Pottery

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Introduction

Research on early Sudanese pottery, which started in the 1940s, resulted in a A.J. Arkell presenting a description of characteristic traits and the first typological classification based on differences in vessel decoration (1949; 1953). His classification was based on material from the Khartoum Hospital and Shaheinab. The first petrographic analyses on Neolithic pottery were carried out in the 1970's (Nordström 1972:33-57; Hays & Hassan 1974; Hays 1976). Successive attempts to modify and adapt the classification system proposed by A.J. Arkell were undertaken by R. Haaland (1981), M. Chłodnicki (1982), I. Caneva (1988), S. Salvatori and D. Usai (2008).

The pottery from the Neolithic site at Kadero was described for the first time by H.N. Chittick (1955). A surface collection of sherds from the site struck him as remarkably similar to the ceramics from the Esh Shaheinab Neolithic settlement. When Lech Krzyżaniak started regular excavations of the site in 1972, he noted the strikingly low frequency of dotted wavy-line ware and the stylistic and technological similarities between material from Kadero and the A-Group culture (Krzyżaniak 1974:221; 1975b: 190). Further incremental descriptions of the Kadero pottery were published successively by M. Chłodnicki. These studies embraced material from excavations on the southern and northern middens (1981; 1982; 1984; 1986; 1987; 1989) as well as from the Neolithic graves (1997). The framework for pottery description and analysis was adapted largely from publications of Nubian pottery presented by W.Y. Adams (1964; 1968) and H.Å. Nordström (1972). A.J. Arkell's pioneer work on the pottery decoration (1949; 1953) was used as well.

The collection of Kadero comprises over 200,000 potsherds and more than 100 complete vessels. The material from the settlement is very fragmentary, but sufficient for identification of vessel form, decoration and pot technology. About 14,000 characteristic fragments (all the rims, the bottoms and also body fragments featuring different technology or decoration) have been studied.

Pottery discovered during the first seasons in Kadero appeared to be mostly Early Neolithic. Simple semicircular bowls of different depths and spherical jars with rounded bottoms were the only two forms represented in the repertoire. Pots were decorated with simple impressed or incised designs, or left undecorated, often the surface was covered with red ochre or sometimes black-topped (Chłodnicki 1997:29). The finds of the next seasons revised this impression of homogeneity, bringing to light more Early Khartoum potsherds and late Neolithic pottery as well as huge amounts of early Neolithic sherds. A certain part of technologically and stylistically different sherds recalls nothing similar from Central Sudan; this collection also seems to be of Neolithic date. The following chapter presents all of the pottery (except for the Meroitic type) found at Kadero.

Technological analyses

Technological analyses did not play an important role in the first publications of Neolithic pottery from Central Sudan, attention being focused on the vessel decoration instead (Arkell 1953; Chittick 1955; Otto 1963). Technological traits, such as colour or texture of the surface, - type of temper or colour of the break, were merely extras in the description. Pottery technology gained importance after 1970 when classifications of Sudanese pottery started to be based on microscopic analysis (Nordström 1972; 1981:243; Hays, Hassan 1974; Palmieri 1983).

Pottery fabrics

Petrographical analyses of the pottery confirmed Nile silt to be the material of choice for the production of vessels in Kadero. Silt is on the average 60-70% of the ceramic paste, sometimes a little more or less (Chłodnicki 1989:370). Based on macroscopic analysis of the size of mineral inclusions, it was estimated that 19.5% of the material has only very fine and fine temper (< 0.25 mm), 73.8% medium-size temper (0.25-0.50 mm), 2.1% coarse temper (0.5-1.0 mm) and only 0.1% very coarse temper (> 1 mm) (Chłodnicki 1982:84). Only a small part of the pottery appears to have been made from unmodified Nile silt, whereas most of the pottery had sand added to the paste. Nile silt has a dark brown color when dry and contains small amounts of finer (clay) and coarser (fine sand) fractions. Analyses of the pottery and the sources on the Kadero site have suggested that the sand used for this purpose comes from the area around the site (Chłodnicki 1989).[1] Practically all the samples that were analyzed petrographically, proved to be of local production (Group M) despite some differences in mineralogical composition and temper size. This placed the pottery in group IIc of Hays' and Hassan's classification (1974). In the Kadero pottery, sand grains are - subangular to subrounded with rounded grains being very rare, thus indicating that the sand sources were close to the river Nile and that Aeolian sand and crushed rock were not used. The most popular mineral is quartz, but feldspar and mica also occur in small quantities. Fragmented shell is also present occasionally.

The most common color of the fracture is black (47.4%), dark gray (17.2%) and dark brown (29.1%), occasionally pale brown (3.1%) and exceptionally red (0.1%). The most common colors according to Munsell Soil Color Charts are: 7.5 YR 2.5-5 and 10 YR 2-5.

The fracture usually displays one color and the oxidation zones are very thin. The latter can be thicker and the fracture then is black, gray or dark brown at the core and lighter in the outer and/or inner zones (1.8%). The fracture can also have just two zones: a lighter outer one and a darker one inside (1.3%). Occasionally, sherds can be black or dark gray on the outside and brown inside (0.0%). The analyzed samples have demonstrated that the pots were fired at temperatures ranging between 600 and 800°C, although in one of the cases a temperature of only 550-600°C was noted.[2]

Pottery of group M has a relatively homogeneous and compact paste with strongly cohered temper. This is the most typical fabric in the Kadero pottery assemblage. It shows some similarities with Fabric IA (fine sandy Khartoum Variant type) and IC (sandy Abkan type) from Lower Nubia according to Nordström (1972:48-49).

Two of the analyzed potsherds differ from the rest of the material in terms of both style and petrography and may represent imports to the Kadero site (Chłodnicki 1989: 372-373). This dark brown pottery, which has found no parallels so far, contains subangular grains of quartz, plagioclase and basalt (Group MX; Chłodnicki 1982: 85).

Organic matter was found only in a small number of the sherds (less than 0.1%; Group R). These are carbonized particles visible in the ceramic mass or voids visible on the surface which are the effect of completely burned chaff or dung particles. The paste is porous and the mineral temper is fine to very fine. The color of the fracture is black or dark gray. This pottery is less hard than in the previous groups. This fabric has some parallels with Fabric IIB (dung-tempered, Nubian type) and IIE (chaff-tempered, Nubian type) from Lower Nubia according to Nordström (1972:51-53).

1 Analyses by Maciej Pawlikowski from the University of Mining and Metallurgy (AGH) in Kraków.
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Surface properties

Surface properties include basic surface color, coating, texture and lustre (Nordström 1972:44). Surface burnishing of the vessels was considered by A.J. Arkell (1949:93) as an important trait distinguishing the Neolithic production in Sudan from older, Early Khartoum pottery.

The basic surface color predominant on the uncoated surfaces of vessels from Kadero is mostly different shades of brown and seldom gray, black or red. Brown color on the outside occurs on 61.8% of the pottery from Kadero, 29,4 % of the pottery is dark brown, 8% is gray, 0.8% very dark gray or black and 0.0%[3] is red. Inner surfaces are darker than the outside : brown 50.8%, dark brown 33.8%, gray 12.5%, black and very dark gray 2.9%, red 0.0%.

Generally, the colors can be divided into two classes: brown (and dark brown) and black (gray, dark gray). Although the color difference is not always clear, it is a useful criterium for differentiating the material. A.J. Arkell (1953:74-75) believed the pottery with black (dark gray) surface to be more popular in the later phase of the Neolithic. Pots with gray surface do not constitute a significant share of the pottery from the Kadero cemetery, whereas they are important in the burials at Kadada and Shaheinab (Arkell 1953:84-88; Geus, Reinold 1979:35-81).

The basic surface color of pots from the graves show a fairly common practice of coating the surfaces with red ochre to make the pots look more attractive. This treatment was applied almost exclusively to the delicate "table" ware. Coated surfaces occur on 50% of the pottery from the cemetery, but only on 25% from the settlement. The coating was applied mostly on the outside and the inside of the vessel (70%; Chłodnicki 1982:86).

Smooth surfaces are very characteristic of the Kadero pottery. Burnishing appears on 90% of the pots, although the degree of polish may differ. High-grade polish is characteristic of surfaces coated with red ochre. Only one example of what may be a rippled surface was found at the settlement (Chłodnicki 1982:86).

Uncompacted surfaces, rough to different extents, are also present, although rare. This group consists of intentionally untreated surfaces, that is, the surfaces are left coarse. The second – larger group consists of combed surfaces characterized by shallow parallel grooves made with a comb. Sharper comb teeth resulted in irregularly scraped surfaces. A few potsherds of this kind have been found at Kadero.

Wall thickness and shaping techniques

Wall thickness, especially associated with vessel size, is an important indicator of the technical level of pottery production. When the sample of complete vessels is limited, an analysis of the wall thickness for the whole assemblage and for the individual vessel groups can help in estimating vessel size because of the close relationship between size and wall thickness (Chłodnicki 1982:Fig. 10). This phenomenon is particularly well visible in small and medium-size vessels. A thicker wall means a bigger vessel.

Tab. 1. Wall thickness of the pottery from Kadero (in %)

Wall thickness (in mm)	Part of the vessel		
	Rim	Body	Base
3	0.9	-	-
4	11.3	1.9	3.3
5	36.5	18.5	16.7
6	31.8	28.6	20.0
7	13.8	26.2	20.0
8	4.3	14.4	16.7
9	0.9	5.8	20.0
10	0.5	2.8	3.3
11	-	1.2	-
12	-	0.3	-
over 13	-	0.3	-
	100	100	100

The wall thickness of Neolithic pottery from Kadero is mostly 5-7 mm (in 70% of the collection). The average wall thickness near the rim is 5.6 mm. Thickness more than 10 mm is very rare, even in the lower parts of the vessels. The finest pottery was only 2.0–2.5 mm thick (Chłodnicki 1979:38). Vessels are obviously thinner near the rim and thicker near the base (Chłodnicki 1982:Fig. 3), but there are exceptions from this rule (Tab.1).

3 0.0 % means that the frequency is less than 0,04 %

The coiling technique for modeling pots has been noted in only a dozen or so cases (among the thousands analyzed). R. Haaland's roentgen examination of pottery samples has shown no evidence of the coiling technique being used in the Neolithic of the Sudan; in effect, Haaland is convinced that most probably a paddle-and-anvil technique was used (Haaland 1981b:162-163). This technique is still known in Sudan (Haaland 1981b:186-187). Traces of the coiling technique were found also on pottery fragments from the Early Khartoum (Arkell 1949:191-193) and the material from Site R12 in the Dongola Reach (Salvatori, Usai 2008:9).

Ware classification

The ware description consists of three elements:

Fabric Group: M, MX or R

Technological groups of pottery can be distinguished based on microscopic analyses. Almost 100% of the material belongs to Fabric Group M with sand temper. A small group belongs to Fabric Group MX, also with sand temper. Fabric Group R is pottery with organic temper.

Presence or absence of coating:

0 – no,
1 – yes

Surface texture:

1 - coarse,
2 - combed,
3 - scraped,
4 - burnished brown,
5 - burnished black (or dark gray),
6 - burnished, black top,
7 - rippled

Distribution of wares in the settlement and in the cemetery is different owing to the fact that certain kinds of pottery were preferred for placement in the graves (Tab. 2).

Ware M.0.1: *Coarse brown or grayish brown ware*

Fabrics: Fine to medium sand temper (M.0.1b), rarely coarse sand temper (M.0.1a); fracture dark gray, black or dark brown; brown or grayish-brown fractures are more frequent than in other wares. Wall thickness: Usually moderate (5-10 mm), rarely thin (4 mm).

Tab. 2. Frequency of different wares at the cemetery and the settlement.

Ware	Cemetery*	Settlement
	%	%
M.0.1 – coarse brown or greyish brown ware	0.8	1.8
M.0.2 – combed ware	9.7	3.0
M.0.3 – scraped ware	-	0.2
M.0.4 – brown burnished ware	34.7	61.6
M.0.5 – burnished black ware	0.8	5.5
M.0.6 – black-topped brown ware	-	0.4
M.1.2 – red combed ware	-	0.0
M.1.4 – red burnished ware	46.7	24.8
M.1.6 – black top, red burnished ware	6.5	2.7
MX.0.1 – coarse exotic ware	-	0.0
R.0.6 – wares with organic temper	0.8	0.0
R.0.7 – rippled ware	-	0.0
	100	100

* Based on 124 pots and big fragment of pots

Surface, external: Brown in different hues from light to dark, rarely gray. Surface gritty with no polishing marks.

Surface, interior: Color usually the same as outside, sometimes a little darker.

Remarks: Rare in Kadero. May be compared to Early Khartoum assemblages.

Ware M.0.2: *Combed ware*

Fabrics: Fine to medium sand temper, but coarse sand can occur as well. Fractures mostly dark gray, dark brown or black, but also brown or brownish gray.

Wall thickness: Usually moderate (5-8 mm), rarely thin (4-5 mm).

Surface, exterior: Mostly brown from pale to dark, sometimes with gray or red patches (M.0.2a). Gray surfaces are present as well (M.0.2b). Ordinarily, the whole surface was combed in different directions. Sometimes only the lower part of the vessel was combed and the upper part decorated. Occasionally comb marks appear all over the pot, but do not cover the whole surface.

Surface, interior: Color the same as on the outside, but gray is more frequent. Smoothed, the upper part sometimes combed and then smoothed.

Remarks: Not frequent, but occurring in both the settlement and the cemetery.

Ware M.0.3: *Scraped brown ware*

Fabrics: Medium to coarse sand. The temper in this ware is the coarsest. Dark colors of the fracture are still frequent (dark gray, black, dark brown), but light brown color is increasingly common (18%).

Wall thickness: Only moderate (5-8 mm).

Surface, exterior: Brown, scraped.

Surface, interior: Brown, smoothed.

Remarks: Only small fragments have been found.

Ware M.0.4: *Brown burnished ware*

Fabrics: Fine to medium sand temper. Fracture brown or dark brown, seldom light brown.

Wall thickness: Usually moderate (5-10 mm, mostly 5-6 mm), rarely thin (3-5 mm), or thick (10-15 mm).

Surface, exterior: Brown or gray brown, sometimes with gray patches. Burnished or well smoothed, sometimes lustrous.

Surface, interior: Brown or dark brown, sometimes gray. Generally, the interior is darker than the exterior. Sometimes only the upper part of the vessel is burnished.

Remarks: The most popular ware in Kadero.

Ware M.0.5: *Burnished black ware*

Fabrics: Fine to medium sand temper. Fracture black, dark-gray or dark-brown.

Wall thickness: Usually moderate (5-10 mm), sometimes thin (3-5 mm).

Surface, exterior: Black or dark gray. Sometimes gray with black patches. Very well burnished, sometimes lustrous.

Surface, interior: Black or dark gray, burnished.

Remarks: This ware was more popular in the late Neolithic.

Ware M.0.6: *Black-topped ware*

Fabrics: Fine to medium sand temper. Fracture dark brown, black or dark brown, rarely brown.

Wall thickness: Usually moderate (5-7 mm) or thin (3-5 mm).

Surface, exterior: Color brown or dark brown, black band near the rim. Burnished.

Surface, interior: Color dark brown or dark gray

Remarks: very rare

Ware M.1.2: *Combed pottery with red external surface*

Fabrics: Fine sand temper. Fracture dark brown or black.

Wall thickness: Thin 4-5 mm.

Surface, exterior: Combed, red.

Surface, interior: Red, smoothed.

Remarks: Very few fragments.

Ware M.1.4: *Red burnished ware*

Fabrics: Fine to medium sand temper, coarser sand exceptionally. Fracture black, dark gray or dark brown, sometimes with dark core and lighter sides or dark inner zone and lighter outer one.

Wall thickness: Usually thin (2-5 mm), rarely moderate (5-7 mm), exceptionally thick (10 mm only near the base).

Surface, exterior: Red in different hues, sometimes reddish-brown. Sometimes with gray patches. Occasionally lustrous (well polished).

Surface, interior: Usually also coated (M.1.4a), sometimes only in the upper part. When uncoated, the inside surface is brown (M.1.4b), sometimes gray or dark gray (M.1.4c).

Remarks: "Table" ware, the finest in Kadero.

Ware M.1.6: *Red black-topped ware*

Fabrics: Fine to medium sand temper. Fracture black, dark gray or dark brown, sometimes with dark core and lighter sides or dark inner part and lighter outer one.

Wall thickness: Usually thin (3-5 mm), also moderate (5-8 mm).

Surface, exterior: Red, lustrous. Band of black triangles or bows near the rim.

Surface, interior: Red or brown, rarely gray or black. Burnished.

Ware MX.0.1: *Coarse exotic ware*

Fabrics: Medium-size and coarse sand temper with basalt particles. Fracture very dark brown.

Wall thickness: 7 mm.

Surface, exterior: Coarse brown.

Surface, interior: Coarse brown.

Remarks: Only two fragments distinguished.

Ware R.0.6: *Burnished black ware*

Fabrics: Fine sand temper, pores after firing left by the temper or bits of charcoal. Fracture black.

Wall thickness: Moderate (5-8 mm).
Surface, exterior: Dark brown to dark gray, burnished.
Surface, interior: Black, burnished.
Remarks: Very rare.

Ware R.0.7: *Rippled brown ware*

Fabrics: Fine sand temper and charred particles. Fracture dark gray.
Wall thickness: Moderate (6 mm).
Surface, exterior: Brown.
Surface, interior: Gray.
Remarks: Only one potsherd found.

Vessel form

The term vessel **shape** concerns the contours of the entire vessel and the proportional relations between the various dimensions. Vessel **form** is here used as a wider notion embracing the connection between shape, size and morphological details (see Nordström 1972:68; Chłodnicki 1982:89-93).

Research on Neolithic pottery from central Sudan has yet to establish a classification system to encompass all of the Neolithic vessel forms known. Arkell's system was burdened by the fragmentary state of the material from the Shaheinab settlement and the limited variety of vessel forms; hence he referred to all the vessels as bowls (Arkell 1953:69-76). From pottery of the burials at Shaheinab Arkell distinguished bowls, deep bowls, ladle-pots, saucers, feeding cups, bowls with constricted mouth and globular pots (Arkell 1953; 84-88). The analysis is of the Kadero settlement ceramic, where not many complete vessels were available (Chłodnicki 1979;1982), is based on the contours of the upper parts of the vessels. These contours and random preserved values of the rim diameter/height (H reconstructed with some probability) and rim diameter/maximum diametre indices were the basis for distinguishing eight different types of vessel shapes (US 1-4, RS 1-3, RNI; Chłodnicki 1982:90). Successive attempts were based on a differentiation between basic vessel shapes, proportions and size (Reinold 1987:30-31; Salvatori, Usai 2008:10-11).

Tab. 3. Comparison of the vessel shapes groups on the cemetery and settlement.

Shape group	Cemetery	Settlement
US – unrestricted simple vessels	51,2	48,7
UD – unrestricted vessels with conical contour	1,7	0.0
RS – restricted simple vessels	42,9	51,3
RC – restricted vessels with concave upper part	1,7	0.0
RN – restricted vessels with short neck	-	0.0
UI – unrestricted vessels with S-shape contour	2,5	-

Vessel shape

The material from the cemetery at Kadero provided a larger number of complete vessels compared to the settlement site, but even then the Kadero series remains innumerous, counting less than 100 pots and twenty or so almost complete vessels.

The system for Neolithic pottery description and classification proposed by H.A. Nordström (1972: 68-72) is based on shape modes which are "an analytical synthesis of the shapes of several vessels, characterized by a specific contour element [...] and certain range of the proportional indices" (Nordström 1972:72). This system, was adopted for the central Sudanese Neolithic pottery (Chłodnicki in press), and has been used extensively in this study.

Despite its three-dimensionality, pottery shape tends to be analyzed in the vertical section which is much more differentiated, but often difficult to recreate when the material is fragmentary. The horizontal section is mostly round and hence plays only a supplementary role; in Kadero, the collection of intact forms from the cemetery demonstrated that an oval shape of the horizontal section was not uncommon.

Vessels with a similar arrangement of characteristic points on the vessel contour are placed in the same shape group. Six shape groups were distinguished on these grounds in Kadero (Tab. 3, Fig. 1).

US - unrestricted vessel with simple contour. The maximum diameter is on the rim top level. They have one convex zone (xi) or two zones — lower convex (xi) and upper vertical (du) — without any significant transition between two zones. This shape is very popular in the Neolithic of Sudan.

UD - unrestricted vessel with one straight, divergent zone (di). The maximum diameter is on the rim top level. These pots are very rare.

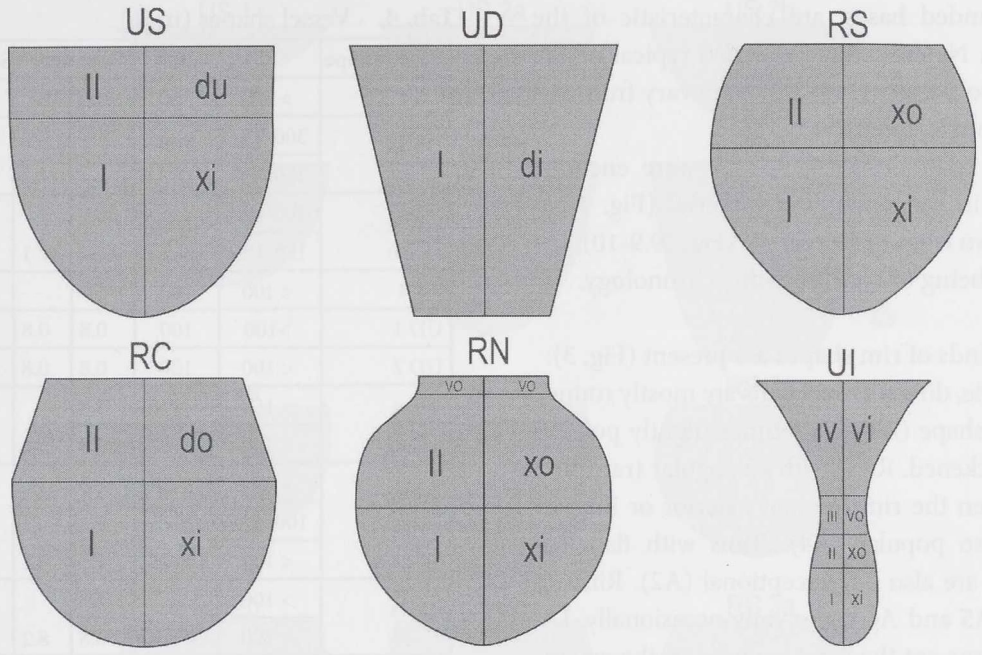

Fig. 1. Vessel shape groups.

RS – restricted simple vessel with simple contour. The maximum diameter is on the body level. It consists of two convex zones — upper (xo) and lower (xi). The most popular shape in Kadero.

RC – restricted vessel with upper zone straight or slightly concave. The maximum diameter is on the body. It consists of two zones — lower (xi) and upper (do). Rare shape.

RN – restricted vessel with short neck. It consists of three zones (xi + xo + vo). The maximum diameter is on the body.

UI - unrestricted inflected vessel with S-shaped contour and four zones (xi + xo + vo + vi). The maximum diameter is on the rim top level; it is much wider than the body — caliciform beakers).

Vessel index and basic parameters

The most important parameters for vessel description are height (*H*) maximum diameter (*Md*) and rim diameter (*Rd*). The proportional relationship between the height and maximum diameter is of greatest significance, especially for the simple-shape pots, like in Kadero. This ratio (*Vi* – Vessel index) is expressed as Md/H x 100.

The *Vi* supplies a basis for differentiating open simple vessels where *Rd* = *Md*, and is also very important for the other vessels (Rd<Md). The border between types is mostly *Vi* = 100 and 200, sometimes additionally 300 and 50. It depends on the character of the examined pottery (Nordström 1972:72; Chłodnicki 1982:90; Reinold 1987:30). The diameter index (*Di*) is of supplementary importance in the case of restricted vessels. It is especially important when vessels are not complete (height cannot be reconstructed) and only this index can be determined (*Di* = Rd/Md x 100). In Kadero, three groups of pottery were distinguished according to the *Di*: A – more than 85, B – between 75 and 85, C – below 75 (Chłodnicki 1982:Tab. 8). The relationship between shape and vessel index is expressed in several vessel shape sub groups (Tab. 4, Fig. 2).

Morphological details - base and rim shapes

Bases

A1: 46 pointed bases were found, probably connected with the Early Khartoum phase of the site (Fig. 8.12).

A2: rounded bases, are characteristic of the Sudan Neolithic, and are also typical of the Kadero pottery (Fig. 21). They vary from paraboloid to spherical.

B: Five examples of flat bases were encountered in the settlement material (Fig. 18.3) and two from the cemetery (Fig. 29.9-10), the latter being of Late Neolithic chronology.

Rims

Three kinds of rim shapes are present (Fig. 3):

A: simple, direct. Direct rims are mostly rounded in shape (A1), sometimes slightly pointed or thickened. Rims with an angular transition between the rim top and exterior or interior are also popular (A4). Rims with flattened shape are also not exceptional (A2). Rims of type A5 and A6 occur only occasionally. Direct rims are the most popular in the assemblage from Kadero, comprising about 80% of the material from the settlement (Chłodnicki 1982:Tab. 9), and 90% from the cemetery.

B: modeled, reverted. Among the modeled, reverted rims (B) only rims with rounded rim top modeled into a rounded lip (B1-B2) are common, especially in restricted vessels of bigger size. In this category, a third of the rims is modeled-reverted, comprising almost 20% of the settlement assemblage and 10% of the cemetery one. Other rims from the B group occur sporadically.

C: modeled, everted Modeled, everted rims occur only sporadically in Kadero (Chłodnicki 1982: 91).

Generally, the orifice of the vessel is horizontal, occasionally however it is modified regardless of whether the vessels are restricted or unrestricted.

There is a group features a kind of handle formed on one side of the rim (Fig. 28.8-11). The horizontal section of these vessels could be rounded as well as ellipsoidal. Fragmentation of the material makes it difficult to recognize pots with such horn-shaped handles. There are only two evident examples noted in the assemblage. The same goes for pots with wavy rim line (Fig. 28.7), but the material from the graves indicates that it is not an exceptional phenomenon.

Vessel size

Vessel size is sometimes described by the height and diameters. It is perfect for grouping vessels of the same shape, less so when vessels of different shape are concerned. Rim diameter is the parameter that is most easily recognized in the fragmentary material from the settlement (almost 700 potsherds were measured). The smallest pots are 5 cm in rim diameter, the biggest almost 50 cm. In the group of unrestricted vessels the predominant size falls within the 16-20 cm range, among restricted vessels it is 24-28 cm (Chłodnicki 1982:92). Restricted vessels are also generally bigger than unrestricted ones with the same rim diameter (since they are obviously deeper, the body diameter is a factor of overall size).

A better method for size differentiation was proposed by H.A. Nordström (1972:79) using the diagonal of the square formed by the height and maximum diameter of a vessel. Using this logarithmic scale, vessels were classified by him into four groups: small (A), medium (B), large (C) and very large (D).

Medium-size vessels predominated at the cemetery in Kadero with large vessels occurring as well (Fig. 4, Tab. 5). The value of the greatest dimension

Tab. 4. Vessel shapes (in %)

Vessel shape	*Vi*	*Di*	Cemetery*		Settlement**
US 1	> 300	100	-		1.8
US 2a	300-250	100	-		
2b	250-200		4.1	4.1	6.2
US 3a	200-150	100	28.9		
3b	150-100		18.2	47.1	40.4
US 4	< 100	100	-	-	0.3
UD 1	>100	100	0.8	0.8	+
UD 2	< 100	100	0.8	0.8	+
RS 1a	> 150		5.8		
1b	< 150	> 85	19.8	25.6	24.2
RS 2a	> 150		0.8		
2b	100-150		6.6		
2c	< 100	85-75	1.7	9.1	17.4
RS 3a	> 100		7.4		
3b	< 100	< 75	0.8	8.2	9.7
RS 4	?	?	-	-	+
RC	< 150	> 85	1.7	1.7	+
RN	?	?	-	-	+
UI	< 100	100	2.5	2.5	+
			100	100	100

* 121 pots analyzed

** 339 fragments of pots analyzed

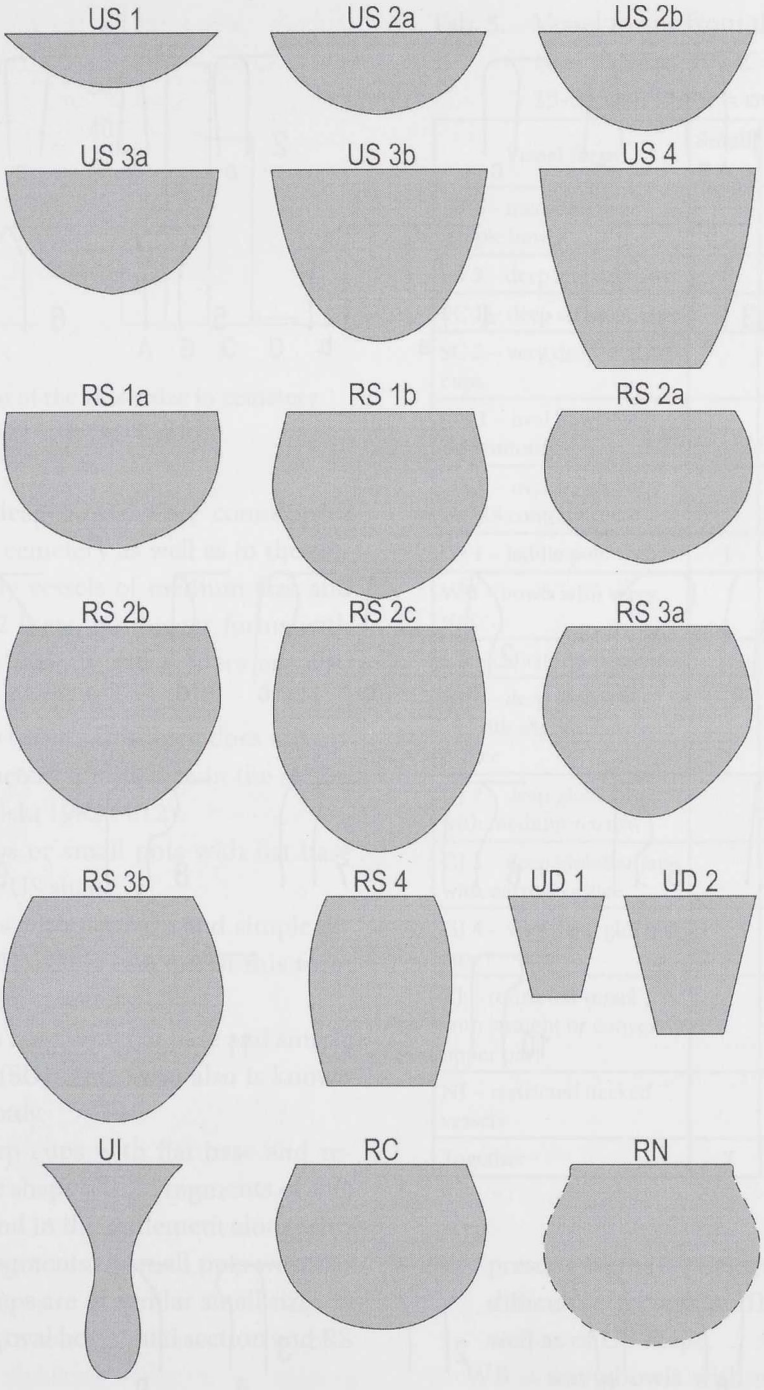

Fig. 2. Vessel shapes.

for most vessels was between 20 and 30 cm. Few small vessels as well as very large ones (preserved only as fragments) have been recorded. Compared to the cemetery, large vessels were more frequent at the settlement site. Very big pots were also much more frequent.

Vessel size is expressed very well by volume. This can be evaluated only for complete vessels. Most of the Kadero vessels had a capacity of 1-2 liters, but a volume of 8 liters is not rare. The biggest pots could have contained up to 35 liters of fluid.

Vessel forms

The form types have been established on the basis of the above criterion: vessel shape, morphological details and vessel size. Nine groups of vessel forms were distinguished - in the Kadero material

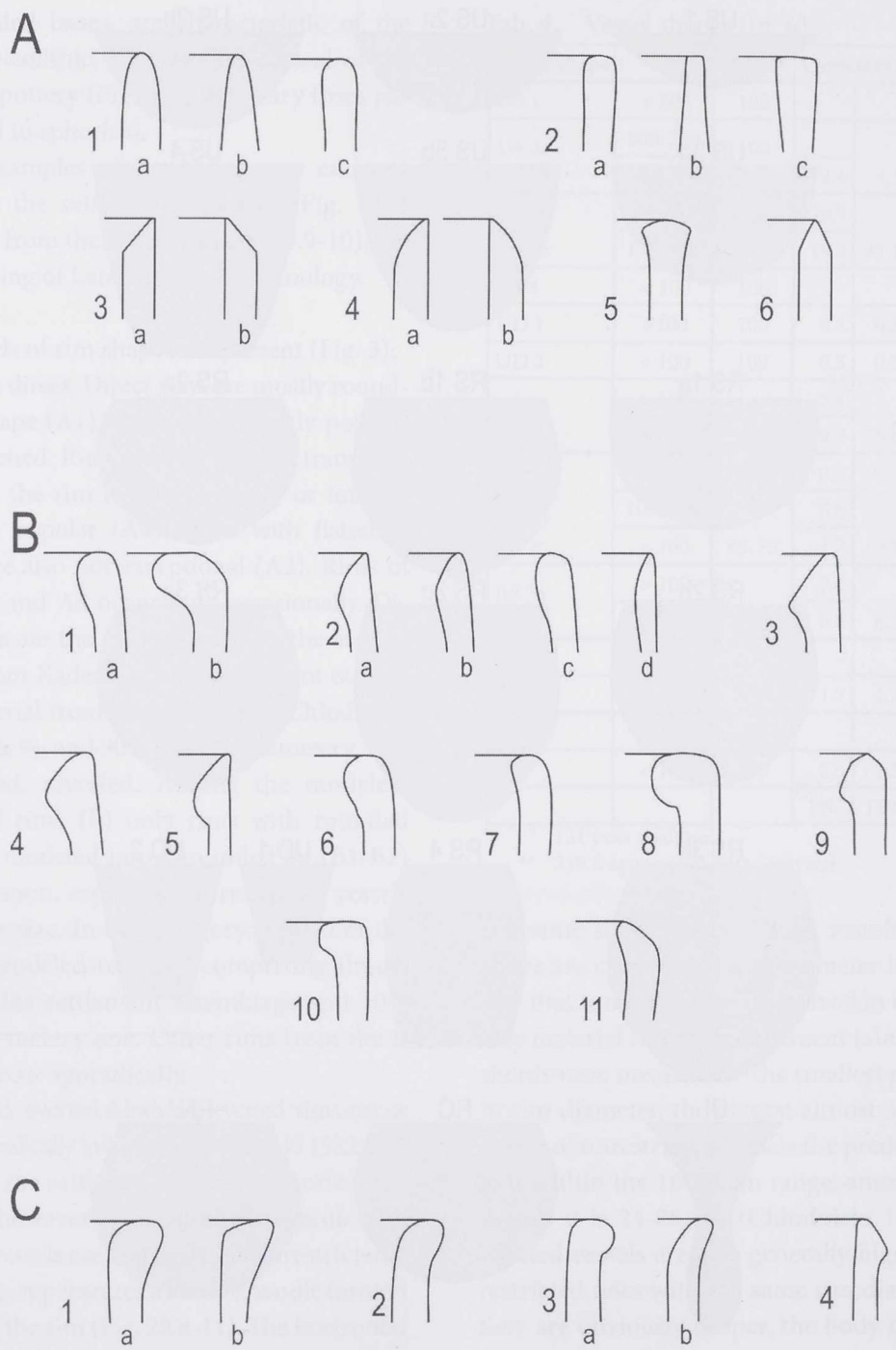

Fig. 3. Rim shapes.

(Fig. 5). Not all of the following forms were found at the cemetery (Tab.5).

SB – simple bowls with simple contour and rounded base; (what shape)

SB 1 – simple shallow bowls. This form is rather rare in the settlement and was not found in the cemetery at all. Generally, pots of this type are small or medium-sized with a capacity not exceeding 0.5 l (Chłodnicki 1982:93). The form was much more popular in the Late Neolithic rather than in the Early Neolithic.

SB 2 – simple medium-deep bowls. This form is present both in the cemetery and the settlement, but is not very common. Pots are of small or medium size, rarely big. Their capacity is mostly about 1 liter.

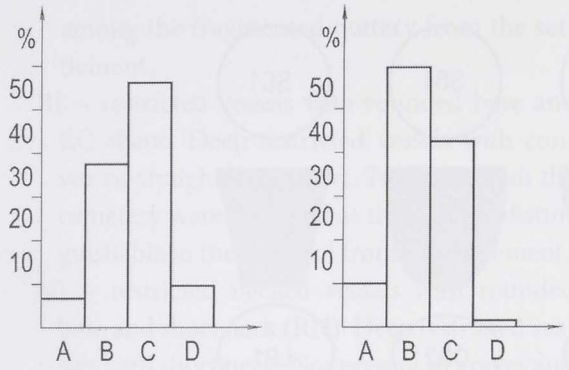

Fig. 4. Comparison of the vessel size in cemetery (right) and settlement (left).

SB 3 – simple deep bowls. Very common in Kadero, at the cemetery as well as in the settlement. Mostly vessels of medium size and capacity of 1-2 liters, but bigger forms with capacity more than 3 and 8 liters are also common.

SB 4 – very deep bowls. This form does not occur at the cemetery and is rare in the settlement (Chłodnicki 1982:Pl.12).

SC – simple cups or small pots with flat base and UD, RS or US shape;

SC 1 - deep cups with flat base and simple diverse shape (SD). Only one pot of this form was found in the cemetery.

SC 2 – very deep cups with flat base and simple diverse shape (SD). This form also is known from one pot only.

SC 3 – very deep cups with flat base and restricted simple shape (RS). Fragments of this form were found in the settlement along with a few other fragments of small pots with flat base. All the cups are of similar small size.

OB – bowls with oval horizontal section and RS or US shape;

OB 1 – oval bowl with US shape. One pot of this shape was found in a grave.

OB 2 – oval bowl with US/RS shape. One pot of this shape was found in a grave. No pots of OB shape were recognized in the material from the settlement. The two OB bowls from the cemetery are of medium size.

LP – 'ladle' pots, restricted (RS) or unrestricted (US) vessels with the handle on one side. Complete forms found at the cemetery. They are small or medium size. While they are present in the settlement material, they are difficult to recognize. They could be of RS as well as of US shape.

Tab. 5. Vessel forms from the cemetery (A – z = 10 – 15.9 cm, B – z = 16-24.9 cm, C – z = 25-51 cm, D – z = over 51.1 cm.

Vessel form	Small A	Medium B	Big C	Very big D
SB 2 – medium deep simple bowls	1	4		
SB 3 – deep simple bowls	3	39	13	
SC 1 – deep straight cups		1		
SC 2 – very deep straight cups		1		
OB 1 – oval bowls with US contour		1		
OB 2 – oval bowls with US/RS contour		1		
LP 1 – laddle pots	1	4		
WB – bowls with wavy rim			1	
CB – caliciform beakers			3	
GJ 1 – deep globular jar with slightly narrow orifice	1	11	14	1
GJ 2 – deep globular jars with medium narrow		2	6	
GJ 3 – deep globular jars with narrow orifice		2	8	
GJ 4 – very deep globular jars	1	1	1	
RJ – restricted vessel with straight or convex upper part			2	
NJ – restricted necked vessels	-	-	-	-
Together	7	67	48	1

WB – wavy bowls with wavy rim and simple US shape. One vessel of this type was identified from a grave. Impossible to distinguish when the pottery is fragmented.

CB – caliciform beakers with UI shape. This form is known only from graves and is extremely characteristic of the Late Neolithic rituals connected with mortuary cult. The three pots from Kadero came from two graves.

GJ – restricted vessels with rounded base and simple shape (RS);

Fig. 5. Vessel forms.

GJ 1 – deep, slightly restricted pots with a body only slightly wider than the orifice. One of the most common forms in both settlement and cemetery context. It occurs in different sizes from small to very big. They have a capacity of mostly around 4-5 liters, sometimes even up to 35 liters. This type of vessel differs only slightly from form SB 3: the rims are often slightly inverted and Md is only slightly wider than Rd.

GJ 2 – deep restricted vessels with a body moderately wider than the orifice. This form is less common then GJ 1 but still abundant. In this type large vessels are more numerous than medium-size pots.

GJ 3 – deep restricted vessels with the body significantly wider than the orifice. Less common than GJ 2 but still abundant at both the settlement and the cemetery

GJ 4 – very deep restricted vessels with the body moderately or significantly wider than the orifice. Their presence in the graves shows that the type was known, although not very common in Kadero. It is not distinguishable

among the fragmented pottery from the settlement.

RJ – restricted vessels with rounded base and RC shape. Deep restricted vessels with convex or straight upper part. Two pots from the cemetery were classified as this type. Indistinguishable in the material from the settlement.

NJ – restricted necked vessels with rounded base and short neck (RN). Deep restricted vessels with short neck. Not present in graves and only one fragment found at the settlement.

The vessel form and "size-comparison can be seen in Table 5. The list is not yet complete, especially for vessels of US and RS shape. Very big bowls are absent from the first group and are rare in the second one, while being quite common at the settlement.

Decoration

The decoration of the Khartoum Neolithic pottery is a frequently discussed in literature, especially with regard to material from settlements where decoration is the main or sole criterion for typological differentiation (Arkell 1953:68-77; Haaland 1981:164-171; Chłodnicki 1982:93).

A.J. Arkell selected the following types of vessel decoration:

on unburnished surface

- dotted (impressed) wavy lines

on burnished surface – impressed decorations

- dotted wavy lines
- two lines of triangles alternating with two lines of dots and variants thereof
- multiple lines of closely spaced dots
- two lines of triangles or 'v'-s with one line of dots between them and variants thereof
- close zigzag of dotted lines and variants thereof, zigzag of curved dotted lines,
- zigzag of continuous lines,
- fish-scale pattern;

incised decorations

- horizontal lines,
- semicircular panels

various atypical decoration

Later classifications of the decoration of the Khartoum Neolithic pottery have all grown out of Arkell's first attempt based on Shaheinab (Arkell 1953:68-77, the tendency being to combine his types into bigger taxonomic units (Haaland 1981: 165; Chłodnicki 1982:97-104). Types of decoration unknown at Shaheinab were also included. I. Caneva proposed an entirely different and interesting classification (1988:83-110) based on four principal decoration techniques:

I – rocker stamp technique,

II – alternately pivoting stamp technique,

III - single impressions technique,

IV - incisions.

The second step in her classification was the identification of the implements used for this purpose: with serrated edge, with plain edge, double-pronged or single-point. Elements of decoration and motifs were the third step in this classification (Caneva 1984:83).

Rich decoration is extremely characteristic of the Sudanese Neolithic. For example, 80% of the pottery assemblage from the Kadero settlement bore some sort of decoration on the body (Haaland 1981:Pls 26-31; Chłodnicki 1982:93; Arkell 1953: 78). When including in the count also vessels with undecorated body but with rim bands or rim top decoration, the percentage of decorated pots rises to 88.1% (Chłodnicki 1979:61). In the Kadero cemetery, 63% of the pottery is decorated, however if one includes the plain vessels with plain red polished body and with decorated rims the total of decorated vessels in the assemblage rises to 78%.

Since surface treatment like coating with red ochre is also deemed a decoration, it can be stated that 90% of the ceramics demonstrates not only simple surface finishing, but a desire on the part of the potter to create an aesthetically pleasing effect. The repertoire of decorative motifs identified in the cemetery assemblage is not as differentiated as in the case of finds in the settlement. Undoubtedly, this is due to the fact that vessels found in graves were specially preselected for ritual burial purposes and thus do not reflect the possible variety used by the community.

Studying the Kadero material, we distinguished three zones of decoration on the vessel: rim top decoration, rim bands, and body patterns.

Impressed but also incised, decoration, is the most characteristic of the Sudanese Neolithic Period. Production technique has been considered of particular significance with experimental stud-

Fig. 6. Rim top decoration.

ies being made such as those by I. Caneva (1978; 1983; 1984) and R. Haaland (1981:171-186). A.J. Arkell (1953: 70-72) had already suggested the use of the spine a catfish (*Synodonthis*) or the shell of the Nile bivalve (*Aspatharia*) as a tool for producing the decoration.

A double-pronged stick was added to this list later (Caneva 1978:Fig. 5) as well as the operculum of the land snail (*Pila ovata*; Haaland 1981: pl. 16). Implements of bone or flint flakes could have been used as well (Chłodnicki 1982:94). The rocker-stamp technique (Caneva 1988:84-94) was the most popular, while the alternately pivoting stamp technique was seldom used (Caneva 1988: 94-100). Occasionally, the simple impression technique is also encountered (Caneva 1988:100-101) and incised decoration was very popular.

Rim top decoration

Rim top decoration was common in the Neolithic of Central Sudan, but only on pots with the certain kinds of body decoration, whereas on other vessels it occurred only was sporadically to say the least (Chłodnicki 1982:Pl. 13). Rim top decoration occurs on 25% of the Kadero assemblage. The classification is based on decorative motifs, that is, impressions produced with a single application of the tool dedicated to the task (Chłodnicki 1982:96). Five groups have been identified (Fig. 6):

A. a stroke or line made with the edge of a sharp tool,
B. dotted line made with a comb stamp,
C. motifs produced by a single stamp of various shapes.

Combinations of pattern elements (AB and AC) occur sporadically. The presented classification does not differ in any way from one proposed earlier (Chłodnicki 1982:96, Fig. 14).

A. Strokes made with the edge of a sharp tool.
   - A 1. Line or of strokes at right angle to the rim line; common (5%),
   - A 2. Oblique strokes; the most popular decoration (51%),
   - A 3. Herring-bone decoration; rare (3%),
   - A 4. Criss-cross decoration; rare (4%),
   - A 5. Zigzag decoration; very rare (0.5%),
   - A 6. Cross and stroke decoration; unique (0.0%).

B. Dotted line made with a comb stamp
   - B 1. Oblique dotted lines, thin lines; common (10 %),
   - B 2. Like B1, but made with implement with thicker teeth; rare (3%),
   - B 3. Line of crescents made with comb; common (14%),
   - B 4. Herring bone pattern; unique (0.1%),
   - B 5. Criss-cross pattern; unique (0.2%).

C. Different motives produced with a single stamp
   - C 1. Row of rounded or oval dots; rare (2.2%),
   - C 2. Maces-shaped; unique (0.1%),
   - C 3. Triangles; unique (0.3%),
   - C 4. Crescents; rare (3%),
   - C 5. Tear-shape; unique (0.1%),
   - C 6. Squares; very rare (0.5%),
   - C 7. Different stamp-combinations; very rare (1%).

AB. Combination of A and B motifs; unique (0.1%).

AC. Combination of A and C motifs; very rare (0.5%).

The range of diverse rim top decoration is considerable, but only a few types are more common. Simple types, such as oblique or dotted lines (A2a, B1a-c, B3b), predominate, comprising over 70% of decorated rims from the settlement. The number at the cemetery is more than 90%. Other decoration, such as criss-cross or zigzag, constitutes only an insubstantial percentage. Of the 86 distinguished variants only 14 are more frequent than 1%. Half the decoration types are known from less than three specimens (29 types fragments from a single specimen; Chłodnicki 1982:Fig. 14).

Rim bands

Separate rim band decoration occur surrounding the orifice of the vessel and sometimes bordering the body decoration. This kind of decoration occurs only on pots with undecorated body (25.5%) or with a multilateral structure in the design (72.6%). On other pots, it is very rare. The decorations were produced with three techniques: A - engraving (71.5%), B - impression (3.8%), and C - coloring (24.7%). Modeled plastic bands (D) occurred on only two fragments (Fig. 7).

The following decoration motifs were distinguished within this overall framework :

A. Horizontal incised lines, 1-9 lines, but mostly 2-4 lines; common on pots with semicircular panels on the body (Fig. 16. 6-7): 71.5%

B 1. Horizontal lines of impressed dots, 1-6 lines; common on pots with semicircular panels of impressed dots on the body of the vessel(Fig. 16.11): 3.0%

B 2. Short vertical strokes, 3 mm long; this decoration type, as well as the two following ones (B 3 and B 4) are rare: 0.1%

B 3. Bands of parallel, diagonal lines made with a comb (Fig. 17.1-2): 0.2%

B 4. Bands of triangles produced with rocker stamp technique (Fig. 17.15): 0.4%

C 1. Black-top decoration (Fig. 19. 3,5, 6) – colour applied as black triangles ; this kind of decoration occurs in connection with red polished pottery (Fig. 19.5-6): 18.3%

C 2. Black coloured bands near the rim; up to 2 cm (but mostly 1 cm) wide (Fig 19. 8-10): 6.3%

D 1. Modeled plastic band; known from only one example (Fig. 17.17): 0.0%

D 2. Modeled plastic band decorated with comb impressions; known from only one example (Fig 17.5): 0.0%

Body decoration

Body decoration motifs were divided into groups according to technique, patterns and style:

I. Simple impressed decoration with concentric or asymmetric patterns, produced

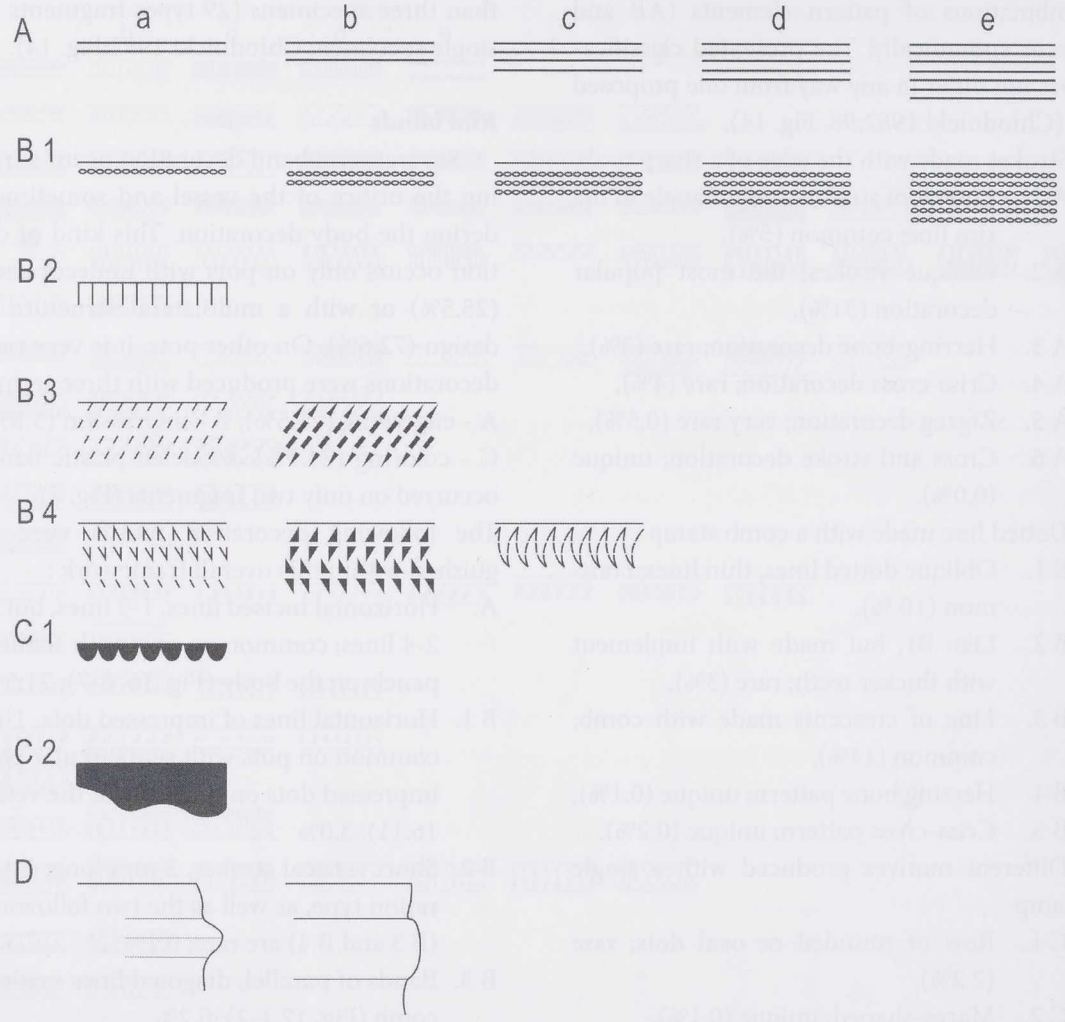

Fig. 7. Rim bands.

with rocker-stamp technique or alternately pivoting stamp.

II. Impressed decoration with multilateral patterns produced by rocker-stamp technique.

III. Incised decoration with concentric or asymmetric patterns produced by a comb or single point (stylus).

IV. Incised decoration with multilateral patterns produced by a single point (stylus).

V. Complex geometric decoration produced by single point and simple impressions.

Group I. Simple impressed decoration with concentric or asymmetric patterns, produced with rocker-stamp technique or alternately pivoting stamp.

Type I.A. Dotted wavy-line; found at Kadero on very few pieces. Arkell (1953:68-69) believed it to be a typological link between the Khartoum Mesolithic and Khartoum Neolithic.

Two subtypes distinguished:

Subtype I.A1. Series of 4-6 wavy lines with dots alternating with straight lines of impressed dots (Fig. 8.6-11); unburnished. Decoration characteristic of the Early Khartoum.

Subtype I.A2. Decoration produced by alternately pivoting stamp (Caneva 1978: fig. 5.9); series of two parallel dotted lines covering the surface (Fig. 10.2-3), burnished; probably the earliest fine ware of the Khartoum Neolithic (Arkell 1953:69).

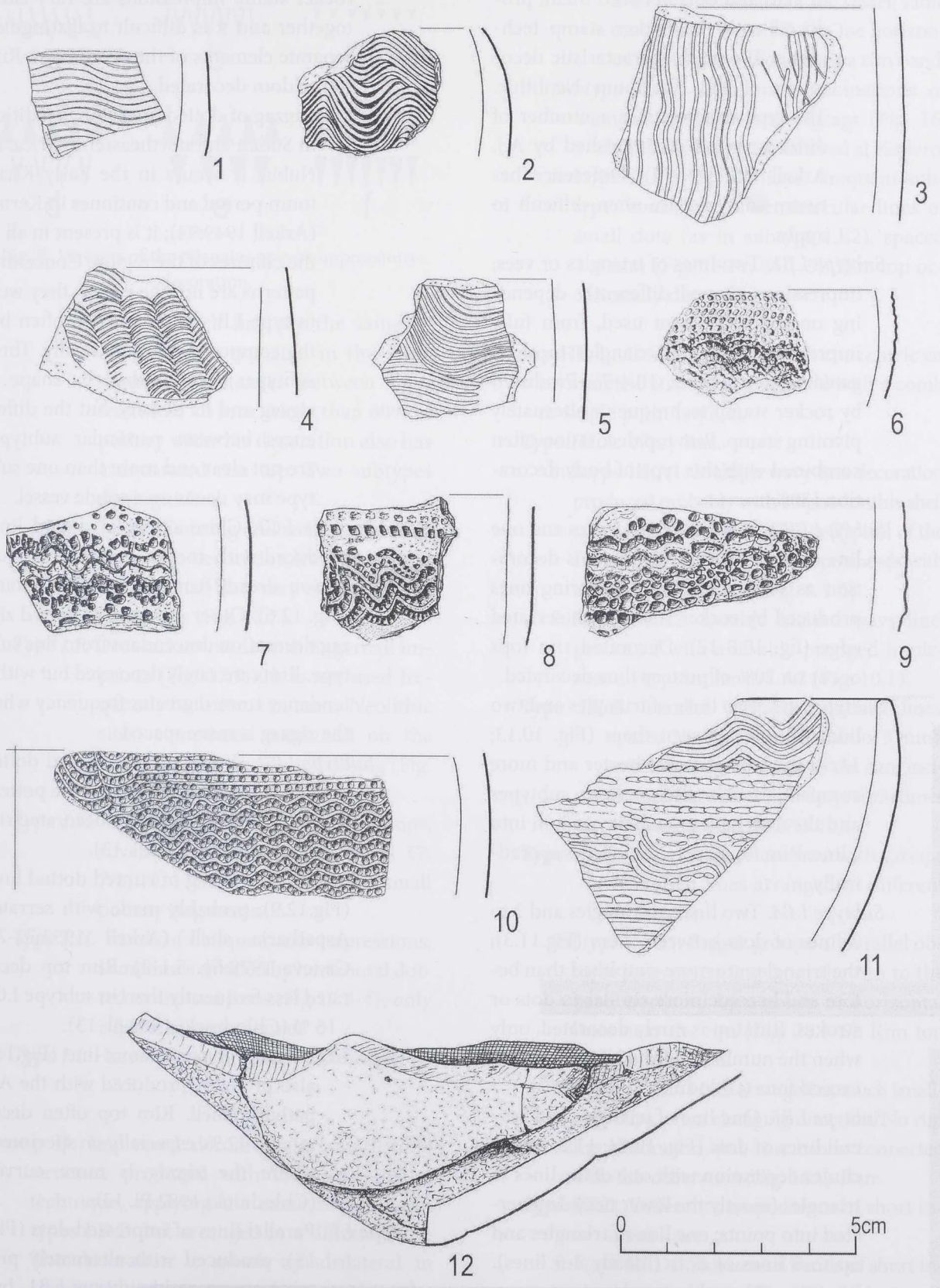

Fig. 8. Early Khartoum pottery. Type MR 1 (1-5), MR 2 (6-11).

Type I.B. Different combinations of triangles or vees and dots between them; produced with the rocker stamp technique. The most characteristic decoration of the Khartoum Neolithic. The type encompasses a number of different types distinguished by A.J. Arkell (1953:69-72). Difference between subtypes are often difficult to apply.

Subtype I.B1. Two lines of triangles or vees; impressions shaped differently depending on the implement used, from fully impressed equilateral triangles to elongated angles (Fig. 9; 10.4-7). Produced by rocker stamp technique or alternately pivoting stamp. Rim top decoration often combined with this type of body decoration (30%).

Subtype I.B2. Two lines of triangles and one line of dots between them. This decoration as well as the four following ones produced by rocker stamp with serrated edge (fig. 10.8-12). Decorated rim tops occur on 20% of pottery thus decorated.

Subtype I.B3. Two lines of triangles and two lines of dots between them (Fig. 10.13; 11.5); the triangles are shorter and more compact than in the previous subtypes and the dots have a tendency to join into a line. Rim top decoration occurs sporadically.

Subtype I.B4. Two lines of triangles and 3 to 7 lines of dots between them (Fig.11.3); the triangles are more simplified than before and become more similar to dots or strokes. Rim top is rarely decorated, only when the number of dotted lines does not exceed four (Chłodnicki 1982:Pl. 13).

Subtype I.B5. One line of triangles and several lines of dots (Fig. 10.14; 11.2, 6); includes decoration with one of the lines of triangles (mostly the lower one) degenerated into points; one line of triangles and up to 9 lines of dots (mostly 3-5 lines). Rim top seldom decorated.

Subtype I.B6. Evenly spaced dots (Fig. 11.7-9); results from the simplification of type I.B decoration (mostly I.B4 and I.B5). The rocker stamp impressions are very close together and it is difficult to distinguish separate elements of the decoration. Rim top seldom decorated.

Type I.C. Zigzag of dotted lines; long tradition in Sudan and northeastern Africa. In Nubia, it occurs in the Early Khartoum period and continues in Kerma (Arkell 1949:94); it is present in all of the cultures of the region. Concentric patterns are not the rule as they were in type I.B, the decoration often being composed asymmetrically. Three subtypes distinguished by shape of zigzag and its density, but the differences between particular subtypes are not clear and more than one subtype may occur on a single vessel.

Subtype I.C1. Close zigzag of dotted lines produced with rocker stamp technique; known already from the Early Khartoum (Fig. 12.6). Other subtypes of dotted zigzag decoration descendant from this subtype. Rims are rarely decorated but with a tendency toward greater frequency when the zigzag is more spaced.

Subtype I.C2. Zigzag of well-spaced dotted lines (Fig. 12.10); one third of the pottery decorated in this way has a decorated rim top (Chłodnicki 1982:Pl. 13).

Subtype I.C3. Zigzag of curved dotted lines (Fig.12.9); probably made with serrated Aspatharia shell (Arkell 1953:72-73; Caneva 1978:fig. 5.1-2). Rim top decorated less frequently than in subtype I.C2 - 16 % (Chłodnicki 1982:pl. 13).

Type I.D. Zigzag of continuous line (Fig.14); also probably produced with the Aspatharia shell. Rim top often decorated – 42 %, especially on specimens where the zigzag is more curved (Chłodnicki 1982:Pl. 13).

Type I.E. Parallel lines of impressed dots (Fig. 15); produced with alternately pivoting stamp as in subtype I.B1, but also possibly with serrated ring (Jórdeczka et alii: in press: figs 6-10).

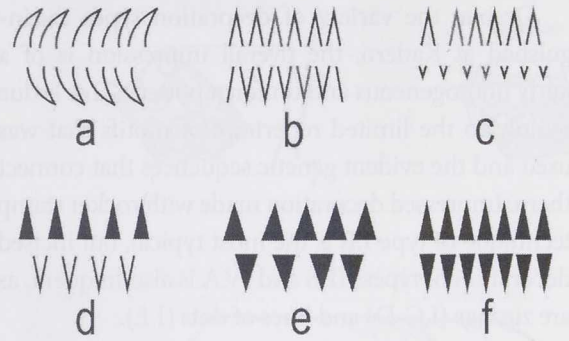

Fig. 9. Variants of the triangles or vees impressions decoration.

Dots in each line are the same or different, but repeated in the same sequence; distances between lines from 5 to 10 mm. More than 80% of pottery with this decoration also has a decorated rim top. Two subtypes distinguished:

Subtype I.E1. Dots big and well spaced (Fig. 15.6); rim top decoration less abundant;

Subtype I.E2. Small dots very close together, forming a line (Fig. 15.7).

Type I.F. Decorations made with fingernail imprints (Fig. 17.9,11); is not used frequently but occurs in many Neolithic sites, sometimes combined on the same pot with the dotted zigzag (Fig. 13.8-9).

Type I.G. Imprints of different simple stamps, covering the entire surface (Fig. 17. 7-8, 10, 12); known from a few small pottery fragments.

Type I.H. Bands of oblique comb impressions, sometimes divided by horizontal dotted or incised lines (Fig.17.3-4); only a few fragments found.

Type I.I. Herring-bone impressed pattern (Fig. 17.5).

Group II. Impressed decoration of multilateral structure produced with the rocker-stamp technique, applying the same motifs as in types I.B-E, but arranged in a different way. The decoration is mostly quadrilateral in structure and is arranged in semicircular panels (Fig. 16.9-12). Trilateral as well as multilateral structure also observed.

Type II.A. Semicircular panels covering the entire external surface of the vessel; same motifs as in types I.B-D. One horizontal line of decoration forms a rim band.

Subtype II.A1. Different combinations of triangles and dots and zigzags (Fig. 16. 9-10, 12); seldom encountered at Kadero.

Subtype II.A2. Dotted lines. Frequent subtype, consisting of semicircular lines of small dots (as in subtype I.E2), spaced 2-4 mm (Fig. 16.11; 26.1-5). Rim top occasionally decorated.

Group III. Incised decoration with concentric or asymmetric structure, produced with a comb or single point (stylus).

Type III.A. Wavy line.

Subtype III.A1. Multiple wavy-line decoration produced probably with a Synodonthis shell spine (Arkell 1949: 81, pl. 59). Typical of the Early Khartoum. Only a few potsherds with this decoration found (Fig. 8. 1-5).

Subtype III.A2. Double incised wavy-line, produced with a double-pronged implement; very similar to I.A2 (Fig. 10.1).

Type III.B. Parallel, horizontal incised lines, spaced 2 to 5 mm (mostly about 3 mm), spiraling from the base to the rim; incisions about 0.5 – 1 mm deep, sometimes 2 mm (Fig. 16. 2, 4; 27.3-10).

Type III.C. Vessel surface covered with groups of incised lines arranged in different directions.

Subtype III.C1. Bigger groups of parallel oblique lines extending from the rim to the base; bordered by a group of horizontal lines near the rim (Fig. 28.1-5). Rim top always decorated.

Subtype III.C2. Lines arranged in much smaller groups, often changing direction. No rim top decoration and rim bands connected with this decoration (Fig. 16.1). Rare.

Type III.D. Different compositions of short incised lines.

Subtype III.D1. Horizontal bands of short incised, vertical lines (Fig. 17.14). Very rare.

Subtype III.D2. Horizontal lines of oblique incised lines (Fig. 17.13). Very rare.

Subtype III.D3. Radiate incised lines (Fig. 16.14). Very rare.

Group IV. Incised decoration of multilateral structure produced with a single point.

Type IV.A. Semicircular decorated panels of quadrilateral structure; trilateral structure also occurs (IV.A1); bordered at the top with horizontal lines below the rim (Fig. 16. 6-8, 26.6-17). Rim top decorated sporadically.

Type IV.B. Vessel surface covered with multiple small semicircular panels (Fig. 28.7).

Group V. Complex geometric decoration produced with single point and simple impressions.

Type V.A. Irregular checker decoration composed of groups of four short incised lines (Fig. 18. 7). Only one fragment with this kind of decoration found.

Type V.B. Vessel surface divided into bands by horizontal incised lines, the bands filled with groups of incised oblique lines or left plain. Triangular or trapezoidal undecorated spaces between incised lines (Fig. 16.13).

Type V.C. Triangles filled with incised or impressed lines.

Subtype V.C1. Vessel surface divided into bands by horizontal incised lines; area between lines divided into triangles alternately filled and plain (Fig. 18.9), the filled ones with an apex pointing either up or down.

Subtype V.C2. Triangles filled with dots and placed between groups of incised horizontal lines (Fig. 18.10).

Type V.D. Geometric decoration composed of bands filled with comb impressions or incisions.

Subtype V.D1. Alternately hatched and plain chevrons (Fig. 18. 1-2).

Subtype V.D2. Complex decoration, different in different vessel zones; identified on caliciform beakers (Fig. 29.6-8).

Subtype V.D3. Other fragmentarily preserved types of decoration composed of filled bands (Fig. 18.3-6,8,11,12,14).

Despite the variety of decoration types distinguished at Kadero, the overall impression is of a fairly homogeneous and uniform pottery. This is due mainly to the limited repertoire of motifs that was used and the evident genetic sequences that connect them. Impressed decoration made with rocker stamp technique of type I.B is the most typical, but incised decoration of types III.B and IV.A is also frequent, as are zigzags (I.C-D) and lines of dots (I.E).

Base decoration

The bases of the Kadero vessels, both the rounded and the flat ones, were also decorated. On simple pots the body and base decoration is the same. When the structure of the decoration is concentric it starts on the bottom and spirals to the top (Fig. 20.1-2); when it is quadrilateral, the bottom has squares of decoration on it (Fig. 20.3-5). Sometimes, as on caliciform beakers, the bases have a separate decoration (Fig. 20.6). On pots with flat bases, the body decoration spreads from the body onto the bottom, even a double row of arches sometimes were added (Fig. 20.7), thus bearing out the strength of tradition: potters were so used to decorating rounded bases that they did so even in cases when the base could not be seen.

Holes below the rim and rivet holes

Holes in the vessel walls are known from all the Neolithic sites of Central Sudan, although on the whole pottery with holes generally it is not frequent. Most of the holes were bored and only a few were punctured. They occur mostly near the rim on vessels of different size and with different decorations. They appear to be more frequent on the bigger pots, but they are not limited to any specific type.

The Kadero assemblage includes 180 fragments of pottery with bored holes and only eight with punctured ones. Of the pottery with bored holes, 87% has one hole, 11% two holes and only 2% 3-5 holes. Punctured holes are always single.

Rows of holes along a break could bear out the hypothesis that these holes were rivet holes for repairing a vessel (fig. 19.4). Some of the holes, especially the punctured ones near the rim, could have been used to attach a loop handle for suspended adornments or to mount a rope handle for hanging the vessels itself (Fig. 21.6, 22.1).

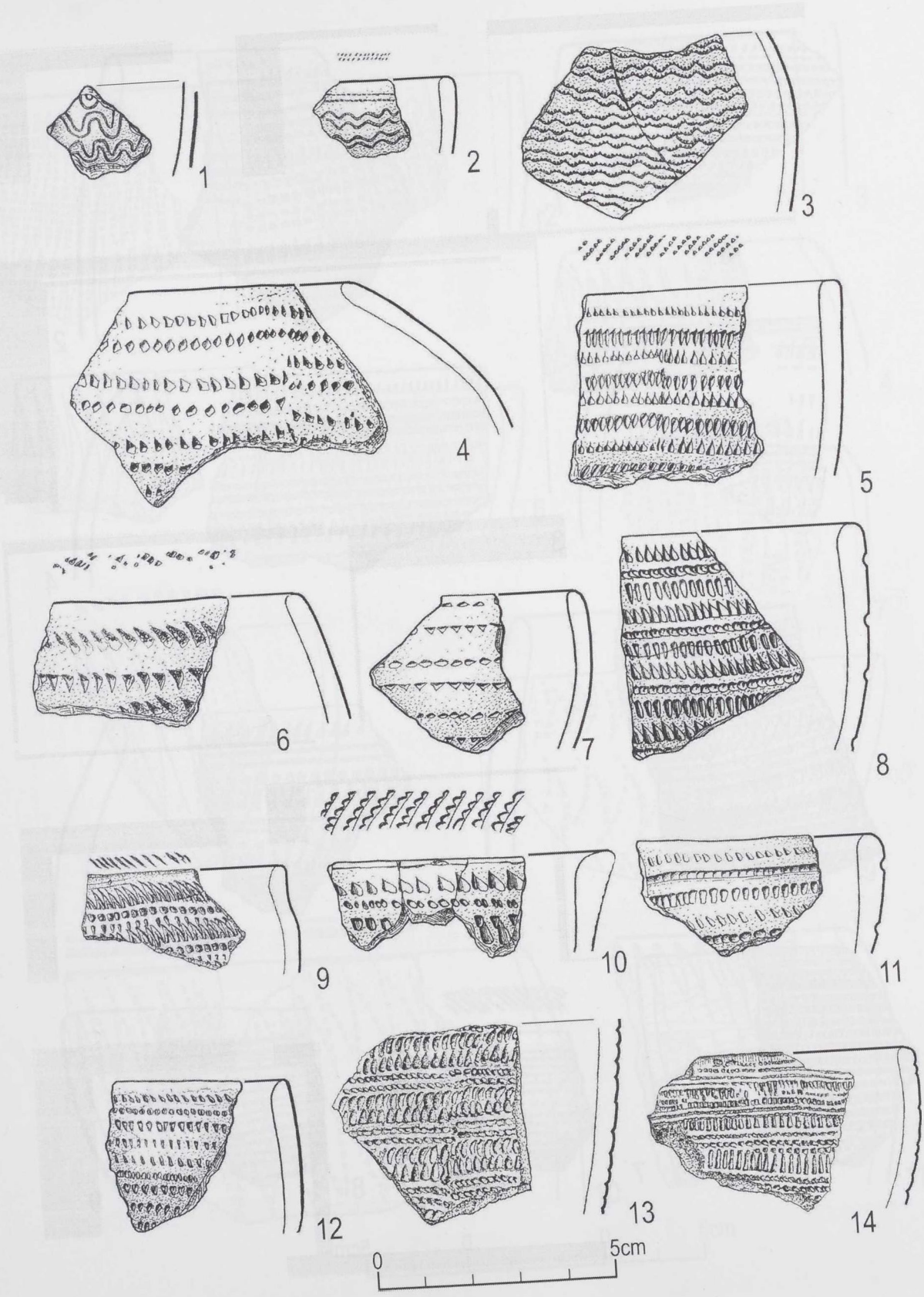

Fig. 10. Impressed ware. Type MB 6A (1), MB 6B (2-3), MB 7 (4-14).

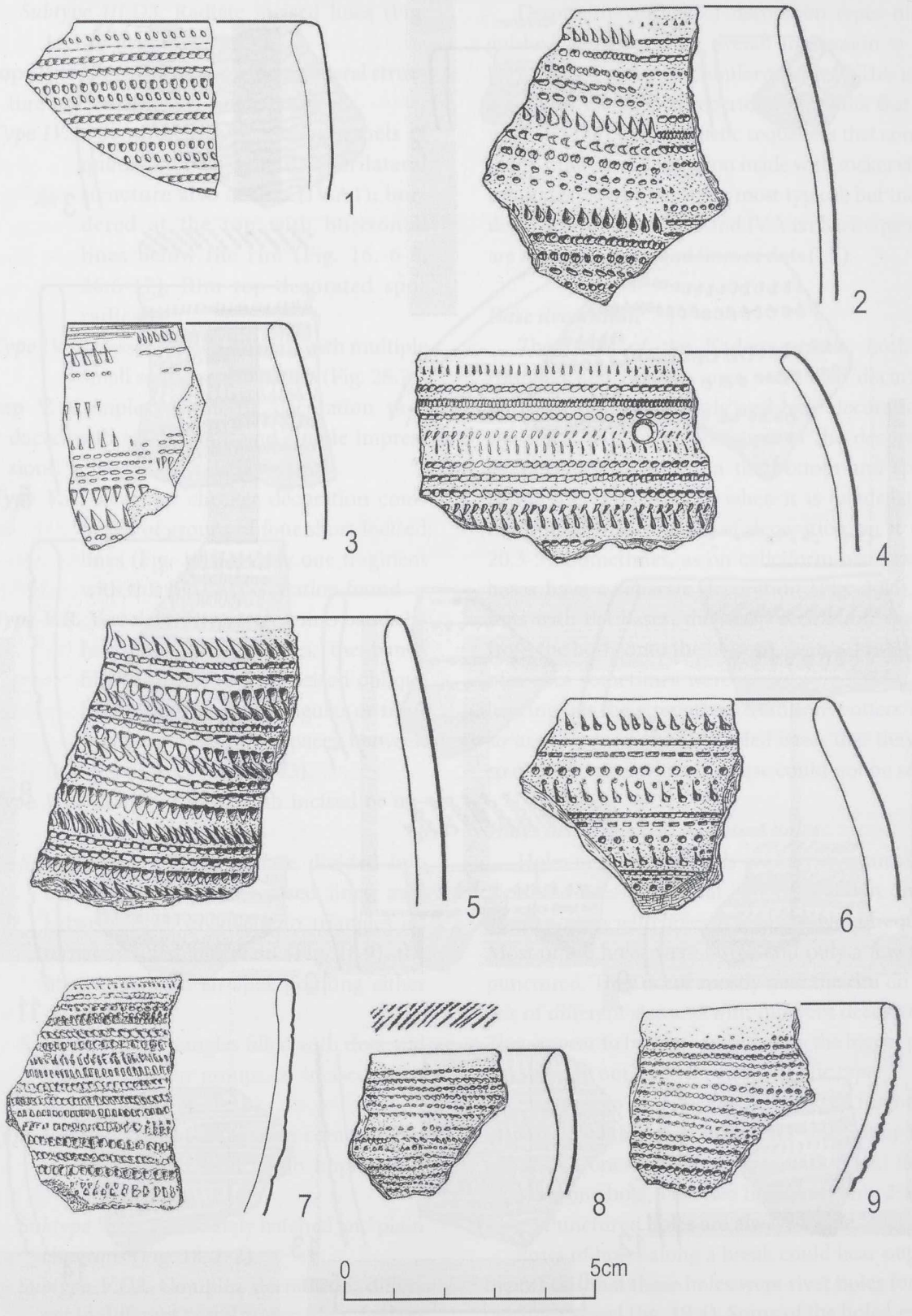

Fig. 11. Impressed ware. Type MB 7.

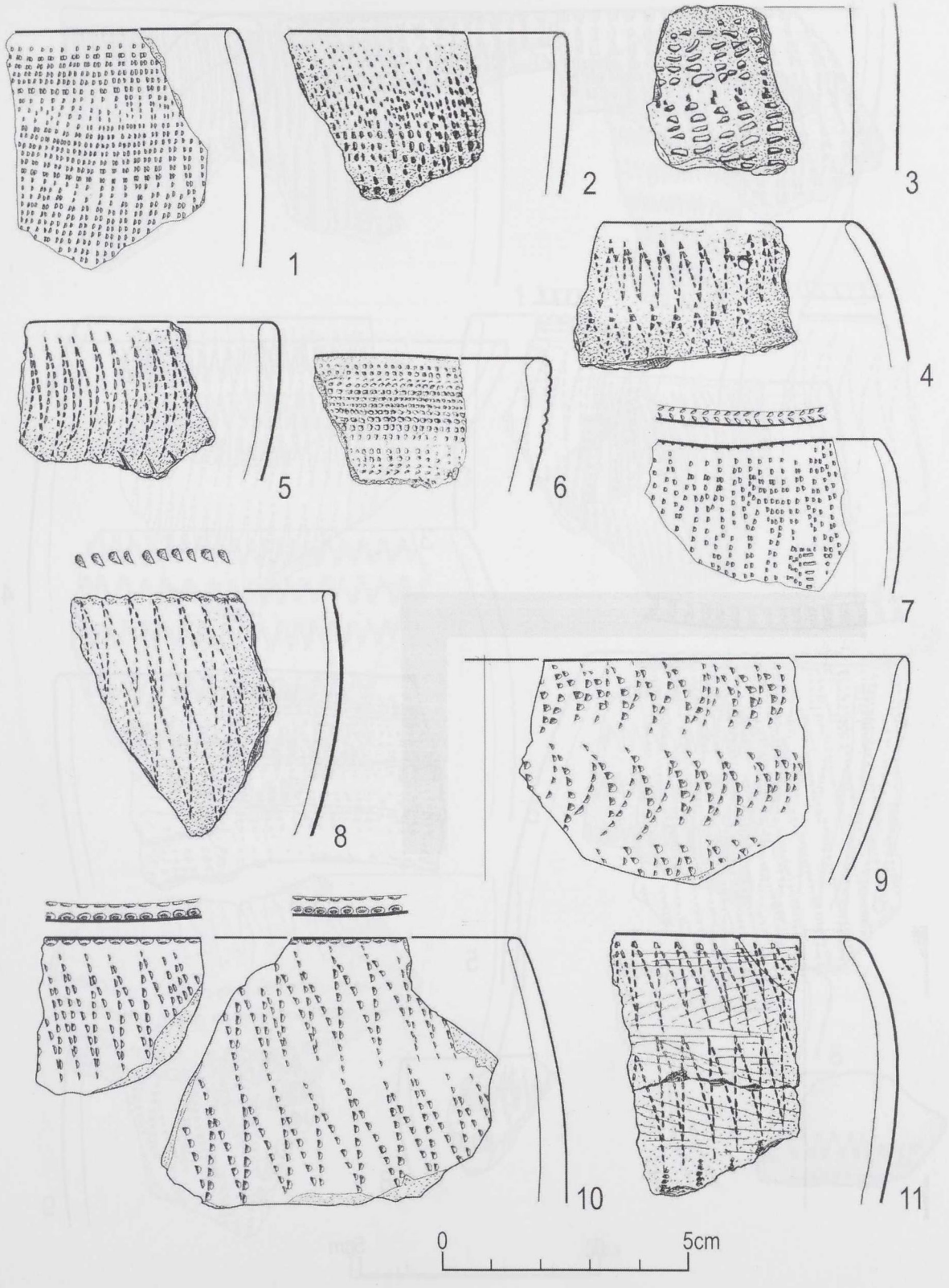

Fig. 12. Pottery decorated with dotted zigzag. Type MB 8.

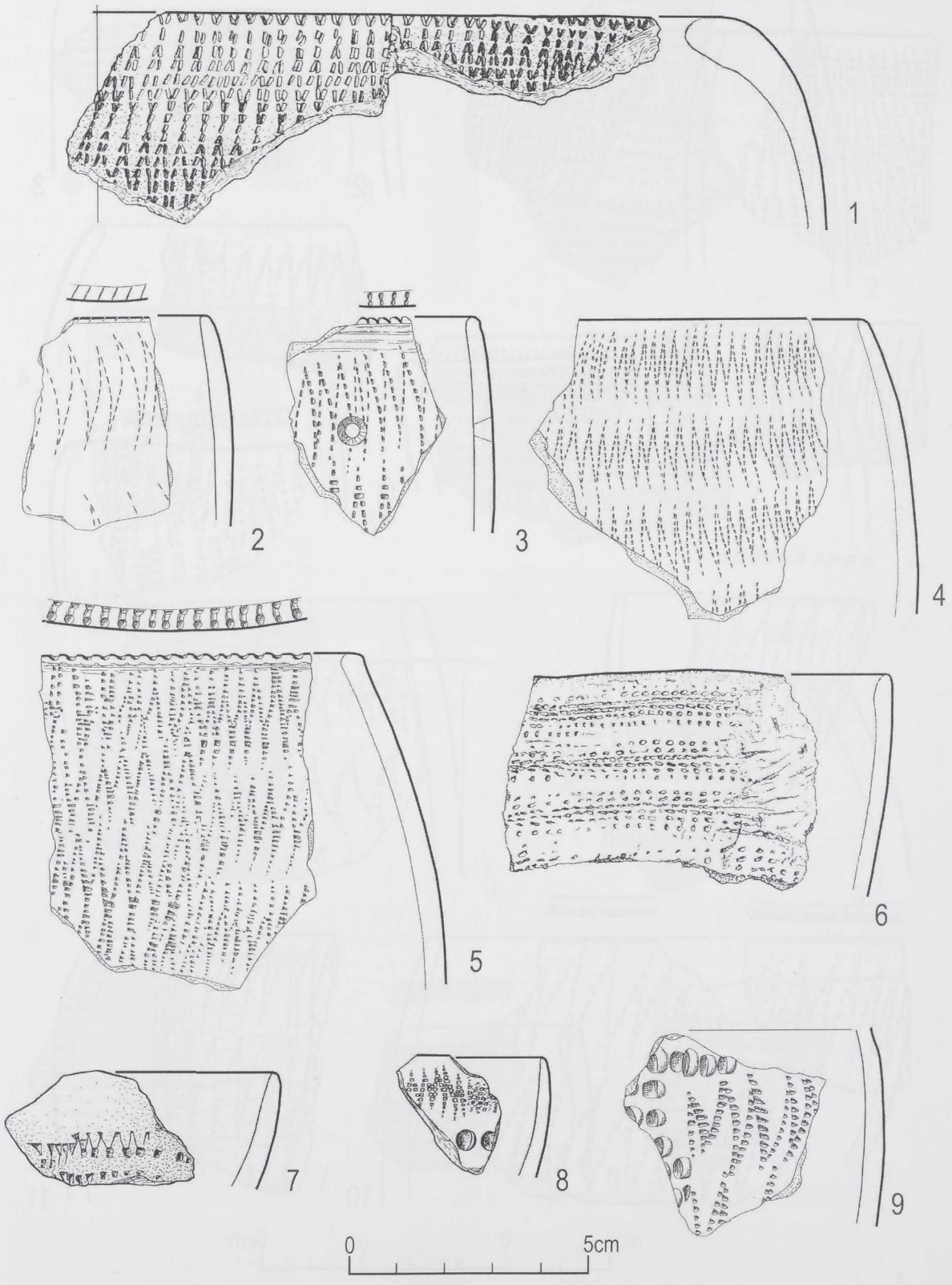

Fig. 13. Pottery decorated with dotted zigzag. Type MB 8.

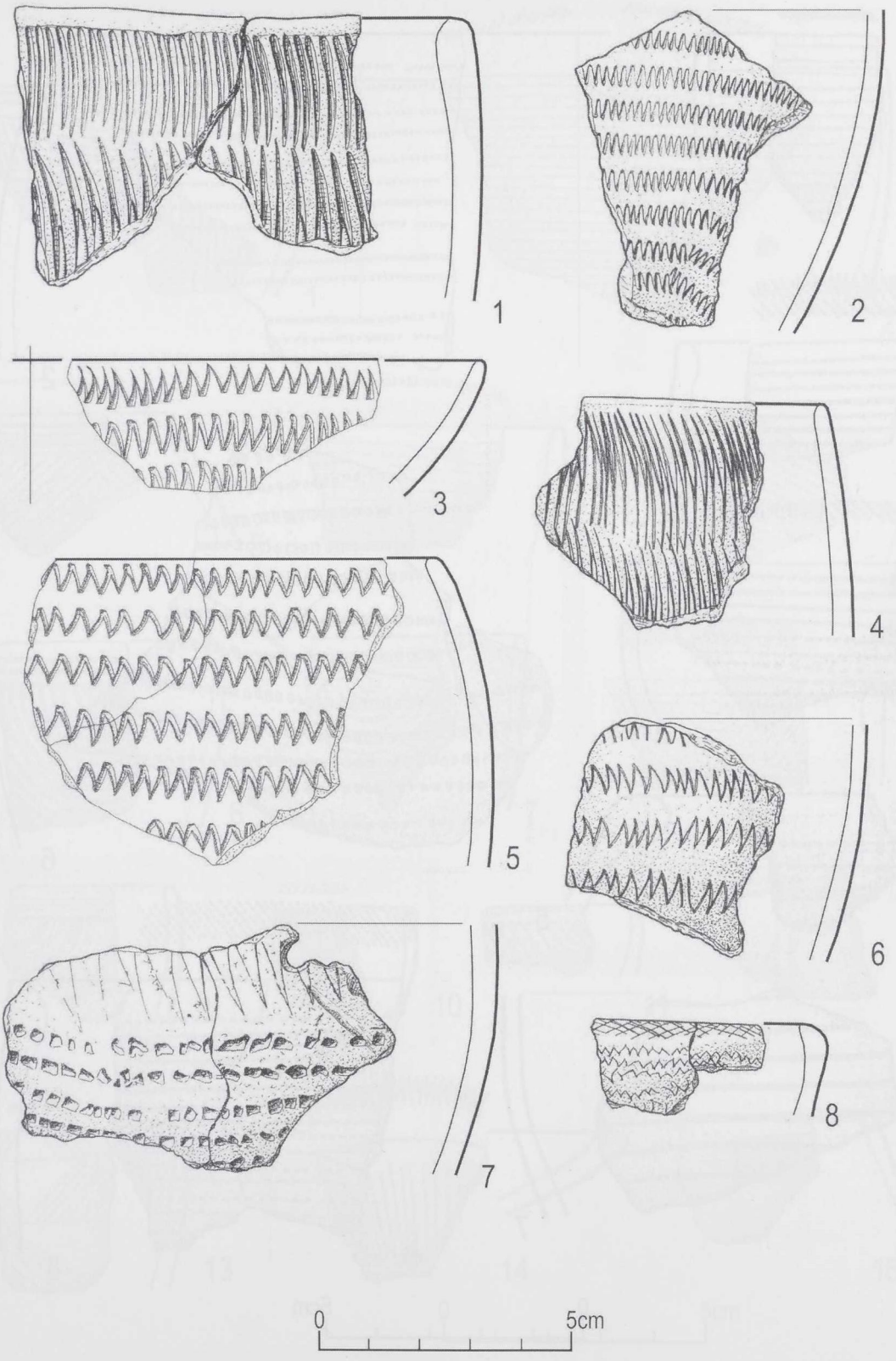

Fig. 14. Pottery decorated with continuous zigzag. Type MB 9.

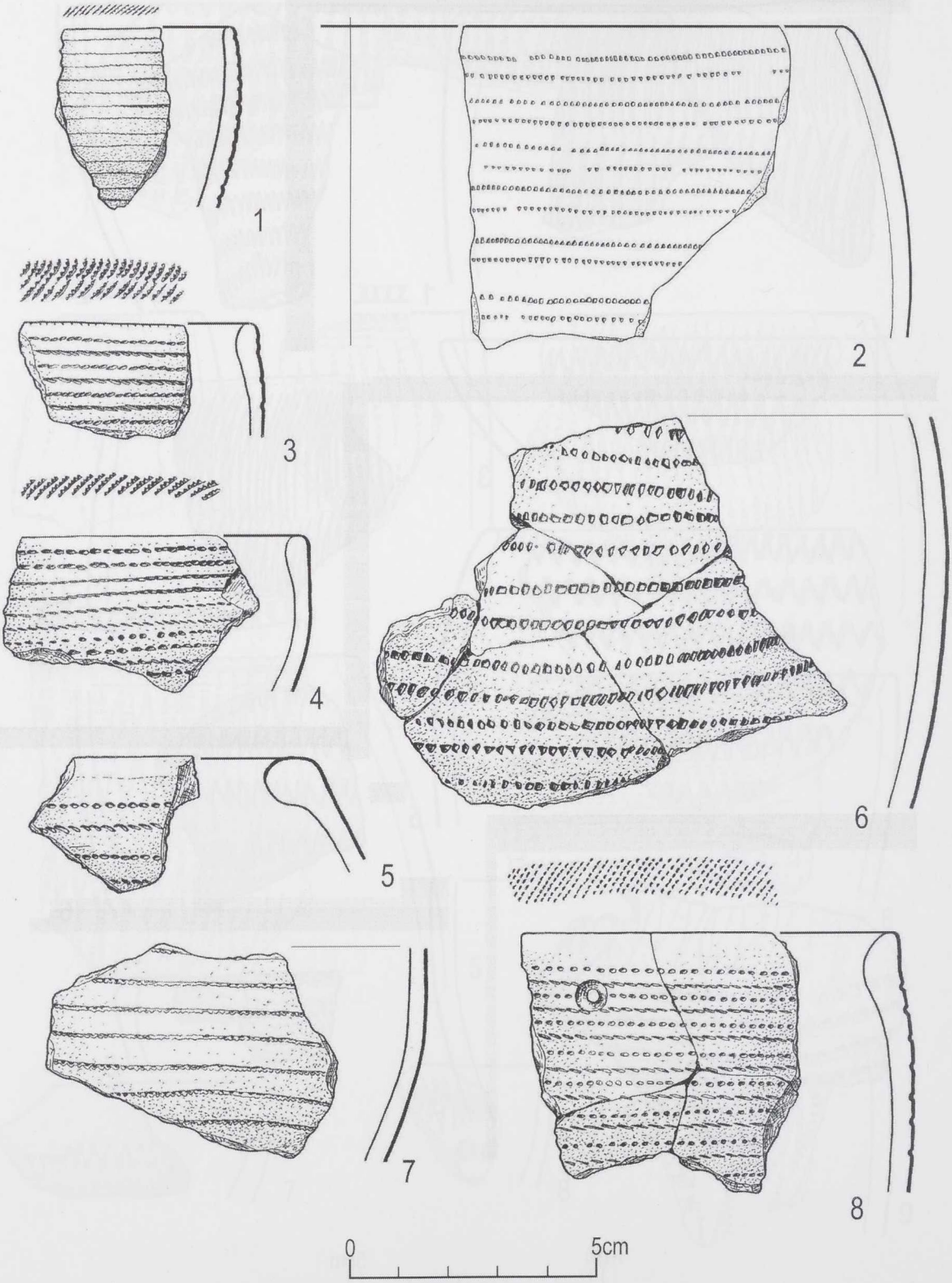

Fig. 15. Pottery decorated with the lines of impressed dots. Type MB 10 (2-8), MB 14 (1)

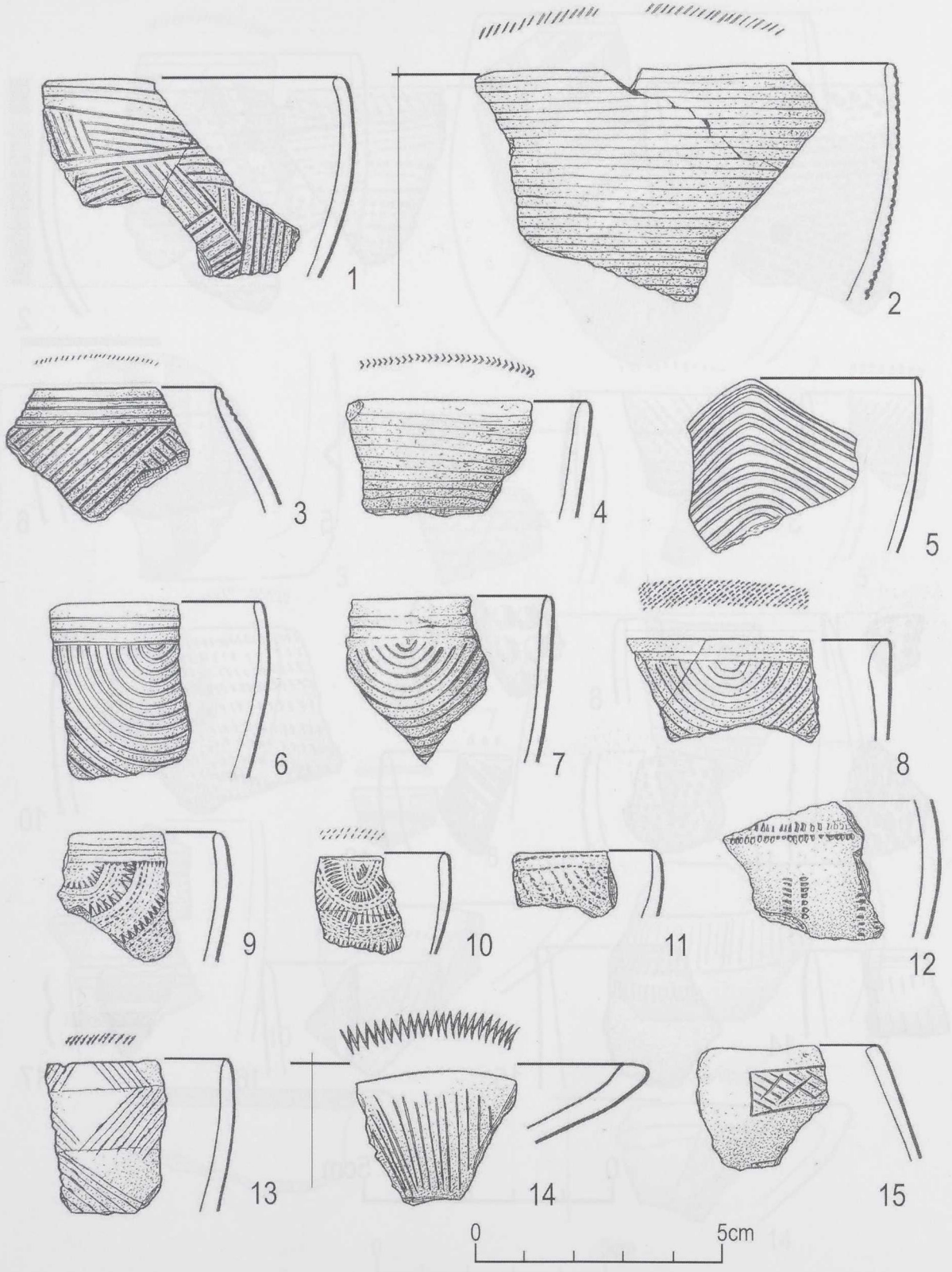

Fig. 16. Incised ware and atypical decoration. Type MB 11 (9, 10, 12), MB 12 (11), MB 13 (6-8), MB 15 (2, 4), MB 17A (1), MB 17D (13), MB 21 (5), MB 28D (15).

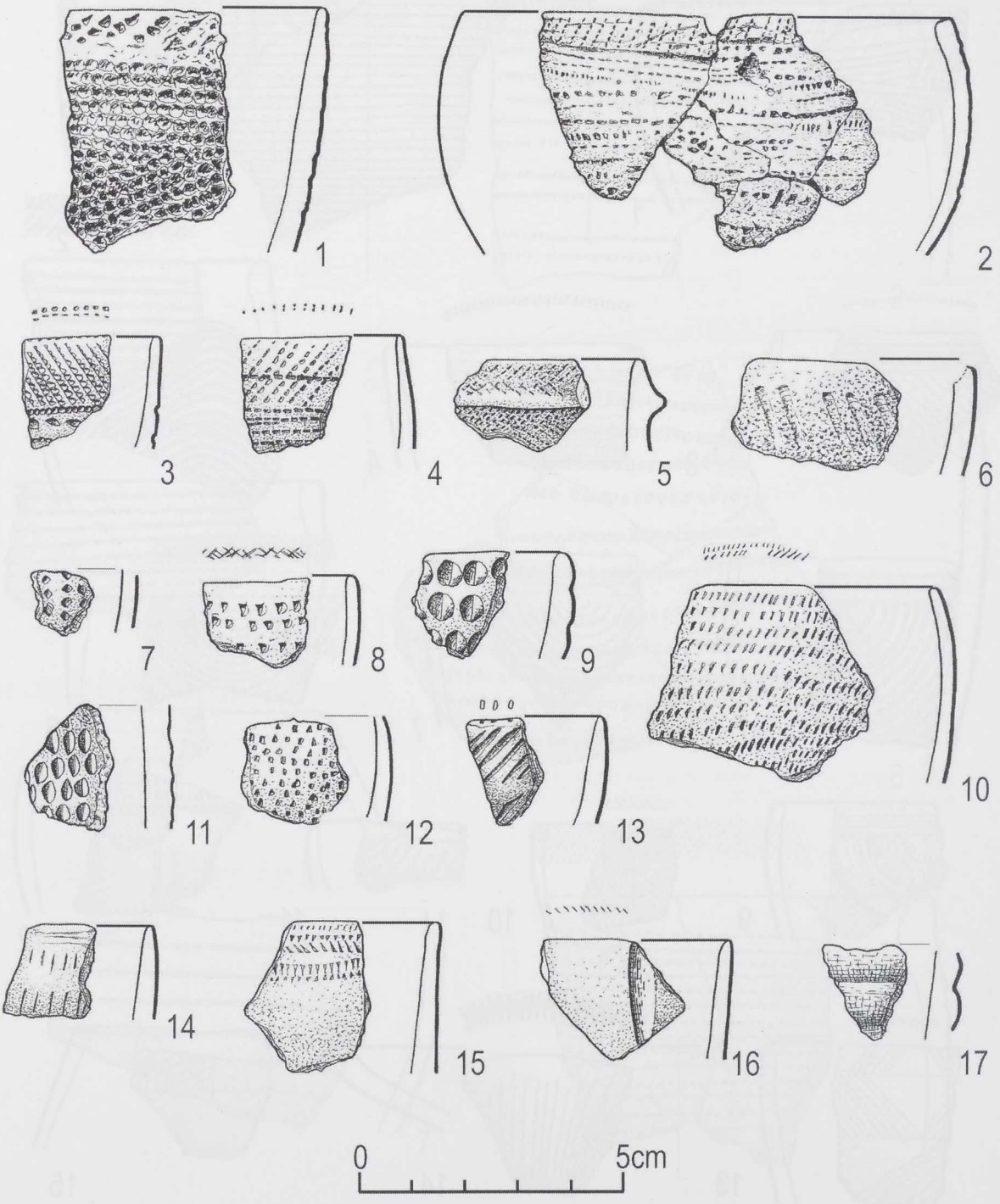

Fig. 17. Pottery with atypical decoration. Type MR 3 (1-2, 6), MB 3 (15, 16), MB 17B (14), MB 17C (13), MB 18A (9), MB 18B (7, 8, 10-12), MB 18C (5, 17), MB 28E (3, 4).

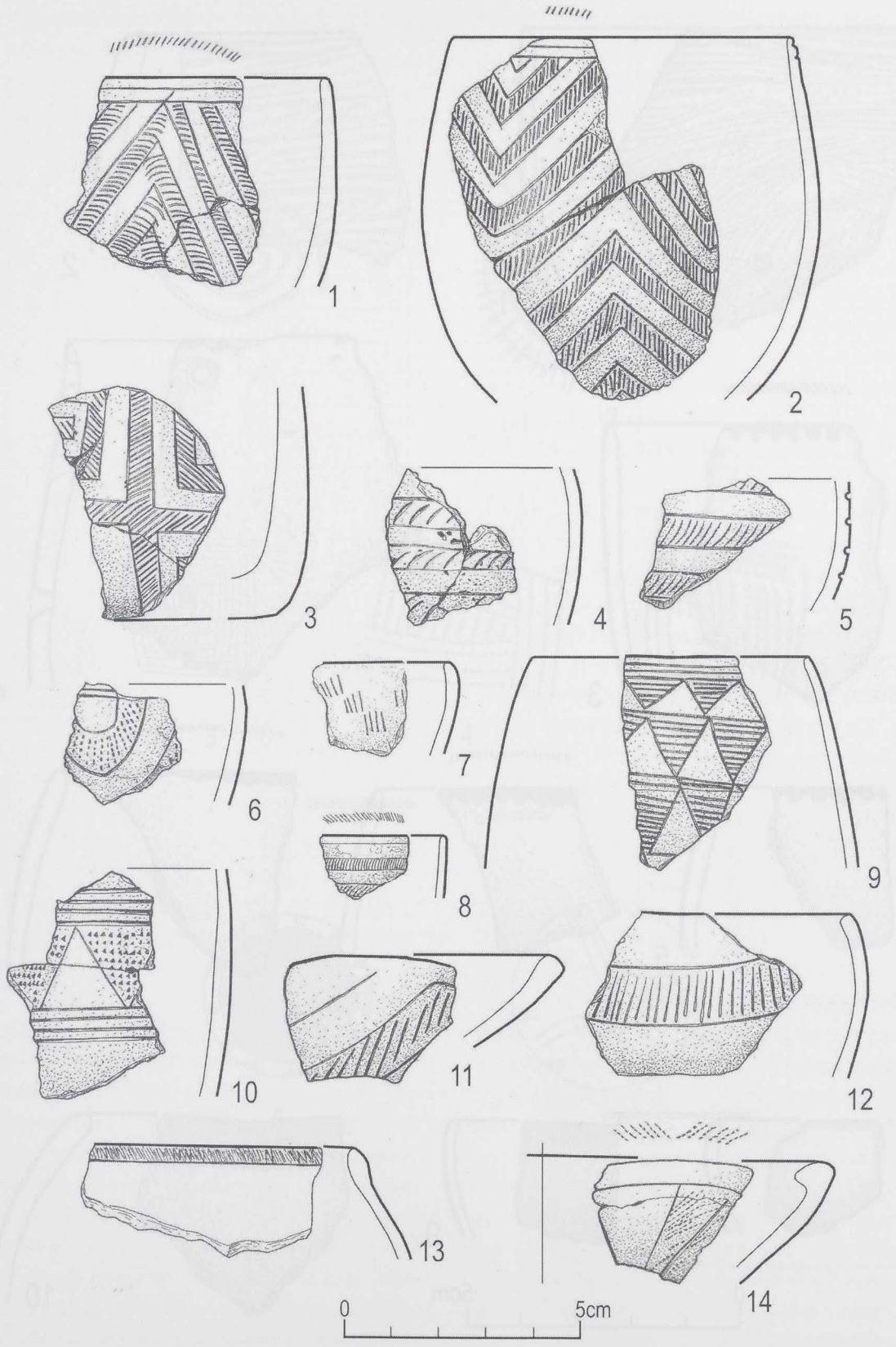

Fig. 18. Pottery with geometric decoration. Type MB 27B (3), MB 28A (9), MB 28B (10), MB 28C (1-2), MB 28D (4-6, 8, 11, 12, 14), MB 29 (13), MB 17B (7).

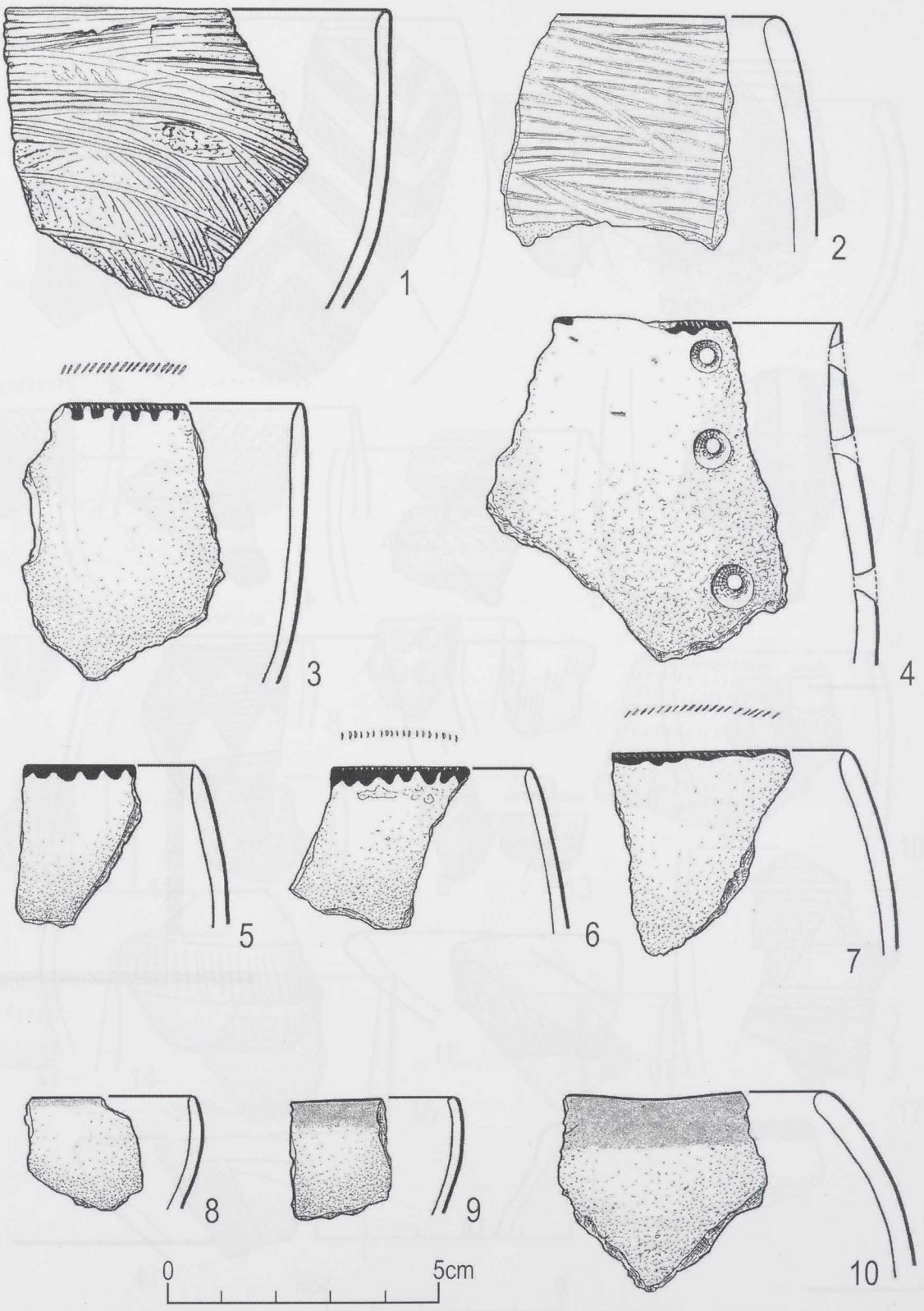

Fig. 19. Combed (1, 2) and black topped ware. Type MB 4 (8-10), MB 5A (7), MB 5B (3-6).

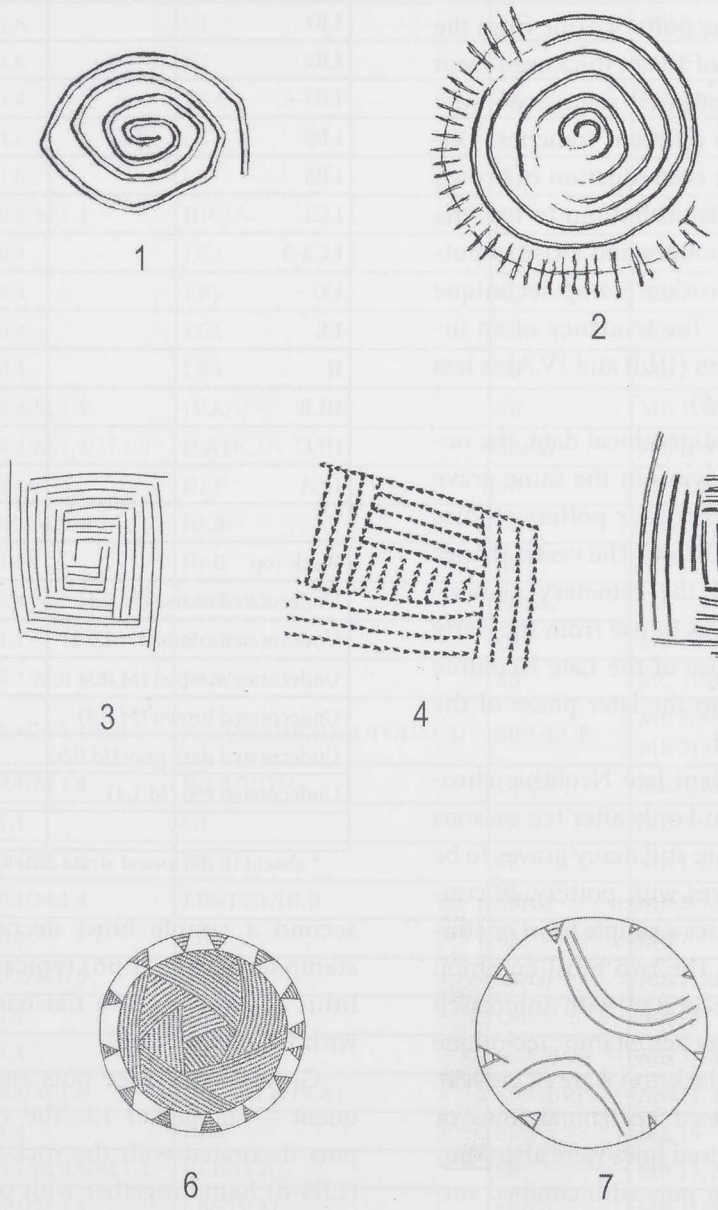

Fig. 20. Base decoration

Chronological analysis of the pottery

Stratigraphic data

Little stratigraphic data is available from the Kadero settlement because the site having been heavily eroded. Most of the pottery came from the much disturbed top layer of 10 cm thickness. Even in the lower layers undisturbed sequences were rare and different for the different trenches. Observed tendencies include the reduction of brown undecorated ware (I.0.4) from bottom to top, the absence of black-topped pottery and a rise in pottery decorated with the rocker stamp technique (I.B) in the lowest layers. The tendency of an increase of incised decoration (III.B and IV.A) is less clearly recognizable (Tab. 6).

Due to the limited stratigraphical data, the occurrence of different pot types in the same grave takes on a special significance for pottery studies and dating the graves in Kadero. The vessel shapes and decoration found in the cemetery demonstrate that the cemetery was in use from the Early Neolithic to the early phase of the Late Neolithic Period. No graves dated to the later phase of the Late Neolithic were found.

The first grave of evident late Neolithic chronology (No. 113) was found only after ten seasons of excavations, but there are still many graves to be excavated. Of the 55 graves with pottery 29 contained only one pot — either a simple bowl or simple globular jar (Tab. 7). The two most common types of pottery were decorated with impressed patterns made in the rocker stamp technique (I.B4-6; I.C1) and of the black-top ware (7 graves). Pots decorated with incised horizontal lines or semicircular panels of incised lines were also common. Undecorated pots or pots with combed surfaces were extremely rare.

Six graves contained two pots each. Undecorated pots were found in one grave and black-top ware only in another. In two graves, an undecorated pot was found together with a decorated one bearing semicircular panels and in the last grave with a pot decorated with incised horizontal lines. Of greatest importance, however, are two other graves. The first contained a simple bowl of combed ware (I.02) associated with a simple jar of black ware (I.05) and the second a simple bowl decorated with rocker stamp technique (I.B6) typical of the Early Neolithic together with a flat-based cup decorated with triangles (V.C1).

Graves with three pots each were more frequent — altogether 13. The vessels were simple pots decorated with the rocker stamp technique (I.B5-6) found together with pots decorated with semicircular panels of incised lines (IV.A) and with, in one case, with a pot with incised horizontal lines (III.B) and a wavy bowl with small semicircular incised panels (IV.B). Simple pots with incised lines also occurred together with pots decorated with semicircular panels. One of the graves contained a combination of undecorated pot, decorated with incised horizontal lines (III.B) and flat base cup with triangles on the body (V.C1). In another grave there was a pot decorated with incised horizontal lines (III.B) together with

Tab. 6. Frequence of different decoration in upper and lower strata of the Northern midden (in %)

Decoration	Upper strata (0-20 cm)	Lower strata (20-40 cm
I.B1	2.0	2.0
I.B2	7.3	2.4
I.B3-4	9.3	8.9
I.B5	8.3	9.9
I.B6	20.4	17.8
I.C1	12.5	12.0
I.C2-3	1.8	4.8
I.D	1.2	1.0
I.E	3.5	3.4
II	0.7	1.0
III.B	11.1	10.9
III.C	0.2	-
IV.A	5.7	5.1
V	0.5	-
Black-top	1.1	1.0*
Undecorated coarse (M.0.1)	0.5	1.0
Undecorated combed (M.0.2)	1.5	2.4
Undecorate scraped (M.0.3)	0.1	-
Undecorated brown (M.0.4)	4.9	9.6
Undecorated dark gray (M.0.5)	0.3	0.3
Undecorated red (M.1.4)	6.9	5.8
	100	100

* absent in the lowest strata (30-40)

Tab. 7. Coexistence of pottery with different fabrics, decoration, vessel form in the graves

Grave	No of vessels	Fabric	Decoration	Form	Type
1	1	M.0.4	III.B	SB	MB 15
2	3	M.0.4/M.1.4	I.B5/IV.A	SB	MB 7, MB 13
3	2	M.1.6	C1	GJ	MB 5
5	1	M.1.6	C1	GJ	MB 5
7	1	M.1.4	IV.A	SB	MB 13
8	1	M.1.6	C1	GJ	MB 5
9	1	M.1.6	C1	GJ	MB 5
12	3	M.0.4/M.1.4	IIIC1/-	GJ	MB 3, MB 16
14	1	M.0.4	I.C1	SB	MB 8
40	1	M.0.4	I.B5	GJ	MB 7
50	1	M.0.4	I.C1	GJ	MB 8
54	1	M.0.4	I.B5	SB	MB 7
55	2	M.0.4/M.1.4	IV.A/-	SB	MB 1, MB 13
60	7	M.0.4/M.1.4/M.1.6	II.A2/C1/-	SB/GJ	MB 3, MB 5, MB 12
61	1	M.1.4	III.B	SB	MB 15
63	2	M.0.2/M.0.4	III.B/-	SB	MC 1, MB 15
95	1	M.1.4	III.B	SB	MB 15
96	2	M.0.4/M.1.4	I.B6/V.C1	SB/SC	MB 7, MB 27
100	1	M.1.4	II.A2	GJ	MB 12
101	3	M.0.2/M.0.4/M.1.4	IV.A/-	SB	MC 1/MB 13
113	11	M.0.4/M.1.4/R.0.1	IC1/IB6/IIIB/IIIC1/IVA/VC1/-	SB/GJ/CB	MB 3, MB 7/8, MB 13, MB 15, MB 16, MB 21, MB 23, MB 26, RB 1
114	6	M.0.4/M.1.4	IIIC1/VD2/-	GJ/CB	MB 5, MB 16, MB 26
130	1	M.1.4	C1	GJ	MB 5
140	3	M.0.4/M.1.4	IIIC1/-	SB	MB 1, MB 5, MB 16
143	4	M.0.4/M.1.4	I.B6/I.C1/III.B	SB/GJ	MB 3, MB 5, MB 7, MB 15
146	1	M.0.4	I.B4	SB	MB 7
150	2	M.0.2/M.0.5	-	SB/GJ	MB 2, MC 1
153	1	M.1.4	IV.A	OB	MB 19
156	6	M.1.4	I.E2/IVA/-	SB/OB/GJ	MB 3, MB13, MB 14, MB 19
157	3	M.0.4/M.1.4	II.A1/III.B/IV.A1	SB/GJ/RJ	MB 11, MB 13, MB 24
160	1	M.1.4	III.B	SB	MB 15
166	3	M.0.2/M.0.4/M.1.4	III.B/IV.A/-	SB	MB 13, MB 15, MC 1
168	3	M.0.4/M.1.4	I.B6/IV.A/-	SB/GJ	MB 3, MB 7, MB 13
170	5	M.0.4/M.1.4	I.C/IV.A/-	GJ/LP	MB 3, MB 8, MB 13, MB 21
182	3	M.1.4	III.C1/-	LP	MB 21, MB 22
186	1	M.0.2	-	SB	MC 1
188	3	M.0.4/M.1.4	I.B6/IIIB/IV.B	SB/WB	MB 7, MB 15, MB 20
189	3	M.0.2/M.0.4	IV.A/-	SB	MB 1, MB 13, MC 1
195	1	M.0.4	III.B	GJ	MB 15
196	1	M.0.4	I.B5	SB	MB 7
202	2	M.0.2	-	SB	MC 1
203	3	M.0.2/M.0.4	III.B/V.C1/-	SB/SC/GJ	MB 15, MB 27, MC 1
208	1	M.0.4	I.B6	SB	MB 7

Grave	No of vessels	Fabric	Decoration	Form	Type
215	2	M.0.2/M.1.4	IV.A/-	SB/GJ	MB 13, MC 1
217	1	M.0.2	I.B6	GJ	MB 7
220	1	M.0.4	I.B5	GJ	MB 7
222	1	M.0.4	III.B	GJ	MB 15
224	1	M.1.4	IV.A	SB	MB 13
225	1	M.0.2	I.B6	SB	MC 2
227	4	M.0.2/M.0.4/M.1.4	IIIC/IV.A2/-	SB	MB 3, MB 13, MB 15, MC 1
228	3	M.0.4/M.1.4	III.B/-	SB	MB 3, MB 15
229	1	M.1.4	IV.A	GJ	MB 13
232	1	M.0.4	C1	SB	MB 1
239	1	M.1.6	I.B5/-	GJ	MB 5
244	1	M.0.4/M.1.4	-	GJ/RJ	MB 1, MB 7, MB 25

pots decorated with semicircular panels – incised (IV.A1) and impressed (II.A1). One of the graves contained only ladle pots.

Graves with four and more pots were rare. Two graves had four pots (Grave 227). In one of them only simple bowls with incised decoration (III.C and IV.A2) were found. In the other (Grave 143) one there was a pot with incised decoration (III.B) together with one decorated with the rocker stamp technique (I.B and I.C1) and a red slip bowl.

In a grave with five pots (Grave 170) there was a combination of globular jars decorated with dotted zigzag (I.C1/3) and ladle pots decorated with semicircular incised panels (IV.A). Two caliciform beakers were found in a rich grave with four other pots (Grave 114): two black-topped jars and two jars decorated with oblique incised lines (III.C1). In another grave (Grave 156), the six vessels found there included an oval bowl decorated with semicircular incised panels (IV.A), two other pots with the same decoration, two pots decorated with horizontal lines of impressed dots (I.E2) and one undecorated vessel. All the pots were red slipped on the surface. A grave with seven pots had all the pots red-coated, three with black tops and three others decorated with semicircular panels of impressed dots (II.A2). Grave 113 is exceptional with its eleven pots, including a caliciform beaker. Three pots were decorated with oblique incised lines (III. C1). One is very deep (GJ.4). Pots with incised semicircular panels (IV.A) and incised horizontal lines (III.B) also occur, as well as a pot decorated in the rocker stamp technique (I.B6/I.C1) — two kinds of decoration on the same pot.

Generally, the pottery tradition seems to have continued unbroken from the Early to the beginning of the Late Neolithic. New vessel forms and types of decoration occur in the second phase, but there are no evident differences in the technology, even if combed ware becomes more frequent in the latter period. Pots are generally more abundant in graves from the early Late Neolithic, although there are exceptions in the earlier, Early Neolithic phase (grave 60).

Radiocarbon data

Radiocarbon dates obtained for the Kadero suggested a dating of the site between 4560 cal. BC and 3830 cal. BC (the one exceptional date 2250 cal. BC of grave 243; see Kabaciński this volume). Changes in the pottery could have taken place over time. Differences in dates between the southern and northern parts of the site indicated that the former could be older, even by a few hundreds of years. Yet despite the differences the pottery from the two parts of the site is very similar (Tab. 8).

A small increase in the frequency of pottery with gray or black surfaces can be observed in the younger part of the site. Pottery with red wash on the external surface only rather than inside and outside is also more frequent and also black top pottery is a little more frequent. A growing tendency in the younger part of the site is also pottery decorated with impressed dots arranged in hori-

Tab. 8. Ocurrence of different types of pottery body decoration in different parts of the site (in %)

Decoration	Settlement		Cemetery
	S midden	N midden	
I.A	0.0	0.0	-
I.B1-2	7.7	10.0	-
I.B3-6, I C1	57.3	59.1	22.1
I.C2-3	3.1	2.9	-
I.D	2.8	1.7	-
I.E	6.3	4.6	2.6
II.	1.6	1.0	6.5
III.A	0.0	-	-
III.B	10.4	13.3	18.2
III.C	0.2	0.1	13.0
IV.	10.0	6.7	31.1
V	0.5	0.6	6.5
other	0.1	0.0	-

zontal lines as well as semicircular panels (I.E2, II.A2) and pottery decorated with a continuous zigzag (I.D). The frequency of pottery decorated with incised lines is constant, but pottery decorated with semicircular panels (IV.A) increased whereas pottery with horizontal lines (III.B) decreased.

Typological classification of wares

The present typology is a summary of the previous classifications with particular pottery types combining technological and morphological traits, as well as decoration styles. Particular vessel traits are of unequal value for the classification, hence non-uniform principles of the typology. The one element rendering most clearly the individuality of a group of pots was used as type identifying factor, regardless of whether it was surface treatment, vessel form or specific decoration. This element should be characteristic of a specific phase of pottery development. Traits, whether technological, morphological or stylistic, develop independently and the groundbreaking date of each could be different. The order of taxonomic levels: group, type, subtype, is determined by the degree of similarity. The division of the material fell into two family groups: pottery with mineral temper and pottery with organic temper.

Tab. 9. Frequency of pottery types found in the Kadero.

Type	Settlement		Cemetery[1]
	Southern part[2]	Northern part[3]	
MR 1-3	0.0[4]	-	-
MR 4	0.7	0.3	-
MC	1.5	1.5	9.7
MS	0.1	0.1	-
MB 1	7.2	10.5	4.0
MB 2	1.4	0.2	0.8
MB 3	6.4	8.9	8.9
MB 4	0.5	0.3	-
MB 5	1.4	0.5	11.3
MB 6	0.0	0.0	-
MB 7	23.9	21.5	10.9
MB 8	13.0	21.8	2.8
MB 9	2.3	3.2	-
MB 10	18.0	12.2	-
MB 11	0.2	0.1	0.8
MB 12	1.1	0.7	3.1
MB 13	8.1	4.0	15.3
MB 14	8.4	8.5	1.6
MB 15	5.1	4.7	11.3
MB 16	0.2	0.1	4.8
MB 17	0.0	0.0	-
MB 18	0.1	0.0	-
MB 19	?[5]	?	1.6
MB 20	?[6]	?	0.8
MB 21	+?[7]	+?	2.4
MB 22			1.6
MB 23	?	?	1.6
MB 24	?	?	0.8
MB 25	?	?	0.8
MB 26	-	-	2.4
MB 27	0.0	-	1.6
MB 28	0.0	0.0	-
MB 29	0.0	-	-
RB 1	0.0	0.0	0.8
RB 2	0.0		-
Other	0,4	0,2	-
	100	100	99

1 124 pots analyzed
2 11.557 rim fragments analyzed
3 2.380 rim fragments analyzed
4 0.0 means less than 0.05 %,
5 on fragment not distinguishable from MB 15
6 on small fragments not distinguishable
7 present on the settlement, distinguishable if handle was recognized

Family M: Mineral tempered pottery

Group MR – coarse, brown, unburnished wares (Ware M.0.1); typical of Early Khartoum pottery (especially types MR 1 and MR 2). Not found in the cemetery.

Type MR 1 – decorated with wavy lines . Only a few potsherds found (Fig. 8. 1-5).

Type MR 2 – decorated with dotted wavy lines. Only a few potsherds found (Fig. 8. 6-11).

Type MR 3 – with other impressed patterns .

Subtype MR 3A – simple bowls decorated with rocker stamp technique, similar to types MB 7 and MB 8.

Subtype MR 3B – simple bowl, restricted and unrestricted, with impressed decoration on the body; the separate rim band decoration (Fig. 17. 1-2) is not encountered on Neolithic impressed pottery of this kind. Also the temper was coarser than in other types.

Type MR 4 – undecorated; almost exclusively pots with simple rim (A1, 2, 4), sometimes thickened (B1-2); the rim top is sometimes decorated (A1, 2, 4, B3). Like Type MB 1, but not burnished.

Type MR 5 – a single fragment with a plastic band attached below the rim (Fig. 17.5), the only one of its kind from central Sudan with unknown chronological attribution.

Most of the pottery of this group is quite probably connected with the Early Khartoum phase of occupation at Kadero.

Group MC – combed wares (Ware M.0.2; M.1.2). Combed pottery occurs on all Neolithic sites in Central Sudan, but it is rare (Arkell 1953: 78; Haaland 1981: pls 26-32; Chłodnicki 1982:Pl. 14). It is quite frequent in the graves at Kadero, especially the younger ones. Most of the combed pottery is brown and without decoration. Surfaces can exceptionally be red and covered with rocker-stamp decoration on all or only part of the surface.

Type MC 1 – undecorated simple bowls and jars (Fig. 21.1-4);

Subtype MC 1A – simple medium-deep or deep bowls of medium size and a capacity of up to 2 liters.

Subtype MC 1B – simple jars (GJ) of medium size, sometimes also large or very large with a rim diameter of more than 30 cm, sometimes up to 50 cm.

Type MC 2 – decorated simple bowls and jars (Fig. 21.5);

Subtype MC 2A – simple bowls decorated with rocker stamp technique, mostly dotted zigzags;

Subtype MC 2B – simple jars (GJ) decorated with the rocker stamp technique.

It seems that this group of pottery was more popular in a later rather than earlier phase of the site.

Group MS – scraped ware (Ware M.0.3).

Only a dozen potsherds were found in Kadero, all of them fragments of rather small simple bowls (16–18 cm in diameter) with simple rims (A1, 4), sometimes with rim top decoration (A2). So far, one type has been distinguished:

Type MS 1 – undecorated simple medium-size bowls.

Group MB – burnished wares (Ware M.0.4, M.0.5, M.06, M.14, M.16). This is the biggest group of pottery in the assemblage and some of the types are the most characteristic of the Khartoum Neolithic. The group is the most differentiated with vessels decorated or plain, but in both cases the surfaces were always burnished and smoothed.

Type MB 1 - simple pots, brown, burnished, undecorated (M.0.4; US, RS). Quite popular in Kadero and on other Neolithic sites. The pottery had rather thick walls (6–7 mm) and simple unrestricted (US) and restricted shapes (RS). Simple rims predominate (A1-4, 6), occasionally thickened (B1-3, 7, 10, 11). Rim diameters vary between 9 and 36 cm. The rim top is often decorated (16%), mostly with rim top decoration of type A2b-c. Almost

all the pots of this type found in the graves have a diameter of about 20 cm and a depth of 13 cm (US 3); only one was a globular jar (RS 1). Subtypes were distinguished based on vessel shape and size (Fig. 21.6-9):

Subtype MB 1A – simple deep bowls of medium or large size (SB 3B-C) (Fig. 21.6-8);

Subtype MB 1B – globular jars of large size (GJ 1C) (Fig. 21.9);

Subtype MB 1C – large storage jars (diameter 28-36 cm) with slightly restricted orifice (RS 1); this subtype occurs only in the settlement.

Type MB 2 - simple pots with black or gray surfaces, undecorated (M.0.5). A seldom found type with simple rim (A1, 2, 4), sometimes thickened (B1-2). The rim diameter varies between 10 and 32 cm (Fig. 21.10). About 20% of the pots have a decorated rim, most frequently of type A5, but other kinds occur as well (A1-3, B1, c1, 2, 4, 7).

Subtype MB 2A – rather small and shallow simple bowls with a diameter of about 15 cm.

Subtype MB 2B – medium-size deep bowls (US) with a diameter about 20–25 cm.

Subtype MB 2C – medium-size restricted vessels with rim diameter about 20 cm. One complete pot was found in the cemetery (GJ 3B) (Fig. 21.10). Pottery of this type is considered rather fine than utility ware. No vessels of a large size were found. The Kadero pottery represents an early phase in the production of this black ware in Central Sudan. It is dark gray rather than black. Black pottery became more common in the later phase of the Neolithic.

Type MB 3 - simple pots, red burnished ware (M.1.4; Fig. 22). Most certainly a luxury fine ware. Pottery walls are thin (no thicker than 7 mm, mostly between 3 and 6 mm), rims simple (A), occasionally thickened (B). Most of the pottery has red slip inside and out (55%). Pottery with red external surface and brown uncoated interior comprised 27% of this type and red exterior with gray or black interior makes up 18%. Rim shapes are simple (A1-4), rarely thickened (B1-2). More than half of the pottery features a decorated rim (A1-4, B1-3, C1, 4, 6, 7; AC).

Subtype MB 3A – simple bowls covered with red wash inside and out. Most of the pots are of medium size with a diameter between 12 and 20 cm, medium deep or deep (SB 2B, SB 3B) (Fig. 22.6,7).

Subtype MB 3B – simple jars (RS) with a diameter between 5 and 28 cm; the interior is brown (variant MB 3B1) or gray or black (variant MB 3B2). Pottery of the first variant is a little thicker (no potsherds thinner than 4 mm). It occurs at the Kadero cemetery as medium or large-size deep pots (GJ 1B-C; GJ 2C, GJ 3C) (Fig. 22.1,2,4,5) sometimes also very deep (GJ 4B) (Fig. 22.3). The second variant (with the grey-black interior) is the finest type with a surface that is very well polished and lustrous. Only fragments are known from the settlement at Kadero. The size of these pots is more unified than in the first variant (rim diameter varies from 15 to 24 cm).

Type MB 4 - Black-top band ware (M.0.6), this ware is known only from the fragments; globular bowls (Fig. 19. 8 -10).

Type MB 5 - black-top ware (M.1.6) (Fig. 19.3-7; 23); mostly the pottery is deep and globular, medium size or large (GJ1-3), sometimes also deep bowls occur (SB 3).

Subtype MB 5A - fine ware with a black or dark gray band around the rim, the band is no more than 1 cm wide. Rims are always simple (A1, 2, 4) and some are decorated (A1, A2, B1). It is very similar to subtype MB 5B, but instead of a row of a black teeth there is an irregular band 5 mm thick (Fig. 19.7).

Subtype MB 5B – pottery with a small triangular black topping (dog-tooth pattern; Arkell 1953:75). This is the finest ware in Kadero. Surfaces are well polished to

a high lustre. Despite the fineness of the ware only medium-size and big vessels are represented, but the rim diameter never exceeding 30 cm. Vessel capacity varies from 2 to about 10 litre. There are no small vessels. Rims are simple and most of the rim tops were decorated (A1-5, B1-3, C1, 5, AC). Vessel interiors are mostly red (variant 1), sometimes brown (variant 2) and exceptionally dark gray (variant 3). It is possible that only the upper part of the interior was red.

Type MB 6 - wavy line ware (M.0.4). Pottery with burnished wavy line pattern is very rare. All fragments come from rather small simple bowls. Despite the variety of techniques used, they look very similar. They are brown, the walls 3-5 mm thick, the rims simple. Arkell (1953:69) believed this type to be a forerunner of fine ware, in particular the vessels decorated with semicircular panels (Type MB 13).

Subtype MB 6A – pottery decorated with a double dotted wavy line. The rims simple (A4), plain or decorated with oblique incisions (A2a). Only a dozen potsherds of this kind have been found (Fig. 10.1).

Subtype MB 6B – pottery decorated with double incised wavy line. Only a few body potsherds have been found (Fig. 10.2-3).

Type MB 7 - simple pots with impressed decoration (M.0.4, M.0.5; SB & GJ, I.B); the most popular type in Kadero (Fig. 11, 12, 24, 25). Simple RS and US shape pots were decorated with the rocker stamp technique or alternately pivoting stamp. About 40% of the discovered pottery belongs to this group. Simple rims are common, as well as rims with small internal lips (the most popular are A1, A4, B1 and B2). Rims thickened outside are very rare.

Subtype MB 7A - small cups with a diameter less than 10 cm.

Subtype MB 7B – small deep bowls with a diameter around 15 cm and a capacity of 0.5 to 1 litre (Fig. 24.2,3,5,6).

Subtype MB 7C – medium-size and large deep bowls with a 20-30 cm diameter and 1-3 litre capacity (Fig. 24.1,4).

Subtype MB 7D – large bowls with a diameter of 30-40 cm or more (Fig. 24.7).

Subtype MB 7E – small restricted vessels with RS shape and rim diameter about 15 cm.

Subtype MB 7F – big restricted vessels with a rim diameter of about 20-35 cm (Fig. 24.8; 25.1-3).

Subtype MB 7G – very big restricted vessels (RS) with a rim diameter of more than 40 cm.

The biggest and the smallest forms do not occur at the cemetery. Small or medium-size bowls of subtypes MB 7BC are the most common there. Of the very big pots (MB 7F), only one fragment was found in a grave.

Six variants based on the types of body decoration (I.B1-I.B6) were found in the group MB7

However, these types of decoration cover vessels of the same shape and fabric and all produced similar effect on the surface. Because it is possible that there are some chronological differences between the variants, the present typology follows Arkell's classification. Not all the variants occur in all the subtypes. Variant 1 (Decoration I.B1) occurs only in subtypes MB 7A and MB 7DE, variant 2 (Decoration I.B2) occurs in subtypes MB 7C and MB 7 G, variant 3 (Decoration I.B3) in subtypes MB 7C-F, variant 4 (Decoration I.B4) is absent on small pots of subtypes MB 7AB and MB 7E, variant 5 in all subtypes except small pots of subtype MB.7A, and variant 6 on all the subtypes. Variants 1 and 2 are the most likely to have decorated rims (more than 50%), while other variants seldom do (less than 5%). The typical rim top decoration was B1b, c, B2c and B3b, seldom A2; other kinds occur sporadically. Only variants 4-6 have been identified in the assemblage from the cemetery.

Type MB 8 – simple pots decorated with dotted zigzag (M.0.4; SB & G.J, I.C1-3) are occasionally classified as separate taxonomic units (Arkell 1953:72, Haaland 1981:165, Chłodnicki 1982:

104-105). Despite considerable variety of the pattern even on the same pot, some pattern in the shape and density of the zigzag can be observed. Two variants were distinguished in – close zigzag of dotted lines (I.C1) and – zigzag of well spaced dotted lines (I.C2-3), . The general opinion is that the close zigzag is of older date. However one has to remember that changes of the zigzag patterns can occur on the same pot . There is a tendency for rim top decoration to be rarer but more differentiated when the lines are further apart (decrease from 30% to 12%). Decoration of variant 1 occurs already on pottery of the Early Khartoum phase (type MR 3), whereas that of variant 2 is popular in the Late Neolithic.

Pottery of type MB 8 is brown or brownish-gray, rarely gray or red. In the latter variant, red disappears and gray becomes popular. Wall thickness is between 4 and 10 mm (mostly between 6 and 7 mm). Simple open bowls (US) are the most popular in the first variant, and restricted deep pots (RS) in the second one (Fig. 25.4-5). Rims are simple (A), although rims thickened inside are also common. Rim diameter is between 15 and 40 cm. The rim top is plain or decorated with oblique dotted lines (B1-3), but other forms of decoration can occur as well (A2cd, A3, A4acdi, A5cdk, C1, C3, C4b, C6a, C7, AB).

Only four pots with dotted zigzag decoration were found in the cemetery. Two of them of variant 1 (I.C1), one with decoration that could be classified partly as variant 1 and partly as variant 2 (I.C1/C3) and one decorated with two kinds of decoration (I.B6/I.C1).

Subtype MB 8A – medium-size simple deep bowls with a diameter of 15-25 cm and a capacity of about 2 l. Two pots from the grave belong to this subtype (SB 3B-C) (Fig. 25.4).

Subtype MB 8B – big deep bowls with a diameter of more than 30 cm.

Subtype MB 8C – small globular pots with a diameter of less than 10 cm.

Subtype MB 8D – medium-size deep restricted simple vessels (RS) with a diameter of 12-20 cm.

Subtype MB 8E – large restricted simple vessels (RS) with a rim diameter of 18-30 cm. A single pot of this subtype occurred at the cemetery (GJ.3C) (Fig. 25.5).

Subtype MB 8F – very large pots. A vessel fragment from a grave (GJ.1D) belonged to a pot with a capacity of about 35 l.

Type MB 9 – simple pots (SB & GJ) decorated with a continuous zigzag (I.D) (Fig. 14); pottery is mostly brown (M.0.4), but gray or dark gray surfaces (M.0.5) are also common. The wall thickness is between 3 and 10 mm (mostly 5–6 mm). Open bowls and restricted vessels are equally common. the rim diameter is 12–50 cm, mostly around 30 cm. The rims are almost always simple (A1, 3, 4, 6), rarely thickened inside (B2). Almost 50% of the pottery features rim top decoration (A2-5; B1-3, 5; C4). This pottery is not very common, but more frequent in the southern part of the site. No complete pots were found and the type was not represented at all in the cemetery. Three subtypes have been distinguished based on rim diameter:

Subtype MB 9A – small and medium-size open bowls with a diameter less than 20 cm.

Subtype MB 9B – medium-size and big restricted vessels with a diameter around 20–25 cm.

Subtype MB 9C – very big storage vessels (RS) with a diameter about 40–50 cm.

Type MB 10 – simple pots decorated with lines of dots (I.E1); known only from potsherds (Fig. 15.2-8). The surfaces are brown (I.04), the wall thickness is 4-10 mm. Shapes are unrestricted (US) as well as restricted (RS), rims mostly simple (A1-6), sometimes thickened (B1-4). The rim diameters vary from 15 to 40 cm, but most are under 26 cm. Most rim tops are decorated (A2, 4, 6;

B1-5; C1, 4, 7; AC). The shapes of vessels of this type can be reconstructed based on complete pots from Kadada (Geus, Reinold 1979:Fig. 25, 27, 29, 30), comprising small or medium-size open bowls and medium-size or big restricted vessels.

Type MB 11 - simple pots decorated with impressed semicircular panels (II.A1). The decorative motifs are the same as in MB 7, that is, they are produced with the rocker stamp technique (I.B), but are arranged in semicircular panels (Fig. 16.9,10,12). This pottery is very fine and the pots are rather small. The rim diameter is less than 20 cm and the rims are simple (Fig. 26.1). Most of the pottery is covered with red wash (I.14), but brown surfaces (I.0.4) occur as well. Rims are seldom decorated. This ware is known only from a few fragments found at the settlement.

Type MB 12 – simple pots, decorated with semicircular panels of impressed dots (II.A2) (Fig. 16.11). A fine ware with red wash inside and out (I.1.4). Very rare in the settlement, but in the cemetery: three bowls of the same shape (SB.3B) (Fig. 26.2-4) in grave 60 were found, a slightly restricted pot (GJ.1C) (Fig. 26.5) was found in grave 100. The rim diameter varies between 15 and 22 cm and the depth between 8 and 14 cm (Fig. 26.1-5).

Type MB 13 – simple pots decorated with incised semicircular panels (IV.A); very similar to type MB 12. Wall thickness between 3 and 7 mm. Almost always red surfaces (I.1.4). Rim diameter between 9 and 30 cm, mostly however in the 15–20 cm range (Fig. 26.6-17). Rims almost always simple (A) and decorated sporadically; rim bands are common (A). The ware was quite common in the settlement and popular in the graves. Deep bowls (SB.3) are the most frequent, especially those of medium size (SB.3B), as also very similar slightly restricted pots (GJ.1B).

Type MB 14 – simple pots decorated with horizontal dotted lines (II.A2). A fine ware known from very few fragments from settlements (Fig. 15.1) and two complete bowls from graves. Very small dots impressed so close to one another that they form a continuous line. The vessels are covered with red wash (I.0.4). The two bowls were small with a diameter of 8 and 11 cm respectively (SB.3B; Fig. 27.1,2).

Type MB 15 – simple pots decorated with incised horizontal lines (III.B). Surfaces brown or dark brown (I.0.4), seldom red (I.1.4). Wall thickness 3-9 mm (mostly 5-6 mm). The rims are simple (A1-4), rarely thickened (B1-2) and almost all rims are decorated with rim top decoration types A2, B1, B3, rarely others. The rim diameter varies between 6 and 45 cm and pots with a diameter of about 30 cm predominated in the settlement, while those from the cemetery are 15 and 20 cm in diameter, although bigger forms occurred as well (Fig. 27.3-10).

Subtype MB 15A – small cups (SB 2) with incised irregular lines (Fig. 27.5).

Subtype MB 15B – medium-size deep bowls (US) with a diameter of about 15–20 cm (Fig. 27.4,6-8,10).

Subtype MB 15C – deep bowls with slightly restricted orifice and a diameter of about 15-20 cm (Fig. 27.3).

Subtype MB 15D – big pots with slightly restricted orifice and a diameter of about 30 cm (Fig. 27.9).

Type MB 16 – simple pots decorated with groups of parallel lines; difficult to recognize on fragmentarily preserved pots (Fig. 28.1-5). Small fragments could well be classified as type MB 13.

Subtype MB 16A – small deep pots with simple rims decorated with patterns III.C2 (Fig. 28.1-4). Surfaces red (I.1.4) or brown (I.0.4).

Subtype MB 16B – large , deep bowl of brown ware (I.0.4) with a diameter around 30 cm, bearing decoration of the III.C2 type.

Subtype MB 16C – deep globular jars with a dark red surfaces (I.1.4) and rim diameter around 14 cm (GJ.2-3C) (Fig. 28.5).

Type MB 17 – simple pots decorated with short incised lines; known from only a few fragments from the settlement.

Subtype MB 17A – small bowl fragmentarily preserved, decorated with groups of short incised lines (III.C2). Brown ware (I.0.4). Simple undecorated rim (Fig. 16.1).

Subtype MB 17B – bowl decorated with horizontal bands of short incised, vertical lines (III.D1) or group of lines (V. D) (Fig. 18.7). Simple rim, undecorated. Brown ware (I.0.4) (Fig. 17.14).

Subtype MB 17C – bowl decorated with horizontal lines of oblique incisions (III.D2). Simple rim decorated with C1c motif. Brown ware (I.0.4) (Fig. 17.13).

Subtype MB 17D – shallow bowl, brown ware (I.0.4) decorated with radiate incised lines (III.D3) (Fig. 16.14).

Type MB 18 – simple pots decorated with different impressed decoration. This group encompasses potsherds with atypical decoration represented by only a few pieces from the settlement.

Subtype MB 18A – potsherds decorated with impressed finger prints. Brown ware, 5–7 mm thick with simple undecorated rims (Fig. 17.9).

Subtype MB18B – potsherds decorated with small impressed stamps, mostly triangular, covering the entire surface. Ware brown or gray with rather thin walls (5 mm). Rims simple and decorated with criss-cross pattern (A4) (Fig. 17.7-8, 10-12).

Subtype MB 18C –fragments of vessels with a modeled plastic band below the rim and the band is additionally decorated with a dotted fish-bone pattern (Fig. 17.5). Temper very fine.

Type MB 19 – oval pots decorated with incised line. Two pots of this type were found at the cemetery, both about 20 cm (long diameter) by 16 cm (short diameter) and about 11 cm deep. Covered with red wash (I.1.4) and featuring simple undecorated rims (Fig. 29.1-3).

Type MB 20 – wavy-rim bowl decorated with small semicircular panels (Fig. 28.7). Fragments of this kind of pot, covered with a red wash (I.1.4) was found in a grave. Rim diameter 21 cm, depth 11 cm. Rim simple undecorated.

Type MB 21 – ladle pots decorated with incised lines covered with red wash (I.1.4); three examples have been found from the cemetery and one fragment from the settlement . Simple rims decorated with the A2a motif or left undecorated. 9–13 cm deep, rim diameters between 13–18 cm (Fig. 28.8-10). Shapes are slightly restricted (RS).

Subtype MB 21A – pots decorated with semicircular panels (IV.A) (Fig. 28.8,10).

Subtype MB 21 B – pots decorated with incised parallel lines (III.C) (Fig. 28.9).

Type MB 22 – ladle pots, undecorated. Two pots from graves were red-coated (I.1.4), 9–12 cm deep and with a rim diameter of 10 and 14 cm respectively (Fig. 28.11). Both are of restricted shape (RS).

Type MB 23 – very deep oval pots with incised decoration of the same kind (III.C2) as type MB 16. The height of these pots is larger than the maximum diameter, which is unusual in Kadero, for this reason they are classified as a separate group. These egg-shaped pots are more characteristic of the Late Neolithic. The type is recognizable only if the whole vessel is preserved (Fig. 29.1-3).

Type MB 24 - deep pots of RC.1C shape, decorated with horizontal incised lines, recognizable when complete (Fig. 29.4). One pot of this type is 16 cm high and has a maximum diameter of 24 cm with a simple undecorated rim and red-coated surface (M.1.4). Very similar to type MB 15.

Type MB 25 – deep pots of RC.1C shape, undecorated but with decoration (A2a) on

the simple rim. The vessel is 18 cm high with a diameter of 22 cm (Fig. 29.5).

Type MB 26 – caliciform beakers, a characteristic form found in graves (Fig. 29.6-8). Known from many sites in Sudan and Egypt, it was probably used in rituals connected with mortuary practices. Almost all the vessels of this type were found in graves. Details of shape can be differ, but on the whole the beakers are tall, slim and have wide flaring mouths. Decoration is almost always unique, covering the whole body, rim and sometimes also the interior. All the beakers from Kadero have a unique decoration.

Type MB 27 – decorated cups with flat base. The Kadero finds of this type constitute a small group, decorated with different geometric patterns.

Subtype MB 27A - two pots found in a grave, decorated with alternately plain and hatched triangles (Fig. 29.9,10).

Subtype MB 27B – fragment of a cup from the settlement, representing dark gray ware decorated with a kind of meander or rectangles (Fig. 18.3); similar to examples known from Kadada (Geus, Reinolds 1979: figs 21-22).

Type MB 28 – other pots decorated with bands or triangles (Fig. 18.9-10). The assemblage from the settlement included fragments of pots decorated with filled bands or triangles; neither shape of the vessel nor pattern of the decoration could be reconstructed because of the fragmentary state of the assemblage. They consist clearly of rather small vessels, like type MB 27. Bottoms either rounded or flat.

Subtype MB 28A – small pot decorated with bands of triangles (Fig. 18.9); similar to vessels known from Kadada (Geus, Reinolds 1979: fig. 20a).

Subtype MB 28B – pot of unknown shape decorated with triangles filled with dots and placed between groups of incised horizontal lines (Fig. 18.10).

Subtype MB 28C – small, deep restricted pot decorated with alternately plain and hatched chevrons (Fig. 18.1,2).

Subtype MB 28D – fragments of different pots decorated with hatched bands; simple bowls or vessels of unknown shape (Fig. 18.5-6,8,11,12,14).

Subtype MB 28E – small bowls, reddish brown ware decorated with oblique comb impressions (I. H) (Fig. 17.3,4).

Type MB 29 – globular jars with short neck, represented by a single fragment from the settlement. Rim modelled and decorated on the outside with a close continuous zigzag (Fig. 18.13).

Family R. Pottery with organic temper

Group RB. Burnished ware with organic temper

Type RB 1 dark gray pottery with undecorated body; some potsherds from the settlement and one pot of restricted shape (RS 1b) and simple rim from a grave. The pot was 17.5 cm high (Fig. 29.11).

Type RB 2 brown ware decorated with bands filled with fingernail impressions. Only body sherds have been found (Fig. 18.4).

Group RW rippled ware with organic temper. Only one fragment of this ware has been found in Kadero until now.

Conclusions

The ceramic assemblage from Kadero demonstrates considerable chronological differentiation. The oldest material is connected with Early Khartoum Culture, while the youngest with early phases of the late Neolithic. The site appears to have been occupied most likely from the terminal sixth through the early third millennium BC, but despite the two thousand years or so of occupation the pottery is substantially homogeneous, essentially demonstrating a ceramic tradition continued unbroken from the Early Khartoum period. Its primary characteristic is the use of sand temper,

simple globular vessel shapes and a prevalence of ornaments executed in the rocker technique. Organic temper, although present, is rare and seems never to have been fancied by the local potters.

The ceramics in the Khartoum Neolithic were strongly uniformized. Basically the same set of vessels of simple semiglobular form decorated in the rocker technique remained in vogue, the one big innovation being surface burnishing. High surface gloss is featured by a certain percentage of the vessels, especially those coated with red pigment. Black-top pots were a special product, common in the graves but sporadic in the settlement. Engraved decoration was introduced and proved to be fairly common on pottery from both the settlement and the cemetery; ornamental motifs include parallel lines forming concentric circles as well as semicircular festoons. There was an evident division into cooking ware, comprising primarily pots with impressed decoration and undecorated brown ware, and fine wares. The latter category is characterized by red ocher coatings on the vessel surface, frequently without any further decoration except for a black-top rim or semicircular panels of incised lines.

Innumerous sherds from both the settlement and the cemetery at Kadero are witness to the transformation that occurred characteristically in the Late Neolithic in Sudan. The repertoire of shapes was enlarged considerably and even among the simple forms there were discernible changes, observed primarily in a growing prevalence of the fairly shallow and the very deep vessels. New forms were also introduced, among these the so-called caliciform beakers, which deserve special note. Three examples of beakers of this kind were discovered in two graves. Despite overall stylistic similarities, the vessels were each decorated in different manner This fact deserves special note as vessels of this kind are unique in the light of the fairly unified and repetitive decoration characterizing Neolithic pottery from Sudan on the whole. They can be found in the Nile Valley all the way from Khartoum to Middle Egypt, as well as in the neighboring desert regions. No two vessels bear exactly the same decoration (Welsby 2001:86; Salvatori, Usai 2002; Chłodnicki 1997; 2000; Gatto 2010).

Other new forms of Late Neolithic chronology found in Kadero include the ladle-pots, unique flat-bottomed cups decorated with geometric motifs. Two vessels of this kind were found in grave inventories and sherds of two others occurred in the assemblage from the settlement. They appear to have been produced locally and the potters who made them were so used to decorating the entire external globular surface of a pot that they ornamented the flat bottom as well.

Singular pieces of vessels with distinguished neck and others representing rippled ware indicate that the site was penetrated also in the younger phases of the Late Neolithic.

The Kadero assemblage resembles in its mass the material known from other sites of the Khartoum Neolithic, specifically Shaheinab and the neighboring site of Kadero 2, as well as Zakiab and Umm Direiwa. The ceramic inventory is similar even though the frequencies of individual types may differ considerably. There is also a substantial similarity between the Kadero assemblage and pottery known from Geili. This is not surprising in view of the similar chronology of the two sites confirmed by radiocarbon dates. Kadero also shares some features with the Late Neolithic cemeteries of Shaheinab and Kadada (Arkell 1953; Geus, Reinold 1979; Haaland 1978; Geus 1984; Abbas 1982; Caneva 1988; Sadig 2010).

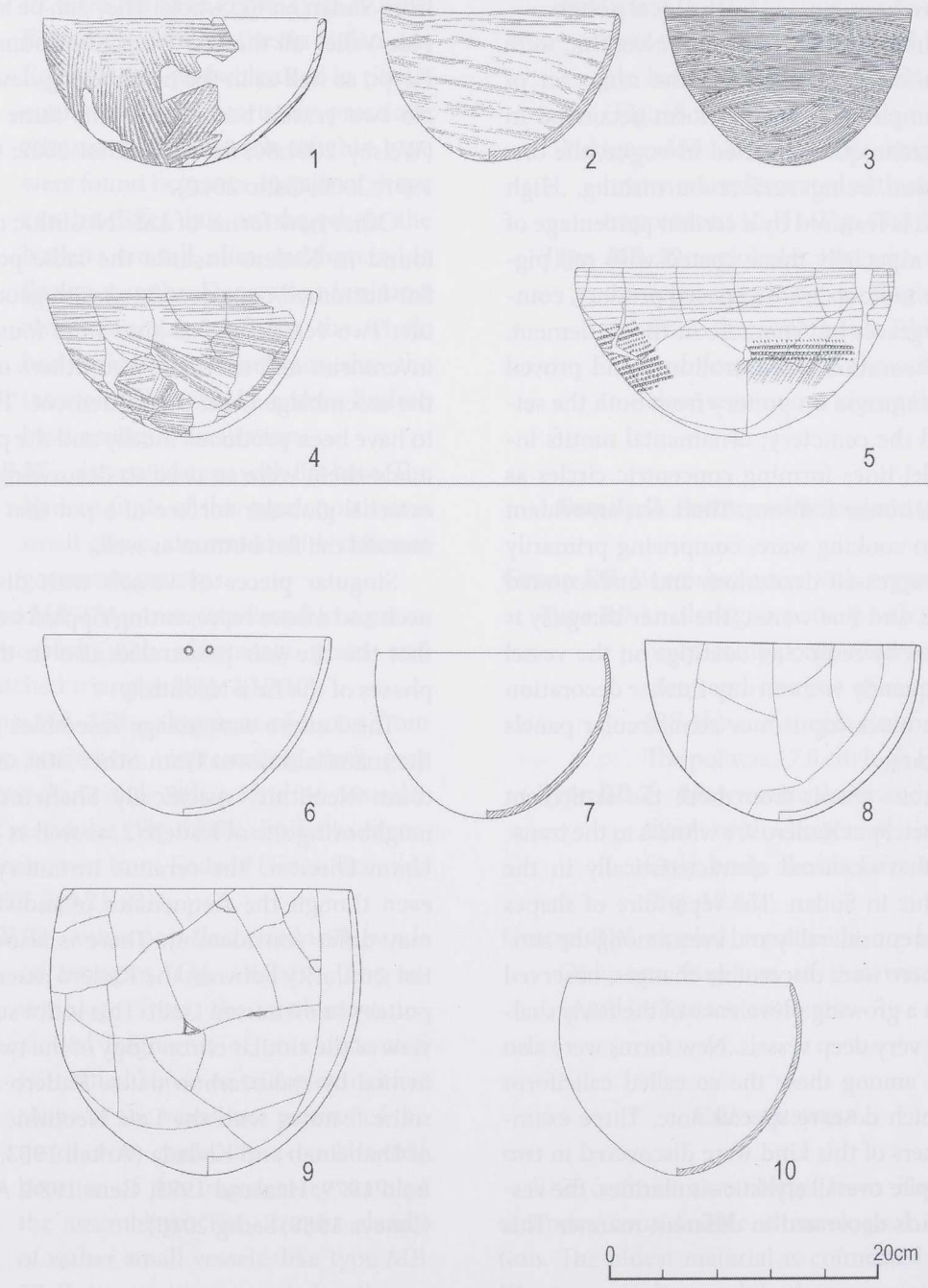

Fig. 21. Pottery type MC 1 (1-4), MC 2 (5), MB 1 (6-9), MB 2 (10).
1 - Grave 63, 2 - Grave 101, 3 - Grave 166, 4 - Grave 227, 5 - Grave 55, 6 - Grave 140,
7 - Grave 189, 8 - Grave 232, 9 - Grave 244, 10 - Grave 150

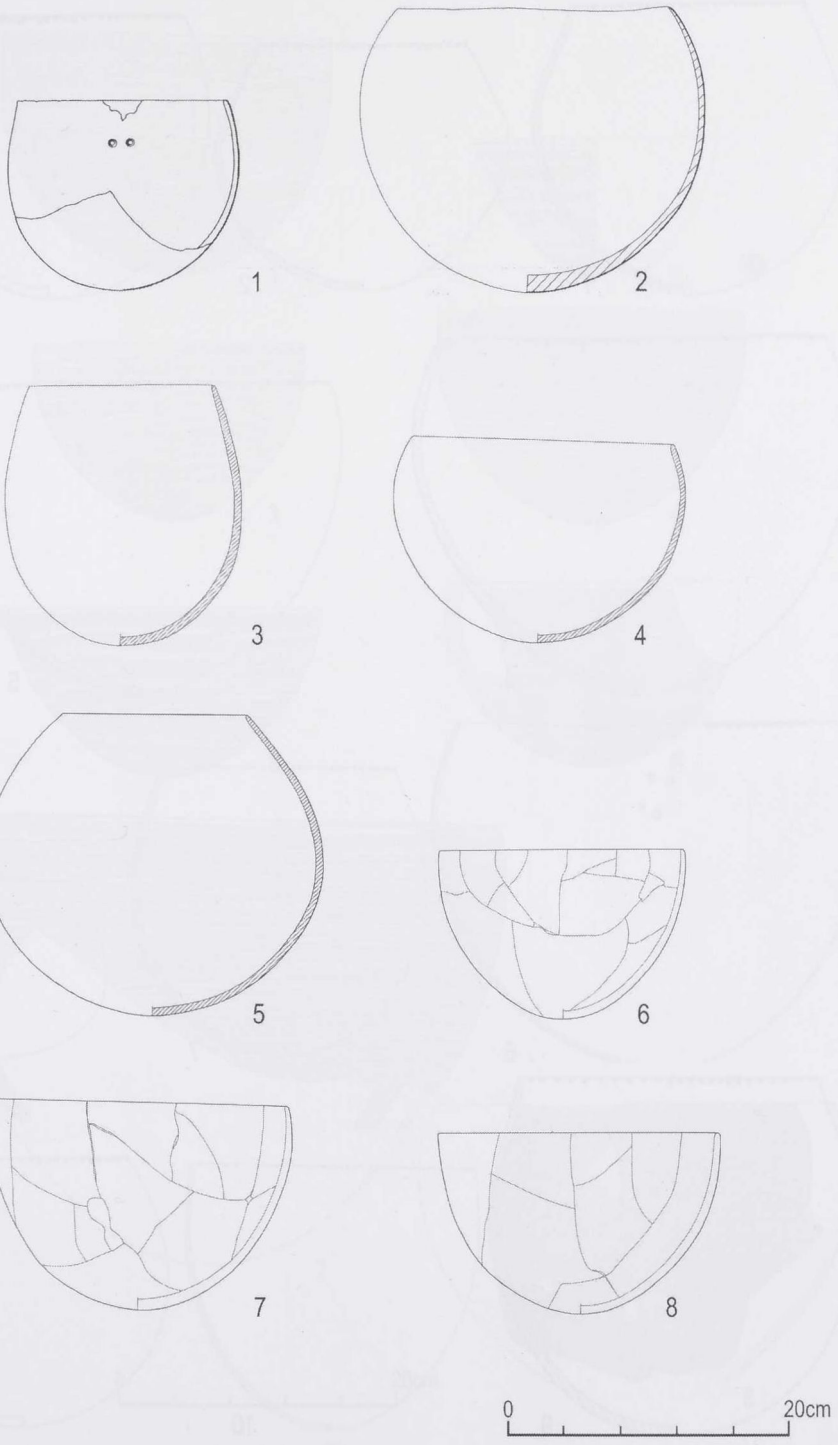

Fig. 22. Pottery type MB 3 (1-8).
1 - Grave 12, 2 - Grave 60, 3 - Grave 113,
4 - Grave 156, 5 - Grave 170, 6 - Grave 227

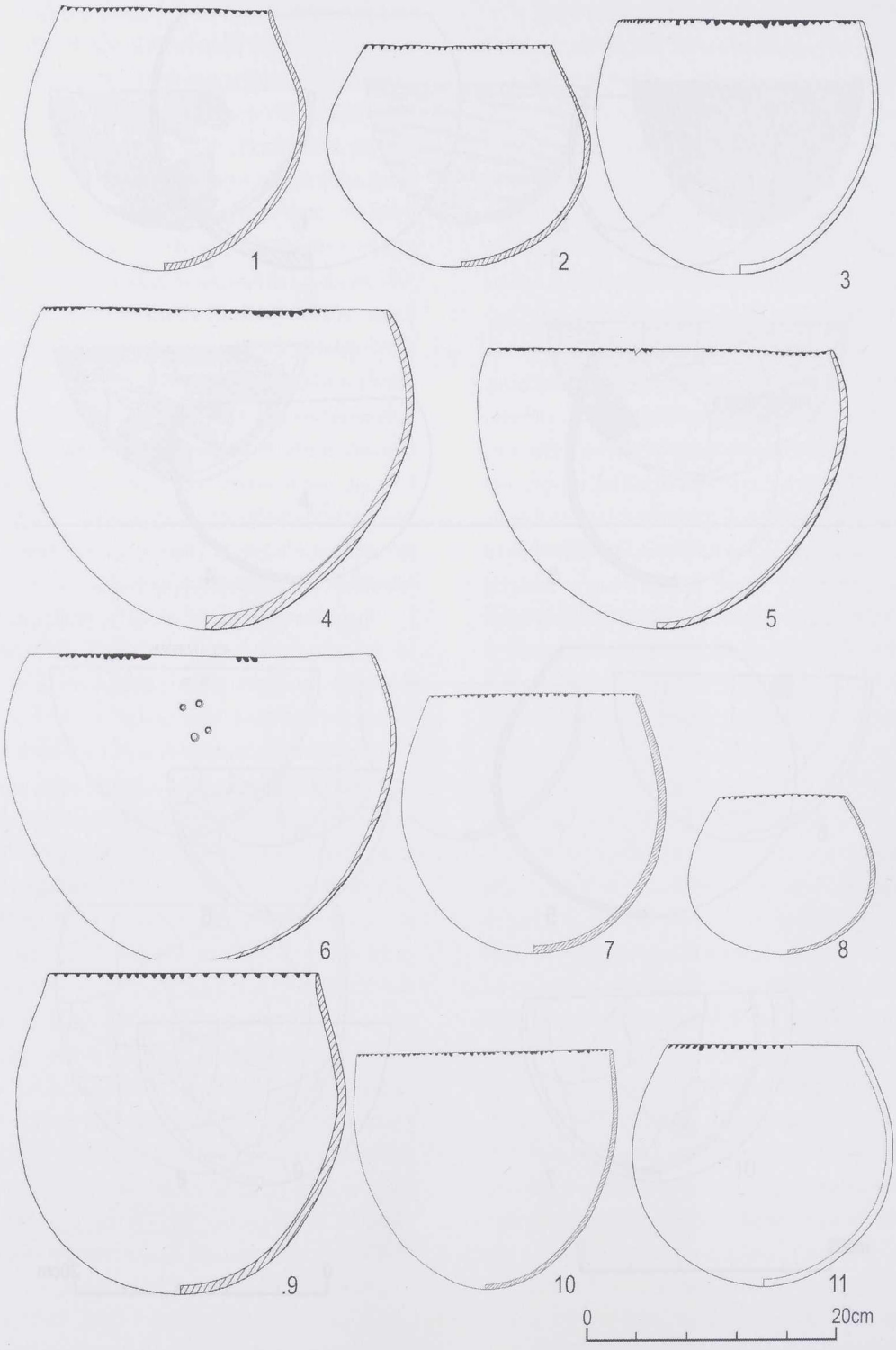

Fig. 23. Pottery type MB 5B.
1, 2 - Grave 3, 3 - Grave 5, 4-6 - Grave 60, 7 - Grave 114,
8 - Grave 130, 9 - Grave 8, 10 - Grave 140, 11 - Grave 239

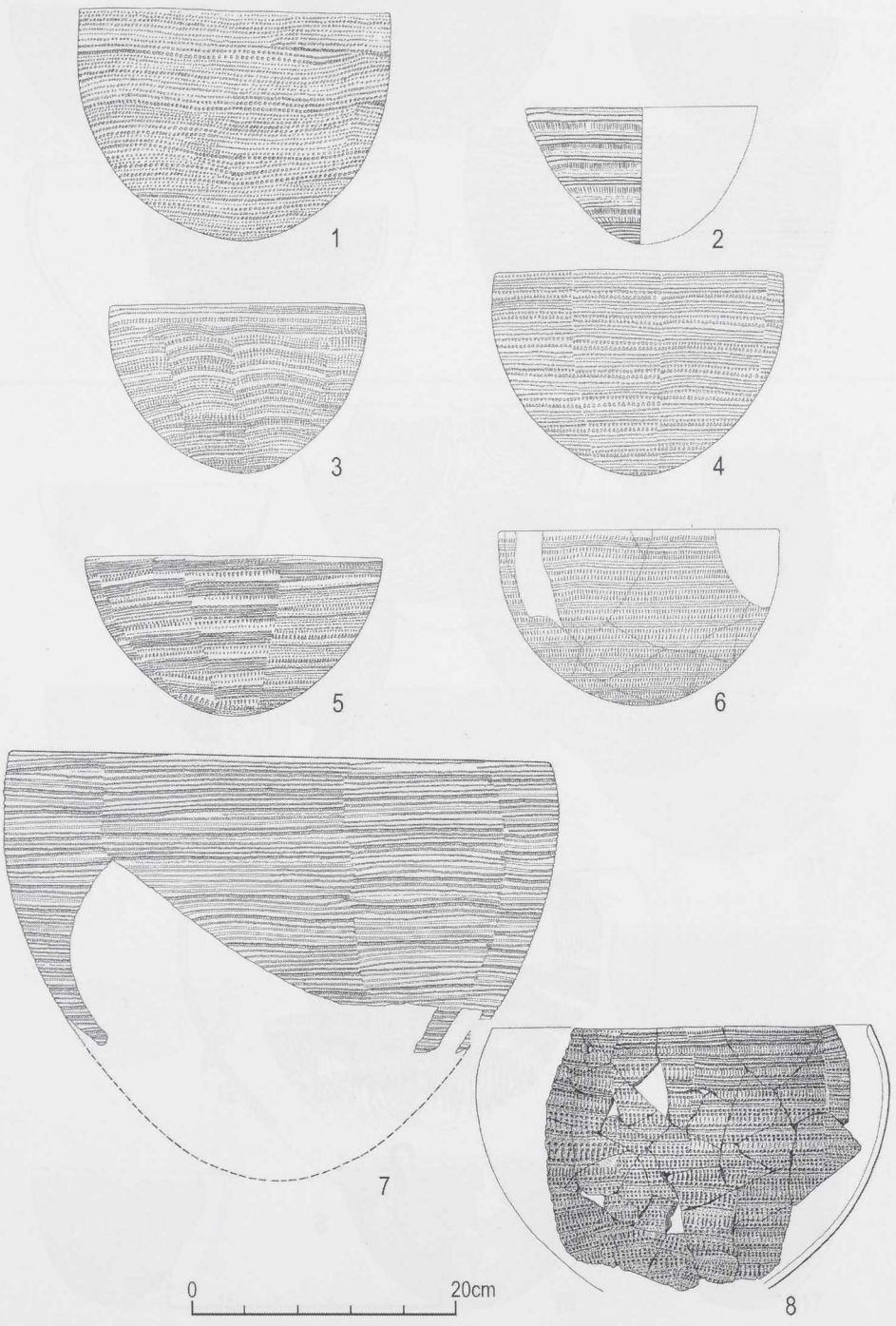

Fig. 24. Pottery type MB 7.
1 - Grave 113, 2 - Grave 2, 3 - Grave 143, 4 - Grave 146,
5 - Grave 168, 6 - Grave 196, 7 - Grave 96, 8 - Grave 40

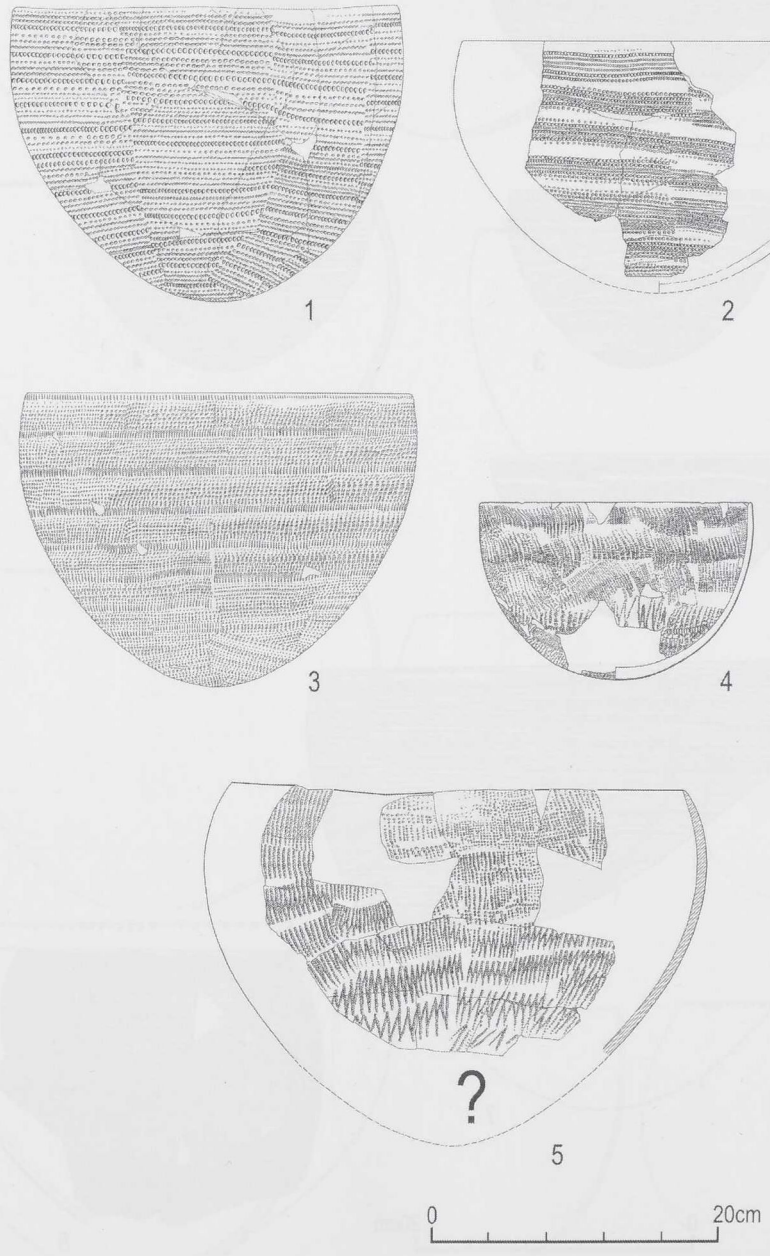

Fig. 25. Pottery type MB 7 (1-3), MB 8 (4, 5).
1 - Grave 208, 2 - Grave 217, 3 - Grave 244, 4 - Grave 14, 5 - Square 562

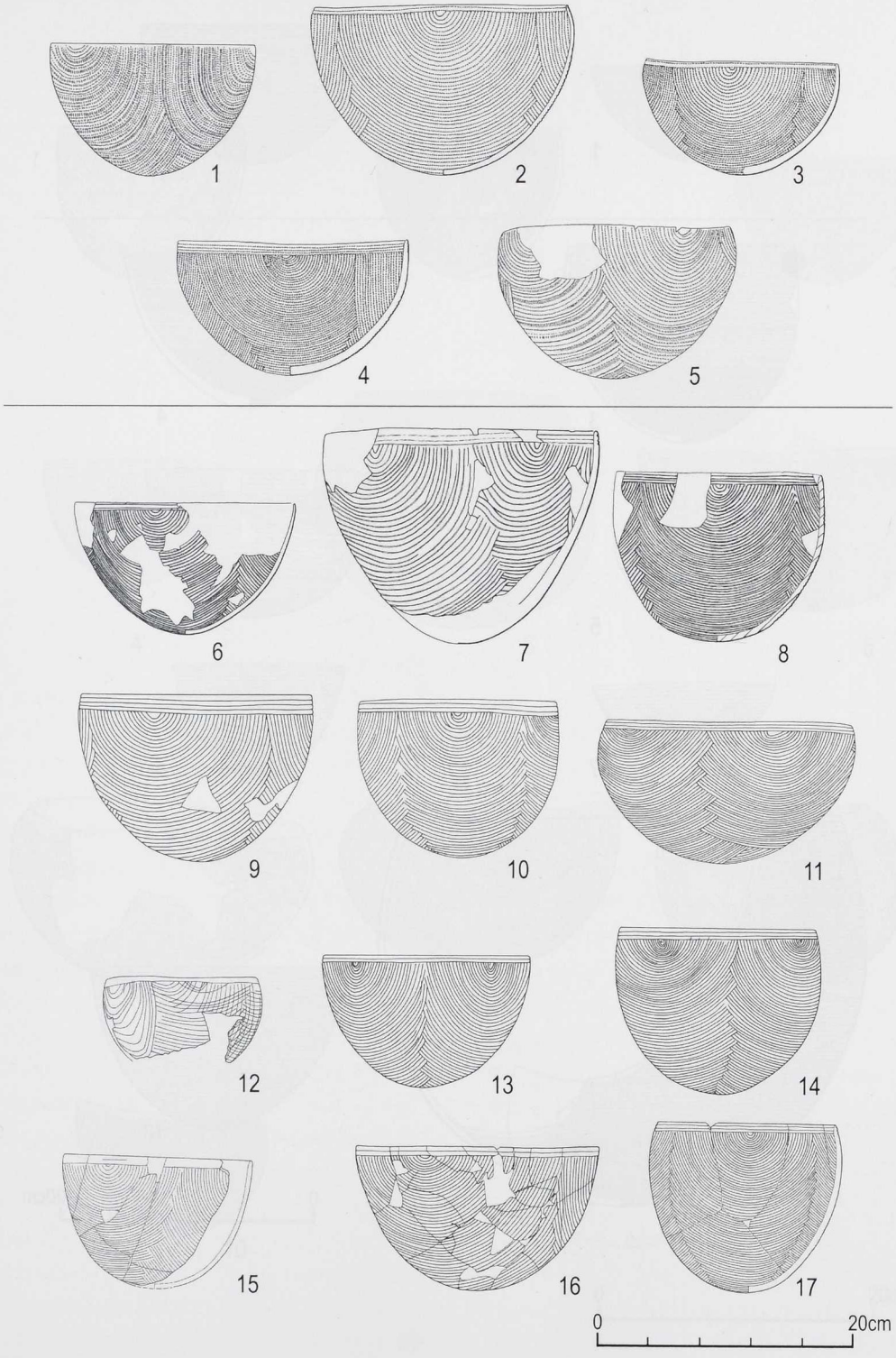

Fig. 26. Pottery type MB 12 (1-5), MB 14 (6-17).
1 - Grave 157, 2-4 - Grave 60, 5 - Grave 100, 6-7 - Grave 2, 8 - Grave 55,
9 - Grave 101, 10 - Grave 113, 11 - Grave 156, 12 - Grave 157, 13 - Grave 166,
14 - Grave 170, 15 - Grave 224, 16 - Grave 227, 17 - Grave 229

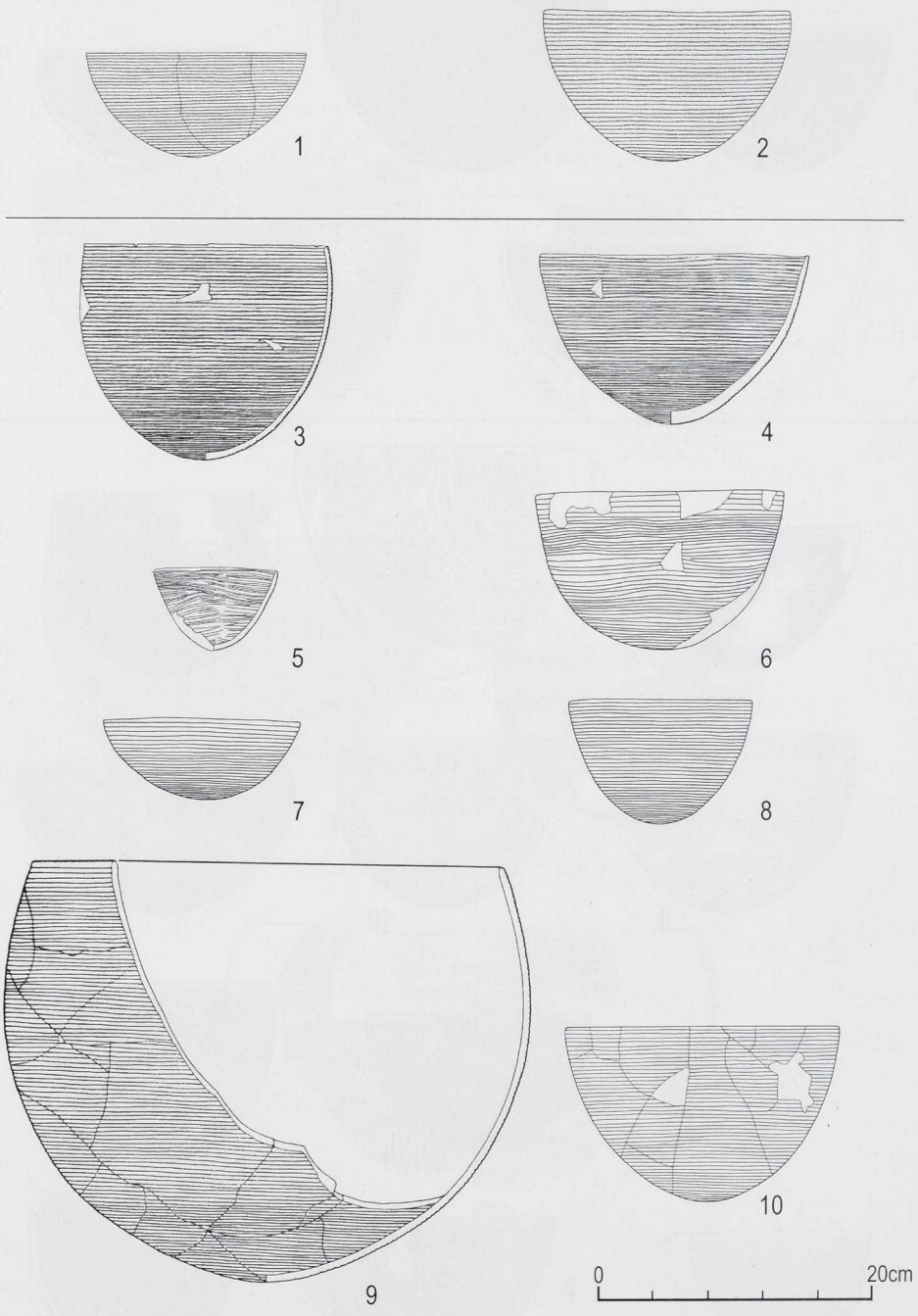

Fig. 27. Pottery type MB 14 (1, 2), MB 15 (3-10).
1-2 - Grave 156, 3 - Grave 1, 4 - Grave 61, 5 - Grave 63, 6 - Grave 95,
7 - Grave 113, 8 - Grave 166, 9 - Grave 222, 10 - Grave 228

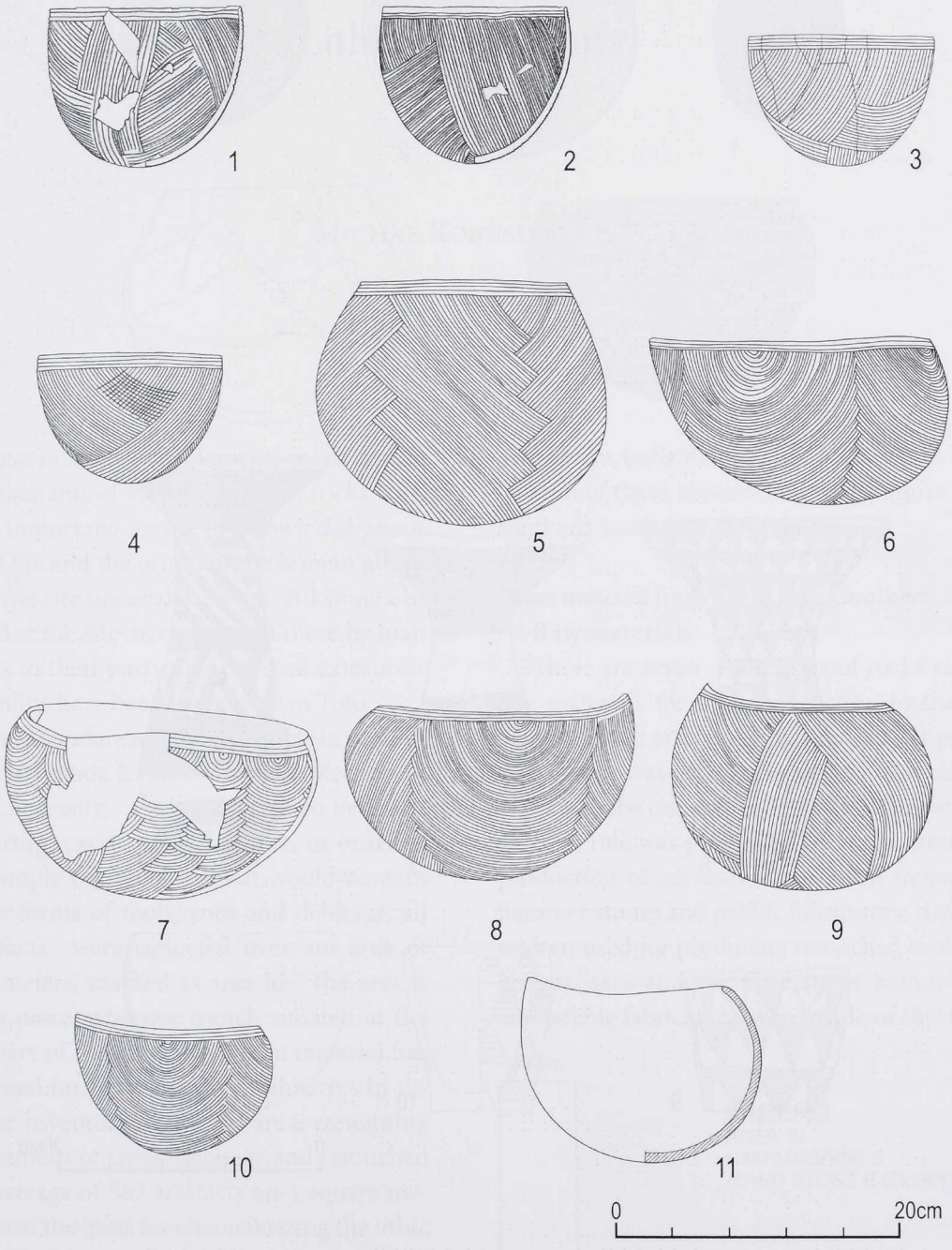

Fig. 28. Pottery type MB 16 (1-5), MB 19 (6), MB 20 (7), MB 21 (8-10), MB 22 (11).
1-2 - Grave 12, 3 - Grave 140, 5 - Grave 114, 6 - Grave 153, 7 - Grave 188,
8 - Grave 170, 9 - Grave 182, 10 - Grave 170, 11 - Grave 182

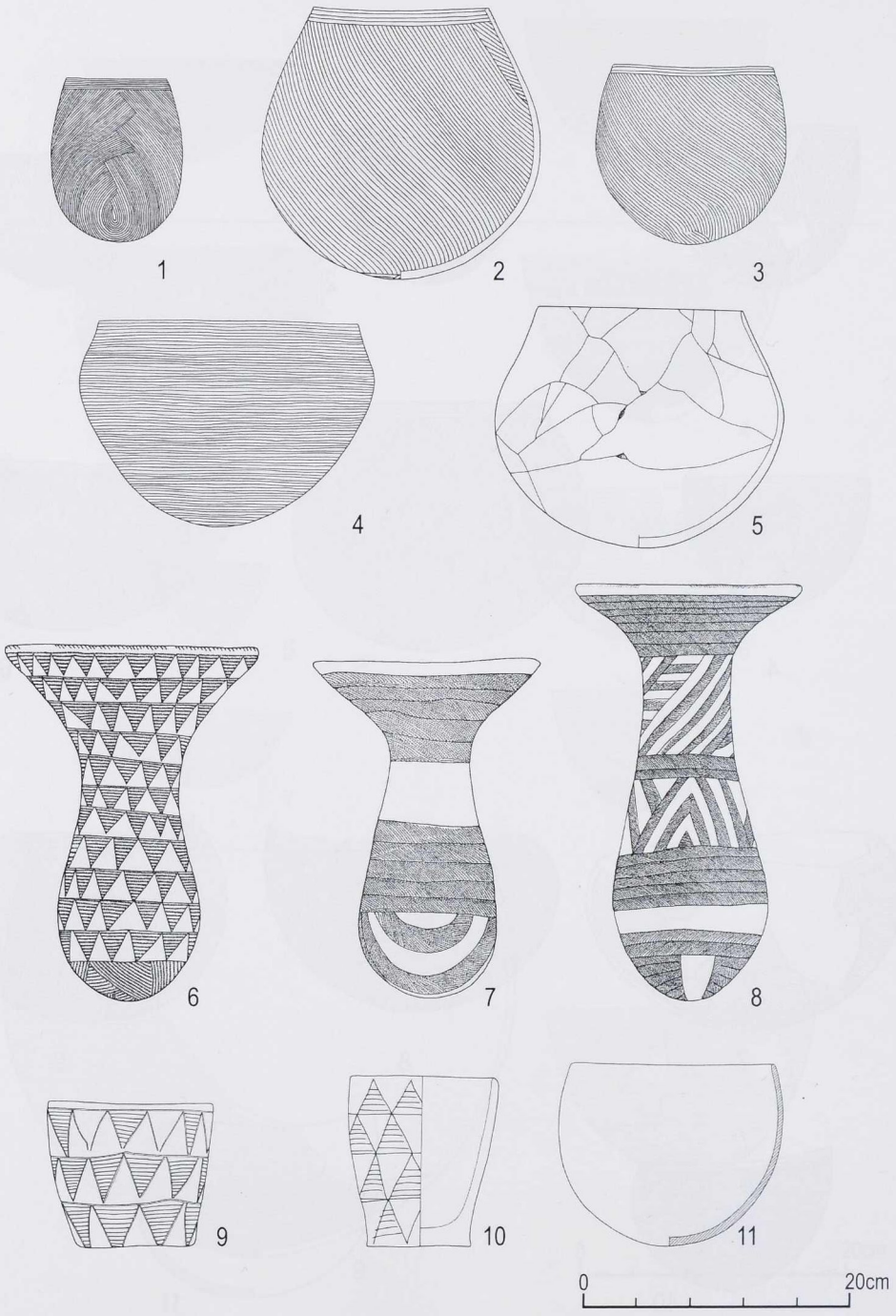

Fig. 29. Pottery type MB 23 (1-3), MB 24 (4), MB 25 (5), MB 26 (6-9), MB 27 (9, 10), RB 1 (11).
1-1,6,11 - Grave 113, 4 - Grave 157, 5 - Grave 144, 7-8 - Grave 114, 9 - Grave 96, 10 - Grave 208