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On the Transition Between the Neolithic and Chalcolithic in Lower Egypt and the Origins of the Lower Egyptian Culture: a Pottery Study

Introduction

During the 4th millennium BC, the first traces of significant cultural, social and economic processes including changes in subsistence strategies, social stratification and craft specialization can be observed in archaeological assemblages of the Nile Valley and the Nile Delta. They seem to be of great importance as they laid the foundation for the emergence of the Egyptian State. In the period in question Upper and Lower Egypt were inhabited by fully agricultural societies with a household mode of production. They adapted to the local conditions and created their cultural tradition consisting of material, social, economic and symbolic practices. In the archaeology of the Predynastic period, the societies settled in the south are referred to as Naqada culture. For the northern societies a few different terms are used, including 'Maadi-Buto culture' (e.g. von der Way 1992; Midant-Reynes 2003; Buchez and Midant-Reynes 2007; Hendrickx 2006; Levy and van den Brink 2003), 'Lower Egyptian culture' (e.g. Ciałowicz 2001; Mączyńska 2003; 2011; 2013) and 'Lower Egyptian cultural complex' (Tassie 2014). These two cultural units were separated by an uninhabited "buffer" zone without any traces of occupation in that period. The cultural division of the Predynastic societies, forcing them into a rigid framework of two distinct archaeological cultures, has

serious consequences on understanding of the occupation of Egypt in the 4th millennium BC. Over the last 20 years researchers have focused mostly on relations between southern and northern societies, a cultural change often called the Naqada expansion or Naqadan-Lower Egyptian transition and the mechanisms of the emergence of the Egyptian state (i.e. Köhler 2008; Mączyńska 2011; Buchez and Midant-Reynes 2007; 2011). The origins of the Egyptian Chalcolithic societies of the 4th millennium BC lie outside the mainstream of that research. Although most researchers were aware that the ancestors of the Lower Egyptian cultural complex should be looked for in the Neolithic among the Merimde and el-Omari cultures, the poor state of research on this period in the whole of Egypt did not encourage detailed analyses (Mączyńska 2017).

For many years I have been involved in the research on the 4th millennium BC in Lower Egypt, including the Chalcolithic Lower Egyptian culture (LEC). In my publications I presented the state of research and focused mostly on interregional relations between Egypt and the Southern Levant or between Lower and Upper Egypt in this early period (Mączyńska 2004; 2008; 2011; 2013; 2014; 2015). In the recent years my scientific attention was attracted by the Neolithic. As a results of my research on the Neolithic pottery from Lower Egypt I proposed a hypothesis on the existence of a single cultural tradition in Lower Egypt in the Neolithic. The hypothesis was presented at the conference "Egypt at its Origin 5" held in the IFAO in Cairo in April 2014 (Mączyńska 2017). In my studies I have noticed strong cultural links between ceramic assemblages of the Neolithic and Chalcolithic periods in the region. For this very reason I chose to return to researching the Lower Egyptian prehistory and to focus on and explore the transition between the Neolithic and Chalcolithic and the origins of the LEC.

The key objective of this paper is to identify the missing links between the Neolithic and Chalcolithic societies of Lower Egypt on the basis of pottery studies and to present a hypothesis on the origins of the LEC. Pottery was chosen as the main source-base for the analyses presented in this paper as it is the most abundant class of material recovered through archaeological excavations on the Neolithic and Chalcolithic sites and has a great research potential to provide a wide array of information. However I am aware of the limitations of my pottery research. The studied features (i.e. fabric, vessel shapes and surface treatment) are very generic and more detailed analyses have not been carried out. I consider my research as an introduction to a more detailed exploration of this still little known part of the Egyptian prehistory. I really hope that my hypothesis can be either disproved or confirmed in the course of further research.

Moreover in this paper I refer to a new dynamic concept of the archaeological tradition to which the pottery tradition belongs (i.e. Pauketat 2001; Lightfoot 2001; Osborne 2008) and to the factors triggering change or ensuring continuity in the pottery production, proposed by P. Rice (1984).

1. State of research on the transition from the Neolithic to the Chalcolithic in Lower Egypt

In the recent years our knowledge of the LEC has improved thanks to the ongoing excavations at Tell el-Farkha, Sais and Tell el-Iswid. Unfortunately, at none of them the earliest occupation of that complex was registered and the studies have not brought any evidence to enrich the state of research on the beginnings of the LEC. Although at Sais the Neolithic and Chalcolithic occupation was identified and according to the excavators the LEC settlement overlays an earlier Merimde settlement, a 200 years long gap in the occupation between levels dated to Merimde and LEC was observed (Wilson *et al.* 2014). Nonetheless, Sais still seems to be a key site in understanding the transition between the Neolithic and Chalcolithic as the end of Merimde occupation at this site coincides with the oldest layer at Buto (Schicht Ia) (Tassie 2014: 361).

The oldest remains of the LEC presence so far have been registered on the sites at Maadi and Wadi Digla, Heliopolis and Buto (Fig. 1-2; Rizkana and Seeher 1987; 1990; Debono and Mortensen 1988; von der Way 1997). They probably represent only a small share of the actual early Chalcolithic occupation in Lower Egypt. Vessels found at Giza, Tura, el-Staff and Mersa Matruth A/600, identified as belonging probably to the early LEC without a clear and secure archaeological context, confirm a view on a wider extent of the LEC occupation (Bates 1915; 1927; Mortensen 1985:145-147; el-Sanussi and Jones 1997: 241-253; Kaiser and Zaugg 1988:121-124; Habachi and Kaiser 1985:43-46). Obviously, this scarcity of evidence does not make the studies on the origins of this cultural complex any easier. Additionally, a lack of evidence dated to the period between the Neolithic el-Omari culture and the Chalcolithic LEC makes the understanding of the transition between these two periods even more difficult. Despite this, most scholars believe that the beginnings of the Lower Egyptian culture are linked to the influence of multiple early Neolithic cultural traditions, including Merimde and el-Omari (i.e. Levy and van den Brink 2003: 10; Tassie 2014: 362). Moreover some scholars are convinced that the origins of the LEC are also closely linked to another Chacolithic unit – the Moerian, distinguished on the basis of excavations

Fig. 1. Map of Lower Egypt in the Chalcoithic period

in the region of Qasr el-Sagha (Fig. 3). K. Schmidt (1993: 273) and then N. Shirai (2010: 50) linked the Moerian flint assemblage to the LEC. According to N. Shirai (2010: 51) "it seems more probable that these two cultures were actually a single culture and different aspects of a single culture were misinterpreted".

Without doubt, new excavation projects in Lower Egypt focusing on the Prehistoric occupation could help us to understand the relations between the Neolithic Fayumian, the Moerian and the LEC occupation in the region. It is worth mentioning the UCLA-RUG-UOA Fayum project and the TOPOI project "The Neolithic in the Nile Delta", which have not only focused on re-studying old ma-

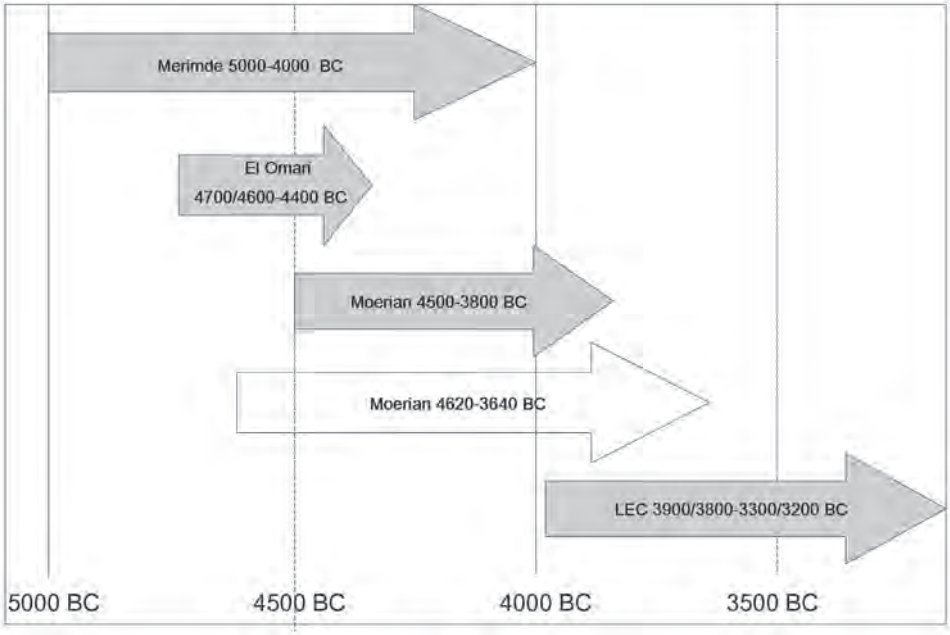

Fig. 2. Chronology of the Lower Egyptian Neolithic and Chalcolithic units (grey arrows according to Hendrick 1999; white arrows according to Shirai 2010)

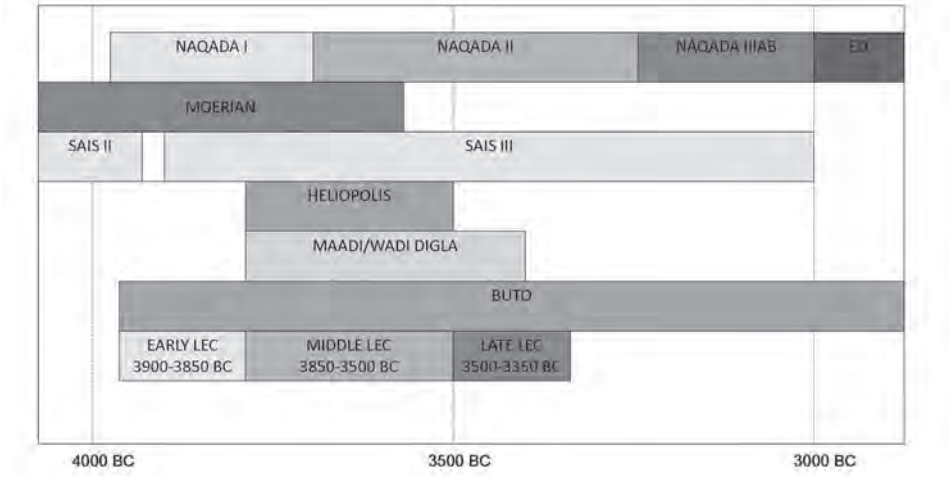

Fig. 3. Correlation of the chronology of the cultural units and the sites in the 4th millenium BC in Lower Egypt

terials, but have also revealed new data thanks to surveys and new excavation (Rowland and Tassie 2015; Rowland and Bertini 2016; Holdaway & Wendrich 2017; Holdaway *et al.* this volume).

Our knowledge on the transition between the Neolithic and Chalcolithic in Lower Egypt and on the origins of the LEC remains poor. The lack of data does not encourage further studies on these two topics. Although most researchers realize that the roots of the LEC should be looked for in the Neolithic, the issue has not been investigated so far. Without doubt, evidence from new excavation projects could be helpful in understanding the cultural situation of this region in the 5th and 4th millennium BC. In my opinion however, some already available data – if analyzed in detail – could help improve our knowledge of the origins of the early Chalcolithic societies of Lower Egypt.

2. Lower Egyptian culture

In my work "The Lower Egyptian communities and their interactions with Southern Levant in the 4th millennium BC" published in 2013 I presented a detailed overview of the LEC in order to provide a background helpful in understanding the relations between the societies of Lower Egypt and the Southern Levant in the period in question. Since then, our knowledge of the LEC has changed. Recent publications of the results of new excavations at Tell el-Iswid (Midant-Reynes and Buchez 2014) and Sais (Wilson *at al.* 2014) contributed new evidence into the discussion. However, our familiarity of the oldest LEC occupation is still based on the results of archaeological works published over 20 years ago (Rizkana and Seeher 1987; 1990; Debono and Mortensen 1988; von der Way 1997).

2.1. Pottery

Studying the oldest LEC pottery is not easy. The analyses of the Maadi ceramic assemblage are based almost solely on complete vessels collected from excavations in the first part of the 20th century (Rizkana and Seeher 1987: 23). As a result, this biased assemblage presents only a fraction of the pottery tradition of the society settled at Maadi. Materials from recent DAI excavations at this site are still awaiting publication[1]. U. Hartung (2004: 339) confirms a more variable character of pottery coming from the German excavations. Also pottery from the graves at

[1] The materials from Buto were published in 2017 after submitting this paper (Hartung *et al.* 2017).

Maadi, Wadi Digla and Heliopolis can be only partially useful in analyzing the ceramic assemblages of the LEC, because of the funeral context in which it was registered. Only the pottery of the oldest Buto layer was studied and published by T. von der Way (1997) in compliance with modern archaeological standards.

Despite limited availability of evidence I decided to study the oldest LEC pottery and compare it to the Neolithic pottery known from Lower Egypt. In my studies I relied on the results of my previous research on the LEC pottery (Mączyńska 2008; 2013) and my recent analyses of the Neolithic pottery from Lower Egypt (Mączyńska 2017). As the ceramic assemblages I am interested in have been analyzed and presented using different methods and in addition detailed data is not always available, in my research I will focus on generic features of the pottery: technology (including fabric) and ware and morphology (including vessel shapes). I am aware that my analyses may seem too basic or too simple in the context of modern theoretical and methodological approaches to ceramic materials. However, this analysis should be treated as preliminary, or even as a first step to further research on the transition between the Neolithic and Chalcolithic in Lower Egypt.

2.1.1. Technology

The earliest LEC pottery was hand-made of local Nile clay tempered with mineral and organic fillers – sand and straw, chaff or even dung. On each site crushed calcite was also identified, but probably as a natural inclusion in the clay or in the sand. Additionally, at the Buto site the pottery of Schicht I contains crushed shells as temper (von der Way 1997: Abb. 44). Pottery surface could be covered by slip and smoothed or burnished. Firing condition were simple and vessels were fired in hearths and simple kilns, at quite low temperatures with little control. After firing, vessel surfaces were hardly ever uniform and ranged from red to reddish brown, brown, and to black, showing variously colored stains. Pottery not covered by slip was rough despite earlier wet smoothing, with many voids caused by burning out of coarse organic temper.

A general overview of the occurrence of wares on LEC sites is difficult to present because of the quality of available data. Similarly, a comparison of ware occurrence between sites is not easy because of varying ware definitions used by scholars[2]. Although similar systems were used in the ceramic analyses at the Maadi settlement and the cemeteries located in nearby Maadi and Wadi Digla,

[2] For details see Mączyńska 2013: 117-120, tab. 17.

different characters and functions of these assemblages could lead to misinterpretation (Rizkana and Seeher 1987; 1990). In my opinion, after taking all these issues into consideration only some general tendencies could be observed in ware occurrence (Fig. 4). First of all, the dominance of pottery with slip over pottery with rough surface on the early sites can be recognized and is accompanied by an increase in rough pottery over time (Rizkana and Seeher 1987: 23-32; Debono and Mortensen 1988: 25; von der Way 1997: 84-88). As the data from the later LEC sites (Tell el-Farkha, Tell el-Iswid, Sais) shows that most of the younger ceramic assemblages are classified as rough ware (for details see Mączyńska 2013: 118; table 17; 2016a), this change in pottery production could have started even earlier. In the opinion of R. Friedman (1994: 905-906), an increase in rough ware could be easily noticed from Naqada I to Naqada II period in the whole of Egypt and is connected with developing specialization. Although in the early Chalcolithic in Lower Egypt the household mode of production dominated and there is no clear evidence implying the presence of workshops, an increase in the amount of rough ware could be linked to the overall increase in pottery production at the time. Rough ware vessels were quicker, cheaper and more efficient to produce than red slip ware vessels. As a result, vessels with rough surface and without

Fig. 4. Percentages of wares at the sites of early phase of LECC

Pottery	**Maadi**[1]	**Buto**[2]	**Maadi – cemetery**[3]	**Wadi Digla I**[4]	**Heliopolis**[5]
red slip	ca. 60%	25,2%	46,7%	34,62%	6,21%
black slip	ca. 35%	13,6%	53,3%	55,22%	
smoothed	–	51,7%	–	–	86,21%
yellow slip	ca. 2%	5,5%	–	0,82%	7,58%
others	3%	4%	–	–	–

[1] Complete vessels only; red slip – wares Ib and II; black slip – ware 1a; Rizkana & Seeher 1987: fig. 5.

[2] The collection of pottery of Schichts I and II; red slip – ware 1c; black slip – ware 1c; smoothed – ware 1a; von der Way 1997: Abb. 52.

[3] red slip – wares Ib and II; black slip – ware 1a.

[4] red slip – wares Ib and II; black slip – ware 1a.

[5] Only 36% of the collection of Heliopolis graves was studied by F. Debono and B. Mortensen (1988).

slip became more numerous over time. It is easy to observe that the repertoire of pottery forms at Neolithic sites is rather unimpressive. However, the number of vessel shapes in the Chalcolithic became higher than in the Neolithic, e.g. at Sais (Wilson *et al.* 2014: 118; fig. 113-114). In addition, a change from multifunctional open vessels to closed vessels with more restricted functions can also be noticed at later Neolithic and early Chalcolithic sites. All these tendencies could be linked to an increase in pottery making and to greater demand, but in my opinion they were also a first step in the process of specialization.

It is also worth mentioning some observation of researchers working with early LEC sites. I. Rizkana and J. Seeher (1990: 78) noticed the dominance of red to brown slip over black slip (ware Ia) in the beginning of the cemetery of Wadi Digla (phase I), together with an increase in pottery covered by black slip (ware II) in the later phase of that cemetery. The authors also mentioned the dominance of black pottery in graves of the younger cemetery at Heliopolis as a representation of the same change in pottery production, despite the fact that slip was registered only on 6.2% of all vessels from graves published by F. Debono and B. Mortensen (1988: 24). At Maadi settlement, red slip pottery dominates over black slip pottery (Rizkana and Seeher 1987: 23-25, fig. 5). At Buto, color change could also be observed among the ceramics in the two first layers dated to LEC. Grayish black pottery (ware Ib) dominates in Schicht I, while reddish-brown vessels (ware Ic) are typical for the later phase of the LEC occupation on the site (von der Way 1997: 86-87). However, this change concerns only the clay surface color, while the slip color remained unchanged in both wares.

Fig. 5. Correlation of the vessel types of the Buto, Maadi and Heliopolis assemblages

Buto	Maadi	Heliopolis
G1a.2	3	
G1a.3	4a	
G1b.2	1a-c, 2	Ia-b
G1b.3	4B, 1a-b	II
G1b.4	1a	V
G2b.2	miniature jars	XII
G3a.1	5a, 5c	VIIb
G3a.3	1c, 6b	
O1a.4	1b	
O2.3	2a, 2b	
O3b.2	2a, 2b	
O3b.3	2, 3	

The changes in slip or clay colors are difficult to interpret. The color of vessel surface including slip depends on firing conditions and the potter's skills to control them. It is possible that some colors could be more or less preferred by certain groups of vessels' users. Interestingly, imitations of Upper Egyptian

black topped vessels with clearly defined surface colors were produced at Maadi (Rizkana and Seeher 1987: 27; Mączyńska 2016a). They should be treated as exceptional production of pottery in response to some special demand. To conclude, surface colors of vessels were probably not a chronological marker for the early LEC.

In my opinion, the pottery making process of the Neolithic Lower Egypt bears a strong resemblance to that of the Chalcolithic. At Merimde III and Sais I the local Nile clay was used to make vessels. At Merimde straw and sand were added to clay as temper. Moreover I. Rizkana and J. Seeher (1987: 25) mentioned the opinion of J. Eiwanger about the presence of dung temper in Merimde pottery. At Sais I, untempered Nile silt was the dominant raw material (Wilson *et al.* 2014: 94, tab. 29). The use of clay without intentionally added fillers is also characteristic for Merimde I, contemporary with Sais Ia (Eiwanger 1984: 18-24). However, untendered pottery is dominant also in Sais Ib, contemporary to the el-Omari culture and to later Merimde phases, as well as in phase II, when it bears traces of both traditions – the Neolithic and the Chalcolithic. Local raw materials other than the Nile clay were used for making pottery only by the el-Omari and Moerian cultures (Debono and Mortensen 1990: 25; Ginter and Kozłowski 1983: 67). Analyzing this stage of pottery production, the process of adaptation to the local environment and its resources can be easily recognized. Physical distance to resources is one of the factors influencing pottery production. People from Wadi Hof, from the region of Qasr el-Sagha, Merimde and Sais used clays easily available in their respective area. According to F. Debono and B. Mortensen (1988: 36) who also registered some sherds made of Nile silt on el-Omari sites, local potters probably also knew this clay, but did not use it because of the distance. The use of local resources could also be reconsidered as a reason for the presence of crushed shell temper in the pottery of layer I at Buto, located not far from the sea shore (von der Way 1997: 87-88). It is still not clear if the use of untempered pottery at Sais could be interpreted resulting from adaptation to local condition. So far, it is the only site with untempered pottery dated to the later Neolithic and probably the early Chalcolithic.

Studies of pottery from the Neolithic and early Chalcolithic sites also show some similarities in the occurrence of different wares. From Merimde II on, one notices a decline in fine polished ware and an increase in smoothed surface vessels which could be classified as rough ware[3]. In Merimde III red slip dominates over

[3] Definition of rough ware according to Mączyńska 2013: 118, tab. 17.

grey and black (Eiwanger 1988: 15-18, Abb. 7; 1992: 14-19, Abb. 4-6; Mączyńska 2017 a). A similar tendency could be noticed among materials of the el-Omari culture with dominance of smoothed pottery over polished. For both wares brown color of slip is the most common (Debono and Mortensen 1988: 27-33, tab. 2). At Sais in the Neolithic layers Ia and Ib the predominance of fine untempered ware can be easily noticed (Wilson *et al.* 2014: 94, tab. 29). However, in the Predynastic layers (Sais III) fine ware decreased and fine to medium tempered ware accounts for approx. 85% of all pottery. Coarse pottery at Sais accounts for less than 5% in all phases. The tendency to change from fine ware to medium or rough ware could also be visible at Sais. Additionally, over time it is easy to observe a general decline in pottery covered by red, brown or black slip, accompanied by an increase in uncoated pottery. Moreover, in the case of the Sais site red-slip polished vessels are the most common in phase I, whereas in phases II and III more brown-slip polished vessels were registered (Wilson *et al.* 2014: 92-99; Tabs. 29, 32). On the Moerian sites only rough ware was registered but due to a small sample of ceramic material this observation could be misinterpreted. Moreover, this site being younger, the ceramic assemblage is more associated to the Chalcolithic. Moerian pottery colors range from red and brown to black, without any dominant coloration (Ginter and Kozłowski 1983).

Taking into account these data it is easy to notice the same growing trend in smoothed/medium rough ware and a decrease in fine polished ware, both in the Neolithic and Chalcolithic. This change was probably caused by the development of pottery production including more efficient methods, an increased number of vessel shapes or improvement in potters' skills. Furthermore, we cannot exclude a greater demand for ceramic vessels in societies becoming more and more dependent on agriculture. In my opinion these tendencies could constitute an initial step in the specialization process, which ultimately led to the emergence of pottery workshops in the later Predynastic period in Egypt.

The presented evidence also shows that there was no convergence in pottery color between the periods in questions. It seems probable that users' preferences/demand and potters' skills influenced the range of colors registered on the sites in the Neolithic and the Chalcolithic. A good example can also be observed in the el-Omari culture, where potters mixed clay with ochre, easily available locally, to obtain red, reddish-brown color, not natural for the calcareous clay, but typical for the Nile silt (Debono and Mortensen 1990: 25; Hamroush and Abu Zied 1990: 117–127).

2.1.2. Morphology

Pottery shapes registered on Neolithic and early Chalcolithic sites are not easy to analyze because of the quality and quantity of the data mentioned above. The ceramic assemblage from Maadi consists mostly of complete vessels, which is unique on settlement sites excavated according to modern standards. The occurrence of vessel shapes in graves of the cemeteries at Maadi, Wadi Digla and Heliopolis also represents only part of the ceramic repertoire used on the settlement sites. Pottery from these cemeteries could be helpful, but only when its special context is taken into consideration. Without doubt, the assemblages from LEC sites share some types of closed and open vessels (von der Way 1997: 89-94). Unfortunately, due to the partial character of the assemblage from the Maadi settlement any quantitative comparisons of the type occurrence with the materials from Buto are difficult or even impossible. Despite these difficulties I decided to use whatever evidence is available to compare pottery shapes not requiring detailed figures. Figure 5 presents some parallel types of vessels from Buto, Maadi and Heliopolis. Unfortunately, as most of them could be with or without slip it is hard to notice a close correlation between wares and types from both sites, even though such correlation is present for Maadi and Buto separately (Rizkana and Seeher 1987: 33, fig. 33; von der Way 1997: 94, Taf. 5).

Pottery types found in graves at Maadi, Wadi Digla and Heliopolis could be easily recognized on both known settlement sites as they were utilitarian vessels before they were put in graves as offerings. The traces on vessels from the graves confirm their earlier household use. By comparing the occurrence of different shapes in graves on these three cemeteries it is possible to notice some small differences and similarities (Fig. 5). At Heliopolis, 10 different types could be recognized among grave offerings, with types I and II being the most common (Debono and Mortensen 1988: 25-29). Among burial offerings from the Maadi cemetery only vessel 5 types are known (1a, 3b, 4a, 4b and 5a) with type 5a, similar to Heliopolis types I and II, being the most prominently represented (Rizkana and Seeher 1992: 27, fig. 9). At Wadi Digla the shapes registered in graves are more numerous than at Maadi (10 types). However type 5 vessels were also the most common offering (Rizkana and Seeher 1992: 78-88). Both differences and similarities between the cemeteries could be caused by many reasons including chronology and factors unknown to researchers, such as group preferences or symbolic meanings.

To conclude, it is impossible to present any general view of the settlement pottery characteristic for the early LEC phase. I am able to identify only some parallels in pottery shapes, which makes all comparisons with Neolithic assemblages

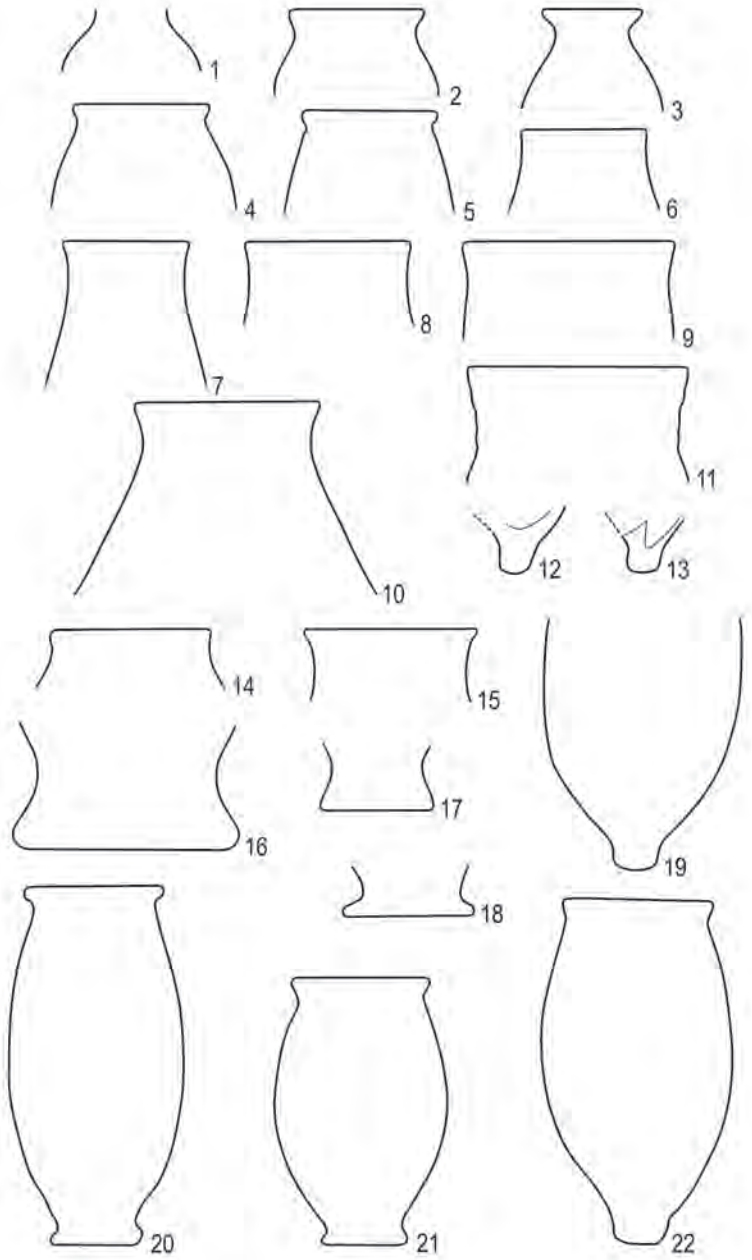

Fig. 6. Vessel forms of the the Lower Egyptian Neolithic and Chalcolithic sites: 1-2 – Qasr el-Sagha; 3-5, 9, 11, 16-18 – Buto; 6-8, 12 – Merimde III; 10, 13, 14-15 – el-Omari; 19-22 – Maadi (Debono and Mortensen 1988; Ginter and Kozłowski 1983; Eiwanger 1992; Rizkana and Seeher 1987; preparation: A. Mączyńska; drawings: J. Kędelska; not in a scale)

difficult. However, taking into consideration their chronological and territorial proximity, this situation is likely to have resulted from the character of archaeological assemblages. In my opinion all known sites – settlements and cemeteries – bear some affinity to each other in terms of pottery shapes, which allows one to treat them as belonging to a common pottery tradition.

The similarities between Chalcolithic and the Neolithic pottery shapes were noticed by researchers working on the materials from Maadi. According to I. Rizkana and J. Seeher (1987: 64-66) parallels in pottery from Maadi and Merimde sites can be found in the younger phases of Merimde. The researchers indicated similarities in the fabric (chaff temper), surface treatment (grey and black-burnished pottery) and vessel shapes (jars with ogival rims, bowls of type 1a and b; ring bases, double-vessels). However, this comparison was made exclusively on the basis of pottery from Merimde published by H. Junker (1929) and H. Larsen (1962) and did not include the materials published later. It is worth mentioning that J. Eiwanger (1992: 75) also indicated general similarities in vessel forms between both sites. I. Rizkana and J. Seeher (1987: 63-64) also compared Maadi pottery to el-Omari materials published by F. Debono and B. Mortensen (Debono 1948; 1956). Similarities in fabric and pottery shapes found by them allowed to treat the el-Omari culture as "a direct predecessor of Maadi, probably only a few centuries older." (Rizkana and Seeher 1987: 64). According to F. Debono and B. Mortensen (1990: 39) the pottery from Maadi and el-Omari represents the same late Neolithic pottery tradition. A few vessel forms (oval basins and small red jars) indicate a connection between both sites. Moreover, in the researchers' opinion local black-topped ware known from Maadi and el-Omari fits well the local development of that tradition. In my opinion however, black-topped vessels from el-Omari culture should be revised as they could be also interpreted as cooking pots blackened by fire or soot.

In my opinion some other similarities could be notices between jars with S-shaped profile known from Buto (Fig. 6:9, 11; special forms; von der Way 1997: Taf. 36:7, 10), Merimde III (Fig. 6:6-8; Eiwanger 1992: Taf. 18) and el-Omari (Fig. 6:10; 14-15; group 2; Debono and Mortensen 1990: Pl. 2: 1-12). Moreover small jars with a simple rim everted to the outside from Buto (Fig. 6:3-5; von der Way 1997: Taf. 2; types G1a.3, G1b.1-3;) resemble a vessel registered at Qasr el-Sagha (Fig. 6:1-2; Ginter and Kozłowski 1983: fig. 34: 7-8). In both periods ring bases appeared at: Merimde III (Eiwanger 1992: Taf. 19); Maadi (Fig. 6:20-21; Rizkana and Seeher 1987: pls. 1-4) and Buto (Fig. 6:16-18; von der Way 1997: Taf. 34: 8-13). It worth mentioning that ring bases are also present among Fayumian pottery (Caton-Thompson and Gardner

1934). Also pointed bases known from phase III of Merimde and el-Omari (Fig. 6:12-13; Debono and Mortensen 1990: pl. 14; Eiwanger 1992: Taf. 40) were registered on the Maadi site (Fig. 6:19, 22; Rizkana and Seeher 1987: pl. 5: 2, 4, 6).

In the context of possible cultural continuity between the Neolithic and the Chalcolithic in Lower Egypt it is also important to mention materials from Sais where the occupation from both periods was registered with a 200-year gap between them. Sais remains to be the most likely site for understanding the transition between the Neolithic and the Chalcolithic. Although phase I is dated to the Neolithic, phase II reflects a mixture of the Neolithic and LEC materials, which could be helpful in understanding the cultural change on the site. However, in the opinion of P. Wilson the overall character of Sais II is Neolithic with younger materials integrated into it (Wilson *et al.* 2014: 109, 159-174). The available evidence does not allow one to answer the question whether there was a single transition between these two periods or the site was resettled after a period of abandonment. Pottery shapes known from Sais I and II have their analogies on the Neolithic sites at Merimde or el-Omari (Wilson *et al.* 2014: 109-125). Although for each phase has its unique repertoire of vessels form, some of them are represented in all Sais phases, thus indicating a long tradition of their use (Wilson *et al.* 2014: 101-125, figs. 113-114). Among open forms, conical bowls with a direct rim or bowls with concave interiors should be mentioned. They are typical for both the other Neolithic sites in Lower Egypt and the later sites of the Predynastic period. Other vessel shapes – bowls with thickened and everted rims should be also focused on as they are not known in the Neolithic context of other sites. This shape first appears in Sais I, occurs among materials of Sais II, but is the most typical for Sais III. According to the researcher this type could be a precursor of later forms characteristic for the Predynastic occupation of the site. The same goes for big vats and platters. The number of closed forms in the Neolithic layers of the site is limited to 2 types only, occurring also in younger layers of the site – the most numerous ovoid jars/rounded bowls (type 12 – 40% of diagnostic sherds) and few examples of broad jars. In the layers of Sais II and III the number of vessel types increased among both closed and open types. Since the problem of continuity on the sites is not fully explained, it is difficult to interpret the presences of some forms among materials from all phases. Their extended use could have resulted from a simple mode of production, multifunctional character or being part of the local pottery tradition transmitted through generations in this region. Despite the possible gap in its occupation, the site could have been resettled by groups belonging to the same or a similar cultural tradition including pottery production.

Lower Egypt could have been settled by groups adapted to local conditions, sharing certain characteristics, and pottery production could have been one of them. Available evidence on the Chalcolithic occupation in this region is poor and does not seem to reflect the actual situation in the past, but rather the state of research. Some small discoveries in northern Egypt indicated a denser settlement pattern in both the Neolithic and the Chalcolithic. It is worth mentioning the presence of the so called lemon-shaped jars in the ceramic assemblage registered by Z. Hawass in 1976 at Merimde Beni Salame (Fig. 7:8-10; Hawass *et al.* 1988: fig. 3:12–14), similar to vessels known from Maadi (Fig. 7:5-7; Rizkana and Seeher 1987: pls. 6-7). This particular vessel type known from many Lower and Upper Egyptian sites of Naqada II period is sometimes treated as cultural markers of LEC (Buchez and Midant-Reynes 2007; 2011; Köhler 2008; 2014; Mączyńska 2016a). Despite unclear cultural affinity, the presence of lemon-shaped jars at Merimde, a site best known for its Neolithic occupation, implies that the occupation of the Chalcolithic societies in the north was wider than indicated by known LEC sites. Moreover, it seems likely that the settling preferences of the Neolithic and Chacolitic groups were similar. In this context two jars registered by E. Caton-Thompson and E. Gardner (Fig. 7:3-4; 1934: LII:7-8) in the region of Fayum similar to Maadi type 4b should also be mentioned (Fig. 7:1-2; Rizkana and Seehre 1987: pls. 8-9) . Although they are not linked to the Neolithic occupation, they could also indicate the presence of the Chalcolithic occupation in this part of Lower Egypt. This observation could be important in the light of the Moerian finds in this region and the possible links between the Moerian and the LEC. An analysis of the ceramic assemblage of the Moerian sites could reveal some features known from Maadi pottery. A jar with a vertical neck and a slightly everted rim (Fig. 7:11; Ginter and Kozłowski 1983: fig. 36:4) resembles jars of Maadi type 5c (Fig. 7:14; Rizkana and Seeher 1987: pls. 22–23). A conical vessel body from the QSVIIA/80 could also be a fragment of this type of jar (Ginter and Kozłowski 1983: 35). The links between the Moerian and LEC can also be noticed in the flint assemblage (Shirai 2010: 50; Schmidt 1993: 273).

Finally, in the research on the links between the Neolithic and the Chalcolithic, pottery from other sites not clearly affiliated to LEC could also be useful. According to Williams (1982: 216-219; 221) pottery found in some pits and graves at Sedment-Mayana/Sedmen J revealed the coexistence of features associated with cultural traditions of the Neolithic and Chalcolithic. Small jars with a short vertical neck or an everted rim (Fig. 7:17-20; Williams 1982: fig. 3; Kaiser 1985: Abb. 3: 6–10) are similar to those of Groups I and III of the el-Omari site (Fig. 7:15-16; Debono and Mortensen 1990: 37),

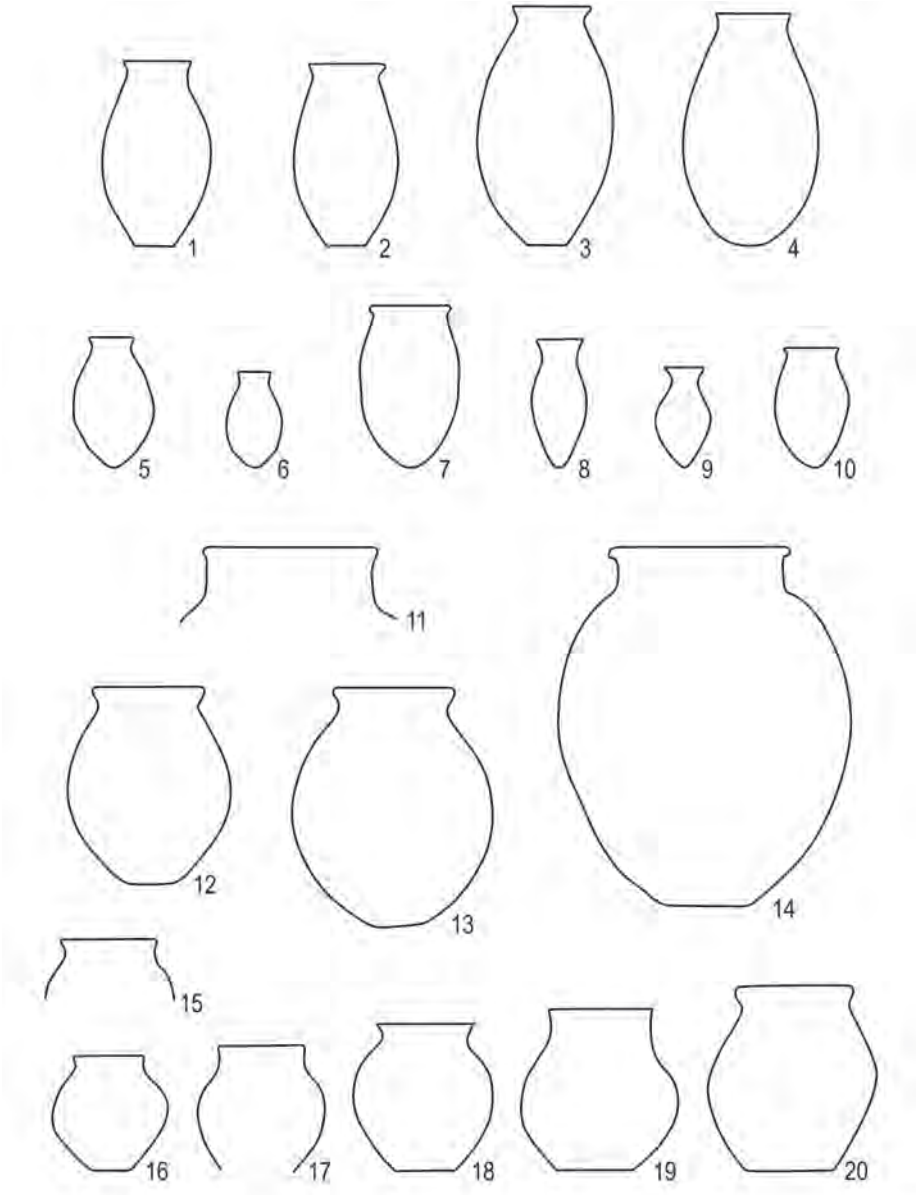

Fig. 7. Vessel forms of the the Lower Egyptian Neolithic sites: 1-2, 5-7, 12-14 – Maadi; 3-4 – Fayum; 8-10 – Merimde Beni Salame; 11 – Qasr el-Sagha; 15-16 – el-Omari, 17-20 – Sedment J (Caton-Thompson and Gardner 1934; Debono and Mortensen 1988; Ginter and Kozłowski 1983; Hawass *et al.* 1988; Rizkana and Seeher 1987; Wiliams 1982; preparation: A. Mączyńska; drawings: J. Kędelska; not in a scale)

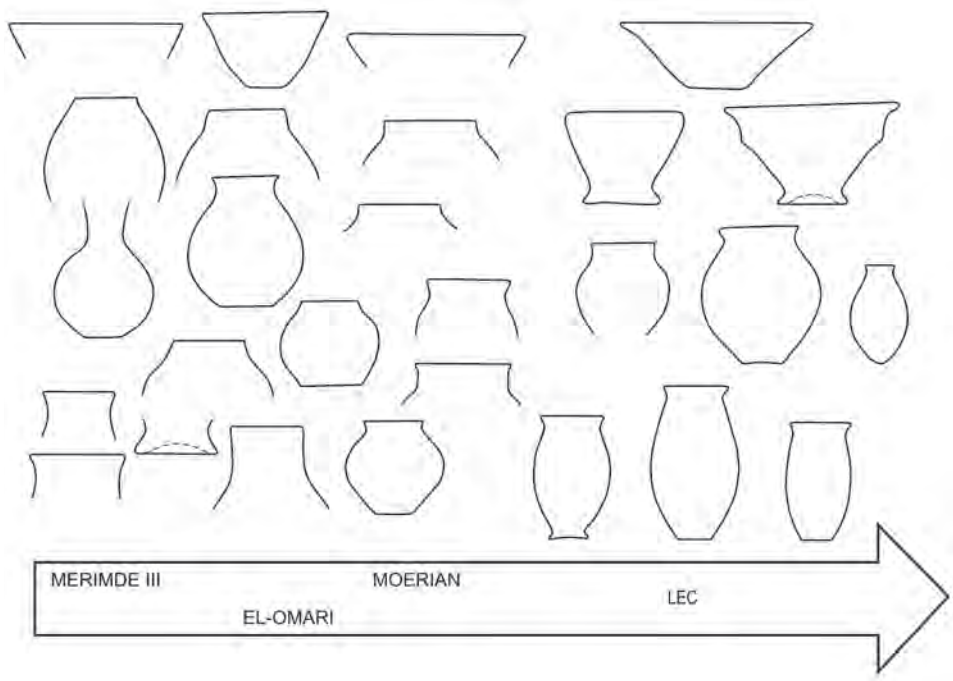

Fig. 8. Development of vessels shapes in the Neolithic/Chalcolithic period in Lower Egypt (preparation: A. Mączyńska; drawings: J. Kędelska)

vessels from QSVIIA/80 (Ginter and Kozłowski 1983: fig. 35: 3, 6) and Maadi small globular jars of type 5a (Fig. 7:12-13; Rizkana and Seeher 1997: pls. 12–19). Additionally, a bottle with a long neck similar to those from Merimde III was found (Williams 1982: fig. 2, 4:22; Kaiser 1985: Abb. 3: 22). At Sedment-Mayana/Sedmen J there are also conical bowls, occurring at Lower Egyptian sites from the Neolithic times through the entire Predynastic period (Kaiser 1985: Abb. 3: 2–3).

To conclude, although the Neolithic and Chalcolithic assemblages present different ranges of forms, some of them could be identified in both periods. Most parallels could be identified among open forms from both periods, as they were multifunctional utilitarian utensils. Among jars these parallels seem to be rarer. In the Neolithic assemblages open forms prevail over closed forms. In the latter part of the Neolithic we can observe an increase in the number of closed forms. At Maadi, more than 90% of preserved vessels are jars, but this situation results from the partial

character of the whole Maadi assemblage, consisting mostly of complete vessels. At Buto I and II both forms are represented in similar numbers (von der Way 1997: 88). The emergence of new closed forms resulted from the development of the pottery tradition, well visible among the Sais ceramic assemblage.

3. Transition from the Neolithic to the Chalcolithic in Lower Egypt: cultural change or continuity?

The stages in the pottery making process, including procurement of raw materials, followed by forming and firing vessels depended *inter alia* on the quality of and distance to resources, social structure and organization, subsistence system, climate, degree of sedentariness, population density and demand (Arnold 1989; Orton *et al.* 2010: 114, tab. 10.1). The available evidence does not show any significant environmental or climatic changes in Lower Egypt between the 5th and the 4th millennium BC. However, some local changes influencing the settlement pattern can be observed (e.g. abandonment of Merimde after phase I or possible abandonment of Sais during phase 2). Although these changes forced people to move, they probably did not seriously affect their way of life. People continued to make pottery in a similar way using the same raw materials as clay or temper. Without doubt potters gained more experience and their skills improved through time. They were able to make more elaborated vessel shapes and to control firing conditions to obtain the desired surface color. The pottery tradition including potters' know-how and pottery making techniques could be transmitted, learned, invented, created or inherited from generation to generation. The changes that the pottery tradition underwent over time and space, influenced by many cultural factors, account for differences between Neolithic and Chalcolithic pottery. By analyzing the pottery tradition of the Neolithic and early Chalcolithic we are able to track partly its development over time and also to notice some constant elements. On the one hand, the use of local resources, simple mode of production and firing, restricted repertoire of forms typical for household mode of pottery production are typical for both periods. The use of some vessel shapes in both periods could also be an element of the common pottery tradition. On the other hand, the increase in rough pottery accompanied by the decrease in polished pottery covered by slip and the increase in the number of vessel shapes in the Chalcolithic could be treated as changes and steps in the tradition's development. Analyses of the pottery tradition of the Neolithic and Chalcolithic show its dynamic character very clearly. In my opinion, the common cultural tradition linked both periods

and the available data indicates the continuity of the pottery tradition between the 5th and the 4th millennium BC.

In the studies on the continuity of the pottery tradition some observations concerning the relation between pottery production and cultural change made by P. Rice (1984) could also be helpful. The researcher proposed a list of factors influencing stability and/or change in pottery production, including recourses, efficiency, diet, ritual or ceremonial behavior, values, social/economic status/organization and market demand (Rice 1984: 241-255, tab. 2). According to P. Rice, pottery does respond to cultural change, but this response is 'subtle and gradual'. Moreover, changes in pottery do not reflect cultural change in a reliable and predictable manner (Rice 1984: 234 after Ehrlich 1965: 13 and Grieder 1975: 850).

In my opinion the cultural boundary between the Neolithic and Chalcolithic is artificial and was distinguished only on the basis on archaeological records. The same goes for the existing framework of archaeological cultures. Neither reflects the actual cultural situation in the past and they are merely an archaeological interpretation of the remains of past societies (see Mączyńska 2017). We can observe the continuity of the pottery tradition between both periods.

In my research on the Neolithic and early Chalcolithic pottery I chose to identify and analyze the factors proposed by P. Rice that account for continuity or change in pottery assemblages. According to her, adaptation to resources is one of the reasons for stability (Rice 1984: 241-244; 2005: 462). Clay, temper and fuel are fixed locally and potters adapt to their properties. All innovations involve the risk of failure, which is why potters are quite conservative and less likely to innovate. Changes can be caused by various situations: exhaustion or inaccessibility of e.g. clays, temper, availability of new resources, forced resettlement of potters, environmental change or natural disaster. The availability of local resources promoted stability in the pottery-making system in the Neolithic and early Chalcolithic. Moreover, pottery manufacturing efficiency / technique known in the period in question also promoted stability. The household mode of pottery-making, in which vessels were made for domestic purposes seems to have been resistant to change. Production and firing techniques were simple, requiring only basic skills.

It is worth analyzing two other factors closely related to each other – diet and demand. Utilitarian vessels are very often described as being the most resistant to change as they have little or even no symbolic meaning (Rice 2005: 45). The mode of their use and their content change little, even during and after a cultural

change. The most change-resistant are water and cooking vessels, which make the majority of the ceramic assemblages on the Neolithic and early Chalcolithic sites. Their fabrics and shapes depend mostly on their function. In my opinion, the similarity of the Neolithic and early Chalcolithic utilitarian ceramic assemblages resulted from their similar function. Moreover, the change in the number of used forms and the well visible development of vessels from open towards closed forms in the later Neolithic and early Chalcolithic could result from changes in function, diet and demand. Evidence from Chalcolithic sites shows that LEC economy was fully based on farming and animal breeding (Mączyńska 2013: 101-106), while in the Neolithic wild recourses were still an important supplement in the diet. The more differentiated repertoire of forms on younger sites could reflect a shift from multifunctional vessels towards containers used for specific functions/products. The limited number of vessel shapes in both periods could influenced the use of utilitarian vessels as grave offerings. Burial customs in both periods were very simple with only single grave goods (or with no grave goods altogether), which probably had been previously used by the dead or their relatives.

To conclude, when analyzing the pottery-making system of Neolithic and Chalcolithic societies, it is easy to recognize the stability of the system. In my opinion, mostly stability promoting factors could be identified. Our limited knowledge on the early Prehistory of Lower Egypt does not allow us to analyze other factors proposed by P. Rice, such as ritual or ceremonial behavior and values. However, my research on the later phases of the LEC pottery shows that the pottery tradition changed as new change-promoting factors emerged in the later part of the 4th millennium BC (Mączyńska 2016b).

4. Conclusion: the origins of the LEC

In my opinion the origins of the LEC are closely linked to the Neolithic societies of Lower Egypt. For many years in the archaeology of Lower Egypt there was a time gap between el-Omari culture and LEC, with no finds dated to that period. The recent excavations at Sais showed that the end of Merimde occupation is dated to 3900 BC, when LEC occupation at Buto started. However, it is still really difficult to propose any hypothesis on the beginning of LEC occupation in this region. According to G. Tassie (2014: 361), LEC occupation did not appear simultaneously in the whole of Lower Egypt and it radiated from the western Delta. However, since only a few sites are known, data interpretation is far from easy. The territorial and chronological proximity of the Neolithic and Chalcolithic settlers

in Lower Egypt allows one to link them to the same cultural tradition. The ancestors of LEC should be looked for within the Neolithic societies of Lower Egypt.

The pottery tradition is part of a cultural tradition and its analyses could give answers to questions concerning its continuity between the Neolithic and the Chalcolithic. My analyses show that ceramic assemblages from both periods differ, but they also indicate some common characteristics which could be explained as a result of a common cultural background of the societies occupying the region in question in the 5th and 4th millennium BC (Fig. 8). The adaptation to and the use of local resources, simple pottery making techniques, limited number of vessels shapes and household mode of production can all be observed in both periods. Moreover, looking beyond the pottery tradition it is not difficult to notice that the societies from both periods also shared some other technologies (e.g. flint production), practices (e.g. burial custom), social structure (egalitarianism) and economy (farming and animal breeding) (Mączyńska 2013; 2017). This Lower Egyptian cultural tradition developed over time and underwent dynamic changes. As a result, the Neolithic and Chalcolithic societies have their unique characteristics distinguishing them from each other. On the one hand, the Chalcolithic produced more differentiated ceramic assemblages, buried their dead in separate areas outside settlements and relied fully on agricultures. But on the other hand, they still made vessels in the same way and used a few of the same shapes, equipped the dead with only a few offerings used before in household activities. They also cultivated and ate the same cereals and kept and used the same animals.

I am aware that my observations are tentative and should be confirmed by further studies on materials other than pottery, including more detailed analyses of social, economic and symbolic systems. However, the first step is always better than no step at all. I hope that my analyses can provoke a discussion on the cultural situation in Lower Egypt in this early period. It requires going beyond the secure framework of archaeological cultures, which makes it difficult to understand early occupation of Egypt. We have to keep in mind that the Neolithic and Chalcolithic societies were the ancestors of the Ancient Egyptian and the foundation of the Egyptian state were created in these very periods.

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