jesse, 2006: 67). The wall thicknesses of both sherd groups range from 5 to 10 mm.

Particularly remarkable is a large collection of Khartoum-style decorated pottery, consisting of 160 sherds from this site. Researchers successfully identified only one decoration motif – a packed dotted zigzag. In most cases, the zigzag decoration is coarse and rough while the impressed dots are rectangular or round. In the opinion of Riemer and Jesse, decorated pottery could be dated to the Middle Holocene (Riemer & Jesse, 2006: 67). The same chronology was proposed for undecorated pottery.

5.2.4. *The Abu Ballas scarp land*

MUDPANS

A rich assemblage of pottery was discovered at site Mudpans 85/56. In the lower layers only decorated pottery was recorded, in contrast to the upper layers where a mixed assemblage of decorated and undecorated pottery was unearthed (Kindermann & Riemer, in press). The decorated sherds are covered with a packed dotted zigzag motif. Researchers successfully reassembled from collected sherds a vessel with nearly complete decoration (Kuper, 1993: 217). Its 8-mm-thick walls were made of a paste tempered with quartz. The vessel's surface was brown to pale brown (Gehlen *et al.*, 2002: 96; Riemer & Jesse, 2006: 64). As the entire sequence of site 85/56 covers ca. 500 years between ca. 6,500-5,900 cal. BC, Kindermann and Riemer suggest that the site is evidence for the local development of a pottery tradition (Kindermann & Riemer, in press).

EASTPANS

Pottery was also recorded in Eastpans, close to the western shore of the depression at site 95/1. It did not come from Epipalaeolithic layers, but instead from the overlying layer, dated to 6,350 BC. In the opinion of Gehlen *et al.*, this assemblage is only slightly younger than the Epipalaeolithic occupation of the site (Gehlen *et al.*, 2002: 95). The ceramic assemblage consists of several sherds with packed dotted zigzags. According to Riemer and Jesse, in terms of fabric, these sherds resemble the pottery from Mudpans 85/96 (Riemer & Jesse, 2006: 64). They are quartz tempered while surface colours range from brown to pale brown. At site Eastpans 95/2, 4 km to the west of Eastpans 95/1, a quartzite potter's comb was found. It may have been used for the decoration of pottery from Eastpans 95/1.

A large amount of undecorated pottery was also collected at site Eastpans 95/2 and in its surroundings. Fabrics with a few temper types were recorded, namely sand and seeds, sand and shale, as well as sand only. All sherds are parallel to thin-walled pottery known from the Dakhleh Oasis (Bashendi B) or the sites on the Abu Muhariq Plateau (Gehlen *et al.*, 2002: 96-97; Riemer & Schönfeld, 2010: 750).

CHUFU

Middle Holocene pottery has also been identified in the area of Chufu, located close to the eastern dune trains of the southern Great Sand Sea. Due to its scarcity and highly abraded surfaces, the chronology and cultural affinity of this pottery are difficult to determine. On the basis of analyses of lithic assemblages from another Chufu site, namely 02/15, Riemer (2006) suggested that people who occupied the Dakhleh Oasis during the dry season would arrive at the area of Chufu after rainfalls. Therefore, undecorated pottery from this area can be linked to the similar pottery of the Late Bashendi A or Bashendi B known from the Dakhleh

Oasis. Unique findings are two pots from site Chufu 02/14 with surfaces decorated in the Khartoum style with a packed zigzag pattern. According to Riemer and Jesse, the presence of organic temper in the sherds implies a younger horizon of Khartoum-style traditions dated to the Middle Holocene period (Riemer & Jesse, 2006: 65-67).

5.2.5. *The Abu Muhariq Plateau*

DJARA, ABU GERARA, EL KARAFISH AND FARAFRA SAND SEA

Pottery has been recorded at sites in the Djara area, Abu Gerara, El Karafish and the Farafra Sand Sea. Although the collection features 423 fragments, only 246 sherds from 19 assemblages are dated to the Late and Final Djara B phase, contemporaneous with the Late Bashendi A and Bashendi B of the Dakhleh Oasis. The remaining assemblages are either dated to the Sheikh Muftah unit and the Islamic period, or their chronology is uncertain.

Three fabrics were recorded in Djara B pottery. That labelled fabric 1 by Riemer and Schönfeld (2010) is typical for Middle Holocene assemblages. It is “insignificantly tempered”, with a dense matrix and it may also contain some intrusions, namely plant seeds, limestone grit and rounded sand. Moreover, some sherds of the Djara B are made of fabric 2, additionally recorded in younger assemblages of the Sheikh Muftah. A characteristic feature of fabric 2 is the presence of a fine shale temper. Most fabric 2 sherds additionally contain sand and, in a few cases, also plant seeds. The least numerous group of sherds from Abu Muhariq Plateau is made of fabric 3, containing rounded or less-angular quartz grains in amounts greater than in the case of fabric 1.

The external surfaces of fabric 1, 2 and 3 sherds have different tones of brown (brown to brownish yellow, brown to reddish yellow, olive brown) and, less often, red (red to reddish brown). Although sherds have burnished or polished surfaces, rough sherds also occur. While a red coating was recorded on both fabric 1 and fabric 2 sherds, in the opinion of Riemer and Schönfeld (2010), this type of surface treatment is most characteristic for fabric 2. The presence of blackened rims was also confirmed on fragments of fabrics tempered with fine shale.

As regards forms, most vessels are open or closed spherical pots with a height to maximum diameter ratio of 1:1. Jars with nearly vertical walls also occur. Although most vessels have rounded rims, some pointed and flat rims have been found as well. Most fragments came from thin-walled vessels while the average wall thickness of Djara-B-phase sherds ranges from 4.5 to 5 mm. It seems likely that the vessels were rather small, with mouth diameters below 180 mm (Fig. 7:9-19).

The pottery of the Djara B is not decorated. However, some sherds from the sites at Abu Gerara 98/5 and 00/111 bear impressions. According to Riemer and

Schönfeld, a sherd with a cord impression is technologically similar to undecorated pottery found at the site and could be linked to the Djara B phase (Riemer & Schönfeld, 2010: 737).

The distribution of pottery across the Abu Muhariq Plateau is not uniform. Greater amounts of material have been found at sites in the southern part of the plateau, namely in the areas of Abu Gerara and El Karafish. In the area of Djara in the north, sherds were recorded at only two sites of the Late Djara B phase. In other locations in the northern part of the plateau, e.g. on Seton Hill, no pottery traces have been found despite lithics indicating that herders were present here in the period in question. According to K. Kindermann (2010), the lithic assemblages from the northern and southern parts of the Abu Muhariq Plateau are homogenous, with only a small number of differences. Both the northern and the southern part of the plateau were occupied by people with the same cultural background. Despite this, pottery was rarely used by groups occupying the northern part of this region, or was not used by them at all. According to Riemer and Schönfeld, the distribution of pottery in this area was linked to a variable landscape pattern (distribution and density of playa locations) and to the fact that further to the north of the plateau, the distances between potential water sources increased (Riemer & Schönfeld, 2010: 750-753).

ABU TARTUR

Abu Tartur sites are also located on the Abu Muhariq Plateau. However, they were not researched directly by archaeologists from the ACACIA project. Pottery from Abu Tartur was collected by Siegbert Eickelkamp at 68 individual sites (50% of all sites recorded). They were located both on the plateau and in playa depressions. The findings were analysed by Riemer and Schönfeld (2006). Pottery was recorded at sites representing Abu Tartur phases B, C and D. The earliest known Abu Tartur pottery was identified at the eight sites of Abu Tartur B. Moreover, a total of 12 medium-walled sherds (6-8 mm) tempered with angular sand have Khartoum-style decorations (packed dotted zigzag motif). C14 dates point to the period of between 6,400 and 6,100 BC for this phase.

Abu Tartur C pottery seems to have been produced locally from two fabrics, namely a thin-walled dense untempered fabric and a fine shale fabric. The surface of the former has colours ranging from reddish brown to pale brown and grey. Sherds made of the latter fabric are brown or yellowish brown. Forms include small open bowls, open bowls with straight walls, hemispherical bowls, and deep restricted vessels. Vessels are thin-walled and sherd wall thicknesses range from 3 to 7 mm. While most pottery is undecorated, two sherds have a rim decoration in the form of incised grooves on the top. Two fragments of one or two small Tasian-like beakers with incised geometric decoration were also recorded. Riemer and

Schönfeld also mentioned black-topped rims and sherds with a rippled surface known from other locations in the Egyptian part of the Sahara and Upper Egypt (Riemer & Schönfeld, 2006: 349).

In terms of fabrics, forms and decoration patterns, the pottery of Abu Tartur shows a large degree of affinity to that of the Late Bashendi A and B from the Dakhleh Oasis. Considering the location of Abu Tartur between the Dakhleh Oasis and the Kharga Oasis, pottery was probably made by groups travelling between the desert and the oases in the Middle Holocene period (Riemer & Schönfeld, 2006).

5.2.6. *The Dakhleh Oasis*

Although C. Hope suggested that the oldest pottery in the Dakhleh Oasis is known from the sites of the Masara A (or B) cultural unit, in the opinion of A. Warfe, the sherds identified as Early Holocene were produced by later groups (Bashendi and Sheikh Muftah) (Hope, 2002: 40; Warfe, 2006; 2018: 34-36; 75). Thus, their presence at Epipalaeolithic sites is a result of reoccupation or post-deposition processes. However, he also suggested that the Masara people could have been aware of this technology through links with other parts of the Western Desert, especially its southern part (Warfe, 2018: 75). Pottery production was not introduced into the Masara cultural unit probably for a few reasons, including economic or social organisation, way of life or a lack of demand for ceramic containers.

The earliest pottery production in the Dakhleh Oasis is known from Late Bashendi A sites. However, the number of recorded sherds at these sites is very low. The most common fabric is tempered with sand and shale. In the estimation of Warfe, most pottery during the Bashendi A period was made of fabric with fine non-plastic inclusions (Warfe, 2018: 38). Other fabrics containing organic temper are rare (Hope, 2002: 41; Warfe, 2018: 52-54). Surface colours range between brown, red and grey. In the view of Warfe, mostly pottery with compacted, plain surfaces was produced during the Late Bashendi A phase (Warfe, 2018: 36-27). Most sherds probably come from small and medium-sized deep open or slightly restricted bowls, or hemispherical bowls with a wall thickness ranging from 3 to 7 mm (Warfe, 2018: 36). On the basis of pottery uniformity, Warfe suggested that Late Bashendi A potters invested considerable time and effort in pottery production despite its small scale and early stage of pottery making. Most pottery is undecorated. Hope (2002) mentioned a few sherds with black tops and some vessels with oblique short incised lines. However, he also suggested that the rippling visible on some sherds had been caused by erosion. Some sherds with Khartoum-style impressed decoration with distinctive quartz-rich fabric have been recorded at Late Bashendi A sites as well. All decorated pottery is treated by Warfe as non-local (Warfe, 2018: 38).

Although the amount of pottery at Bashendi B sites grew, pottery production was still rather limited (Warfe, 2018: 76). It is better preserved than the older

pottery from the oasis. In terms of fabrics, surface treatments and forms, Bashendi B pottery is reminiscent of ceramics known from Late Bashendi A sites. Most fabrics are tempered with sand and shale (fine and coarse) (Warfe, 2018: fig. 14). According to M.A.J. Eccleston, the raw material used for local pottery production came from within the oasis, although its inhabitants could have also sourced it from other clay deposits (Eccleston, 2002: 64; Warfe, 2018: 66-73). Additionally, sherds made of a fabric tempered with gypsum/quartz, quartz/straw and a high amount of quartz were also recorded. In the estimation of Warfe, the continuation of a preference for fabrics with fine to medium inclusions is clearly visible during the Bashendi B phase (Warfe, 2018: 40). All vessels were made of coils by hand. Most sherds came from small and medium-sized deep, open or slightly restricted bowls (Fig. 7:1-7) (Warfe, 2018: figs. 16, 29). Hope (2002) suggests a self-slip on the external surfaces of most of the vessels, resulting in non-uniform surface colouration. According to Warfe, almost half of Bashendi B pottery was plain while approximately 35% had a compacted surface (Warfe, 2018: fig. 15). Coatings were first used at this time, although rarely. Warfe also noticed that vessel colours changed during the Middle Holocene, mostly to reddish-brown (Warfe, 2003: 183). In his opinion, vessels with very thin walls (3.5 to 5 mm) appeared at Bashendi B sites, although vessels with a wall thickness below 3 mm occurred there as well (Warfe, 2018: 28).

Within the pottery of the Bashendi B culture, low-fired vessels appeared. As they are very fragile and easy to break by hand, Warfe suggested that they were used for less rigorous purposes, such as serving food or short-term storage (Warfe, 2018: 76). Moreover, as proposed by Gibbs (2012), the features of Middle Holocene low-fired pottery from the Dakhleh Oasis fit short-life or disposable pottery very well.

A vast majority of pottery is undecorated, while only a few bowl sherds have oblique grooves on rim tops. Other decorations include oblique or vertical incised lines found on some sherds. At site Locality 74 fragments of decorated beakers were found, displaying a typical Tasian motif of incised triangles filled with vertical or horizontal rows of impressed dashes or dots, probably arranged in several rows between incised lines (Hope, 2002: 43, fig. 1: a-f, pl. 53). From the same site comes the only jar known from the Dakhleh Oasis, with incised decoration in its upper part. Although Hope suggests that its form is similar to that of Maadi jars, its origin and chronology are uncertain. Other noteworthy items include fragments with impressed decorations from Locality 212. Hope suggested that the decoration pattern was an imitation of basketry or woven mat, and that the vessel had been made outside the oasis.

To conclude, pottery from both Late Bashendi A and Bashendi B sites may be divided into two groups. The first one includes undecorated thin-walled simple

and open vessels made mostly of quartz and shale fabric with smoothed surfaces. The other group features pottery made outside the oasis and introduced by people coming from different directions. The Khartoum-style pottery was the first to arrive and is now believed to reflect influences from the south (Riemer & Jesse, 2006; McDonald, 2016: 190; Warfe, 2018: 61-66). At Bashendi B sites there probably appeared imports from the Nile Valley and from the desert, namely fragments of beakers with incised decorations and blacktopped sherds from the desert.

5.2.7. *The Kharga Oasis*

According to M. McDonald, the earliest evidence of pottery in the Kharga Oasis appears at sites dated to the 7th millennium BC, similar to those from the Dakhleh Oasis, of the Masara C cultural units (McDonald, 2009: 31-32). It is decorated with Khartoum-style impressions. Parallel pottery has also been recorded by French archaeologists working in the north of the oasis, namely at Epipalaeolithic sites (e.g. KS121) similar to the Masara C sites (Briois & Midant-Reynes, 2010: 46; see also Dachy *et al.*, 2018). In the opinion of McDonald, the sites in the Midauwara area with Masara C materials may have been used by Epipalaeolithic groups who left the Dakhleh Oasis in the middle of the 7th millennium BC (McDonald, 2009: 32). The remains from the Kharga Oasis probably fill in an occupation gap observed in the Dakhleh Oasis between 6,500-5,800 cal. BC.

In the Kharga Oasis, pottery has also been recorded at Baris sites. It is made of a sand and gypsum fabric and its walls are thin and undecorated. Sherds with Khartoum-style decoration made of a coarse sand fabric have been recorded as well (e.g. at the sites MD-18, MD-24, MD-66, MD-69) (McDonald, 2009: 32-34). Archaeological assemblages, including the pottery from Early Baris sites, are reminiscent of those of the Late Bashendi A culture from the Dakhleh Oasis. The amount of pottery at Late Baris sites (e.g. at site MD-22) grew. The recorded fragments mostly come from undecorated thin-walled, open or closed simple bowls. A fabric tempered with sand and shale (in varying quantities) is the most common type, although fabrics with organic temper and coarse shale inclusions have also been recorded. In addition, vessel fragments with rippling, believed to have been linked to the Badarian culture, were found at sites MD-22 and MD-36 (McDonald, 2006: 489).

In terms of forms and fabrics, the pottery of the Early and Late Baris cultures resembles that of the Late Bashendi A and Bashendi B from the Dakhleh Oasis. This situation is associated with cultural links existing between the two oases during the Middle Holocene. However, in the Late Baris period, the connection was gradually weakened, while Khargan sites contain evidence suggesting more intensive contacts with the Nile Valley (McDonald, 2009: 11). Given its short distance from the Nile Valley, towards the end of the Holocene humid phase, the

oasis became a place of activity of groups travelling between the river and the oasis. Badarian rippled pottery in the Midauwara area, black-topped pottery and Tasian incised beakers found at site KH043 appeared in the Kharga Oasis probably because of the movement of people between the two regions at the time when settlement activity had begun in the Nile Valley in the 5th millennium BC (Briois & Midant-Reynes, 2010: 49; Briois *et al.*, 2012). The presence of Neolithic pottery from the Nile Valley in the Western Desert not only confirms contacts between groups inhabiting both regions and travelling across the desert but may also point (at least partially) to African roots of the Egyptian Predynastic civilisation (McDonald, 2009: 37; Briois & Midant-Reynes, 2010; Dachy *et al.*, 2018).

5.2.8. *The Farafra Oasis*

Pottery dated to the Neolithic period has been recorded in two locations in the Farafra Oasis: at site Sheikh el-Obeiyid 99/1 and at site Hidden Valley 2/Area 1. However, it should be pointed out that the overall number of recorded sherds is very small. Only five fragments were analysed in detail, including three from Sheikh el-Obeiyid 99/1 and two (probably coming from the same vessel) from Hidden Valley 2/Area 1. The material used to make Late Neolithic pottery was probably sourced from within the oasis, although its exact place of origin was not identified due to the fact that our knowledge of the oasis is rather limited. M.C. Gatto and I. Muntoni suggest silty sands or clayey sediments of playa deposits as a possible source of raw materials (Muntoni & Gatto, 2014: 456). The vessels were made both of naturally tempered fabric, and of a fabric with additionally added tempers – medium-sized sand or organic tabular remains. The sherd surface colour is greyish black or pale brown. The surface treatment is difficult to identify because the sherds are either completely or partially abraded. Only in the case of a potsherd from the Hidden Valley were traces of smoothing on the external and internal surfaces recognised. The vessels were fired in a semi-controlled oxidizing atmosphere at a maximum temperature of 700°C. Most fragments were thin-walled, except for a fragment from Sheikh el-Obeiyid, probably coming from a jar or a deep bowl (Muntoni & Gatto, 2014).

According to Muntoni and Gatto, the pottery from the Farafra Oasis displays considerable affinity in terms of fabrics to Middle Holocene pottery known from other sites in the Western Desert (Muntoni & Gatto, 2014: 456-457). The lack of shale ware, found in copious amounts in other locations, is explained as a specific technological choice or as a consequence of the absence of shale deposits in the oasis.

5.2.9. *Sodmein Cave*

Pottery fragments have been recorded at only one site in Sodmein Cave in the Eastern Desert. The greatest number of sherds were recorded in the northern

part of the cave, mostly in the A and C1 deposits, associated with feature 111, dated to $6,148 \pm 38$ BP. Due to vertical scattering of other sherds at the site, it is not possible to link them to any other structures and, consequently, to precisely date them (Vermeersch *et al.*, 2015: 482). According to P. Vermeersch *et al.*, the pottery from the cave should be linked to the presence of ovicaprine herders between 5,400-5,000 cal. BC (horizon C1) (Vermeersch *et al.*, 2015: 499). This assumption is based on the similarities to flint inventories belonging to the bifacial tradition known from the northern part of the Western Desert.

All vessel fragments found in Sodmein Cave were made of coils by hand. On three sherds, turntable traces were identified (Vermeersch *et al.*, 2015: figs. 19: 4-5, 10-11, 18). The fine paste is sandy, usually without temper. In a few cases, small open pores are visible in the paste, although it is unclear whether they are traces left by a burnt organic admixture (Vermeersch *et al.*, 2015: online resources 3; fig. 19: 1-2, 4, 8). In one case, fine, red grit particles were recorded in the paste. Surface colours are yellow, red, grey and black, while surface treatment techniques include burnishing, both on the inside and outside. Slip traces are visible only in one case (Vermeersch *et al.*, 2015: fig. 19: 8). Firing is described as hard, resulting in some degree of sintering of the paste. Most sherds are undiagnostic, while the original vessel forms are beyond identification. Three of the preserved rims suggest the so-called spherical vessels with incurving walls and round rims (Vermeersch *et al.*, 2015: fig. 19: 2-3, 8). One fragment was part of a simple bowl with a rim that was slightly thickened on the outside (Vermeersch *et al.*, 2015: fig. 19: 11).

From among the few sherds found in Sodmein Cave, two are particularly worthy of attention, namely one with a blackened rim similar to those known from other localities on the Western Desert, and the other with engraved herringbone decoration on the outside. Desert black-topped pottery is well known from Middle Holocene sites in the Western Desert (e.g. Abu Gerara, Abu Tartur, the Dakhleh Oasis, Nabta Playa). In addition, the decorated fragment comes from a hole-mouth jar, probably with a diameter of approximately 18 cm. Its inner and outer surface is red and burnished. The fragment consists of a few smaller sherds, one of which is related to feature 10, dated to approximately 5,600 cal. BC (Fig. 7:8). Both may be helpful in determining the cultural identity of the herders who occupied the site.

Since Vermeersch *et al.* have suggested that the pottery from Sodmein Cave can be dated to the period 5,400-5,000 cal. BC, the cave may have been visited by herders moving with their animals across the eastern Sahara in search of water, food, and pastures (Vermeersch *et al.*, 2015: 499). Other pottery features (fabrics and surface treatment techniques) show similarities to pottery typical for groups from the northern part of the Western Desert, belonging to the Bifacial techno-complex. The herringbone pattern is known in Egypt from the site at Merimde

Beni Salame, where it was recorded in layers representing the oldest settlement phase dated to approximately 5,000 BC. In terms of design, the decoration pattern from Sodmein Cave diverges slightly from the Merimde herringbone pattern (Figs. 7:8; 22). It is rougher than that known from specimens found in the Nile Delta. On the other hand, vessel forms and homogenous paste display a high degree of affinity. At the current state of research, it is nevertheless difficult to draw any conclusions on such remote connections. However, the above-mentioned connections no longer appear unlikely assuming that the herders from Sodmein Cave belonged to the Bifacial tradition of the northern part of the Western Desert and could travel over long distances, and additionally assuming (on the basis of the similarity of the lithic assemblages of Middle Holocene sites from the Western Desert and the sites in the Fayum and Merimde Beni Salame) that mobile herders could have visited the Fayum and the Delta margins or even settled there at the beginning of the desiccation of the desert. Undoubtedly, it is yet another issue that calls for more research.

5.2.10. The eastern Saharan pottery tradition - a summary

The pottery that appeared in the Egyptian part of the eastern Sahara during the Holocene humid phase does not form a homogenous group and displays many regional differences. Its roots are definitely local (African). As the desert pottery spread in the Early and Middle Holocene periods, its production underwent changes visible both in technology and vessel forms/decorations. These changes are attributable to many different factors, including the environment and climate, on the one hand, and social, economic and cultural changes in various regions of the eastern Sahara, on the other.

Pottery appeared in southern Egypt in the 9th millennium BC at sites in the Nabta Playa-Bir Kiseiba region. Throughout nearly the entire Holocene humid phase, the southern part of the Western Desert showed strong connections with Sudanese regions, visible in pottery decorations (e.g. at Nabta Playa, Gilf Kebir). During the Early and Middle Holocene, the southern Khartoum tradition spread northwards, reaching the Dakhleh-Abu Tartur-Kharga line in the late 7th/early 6th millenniums BC. Khartoum-style decoration appeared at the sites of Abu Ballas (Mudpans, Eastpans, and Chufu) and in the Dakhleh, Kharga and Farafra oases. Although it was also recorded at the sites at Abu Tartur located in the southern part of the Abu Muhariq Plateau, no sherds with Khartoum-style decoration have so far been recovered in northern locations of the plateau at Abu Gerara, El Karafish, and Djara.

The oldest known evidence of the undecorated pottery tradition comes from the area of the Dakhleh Oasis and, specifically, from Late Bashendi A sites dated to approximately 6,100-5,700 cal. BC. Around 5,600 BC, similar pottery appeared

on the Abu Muhariq Plateau in Late and Final Djara B assemblages. Undecorated thin-walled sherds are also known from the Kharga and Farafra oases, a number of locations in the area of Abu Ballas (Chufu, Eastpans) and the eastern margins of the Great Sand Sea. The pottery from Sodmein Cave in the Eastern Desert is also associated with the northern tradition.

It seems likely that the development of the pottery tradition in the area of the Dakhleh and Kharga oases in the Middle Holocene was not accidental. According to McDonald, owing to the bimodal rainfall pattern (winter-summer), the conditions in the oases were more favourable for human occupation and resulted in a certain degree of sedentism (McDonald, 2015: 277). Longer stays in (or more frequent returns to) the same place could promote adaptation of the new technology and its incorporation in the existing system. Despite the fact that the Bashendi B people returned to a mobile lifestyle, they continued to make and use undecorated thin-walled pottery. This has been found at numerous sites dated to the 6th millennium BC and shows a high degree of technological and stylistic convergence.

As the pottery tradition spread northwards, it probably underwent a technological change. Decorated pottery from older Middle Holocene sites (6,600-6,000 cal. BC) is tempered with mineral materials, while Khartoum-style decorated pottery from younger Middle Holocene sites (ca. 5,600-5,000 cal. BC) contained organic temper (e.g. Glass Area 83/20 and 96/12, Chufu 02/14) (Riemer & Jesse, 2006; Riemer *et al.*, 2013). Another novelty observed in the late 7th/early 6th millenniums BC was the fact that decorated pottery was accompanied by undecorated sherds. Kindermann and Riemer suggest that a new undecorated pottery tradition developed in the area of the Dakhleh Oasis in the above-mentioned period, and which they treat as undecorated facies of the Khartoum-style technocomplex (Kindermann & Riemer, in press).

In the estimation of Riemer *et al.* (2013), in the final stage of the Holocene humid phase (6,000-5,300/5,200 cal. BC) two distinct cultural traditions/technocomplexes can be differentiated on the basis of material culture, namely the northern Bifacial tradition and the southern Khartoum-style tradition. While the differences between them are visible, first of all, in lithic assemblages, the pottery of both traditions differs also. The Khartoum-style tradition continued to have many links with Sudanese regions, visible in decoration patterns (packed dotted zigzags, incised wavy lines, dotted wavy lines) (e.g. Nabta Playa, Gilf Kebir). However, undecorated, thin-walled pottery is typical for the northern tradition. The current state of research does not indicate any pottery presence north of the Farafra Oasis.

Unquestionably, the low quality and quantity of finds have a bearing on our poor level of knowledge of the pottery tradition of the eastern Sahara in the Early

and Middle Holocene. It is unclear why and when people adapted pottery in the southern part of the Western Desert. Little is known about the process of spreading pottery technology and knowledge (Close, 1995; Jesse, 2003; 2010). In some ways, the mobile lifestyle of hunter-gatherers and herders involving frequent relocations over long distances in search of food, water, and animal pastures must have helped promote the idea of pottery production. On the other hand, it should not be forgotten that the transport of clay vessels was rather cumbersome (see Eerkens, 2008). While pottery is present in the Dakhleh and Kharga oases and at nearby sites such as Abu Tartur or Chufu (likely stopover places used by groups that seasonally or occasionally travelled between the oases), the small number of sherds at most of the explored sites may reflect certain limitations in carrying ceramic vessels and/or their limited use.

Archaeological assemblages tell us little about why people chose to add pottery to previously available tools. Unquestionably, pottery was far more difficult to make than lithic tools. Even though raw materials for both technologies were available in the desert, the requirements associated with both production processes were different. Although some know-how was necessary for both technologies, knapping can be done basically anywhere, while pottery making – apart from raw materials – additionally requires water, fire, and fuel to sustain it. Due to the said challenges, groups wishing to make and use pottery had to incorporate its production into their way of life and to secure access to all necessary materials. According to Riemer and Schönfeld, in the case of the northern part of the Abu Muhariq Plateau, long distances between water sources (more than a day's walk) are the reason for the scarcity of pottery in this area (Riemer & Schönfeld, 2010: 752-753).

Vessel functions are an important aspect of the discussion on the adaptation of pottery production in the eastern Sahara. If its functions were attractive enough, hunter-gatherers or herders could have chosen to make pottery regardless of the inconvenience involved. Since pottery emerged simultaneously with domesticated animals and the exploitation of wild plants, its function is usually associated with these new food sources. In periods of intensive plant gathering, pottery could be used for plant processing (Dunne *et al.*, 2016). Similarly, the use of animal secondary products, such as milk and blood, could be linked to ceramic containers. Although traces of the first dairying practices have so far been confirmed only for the 5th millennium BC among pastoral groups in the Libyan Sahara, earlier knowledge of milk processing cannot be excluded at this stage without further studies on materials in other parts of the Sahara. In addition, dairying would have enabled the consumption of milk products by desert herders who were lactose intolerant (Dunne *et al.*, 2012; 2013; 2018).

The size of ceramic assemblages does not grow significantly in the Holocene humid phase. The quantity of sherds recorded at sites is rather small, which can

result both from deposition or post-deposition processes, as well as from pottery functions and methods of use. According to both Close and Gatto, the small number of sherds at the oldest sites may denote a special or even symbolic function of pottery (Close, 1995: 28; Gatto, 2002: 77). However, Wendorf and Schild (2001) are of the opinion that the increased quantity of vessels at El Ghorab sites in the Nabta Playa–Bir Kiseiba area may be attributable to their emerging utilitarian function (as containers), although the absolute number of vessel fragments at El Ghorab sites continues to be low. It seems that ceramic vessels were not the only containers used by herders. Already from the beginning of the Holocene, they used bottles made of ostrich eggshells. Indeed, Gatto made an interesting remark on the presence of the same decoration pattern on ostrich eggshell containers dated to the El Adam phase, and on the younger ceramic vessels from the El Ghorab phase (Gatto, 2002: 72). In her opinion, while this similarity may suggest a special or symbolic character of the decoration, it may also indicate that both types of containers were used for similar purposes.

The addition of pottery to the toolkit used by Early and Middle Holocene mobile herders had a number of consequences. On the one hand, it required knowledge, access to raw materials and a series of deliberate pottery-making activities. Due to their structure, the transport of vessels also required certain attention in order to avoid breakage. On the other hand, the use of pottery offered certain benefits. In most cases, ceramic vessels were open or closed spherical vessels with vertical or incurving rims, as well as simple open bowls that could be used for a variety of purposes, such as the storage, processing or even transport of products. In all likelihood, pottery became yet another adaptation tool, helping people survive in the harsh conditions prevailing in the Sahara during the Holocene humid phase.

The end of the 6th millennium BC saw some profound climatic changes in the Sahara. The desert began to desiccate, first expelling people from areas with limited access to water, and then forcing them to leave the desert altogether in the middle of the 5th millennium BC. Initially, people moved with their cultural heritage to or near oases, or even to the Nile Valley. Movements to the north, towards the Fayum or even the Nile Delta, were likely as well. At the same time, an important economic change took place, accompanied by the rise of cattle pastoralism across the eastern Sahara. Nomadic groups travelled with animals over large territories during the annual cycle, searching for water and pastures. Remains of human occupation are known from the Nabta Playa area (Late and Final Neolithic), Gilf Kebir (Gilf C-D) in the south, as well as from the Dakhleh, Kharga and Farafra oases (Bashendi B, Sheikh Muftah, Wadi el-Obeiyid C) in the central part of the Western Desert. In all these locations, pottery was still used, despite the mobile way of life.

The emergence of Badarian societies in the Nile Valley around 4,500 cal. BC coincided with the second dry spell in the eastern Sahara and the final exodus from the desert. People probably moved to the Upper Egyptian Nile Valley and to the south, thus following the monsoonal belt. The movement of people towards northern Egypt was also possible (Qasr el-Sagha, Merimde II) Therefore, researchers have increasingly often suggested the African or desert heritage of the Predynastic Egyptian civilisation (see Wengrow, 2003; Gatto, 2011; Mączyńska, 2018a). Some links between the desert and the valley are visible in pottery production. Fine examples are the so-called Tasian beakers known from Gebel Ramlah, Kharga Oasis (e.g. sites KS043 and KS051), Wadi el-Hol in the middle of the Qena bend, or even from the Wadi Atulla located in the Eastern Desert. Currently, the so-called Tasian culture is often discussed and identified with nomadic people coming from the desert, with cultural links to A-group and Nubian Neolithic (Darnell, 2002; Friedman & Hobbs, 2002; Gatto, 2010; see also Horn, 2017a; 2017b; Dachy *et al.*, 2018). Apart from the issue of the origins of Tasa pottery and Tasian society, links between black-topped pottery known from the Western Desert (Nabta Playa, central oases, Abu Muhariq Plateau) and Predynastic black-topped pottery typical for the Naqada society in Upper Egypt are the subject of discussion. Riemer and Schönfeld suggested that black-topped pottery known in the Nile Valley could have been initiated by the pottery tradition of the Western Desert at the end of the Holocene humid phase (Riemer & Schönfeld, 2010: 754-758). However, the issue of cultural connections between the Western Desert and the Nile Valley still needs more research.

5.3. The southern Levant

The emergence of pottery in the southern Levant is linked to a new stage in the development of farming communities in this area, referred to as the Pottery Neolithic. Pottery-making skills are believed to have appeared after the Pre-Pottery Neolithic and became a hallmark of the Pottery Neolithic. Recent research has shed new light on the transition from the PPN to the Pottery Neolithic. As a result, it is no longer seen as a collapse or a break in the cultural development of this region. This transition involved considerable social and economic changes, even with the continuation of a number of PPNB traits into the Pottery Neolithic. Particularly important in this context are the discoveries from the site of Kfar Ha-Horesh, where ceramic potsherds were found in layers dated to the Early and Late PPNB (Biton *et al.*, 2014). These finds have redefined earlier views on the introduction of ceramic vessels to the southern Levant. However, while the skills of pottery making and use were known before the Pottery Neolithic, ceramic containers began to be commonly used only in the Pottery Neolithic.

5.3.1. *The origins of pottery in the southern Levant*

Originally researchers were of the opinion that pottery was introduced to the southern Levant from the north. Given that the form and decorations of the early Levantine pottery were not primitive enough as for an initial production stage, its emergence was linked to migrations from other regions, including, first and foremost, the northern Levant (Kenyon, 1957: 82; Amirian, 1965: 243-247; Mellart, 1975). Currently, most researchers agree that early pottery production in the southern Levant originated locally and link it to the production of plaster for architectural and artistic purposes (Goren *et al.*, 1993; Banning, 1998: 206; Garfinkel, 1999; Rice, 1999: 5-6, 45; Gibbs, 2015: 347; Budja, 2016: 78).

Plaster products first appeared in the PPNA or even slightly earlier. Initially, burnt lime was closely connected with residential structures. It was used for the plastering of floors or walls and for the paving of installations. In the PPNB, this began to be used for the plastering of skulls, figurines, beads, as well as for making small vessels, such as bowls and basins referred to as White Ware, a name derived from their light surface colour (Goren *et al.*, 1993: 34). Towards the end of the 7th and during the 6th millenniums BC, such vessels became more common while closed forms began to be used alongside open forms (Garfinkel, 1999: 13-15, figs. 3-5).

It seems that there is a relationship between White Ware production and pottery production. Ceramic vessels are believed to have been a continuation of a tradition that began in the PPN. Remains of both technologies have been found alongside one another at a number of Pottery Neolithic sites (Garfinkel, 1999: 13). Another important point in the discussion on the origins of pottery in the southern Levant and its relations with White Ware is *pyrotechnology*. The term refers to a production process requiring high temperatures, necessary in both cases. In lime production, a high temperature (850°C) triggered decalcination of the raw material (limestone). The resulting quicklime was mixed with water, and the paste obtained in this way was used to form vessels that were subsequently dried. In the case of pottery, pyrotechnology is used at a later stage, in order to harden clay and to finish off the entire process. Although the timing of using high temperatures was different in each process, both of them had to be controlled by people and required specific knowledge and skills (Garfinkel, 1999: 12). The proponents of this hypothesis suggest that people skilled in pyrotechnology were capable of initiating pottery production without any external assistance (Banning, 1998: 206).

Some thoughts linking the origins of pottery with White Ware can also be found in the works of Y. Goren *et al.*, (1993: 37-39; Gopher & Goren, 1998: 224-225). Having analysed PPN materials in detail, these researchers noticed that the use of burnt lime was not as common as it was often believed and that the paste

used to form White Ware additionally contained other materials, such as clay, dung, marl or soil. In their view, the use of other raw materials and their mixing with burnt lime could indicate a link between early Pottery Neolithic and Pre-Pottery Neolithic plaster and mud technology. Furthermore, these analyses inspired Y. Goren and A. Gopher to propose a hypothesis on the dichotomy of the origins of decorated and undecorated pottery in the Pottery Neolithic (Gopher & Goren, 1998: 224). Decorated pottery was always made of light-coloured calcareous materials, including marl or even burnt lime, and its sophisticated decorations required a lot of time and effort (see Yarmukian and Lodian pottery). Meanwhile, undecorated pottery was darker and made of mud. Following these observations, Goren and Gopher proposed a new explanation for the beginning of pottery in the southern Levant, including two different origins and development pathways of the new technology (Gopher & Goren, 1998: 224-225). In the case of undecorated pottery, the introduction of the new form of containers was inspired by their utilitarian functions and by the need for improvement in cooking and storage. However, the origins of decorated pottery go beyond a culinary explanation and are linked to rituals and symbolic contexts, in which White Ware was used as well, alongside figurines and other objects not related to architecture made of burnt lime (see also Rice, 1999: 45).

The hypothesis by Goren *et al.* (1993) has a few weak points. First of all, it focuses on a small part of Pottery Neolithic ceramic assemblages. Secondly, the relative share of decorated vessels is not greater than 10-25% of Yarmukian pottery, while most vessels found at sites are plain (75-90%). Furthermore, the latest studies on the functions of Yarmukian pottery suggest that both decorated and undecorated vessels were used for utilitarian purposes (Vieugué *et al.*, 2016: 103).

The other explanation for the introduction of pottery into the southern Levant has been proposed by Garfinkel (2014). He considers this event as a gastronomic revolution that opened up new possibilities in food preparation.

In the light of research conducted to date, southern Levantine pottery seems to be of local origin. Although its emergence is generally associated with technological development, the reason why ceramic containers began to be commonly produced and used continues to be unclear. Given the high popularity of the architecture hypothesis and the culinary hypothesis, it is possible that the new technology had a symbolic and utilitarian function for Pottery Neolithic people.

5.3.2. *Yarmukian pottery*

Yarmukian pottery was made of local materials sourced from near a given site (Garfinkel, 1999: 16). Most clays were calcareous while tempers identified so far include sand, crushed calcite, chalk, straw, basalt, grog, and flint (Vieugué *et al.*, 2016: 99). In the view of A. Gopher and R. Eyal, analyses of pottery from Nahal

Zehora II imply that paste was prepared in a labour-intensive manner, including, in particular, the mixing of alluvial soils and chalk (Gopher & Eyal, 2012c: 703).

Yarmukian vessels were made of coils or slabs by hand, although traces of moulding and pounding have also been observed. Mat impressions visible on some surfaces suggest that mats were used to form vessels. While vessel surfaces could be smoothed, some vessels still had uneven undulating surfaces (Gopher & Eyal, 2012c: 725). Yarmukian vessels were covered with slip and may have been burnished. Although, according to Garfinkel, red slip was a form of decoration, Gopher and Eyal do not preclude utilitarian reasons for its application (Garfinkel, 1999: 59; Gopher & Eyal, 2012c: 726). At Sha'ar Hagolan only 9% of all recorded sherds and 60.5% of all treated sherds have traces of slip, while in Munhata slip is present on less than 5% of all sherds and on 38.6% of all treated sherds (Garfinkel, 1999: tab. 6). In the assemblage from Nahal Zehora II, slip was recorded on 45% of all treated sherds found in Yarmukian layers.

While some Yarmukian vessels are burnished, such surface treatment may be present over plain, self-slipped or slipped vessels. Plain burnishing is considered to be a purely Yarmukian phenomenon. At Nahal Zehora II, it is present on 12% of all treated sherds. Other characteristic Yarmukian elements include rough surfaces, while in the course of the Yarmukian culture, honeycomb roughening also appeared (Gopher & Eyal, 2012c: 726-727). Moreover, the internal walls of some vessels show traces of wiping and smoothing using grass or straw.

In most cases, vessels were fired in an oxidising atmosphere, probably controlled by potters. However, pottery suggesting a relatively high level of firing atmosphere control is accompanied by fragments displaying a low level of such control (Gopher & Eyal, 2012c: 725).

Garfinkel (1999) presented a sophisticated typology of vessels of this cultural unit based on two features, namely their basic shape (open vs. closed) and size. Open vessels include small and medium-sized truncated bowls, small and big chalices, pots, basins, and pithoi (Fig. 8:2-4, 6). Closed vessels feature jars of various sizes with a spherical body, a long vertical neck and a simple rim with two lug handles (Sha'ar Hagolan jars) (Fig. 8:5, 7, 8), jars with a spherical body, a short vertical neck and a simple rim (Jericho IX jars), hole-mouth jars and large jars with an ovoid body, a wide flat base and an S-shaped profile (Fig. 8:1, 9).

Interesting observations about the frequencies of different vessel types and the functions of Yarmukian vessels from three sites, namely Sha'ar Hagolan, Munhata and Nahal Zippori 3, were made by J. Vieugué *et al.* (2016), who divided Yarmukian pottery into six functional classes, four of which were analysed in detail. The first group includes big pithoi, used for long-term storage. Group 2 consists of vessels used for the storage and transport of liquids, i.e. different types of small and medium-sized jars, mostly with handles, and decorated in some cases. Group 3

is represented by vessels used to serve and consume food, such as bowls of different sizes. Vessels showing signs of use-wear only belong to group 4. They include hole-mouth jars used for cooking, sometimes fitted with handles.

Statistical analyses of three ceramic assemblages showed that the most common group consists of vessels used for serving and consuming food (38%), which is fairly typical for settlement sites. The second largest group are big pithoi used for long-term storage (27%). Given the long-life span of such vessels and their lower replacement rate, their quantity may suggest that food storage played a particularly important role in the Yarmukian culture. As the vessels' capacity ranges from 40 to 100 litres, they could contain supplies for groups inhabiting compounds typical for the period in question. Jars used for the storage and transport of liquids with capacities ranging from 3 to 16 litres (group 3) are also well represented in, and constitute an important element of Yarmukian assemblages (approximately 15%). The fourth group of vessels, although the least numerous (7%), provides additional information on vessel functions. Charred residues in the form of organic impregnation trapped within vessel walls have been identified by Vieugué *et al.*, in all hole-mouth jars. In Vieugué's opinion, they indicate that such vessels were used for cooking. Marks on vessels also indicate that they were placed inside fireplaces and had direct contact with fire. Food inside vessels was boiled rather than fried or grilled, which is contrary to earlier observations on the low thermal shock resistance of Yarmukian pottery that precluded its use in open fire cooking (Gopher & Eyal, 2012c: 719 ; Vieugué *et al.*, 2016: 105). According to Vieugué *et al.*, one hole-mouth jar could hold from 11 to 29 litres of food, which was sufficient to feed the residents of a single compound typical for Yarmukian settlements (Vieugué *et al.*, 2016: 108).

The relative proportions of various vessel types recorded at Nahal Zehora II were somewhat different. The most common group here were variously sized bowls (46.5%). Small and medium-sized jars represent 4.8% of all assemblages, while only 1.4% of the Yarmukian ceramic assemblage from Nahal Zehora II are big pithoi used for long-term storage. Unfortunately, no use marks that would suggest open fire cooking were recorded on kraters (36.3%) and hole-mouth jars (9.1%) (Gopher & Eyal 2012c: 725).

An important feature of Yarmukian pottery is decoration, present on 10 to 25% of all vessels and found both on bowls (conical shapes and deep bowls with a slightly restricted orifice) and on tall handled jars. Vessels were decorated with incised and/or painted patterns. Incised motifs include, first of all, horizontal lines located below the rim or on the neck, zigzag lines and herringbone patterns on the body. All these elements come in a variety of arrangements (Fig. 8:2-3, 8) (Garfinkel, 1999: 64-65). Incised patterns are sometimes accompanied by painted decorations. Paint would be applied all over the non-incised surface or only on a part thereof (Fig. 8:7). Sometimes only a small space adjacent to or around incisions is

painted (Garfinkel, 1999: 67). Incised decorations, including herringbone patterns and parallel lines, are present on more than 58% of all decorated sherds (excluding sherds covered with red slip) from Sha'ar Hagolan. At Munhata, these decoration patterns are present on 69% of all decorated sherds (Garfinkel, 1999: 61). Painted decorations in the form of triangles, zigzags, and lines in various arrangements on a beige background have also been recorded on Yarmukian vessels (Garfinkel, 1999: 61; Vieugué *et al.*, 2016). While decorated pottery represents a small portion of Yarmukian ceramic assemblages (10 to 25%), the great variety of decoration patterns has attracted researchers' attention. Gopher and Goren consider decorated pottery to be a continuation of the production of symbolic objects (figurines, beads) using plaster technology (Gopher and Goren, 1998: 224). Consequently, they are of the opinion that its meaning was symbolic. E. Orrelle and A. Gopher (2000) suggest non-utilitarian functions of decorations on Yarmukian pottery. They assert that pottery decoration could be linked to gender roles. In their approach, the triangles, V motifs, and zigzags present among decoration patterns should be seen as a single symbol, associated with vulvae. The red colour (paint or slip) in its vicinity should be interpreted as menstrual blood. The interpretation of Yarmukian pottery decoration presented by Orrelle and Gopher is a follow-up to their interpretation of figurines proposed earlier (Orrelle & Gopher, 2000: 299-300).

In addition, Gibbs (2013) associates decorated Yarmukian pottery with symbolic meanings. He is of the opinion that decorated pottery conveyed a certain symbolic message. Apparently, this pottery was a part of a rigid symbolic system in existence during the Yarmukian period, one which also included pottery. The system was easy to interpret and clear to understand. The complex decoration system of Yarmukian pottery does not give much freedom for interpretation. According to Gibbs, the variability of decorative motifs grew over time, which was accompanied by a shift towards simpler designs. The process is particularly visible in the case of Wadi Rabah pottery. The changes were associated with an increase in the ambiguity of pottery symbolism promoting more flexible interpretations (Gibbs, 2013: 80).

5.3.3. Lodian pottery

In terms of technology, typology, and decoration, Lodian pottery is in many ways similar to that of the Yarmukian culture, which is one of the arguments used by Garfinkel to suggest that both cultures were contemporaneous (Garfinkel, 1999: 101). However, Gopher is of the opinion that the existing differences are strong enough to consider both units as separate cultures.

Local clays and tempers were still used in pottery production. Such a situation was observed at the site of Lod, where vessels were made of marl clay of the Taqiya

Formation, the outcrops of which were located near the settlement, only a few kilometres to the east (Goren, 2004: 53; Paz *et al.*, 2005: 121-122). Local raw materials were also used at Nahal Zehora II. However, the analyses of pottery from the Lodian layers showed that the choice of raw materials evolved over time (Gopher & Eyal, 2012c: 702). Petrographic analyses of pottery indicated the presence of new raw materials used for paste preparation, different from those used by the Yarmukians (Nativ *et al.*, 2012b: 676). Although in the Yarmukian culture alluvial soil and chalk were mixed on site, Lodian pottery was made of terra rosa clay mixed with rendzina available locally. Raw material changes entailed some modifications to the organisation of the pottery production process. While terra rosa was a local material, it was transported to the site over a distance of approximately 10 km. This raw material was much easier to prepare than the raw materials used by Yarmukian potters (particularly as regards their mixing with rendzina). Thus, while transporting the material to the site took more time and effort, preparation of the paste itself was far easier.

A different situation was observed at Yesdot, i.e. another Lodian site (Nativ *et al.*, 2012a). As in Nahal Zehora II, clays used for pottery making were of local origin. Calcareous clay originated partially from the Taqiya Formation, and partially from Bira and Gesher deposits. Alluvial soils were taken from the Soreq River. Over time, the production of marl clay vessels decreased, while those made of alluvial soils became more numerous. According to A. Nativ *et al.*, the change may have been related to a preference for materials available closer to the site (alluvial soils) and to technological improvements (fine-grained calcareous paste was replaced with coarser and more ferruginous clay) (Nativ *et al.*, 2012a: 130). Furthermore, certain changes were also noticed in the choice of tempers. Ground chalk, wadi sand, and grog were added to the paste directly on site. However, in the period of the settlement's operation, the relative share of chalk grew from 40 to 90%. Both raw material and temper changes influenced the overall pottery production process. Unlike at Nahal Zehora II, where, despite the greater raw material transport distance, paste preparation became easier, Yesdot saw a shift to a more complicated procedure of mixing alluvial soil and chalk, which required more time, effort and skill. Such a change is not easy to interpret, one which, in the opinion of A. Nativ *et al.*, may even be linked to some symbolic meaning (Nativ *et al.*, 2012a: 132-133).

In 2016, results of petrographic tests of new materials from Lod were published. The materials included a single sherd made of marl of the Moza Formation, exposed along the Judean-Samaritan anticline, at least 20 km east of Lod. It is the only Lodian sherd made of a raw material whose outcrops are located so far away from the production place. Due to its isolated character, any interpretations linking it to the question of contacts and exchange would be mere speculation at the current stage (van den Brink & Commenge, 2016: 21).

The Lodian method of vessel shaping and firing did not differ from the techniques known in Yarmukian assemblages. Pottery was made on mats using coils or slabs, although the former was used less frequently than the latter. On the basis of studies carried out at Lod, E. van den Brink and C. Commenge also suggest that bowls were moulded (van den Brink & Commenge, 2016: 13, 20).

So far, such surface treatment methods as smoothing, slip covering, burnishing, plain burnishing, roughening (including honeycomb roughening) have been identified in Lodian pottery. Garfinkel differentiated two slip colours, namely red and pale (creamy pink), with the latter always being a background for the former (Garfinkel, 1999: 95). Slip-covered surfaces could be burnished (e.g. on Jericho IX jars). At Nahal Zehora II, the relative proportion of slip-covered pottery was greater in Lodian layers than in Yarmukian layers, with more than 50% of treated bodysherds belonging to this group. Simultaneously, the quantity of burnished pottery (and plain burnished in particular) decreased. Surface treatments typical for the Lodian include burnishing over painted elements (Gopher & Eyal, 2012b: 551).

A different situation was observed at Yesodot, where one's attention is drawn to a high quantity of untreated pottery (without any surface treatment or decoration). Its relative proportion grew from 68 to 85% in the course of the site's occupation which was accompanied by a decrease in the quantity of treated pottery (Nativ *et al.*, 2012a: 122-123).

At Lod more than 76% of the pottery was plain (slightly smoothed or left unfinished) (Gopher & Blockman, 2004: 8).

According to Gopher and Eyal, vessels of the Lodian period were fired in a well-controlled low-to-medium temperature (Gopher & Eyal, 2012c: 727). Although most pottery is light in colour (cream, pink, pale brown, orange), according to Gopher and Eyal, the variety of surface colours was reduced compared with that of Yarmukian pottery (Gopher & Eyal, 2012c: 727).

Vessel shapes display continuity between the Yarmukian and the Lodian cultures, although Lodian sites additionally feature new forms (Fig. 9:1, 4-5). The relative shares of each vessel type at Lodian sites did not change much compared with Yarmukian sites. At Nahal Zehora II, bowls, kraters, jars and hole-mouth jars are present in similar quantities in layers corresponding to either culture. At most sites, the prevailing form are open vessels, including, in particular, variously sized bowls and kraters (Lod: 70%; Yesodot: 60 to 67%; Nahal Zehora II: over 86%), as they were commonly used for food serving and consumption. Hole-mouth jars, probably used for cooking, represent less than 10% of vessels found at the Lodian sites mentioned above. The frequencies of storage vessels, including small and medium-sized jars and pithoi, vary from site to site, which may be explained by different storage methods. Jars represent approximately 30% of the ceramic assemblage from Yesdot and around 22% at Lod (with amphoriskoi), as compared

with only 2% at Nahal Zehora II. No fragments of large pithoi associated with long-term storage were recorded at Yesdot or Lod. However, at Nahal Zehora II, only 1.3% of the assemblage are large jars. Studies at the Yesdot site additionally showed that Lodian pottery changed over time. A reduction in the relative proportion of bowls from 64 to 40%, accompanied by an increase in kraters from 3 to 20% is clearly visible. Although these changes may reflect changes in culinary behaviours, they did not have any significant effect on the number of open vessels used in the settlement, varying from 60 to 67% of the entire assemblage.

In the Lodian assemblages some new features could also be observed (Fig. 9). According to Garfinkel, shallow and spherical bowls were far more common in this culture than in that of the Yarmukian (Garfinkel, 1999: 75). In Lodian assemblages, the number of jars with vertical or slightly inverted necks decreased, while in Yarmukian assemblages they were one of the most important vessel groups (Fig. 9:1, 3, 5) (Gopher, 2012c: 1588). According to Garfinkel, a characteristic feature of the Lodian ceramic assemblage is the Jericho IX jar, well represented in Jericho's Stratum IX (Garfinkel, 1999: 87). It is a medium-sized vessel with handles and a low neck, either straight or slightly everted outwards. In contrast, Gopher considers the inclined-neck jar with a spherical or oval body and an indentation or ridge between the neck and the shoulder as a typical Lodian jar (Gopher & Blockman, 2004: 10; Gopher & Eyal, 2012a). In the estimation of Gopher and Blockman, the Jericho IX jar is more closely linked to Yarmukian jars, considering it to be archaic rather than typical for the Lodian culture (Gopher & Blockman, 2014: 15). Other characteristic Lodian elements include cylindrical handles known from Jericho (Fig. 9:2, 7) (Garfinkel, 1999: 95).

Not unlike Yarmukian pottery, Lodian vessels were richly decorated. According to Garfinkel, the most characteristic feature of Lodian pottery are painted and burnished narrow or wide red/brown lines applied on a creamy/whitish slip, resembling the incised herringbone decoration of the Yarmukian culture (Garfinkel, 1999: 68). Painted motifs of the Lodian include triangles, lozenges, and zigzags (Fig. 9:1, 4). Some of them are made of thin or wide parallel lines. Another unique design of the Lodian culture is well-burnished and lustrous paint. Although rare, incised motifs do occur at Lodian sites. These include herringbone patterns inside a frame or frames of parallel lines (Fig. 9:6) (Garfinkel, 1999: 95-96; Gopher & Eyal, 2012c: 727-728). Painted decorations are known from cups, deep bowls, hemispherical bowls, as well as necked jars.

5.3.4. *Wadi Rabah pottery*

Compared with the ceramic assemblages of the Yarmukian and Lodian cultures, the pottery of the Wadi Rabah culture shows considerable differences in terms of raw material choices, shaping techniques, surface treatments, forms, and deco-

ration. In the opinion of Gopher, Wadi Rabah pottery marked the technological peak of pottery production in the Pottery Neolithic (Gopher, 2012c: 1557; Gopher & Eyal 2012c: 723).

Raw materials continued to be of local origin. According to Garfinkel, a preference for carbonatic clay is visible (Garfinkel, 1999: 109). Studies of Nahal Zehora II pottery assemblages showed that pottery was made using rendzina soils, which being abundant in the vicinity of Nahal Zehora II, did not need tempering and could be readily formed in its moist state (Nativ *et al.*, 2012b: 676). It is, therefore, reasonable to conclude that pottery technology was further simplified by reducing the time and effort necessary for transport and preparation of the paste. Tempers added to Wadi Rabah pottery include a variety of materials, the choice of which was most probably determined by their local availability. The following materials have been identified so far: chalk (Munhata); grit (Nahal Zehora II); grog; and organic temper (Tel Te'o) (Goren, 1992; Gopher & Eyal, 2012c: 728; Goren & Halperin, 2001). Wadi Rabah pottery was made by hand using different techniques, namely coiling, slabbing, pinching and drawing. The coiling technique was used to form most of the inventory found in al-Basatin and Tabaqat al-Bûma and was the only method used in Nahal Zehora II (Gibbs, 2008: 267; Gopher & Eyal, 2012c: 728). A possible use of a stone mould was suggested by E. Yannai *et al.* with regard to some bowls from En Assawir (Yannai *et al.*, 2006: 64). Vessels may have also been finished using a tournette in the form of a stone mould or a round reed mat (Streit, 2016: 235). In the Wadi Rabah culture, firing was well controlled, probably in kilns that could create both an oxidizing and reducing atmosphere (Garfinkel, 1999: 10-19; Gopher & Eyal, 2012c: 728).

The quality of surface treatment on the pottery of Wadi Rabah is very high. Slip (red, orange, brown, dark brown, grey and black) and burnishing occur over large parts of the vessel surface or even cover the entire vessel. In Munhata layer 2A, 86.4% of all decorated sherds were covered with slip (red, black or both) (Garfinkel, 1992: 82). At Ein el-Jarba the pottery with burnished slip represents 71% of all decorated sherds. In Nahal Zehora II, in layers related to Wadi Rabah occupations, slip is present on 59% (Stratum II) and 56% (Stratum I) of all treated items (Gopher & Eyal, 2012b: 550). Plain burnishing and honeycomb roughening known from older units are absent from Wadi Rabah assemblages.

Major changes are also visible in vessel shapes produced and used by Wadi Rabah communities. One characteristic feature of this culture is a sharp carination between the neck and the body and/or between the shoulder and the lower part of a vessel, near the base. One's attention is also drawn to carefully formed rims (Fig. 10:4, 8, 11) (Garfinkel, 1999: 109). Typical Wadi Rabah vessels include carinated, S-shaped or V-shaped bowls, pedestaled bowls, mini bowls, jars with bow-rims, flaring rims, or collared jars, tabular stands, pithoi with thumb-impressed

ledge handles and hole-mouth jars (Fig. 10:4-11). Churns, spouted bowls and spouted kraters appear for the first time (Garfinkel, 1999: 108-141; Gopher & Eyal, 2012c: 728). Hole-mouth jars are the most numerous group of Wadi Rabah ceramic assemblages from Ein el-Jarba (30.8%), Abu Zureiq (41.5%) and Munhata (38.3%) (Streit, 2016: 225, tab. 6.28). At Nahal Zehora II, they represented only 9% in Stratum II and 13% in Stratum I of all vessels. A large group of vessels at this site are kraters – 37% in Stratum II and 32% in Stratum I. Bowls of various shapes and sizes are plentiful at all sites (nearly 50% in Nahal Zehora; 32% in Munhata 2A; and 47.9% in Ein el-Jarba) (Gopher & Eyal, 2012b: 538, tab. 11.4; Streit, 2016: 225, tab. 6.28). Jars, including bow-rim jars, do not account for more than 10% at any site occupied by the Wadi Rabah people.

Although the pottery of the Wadi Rabah culture is decorated, considerable changes in the number of decorated vessels, as well as in decoration techniques and forms, are visible compared with the Yarmukian and Lodian cultures. Burnished slip, generally considered to be a decorative form on Wadi Rabah pottery, is accompanied by painted, incised and combed decorations. Painted horizontal lines are present on the inside or the outside of the rim or (less frequently) on the body, in the form of horizontal lines, parallel lines, semi-circles, triangles or a net pattern (Garfinkel, 1999: 142; Gopher & Eyal, 2012c: 729; Streit, 2016: 232). Incised motifs on Wadi Rabah pottery include net and herringbone bands (Fig. 10:1-3) (Garfinkel, 1999: 145; Streit, 2016: 232). Although combed decoration takes the form of wavy line motifs, this technique could also be used to form herringbone patterns and zigzags (Garfinkel, 1999: 142, fig. 90). According to Garfinkel, Wadi Rabah pottery also features impressed decorations made using a comb or a round/triangular stylus (Garfinkel, 1999: 145). These take a variety of forms, including dense puncturing, round or triangular impressions, lunar-shaped impressions or roulette impressions. Equally remarkable are plastic decorations in the form of pendants or figural representations (e.g. snakes from Munhata). One of the most noteworthy discoveries is a hole-mouth jar with two applied figurines from Ein el-Jarba. According to Streit (2015b), although the vessel's form is typical for the Wadi Rabah culture, its applied plastic decoration is unique for the southern Levant and shows affinities with plastic decorations from the northern Levant, or even Anatolia and south-eastern Europe.

The relative amounts of various decorative forms (other than burnished slip) vary considerably at Wadi Rabah sites. Although sherds with painted decorations are the least numerous type in Munhata 2A (0.4%), in Ein el-Jarba they account for approximately 17%, in Nahal Zehora II – 20% (Stratum II) and 23% (Stratum I) and in Abu Zureiq – nearly 26%. Incised sherds represent 10% of all decorated sherds from the Wadi Rabah strata in Nahal Zehora II, while they constitute less than 5% of the decorated assemblages at other sites. A similar situation is

observed with regard to impressed and combed decorations, which, in addition, are absent from certain sites, such as Nahal Zehora II (Gopher & Eyal, 2012b: fig. 11:9; Streit, 2016: fig. 6:30).

Compared with Yarmukian and Lodian decorations, the assemblages of the Wadi Rabah show an increase in the range of decorative motifs and techniques, while a shift towards simpler decorative motifs is noticeable. According to Gibbs (2013), changes in pottery decoration were linked to changes in the symbolic system of the Wadi Rabah culture. The variability of motifs and their simpler designs may have been associated with the fact that their interpretations were more flexible than in the Yarmukian or Lodian cultures. In turn, this had an effect on the community, its relations with others and the boundaries between them. A more ambiguous symbolic system may have facilitated contacts and positively influenced social relationships.

5.3.5. *Nizzanim pottery*

Nizzanim pottery has been recorded at three sites, namely Nizzanim, Giv'at Haparasa, and Ziqim. The ceramic assemblage features coarse and crumbly sherds, mostly low fired. Vessel shapes are basic and undecorated for the most part. The prevailing forms include hole-mouth jars (ca. 46% in Nizzanim) and deep bowls (ca. 35% in Nizzanim). Although pithoi represent only ca. 20% of the assemblage, it should be mentioned that a high number of lug handles, possibly coming from pithoi, were found as well. A few sherds covered with red slip, as well as a few sherds with painted and incised decoration were also recorded (Garfinkel, 1999: 99).

5.3.6. *Qatifian pottery*

Qatifian pottery was made by hand of clay available locally. Petrographic analyses of the pottery from site P14 demonstrate its considerable similarity to pottery known from Qatif. According to Goren, the clay used to make pottery from both locations is of local origin and is typical for coastal environments, such as the Qatif area (Goren, 1988: 133*). Qatifian pottery was usually tempered with copious amounts of straw, although grit, sand, and shells were added as well (Gilead 2007: 43; Abadi-Reiss & Gilead, 2010). Due to the large size of temper particles, vessel surfaces are rough and uneven, sometimes with visible finger pressure marks. Moreover, C. Epstein drew attention to marks left by smoothing the surface by means of a bunch of grass (Epstein, 1984: 212). The pottery was fired at a low temperature, which is evidenced by the presence of a dark core (Epstein, 1984: 212; Goren, 1990: 101*; Abadi-Reiss & Gilead, 2010: 28). According to Epstein, Qatifian pottery was “coarse, heavy, crumbly, crudely fashioned and exhibiting little variety of shape” (Epstein, 1984: 212). Indeed, the latest studies on Qatifian pottery have confirmed its homogeneity in terms of technology (Abadi-Reiss & Gilead, 2010: 28).

The variety of vessel shapes is greatly limited. Most items found at Qatifian sites were, first of all, small and medium-sized bowls and hole-mouth jars. Little intra-type variability has been observed. At site P14, hole-mouth jars represent 23.5% of the entire assemblage, as compared with 42.9% at site D and 30% at site Y3 (Garfinkel, 1999: 191; Adadi-Reiss & Gilead, 2010: 28). Another characteristic feature of the Qatifian are pie-crust rims and loop handles located low on the body. Lug handles and pierced handles have also been recorded in Qatifian pottery.

Although most of the ceramic assemblages of the Qatifian are undecorated, some sherds do bear decoration. Garfinkel differentiated vessels covered with red slip and traces of painted stripes (Garfinkel, 1999: 197). Furthermore, the Qatifian assemblage features impressed and incised decorations. Another characteristic feature of Qatifian pottery is applied plastic rope decoration.

5.3.7. The Pottery Neolithic pottery tradition of the southern Levant – a summary

Although the circumstances in which pottery first appeared in the southern Levant are unclear, no trial stage has been identified in pottery production in this region, one typically associated with the learning of, and experimenting with a new technology. The technological sophistication of the early Pottery Neolithic pottery may be partially explained by its links with plaster technology, on the one hand, and the fact that White Ware requires a similar set of skills, on the other. However, one element is still missing from the above hypothesis, i.e. the reasons why people began to make clay vessels. While researchers link the early pottery with food preparation and storage and, simultaneously, see some symbolic meaning in it, the issue needs to be further researched.

From the very beginning of the Pottery Neolithic, pottery production was fairly advanced in terms of technology, which is demonstrated by the diversity of colours, surface treatments, firing and shapes in Yarmukian pottery. Vessels were made by hand of coils of local raw materials. Their surfaces were smoothed, although rough-surfaced vessels have also been recorded. There was a great diversity of forms, including jars, bowls, cups of different sizes, very often with burnished and decorated surfaces. Decorations, present in less than 25% of all assemblages, feature a variety of motifs and techniques and indicate a high level of pottery-making skills.

Lodian pottery was similarly advanced technologically and had many features in common with Yarmukian ceramic assemblages in terms of the choice of raw materials, vessel forming techniques, surface treatments, firing, vessel forms, or even decoration. The similarities were connected to still not fully explained links between both cultures which are sometimes treated as contemporaneous, and sometimes as consecutive cultural units. However, Lodian pottery has certain distinct features that make it different from earlier ceramic products, most prob-

ably resulting from the development of pottery production. Progress is visible in the paste preparation mode. Moreover, new vessel forms appeared and decoration techniques evolved. The most characteristic feature of Lodian pottery is decoration, including painted and burnished narrow or wide red/brown lines applied on top of creamy/whitish slip.

The pottery of the Wadi Rabah, the next Pottery Neolithic culture, stands out clearly from that of the two previous cultural units, i.e. the Yarmukian and Lodian cultures. Progress and innovations in technology, morphology or decoration are much more clearly visible. Potters' skills were significantly improved, which is testified by the choice of raw materials, forming techniques, elaborate burnishing, or control of the firing process to obtain the desired surface colour. In the estimation of Gopher, Wadi Rabah pottery marked the peak of the Pottery Neolithic technology (Gopher, 2012c: 1557; Gopher & Eyal, 2012c: 723). The gradual disappearance of vessel forms known from the Yarmukian and Lodian cultures is accompanied by the emergence of new types of bowls and jars. Decorations changed significantly, in terms of both techniques and patterns. Although a shift towards simple decorations is visible, the number of different motifs used is greater. It is likely that the changes in pottery production that took place during the Wadi Rabah culture were in some way linked to social and economic changes (a shift towards the nuclear family, changes in subsistence activities, the emergence of specialisation). Pottery production may have also been influenced by more intensive interregional contacts of Wadi Rabah communities with other areas, including the exchange of goods and ideas.

The analyses of Pottery Neolithic ceramic assemblages suggest their homogeneity. Moreover, the pottery of each Pottery Neolithic culture has certain common features. Some of these are easy to identify and are used by archaeologists in order to determine cultural identity or chronology (decorations, forms). However, some intra-site variability can be also observed within each culture. Site-to-site differences are visible in the choice of raw materials, surface treatments, shapes and even decorations. They may have resulted from a multitude of environmental, social or even symbolic factors affecting pottery production in a given location. Pottery production was determined by the availability of raw materials, social organisation and structure, subsistence system and demand at the site. In addition, ritual/symbolic behaviours may have influenced what vessels were produced and used locally. As a result, despite characteristic features visible across the entire cultural unit, each site has its own endemic features.

Variability during the Pottery Neolithic is not limited to the Yarmukian, Lodian, and Wadi Rabah cultures. A similar phenomenon can be observed in two smaller cultural units identified in this period, namely the Qatifian and Nizzanim. Although it is difficult to determine their character (culture, local variant, ware,

style) and chronological position (the Pottery Neolithic or Chalcolithic period), their ceramic assemblages fit well in the Pottery Neolithic pottery tradition (raw materials, shapes). The existing differences between these two and the other Pottery Neolithic cultures (i.e. considerable amount of straw temper, low firing) may have also resulted from multiple environmental, functional, social or even symbolic factors. However, this question will not be answered without further studies.

Pottery is one of the most common discoveries at sites dated to the Pottery Neolithic. It provides a basis for differentiating archaeological cultures and is commonly used by researchers for the purpose of cultural identification and chronology determination. However, it needs to be remembered that an archaeological culture is an artificial term created to suit the needs of archaeology. It helps systematise archaeological evidence and put it in the framework of time and space. Archaeological cultures have little in common with past societies, while the boundaries marked by their names never really existed. The three main Pottery Neolithic entities identified by archaeologists do not necessarily correspond to actual human groups from the past. Therefore, the development of the pottery tradition in the Pottery Neolithic needs to be seen as a continuous process, without any cultural borders. After its emergence in the southern Levant, pottery production underwent dynamic changes visible in technology, typology, decoration, or even vessel functions. The peak of its development occurred during the Wadi Rabah culture, which constituted a basis for further changes leading to a new level of quality of pottery production in the Chalcolithic period.