Kutná Hora - Denemark

Hradiště řivnáčské kultury (ca 3000–2800 př. Kr.)

Kutná Hora - Denemark

Ein Burgwall der Řivnáč-Kultur (ca. 3000–2800 v. Chr.)

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Obsah – Inhalt

7. Animal bone analysis from a Řivnáč culture horizon at the Kutná Hora - Denemark site

Rozbor osteologického materiálu
z objektů řivnáčské kultury na Denemarku
(Kutná Hora district, Czech Republic)

René Kyselý

7.1. Introduction

Not all archaeological sites produce osteological material as well as other finds and even those potential Eneolithic sites in Bohemia, which have produced such material, only a few have been subject to osteological analysis and publication. The most significant publications of archaeozoological analysis from Řivnáč horizon sites are from Stehelčeves - Homolka (*Allen 1968*; *Ambros 1968*; *Bogucki 1979*), with limited information is Prague - Lysolaje (*Pleslová-Štiková 1972*) and Cimburk (*Peške 2000*) and also there are unpublished reports from Prague - Podhoří, Prague - Lysolaje and Soběsuky (see *Tab. 1*).

Material from Kutná Hora - Denemark[1] was analysed concurrently with material from the other Řivnáč culture sites of Tuchoměřice, Prague - Miškovice, Tišice, Hradenín, Hostivice - Litovice and possibly the Baden/Řivnáč period material from feature 5 at Velké Přílepy (for list of sites see *Tab. 1*). These Řivnáč and in time foregoing Baden period sites form a single cultural/developmental complex. To the contrary of Kutná Hora - Denemark all of the cited sites are situated in a central Řivnáč horizon settlement area (map: *Fig. 1*). They produced relatively small bone assemblages (*Tab. 1*) except from the site at Stehelčeves - Homolka which produced a large amount of material (comparable with Kutná Hora - Denemark).

The site was settled in middle and later phase of Řivnáč period. The end of this culture, which was superseded by the radically different Corded Ware culture, may have been connected with a critical situation (M. Zápotocký, pers. comm.), possibly connected with a supposed climatic crisis (see significant temperature drop in the period ca. 3000–2800 BC, presumed on the base of the carbon curve: *Stuvier – Reimer – Reimer 2005*).

The material from Kutná Hora - Denemark has not yet to be published in its entirety. Osteological analysis of finds from one of the richest features (storage pit 41/41a) was deposited in the archive of Institute of Archaeology of the Academy of the Sciences in Prague in 2003 (*Kyselý 2003*). A detailed analysis of the mass frog bone find was published in advance as a specific theme (*Kyselý 2005a*; *2008a*) and other article about the Řivnáč material from this site is forthcoming (*Kyselý 2008b*). Detailed information about all osteological finds are in the author database (ARCHZOO[2]) and will be deposited in the archive of finds reports in the Institute of Archaeology in Prague. Analysis of the material was undertaken as part of two Czech grant projects (GA ČR 404/99/0935 and GA ČR 404/02/0481) and as part of an international project[3]. The Řivnáč period is part of the author's dissertation[4] and a more detailed comparison of the sites will be the subject of this study.

7.2. The Kutná Hora - Denemark site

The Kutná Hora - Denemark site (Kutná Hora distr.) lies in the eastern part of central Bohemia approximately 1 km to the south of Kutná Hora and not far from the well known Neolithic site of Bylany (*Fig. 1*). The site is a hillfort of the middle-final phase of Řivnáč culture (absolute data 3000–2800 BC, see *Zápotocký – Zápotocká – this supplement*). Excavations under supervision of Dr. M. Zápotocký and Dr. M. Zápotocká (in 1980–1989) revealed almost the complete area of the settlement (acropolis, three large ditches and a bailey). The field situation (superposition of features etc.) indicated two settlement phases. The development into the second phase was probably not completed (*Zápotocký – Zápotocká – this suppl.*). Since the Řivnáč culture settlement can be considered as continuous with no further possible ceramic material differentiations, the osteological material will be analysed as a single period assemblage. Maximum duration of the settlement corresponding with the accumulation of the osteological material is 200 years, but the actual period of the settlements existence is estimated by M. Zápotocký to 20–50 years only. The site is the most eastern promontory of Řivnáč settlement area. To the east and southeast the ground rises to higher sea levels (i.e. Czech-Moravian uplands) with no evidence for the existence of further settlements of the same period. However there is evidence for trade routes to central and south-western Moravia (*Zápotocký 2000*) and the Kutná Hora - Denemark site could play a role in this way. Opinions on Řivnáč hillforts functions are discussed in *Zápotocký* (*2000*) and *Zápotocký – Zápotocká – this suppl.* Described hillfort was at marginal site of Řivnáč settlement in Bohemia. Even within Čáslav region, which is 20–30 km wide and which is the most eastern part of Řivnáč settlement, it had not a central but marginal, and maybe isolated, position. Particular differences from other hillforts in the region were detected, so this site could play a special role (*Zápotocký – Zápotocká – this suppl.*).

The site is surrounded by slightly rolling countryside with altitudes reaching no more than 350 metres above sea level. The settlement is situated at the north-western edge of the Čáslav Basin approximately 10–15 km south from the Labe (Elbe) River. The promontory with the settlement is confined by the Vrchlice stream (ca. 2–6 metres wide). The site (i.e. the promontory) lies at 290–300 metres above sea level.

Specifics in dating, character, function and position of the site can influence (individually or in combination) the form of the subsistence economy and therefore also the final bones assemblage.

[1] Also cited as Denemark, Dänemark or Kutná Hora - Dänemark in literature.

[2] ACCESS Application created by R. Kyselý and T. Kubálek under grants GAAV A9002809/98 and GAČR 404/98/1565.

[3] ECONET n° 12676 VE. Des bœufs, des souris et des hommes : premiers animaux domestiques et premiers commensaux en Europe continentale tempérée (fin du 7e mill. – 3e mill. avant J.-C.): Eclairages centre-européens (Moldavie, Muntenie, Doubroudja, Moravie, Bohême) et ouest-européens (Bassin Parisien, Ouest de la France); Tresset, A. et al. 2006–2007; Egide egency.

[4] Faculty of Natural Sciences of Charles University in Prague, zoological departement; supervisor Prof. I. Horáček, CSc.

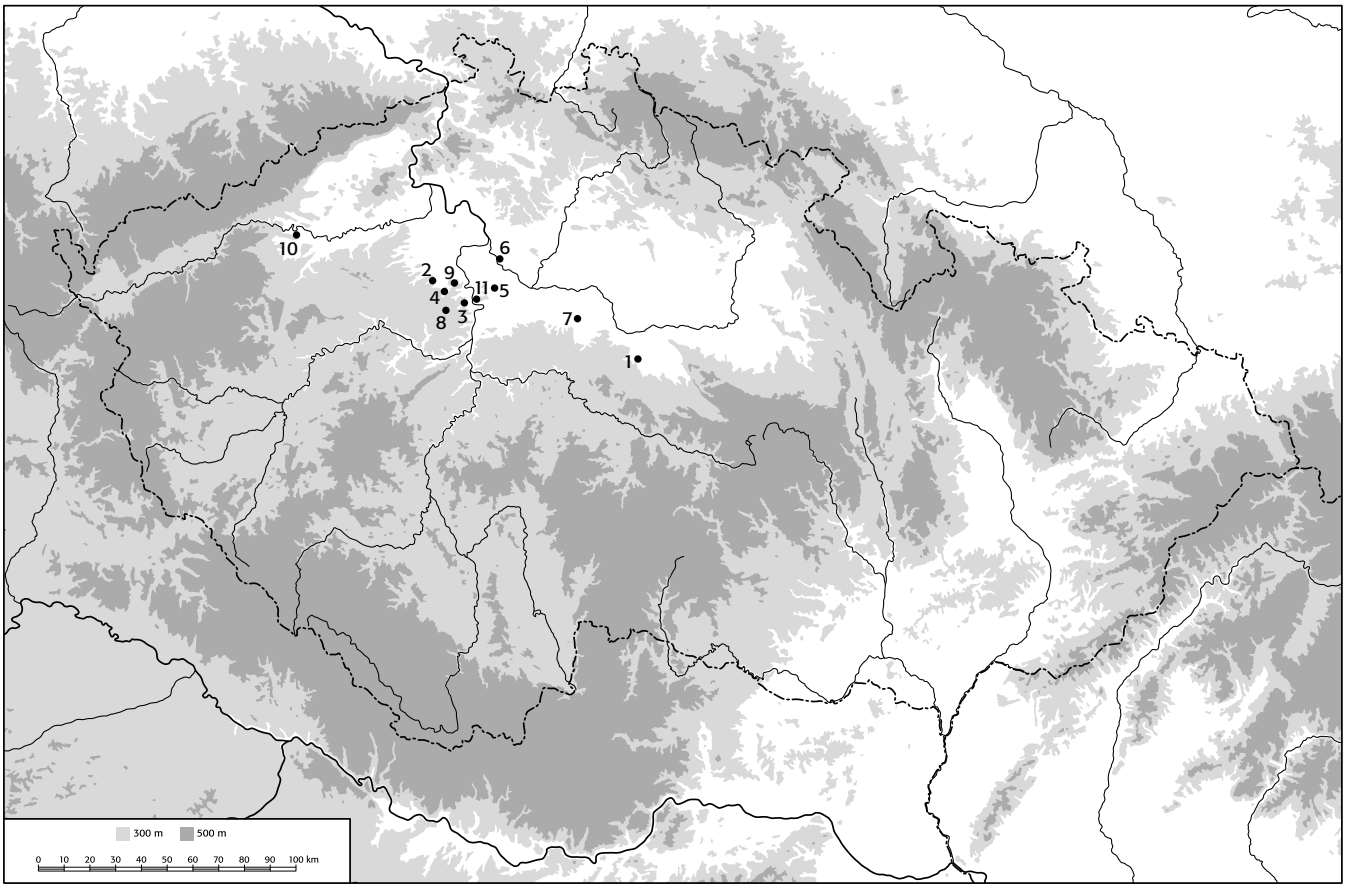


Fig. 1. *Map of Bohemian Řivnáč sites with archaeozoological data. Numbers correspond to Tab. 1. Drawn by author and editors. —* ***Obr. 1.*** *Mapka Čech s řivnáčskými lokalitami, které poskytly archeozoologická data. Čísla odpovídají tab. 1. Kresba autor a redakce.*

code	site	district	investigated by, in year	context
1	Kutná Hora-Denemark	Kutná Hora	M. Zápotocký, 1980-1989	118 features
2	Stehelčeves-Homolka	Kladno	R. W. Ehrich, 1930-1931, E. Pleslová-Štiková, 1960-1961	more features
3	Praha-Lysolaje	Praha-hl. město	E. Pleslová-Štiková, 1944	more features
4	Tuchoměřice	Praha-západ	P. Sankot, 1998, 2000	3 features
5	Praha-Miškovice	Praha-hl. město	M. Ernée, 2003, 2004	hut 1052
6	Tišice	Mělník	M. Kuna, D. Marešová, 2005	4 features
7	Hradenín	Kolín	V. Šaldová, 1978	hut 6
8	Hostivice-Litovice	Praha-západ	I. Pleinerová, 2003, 2004	6 feature
9	Velké Přílepy	Praha-západ	L. Šulová, 2002	feature
10	Soběsuky	Chomutov	P. Holodňák, 1986	feature 909
11	Praha-Troja (Podhoří)	Praha	M. Fridrichová, 1974	feature 2, trench IA,IB
code	**dating**	**publication of arch. situation and artefacts**	**archaeozoological analysis**	**NISP**
1	Řivnáč C. - middle and late phase	*Zápotocký – Zápotocká this publication*	herein	15611
2	Řivnáč C.	*Ehrich – Pleslová-Štiková 1968*	*Allen 1968; Ambros 1968; Bogucki 1979*	1382+417+?
3	Řivnáč C.	*Pleslová-Štiková 1972*	*Zikmundová 1959*	?
4	Řivnáč C.	none	Kyselý, own data	429
5	Řivnáč C.	*Ernée et all. 2007*	*Kyselý 2007a; 2007b*	523+2511*
6	Baden C./early Řivnáč C.	none	Kyselý own data	72
7	Řivnáč C.	*Štefanová 1982; Zápotocký 2006*	*Kyselý 2006a*	743
8	3x Řivnáč C. and 3x Baden C.	none	*Kyselý 2005c; 2005d*	70 a 37
9	Řivnáč C. ?	none	*Kyselý 2006b*	74
10	Řivnáč C.	none	*Peške 1991*	192
11	Řivnáč C.	none	*Peške 1974*	22

Tab. 1. *Řivnáč sites with animal bones usable for comparison (Graph. 14). Location – Fig. 1, * floatation. —* ***Tab. 1.*** *Řivnáčské lokality poskytující zvířecí kosti a použité ke srovnání (graf 14). Lokace – obr. 1, * plavení.*

7.3. Material and its dating

The material to be analysed was received after the field part of the excavation had terminated and since I did not participate in the excavation I do not posses firsthand knowledge of the manner of acquiring the material and its distribution in the field. Nevertheless it was reported that most of the bones were retrieved manually during excavation and by the flotation techniques used on bulk samples from some of the features (*Tab. 8*).

The list of features included in the osteological analysis and the amount of material in them is contained in *Tab. 7* and *8* (for a more detailed description of the features and their functions see *Zápotocký – Zápotocká – this suppl.*). Only material from the sunken features infilled during the occupation of the settlement, i.e. features from the first building phase, was submitted for archaezoological analysis. That includes 123 larger features (among them: 19 semi sunken houses, 3 timber huts, 31 storage pits, 20 kilns), bones were present in 79 of them (i.e. 64 %). From total number of 409 post holes 39 contained bones (i.e. 10.2 %) and a small assemblage of bones from them (2.3 %, *Tab. 7*), which belong mainly to the peripheral palisade round the acropolis (feature 16), was also included into the analysis. Also material from the remnant of a cultural layer (feature 127) was included (see *below*). According to the interpretation of M. Zápotocký features of this first building phase, including all the material sealed in these features, were infilled, probably in a single operation, during the restructuring of the enclosed settlement into a hillfort. Contamination by earlier archaeological material was not possible and there is no evidence for a later settlement and pottery from these features is always assigned to Řivnáč culture. Contamination by small fossorial vertebrates was not osteologically observed – rodent bones were sporadic and there was no evidence of fossorial species (regarding the interpretation of the frog bones see *Section 7.5.2.4*).

Features from the second building phase, i.e. mainly the three ditches (inner ditch /feature 3/, middle ditch /feature 2/ and outer ditch /feature 1/) and the three large sunken houses (34, 37 and 73) were probably being infilled for a long period after the abandonment of the settlement and so bones from these features can be later than the Řivnáč culture. Although Řivnáč pottery completely predominated even within these features the osteological material was generally removed from the analysis. Also material from the ramparts was not included since contamination was more likely due to the upstanding structural character of these features. From the second building phase only bones from the bottom of ditch 1 were included, since they are considered uncontaminated (only bones from deeper layers bellow a stone mass – these bones could have originally come from the bailey area in the first building period). Also material from layers of outside features was excluded from analysis – material from trenches 1 to 12 on the north-eastern slope since they contained medieval pottery and material from features 38 and 39 which contained Bronze Age pottery. This selection reduced the material recovered from the field work to a half, but it ensured that only Řivnáč horizon material was analysed. The excluded material was briefly looked at, and no anomalies or features, which potentially could significantly influence our results, were observed. All artefacts and one complete metatarsus of an aurochs from ditch 3 were selected from this non-analysed material. Altogether there are 15 611 fragments, but 4 303 of them are minute fragments of only several millimetres (relative size 7 – see *Section 7.5.1.4*). Total weight of the analysed material is 99.3 kg and the weight of non-analysed material is 61.3 kg.

The majority of the features were presumably infilled all at the same time. The osteological assemblage covers material, which was to be found within the settlement and was probably deposited into the features in a non-selective way. Hence, in the specific case of the Kutná Hora-Denemark site, this relatively large bone assemblage gives evidence about a relatively short time period, i.e. several years before the remodelling of the settlement (see *Section 7.5.1.2*). On other sites, howbeit monocultural types, the time context of the features usually has less clarity.

7.4. Methodology

7.4.1. Determination of species

Domestic cattle (*Bos taurus*) and aurochs (*Bos primigenius*) were distinguished on the basis of size. Information concerning aurochs sizes was adopted from several publications, but mainly from *Degerbøl – Fredskild* (*1970*). Distinguishing between aurochs (*Bos primigenius*) and wisent (*Bison bonasus*) in fragmentary material is problematic. For determination comparative collections of archaeozoological department in The Institute of Archaeology in Prague and the publications *Boessneck – Jéquier – Stampfli* (*1963*) and *Patou-Mathis – Auguste* (*1994*) were used. Domestic pig (*Sus s.* f. *domestica*) and wild boar (*Sus scrofa*) were identified on the basis of size with help of the comparative collections. A wide size interval was left for general cattle and pig not assigned to either domestic or wild form. Sheep and goat were distinguished with help of the comparative collections and the publications *Boessneck – Müller – Teichert* (*1964*); *Prummel – Frisch* (*1986*); *Payne* (*1985*) and *Halstead – Collins – Isaakidou* (*2002*).

A number of fragments could not be determined to species; there are therefore instrumental categories in the tables: 'Small ruminant' including sheep + goat + roe deer, '*Cervus/Sus* size group' including bones of boar to red deer size. There is a high percentage of wild species in the assemblage, which makes the distinguishing of domestic or wild species difficult, especially in case of cattle or pig. In the quantifications there is therefore a large group of this undistinguishable form: '*Bos/Bison*' which includes bones not assigned to domestic or wild species of large bovids (domestic cattle, wild *Bovini*), '*Bos primigenius* f.?' or '*Bos* f.?' including bones not assigned to domestic or wild form of cattle (*Bos taurus* or *Bos primigenius*). '*Sus scrofa* f.?' or '*Sus* f.?' includes bones, where domestic or wild form of pig could not

be recognised (*Sus scrofa* f. *domestica* or *Sus scrofa*). Evaluation of the rate of hunted and domestic animals (*Graph 12*; *Tab. 11*) includes also the portion of these non-determined forms of cattle and pig, plus the sporadic taxons with not clear domestic/wild satus (dog/wolf, sheep/goat/roe deer group and horse).

Czech equivalents of Latin names of species are presented in *Tab. 7* and *11*.

7.4.2. Methodology of quantification

Evaluation of representative taxons uses several quantification methods:

(1) NISP (number of identified specimens) covers the basic number of bones or fragments. Each fragment was always included as a single item. Singularly part of a dog skeleton from the feature 124 with a total of 41 bones or fragments were entered as one item. Taking into account each bone separately would distort the quantification of this species. If two or more cojoining fragments could be fitted, they were counted as a single item. Antler fragments were entered as a single item independently of weather they were sheds or not.

NISP	definitely shed	definitely attached to skull
red deer	2	5
roe deer	0	3

Since the finds of antler fragments, which amount 21 % of red deer bones and 26 % of roe deer bones, usually come from hunted animals and not from sheds, this method of counting would not greatly influence the image of hunted cervids.

(2) Method of the number of positive contexts (features) adds up the features, which contained one bone at least of relevant species or taxon group. Since the features are not equal in size, they will be quantified as separate groups: (a) the ditch (feature 1), (b) post holes and (c) other features (storage pits, semi sunken houses etc.) – see *Tab. 7*.

(3) Weighing method. Only the larger determinable fragments for each species and individual anatomical parts in the case of the more common species were weighed (*Tab. 9* and *12*; *Graph 6, 8, 10*). The total weight of material evaluated in this way is 42 % from the analysed sum. Excluding the tiny, mostly undeterminable, fragments from weighing will not overly influence the results.

(4) MNE (minimal number of elements) method probes the minimum number of anatomical units (i.e. complete bones), which could be identified in the assemblage. This quantification was used for selected bones only (see *Tab. 10*) and for the more represented species. For comparison of species representation the sum of MNE of various anatomical parts will be used (*Graph 13*).

(5) MAU (minimal number of animal units) method is counted by dividing MNE by the real number of anatomical units in the body of an animal (usually 2 in case of long bones). This method eliminates the multiplying effect given by various numbers of anatomical parts and anatomical differences in various species. This enables more visual comparison of body parts representation within a body than using the MNE method (*Tab. 10*).

(6) Minimum number of individuals (MNI) was probed for selected bones and species only, for each anatomical unit separately (*Tab. 10*; *Graph 7*). Quantification of the MNI was done on basis of size, age and gender. The total MNI, i.e. of the total material of individual species, was not determined.

(1), (3), (4), (5) and (6) methods are useful for the comparison of species representation (*Tab. 6, 7, 8, 11, 12*; *Graph 9, 10, 12, 13*) as well as representation of body parts, i.e. anatomical parts (*Tab. 10, 13, 14*; *Graph 6, 7, 8*). Method (2) was used for evaluating representation of species only (*Tab. 11*; *Graph 12*).

One has to admit, that the methods 2, 4, 5 and 6 overrate the less represented species. For more details, discussions and exact definitions of applied quantification methods see *Chaplin* (*1971*); *Klein – Cruz-Uribe* (*1984*); *Grayson* (*1984*); *Reitz – Wing* (*1999*) and *Kyselý* (*2004*).

The NISP method and weight was used for evaluating equality in the representation of species between the acropolis and in the bailey (*Graph 9* and *10*). The lower part of the graphs always contains the absolute data. The upper part shows how more often is the species represented on the acropolis (top) or in the bailey (bottom). The null value (horizontal line) means, that the species is distributed in an appropriate rate. As null is considered the rate of total amount of determined material (i.e. all analysed species together) in the acropolis and in the bailey.

Representation of anatomical parts is quantified for total material according to NISP (*Tab. 13* and *14*) and for the most represented species according to weight (*Tab. 9*; *Graph 6* and *8*) and to MNE, MAU and MNI (*Tab. 10*; *Graph 7*). The weighing method (*Graph 6*) should probe whether the relevant anatomical parts are underrated or overrated within the material: in the lower part of *Graph 6* there are absolute weights of anatomical parts, in the upper part there is the percentage of finds, which indicates approximately how much is the appropriate anatomy represented more (above horizontal axis) or less (below horizontal axis) against presumed ideal state. Ideal state (horizontal axis, i.e. the null value) means in this case, that weighs or appropriate anatomical parts are represented equally, i.e. as in a body of a living individual. Live weight standards (*Tab. 9*) of anatomical parts were adopted from *Steppan* (*2003*). His relative rates for domestic cattle were used for domestic and wild cattle and red deer from Kutná Hora - Denemark and those for domestic pig were used for domestic pig and wild boar. Since vertebrae and ribs are usually not determinable to species and therefore underrated within the material, they were excluded from this analysis. Also antlers were excluded since within the analysed species they occur on red deer only. The number of individuals identified

on the base of various anatomical parts (MNI) should correspond in the ideal case; lower values visible in the case of some body parts (*Tab. 10*) may therefore indicate intentional manipulation. However it must be admitted that the acquired amount of data is relatively low in the case of the MNI method for individual anatomical parts of individual species.

Differences in the representation of anatomical parts on the acropolis and in the bailey were probed again by the weighing method (*Graph 8*). Analogically with *Graph 6* the upper part shows how much more the anatomical parts are represented on the acropolis or in the bailey. The null value (horizontal line) means that they are distributed equally on the acropolis and in the bailey (i.e. with the rate given by total representation of a certain species). Values above null mean higher relative occurrence of the species on the acropolis, values bellow null mean higher occurrence in the bailey. Vertebrae and ribs were again excluded.

7.4.3. Methods for estimating the age of individuals

The age was estimated on the basis of two facts:

(1) The stage of fusing of long bones epiphyses and phalanges epiphyses. *Table 15* summarises the numbers of bones with fused or unfused epiphysis[5]. If epiphysis fuses in the same or a very close period, they are summed up in one row; proximal phalanges, proximal radius and distal humerus of cattle fuse in his 1.5 year for example. Absolute data of epiphyses fusing used in the *Tab. 15* and in the *Graph 18, 19, 22, 26, 27* and *28* are adopted from *Silver* (*1969*) in the case of cattle, pig, sheep/goat, horse and dog, from *Heinrich* (*1991*) in the case of red deer, from *Tomé – Vigne* (*2003*) in the case of roe deer and from *Fandén* (*2005*) in the case of beaver. The fusion of epiphyses can be delayed by castration (*Figdor 1927*), but this fact could not be considered in our analysis since it was not possible to identify castratos bones. *Graph 18, 19, 22, 26, 27* and *28* show the rates of finds (NISP) with fused or unfused epiphysis in selected age categories. If a complete long bone with both epiphyses was found (which was the case of beaver only) it was included just once, not twice. The disadvantage of this method is that it cannot provide further segmentation of age older than the fusion of the latest fusing epiphysis, which in case of domestic animals is maximum up to 3.5–4 years. Character of age distribution for older age categories can be estimated by the state of dentition.

(2) The second method estimates age according to teeth eruption and abrasion (analysis included isolated teeth as well as jaw fragments). Estimated span (see the height of grey rectangle in graphs) and number of teeth in a find (number in the rectangular) is registered for every find (jaw or tooth) with determinable age of the individual – *Graph 16* and *23*. The number of finds in given age span (A) and total number of teeth in given age span (B) are then analysed separately in so called kill-off pattern and survivorship or slaughter curves (*Graph 17, 20, 21, 24, 25*). Age was determined at cheek teeth only (all permanent and deciduous molars and premolars), incisors and canines were not included. In the course of personal observations of comparative complet skulls of suids and ruminants I did not find big differences between times of eruptions and abrasion stages in upper and lower cheek teeth of one individual. This experience encouradged me to use a combination of both (upper and lower) teeth for the analyses.

For estimation of absolute age of an individual a combination of sources was used: (a) values of absolute time of eruptions of individual teeth and (b) abrasion stage of individual teeth. The following methods were used:

In case of cattle: absolute age estimated according to (a) values of teeth eruption stated by *Silver 1969* and *Schmid 1972* (values for permanent teeth: M1 – 5–6 months, M2 – 15–18 months, M3 – 24–30 months) and (b) abrasion stage of erupted teeth after an index (crown height/width of the neck of the tooth), used in methodology by *Ducos 1968*. Finds are analysed after equal time periods, i.e. half a year (*Graph 16* and *17*). Finds which overrate this interval, which is the majority, are divided by the number of impinge periods. Values with decimal point occur in this way – *Graph 16*. This system enables synoptic expression of the distribution (*Graph 17*).

In the case of sheep/goats: absolute age estimation is done on basis of methodology by *Payne* (*1973*) and, in case of erupted teeth, by *Helmer* (*1995*) with index crown height/width of the neck of the tooth. Finds are sorted into categories after *Payne* (*1973*): categories A–I (*Graph 23*). Intervals in the case of sheep/goat vary in size and are shown with corresponding widths (see *Graph 24* and *25*). The graphic form (*Graph 24* and *26*) was corrected, i.e. the finds impinging into several intervals are divided by the number of intervals and the results are divided by the width of the intervals. Division of total number of usable data transforms the data into percentages. Relatively large differences in the *Graph 24* and *25* are caused by the fact that apart from several singular teeth several almost complete jaws were also available.

In the case of pig: absolute data for teeth eruptions are quoted from values for wild pigs in *Matschke* (*1967* – table 1), which seem to correspond better with primitive domestic forms. Abrasion stages (codes after *Grant 1982*) were unified with absolute age after *Horard-Herbin* (*1997*). Before completing the graphs correction was done as with the sheep/goat. Nevertheless some primary data did not allow definition of exclusive intervals at the lowest age categories (*Graph 20* and *21*). Age estimation of finds with known gender (*Tab. 18*) was done as stated above, plus in some cases the state of incisors or canine teeth was also evaluated (after *Silver 1969* and *Habermehl 1975*).

Publication by *Lochman et al.* (*1979*) was used in the case of red deer.

[5] Fused means that diaphysis and epiphysis are not found as two isolated osteological pieces but are firmly attached one another.

7.4.4. Methodology for gender determination

In the case of pigs the gender was identified after morphology of canine teeth or their alveoluses. In two cattle cases the gender was identified after pelvis fragments using a drawing by *Grigson* (*1982*). Pelvis fragments of sheep/goats were qualified after the work of *Boessneck – Müller – Teichert* (*1964*). In the case of red deer the gender was determined by presence of a canine tooth. Each individual item of evidence was included in *Tab. 17* and *18* just once (NISP); cervid antler fragments were not included in the quantification because females cannot be recognised by them.

7.4.5. Determination of season

The season of death of individuals could be recognised from some fragments of cervid antlers where the stage of development was recognisable. Also an estimation of absolute age for pigs could be used, which was added to average presumptive time of birth, i.e. to three and half months. This presumption was chosen since modern wild boars are born mostly in March or April and the prehistoric domestic breeds presumably had a reproductive rhythm similar to wild populations (*Herre 1986*; *Dobney – Ervynck 2000*). Possible human interference into this rhythm is not taken into account. Only the youngest age categories were used since there the age estimation is most accurate, specifically finds up to 16 months old. If the date estimation exceeded one month, a correction was made, dividing by the number of months. The result was subsequently transformed into a percentage from the total number of finds (*Graph 33* and *34*).

7.4.6. The metrics

Metric evaluation was chiefly performed after *Driesch* (*1976*): *Tab. 23*. The dimensions not measured after Driesch are explained in the *Tab. 23*. For the combined evaluation of several measurements together (*Graph 15* and *32*) the log-ratio method was used (*Simpson – Roe – Lewontin 1960*). Use of this method in archaeozoology is described in greater detail by *Meadow* (*1999*). Only cattle and horse was evaluated in this way. *Graph 15* shows the evaluations of distal widths of proximal phalanx together with proximal widths of middle phalanx. As standard (null value) values for aurochs males from Danmark were used (*Degerbøl – Fredskild 1970*). The choice of dimensions, methodology, discussion of the results and other aspects are described in greater detail separately (*Kyselý 2008b*). *Graph 32* evaluates all usable postcranial dimensions of horses. The skeleton of Przewalski horse from National museum in Prague (P6V 48351, female "AFRODITA") was used as standard (null value) during log-ratio transformation, a skeleton of a donkey from the collections in archaezoological department of the Institute of Archaeology in Prague (female, ZOO Ostrava 1984) was used as comparative material – *Tab. 20*.

7.5. Results

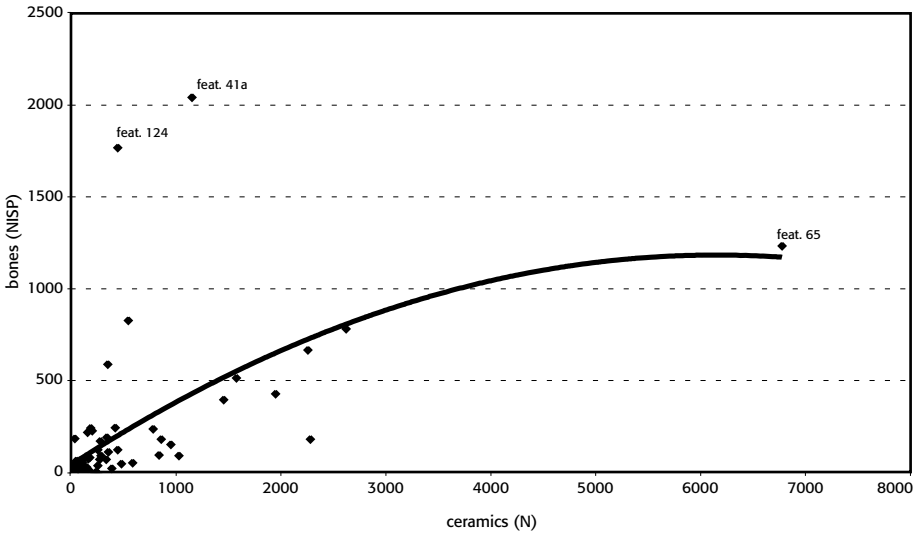
7.5.1. Taphonomy observations

7.5.1.1. Pottery vs. bones (number)

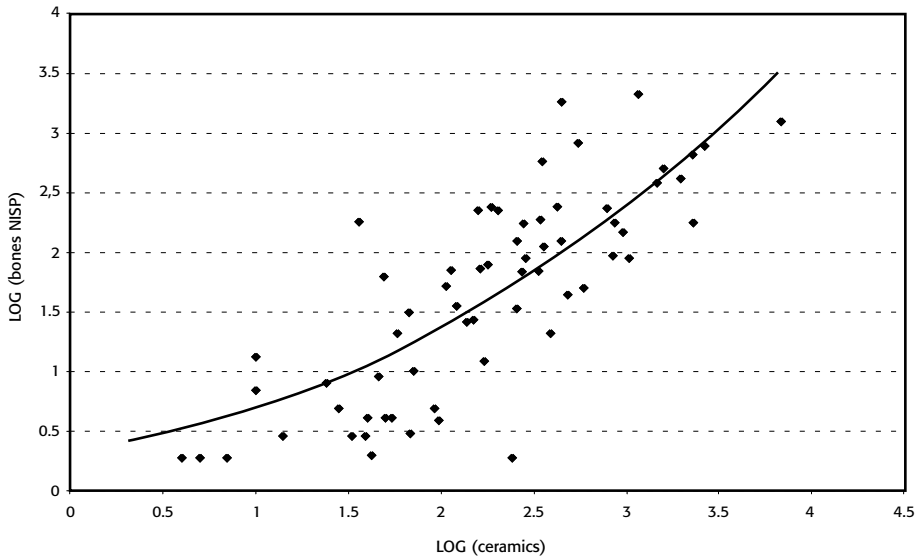
A test to examine whether large amounts of pottery in the features correspond with a large quantity of bones. The number of pottery fragments (data provided by M. Zápotocký) was compared to the number of bones/fragments (NISP). The comparison proved that correlative coefficient is of positive value (*Graph 1* and *2*), meanwhile there are large individual differences between features (compare for example in *Graph 1* the richest features 41a, 65 and 124). The correlative coefficient is relatively low (0.54), prospective estimation of bone number from the amount of pottery is therefore not reliable, nor feasible.

7.5.1.2. Preservation of bones

Altogether about fifteen thousands bones/fragments, including minute fragments, were evaluated from this site, but only 23 % could be zoologically identified to species or genus because the assemblage was very fragmentary and the surfaces of the bones were often strongly eroded. Preservation of bones differed significantly in various features with differences being observed in the level of erosion, colour, and fragmentation. The specific conditions of some features enabled very good preservation of even the minute bones of frog and fish (for example feature 36 and 103). To the contrary bones from other features were in relatively poor condition. A large amount of the assemblage had a 'chalky' character, probably caused by partial de-calcification. The preservation and character of the material was influenced by the micro environment, mainly because of uneven relief, burning, gnawing and digesting by dogs, the differences in size and the robustness of bones of various species, and other factors. In essence it means that small species and young individuals, whose bones resist less to the factors mentioned above, will be underrated in our calculations. Often bones with different level of erosion, fragmentation and colour were mixed in one feature. Differences in bone character is in my opinion caused, among other things, by some bones being thrown fresh into a features (i.e. shortly after consummation), while other were subjected to erosion on the surface of the settlement for a longer period before becoming included in a feature fill. This period is limited by several factors; the duration of the settlement, resistance of the bones, destruction on the surface by scavengers, meteorological impact and other environmental conditions. Generally the longer the bones are on the surface, the lower the probability of their successful preservation. Presumably therefore the analysed material enclosed generally represents a relatively short time period, specifically a few years just before the re-development of the settlement.



Graph 1. *Kutná Hora - Denemark – relationship between the amount of pottery and bones in individual features (number of specimens).* — ***Graf 1.*** *Kutná Hora - Denemark – vztah množství keramiky a kostí v jednotlivých objektech (počet nálezů).*



Graph 2. *Kutná Hora - Denemark – relationship between the amount of pottery and bones in individual features (number of specimens; calculated in a logarithm).* — ***Graf 2.*** *Kutná Hora - Denemark – vztah množství keramiky a kostí v jednotlivých objektech (počet nálezů; logaritmováno).*

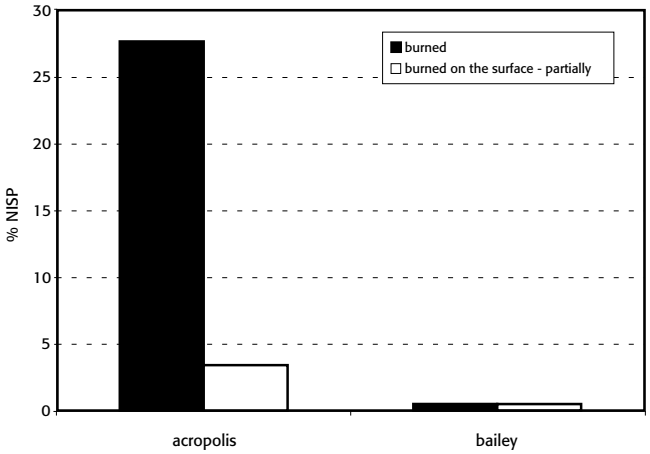
7.5.1.3. The cause of bone accumulation and charring

The nature of the bones clearly show that the majority of the 15 000 fragments are a waste product of human sustenance or of other economic use of animals (fur products etc.). According to the interpretation of M. Zápotocký the presence of material, including bones, in the features is a result of cleaning, which is also indicated in several ways directly by the bones. Evidence of cleaning is supported by charring and burning of bones, which occurs in a number of features, sometimes in high quantities. Evidence for contact or close association with fire was observed on 25 % of all bones (presence of charred/burnt bones in individual features is shown in *Tab. 2*). Charred or burnt bones were present in 50 from 80 larger features and in 16 from 39 osteologically positive post holes. Comparison of burnt bone proportions in the bailey and at the acropolis (*Tab. 3*; *Graph 3*) showed that the acropolis material is much more affected by fire. The bulk of the burnt bone comes from feature 41/41a (*Tab. 3*), however the greater amount of burnt bones at the acropolis is evident even if this feature is excluded from the comparison. If the burning really happened mostly just before clearing the material into pits, it can also reflect intensity or extent of fire use in various places. The kilns vary in the percentage of burnt fragments: for example in the pit with a kiln 124 only 4.5 % of the fragments are burnt, while in the kiln 125 it is approximately 38 % of the fragments.

Considering the character and position of burning, some of the burnt fragments can only partly be the result of baking in open fire, such as the tibia and humerus of a beaver from feature 22 and a fragment of wild cat humerus from posthole 155 and other bones of cattle, pigs, red deers and sheep/goats for example. Charring of frog bones (see *below*), will not be a result of baking since the meat would burn as well, but probably relates to cleaning. Even if one can presume, that many portions of food were boiled including the bones, this way of preparation could not be distinguished on the bones. Some of the fragments are so big, that it would be difficult to place them even in medium large

	Feature	burned completely	burned on the surface — partially	non-burnt fragments
larger features	1 - ditch	40	4	828
	7	0	0	10
	9	1	1	23
	12	1	2	6
	16-K155	0	0	15
	16-k157	6	0	2
	16-k159	0	0	1
	19	0	0	110
	21	3	0	177
	22	13	5	759
	25	15	0	85
	27	360	3	151
	28	55	0	96
	29	13	0	8
	29a	8	1	70
	3	2	0	10
	30	32	0	203
	32	71	0	109
	33	24	0	65
	34	1	0	0
	35	45	0	6
	36	91	5	911
	41a	1808	19	215
	41	65	1	329
	42	0	0	3
	43	0	0	1
	44	0	0	2
	45	1	0	3
	47	2	0	10
	48	0	0	1
	50	19	0	26
	51	0	0	3
	52	0	0	4
	53	2	3	420
	56	1	0	33
	57	0	0	26
	59	0	0	4
	60	3	0	239
	61	1	0	1
	62	0	0	1
	63	31	1	633
	64	1	0	6
	65	107	1	1124
	66	6	0	116
	74	21	0	72
	75	16	0	15
	79	0	0	1
	80	1	1	68
	83	0	0	8
	84	2	0	67
	90	2	4	163
	91	0	0	3
	92	100	0	90
	93	0	0	35
	94	0	0	5
	95	2	0	25
	96	0	0	5
	97	0	0	21
	98	0	0	3
	102	3	0	213
	103	184	0	402
	104	3	0	86
	105	0	0	13
	107	0	0	1
	108	0	0	2
	109	0	0	1
	112	0	0	1
	114	0	0	63
	115	11	0	42
	117	2	0	0
	118	0	0	1
	119	3	0	67
	120	0	0	4
	121	0	0	3
	124	80	5	1683
	125	168	14	297
	126	22	0	49
	127	25	2	199
	130	20	2	219
	131	2	0	0
	K3	50	0	55
	K4	0	0	11
	K7	0	0	3
	K14	0	0	2
	K74	0	0	2
	K89	0	0	5
	K100	0	0	1
	K111	0	1	1
	K113	0	0	2
	K114	0	0	7
	K115	0	0	1
	K117	3	0	2
	K182	0	0	1
	K185	0	0	1
	K267	0	0	1
	K274	5	0	8
	K282	0	0	2
	K284	1	0	3
	K288	0	0	16
	K292	31	0	3
	K299	0	0	3
	K302	0	0	4
	K350	1	0	1
	K352	2	0	7
	K353	10	0	0
	K354	2	0	2
	K355	0	0	1
	K358	10	0	2
	K360	2	0	4
	K361	0	0	2
	K369	0	0	1
	K371	0	1	3
	K372	0	0	2
	K376	0	0	1
	K377	2	0	1
	K379	0	0	2
	K401/2	3	0	5
	K403	4	0	2
	K?	0	0	1
	?	1	0	1
	124	23	0	466
	125	10	0	44
	130	1	0	34
TOTAL		3656	76	11488

Tab. 2. *Kutná Hora - Denemark – distribution of charred and burnt bones in the features (quantification after NISP).* — ***Tab. 2.*** *Kutná Hora - Denemark – distribuce opálených a spálených kostí v objektech (kvantifikace dle NISP).*



Graph 3. *Kutná Hora - Denemark – comparison of the amount of charred and burnt bones at the acropolis and in the bailey.* — ***Graf 3.*** *Kutná Hora - Denemark – srovnání množství opálených a spálených kostí v akropoli a předhradí.*

Tab. 3. *Kutná Hora - Denemark – quantification of charred and burnt bones after NISP. —* ***Tab. 3.*** *Kutná Hora - Denemark – kvantifikace opálených a spálených kostí dle NISP.*

	acropolis		bailey	acropolis %		bailey %
	total	just feat. 41/41a		acropolis %	just feat. 41/41a	
burned on the surface - partially	61		15	0.5		0.6
burned	3499	1872	74	28.9	15.4	2.8
TOTAL	12125	1872	2642		15.4	

pots (for example parts of the long bones of aurochs from the semi-sunken house 22; the maximum diameter of the humerus fragment is 24 cm).

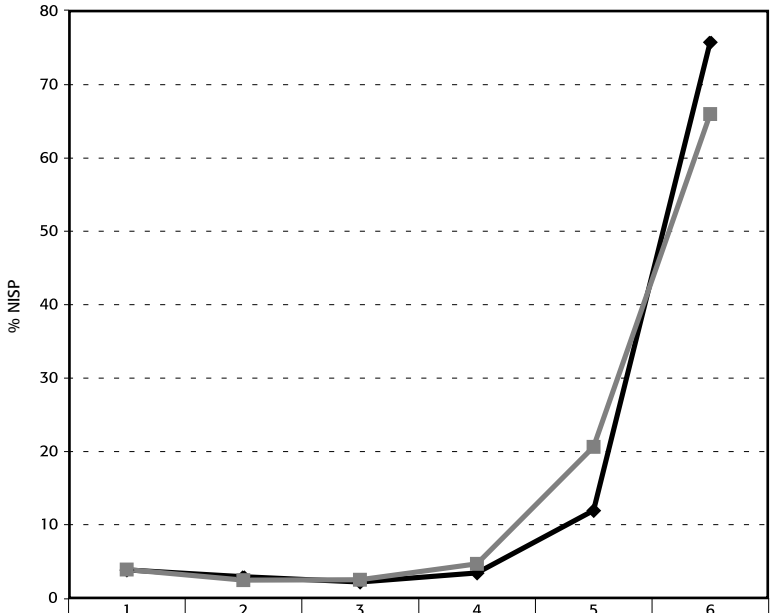
7.5.1.4. Fragmentation

For the evaluation of fragmentation the relative size of each fragment was recorded: 1 = whole bone, 2 = more than half of a bone, 3 = almost half a bone, 4 = less than half of a bone, 5 = fragment, 6 = small fragment, 7 = minute fragment (usually millimetres) – *Tab. 4*; *Graph 4* and *5* (frog bones excluded). Fragmentation is a result of intentional impact and other taphonomic agents (see *Lyman 1994*). For the evaluation of the scale of intentional impact fragments of category 7 will be excluded, since it is considered that most of them are the result of spontaneous decay, although intentional crushing of bones cannot be totally ruled out. The majority of bones belong to category 6. Since the manner of fragmentation depends on the type of bone, intensity of fragmentation is influenced by the representation of anatomical parts. Therefore fragmentation was evaluated separately for long limb bones only (*Tab. 4*; *Graph 5*). In this case fragments of category 5 prevail. The reason for the smallest included category to be relatively little represented is, that such tiny fragments are difficult to be anatomically determined (even though the long bones were included, which could not be anatomically closely identified). Both analysis point to a high level of fragmentation, which evidently corresponds with butchery and kitchen practices. Significant differences between the acropolis and the bailey were not observed. The largest fragment was a shed half of a red deer antler (burr) from feature 65, layer 2, with a maximum length of 0.57 m.

relative size	all material	
	acropolis	bailey
1	294	88
2	224	55
3	167	56
4	264	105
5	918	466
6	5844	1492
7	3798	337
total	11509	2599

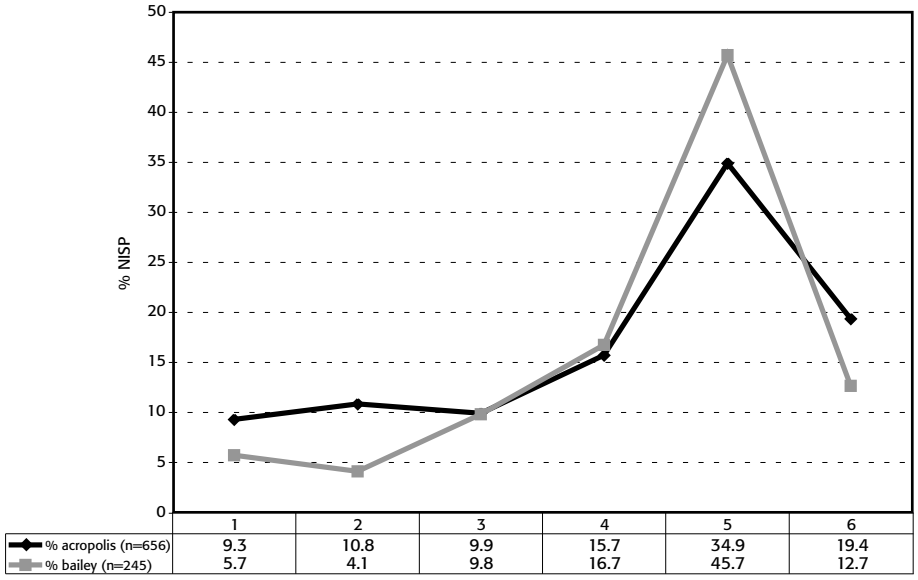
relative size	long bones only	
	acropolis	bailey
1	24	10
2	71	10
3	65	24
4	103	41
5	229	112
6	127	31
total	619	228

Tab. 4. *Kutná Hora - Denemark – relative size of fragments quantified after NISP (for explanation see Section 7.5.1.4). Frog bones excluded. —* ***Tab. 4.*** *Kutná Hora - Denemark – relativní velikost fragmentů kvantifikovaných dle NISP (metodika viz kap. 7.5.1.4). Žabí kosti vyloučeny.*



	1	2	3	4	5	6
% acropolis (n=7711)	3.8	2.9	2.2	3.4	11.9	75.8
% bailey (n=2262)	3.9	2.4	2.5	4.6	20.6	66.0

Graph 4. *Kutná Hora - Denemark – relative size of fragments; all fragments except size category 7 (see Section 7.5.1.4 for explanation). —* ***Graf 4.*** *Kutná Hora - Denemark – relativní velikost fragmentů; všechny fragmenty kromě velikostní kategorie 7 (definice kategorií viz kap. 7.5.1.4).*



	1	2	3	4	5	6
% acropolis (n=656)	9.3	10.8	9.9	15.7	34.9	19.4
% bailey (n=245)	5.7	4.1	9.8	16.7	45.7	12.7

Graph 5. *Kutná Hora - Denemark – relative size of fragments; long bones only (see Section 7.5.1.4 for explanation).* — ***Graf 5.*** *Kutná Hora - Denemark – relativní velikost fragmentů; pouze dlouhé kosti (definice kategorií viz kap. 7.5.1.4).*

7.5.1.5. Gnawing

As suggested above, a large number of the available bones could have been consumed by dogs. The presence of dogs within the settlement is evident from finds of both dog bones and coprolites, and from the distinctive gnawing marks observed on many of the bones. Since the acropolis with most of the finds was enclosed by a palisade even in the older phase, it is not likely that gnawing on the bones could be caused by other beasts, such as wolves and foxes, since it is presumed that they would not be able to get inside the settlement. Gnawing was registered on about 1 % (NISP) of finds and is present in a total of 30 from 119 settlement features (*Tab. 5*). Significant differences in the quota of gnawed bones in the acropolis or in the bailey were not observed.

	NISP			
	acropolis	bailey	acropolis %	bailey %
total	12 139	2 645		
gnawed by dogs	99	33	0.91	1.25
gnawed by rodents/hares	11	0	0.08	0

Three fragments, red deer antler and a metapodium of a boar, were gnawed by rodents and other fragments, usually antlers, were gnawed either by rodent or hare. All come from the acropolis, but since it is mostly red deer antlers, they could have been found as sheds outside the settlement. A shoulder blade of domestic cattle from the feature 41 shows specific marks, which maybe the result of rodents gnawing (*Photo 1*). Gnawing by a dog is shown by the impressions of canine teeth on a distal epiphysis of a femoral bone of cattle (*Photo 2*).

The corroded character of some fragments suggests that they were digested (see *Lyman 1994*). This phenomenon occurred on a minimum 41 fragments from 12 features. An accumulation of such fragments was found in posthole 3 which are possible remnants of coprolite.

Feature	gnowing by rodents/hares	gnowing by dogs	gnowing?	without gnowing
1-ditch		11		861
16-K155		1		14
21			1	179
22		12	2	763
27		4		510
28		2		149
29		1		20
30		1		234
32	4	1		175
36		2		181
41a	4	5	3	2031
41	1	6	1	387
50		2		43
53		3		423
57		1		25
60	1	0	1	240
63		15		650
65		5		1228
66		2		120
80		1		72
84		2		67
90		4		165
103		1		586
119		1		69
124		5	1	1763
125		10		398
125		15	1	403
127		6		220
K352		1		8
K4		2		9
TOTAL	10	122	10	11993

Tab. 5. *Kutná Hora - Denemark – quantification of gnawed bones after NISP (features with evidence of gnawing only).* — ***Tab. 5.*** *Kutná Hora - Denemark – kvantifikace okousaných kostí dle NISP (pouze objekty s doklady okusu).*

7.5.1.6. Intentional interference and butchery practises

The bone assemblage is of a generally fragmented nature. This fragmentation was most likely intentional with the aim of extracting the marrow. Deliberate fragmentation can be proven only if incisions, cuts and similar traces are present. Such traces were observed on 197 fragments. But since the surface on most of the bones was eroded (chalky in character), it is probable

		incision	possible incision / slash	cut mark / chop off / split	possible cut mark / chop off / split	incision / chop	others	TOTAL
Equus	Talus		1					1
Bos taurus	Mandibula + dens					1		1
	Axis	2						2
	Sacrum						1	1
	Scapula	1						1
	Radius	1						1
	Metacarpus		1					1
	Tibia						1	1
	Metatarsus	1	1					2
	Phalanx I	1						1
	Phalanx II						1	1
Sus domesticus	Costa	2						2
	Scapula	1						1
	Humerus	2						2
	Ulna		1					1
	Tibia	2	1					3
	Talus	3						3
Ovis aries	Humerus	1						1
	Femur	2						2
	Tibia	2						2
cf. *Capra hircus*	Radius + ulna	1						1
Ovis/Capra	Mandibula	2						2
	Radius	2	1					3
	Pubis with acetabulum	1						1
	Metatarsus	1						1
Canis familiaris	Costa (posterior)	1					2	3
Bos f.?	Mandibula						1	1
	Hyoideum	2						2
	Vertebra thoracica	1						1
	Vertebra lumbalis	1						1
	Costa	2						2
	Scapula		1				2	3
	Radius	2						2
	Ilium	1						1
	Tibia						1	1
	Phalanx I	2					1	3
	Sessamoid (Ph1)					1		1
Bos primigenius f.?	Mandibula	1						1
	Vertebra lumbalis				1			1
	Radius	1						1
	Metacarpus		1					1
	Tibia						1	1
	Talus	1						1
Bos/Cervus	Costa						1	1
	Scapula	1						1
Small ruminant	Vertebra cervicalis			1				1
	Vertebra lumbalis				1			1
	Tibia	1						1
Sus scrofa f.?	Nasale	1						1
cf. *Sus scrofa* f.?	Hyoideum					1		1
	Costa	1						1
Sus scrofa f.?	Scapula	1				1		2
	Humerus						1	1
	Femur	2						2
	Tibia		1					1
	Centroquartale	1						1
Bos primigenius	Mandibula					1	2	3
cf. *Bos primigenius*	Costa						1	1
Bos primigenius	Humerus			1				1
cf. *Bos primigenius*	Radius	1						1
Bos primigenius	Ulna	1						1
	Carpale 4	1						1
	Ilium	1						1
	Tibia		1					1
	Talus	1						1
	Centroquartale	1						1

		incision	possible incision / slash	cut mark / chop off / split	possible cut mark / chop off / split	incision / chop	others	TOTAL
Bos primigenius	Nasale		1			1		2
	Occipitale				1			1
	Vertebra						1	1
	Vertebra thoracica	1						1
	Metacarpus	3						3
	Calcaneus	1						1
	Metatarsus	1						1
Cervus elaphus	Neurocranium				1			1
	Frontale			1				1
	Antler	2						2
	Scapula	1					2	3
	Humerus	1						1
	Radius	1						1
	Ulna				1			1
	Tibia	1						1
	Centroquartale	1						1
Capreolus capreolus	Neurocranium						1	1
	Antler	1						1
	Atlas	1						1
Sus scrofa	Vertebra lumbalis				1			1
	Scapula	1						1
	Humerus	1						1
	Radius	3						3
	Ulna	1						1
	Metacarpus 2	1						1
cf. *Sus scrofa*	Tibia						1	1
Sus scrofa	Calcaneus	1						1
	Talus	1						1
	Tarsale 4	1						1
	Phalanx I			1				1
Castor fiber	Vertebra thoracica	1						1
	Humerus	2						2
	Femur	1						1
	Vertebra caudalis			8				8
Large mammal	?	7				1	1	9
	Calva	1						1
	Vertebra thoracica	1			1			2
	Costa	7	4				1	12
	Pelvis		1					1
	Undetermined						1	1
Sus scrofa/ Cervus size group	?						1	1
	Hyoideum	1						1
	Costa	6						6
	Tibia		1					1
Medium mammal	?	4						4
	Vertebra thoracica	1						1
	Costa	15				2	1	18
Undetermined mammal	?	4						4
	Nasale	1						1
TOTAL		134	17	12	7	9	26	205

Canis familiaris - skeleton	ulna	1 (*6)
	humerus	1 (*7)
	tibia	1 (*2)
	radius	1 (*17)
	os occipitale	1 *(1)
	vertebra thoracica	1 (*7)
	vertebra cervicalis 7	1 (*4)
	vertebra lumbalis	1 (*8)

Tab. 6. *Kutná Hora - Denemark – number of bones with intentional cut marks (without artefacts) quantified after NISP; * number of cut marks on a single bone (shown only in a case of a dog skeleton). For Bos primigenius see footnote 6. —* ***Tab. 6.*** *Kutná Hora - Denemark – počty kostí s intencionálními zásahy (bez artefaktů) kvantifikovaných dle NISP; * počty zásahů na jedné kosti (uvedeno pouze v případě skeletu psa). Bos primigenius viz poznámka pod čarou 6.*

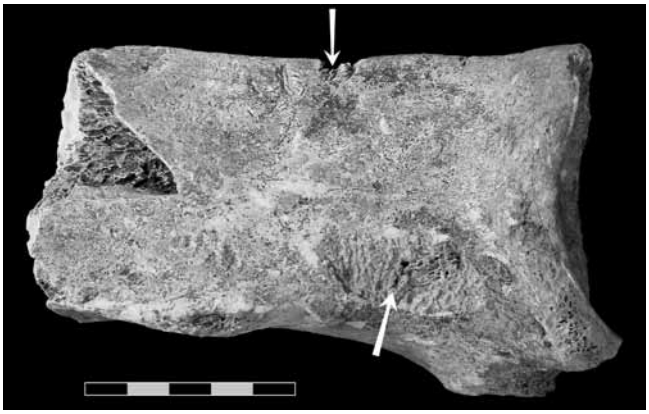


Photo 1. *Kutná Hora - Denemark – feature storage pit 41, layer 3. Bos – scapula – gnawed by a rodent in several places (arrows).* — ***Foto 1.*** *Kutná Hora - Denemark – obj. silo 41, vrstva 3. Tur – scapula – ohlodáno hlodavcem na více místech (šipky).*

Photo 2. *Kutná Hora - Denemark – feature storage pit 41, layer 3. Bos – femur dist. – gnawed by a dog of a small to medium size.* — ***Foto 2.*** *Kutná Hora - Denemark – obj. silo 41, vrstva 3. Tur – distální femur – okousáno psem menší–střední velikosti.*

Photo 3. *Kutná Hora - Denemark – feature hut 53, layer 3. Castor fiber – femur – two incisions on the collum (arrow).* — ***Foto 3.*** *Kutná Hora - Denemark – obj. chata 53, vrstva 3. Bobr evropský – femur – dva zářezy na krčku (šipka).*

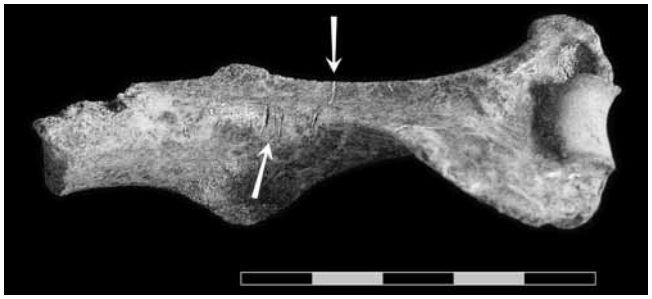


Photo 4. *Kutná Hora - Denemark – feature ditch 1, layer 80–100 cm. Castor fiber – humerus – diagonal incisions (arrows) on the dorsal side (same bone as on the photo 5).* — ***Foto 4.*** *Kutná Hora - Denemark – obj. příkop 1, vrstva 80–100 cm. Bobr evropský – humerus – příčné zářezy (šipky) na dorzální straně (stejná kost jako na foto 5).*

Photo 5. *Kutná Hora - Denemark – feature ditch 1, layer 80–100 cm. Castor fiber – humerus – diagonal incisions (arrows) on the ventral side (same bone as on the photo 4).* — ***Foto 5.*** *Kutná Hora - Denemark – obj. příkop 1, vrstva 80–100 cm. Bobr evropský – humerus – příčné zářezy (šipky) na ventrální straně (stejná kost jako na foto 4).*

Photo 6. *Kutná Hora - Denemark – feature 125, layer 4. Castor fiber – butchered vertebrae caudales.* — ***Foto 6.*** *Kutná Hora - Denemark – obj. 125, vrstva 4. Bobr evropský – rozseklé ocasní obratle.*

that many of the traces were erased. Especially shallow incisions become erased and yet they totally prevail at Kutná Hora - Denemark. Incisions make up to approximately 90 % of the traces (*Tab. 6*). Others are various scars, cuts, intentional hacking, chopping off or splitting. Stone (flint) tools were evidently used for portioning the bodies and separating the meat, which reflects

Photo 7. *Kutná Hora - Denemark – feature storage pit 90, layer 3. Bos – hyoideum with incisions on both sides (same bone as on the photo 8). —* ***Foto 7.*** *Kutná Hora - Denemark – obj. silo 90, vrstva 3. Tur – hyoideum se zářezy na obou stranách (stejná kost jako na foto 8).*

Photo 8. *Kutná Hora - Denemark – feature storage pit 90, layer 3. Bos – hyoideum with incisions (arrow) on both sides (same bone as on the Photo 7). —* ***Foto 8.*** *Kutná Hora - Denemark – obj. silo 90, vrstva 3. Tur – hyoideum se zářezy (šipka) na obou stranách (stejná kost jako na foto 7).*

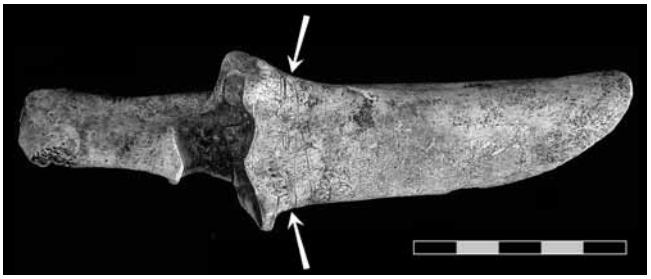


Photo 9. *Kutná Hora - Denemark – feature storage pit 41, layer 3. Cf. Capra hircus – radius + ulna – diagonal incisions circling round in the level of proximal joint surface (arrows). —* ***Foto 9.*** *Kutná Hora - Denemark – obj. silo 41, vrstva 3. ? koza – radius + ulna – příčné zářezy dokola v úrovni proximální kloubní plochy (šipky).*

Photo 10. *Kutná Hora - Denemark – feature 130, layer 4. Bos – phalanx proximalis – diagonal incisions on the proximal end (arrows). —* ***Foto 10.*** *Kutná Hora - Denemark – obj. 130, vrstva 4. Tur – phalanx proximalis – příčné zářezy na proximálním konci (šipky).*

in the irregular, uneven character of many of the incisions. Total majority of incisions and very low number of chopping marks suggest that a body stripped off the skin was divided into joint areas by knives and that separating the meat was also done by knives. Stripped long bones were consecutively broken rather than hacked to gain access to the marrow. The resulting portions were suitable enough for further manipulation such as cooking for example.

An overview of the butchery/kitchen evidence is summed up in *Tab. 6*. The location of many of the incisions on the bones of beaver (*Photo 3 to 6*) provides evidence for portioning the body and further butchery processes which indicate food preparation. Eight fragments (*Photo 6*) of transverse and obliquely chopped tail vertebrae of a beaver from feature 125, layer 4 are most probably a result of using the tail for food, minced in a soup perhaps, but an alternative interpretation cannot be excluded. There are interesting incisions on both surfaces of hyoid bone of cattle (*Photo 7* and *8*). Incisions on a caprine radius (probably of goat; *Photo 9*), are a result of dismembering the body and incisions in the proximal area of finger bone (phalanx) of cattle (*Photo 10*) could originate during cutting the finger off, however it could also be the result of skinning.

The position of incisions on the skeleton of a dog from feature 124 is evidence for beheading (*Photo 34*), dismembering and/or skinning (*Photo 12 to 14*) and possibly de-fleshing (*Photo 11* and *12*). Incisions on a distal radius and ulna bones of this dog (*Photo 13* and *14*) probably indicate the removal of the paws. Neither the paws nor the tail were found in the given context. These body parts, the paws and tail, remain attached to the hide during skinning and therefore their disposal could have been at a different location. Incisions on dog bones are not limited to the skeleton mentioned above (*Tab. 6*).

Another category of intentional impact on bones relates to the artefacts (see *Section 7.5.4*).

7.5.1.7. Representation of anatomical parts and import/export (*Tab. 9, 10, 13, 14*)

Uneven relative representation of anatomical parts can be a result of various taphonomic factors or their combinations (*Lyman 1994*). Anatomy representation was analysed on Kutná Hora - Denemark material for two reasons:

(1) to find out whether some parts are missing or are distinctly underrated. In the case of wild animals (for example red deer) this can detect whether they were transported to the settlement as complete bodies or only as selected parts of the kill. The weighing method and MNE, MAU, MNI methods were used for this analysis (*Tab. 9* and *10*; *Graph 6* and *7*, concerning the methodology see *Section 7.4.2*), since they are not so

Photo 11. *Kutná Hora - Denemark – feature 124, layer 3. Canis familiaris – vertebra lumbalis – incisions on the ventral surface.* — ***Foto 11.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – vertebra lumbalis – zářezy na ventrální ploše.*

Photo 12. *Kutná Hora - Denemark – feature 124, layer 3. Canis familiaris – humerus – incisions on the ventral surface of distal diaphysis (arrows).* — ***Foto 12.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – humerus – zářezy na ventrální ploše distální diafýzy (šipky).*

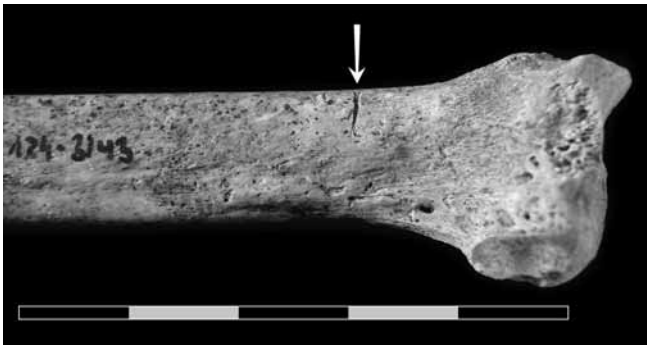


Photo 13. *Kutná Hora - Denemark – feature 124, layer 3. Canis familiaris – radius – incision on the distal end (arrow).* — ***Foto 13.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – radius – zářez na distálním konci (šipka).*

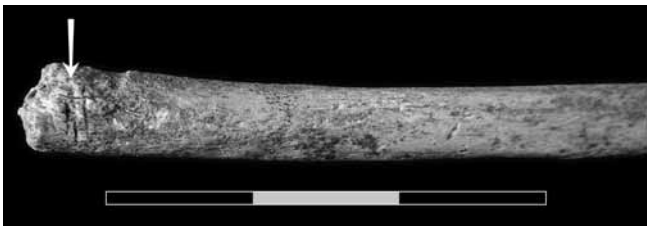
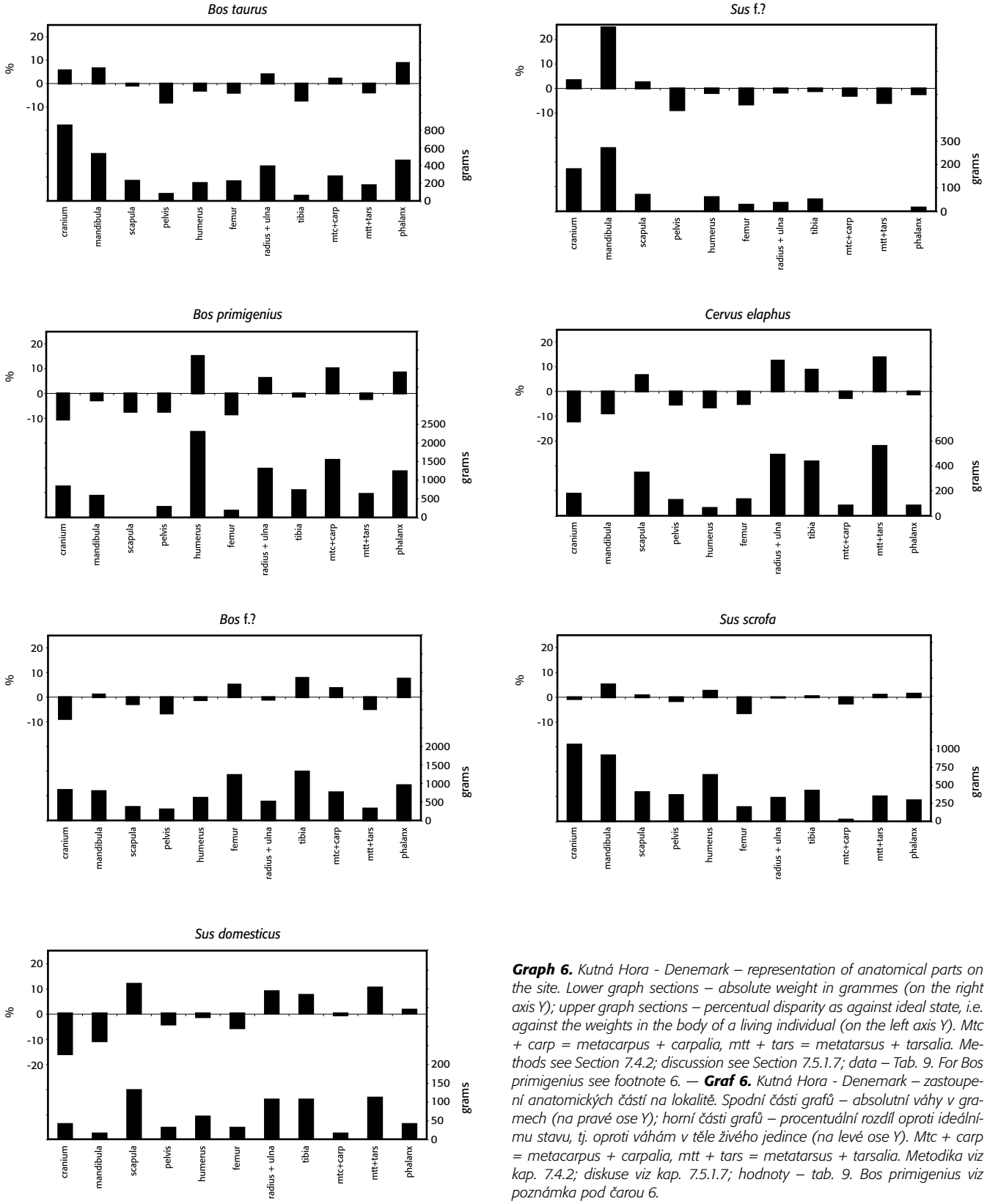


Photo 14. *Kutná Hora - Denemark – feature 124, layer 3. Canis familiaris – ulna – incisions on the distal end (arrow).* — ***Foto 14.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – ulna – zářezy na distálním konci (šipka).*

dependant on the fragmentation stage, which can be different for various anatomical parts. Although individual bones were evaluated separately, it was appropriate to evaluate larger anatomical units in overall numbers: mainly distal limb parts poor on nutrition (metacarpus + metatarsus + phalanges) versus proximal limb parts rich on nutrition (humerus + radius + ulna + femur + tibia). The result was that all the larger (summational) anatomical parts were present for all analysed species and significant underrating of anatomical parts as defined above was not observed. The concept of import/export or the selective transport of body parts was not supported by the analysis. However some differences were recognised. In the case of aurochs and red deer, according to the weights, fragments of skulls and jaws were underrated. In the case of cattle (both wild and domestic) the phalanges are overrated. The total lack of horncores is specific in all of the bovid mammals (*Tab. 13*, discussed in *Section 7.5.2.9*). Attention is drawn to the fact that by dividing the material into individual anatomical parts causes a large decrease of data in the subgroups in this analysis, the amount of material is sometimes so small, that their inclusion can have a distorting effect (for absolute data see *tables*).

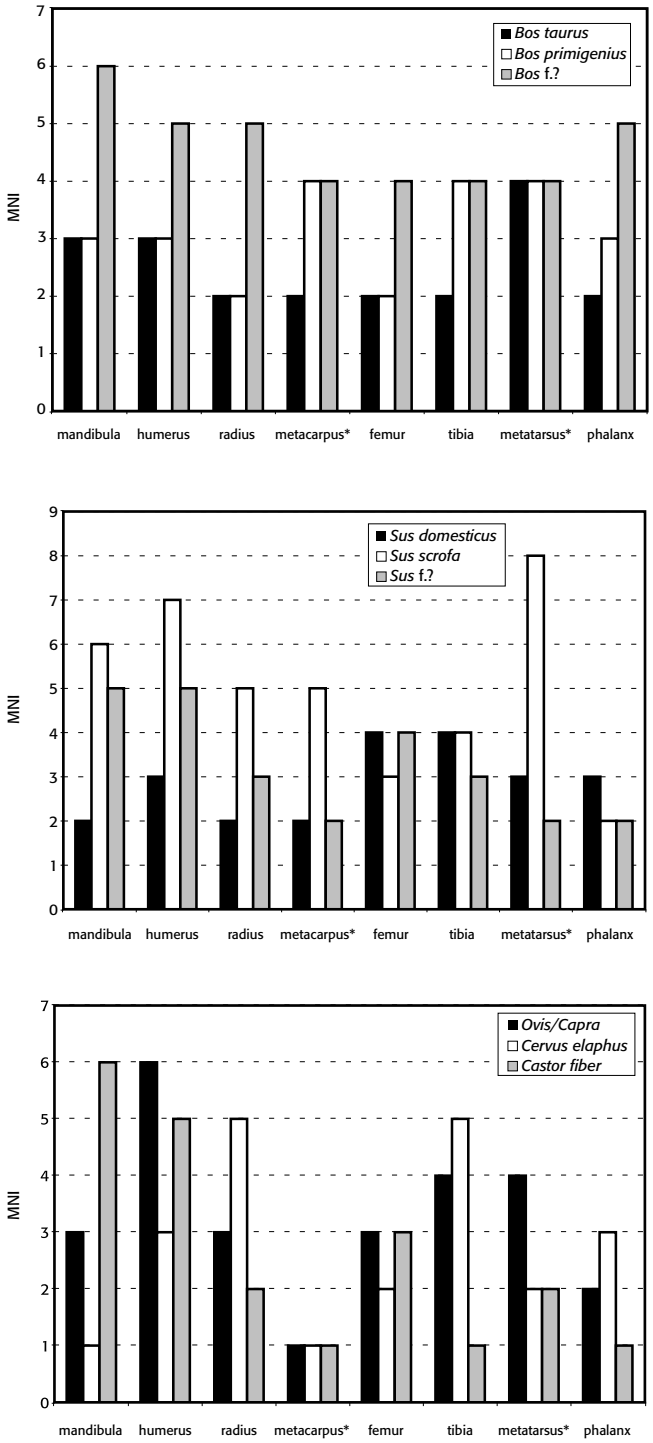
(2) to find out whether there are differences between the representation of body parts at the acropolis and in the bailey. Possible differences could be a result of spatial specialisation during processing the animal body parts; for example, the spatial division of the initial slaughter and dismembering place and the final kitchen processing. The weight method was used (*Graph 8*), again since it is not so dependent on the fragmentation stage, which can be different for various anatomical body parts. Individual anatomical elements are evaluated separately and various uneven differences are noticeable for different species. Of interest is the higher relative representation of red deer antlers and metapodia of cattle and red deers at the acropolis, since this material is traditionally used for tool produc-

Tab. 7. *Kutná Hora - Denemark – representation of species in the features quantified after NISP;. material acquired by manual selection; * size of red deer or larger, ** size from sheep to wild boar, *** size up to dog, **** all determinable elements were determined as Rana temporaria, ***** remainder of cultural layer.* — ***Tab. 7.*** *Kutná Hora - Denemark – zastoupení druhů v jednotlivých objektech kvantifikovaných dle NISP; materiál získaný ručním výběrem; * velikost jelena a větší, ** velikost ovce až divočáka, *** do velikosti psa, **** všechny determinovatelné fragmenty určeny jako Rana temporaria, ***** torzo kulturní vrstvy.*



Graph 6. *Kutná Hora - Denemark – representation of anatomical parts on the site. Lower graph sections – absolute weight in grammes (on the right axis Y); upper graph sections – percentual disparity as against ideal state, i.e. against the weights in the body of a living individual (on the left axis Y). Mtc + carp = metacarpus + carpalia, mtt + tars = metatarsus + tarsalia. Methods see Section 7.4.2; discussion see Section 7.5.1.7; data – Tab. 9. For Bos primigenius see footnote 6. —* ***Graf 6.*** *Kutná Hora - Denemark – zastoupení anatomických částí na lokalitě. Spodní části grafů – absolutní váhy v gramech (na pravé ose Y); horní části grafů – procentuální rozdíl oproti ideálnímu stavu, tj. oproti váhám v těle živého jedince (na levé ose Y). Mtc + carp = metacarpus + carpalia, mtt + tars = metatarsus + tarsalia. Metodika viz kap. 7.4.2; diskuse viz kap. 7.5.1.7; hodnoty – tab. 9. Bos primigenius viz poznámka pod čarou 6.*

tion. Evaluation of anatomical units with similar nutrition or utility value, for example distal limb parts poor on nutrition (metacarpus + metatarsus + phalangs) versus proximal parts rich in nutrition (humerus + radius + ulna + femur + tibia), did not reveal any apparent differences. Thus the analysis does not support the theory concerning the spatial specialisation of individual stages of butchery processing at the acropolis. Nevertheless the original differences could have been eliminated by the transposition of the material by dogs



Graph 7. *Kutná Hora - Denemark – minimum number of individuals based on various anatomical elements (* see Tab. 10). For Bos primigenius see footnote 6. —* ***Graf 7.*** *Kutná Hora - Denemark – minimální počty jedinců zjištěné na základě různých anatomických částí (* viz tab. 10). Bos primigenius viz poznámka pod čarou 6.*

		124	125	130	?	TOTAL
domestic mammals	*Ovis/Capra*	3				3
	Sus domesticus	3				3
wild mammals	*Sus scrofa*	2				2
	Rodentia	2			2	
domestic / wild mammals	*Bos/Cervus*	2				2
	Small ruminant	1		1		2
	Sus scrofa f.?	4				4
	Large mammal	4				4
	Medium mammal	7	1			8
	Small mammal	1				1
	Undetermined mammal	432	46	26	2	506
amphibians - fish	*Rana*	19	1	5		25
	Anguilla anguilla	2		1		3
	Undetermined fish	1		1		2
	Undetermined bone		1			1
human	*Homo sapiens*	1				1
	TOTAL determinated	35	1	6		42
	TOTAL	479	51	34	2	569

Tab. 8. *Kutná Hora - Denemark – representation of species in the features; material acquired by floatation. —* ***Tab. 8.*** *Kutná Hora - Denemark – zastoupení druhů v jednotlivých objektech; materiál získaný plavením.*

	standard		Kutná Hora - Denemark - measured data						
	Sus domesticus (%)	*Bos taurus (%)*	*Bos taurus*	*Bos primigenius*	*Bos primigenius f.?*	*Sus domesticus*	*Sus scrofa*	*Sus scrofa f.?*	*Cervus elaphus*
cranium	22.1	19.1	855	830	820	40	1070	180	175
mandibula	13.2	8.8	530	580	790	15	920	270	0
scapula	7.4	7.4	225		360	130	405	70	345
pelvis	8.8	10.3	75	280	295	30	365		125
humerus	10.3	8.8	200	2300	610	60	645	60	60
femur	10.3	10.3	220	180	1225	30	195	27	130
radius/ulna	6.6	7.4	390	1310	505	105	325	35	490
tibia	8.1	8.8	55	730	1320	105	425	50	435
metacarpus+carpalia	2.9	5.9	275	1545	760	15	20	0	80
metatarsus+tarsalia	5.9	8.8	455	1240	950	110	345	0	560
phalanx		4.4	230	535	1120	40	290	15	80
TOTAL	100.0	100.0	4039	11110	10375	765	5200	757	2815
antler									3935
vertebrae + costae			354	950	1300	65	180	50	185

Tab. 9. *Kutná Hora - Denemark – weights of individual anatomical parts of most common species. Standard after Steppan (2003), counted without vertabrae and ribs. For Bos primigenius see footnote 6. —* ***Tab. 9.*** *Kutná Hora - Denemark – váhy jednotlivých anatomických částí pro nejběžnější druhy. Standard dle Steppana (2003), přepočteno bez obratlů a žeber. Bos primigenius viz poznámka pod čarou 6.*

or because the quantity of actual material might not be sufficient enough. The plan (*Fig. 3*) shows the distribution of parts not useful for nutrition (matapodia and phalanges), which could potentially be: (a) a material for tool production (mainly metapodia), (b) primary waste produced during dismembering (metapodia above phalanges), (c) the remains after skinning (phalanges – sometimes remain attached to the skin or pelt), (d) from distal limb parts being intentionally left in the skin as handles for carrying the carcases of large wild animals in the skin (*Perkins – Daly 1968*). *Fig. 3* (with a comparison of the plan in *Fig. 2* – total bone distribution) shows that the analysed material is not concentrated in any place and is evidently not restricted to either the acropolis or the bailey. Their almost complete absence in the largest analysed features at the acropolis (features 32, 35, 59, 61, 62, 84) is given by the generally small amount of osteological material within them.

In comparison the total number of red deer bones at the acropolis is remarkable for an accumulation of distal parts of the tibia bones of red deer within a single

Fig. 2. *Kutná Hora - Denemark – plan of the site showing spatial distribution of bones in Řivnáč culture features. Features from the first building period with bones marked in black, the ditch 1 and the remainder of the cultural layer (feature 127) marked in grey. —* ***Obr. 2.*** *Kutná Hora - Denemark – plánek lokality zobrazující prostorovou distribuci kostí v objektech řivnáčské kultury. Objekty první stavební fáze s kostmi vyznačeny černě, příkop 1 a torzo kulturní vrstvy (obj. 127) označeny šedě.*

Fig. 3. *Kutná Hora - Denemark – plan of the site showing spatial distribution of limb end parts. x = 1 phalanx (Bos and Cervus together), + = 1 metapodium (Bos and Cervus together), grey = features with incidence 2 to 5 %, black = features with incidence higher than 5 % (all quantified after NISP). —* ***Obr. 3.*** *Kutná Hora - Denemark – plánek lokality zobrazující prostorovou distribuci koncových částí končetin. x = 1 phalanx (tur a jelen dohromady), + = 1 metapodium (tur a jelen dohromady), šedá = označuje objekty, kde je výskyt 2 až 5 %, černá = označuje objekty s výskytem vyšším než 5 % (vše kvantifikováno dle NISP).*

MNE (minimal number of elements)

	Bos taurus	*Bos primigenius*	*Bos primigenius* f.?	*Sus domesticus*	*Sus scrofa*	*Sus scrofa* f.?	*Ovis/Capra*	*Cervus elaphus*	*Castor fiber*
mandibula	5	6	11	3	9	12	6	2	7
humerus	4	5	7	5	14	11	7	5	9
radius	6	5	10	4	7	4	3	10	3
metacarpus*	5	9	6	7	23	4	2	3	1
femur	4	4	7	9	6	5	3	3	5
tibia	3	7	9	9	11	6	5	11	2
metatarsus*	7	6	8	13	15	8	5	5	2
phalanx*	23	18	45	12	25	8	5	17	6
TOTAL	57	60	103	62	110	58	36	56	35

MAU (minimal number of animal units)

mandibula	2.5	3	5.5	1.5	4.5	6	3	1	3.5
humerus	2	2.5	3.5	2.5	7	5.5	3.5	2.5	4.5
radius	3	2.5	5	2	3.5	2	1.5	5	1.5
metacarpus*	2.5	4.5	3	0.88	2.88	0.5	1	1.5	
femur	2	2	3.5	4.5	3	2.5	1.5	1.5	2.5
tibia	1.5	3.5	4.5	4.5	5.5	3	2.5	5.5	1
metatarsus *	3.5	3	4	1.63	1.88	1	2.5	2.5	
phalanx*	0.96	0.75	1.88	0.5	1.04	0.33	0.21	0.71	
TOTAL	17.96	21.75	30.88	18	29.29	20.83	15.71	20.21	13
MAXIMUM	3.5	4.5	5.5	4.5	7	6	3.5	5.5	4.5

MNI (minimal number of individuals)

mandibula	3	3	6	2	6	5	3	1	6
humerus	3	3	5	3	7	5	6	3	5
radius	2	2	5	2	5	3	3	5	2
metacarpus*	2	4	4	2	5	2	1	1	1
femur	2	2	4	4	3	4	3	2	3
tibia	2	4	4	4	4	3	4	5	1
metatarsus*	4	4	4	3	8	2	4	2	2
phalanx*	2	3	5	3	2	2	2	3	1
MAXIMUM	4	4	6	4	8	5	6	5	6

Tab. 10. *Kutná Hora - Denemark – quantification of MNE, MAU and MNI for most common species (see Section 7.4.2 for methodology).*
** Sus and Castor: with consideration of metacarpus I to V, metatarsus I to V, phalanx proximalis, media and lateralis I to V; Bos, Ovis/Capra and Cervus; with consideration of metacarpus III+IV, metatarsus III+IV, phalanx proximalis, media and lateralis III et IV. MAU for Castor-phalanx and metapodia not counted. For Bos primigenius see footnote 6. —* ***Tab. 10.*** *Kutná Hora - Denemark – kvantifikace MNE, MAU a MNI pro nejběžnější druhy (metodika viz kap. 7.4.2).*
** Sus a Castor: brán v úvahu metacarpus I–V, metatarsus I–V, phalanx proximalis, media lateralis I–V; Bos, Ovis/Capra a Cervus; brán v úvahu metacarpus III+IV, metatarsus III+IV, phalanx proximalis, media a lateralis III a IV. MAU u druhu Castor fiber – phalangy a metapodia nejsou započítány. Bos primigenius viz poznámka pod čarou 6.*

feature – storage pit 41 (in total 4 left ones and 2 right ones – compare with *Tab. 2*). This accumulation can hardly be explained as accidental. The spatial distribution of the finds is discussed further in the next paragraph.

7.5.1.8. Spatial distribution and comparison of features

The vision of bone distribution is based on comparing the space of the bailey and the space of the acropolis. The comparisons are undertaken to reveal any possible functional specialization being undertaken in these two areas. The same method of comparative analysis was used for the representation of anatomical parts, for the proportion of burnt and gnawed bones and for comparing fragmentation described in previous paragraphs (*Section 7.5.1.3*, *7.5.1.4*, *7.5.1.5* and *7.5.1.7*). NISP and weight method were used for the comparison of species ratio and the results are shown in *Graph 9* and *10*, which reveal a relatively even distribution in both areas. Larger anomalies were observed only in case of those species with little representation and frogs.

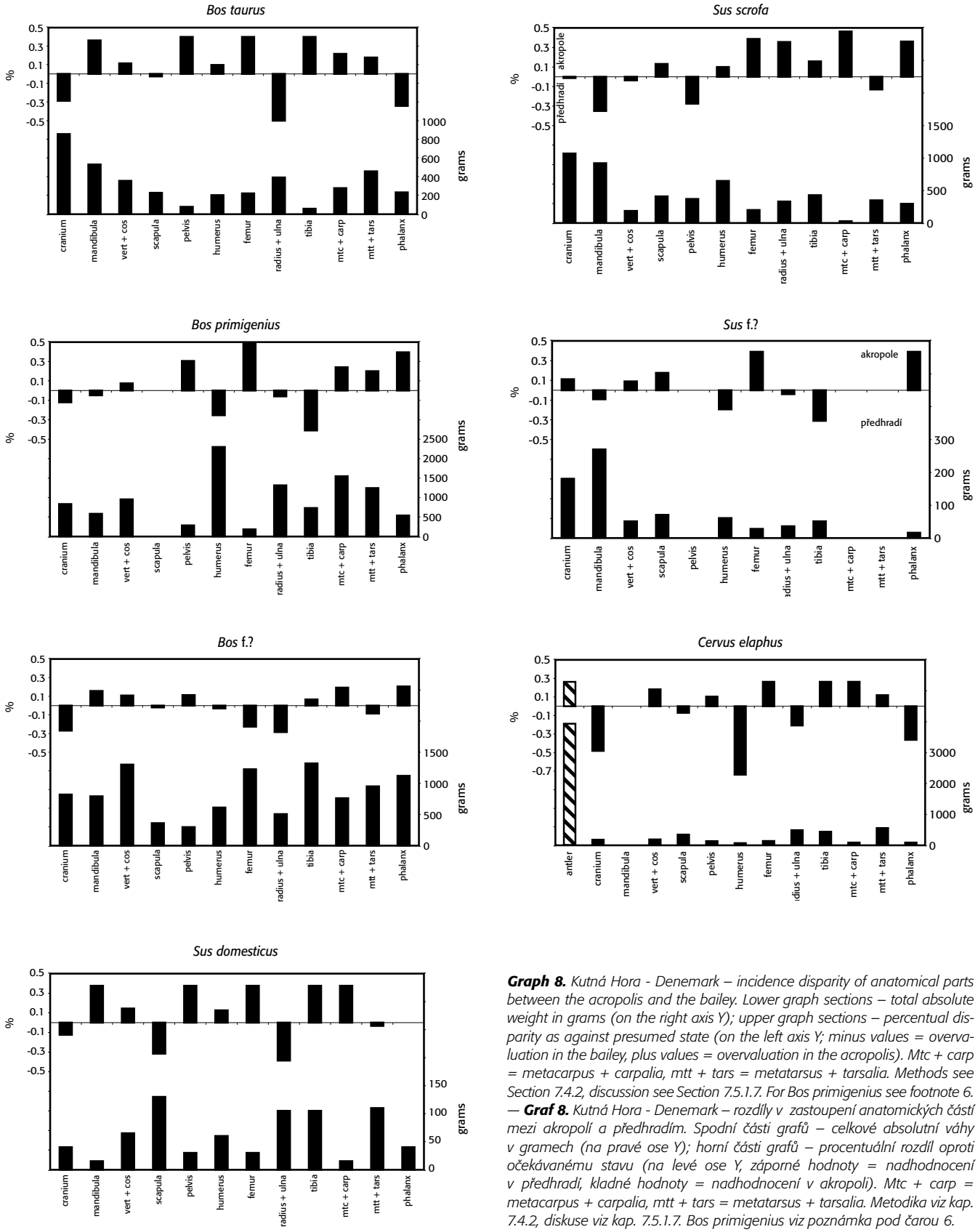
Comparing the results from individual features will enable a more detailed analysis. Anomalies in the features are partly accidental, but the infill of the features can to a certain extent relate to the original function of these features or their surroundings. Spatial distribution of bones on the site is shown on the *Fig. 2*, where the black colour highlights features, which contained at least one bone (note: largest features at the acropolis, i.e. 34, 37, 73 are white because they were not included in the analysis). Bones were not present in each feature, but their distribution covers the whole settlement area quite evenly. The amount of bones varies in the features (*Tab. 7* and *8*), for example the very low quantity of material in some relatively large features at the acropolis (mainly feature 35, 59, 61, 62, 84, and in features 61 and 62 almost no osteozoological material is present – *Tab. 7*) is striking. Also similarly low of pottery fragment counts were observed in some of these same features (features 59, 61).

There is no space in this paper for a detailed list of archaeozoological finds from every feature separately – that will be included in the faunal report submitted to the Archive of the Institute of Archaeology in Prague. Therefore this paper is limited to some aspects only. The distribution of animal species in individual features is shown in *Tab. 7* and *8*. These tables show that the spectrum of species in the features is relatively distinctively different. Comparison of representation of wild and domestic species in individual features is shown in *Graph 11* (sorted ascendingly after the amount of material).

Fish have the most presence in feature 63 and in features 21, 124 and 130, which are pits with ovens. Similarly three from five features with frog bones (features 36, 103, 124, 125, 130) are in a context associated with a heat. While fish bones were found both in the bailey and at the acropolis, evidence of frogs is from the acropolis only (*Section 7.5.2.4*).

The distribution of features with artefacts is in *Fig. 4*. A comparison of *Figs. 2* and *4* suggests that there is a larger concentration of artefacts in the area outside acropolis. The accumulation of artefacts in hut 22 (ca. 30 % of all artefacts found) suggests a workshop nearby. Most frequent are the artefacts in features 22 and 21 (see *Section 7.5.4*) and relatively frequent are artefacts in features 36, 53, 103 (see quantification in the *chap. 3.2.6* in *Zápotocký – Zápotocká – this suppl.*).

Unusual anomalies are found in features 36 and 103 such as large accumulations of frog bones (*Fig. 5*; *Tab. 7*, see *Section 7.5.2.1.3* and *7.5.2.4*), a high ratio of beaver bones (75 % if frog bones are not taken into the equation) and unusual artefacts (scalpers prevail and a "beamer" was found – see *Section 7.5.4*; *Photo 41*), were found in feature 36. Special finds come from a double storage pit 41/41a with a rich assemblage of material



Graph 8. *Kutná Hora - Denemark – incidence disparity of anatomical parts between the acropolis and the bailey. Lower graph sections – total absolute weight in grams (on the right axis Y); upper graph sections – percentual disparity as against presumed state (on the left axis Y; minus values = overvaluation in the bailey, plus values = overvaluation in the acropolis). Mtc + carp = metacarpus + carpalia, mtt + tars = metatarsus + tarsalia. Methods see Section 7.4.2, discussion see Section 7.5.1.7. For Bos primigenius see footnote 6.* — ***Graf 8.*** *Kutná Hora - Denemark – rozdíly v zastoupení anatomických částí mezi akropolí a předhradím. Spodní části grafů – celkové absolutní váhy v gramech (na pravé ose Y); horní části grafů – procentuální rozdíl oproti očekávanému stavu (na levé ose Y, záporné hodnoty = nadhodnocení v předhradí, kladné hodnoty = nadhodnocení v akropoli). Mtc + carp = metacarpus + carpalia, mtt + tars = metatarsus + tarsalia. Metodika viz kap. 7.4.2, diskuse viz kap. 7.5.1.7. Bos primigenius viz poznámka pod čarou 6.*

including burnt unbroken limb bone of one cattle individual and numerous fragments of burnt human bones, including a reconstructed brain case of human skull. Large mammals including horse dominate among zoological species; while domestic pig, sheep/goat and dog are almost absent (*Tab. 7*). Most of the bones are

Fig. 4. *Kutná Hora - Denemark – plan of the site showing spatial distribution of artefacts: x = 1 artefact, grey features = cummulation of artefacts (2 to 4 %), black features = cummulation of artefacts (more than 4 %), percentage (NISP) from counted fragments (see text for explanation).* — ***Obr. 4.*** *Kutná Hora - Denemark – plánek lokality zobrazující prostorovou distribuci artefaktů: x = 1 artefakt, šedé objekty = kumulace artefaktů (2 až 4 %), černé objekty = kumulace artefaktů (více než 4 %), procenta (NISP) z počítaných fragmentů (viz text).*

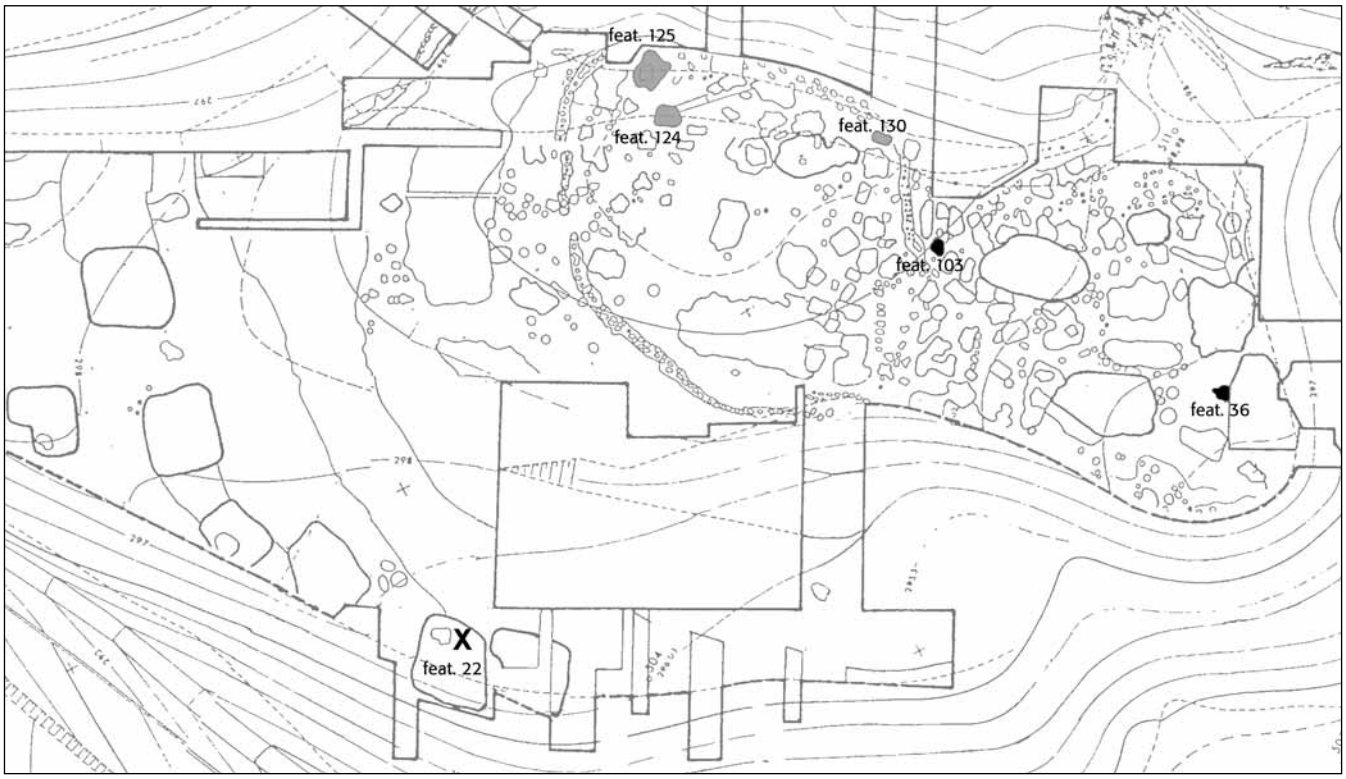


Fig. 5. *Kutná Hora - Denemark – plan of the site: black features = multiple finds of frog bones, grey features = sporadic finds of frog bones; X = feature with fibula of Pelecanus crispus; note a position of feat. 124 which contained the dog skeleton.* — ***Obr. 5.*** *Kutná Hora - Denemark – plánek lokality: černé objekty = hromadné nálezy žabích kostí, šedé objekty = sporadické nálezy žabích kostí; X = objekt s nálezem fibuly pelikána kadeřavého; obj. 124 obsahoval skelet psa.*

burnt (*Tab. 3*), but the burnt fragments are only in layers 2, 3 and 4, burning was not detected in the upper layer (1) (for more detail about the feature 41/41a see *Kyselý 2003*). In the layer 3 within feature 124 (a pit with a kiln) part of a dog skeleton was found (see *Section 7.5.1.10*), which had no signs of burning. The rest of the material in this feature, but mainly in the layer 3, is formed by a large quantity of minute fragments of size 6 and 7.

7.5.1.9. Cultural layer

The remains of only a single general site cultural layer (feature 127), which could contain an assemblage of bones in such a form as it occurred on the surface during the life of the settlement and therefore may provide a better reflection of the original state of the cultural material than the deposits within of other dispersed features found during the excavation. This layer (maximum width 350 cm, length 200 cm) covered uneven bedrock to a maximum thickness of between 12 and 20 cm and contained a total of 226 bones/fragments. Wild species, mainly red deer and beaver, are represented more in the layer at about twice that of domestic animals, which is slightly different from overall situation – see *Section 7.5.2.1.1*). Otherwise this assemblage generally corresponds to the overall situation in the settlement area. The variety of animal species is relatively high in this layer with 6–7 species (species composition see *Tab. 7*) including a horse and new born piglet. Some of the bones are charred or burnt (about 12 %), some gnawed by dogs (about 2.5 %) and bones (fragments), which anatomically belong together were found in several instances and are evidence of relatively fresh waste material on the original surface. Since the content of this layer is not radically different from the overall situation, the results of analysis of the complete assemblage should roughly correspond with the situation at the life time of the settlement.

Another context, which could be informative concerning the occupation activities within the settlement, is the floor deposits of a half sunken house (feature 21) in the bailey. There are finds also from the space between two of the floor linings and bones could accumulate here during the occupation of the hut. Unfortunately in total only limited amount of osteozoological material was present here; 2 fragments from the space between the lining, the determinable one belongs to a mandible of a young cattle or red deer, and 23 fragments from the upper lining, of which two determinable ones belong to wild cattle (mandible fragment and a larger rib fragment).

7.5.1.10. Articulated parts of skeletons

Most of the osteological finds tend to be fragmented. Only short compact bones (phalanges, carpals and tarsals, teeth) are usually found complete. Complete long bones are preserved quite sporadically and articulated parts are also rare. Such finds are:

1) almost half of a young canine skeleton in black layer 3, below the baked clay surface in the pit with a kiln – feature 124 (145 x 120 cm, depth 42 cm). However it is not known whether the find was originally an articulated part of a skeleton since the field documentation does not mention its state (M. Zápotocký, pers. comm.). The parts found: skull without left praemaxilla (+ 2x M2, 2x M1, 2x P4, P2 dex., I3 dex., I2 dex.), mandibula dex. (+ M1, M2), mandibula sin. (+ P2 to M1), femur dex., tibia dex., fibula dex. prox. diaphysis, pelvis dex., radius sin., radius dex. dist., ulna sin., ulna dex., humerus sin., 3x vertebra cervicalis (not atlas and axis), 6x vertebra lumbalis, 12x vertebra thoracica, 4x costa prox. (2x sin., 2x dex.) = 41 bones or fragments. Shoulder blades, tail and autopodia (i.e. paws) are missing. Degree of fragmentation is low: long bones are mostly complete or broken in half (most likely unintentionally) while skull, vertabrae and the pelvis bone are preserved almost complete. The interpretation of this find, which has several knife mark incisions (see *Section 7.5.1.7*), is problematic (see *Section 5.2.3* and *7.5.2.9*).

2) remains of a skull and three postcranial bones (metacarpus 3, two tibias) of a young dog (7–9 months old) from a feature 84, layer 2.

3) remains of a burnt, almost complete, hind limb of a domestic cattle from storage pit 41a (layers 3 and 4), possibly articulated when thrown into the feature.

4) most of the burnt human bone fragments in various layers of the double storage pit 41/41a may belong to one individual.

In several other cases it was possible to refit at least two, or more bones or fragments together: (1) a finger of a aurochs (3x phalanx) from a pit 125 (layer 4, bellow the daub), and couples of metapodial or sezamoid bones of domestic cattle, red deer and wild pig from the same feature (layer 3 with daub); (2) a couple of carpal bones of aurochs (semi sunken house 22, storage pit 60, post hole 379). Mutually corresponding unfused epiphysis and diaphysis of long bones present in the same context were found in 17 cases.

All these finds described above probably belong to fresh waste; otherwise they would loose the spatial coherence due to scavenging dogs and other taphonomic factors. The described parts of skeletons could be a result of clearing the articulated, i.e. “fresh”, remains of bodies into relevant pits.

7.5.2. Zoological observation and the significance of animals

7.5.2.1. Overview and representation of species

7.5.2.1.1. Proportion of hunted and breeding (mammals)

Taphonomic research (*Lyman 1994*) proved that the bones of smaller species deteriorate more easily than the bones of larger species. Empirically elicited regressive relations between Log (live weight of animals) and Log (N observed / N expected) enable an estimation that for example a hare (4 kg) compared to aurochs (800 kg) is underrated by 21–37 times. Sheep (40 kg) compared to red deer (150 kg) is underrated due to dif-

	Latin	Czech	NISP					number of positive features		
			after method		after space			larger features		
			manual selection	floatation	acropolis	bailey	TOTAL	(incl. feat. 1)	post holes	TOTAL
domestic mammals	*Bos taurus*	tur domácí	274		208	66	274	39	6	45
	cf. *Capra hircus*	? koza	2		2		2	2		2
	Ovis aries	ovce	14		8	6	14	6	1	7
	cf. *Ovis aries*	? ovce	2		1	1	2	2		2
	Ovis/Capra	ovce/koza	122	3	94	31	125	27	4	31
	cf. *Ovis/Capra*	? ovce/koza	2		2		2	1	1	2
	Sus domesticus	prase domácí	175	3	138	40	178	27	3	30
	cf. *Sus domesticus*	? prase domácí	5		5		5	4		4
	Canis familiaris	pes	19		14	5	19	12		12
	cf. *Canis familiaris*	? pes	1		1		1	1		1
wild mammals	*Bos primigenius*	pratur	96		62	34	96	25	1	26
	cf. *Bos primigenius*	? pratur	19		16	3	19	4		4
	B. primigenius/Bison bonasus	pratur/zubr	73		41	32	73	20	1	21
	Cervus elaphus	jelen evropský	197		144	53	197	38	2	40
	cf. *Cervus elaphus*	? jelen evropský	13		11	2	13	10		10
	Capreolus capreolus	srnec obecný	61		39	22	61	24	3	27
	cf. *Capreolus capreolus*	? srnec obecný	4		3	1	4	3		3
	Sus scrofa	prase divoké	301	2	212	91	303	39	9	48
	cf. *Sus scrofa*	? prase divoké	13		10	3	13	8		8
	Lepus europaeus	zajíc polní	5		5		5	2		2
	Ursus arctos	medvěd hnědý	9		6	3	9	5	1	5
	Felis sylvestris	kočka divoká	1		1		1			
	Meles meles	jezevec lesní	1			1	1	1		1
	Martes foina	kuna skalní	1		1		1	1		1
	cf. *Martes*	? kuna	1		1		1	1		1
	Lutra lutra	vydra říční	1		1		1	1		1
	Castor fiber	bobr evropský	133		106	27	133	17	2	19
	cf. *Castor fiber*	? bobr evropský	5		5		5	2		2
	Rodentia	hlodavec	2	2	4		4	2		2
	Apodemus cf. flavicolis	myšice ? lesní	1		1		1	1		1
domestic / wild mammals	*Equus ferus* f.?	kůň	37		28	9	37	10		10
	cf. *Equus ferus* f.?	? kůň	3		3		3	3		3
	Bos f.? *(cf. Bison)*	velký tur	373		262	111	373	44	6	50
	Bos primigenius f.?	domácí tur/pratur	87		75	12	87	23	1	24
	Bos/Cervus	tur/jelen	56	2	39	19	58	25		25
	Small ruminant	malý přežvýkavec	52	2	41	13	54	16	6	22
	Sus scrofa f.?	prase	257	4	174	87	261	36	7	43
	cf. *Sus scrofa* f.?	? prase	9		3	6	9	3	1	4
	Large mammal	velký savec	2138	4	1548	594	2142	59	12	71
	Canis lupus f.?	pes/vlk	5		5		5	2		2
	cf. *Canis lupus* f.?	? pes/vlk	1		1		1	1		1
	Sus/Cervus size group	velikost divočáka/jelena	186		113	73	186	30	2	32
	Medium mammal	středně velký savec	636	8	451	193	644	45	17	62
	Small mammal	malý savec	8	1	7	2	9	6	1	7
	Very small mammal	drobný savec	1			1	1	1		1
	Undetermined mammal	neurčený savec	8503	506	7914	1095	9009	63	24	87
birds	*Tetrao urogallus*	tetřev hlušec	3		3		3	1		1
	Corvus corone/frugilegus	vrána/havran	2		2		2	2		2
	Pelecanus crispus	pelikán kadeřavý	1			1	1	1		1
	Undetermined bird	neurčený pták	1		1		1	1		1
reptile-amphibian-fish	*Emys orbicularis*	želva bahenní	1		1		1	1		1
	Rana	skokan	868	25	893		893	3		3
	Abramis brama	cejn velký	1		1		1	1		1
	Leuciscus cephalus	jelec tloušť	1			1	1	1		1
	Perca fluviatilis	okoun říční	4		4		4	1		1
	Anguilla anguilla	úhoř říční		3	3		3	1		1
	Undetermined fish	neurčená ryba	9	2	8	3	11	4		4
	Undetermined bone	neurčený fragment	119	1	120		120	4	1	5
	Coleoptera	brouk	1		1		1	1		1
human	*Homo sapiens*	člověk	88	1	88	1	89	5		5
	cf. *Homo sapiens*	? člověk	38		38		38	3		3
	TOTAL	**CELKEM**	**15020**	**569**	**12969**	**2642**	**15611**	**77**	**43**	**120**
SUMMARY	**TOTAL determinated**	**CELKEM určeno**	**3397**	**47**	**2773**	**671**	**3444**	**495**	**48**	**543**
	TOTAL domestic mammals	**domácí savci**	**616**	**6**	**473**	**149**	**622**	**51**	**13**	**64**
	TOTAL wild mammals	**divocí savci**	**939**	**4**	**669**	**272**	**941**	**57**	**15**	**72**
	TOTAL undetermined form	**neurčená forma**	**883**	**8**	**631**	**257**	**888**	**51**	**18**	**69**
	TOTAL large mammals	velcí savci celkem *	3555	6	2443	938	3381	69	24	93
	TOTAL medium mammals	střední savci celkem**	1692	24	1296	567	1863	56	28	84
	TOTAL smaller mammals	menší savci celkem***	177	3	147	35	182	25	3	2

Tab. 11. *Kutná Hora - Denemark – sum quantification of species: NISP and number of features; * size of red deer or larger, ** size from sheep to wild boar, *** size up to dog. —* ***Tab. 11.*** *Kutná Hora - Denemark – sumární kvantifikace druhů: NISP a počet objektů; * velikost jelena a větší, ** velikost ovce až prasete divokého, *** do velikosti psa.*

	acropolis	bailey	TOTAL
Bos taurus	2334	1530	3864
Bos primigenius	3980	5450	9430
Bos f.?	7795	2315	10110
Sus domesticus	465	280	745
Sus scrofa	2780	2405	5185
Sus f.?	462	295	757
Equus	460	100	560
Ovis/Capra (O. aries, C. hircus incl.)	430	360	790
Cervus elaphus	1965 + 3935*	715	2680 + 3935*
Capreolus capreolus	170	150	320
Canis familiaris	125	23	148
Canis familiaris - skeleton	380		380
Ursus arctos	110	160	270
Castor fiber	560	195	755
Meles meles	3		3
Lutra lutra	3		3
Lepus europeus	16		16
Martes foina	3		3
Pelecanus crispus		2	2
Corvus corone/frugilegus	2		2
Tetrao urogallus	22		22
Rana	79		79
fish	1	0.3	1
TOTAL	26080	13980.3	40060,3
TOTAL domestic mammals	3734	2193	5897
TOTAL wild mammals	9590 + 3935*	9075	18695 + 3935*
TOTAL undetermined form	8717	2710	11427
TOTAL large mammals	16644 + 3935*	9555	26914 + 3935*
TOTAL medium mammals	5397	3708	9105

Tab. 12. *Kutná Hora - Denemark – sum quantification of species: weights (in grammes); * antlers. For Bos primigenius see footnote 6. —* ***Tab. 12.*** *Kutná Hora - Denemark – sumární kvantifikace druhů: váhy (v gramech); * parohy. Bos primigenius viz poznámka pod čarou 6.*

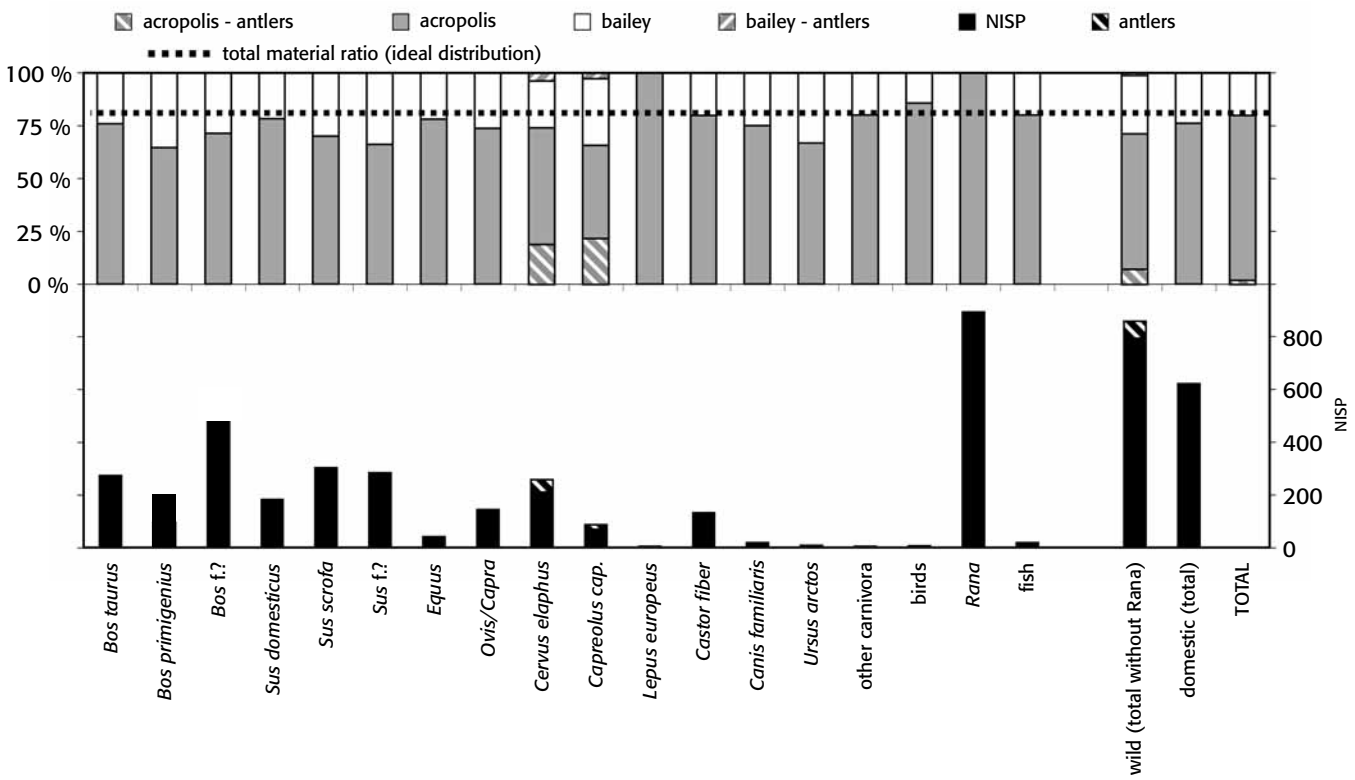
ferent degradation only by 2–2.5 times (depending on applied methodology – *Lyman 1994*, 397–398). Such distortions must be accounted for during comparison analysis of species with different sizes.

Proportions of hunted and breeding were first evaluated for mammals. All wild mammal bones of belong to hunted (or potentially hunted) species except for sporadic rodent bones (from which only *Apodemus* cf. *flavicolis* could be determined). The *Graph 12* shows the proportion of definitively domestic forms, definitively wild forms and non differentiated forms (domestic/wild – see *Section 7.4.1* for methodology). In the view of NISP method and the number of contexts method, all of these three groups are represented in roughly the same portion, according to weight method the wild species clearly dominate. If the "non differentiated" component is not taken into account (although it could strongly change the representation depending on which group it was assigned to) the proportion of domestic and wild animals is: 40 % to 60 % (after NISP), 47 % to 53 % (according to the number of positive features) or 21 % to 79 % (according to weight). That indicates a certain domination of wild species. Comparison of wild and domestic forms calculated separately for cattle (*Tab. 11* and *12*; *Graph 9* and *10*) shows, that in NISP domestic cattle somewhat dominates (59 %), aurochs dominates in weight on the other hand (70 %)[6], which is due to the larger body size of aurochs. In case of pig, the wild form is represented more than in the case of cattle: the number of bones is more than double in the wild form, in weight the predomination is roughly by seven times. All of the three quantification methods used (*Tab. 9* and *11*; *Graph 12*) indicate that hunting was very important for the inhabitants of Kutná Hora - Denemark. This observation is probably not overly influenced by taphonomic factors[7].

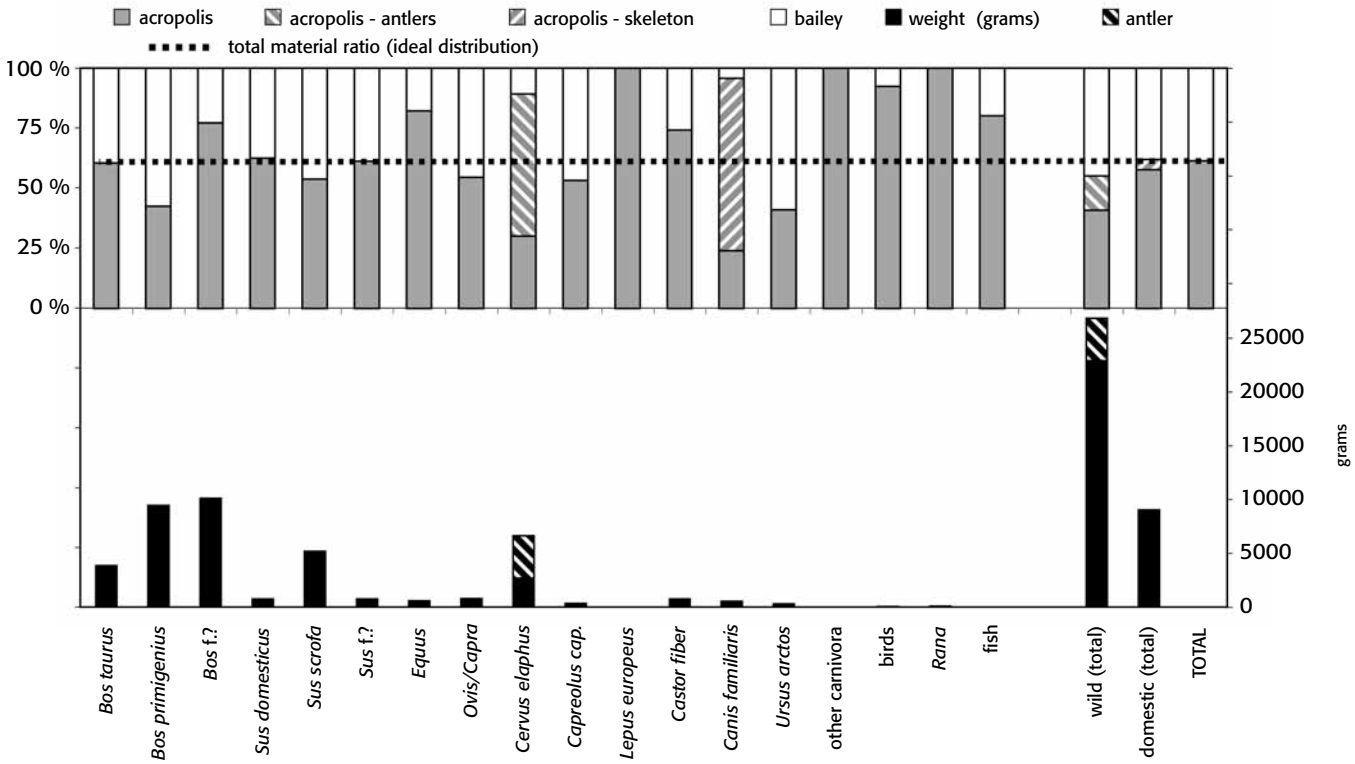
Among all the compared Czech Řivnáč culture sites Kutná Hora - Denemark is the one with the highest percentage of hunted animals. That is particularly noticeable compared to a similar large assemblage from the site at Stehelčeves - Homolka, which is located in the centre of the settlement region (*Graph 14*). A relatively high percentage is also found at Hradenín (and possibly on other Řivnáč sites too, but in those cases the amount of osteological material is not high enough: *Graph 14*; *Tab. 1*). High percentages may correspond with the position of the site on the edge of settlement region close to the wilds cape. This special position (see *Section 7.2*) could lead to a higher preference for hunting than was usual in the central area of the inhabited region, where domestic species dominate (and where wild animals were possibly already rarer due to overexploitation). This also corresponds with the high percentage of hunted game in the nearby Eneolithic site of Cimburk (after NISP about 55 %; *Peške 2000*). A high rate of hunted game is not only one record in the Neolithic and Eneolithic periods within

[6] In these calculations as well as in *Graph 6, 7, 8, 9, 10, 13, 16, 18* and in *Tab. 6, 9, 10, 12, 15* (since *Bison* presence is very unprobable in the site and because of a simplification) *Bos primigenius* group includes all wild *bovines* finds (differently than in *Tab. 7, 11* and *13*).

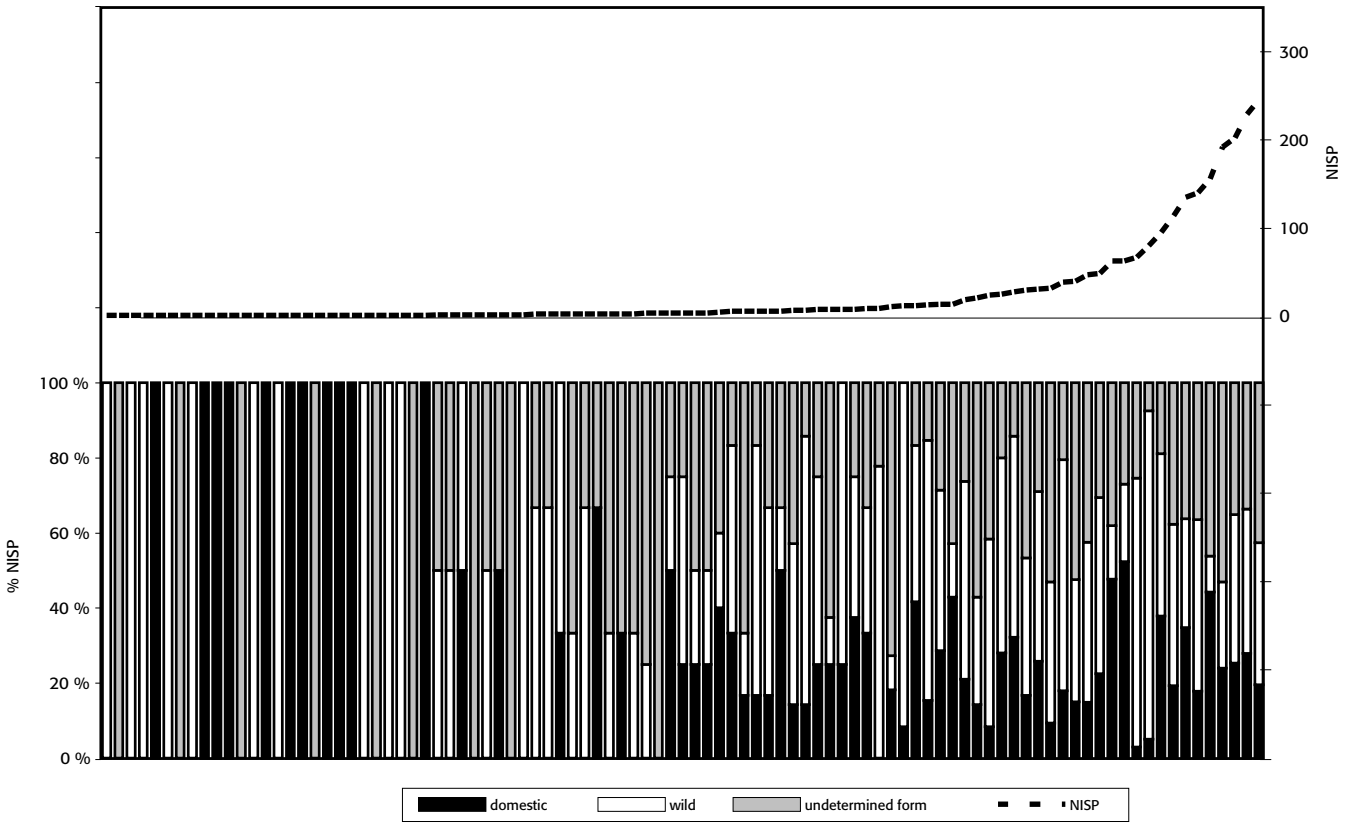
[7] Sometimes it is presumed that some body parts are left behind after hunting. In that case there would be less finds of bones of hunted species on the settlements than in reality. In Denemark however all anatomical parts of hunted species are represented (see *Section 7.5.1.7*, *Graph 6* and *7*) and their distribution (*Section 7.5.1.7* and *Graph 8*) does not indicate that hunted species would be underrated in this way.



Graph 9. *Kutná Hora - Denemark – icidence of species – quantified after NISP. Lower graph section – total NISP (on the right axis Y); upper graph section – percentual finds proportion at the acropolis and the bailey (on the left axis Y). For Bos primigenius see footnote 6. —* ***Graf 9.*** *Kutná Hora - Denemark – zastoupení druhů – kvantifikováno dle NISP. Spodní část grafu – celkové dle NISP (na pravé ose Y); horní část grafu – procentuální podíl nálezů v akropoli a předhradí (na levé ose Y). Bos primigenius viz poznámka pod čarou 6.*



Graph 10. *Kutná Hora - Denemark – incidence of species – quantified after weights. Lower graph section – total weights in grams (on the right axis Y); upper graph section – percentual finds proportion at the acropolis and the bailey (on the left axis Y). For Bos primigenius see footnote 6. —* ***Graf 10.*** *Kutná Hora - Denemark – zastoupení druhů – kvantifikováno dle váhy. Spodní část grafu – celkové váhy v gramech (na pravé ose Y); horní část grafu – procentuální podíl nálezů v akropoli a předhradí (na levé ose Y). Bos primigenius viz poznámka pod čarou 6.*

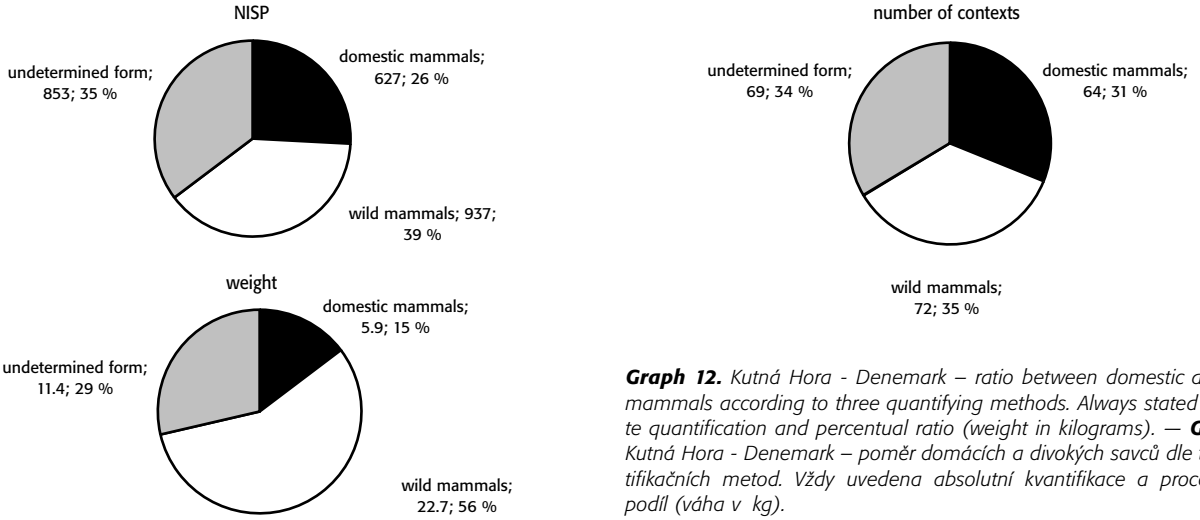


Graph 11. *Kutná Hora - Denemark – ratio between domestic and wild species (% NISP; left axis Y, lower graph section) in individual features arranged by the amount of material (right axis Y, upper graph section). —* ***Graf 11.*** *Kutná Hora - Denemark – poměr domácích a divokých druhů (% NISP, levá osa Y, dolní část grafu) v jednotlivých objektech seřazených dle množství materiálu (pravá osa Y, horní část grafu).*

the Czech Republic since similar "anomalies" were observed in a Lengyel cultural complex (*Dreslerová 2006*) and have been ascertained from Jevišovice culture settlement by Vysočany in Moravia (*Medunová-Benešová 1993*). Another reason for this non-standard situation could be, for example some form of socio-economic crisis, which is presumed for the given period (Zápotocký, pers. comm.), or the specialisation of a certain method of subsistence.

7.5.2.1.2. Wild mammals

Among wild mammals there is evidence for species: *Bos primigenius* (Aurochs), *Cervus elaphus* (Red Deer), *Capreolus capreolus* (Roe Deer), *Sus scrofa* (Wild Boar) – *Photo 29*, *Lepus europaeus* (Brown Hare), *Ursus arctos* (Brown Bear) – *Photo 27*, *Meles meles* (Eurasian Badger), *Lutra lutra* (Otter), *Martes foina* (Beech Marten), *Castor fiber* (European Beaver) – *Photo 20, 21* and



Graph 12. *Kutná Hora - Denemark – ratio between domestic and wild mammals according to three quantifying methods. Always stated absolute quantification and percentual ratio (weight in kilograms). —* ***Graf 12.*** *Kutná Hora - Denemark – poměr domácích a divokých savců dle tří kvantifikačních metod. Vždy uvedena absolutní kvantifikace a procentuální podíl (váha v kg).*

Photo 15. *Kutná Hora - Denemark – feature 27b, layer 20–40 cm, Equus – praemolar 2 superior – occlusal surface. —* ***Foto 15.*** *Kutná Hora - Denemark – obj. 27b, vrstva 20–40 cm, kůň – praemolar 2 superior – oklusní plocha.*

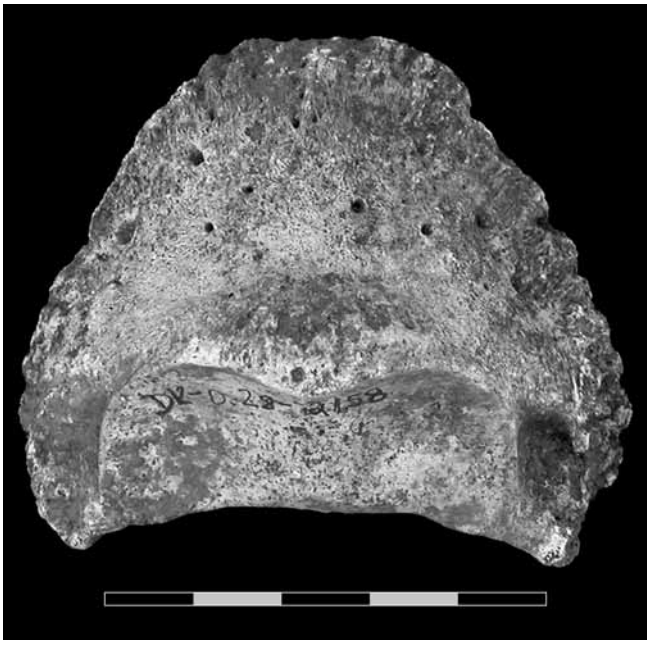
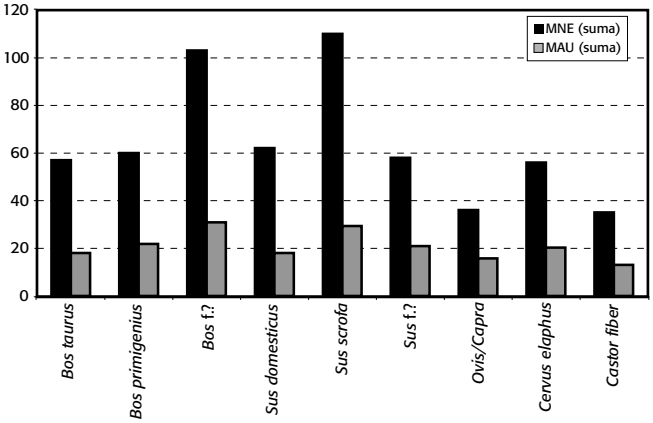


Photo 16. *Kutná Hora - Denemark – feature storage pit 28, layer 2, Equus – phalanx distalis – norma dorsalis. —* ***Foto 16.*** *Kutná Hora - Denemark – obj. silo 28, vrstva 2, kůň – phalanx distalis – norma dorsalis.*

27, *Apodemus* cf. *flavicolis* (?Yellow-necked Mouse). Also horse (*Equus – Photo 15 to 17*) may be wild, where more precise differentiation was not made between domestic and the wild form. Mutual representation of these species is given in the *Tab. 11* and *12* and *Graph 9* and *10*. After NISP the most represented hunted species is wild boar, followed by red deer and aurochs. By bone weight the most represented is aurochs, followed by red deer and then wild boar. Among wild *Bovini* bones from Kutná Hora - Denemark (altogether a minimum of 169 fragments) aurochs was safely determined in 96 fragments, wisent (*Bison bonasus*) was not safely determined in a single case. Since wisent has not been reliably determined on any site from Bohemian agricultural prehistory (*Kyselý 2005b*), its occurrence was not likely even at Kutná Hora - Denemark. Therefore, with reservations, all bones of wild *Bovini* will be considered as belonging to aurochs. Evidence of other hunted mammals is (except beaver and roe deer) sporadic or singular.

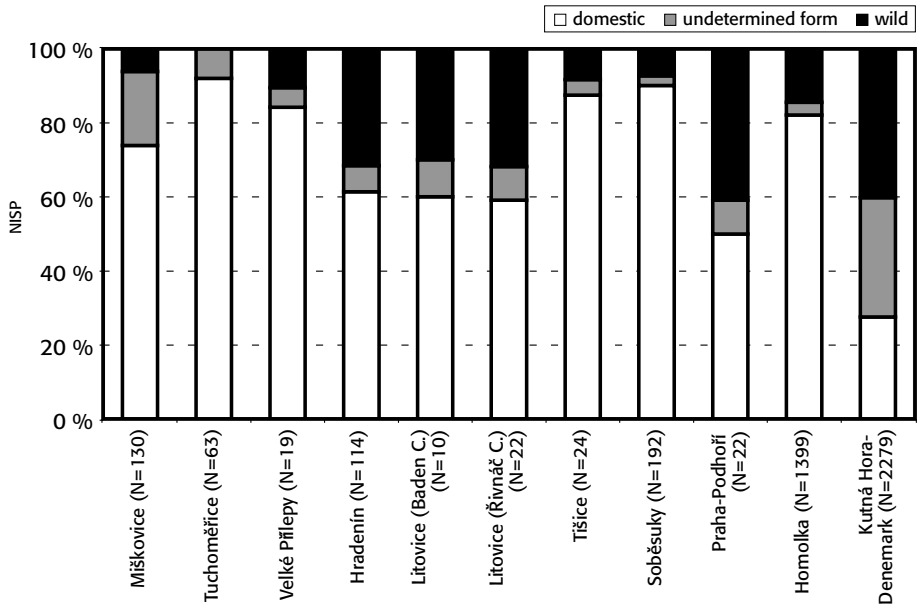


Graph 13. *Kutná Hora - Denemark – incidence of most common mammal species according to the sum of MNE and MAU (see Section 7.4.2 for explanation). For Bos primigenius see footnote 6. —* ***Graf 13.*** *Kutná Hora - Denemark – zastoupení nejhojnějších druhů savců dle součtu MNE a MAU (viz kap. 7.4.2). Bos primigenius viz poznámka pod čarou 6.*

The non-standard high proportion of beaver (compare with *Kyselý 2005d*) is interesting, especially when compared with the Eneolithic site Cimburk only 300 metres away, with only 0.2 % (NISP) of beaver from all determined species (*Peške 2000*). Its biotope could have been along the Vrchlice stream (*Photo 18*), which confines the promontory of the settlement. The hunting ground for beaver could also have been along the environs of the Labe River.

Evidence a high representation of some hunted species is also provided by the number of individuals in a single feature: for example a minimum of 4 red deers in a storage pit 41, a minimum of 3 beavers in feature 36 and a minimum of 3 beavers in feature 22. Such total minimum sums of individuals (*Tab. 10*; *Photo 20* and *21*) confirm high representation of red deer and beaver. Moreover hare, which usually is a frequent species on prehistoric sites (*Kyselý 2005b*), is only sparsely represented at Kutná Hora - Denemark (see also *Section 7.5.2.11*), especially when its occurrence is compared with other species of a similar size it is apparent that hare catching did not play a significant role at Kutná Hora - Denemark: (1) it is similarly frequent as martens, which usually show only low occurrence in prehistoric assemblages, (2) although only slightly larger than the hare the beaver is much more predominant, after NISP in relation 27 : 1. This indicates that hare is of much lower importance than beaver[8].

[8] Bones of both species are in this case almost equally well identifiable.



Graph 14. *Comparison of the ratio of hunted and domestic species on Řivnáč sites in the Czech Republic. (N in brackets means total sum of material for given site). For sites see Tab. 1 and Fig. 1.* — ***Graf 14.*** *Srovnání podílu lovených a chovaných druhů na řivnáčských lokalitách v ČR (N v závorce představuje celkový počet materiálu pro danou lokalitu). Lokality viz tab. 1 a obr. 1.*

Photo 17. *Kutná Hora - Denemark – feature storage pit 41, layer 3. Equus – distal radius, calcaneus and talus found in a single context.* — ***Foto 17.*** *Kutná Hora - Denemark – obj. silo 41, vrstva 3. Kůň – distální radius, calcaneus a talus nalezené v jednom kontextu.*

Photo 18. *The surroundings of Vrchlice stream confining the promontory with the acropolis – potentional biotop of European Beaver and Common Frog found in osteological assemblage.* — ***Foto 18.*** *Okolí potoka Vrchlice obtékajícího ostrožnu s akropolí – potenciální biotop bobra evropského a skokana hnědého nalezených v osteologickém souboru.*

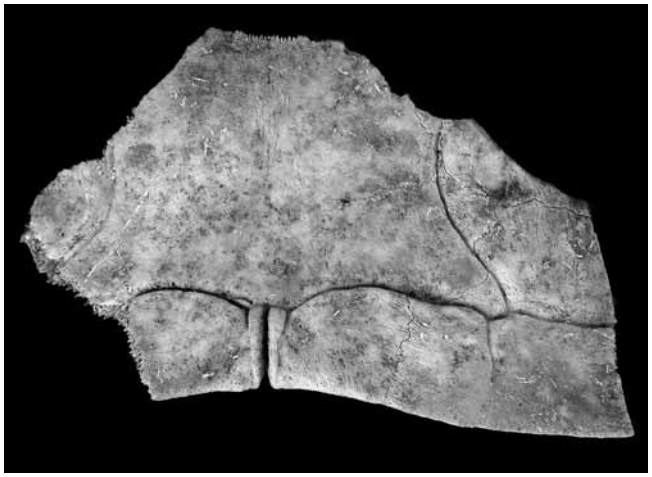


Photo 19. *Kutná Hora - Denemark – feature 50, layer 1. Emys orbicularis – part of a carapace.* — ***Foto 19.*** *Kutná Hora - Denemark – obj. 50, vrstva 1. Želva bahenní – část krunýře (karapaxu).*

7.5.2.1.3. Birds, reptiles, amphibians and fish

Besides mammals the sporadic presence of the bones of birds, fish and a single reptile along with a large quantity of frog bones (*Tab. 11, 12*) was found among the wild species. There is positive identification for: *Pelecanus crispus* (Dalmatian Pelican) – see *Section*

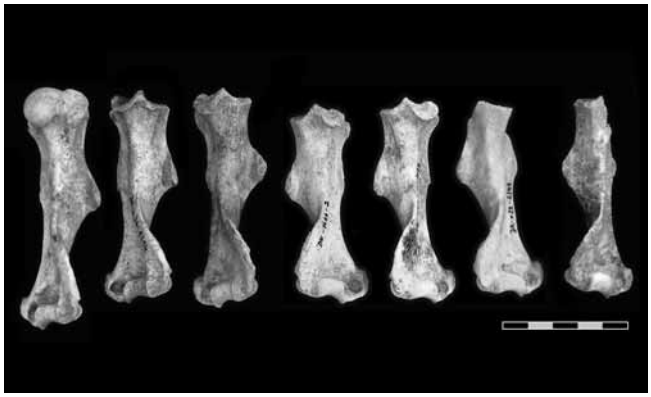


Photo 20. *Kutná Hora - Denemark – Castor fiber – humerus bones from features 1 (1x), 22 (3x), 36 (2x) and 127 (1x) – they belong to a minimum of six individuals, 5 of them with proximal epiphysis not fused. —* ***Foto 20.*** *Kutná Hora - Denemark – Bobr evropský – humery z objektů 1 (1x), 22 (3x), 36 (2x) a 127 (1x) – patří minimálně šesti jedincům, 5 z nich má nepřirostlou proximální epifýzu.*

Photo 21. *Kutná Hora - Denemark – Castor fiber – left mandibles from features 60 (1x), 125 (1x) and 127 (2x). —* ***Foto 21.*** *Kutná Hora - Denemark – bobr evropský – levé mandibuly z objektů 60 (1x), 125 (1x) a 127 (2x).*

Photo 22. *Kutná Hora - Denemark – feature kiln 63, layer 3. Tetrao urogallus – distal femur and carpometacarpus probably from a single individual. —* ***Foto 22.*** *Kutná Hora - Denemark – obj. pec 63, vrstva 3. Tetřev hlušec – distální femur a carpometacarpus asi z jednoho jedince.*

7.5.2.1.4, *Tetrao urogallus* (Capercaillie) – *Photo 22*, *Corvus corone/frugilegus* (Crow or Rook), *Emys orbicularis* (Swamp Turtle), *Rana temporaria* (Common Frog), *Abramis brama* (Bream), *Perca fluviatilis* (Perch), *Leuciscus cephalus* (Chub) and *Anguilla anguilla* (Eel). Considerable distortions of the original situation could occur because of the lesser durability of small bones. Regardless quantifications show (*Tab. 11, 12*; *Graph 9, 10*), that bird hunting and fishing were far less important a means of sustenance as that of hunting mammals.

That some present fish (bream, perch) live in larger and peaceful watercourses and reservoirs is of interest. Especially when the estimated length of an *Abramis brama* is at a minimum 50 cm and the estimated length of *Leuciscus cephalus* is 45–55 cm, one would not expect them in the relatively powerful waters of Vrchlice. Since *Baruš – Oliva eds.* (*1995*) describe the biotope of bream and perch as being that of the slowly flowing lower courses of rivers and river tributaries (*Abramis brama* zone), these fish were probably hunted in the Labe River some 10–15 km away or in a lower course of some of its tributaries. Eel on the other hand could occur in the Vrchlice stream (*Baruš – Oliva eds. 1995*). Its body length was estimated on the base of all three finds to be 50–55 cm.

A fragment of turtle carapace is interesting from both a zoogeographic and an ecological point of view (*Photo 19*, feature 50, layer 1), since it is not present in Bohemia nowadays (the nearest populations currently occur in Moravia: *Kminiak 1992*; *Široký – Stuchlík – Moravec 2004*). Although it could be explained as the import of an alive animal or just its carapace, its natural occurrence in the past in Bohemia is probable since there are twelve holocene archaeological sites with evidence of this species here (*Široký – Stuchlík – Moravec 2004*). However only one of these finds is close to the same period as Kutná Hora - Denemark (from the site at Mlékojedy – Baden culture). There are more finds from the Early Eneolithic and Bronze Age periods. Eneo-

lithic pits with turtle carapaces in Breść Kujawski in Poland were interpreted as storage pits for turtles (*Grygiel 1984*). The apparent high number of frog bones (after NISP – i.e. 893 – are common frogs the most represented taxon) is in fact not more than two hand fulls (79 grams – *Tab. 12*). Genus determination was not a problem: all bones belong to Frog (*Rana*). Identification of the species within frog family was problematic however and therefore done quite rigorously (determination done with the use of collections of Z. Roček – The Geological Institute of the Academy of the Sciences in Prague, collections of archaeozoological laboratory of Institute of Archaeology in Prague, and with help of *Bailon 1997*; *1999* and *Böhme 1977*). All illium bones (N=74), which are one of the best identifiable anatomical parts, were determined to Common Frog (*Rana temporaria)* and even other anatomical parts did not indicate different species. Therefore all frog bones were assigned to this species. Only in feature 36 there is in minimum 123 individuals. For sustenance use of frogs and other aspects of this unusual find see *Section 7.5.2.4* and *Kyselý* (*2005a* and *2008a*).

7.5.2.1.4. Dalmatian Pelican in Kutná Hora - Denemark

In layer 1 (0–40 cm) of hut 22 (eastern part, bailey – see *Fig. 5*) an avian left fibula, with dimensions of prox. end 8.4 x 13.3 mm, was found. Exhaustive comparative research proved that the fibula comes from a pelican. Contamination is unlikely, since the find is from the infill of a feature where pottery contamination of other cultures is completely insignificant (only 3 medieval sherds, i.e. only 0.1 % of the total amount in this pit). Bird fibula bones are difficult to determine and they are variable even within species, however this bone is morphologically markedly more similar to *Pelecanus crispus* than *Pelecanus onocrotalus* (compared in the collections of the Musée National d'Histoire Naturelle in Paris – see *Photo 23* and *24*), that it was determined as *P. crispus*. Other pelican species were excluded either because of morphology or geographic location. Certain differences in the shape of proximal surface (see *Photo 24*) can be explained as a result of the variability within species. Evidence of *Pelecanus crispus* on a Czech site is surprising since this species does not occur in the Czech Republic today. The situation is even more surprising since the pelican bone is one of the only seven bird bones found on the site (i.e. 14 % after NISP). In the 20th century pelican has been observed only ten times in the Czech Republic, but it was always *P. onocrotalus* species. Such observations are interpreted as rare involvements. *P. crispus* species is not mentioned in the Czech Republic at all (*Hudec et al. /eds./ 1994*). Currently in Europe it lives and nests in south eastern region in the area around the Black and Caspic seas, the Danube delta and in Yugoslavia (*Hoyo – Elliot – Sargatal 1992*; *Hudec et al. /eds./ 1994*). The most western and northern current nesting area is on the Nezider lake (*P. onocrotalus*) and the Skadar lake (*P. crispus*), but in the 19th century *P. crispus* was nesting in Hungary (*Hudec et al. /eds./ 1994*). Some archaeozoological finds of *P. onocrotalus* are described from the Balkans (Romania: *Gál – Kessler 2002*; *2003*, Hungary: *Jánossy 1985*). The pelican is bound to extensive water reservoirs, deltas and river estuaries, and tributaries, where they feed on only the larger fish (*Hudec et al. /eds./ 1994*; *Hoye – Elliot – Sargatal 1992*). The Czech Republic is an inland country where large areas of open water were very limited in the past, which makes such a find much unexpected. One could therefore presume that it could be an import (for example a gift or a trade item). Nevertheless even natural occurrence is possible due to migrations or accident flight. Natural occurrence cannot be excluded especially considering its occurrence in northern and western Europe during the Holocene. Seven pelican finds (safely identified only *P. crispus*) come from Stone Age sites (Atlantic, Subboreal) in Denmark (*Hatting 1963*), where pelicans were probably a hunted species. Another find described from Glastonbury in southern England is dated to the Bronze Age (*Yeatman 1971*). These areas are much further to the north or west from current habitats than the Czech Republic. Potential stations of this species could have been on Labe tributaries 10–15 km away from the site. The fibula found belongs to an adult individual and could therefore come from an accidental flight or a migration of the adults. Also the finds from Denmark do not belong to immature individuals (*Hatting 1963*); there is therefore no evidence for the nesting of pelicans in central or northern Europe.

Photo 23. *Pelecanus crispus – fibula. Below – Kutná Hora - Denemark, hut 22, layer 2; above – recent specimen. —* ***Foto 23.*** *Pelikán kadeřavý – fibula. Dole – Kutná Hora - Denemark, chata 22, vrstva 2; nahoře – recentní exemplář.*

Photo 24. *Pelecanus crispus – fibula (norma proximalis). To the right – Kutná Hora - Denemark, hut 22, layer 2; to the left – a recent specimen. —* ***Foto 24.*** *Pelikán kadeřavý – fibula (norma proximalis). Vpravo – Kutná Hora - Denemark, chata 22, vrstva 2; vlevo – recentní exemplář.*

7.5.2.1.5. Domestic mammals

From domestic mammals the largest role belongs to the domestic cattle (*Bos taurus*, *Bos primigenius* f. *taurus*), which corresponds with the results of the basic quantifications (NISP, number of contexts and weight – *Tab. 11* and *12*; *Graph 9* and *10*), and which of the domestic species, considering its size, also provides the most meat.

Among the remaining domestic animals pig (*Sus domesticus*, *Sus scrofa* f. *domestica*) was more important than sheep (*Ovis aries*, *Ovis orientalis* f. *aries*) and goat (*Capra hircus*, *Capra aegagrus* f. *hircus*). Among small ruminants there is positive evidence of sheep only, the two finds of goat are not very reliable (molar inferior and radius + ulna; *Tab. 11*; *Photo 9*). If goat was present, it was not very economically important. Evidence of horse, which were not assigned to either domestic or wild forms, comprises 1.2 % (NISP) or 1.4 % (weight) – *Tab. 11, 12*. It is present in various contexts including the remnants of cultural layer (*Tab. 7*), so this evidence cannot be taken for accidental intrusion. Such a low percentage of horse is a common feature on Czech Eneolithic sites; according to *Peške* (*1986*) up to 2 %. This species occurs even in Řivnáč or potential Řivnáč material from other Czech sites (Hostivice - Litovice, Stehelčeves - Homolka, Velké Přílepy, Cimburk, ?Lysolaje; sites – see *Tab. 1*). Dog (*Canis familiaris*, *Canis lupus* f. *familiaris*) is represented very little and its role was probably different from other economic species (that can be indicated by the occurrence of its skeleton in the feature 124), which could influence its quantification.

List of animal species concludes with a remnant of a not reliably identified small beetle.

7.5.2.2. Local domestication (crossbreeding) of cattle?

The most represented species at Kutná Hora - Denemark is domestic cattle, aurochs, domestic and wild pig[9]. A question of crossbreeding domestic and wild forms (or directly local domestication) of cattle and pig has already been debated within central Europe for a long period of time (*Bökönyi 1962*; *1969*; *1974*; *Müller 1964*; *Bogucki 1989*; *Benecke 1994*) and was presumed by *Ambros* (*1968*) in case of the site at Stehelčeves - Homolka. This problem is intensively discussed still today and a new view is given by recent archaeogenetic research (e.g. *Bollongino et al. 2006*; *Götherström et al. 2005*). Local domestication is probable with the possibility of accidental insemination of cows by wild bulls on the edge of the settlement area in direct contact with the wilds cape but intentional management is also possible. Within our osteological material aurochs and wild boar (potential novices for local domestication) are represented relatively more than other hunted animals (red deer, roe deer, hare). Their higher rate is apparent in comparison with Stehelčeves - Homolka:

NISP	Kutná Hora - Denemark	Stehelčeves - Homolka
Bos primigenius	**189**	**40**
Cervus elaphus	210	123
Capreolus capreolus	66	13
Sus scrofa	**314**	**12**
Lepus europaeus	14	0
Carnivora	14	9
Castor fiber	132	5

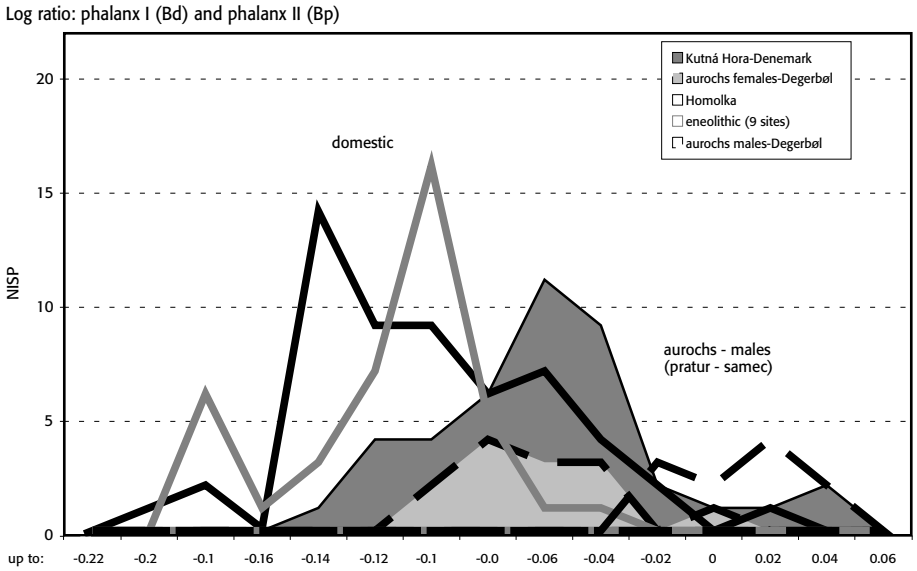
Remarkably high representation of aurochs was also found on the Cimburk Eneolithic site nearby (*Peške 2000*).

Photo 28 shows (on the right) a undetermined cattle find of roughly wisent female size. This find is inside the aurochs size range published by *Degerbøl – Fredskild* (*1970*). However, in spite of the fact that aurochs sex dimorphismus is big we can exclude that the find on the right belongs to the same population as aurochs represented by the two finds in the middle (of *Photo 28*). On the other hand, it seems too large to be domestic cattle. Therefore it could be an individual geneticaly influenced by wild form. Such cases are frequent in the Kutná Hora - Denemark assemblage (in graphs they are in center of the total *Bos* size distribution) and possibly indicate discussed local domestication or crossbreeding.

The theory concerning crossbreeding wild and domestic cattle is mainly supported by metric analysis. Graphic evaluation of bones sizes helps separating the domestic form wild individuals. Some finds however cannot be assigned to relevant form because the sizes of domestic and wild cattle overlap. Distribution of width measurements of long bones and phalanges from Kutná Hora - Denemark show non-standard high representation in this size transitive metric zone, even most of the phalnges belong to this zone (see *Graph 15*; log-ratio transformation; standard = aurochs from Denmark after *Degerbøl – Fredskild 1970*). This problem is discussed in more detail in a separate publication (*Kyselý 2008b*), with analysis of the state of research, methodology, material, measurement selection and the metric analysis of material from Kutná Hora - Denemark and other Eneolithic sites in the Czech Republic. The situation cannot be explained by general lowering the relative size of aurochs in the study area (for smaller body sizes of cattle in the early period of domestication see *Helmer et al. 2005*), since some aurochs males reached the maximum height of this species (compare measurements in the *Tab. 23* with data published by *Degerbøl – Fredskild 1970*). The strong representation of cattle with transitive size can have several potential interpretations (*Kyselý 2008b*): (1) it can be a crossbreed of domestic and wild form, (2) it can be a preferred hunt of female aurochs (they are much smaller than males) – see *Helmer et al. 2005*, (3) it can be very large males of domestic cattle. In the current state of knowledge we cannot exclude any of these hypotheses and their combination is also possible.

Hypothesis of the crossbreeding of domestic and wild forms is supported also by:

[9] Wild boar (wild pig) is an ancestor of domestic pig and aurochs (wild cattle) is an ancestor of domestic cattle.



Graph 15. *Size distribution of Bos in Kutná Hora - Denemark and its comparison with other sites and aurochs finds from Denmark: by the widths of phalanges (log-ratio transformation).* — ***Graf 15.*** *Distribuce velikostí turů v Kutné Hoře - Denemarku a její srovnání s dalšími lokalitami a pratury z Dánska: dle šířek prstních článků (log-ratio transformace).*

A) there is a distinct difference in the representation of domestic and wild forms according to teeth and postcranial skeleton: i.e. small size teeth were usually interpreted as indicating the domestic form (*Tab. 10*; *Graph 16*), while the other bones may equally indicate either form. This difference can be a result of crossbreeding, when the teeth stay at the size of the domestic form, while the remaining skeleton (and body size) can attain growth to a medium size between both forms (working hypothesis; *Kyselý 2008b*).

NISP	teeth	jaws	postcranial
Wild Bovini	3	11	144
Domestic cattle	90	24	151

B) Low limit of cattle sizes (*Graph 15*) is much higher than at other Eneolithic sites in the Czech Republic including Stehelčeves - Homolka. High lower limit can again be a result of gene mixing. That could also be caused by absence of domestic cows (females) in given assemblage, but that is highly improbable (see also *Tab. 17*) – for details and discussion see *Kyselý 2008b*.

A study of DNA extracted from bones could help solving this problem; a genetic determination of gender is therefore intended for the cattle bones from Kutná Hora - Denemark[10].

7.5.2.3. Vertebrate as sustenance

Among primary products of domestication and hunting are tissues used as sustenance (meat, fat, etc.). All identified species perhaps except the few rodents are a potential part of sustenance and the quantification of osteological material will therefore give evidence concerning their proportion in the diet. Mustelids are normally hunted for their fur only, but that would not influence the quantification since they are represented by only a very small percentage. Animal taxons other than vertebrate which could be used as food were not observed.

The proportion of species in the diet is best illustrated by the weight method. Since bones of large mammals form about 7.5 % of body weight and meat of ungulate mammals about 50 %, and other species 70 % of body weight (*Reed 1963*; *White 1953*), it is possible to count the weight of the meat (multiplying the bone weight by factor 6.67 in case of ungulate mammals or 9.33 in other mammals). The rate of bones weights shows (*Graph 12*), that the proportion of meat from hunted animals was higher than from domestic species, and most of the meat came possibly from aurochs. The importance of the aurochs and other wild ungulates in a subsistence is not a notion biased by taphonomical effects such as a presence of fragments of only one well preserved individual; this is clearly visible from the comparison of MNE, MAU and MNI of particular domestic and wild species (*Tab. 10*; *Graph 13*), and from distribution of bones of particular species in various contexts (*Tab. 7* and *8*). Second highest meat source was probably wild boar and then red deer. Even if the primary reason for beaver hunting could have been the use of its fur, evidence for also being a meat source is indicated by butchery marks on some of the bones (see *Section 7.5.1.6*). Other wild vertebrate were only a supplementary source of sustenance. Some of the identified species (e.g. badger, otter, marten, rook/crow, turtle) may have not been used for consumption at all.

Among domestic animals most of the meat was gained from cattle, followed by pig, both species can be undervalued in the quantifications since many of the bones could not be assigned to either domestic or wild form. The weight quota of sheep (+ goat) is low and it is represented slightly less than beaver (*Tab. 12*; *Graph 10*). The dog skeleton from feature 124 shows several cuts which could be classed as evidence for skinning (*Section 7.5.1.6*). Other cut marks in various anatomical parts of this dog could come from further dismembering (cutting off the meat, portioning of the body).

[10] Kyselý, R. and Hájek, M.: GAAV, id.c. IAA600020901 and GAČR reg.c. 206/09/2038.

This could be interpreted as evidence for dog meat consumption. But it could have also other reasons such as ritual purposes for example, since in spite of all these cuts, the bones of this skeleton are not very fragmented (see *Section 7.5.1.6*). Incisions on canine ribs from the feature 125 appear to be typical kitchen cuts, and there are many other dog bones fragments from Kutná Hora - Denemark which are as fragmented as commonly consumed species. Consumption of dog meat is therefore probable, but not absolutely confirmed. Evidence for consumption of horse meat is less decisive – only one hardly persuasive incision on an anklebone from feature 50. Nevertheless dog teeth marks on four horse bones (*Tab. 5*) indicate that they could have been "a common kitchen" waste.

7.5.2.4. Frogs as sustenance

Common Frog (*Rana temporaria*) bone accumulations are an unusual find within archaeological contexts (see *Section 7.5.2.1.3*). In the most significant feature (36) with charred frog bones there was an accumulation of 739 frog bones belonging to at least 123 individuals. Pottery from this feature does not show any evidence of intrusion or residuallity. They are unusual for their quantity, according to NISP they are the most represented vertebrate – *Tab. 11, 12*; *Graph 9*, as well as their interpretation in this instance. Since some of the frog bones from feature 36 were charred or burnt (in total 10.2 %), connection with humans is proven. Charring of the bones occurs in various discolorations: white, black, grey, brown or their combinations (*Photo 25*). Bones from head or spine, which are not attractive for consumption, occur only in 1 % of all frog bones (*Tab. 13* and *14*). Hind limb bones (+ urostyl bones), on the contrary form 92 % of anatomically identified material. Since hind limb bones predominate absolutely, it is almost certain, that they were used as part of the diet (as "frog legs") by the inhabitants of the settlement of the Eneolithic period. Discussion of the frog bones from Kutná Hora - Denemark and their consumption in the Eneolithic has been published in detail separately as a specific theme (*Kyselý 2005a*; *2008a*). These publications discuss potential theories explaining the occurrence of frog bones in archaeological features, determination of frog bones, morphological aspects, biology of Common Frog, analogies etc. Within archaeological excavations in Europe there are only eight other published references regarding a potential for frog consumption (see *Kyselý 2005a*; *2008a*). A very similar find from a comparable period (3179–3072 BC) is from the Chalain 3 site in eastern France (*Bailon 1993*; *1997*). Since there is evidence of a single amphibian species in Kutná Hora - Denemark, one could speculate about the specialised hunting of this species. One has to consider however, that other amphibians are not suitable for consumption (for example toads) or perhaps they did not live in the given area or were only little represented in the fauna (for example other species of Frog).

Predominance of males and the presence of adult individuals only indicate that the frogs were being caught/gathered in March or April. This is explained by the biology of Common Frogs (*Kyselý 2005a*; *2008a*). The number of frog individuals in a single feature indicates that frogs were a seasonal springtime delicacy considered an important addition to the general diet. Nevertheless the amount of meat given by this species was not large (compare weights – *Tab. 12*; *Graph 10*). As a starter in a restaurant today the thighs from 5–7 individuals would be served for example. The assemblage from feature 36 would therefore provide a minimum of 18–25 portions.

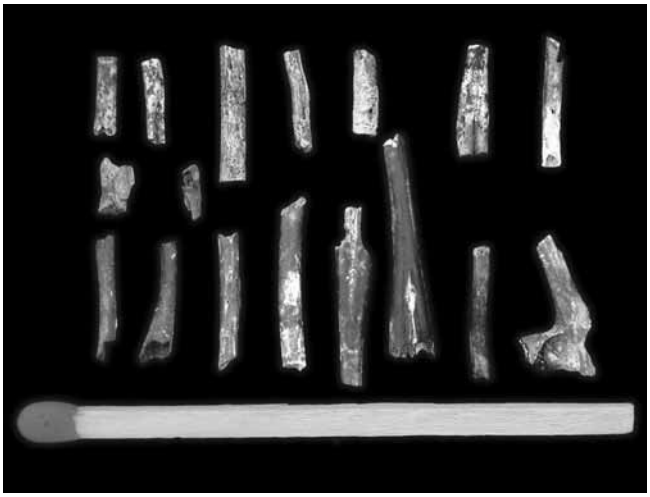


Photo 25. *Kutná Hora - Denemark – feature 36. Fragments of charred Frog bones (various anatomical parts). —* ***Foto 25.*** *Kutná Hora - Denemark – obj. 36. Fragmenty opálených kostí skokanů (různé anatomické části).*

7.5.2.5. Non sustenance use of animals

Apart from meat, fat and other consumable substances the identified species could have supplied fur or skin. Some species could have been hunted primary for fur (e.g. mustelids, beaver) or solely for their fur (mustelids). Also the skin of the dog from feature 124 was removed (*Section 7.5.1.6*) and therefore may have been used for some purpose. Bones were used for the production of a variety of artifacts (see *Section 7.5.4*), some more frequently than others – the ratio of antler and boar canine teeth products is particularly high. Also the use of horn is presumed and see also the incisions on phalanx – *Photo 10* – indicating separating of the hoof. The use of domestic animals for labour (ox) and milk production (domestic cattle and sheep/goat) can be recognised with help of slaughter curves, gender rate and pathology, which is discussed in next paragraphs. Also there are many other uses of animals, which are not recognisable in osteological analysis, such as their production of manure for agricultural purposes for example.

7.5.2.6. Age at slaughter and gender analysis

The age spectrum of the population sample can indicate economic strategies and use of domestic animals and hunting practices. Age and gender were estimated using several methods (see 7. *Section 7.4.3* and 7.*4.4*).

	Bos taurus	*Sus domesticus*	cf. *Sus domesticus*	cf. *Capra hircus*	*Ovis aries*	cf. *Ovis aries*	*Ovis/Capra*	cf. *Ovis/Capra*	*Canis familiaris*	cf. *Canis familiaris*	*Equus ferus* f.?	cf. *Equus ferus* f.?	*Bos* f.? (cf. *Bison*)	cf. *Bos* f.? (cf. *Bison*)	*Bos primigenius* f.?	*Bos/Cervus*	Small ruminant	*Sus scrofa* f.?	cf. *Sus scrofa* f.?	*Canis lupus* f.?	cf. *Canis lupus* f.?	*Bos primigenius*	cf. *Bos primigenius*	*Bos primig./Bison bonasus*	*Cervus elaphus*	cf. *Cervus elaphus*	*Capreolus capreolus*	cf. *Capreolus capreolus*	*Sus scrofa*	cf. *Sus scrofa*
part of skeleton									2																					
Calva	9	5			2		3		3				12		3	3	1	39				2		3	4	3	1		20	1
Praemaxilla		1											3		1		1	4				1			1				7	
Maxilla	9						3						6					9	1				1	1	2				13	1
Mandibula	15	5			1		18		2	1	2		31		4	2	4	30				10			3		5		11	
Cranial element																														
Dens inferior	36	10		1	2	1	18				4		11		2	1		11				3			1				18	
Dens superior	34	6					9		1		12		38					10					4		7		2		12	
Dens	20	2					4				1		27			2		5		2					4				2	
Antler																									47		17			
Hyoideum													1						1											
Sternum																														
Atlas	3	1					1		1				4					3		2		1		1	2		1		4	
Axis	4	1											2			3	1													
Vertebra cervicalis	7	1					1					1	12		1	2	1	6						3	1	2	2	2	4	
Vertebra thoracica	2	4	1				3						15			2	6	6						5						
Vertebra lumbalis	8	1						1	1				8		1	1	5	6		1					1				3	1
Sacrum	4												1					1											1	
Vertebra caudalis/urostyl													2					1						2						
Vertebra													1				5							1						
Costa		7					3	1	2		1		24			2	6	10	7			1	5	13		1			2	6
Cartilago costae																														
Clavicula																														
Scapula	6	14			3		3				1		10		2	10	3	12				1			11	1	2	1	16	
Coracoideum																														
Humerus	6	6			2		8		2				7		3	1	1	16			1	5	1	3	8		1		15	
Radius	10	9					11				1		9		7	1	4	8				5	2	1	17	1	4		9	1
Ulna	4	11					5					1	5		3	1		3				5			5				11	
Radius + ulna				1									2			1	1					3								
Carpale	6	1											4		7							18	1		5				4	
Metacarpus	9	7					4				2		9	1	3			4				6	1	5	3	1	1		26	
Carpometacarpus																														
Pelvis	2	3					6		1				13			3		4				7	1	1	6	1	3		13	
Femur	10	6	1		1		3		1		2		13		6	1	7	8				3	1	2	3	1	4		8	1
Tibia/tibiofubula	12	20			1		4		1		1	1	11		14	3	4	11				7		3	12	1	4		15	1
Fibula		9	2															8											10	
Patella	3												1		2			1					1						4	
Calcaneus	5	4			1						1		6		1	3	1	3				2		1	7		2		8	
Talus	5	5									1		8		2	2		1				2			19			1	7	
Tarsale	1						2				1		3		5	3		3				6			1	1			3	
Metatarsus	17	13				1	7		1				17		2	1		8				5		6	5		7		16	1
Carpal or Tarsal																														
Metapodium		6	1				1						11			6	1	4						2	2		1		6	
Phalanx I	7	7					2				2		22		4			2					1	5	4		2		15	
Phalanx I post.																														
Phalanx II	9	2			1		1				1		9		5	1		4				1		6	9		1		10	
Phalanx II ant.																														
Phalanx II post.																														
Phalanx III	7	4									2		5		4			3						6	4		1		5	
Phalanx													1																	
Sessamoid	4						1						7		4	1									3					
Os penis									1																					
Radialia																														
Carapax																														
undetermined							1							1	1							1	1	3						1
TOTAL	274	171	5	2	14	2	122	2	19	1	35	3	371	2	87	56	52	244	9	5	1	95	20	73	197	13	61	4	298	14

Tab. 13. *Kutná Hora - Denemark – representation of anatomical parts of individual species: material acquired by manual selection (quantification after NISP).*

Lepus europaeus	*Felis sylvestris*	*Ursus arctos*	*Meles meles*	*Lutra lutra*	*Martes foina*	cf. *Martes*	*Castor fiber*	cf. *Castor fiber*	*Apodemus cf. flavicolis*	*Rodentia*	Large mammal	*Sus scrofa/Cervus* size group	Medium mammal	Small mammal	Very small mammal	Undetermined mammal	*Pelecanus crispus*	*Tetrao urogallus*	*Corvus corone/frugilegus*	Undetermined bird	*Emys orbicularis*	*Rana*	*Abramis brama*	*Leuciscus cephalus*	*Perca fluviatilis*	Undetermined fish	Undetermined bone	*Arthropoda*	*Homo sapiens*	cf. *Homo sapiens*	TOTAL
																														2
							2	1			48		15			98											1		25	1	305
																														19
											3		1									4							1		55
			1				12				18		2									4									181
																							1	1	4	2					8
							5			1	1																				126
		1				1	3																								140
							4				21		3			34															131
																16															80
											6	1	3			2															14
											1		1																		2
		1									3					1															29
																															11
											25	1	4			2															78
							6				31	1	11			2													1		96
1							3				16	4	8			2															72
											1	2	1																		11
							8				2		1									13									29
							12				44	3	10									1							1		78
							14	1			236	59	239	6		1										2				1	650
											3		2			1															6
							1	1																							2
		2		1			8	1			15	1	4			3						1									132
																						3									3
1	1						10				10	4	11					1	2			39									165
		2					3				3	2	5																1		116
		1					6				1									1											63
																						4									12
																															46
							1																						2		85
																		1													1
1							6				12		1			2						68							1	1	156
1							5				7	2	5					1				214							4		321
1							2		1	1	8	3	12									282							1		437
							1										1														31
																															12
							2				1																		2		50
							1																						1		55
							1				1											42									73
							2				1																				110
							1				3		1																5		10
		1											1			1													5		49
											3	3																	1		80
							4																								4
											1																				61
							1																								1
							2																								2
																															41
		1																				1									3
											5																				25
					1		1																								3
																										2					2
																					1										1
							6	1			1613	100	296	2	1	8338						180				3	117	1	37	35	10739
5	1	9	1	1	1	1	133	5	1	2	2143	186	637	8	1	8503	1	3	2	1	1	856	1	1	4	9	118	1	88	38	15014

Tab. 13. *Kutná Hora - Denemark – zastoupení anatomických částí u jednotlivých druh: materiál získaný ručním výběrem (kvantifikace dle NISP).*

	Ovis/Capra	*Sus domesticus*	*Bos/Cervus*	*Small ruminant*	*Sus scrofa f.?*	*Sus scrofa*	*Rodentia*	Large mammal	Medium mammal	Small mammal	Undetermined mammal	*Rana*	*Anguilla anguilla*	Undetermined fish	Undetermined bone	*Homo sapiens*	TOTAL
Calva					1				1		11					1	14
Cranial element													1				1
Mandibula				1													1
Dens		2			1						2						5
Dens inferior	1		1			1	1		1								5
Dens superior		1				1											2
Hyoideum								1									1
Vertebra thoracica									3								3
Vertebra caudalis/urostyl												2	2				4
Vertebra									2		1			1	1		5
Costa			1					1		1							3
Scapula												1					1
Coracoideum												2					2
Humerus							1					6					7
Pelvis												6					6
Femur												13					13
Tibia					1												1
Metapodium				1	1												2
Phalanx I	2								1			1					4
Phalanx												2					2
undetermined								2			492	3		1			498
TOTAL	3	3	2	2	4	2	2	4	8	1	506	36	3	2	1	1	580

Tab. 14. *Kutná Hora - Denemark – representation of anatomical parts of individual species: material acquired by floatation (quantification after NISP).* — ***Tab. 14.*** *Kutná Hora - Denemark – zastoupení anatomických částí u jednotlivých druhů: materiál získaný plavením (kvantifikace dle NISP).*

In case of cattle, the 44 finds, including 74 teeth, indicate that most individuals were slaughtered between their first and sixth year of age (*Graph 16* and *17*) and there are no significant fluctuations within this interval. Results from both methods (number of teeth and number of finds) are quite similar (*Graph 17*). There is also evidence of a small group of older individuals (10–12 years) and sporadic finds of very young individuals of up to half a year old. Jaws and teeth were interpreted usually as domestic because of their small size; the analysis is therefore more informative about domestic rather than hunting practices. For example, up to the age of 3.5–4 years the dentition indicates the slaughtering of about 50 % of animals. This ascertainment corresponds with age pattern indicated on the basis of the epiphysis state (N=154), according to which again 50 % of domestic population is slaughtered at this age (*Graph 18* and *19*; *Tab. 15*).

Six month old calves of primitive breeds do not require feeding with since lactation terminates in this age (*Peške 1994*; *Balasse et al. 2000*; *Balasse 2003*) and these calves can be slaughtered with no wastage of milk. Strong representation of six month old individuals could potentially reveal the use of milk (see *Balasse et al. 2000*; *Balasse – Tresset 2002*). This was not ascertained in case of the Kutná Hora - Denemark assemblage. However milking cannot be excluded on the basis of this analysis.

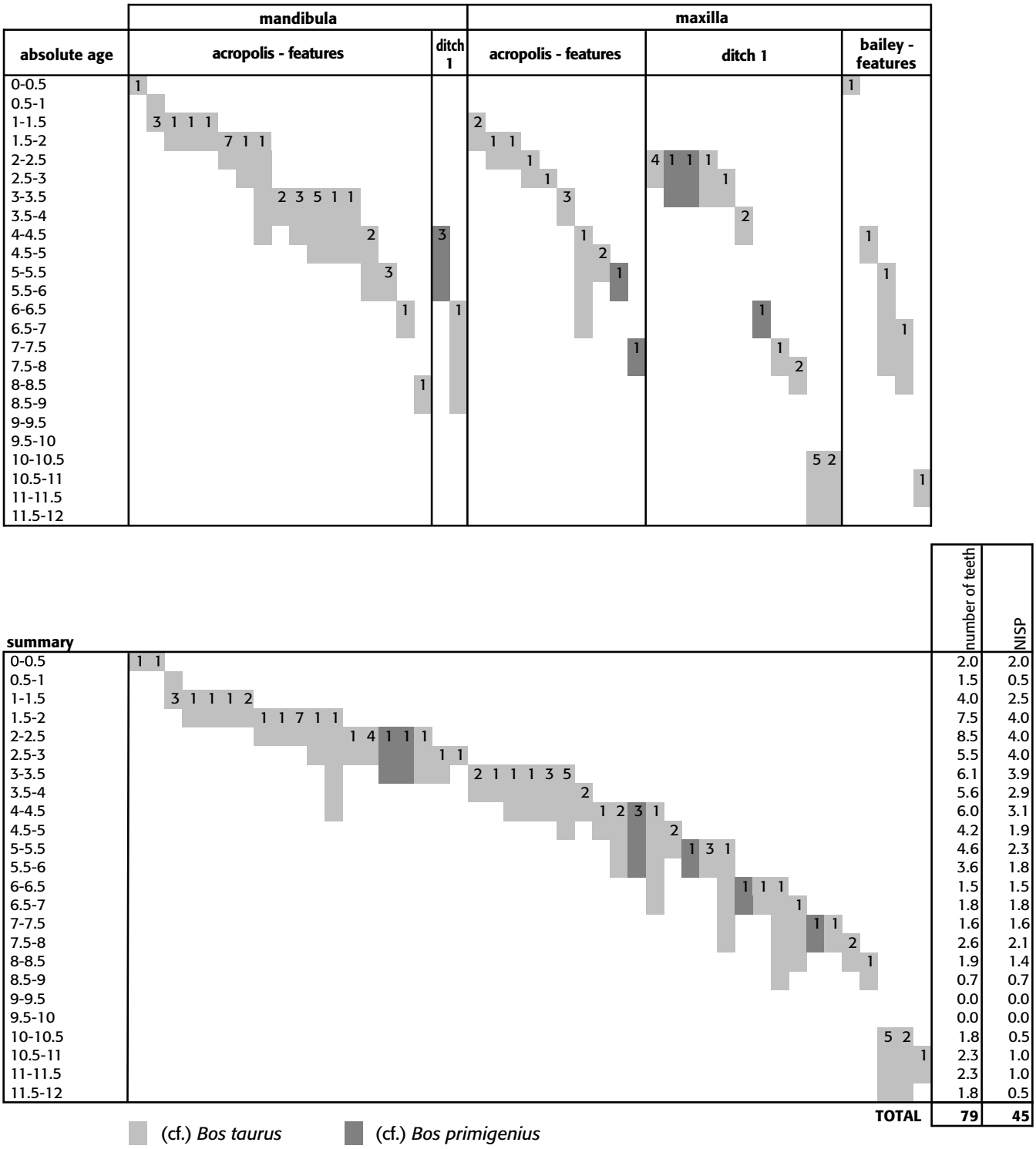
Use of secondary products (sensu *Greenfield 2005*), i.e. mainly milk and work power, is supported by a relatively high rate of individuals with ages exceeding maximum usefulness (from the biomass yield point of view – i.e. around 3.5–4 years in the case of cattle), when the body growth is terminated. At this age, as both methods show, about half of the individuals were slaughtered. In that way every second individual was retained as stock for secondary uses and breeding. However a 50 % slaughtering up to the 3.5–4th year indicates that the production of meat was also intensive and the use of cattle can therefore be interpreted as combined utility. Relatively old individuals (around 10–12 years) can represent castratos used for work purposes and although cows can be used for work (*Bartosiewicz – Van Neer – Lentacker 1997*; *Johannsen 2002*) they can also be old cows destined for combined exploitation. However they can also represent old aurochsen. Bulls are of no use as work animals and ethnographic observations of African herdsmen show, that within a herd they represent only a small percentage of population (sex ratio between 1 : 5 – 1 : 60 according to various sources – see *Dahl – Hjort 1976*), therefore they might not overly occur in our data. According to epiphysis state the age distribution of domestic cattle is different from distribution of wild cattle (*Graph 18*). Aurochsen up to the age of 3.5–4 years represents only 20 % from 46 fragments; hunting was therefore aimed more at mature individuals. Our limited gender data – *Tab. 17* – (and possible castration) makes closer characteristics of the economic processes connected with cattle usage difficult.

In case of pig jaw finds quantification (N=38) and tooth quantification (N=99) prominent high representation of two age categories are revealed: 0.5 to 1.1 and 1.8 to 2.5 years (*Tab. 16*; *Graph 20* and *21*). First category probably represents winter slaughter or winter hunting (see also *Section 7.5.2.10*). In the other category wild pigs totally predominate, which can be interpreted as the hunting of fully mature individuals. There is only weak evidence for the slaughter of newly born or very young piglets (0–0.5 year) (only one jaw fragment

acropolis		bailey		total	
Bos primigenius					
fused	unfused	fused	unfused	fused	unfused
acetabulum (7-10 months)					
2		1		3	
phalanges prox. et media III et IV prox., radius prox., humerus dist. (1.5 years)					
13	1	4		17	1
metacarpus dist., tibia dist. (2-2.5 years)					
3	1	3		6	1
metatarsus dist. (2.25-3 years)					
2		1		3	
calcaneus (3-3.5 years)					
1				1	
femur prox.+ dist., tibia prox., humerus prox., radius dist., ulna dist. (3.5-4 years)					
1		3	1	4	1
Bos taurus					
fused	unfused	fused	unfused	fused	unfused
acetabulum (7-10 months)					
2				2	
phalanges prox. et media III et IV prox., radius prox., humerus dist. (1.5 years)					
14	1	5		19	1
metacarpus dist., tibia dist. (2-2.5 years)					
3				3	
metatarsus dist. (2.25-3 years)					
	1				1
calcaneus (3-3.5 years)					
femur prox.+ dist., tibia prox., humerus prox., radius dist., ulna dist. (3.5-4 years)					
3	3	1	1	4	4
Bos					
fused	unfused	fused	unfused	fused	unfused
acetabulum (7-10 months)					
3				3	
phalanges prox. et media III et IV prox., radius prox., humerus dist. (1.5 years)					
34	1	2		36	1
metacarpus dist., tibia dist. (2-2.5 years)					
6	5			6	5
metatarsus dist. (2.25-3 years)					
6	1		2	6	3
calcaneus (3-3.5 years)					
	2		1		3
femur prox.+ dist., tibia prox., humerus prox., radius dist., ulna dist. (3.5-4 years)					
7	13		4	7	17
Ovis/Capra					
fused	unfused	fused	unfused	fused	unfused
radius prox., humerus dist., acetabulum (6-10 months)					
7	3	2		9	3
phalanges prox. et media prox. (1-1.5 years)					
3	1	3		6	1
tibia dist. (1.5-2 years)					
1				1	
ulna prox., femur prox. + dist., tibia prox. (3-3.5 years)					
2	2			2	2
Sus domesticus					
fused	unfused	fused	unfused	fused	unfused
phalanges media III et IV prox., humerus dist., radius prox., acetabulum (1 year)					
4	1	3	1	7	2
metacarpus III et IV dist., metatarsus III et IV dist., tibia dist., fibula dist., phalanges prox. III et IV prox., calcaneus (2-2.5 years)					
6	9	5		11	9
femur prox.+ dist., tibia prox., humerus prox., ulna prox., radius dist. (3.5 years)					
	2		1		3
***Sus scrofa* f.?**					
fused	unfused	fused	unfused	fused	unfused
phalanges media III et IV prox., humerus dist., radius prox., acetabulum (1 year)					
1		2	2	3	2
metacarpus III et IV dist., metatarsus III et IV dist., tibia dist., fibula dist., phalanges prox. III et IV prox., calcaneus (2-2.5 years)					
4	3	2	2	6	5
femur prox.+ dist., tibia prox., humerus prox., ulna prox., radius dist. (3.5 years)					
1	9			1	9

acropolis		bailey		total	
Sus scrofa					
fused	unfused	fused	unfused	fused	unfused
phalanges media III et IV prox., humerus dist., radius prox., acetabulum (1 year)					
18	2	8	2	26	4
metacarpus III et IV dist., metatarsus III et IV dist., tibia dist., fibula dist., phalanges prox. III et IV prox., calcaneus (2-2.5 years)					
20	5	6		26	5
femur prox.+ dist., tibia prox., humerus prox., ulna prox., radius dist. (3.5 years)					
4		1		5	
Cervus elaphus					
fused	unfused	fused	unfused	fused	unfused
humerus dist., radius prox. (8-10 months)					
10		3		13	
tibia dist., metatatrsus dist., metacarpus dist., phalanx 1 a 2 (1.5-2)					
17	1	3		20	1
femur prox., tibia prox., radius dist., calcaneus (2.5-3 years)					
3	2	2		5	2
Capreolus capreolus					
fused	unfused	fused	unfused	fused	unfused
phalanx prox. prox., radius prox. (4-7 months)					
2		1		3	
radius dist., femur dist., tibia dist., metatarsus dist., calcaneus, phalanx media prox. (12-16 months)					
4	2	1	1	5	3
Lepus					
fused	unfused	fused	unfused	fused	unfused
tibia prox.					
2				2	
Castor fiber					
fused	unfused	fused	unfused	fused	unfused
humerus dist., phalanx media ant., metacarpus III (3.5 years or earlier)					
5		4		9	
ulna prox., phalanx prox. et media post., metatarsus II et IV (4-6 years)					
7	3			7	3
humerus prox., femur prox. + dist., fibula prox. (7-9 years)					
1	5	1	4	2	9
radius dist., ulna dist. (12 years)					
	3		2		5
Equus					
fused	unfused	fused	unfused	fused	unfused
phalanx prox. et media (9-15 months)					
3				3	
metacarpus dist. (15-18 months)					
1				1	
tibia dist. (20-24 months)					
1				1	
radius dist., femur prox. (3-3.5 years)					
2				2	
Canis familiaris					
fused	unfused	fused	unfused	fused	unfused
metatarsus V (10 months)					
		1		1	
femur dist. + prox. (1.5 years)					
1				1	

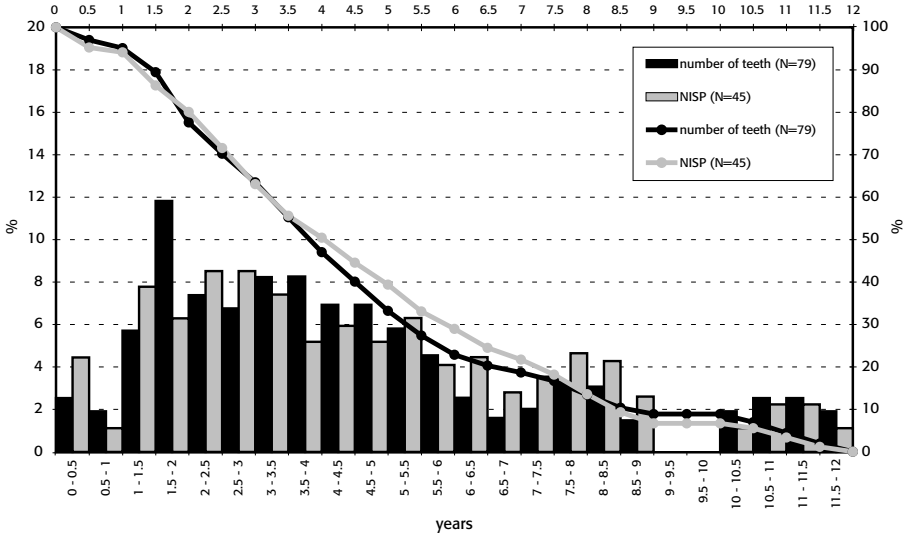
Tab. 15. *Kutná Hora - Denemark – quantification of ratio of fused and unfused epiphysis and acetabulum suturas (NISP). For methodology see Section 7.4.3. For Bos primigenius see footnote 6. —* ***Tab. 15.*** *Kutná Hora - Denemark – kvantifikace srostlých a nesrostlých epifýz a švů acetabula (NISP). Metodologie viz kap. 7.4.3. Bos primigenius viz poznámka pod čarou 6.*

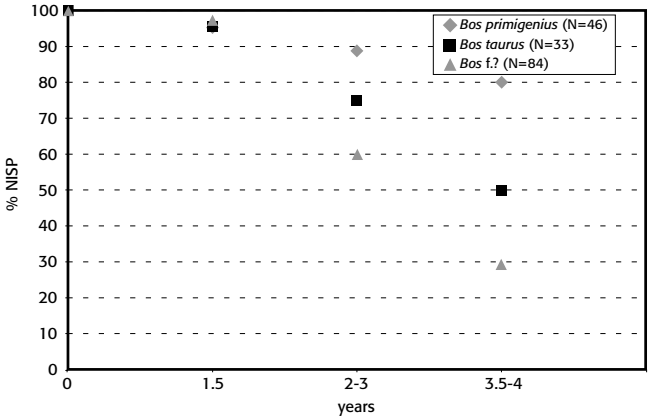


Graph 16. *Kutná Hora - Denemark – Bos – jaw finds of identifiable age (years). Each column is a single find, the height of the grey columns corresponds with the determined time spam, numbers in columns mean number of teeth preserved in the find. For Bos primigenius see footnote 6.* — ***Graf 16.*** *Kutná Hora - Denemark – tur – věkově určitelné čelistní nálezy (roky). Každý sloupec představuje jeden nález, výška šedých sloupců odpovídá determinovanému časovému rozsahu, čísla v sloupcích uvádějí počet zubů zachovaných v nálezu. Bos primigenius viz poznámka pod čarou 6.*

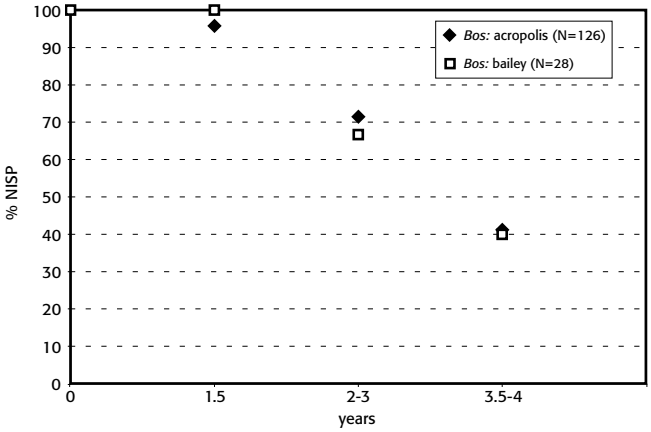
from neonatal category). This ascertainment can be distorted, however (see *Section 7.5.1.2*). According to the methods used the highest age for wild pig was 6–9 years. The study of epiphysis indicates, that (similar to cattle) domestic pigs were killed at a younger age than wild ones (*Graph 22*). Epiphyses, which fuse at 3.5 year of age, are in the case of domestic pigs all unfused and all fused in wild pigs (distortion has to be taken into account caused by the small number of observations within the given age stage – *Tab. 15*). Also dental data indicates that wild pigs are on average older than domestic or unspecified forms (*Graph 20* and *21*). For the dental data see also *Section 7.5.2.7* and *Tab. 19*.

Graph 17. *Kutná Hora - Denemark – Bos – kill-off pattern (columns, on the left axis Y) and survivalship curve (lines, on the right axis Y).* — ***Graf 17.*** *Kutná Hora - Denemark – tur – distribuce porážkového stáří (sloupce, na levé ose Y) a křivka přežívání (křivky, na pravé ose Y).*





Graph 18. *Kutná Hora - Denemark – Bos – percentage of fused epiphysis in various age categories according to data from Tab. 15. N = amount of analysed fragments. For Bos primigenius see footnote 6.* — ***Graf 18.*** *Kutná Hora - Denemark – tur – procento srostlých epifýz v různých věkových kategoriích dle dat z tab. 15. N = množství použitých fragmentů. Bos primigenius viz poznámka pod čarou 6.*



Graph 19. *Kutná Hora - Denemark – Bos – percentage of fused epiphysis in various age categories according to data from Tab. 15 – comparison of the acropolis and the bailey. N = amount of analysed fragments.* — ***Graf 19.*** *Kutná Hora - Denemark – tur – procento srostlých epifýz v různých věkových kategoriích dle dat z tab. 15 – srovnání akropole a předhradí. N = množství použitých fragmentů.*

Analysis of 35 canine teeth and their alveolars show, that in case of wild pigs the males noticeably predominate (ascertained at the acropolis only), in case of domestic pigs the situation is not explicit (*Graph 29* and *30*; *Tab. 17*). These results show, that pig hunting was probably aimed at adult boars. Where gender was possible to assign to the given age group, the lower age of unidentified forms was usually assigned to males and higher age to females. In the case of reliably identified wild pigs this is contrariwise, two males are prominently old (*Tab. 18*). Nevertheless data of wild pigs contain adults and older individuals only.

On the basis of twenty usable jaw fragments together with 39 teeth it was ascertained that the sheep/goat finds were aged between 0.5 to 8 years old. The shape of *Graph 25* and *26* was interpreted on the basis of *Helmer – Vigne* (*2004*) as a combined utility. According to the quantification there is a very significant representation of the age category 2 to 3 years, that is newly matured individuals (*Graph 23 to 25*). The same peak occurs in number of teeth, but is not so significant. Slaughtering at the age of 2–3 years corresponds with the highest usefulness of the biomass (meat and primary products sensu *Greenfield 2005*). Young individuals up to 2 years old have little representation, which corresponds with the state of the epiphyses (*Graph 26*). A significant decrease in number at the age of 6 years (*Graph 24* and *25*) corresponds with the period when the quality of wool significantly decreases (*Helmer – Vigne 2004*). This gives an indirect indication for a strategy that includes secondary products (sensu *Greenfield 2005*), but it is based on a low quantity of finds.

The interpretations stated above are valid under the presumption that, (1) the herd was not markedly reduced or enlarged in the analysed period. Abrupt changes in the size of a herd may possibly be connected with a potential socio-economic crisis and can be a problem to interpret; (2) animals of certain age category were not selectively imported or exported. It is presumed, that in sustenance Eneolithic settlements might be similar to those of the early Neolithic, which were apparently self-sufficient and not radically diversified

mandibula - acropolis	*Sus scrofa*		*Sus domesticus*		*Sus* f.?	
	NISP	n. of teeth	NISP	n. of teeth	NISP	n. of teeth
neonatus						
up to 0.5	1	3				
0.5-1.1			1	4	2	5
1.1-2.1			1	1	1	2
1.8-2.5	1	8				
2.5-4	1	1				
4-6	1	1				
6-9						

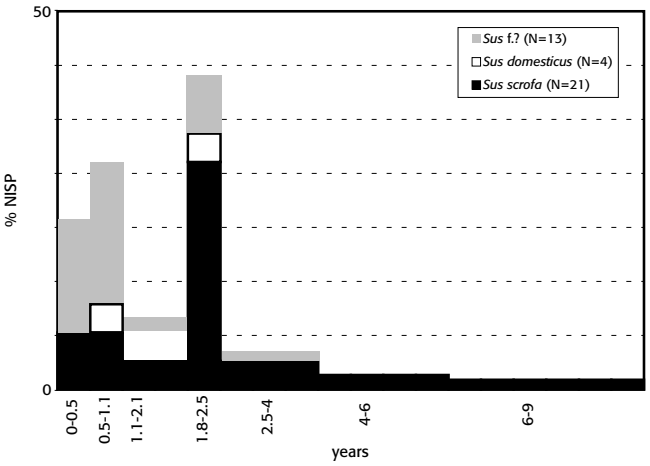
mandibula - bailey	*Sus scrofa*		*Sus domesticus*		*Sus* f.?	
	NISP	n. of teeth	NISP	n. of teeth	NISP	n. of teeth
neonatus					1	6
up to 0.5	1	2				
0.5-1.1						
1.1-2.1						
1.8-2.5	1	1			1	1
2.5-4						
4-6	1	4				
6-9	2	13				

maxilla - acropolis	*Sus scrofa*		*Sus domesticus*		*Sus* f.?	
	NISP	n. of teeth	NISP	n. of teeth	NISP	n. of teeth
neonatus						
up to 0.5					1	3
0.5-1.1	1	7			3	7
1.1-2.1	2	3	1	1		
1.8-2.5	5	11	1	1	1	1
2.5-4	2	2			1	1
4-6						
6-9						

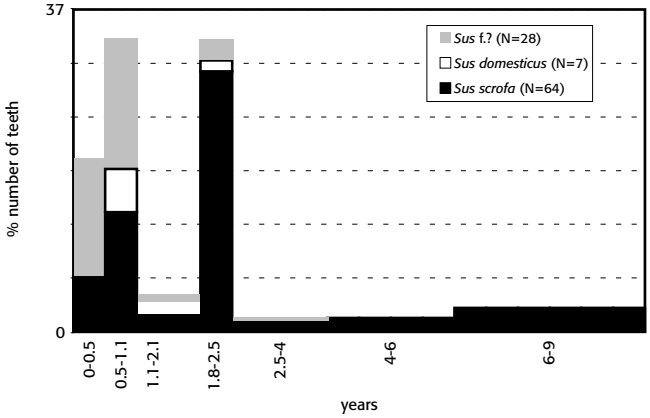
maxilla - bailey	*Sus scrofa*		*Sus domesticus*		*Sus* f.?	
	NISP	n. of teeth	NISP	n. of teeth	NISP	n. of teeth
neonatus						
up to 0.5					2	2
0.5-1.1	1	4				
1.1-2.1						
1.8-2.5	1	4				
2.5-4						
4-6						
6-9						

summary	*Sus scrofa*		*Sus domesticus*		*Sus* f.?	
	NISP	n. of teeth	NISP	n. of teeth	NISP	n. of teeth
neonatus					1	6
up to 0.5	2	5			3	5
0.5-1.1	2	11	1	4	5	12
1.1-2.1	2	3	2	2	1	2
1.8-2.5	8	24	1	1	2	2
2.5-4	3	3			1	1
4-6	2	5				
6-9	2	13				

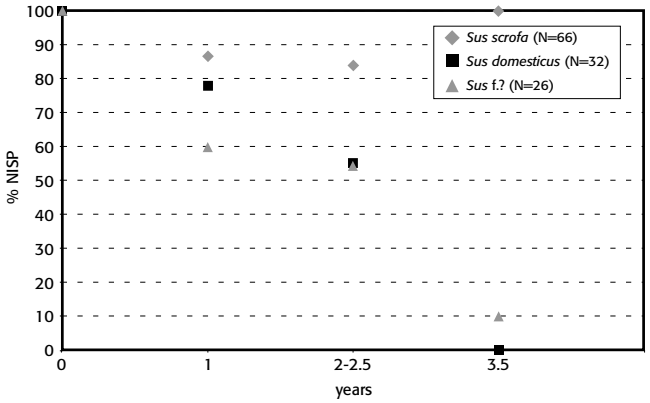
Tab. 16. *Kutná Hora - Denemark – Sus – quantification of age categories after molars and premolars; absolute data in years after Matschke (1967) and Horard-Herbin (1997), age intervals modified. —* ***Tab. 16.*** *Kutná Hora - Denemark – prase – kvantifikace věkových kategorií dle molárů a premolárů; absolutní data v rocích dle dle Matschke (1967) a Horard-Herbin (1997), věkové intervaly upraveny.*



Graph 20. *Kutná Hora - Denemark – Sus – kill-off pattern: quantification after the number of finds (corrected, N = amount of analysed fragments). —* ***Graf 20.*** *Kutná Hora - Denemark – prase – distribuce porážkového stáří: kvantifikace dle počtů nálezů (provedena korekce, N = množství použitých nálezů).*



Graph 21. *Kutná Hora - Denemark – Sus – kill-off pattern: quantification after the number of present teeth (corrected, N = amount of analysed fragments). —* ***Graf 21.*** *Kutná Hora - Denemark – prase – distribuce porážkového stáří: kvantifikace dle počtu všech přítomných zubů (provedena korekce, N = množství použitých zubů).*



Graph 22. *Kutná Hora - Denemark – Sus – percentage of fused epiphysis in various age categories according to data from Tab. 15. N = amount of analysed fragments. —* ***Graf 22.*** *Kutná Hora - Denemark – prase – procento srostlých v různých věkových kategoriích dle dat z tab. 15. N = množství použitých fragmentů.*

in farming practices although perhaps differences in household space and productive space could occur (*Bogaard 2004a*; *2004b*). For example, such a differenciation was found in Near East early state societies on the basis of the sheep/goat survivorship curves (*Stein 1987*). Thus we cannot definitely exclude certain differentiation of Řivnáč settlements, with some producing – exporting meat or whole animals (agricultural background space) – and some consuming – importing meat or whole animals (possibly hillforts). The region surrounding the Kutná Hora - Denemark site has not

species	acropolis/bailey	sex	caninus inferior or its alveolus	caninus superior or its alveolus	caninus	pelvis	TOTAL
Bos primigenius	acropolis	possibly male				1	1
Bos taurus	acropolis	female				2	2
Cervus elaphus	acropolis	female				1	1
Cervus elaphus	bailey	male		1			1
Ovis/Capra	acropolis	possibly male				1	1
Ovis/Capra	acropolis	female				1	1
Ovis/Capra	bailey	female				1	1
Sus scrofa	acropolis	female	1	1			2
Sus scrofa	acropolis	male	10	4	1		15
Sus scrofa	bailey	female	1	3			4
Sus scrofa	bailey	male	2				2
Sus domesticus	acropolis	female	2				2
Sus domesticus	acropolis	male	2				2
Sus domesticus	bailey	male		1	1		2
Sus f.?	acropolis	male	4				4
Sus f.?	bailey	female		1			1
Sus f.?	bailey	male		1			1

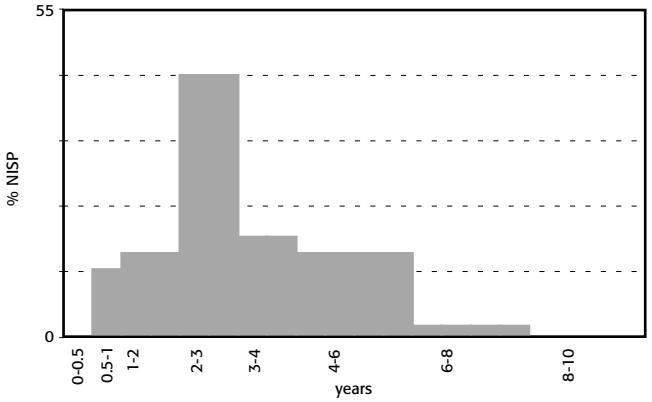
Tab. 17. *Kutná Hora - Denemark – quantification of finds with determined gender (after NISP).* — ***Tab. 17.*** *Kutná Hora - Denemark – kvantifikace pohlavně determinovaných nálezů (dle NISP).*

	Sus scrofa		*Sus domesticus*	*Sus* f.?
neonatus				
do 0.5				
0.5-1.1			F	MM
1.1-2.1				MF
1.8-2.5	FF			F
2.5-4	F	FM		
4-6	M		F	
6-9				

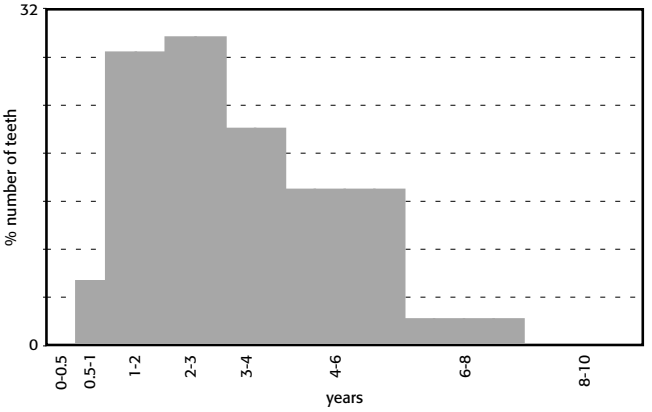
Tab. 18. *Kutná Hora - Denemark – quantification of gender at finds with determined age (in years); except material in Tab. 16 also isolated canine teeth included (see Section 7.4.2 for explanation). M = 1 male, F = 1 female.* — ***Tab. 18.*** *Kutná Hora - Denemark – kvantifikace pohlavně determinovaných nálezů v jednotlivých věkových kategoriích (roky); kromě materiálu z tab. 16 zařazeny i izolované špičáky (metodika viz kap. 7.4.2). M = 1 samec, F = 1 samice.*

categories after *Payne (1973)*	absolute age	mdb - acropolis	mdb - bailey	max - acropolis	max - bailey	NISP	number of teeth
a-b	0-6 months					0	0
c	6-12 months			1		1	1
d	1-2 years	4	5	1		2.5	9.5
e	2-3 year	3 1 1 1	1	1 1 1		8	10
f	3-4 years	5 1	1			3	7
g	4-6 years	1	3	1	5 1	5	9.5
h	6-8 years					0.5	1.5
i	8-10 years					0	0
					TOTAL	20	39

Graph 23. *Kutná Hora - Denemark – Ovis/Capra – jaw finds of identifiable age. Each column is a single find, the height of the grey columns corresponds with the determined time span, numbers in columns mean number of teeth preserved in the find. Mdb = mandible, max = maxilla.* — ***Graf 23.*** *Kutná Hora - Denemark – ovce/koza – věkově určitelné čelistní nálezy. Každý sloupec představuje jeden nález, výška šedých sloupců odpovídá determinovanému časovému rozsahu, čísla v sloupcích uvádějí počet zubů zachovaných v nálezu. Mdb = mandibula, max = maxilla.*



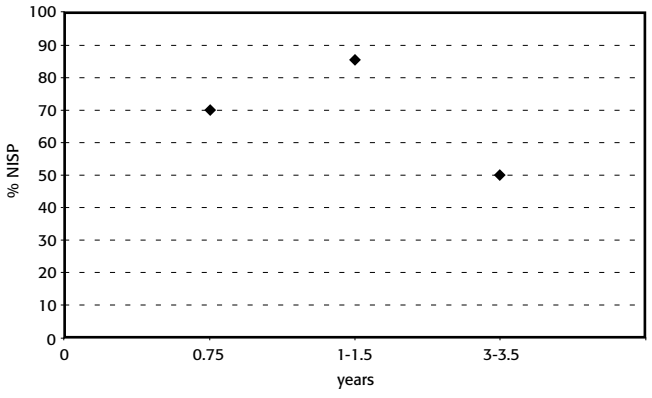
Graph 24. *Kutná Hora - Denemark – Ovis/Capra – kill-off pattern: quantification after the number of finds (corrected; amount of analysed fragments = 20).* — ***Graf 24.*** *Kutná Hora - Denemark – ovce/koza – distribuce porážkového stáří: kvantifikace dle počtů nálezů (provedena korekce; množství použitých nálezů = 20).*



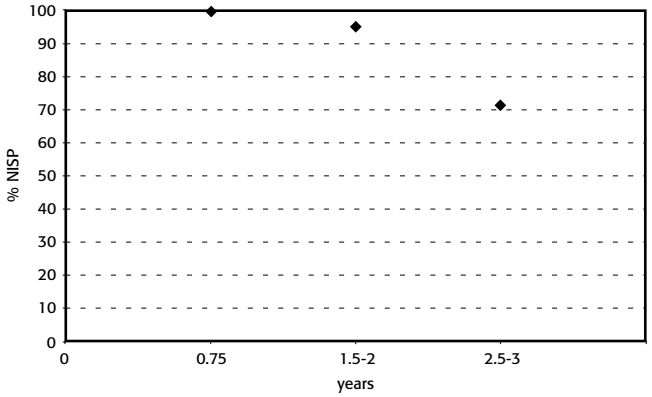
Graph 25. *Kutná Hora - Denemark – Ovis/Capra – kill-off pattern: quantification after the number of present teeth (corrected; amount of analysed teeth = 39).* — ***Graf 25.*** *Kutná Hora - Denemark – ovce/koza – distribuce porážkového stáří: kvantifikace dle počtů zubů (provedena korekce; množství použitých zubů = 39).*

been sufficiently archaeologically investigated, and so we lack information about the spatial structure of Řivnáč settlement situated here. However, no settlements have yet been found close to the site and the frequency of finds in the region is noticeably lower than in Prague region for example (see *Zápotocký – Zápotocká – this suppl.*). The presence of mature and old individuals of farming animals indicate that the site was not supplied nutritionally with animals designated for meat production or with selected individuals of appropriate age, i.e. subadult or just adult animals. Breeding activities directly on the site or the site vicinity are therefore probable; this is also implied by agrarian finds, e.g. number of storage pits and cereal grains (*Zápotocký – Zápotocká – this suppl.*; *Čulíková – this suppl. – Chap. 3.3.1*). Nevertheless, information coming from the osteological material is not able to exclude a possibility of other transportation activities.

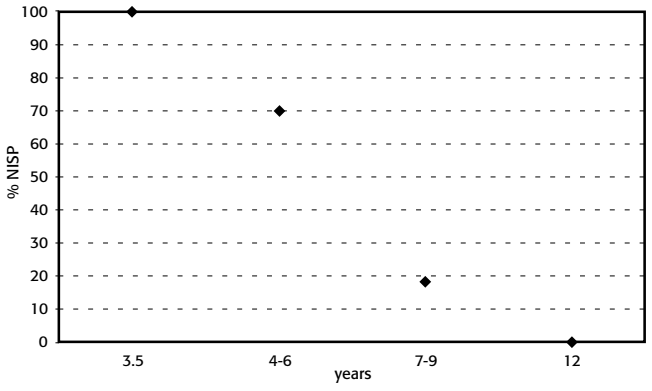
The dog skeleton from feature 124 belongs to an adult individual. This is proven by all the epiphyses being fused and by the state of skull sutures. Sutures between the frontal bones among themselves and between frontal bone and parietal bone are not obliterated, but obliteration has started between the parietal bones among themselves, which indicates age of around



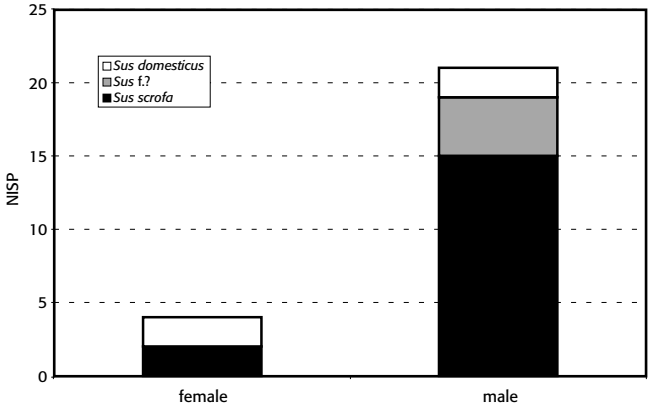
Graph 26. *Kutná Hora - Denemark – Ovis/Capra – percentage of fused epiphysis in various age categories according to data from Tab. 15 (amount of analysed fragments = 23). —* ***Graf 26.*** *Kutná Hora - Denemark – ovce/koza – procento srostlých epifýz v různých věkových kategoriích dle dat z tab. 15 (množství použitých fragmentů = 23).*



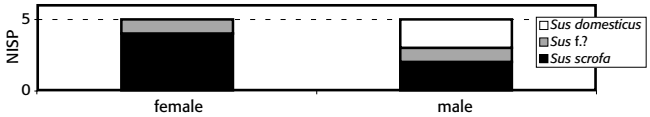
Graph 27. *Kutná Hora - Denemark – Cervus elaphus – percentage of fused epiphysis in various age categories according to data from Tab. 15 (amount of analysed fragments = 42). —* ***Graf 27.*** *Kutná Hora - Denemark – jelen lesní – procent srostlých epifýz v různých věkových kategoriích dle dat z tab. 15 (množství použitých fragmentů = 42).*



Graph 28. *Kutná Hora - Denemark – Castor fiber – percentage of fused epiphysis in various age categories according to data from Tab. 15 (amount of analysed fragments = 35). —* ***Graf 28.*** *Kutná Hora - Denemark – bobr evropský – procento srostlých epifýz v různých věkových kategoriích dle dat z tab. 15 (množství použitých fragmentů = 35).*



Graph 29. *Kutná Hora - Denemark – Sus – sex ratio on the acropolis. —* ***Graf 29.*** *Kutná Hora - Denemark – prase – poměr pohlaví na akropoli.*



Graph 30. *Kutná Hora - Denemark – Sus – sex ratio in the bailey. —* ***Graf 30.*** *Kutná Hora - Denemark – prase – poměr pohlaví v předhradí.*

Photo 26. *Kutná Hora - Denemark – feature 36. Castor fiber – os penis. —* ***Foto 26.*** *Kutná Hora - Denemark – obj. 36. Bobr evropský – os penis.*

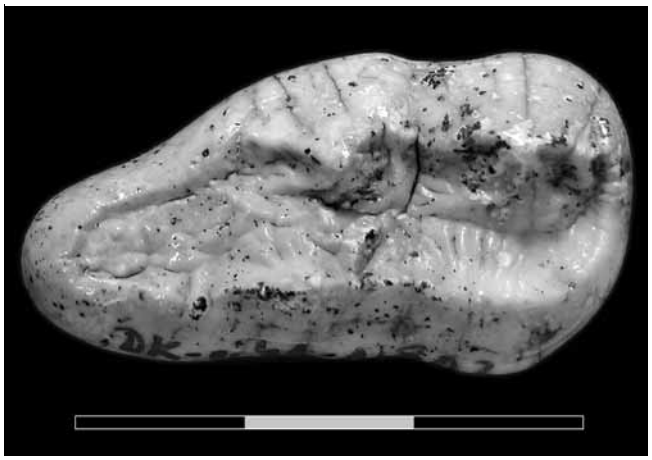


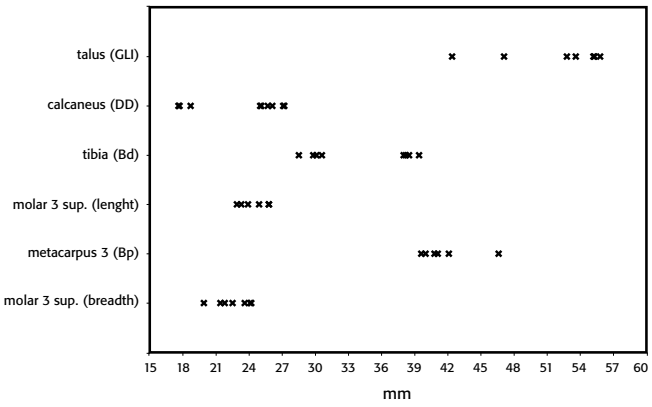
Photo 27. *Kutná Hora - Denemark – feature storage pit 41, layer 1. Ursus arctos – molar 2 superior. —* ***Foto 27.*** *Kutná Hora - Denemark – obj. silo 41, vrstva 1. Medvěd hnědý – molar 2 superior.*

4 to 6 years (after *Kolda 1936*). Another partial dog skeleton (feature 84) shows an individual of 7 to 9 months old, since the permanent teeth are erupted, but the epiphysis of dist. tibia and dist. metapodium are unfused. The find of a penis bone in feature 36 (*Tab. 13*) indicates the presence of males in the settlement.

Two lower molar teeth of a horse belong to a subadult individual/s (for postcranial horse bones with identifiable age see *Tab. 15*). There is a relatively high amount of data for the state of red deer epiphyses (N=42; *Tab. 15*; *Graph 27*). Adult individuals are prevailing, for example epiphyses fusing in 1.5 to 2 years are fused in 95 % of the cases and epiphyses fusing in 2.5 to 3 years are fused in 70 % of the finds. Fragmentary finds of red deer teeth belong to individuals of various ages from subadult to fully adult or older. Two roe deer jaws belong to 12 to 23 and 14 to 22 months old individuals.

Beaver hunting was not limited to any age category, however markedly juvenile individuals are not present. The *Tab. 15* and *Graph 28* show that most of the beavers were killed in the age group 3.5 to 9 years of age (mainly 4–9 years). A penis bone (length 37 mm; *Photo 26*) indicates that males were not excluded from the hunt.

Analysable bones of bear, mustelids, hare and birds all probably belong to adults. A molar tooth of a bear is not significantly abraded and it could have come from a younger individual (*Photo 27*). Frog bones belong generally to adults – see *Section 7.5.2.4*. Human bones – see *Section 7.5.3*.



Graph 31. *Kutná Hora - Denemark – Sus – distributions of metric data of the best represented dimensions (data from Tab. 23).* — ***Graf 31.*** *Kutná Hora - Denemark – Sus – distribuce naměřených hodnot nejlépe zastoupených rozměrů (data z tab. 23).*

7.5.2.7. Breed affiliation – body characteristics

The character of domestic species on prehistoric sites is usually evaluated according to skull morphology, horns, absolute size of bones, robustness and pertinently according to special morphological marks on the bones. The morphological description of bones from Kutná Hora - Denemark can be very limited since, skulls are in fragmentary condition (apart from the dog skeleton), complete long bones were only found sporadically and horncores not at all. Evaluation of the size of domestic cattle and pigs is problematic due to difficultities in distinguishing from wild forms and the possibility of their crossbreeding with wild forms. Maximum sizes of these domestic species can therefore become lost amongst cross-breed sizes. Therefore it is better to use the lower limit of size intervals corresponding with the smallest individuals (*Kyselý 2008b*).

Photo 28. *Humerus. Size comparison of recent female Bison bonasus (left specimen), aurochs from Kutná Hora - Denemark (two middel specimens; hut 22, layer 1) and domestic/wild cattle from Kutná Hora - Denemark (right specimen; feature kiln 124, layer 1).* — ***Foto 28.*** *Humerus. Srovnání velikosti samice recentního zubra (vlevo), pratura z Kutné Hory - Denemarku (dvě kosti uprostřed; chata 22, vrstva 1) a domácího/divokého tura (vpravo; jáma s pecí 124, vrstva 1).*

Photo 29. *Kutná Hora - Denemark – feature 36, layer 1 and kiln 63, layer 3. Sus scrofa – ulnae. —* ***Foto 29.*** *Kutná Hora - Denemark – obj. 36, vrstva 1 a pec 63, vrstva 3. Prase divoké – ulny.*

In the case of cattle, complete long bones of hind limbs were found only in feature 41a (metatarsus of domestic cattle of an almost well preserved limb, length 243.3 mm, prox. width 50.8 mm, min. width of diaphysis 28.2 mm – the bone is burnt; subadult and therefore not included in *Tab. 23*) and ditch 3 (metatarsus of aurochs, max. length 279.5 mm, prox., width 65.5 mm, dist. width 43.3 mm; belong to material taken out of the analysis, but included in *Tab. 23*). Metric analysis (log-ratio method) for *Bos* was done in finger bones (*phalanx proximalis* and *phalanx media*; *Graph 15*) – see *Section 7.5.2.2*. It showed that the lower limit of size is higher in the case of Kutná Hora - Denemark than on other Bohemian Eneolithic sites. Some large phalanges were interpreted as aurochs, some small ones were interpreted as domestic cattle. A large group of finds could not be specified (*Section 7.5.2.2*).

The comparison of a well preserved humerus fragments of aurochs with a recent female wisent (collections of archaeozoological department of Institute of Archaeology in Prague) is shown on the *Photo 28*. The extreme size of these aurochs individual/s clearly shows that they belong to males. Metric data apparently exceeds the maximal records for aurochsen from Denmark published by *Degerbøl – Fredskild* (*1970*). This fact shows that aurochsen in the Bohemian Basin were not reduced in their size, which possibly could result from the geomorphological conditions.

The pig skulls are too fragmented for closer descriptions of the skull morphology and there is little metric data from the pig bones and teeth (*Tab. 23*). Distribution within the best represented dimensions (*Graph 31*) does not indicate the so called "peak and tail" distribution (sensu *Albarella – Dobney – Rowley-Conwy 2006*) typical for many European Neolithic-Eneolithic sites. Broad size variability clearly shows that it is not a single-breed population. Two size groups can easily be separated in some cases (e.g. dist. tibia and calcaneus; *Graph 31*); which evidently represent a group of domestic and wild pigs. Some of *Sus* finds indicate noticeably big individuals, which are evidently wild boar males. Six complete third superior molars show some variability in both, the size and the morphology (*Photo 30*). Premolar 1 was present in all analysable jaw fragments: 5 observations in the upper and 5 in the lower jaw; from which wild boar 2 times in the upper and 2 times in the lower, domestic pig 1 time in the

Photo 30. *Kutná Hora - Denemark. Sus – molar 3 superior – variability in morphology of six whole specimen; four left – classified as S. srofa, one right – classified as S. srofa domestica. —* ***Foto 30.*** *Kutná Hora - Denemark. Prase – molar 3 superior – variabilita v morfologii šesti vcelku zachovaných nálezů; čtyři vlevo – klasifikovány jako prase divoké, jeden zprava – klasifikován jako prase domácí.*

cross table M1-M2

M1:	C	V	E	0.5	U	a	b	c	d	e	f	g	h	i	j	k	l	m
M2:																		
C								X-ml										
V						S-ml												
E									S-ml									
0.5																		
U																		
a									D-md									
b																		
c											S-ml							
d										S-md								
e																		
f												S-ml						
g																		
h																		
i																		
j																		S-md
k																	S-md	
l																		

cross table M2-M3

M1:	C	V	E	0.5	U	a	b	c	d	e	f	g	h	i	j	k	l	m
M2:																		
C							D-md											
V																		
E																		
0.5																		
U																		
a									S-ml	S-md								
b																		
c																		
d																		
e																		
f																		
g																		
h																	S-md	
i																		
j																		
k																		
l																		

cross table M1-M3

M1:	C	V	E	0.5	U	a	b	c	d	e	f	g	h	i	j	k	l	m
M2:																		
C										D-md								
V																		
E																		
0.5																		
U																		
a											S-md	S-ml						
b																		
c																		
d																		
e																		
f																		
g																		
h																		S-md
i																		
j																		
k																		
l																		

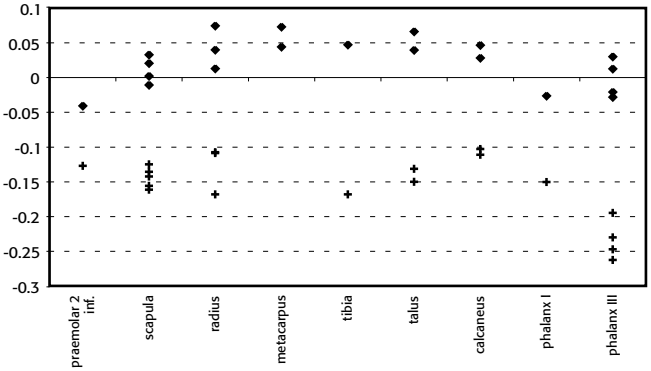
Tab. 19. *Kutná Hora - Denemark – Sus – relation of the teeth eruption level and abrasion within a single jaw after methodology by Rolett – Chiu 1994 (Section 7.5.2.7).*

Abbreviations within the table: S = Sus scrofa, D = Sus domesticus, X = Sus s. f.?, md = mandibula, ml = maxilla; M1, M2, M3 = molar 1, 2, 3. Abbreviations in the table header: a to m = codes after Grant (1982); C, V, E, 0.5, U = codes after Rollet – Chiu (1994). — ***Tab. 19.*** *Kutná Hora - Denemark – prase – vztah stupně prořezání a obrusu zubů z jedné čelisti dle metodiky Rolett – Chiu 1994 (kap. 7.5.2.7).*

Zkratky uvnitř tabulky: S = Sus scrofa, D = Sus s. domestica, X = Sus s. f.?, md = mandibula, ml = maxilla; M1, M2, M3 = molar 1, 2, 3. Zkratky v hlavičce tabulky: a až m = kódy dle Grant (1982); C, V, E, 0.5, U = kódy dle Rollet – Chiu (1994).

anatomy	dimension*	standard (*Equus przewalski*)	Kutná Hora-Denemark	recent donkey
praemolar 2 inf.	lenght	39	35.5	29.1
scapula	SD	20	20.1	15
scapula	SLC	61	65.8	42.6
scapula	GLP	90.8	88.6	62.6
scapula	LG	55.2	57.9	40.4
scapula	BG	48.6	47.6	35
radius	DD	25.1	29.8	19.6
radius	Bd	70.8	77.6	55.1
radius	Dd	43	44.3	29.2
metacarpus	Bd	47	55.6	
metacarpus	Dd	34.4	38.1	
tibia	DD	29.6	33	20.1
talus	GH	55.5	60.8	41
talus	BFd	48.6	56.6	34.4
calcaneus	GB	47.8	51	37
calcaneus	SD	18.5	20.6	14.6
phalanx prox.	Bp	51.2	48.2	36.2
phalanx dist.	GL	63.6	59.6	36
phalanx dist.	BF	43.4	46.5	27.7
phalanx dist.	GB	67	69	36.6
phalanx dist.	Ld	55.7	53.1	32.8

Tab. 20. *Equus – metric data from Kutná Hora - Denemark, recent donkey skeleton and recent Equus przewalski skeleton (standard for Graph 32, see Section 7.4.6); * abbreviations by von den Driesch 1976. —* ***Tab. 20.*** *Kůň – metrická data získaná z Kutné Hory - Denemarku, skeletu recentního osla a skeletu recentního koně převalského (Equus przewalski) (standard pro graf 32, viz kap. 7.4.6); * zkratky podle von den Driesch 1976.*



Graph 32. *Kutná Hora - Denemark – Equus – distribution of metric data (black diamond; in a single column always sizes of one bone) and their comparison with a skeleton of a recent donkey (crosses). Log-ratio transformation; standard: Equus przewalski (see Section 7.4.6 for explanation, data in Tab. 20). —* ***Graf 32.*** *Kutná Hora - Denemark – kůň – distribuce naměřených hodnot (černé kosočtverce; v jednom sloupci vždy rozměry z jedné kosti) a jejich srovnání s kostrou recentního osla (křížky). Log-ratio transformace; standard: Equus przewalski (diskuse viz kap. 7.4.6, data v tab. 20).*

lower jaw. A breed is also characterised by the period of teeth eruption. That can also reflect in the state of abrasion of the teeth, although the type of food being eaten plays a large role in this. Comparison of the state of teeth eruption and teeth abrasion for pigs was done using the methods of *Rolett – Chiu* (*1994*), which in cross tables always compares the state of two molars of a single individual. Results are shown in *Tab. 19*.

More detailed information was given by the dog skeleton from the feature 124 (*Photo 31 to 35*): it was of a medium size (withers height about 43 cm – after indices by *Koudelka 1885*), *crista sagitalis* on the skull is only slightly developed and the skull itself is relatively broad with a slightly concave forehead. Condylo-basal length was 155.5 mm (other linear measurements see *Tab. 23*), content of the brain 78 cm^3. Bone sizes of 27

Photo 31. *Kutná Hora - Denemark – feature kiln 124, layer 3. Canis familiaris skeleton – cranium (norma ventralis).* — ***Foto 31.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – cranium (norma ventralis).*

Photo 32. *Kutná Hora - Denemark – feature kiln 124, layer 3. Canis familiaris skeleton – cranium (norma dorsalis).* — ***Foto 32.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – cranium (norma dorsalis).*

various dog breeds with basic dog types and indices defining their skulls and limbs are given in *Wagner* publication (*1930*). According to the described breeds, and with regards to *Stockhaus* (*1962*), the finds from feature 124 correspond, by the size of the skull and the limb length, well with a middle sized Standard

Photo 33. *Kutná Hora - Denemark – feature kiln 124, layer 3. Canis familiaris skeleton – cranium (norma lateralis).* — ***Foto 33.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – cranium (norma lateralis).*

Photo 34. *Kutná Hora - Denemark – feature kiln 124, layer 3. Canis familiaris skeleton – cranium – diagonal incisions on condylus of occipital bone (arrow).* — ***Foto 34.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – cranium – příčné zářezy na occipitálních condylech (šipka).*

Photo 35. *Kutná Hora - Denemark – feature kiln 124, layer 3. Canis familiaris skeleton – postcranial bones.* — ***Foto 35.*** *Kutná Hora - Denemark – obj. 124, vrstva 3. Pes – postkraniální kosti.*

Schnauzer and a Norwegian hunting dog (harrier), but comparison of width-length indices indicates slightly wider/shorter head than these breeds (see also *Photos 31 to 33*) and definitely wider than a wolf or dingo. Although the size and body proportions correspond roughly with these breeds, the outer appearance (soft tissue, coat) cannot be determined from the bones and genetic relation with these breeds is not presumed.

Other dog finds did not include dogs of very small or very large sizes. Also gnawing on cattle bone (*Photo 2*) was probably caused by a medium sized dog. Medium sized dogs are typical for Eneolithic period also in other parts of Central Europe (compare *Benecke 1994*).

The horse bones do not belong to a single individual, as is indicated by their spatial distribution (location of finds see *Tab. 7*) and size differences (*Tab. 20*; *Graph 32*). Size variability however is not very large; the finds can belong to a single breed or population slightly larger in body size than the Przewalski horse. The size divergence from standard and variability within the group enables comparison with a donkey (*Graph 32*); howbeit the alometries between species and within species have to be taken into account (see phalanges for example). Eneolithic horse bones from Bohemian region will be studied later in detail, which can provide more certain information about status of *Equus*. However presence of domestic form here is probable as indicated by results from contemporary cultures in Central European space (*Benecke 1994*; *1999*).

The quite large size of some of the red deer males is indicated by antler fragments: the largest diameters of antlers are: 86 mm (with perimeter 270 mm; shed) and 90 mm (perimeter 280 mm; accreted to skull).

7.5.2.8. Pathologies and work use of cattle

Extremely developed pathology was observed on a bone of a large mammal from the feature 102 (*Photo 36* and *37*). Hyperostosis is so extensive, that it was difficult to even identify anatomic affiliation, but almost certainly it is a distal diaphysis of femur. The distal joint part of this femur is missing, but not taphonomically broken off, which in that case it would be a healing or healed amputated limb, pertinently pseudarthrosis or healing dislocating fracture. The extent of hyperostosis indicates a long term healing process. On the basis of diaphysis diameter (max. 38.4 mm) and thickness of compacta (max. 4.5 mm) the find belongs to a mammal in the size of red deer or wild boar. According to morphological observations (shape of *fossa supracondylaris* and rounded section of diaphysis – *Photo 36*) the fragment most probably belongs to red deer. Since the survival of such an individual in the wild is unlikely, one can speculate whether this particular individual was kept in captivity. Other pathologies observed in the assemblage are of small extent and intensity.

Two cattle finger bones (1x phalanx I[11] – feature 65 and 1x phalanx II – feature 41a, *Photo 38* and *39*) of transitional size (*Bos* f.?) have pathology on their proximal area. It is a widened joint surface, so called lipping, according to the graduated table by *Bartosiewicz – Van Neer – Lentacker* (*1997*) they were both classified as stadium 3 (second pathological stage). Other 3 PhI and 3 PhII show only a sign of this pathology (stadium 2). Pathology of phalanges, and mainly widening of prox. joint surface (lipping), are often explained as a result of excessive load, i.e. use for labour (see *Johannsen 2002*; *Bartosiewicz – Van Neer – Lentacker 1997*). These two cases were observed between 71 phalanges I and II (40x PhI, 31x PhII), from which only 20 PhI and 22 PhII finds also contained a part of bone with a possible occurence of lipping. Attention to phalanx pathology on Neolithic excavations was first systematically studied at the Danish Neolithic settlement

[11] phalanx I = PhI, phalanx II = PhII

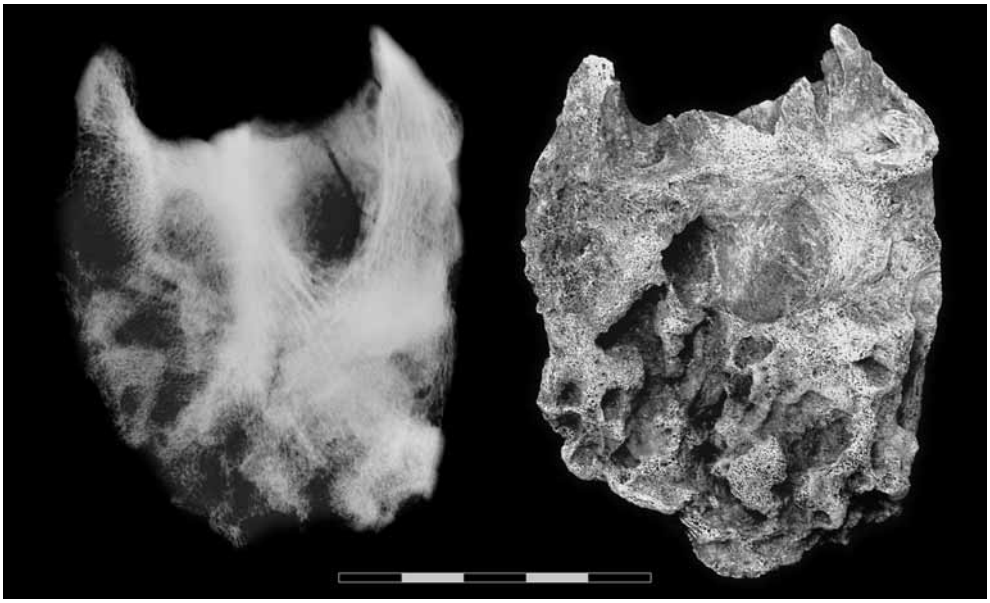


Photo 36. *Kutná Hora - Denemark – feature storage pit 102, layer 3. Extensive pathology on ?distal femur of ?Cervus elaphus (side view) and comparison with X-ray photograph.* — ***Foto 36.*** *Kutná Hora - Denemark – obj. silo 102, vrstva 3. Rozsáhlá patologie na ?distálním femuru ?jelena (pohled z boku) a srovnání s rentgenovým snímkem.*

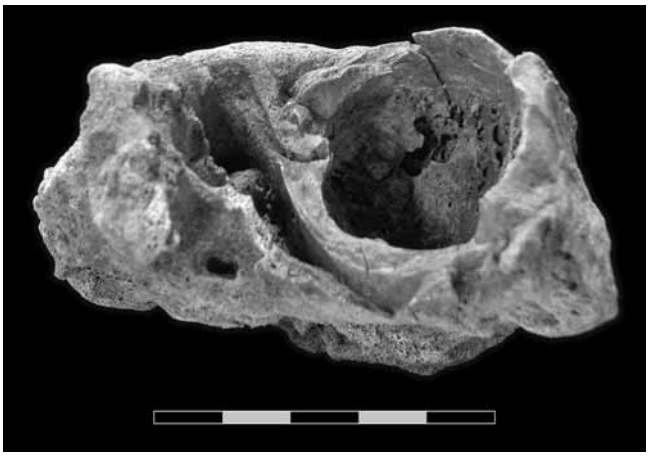


Photo 37. *Kutná Hora - Denemark – feature storage pit 102, layer 3. Extensive pathology on ?distal femur of ?Cervus elaphus (section of a diaphysis).* — ***Foto 37.*** *Kutná Hora - Denemark – obj. silo 102, vrstva 3. Rozsáhlá patologie na ?distálním femuru ?jelena (pohled na průřez diafýzy).*

Photo 38. *Kutná Hora - Denemark – feature hut 65, layer 2. Bos – phalanx proximalis – pathology (lipping) on proximal joint surface.* — ***Foto 38.*** *Kutná Hora - Denemark – obj. chata 65, vrstva 2. Tur – phalanx proximalis – patologie (lipping) na proximální kloubní ploše.*

Trolderbjerg (3300 BC, Funnel Beaker culture), where pathology of lipping was ascertained at almost 40 % of PhI finds, and strongly pathological bones (stadium 3 or 4) reached up to approximately 10 % (*Johannsen 2002*). The results from Kutná Hora - Denemark are distorted since quantifications were taken for all of the phalanges, domestic and wild cattle together, but the pathology representation in Kutná Hora - Denemark is twice as small in comparison with results from Trolderbjerg. Also on Eneolithic sites in Romania (Cucuteni and Gumelniţa cultures, 4500–3700 BC; 6 sites in total) the ratio of pathological phalanges is approximately two times higher than in Kutná Hora - Denemark. The authors came to a conclusion that: "we cannot speak at this stage about a systematic and intensive use of bovine traction" (*Bălăşescu – Moise – Radu 2005*). However their pathologies were only slightly developed, stadium 3 and 4 were unusual in this large assemblage of material.

Although low development of pathologies and its relatively not high occurrence (20 % from usable finds PhI, while a find of stronger pathology is only 5 %; and 18.2 % from usable finds PhII, with stronger pathology only on 4.5 %) at Kutná Hora - Denemark site is not a reliable proof of labour use of cattle, such use can be presumed. However the use of cattle for labour, which

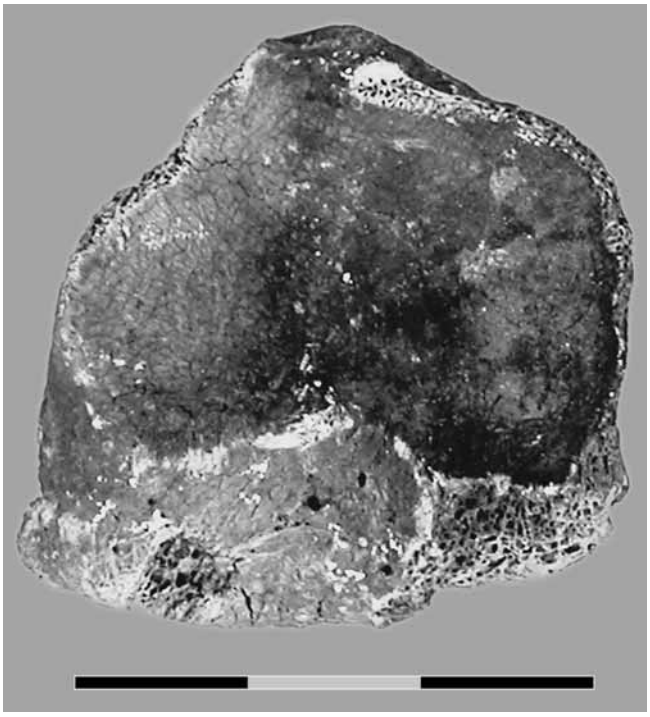


Photo 39. *Kutná Hora - Denemark – storage pit 41a, layer 6. Bos – phalanx media – pathology (lipping) on proximal joint surface; burned. —* ***Foto 39.*** *Kutná Hora - Denemark – obj. silo 41a, vrstva 6. Tur – phalanx media – patologie (lipping) na proximální kloubní ploše; spáleno.*

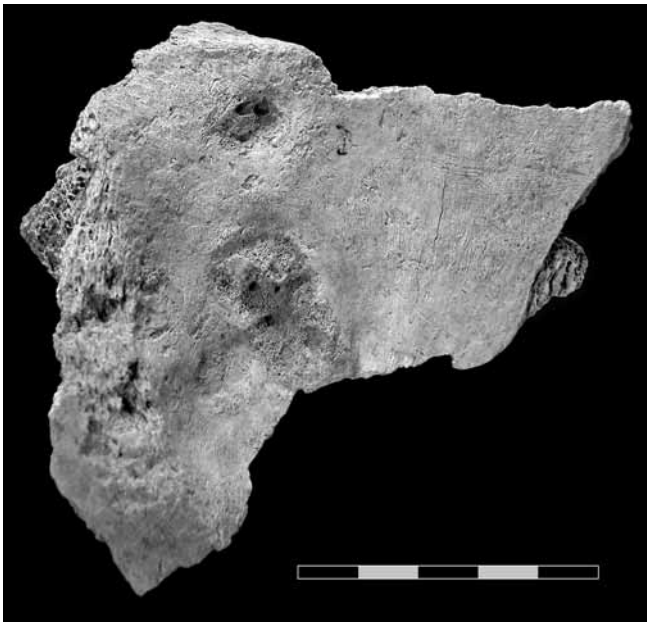


Photo 40. *Kutná Hora - Denemark – feature 119. Pathology (periostitis) on an undetermined bone fragment. —* ***Foto 40.*** *Kutná Hora - Denemark – obj. 119. Patologie (periostitida) na fragmentu neurčené kosti.*

was proven for the Eneolithic period (summarised in for example *Greenfield 2005*; *Bartosiewicz – Van Neer – Lentacker 1997*; Czech osteological evidence: *Peške 1985*), cannot be osteologically supported even by horncores, which potentially can show imprints of yoke, from Kutná Hora - Denemark since they do not appear in the assemblage (*Section 7.5.2.9*).

One distal tibia of a aurochs is affected by periostitis to a small extent. Diminutive periostitis, two patches next to each other, was also found on a fragment of not closely identified flat bone (*Photo 40*). One rib fragment of a middle sized mammal (probably sheep/goat) shows a possible healed break and one ulna of a red deer has slight exostosis at the point of connection with the radius. For pathology on the human skull see *Section 7.5.3*.

The ratio of pathological bones is very low in the assemblage: they form about 0.01 % from all fragments with relative size min. 6 or 0.025 % from all fragments with relative size min. 5 (i.e. from larger and therefore more suitable for analysis; graduated table see *Section 7.5.1.4*).

7.5.2.9. Ritual evidence?

Ritual or religious practices, such as animal burials and apparently ritual bone artefacts were not recorded in Kutná Hora - Denemark. An exception may perhaps be the dog skeleton in feature 124 (*Section 7.5.1.10*) and the human bones in the feature 41/41a (*Section 7.5.3*). Evidence for dog burials is not common in settlement features in Central European Neolithic and Eneolithic (*Behrens 1964*; *Žid 2000*; *Stuchlík 2004*). Despite this a possible role in a sacrificial act is suggested in some cases, but the meaning of these burials is usually unclear. However, analogical finds were not recorded in any other settlement from the Bohemian Řivnáč culture.

The absence of horns in the assemblage could have a special meaning, since in spite recovering and anatomically identifying 3 760 fragments of osteological material, of which 1 062 have been securely identified as belonging to bovids, not a single one belonged to a horncore, complete or fragmented.

Horncores (*processus cornualis*), i.e. parts of frontal bones (*frontale*), are a standard component of prehistoric archaeozoological assemblages. In the material from Stehelčeves - Homolka, for example, they are present in large numbers (*Allen 1968*; *Ambros 1968*; *Bogucki 1979*). In case of sheep/goat the absence of horns can be explained by the relatively small amount of material recovered (144 fragments), absence of cattle horns however cannot be entirely accidental since there are a total of 922 cattle bone fragments. Since horncores are absent in the whole assemblage (i.e. also in the case of aurochs which surely was horned) I think this absence is not an indication of hornless domestic cattle in the site and has other reason. One explanation could be that they were used for special purposes such as: (1) economic use (production of glue from horn, tool production etc.), however in this case it is doubtful that horncores would not be found, especially if almost all of the settlement area was excavated, or (2) ritual practices. There are several cases where horns are known to have been used for ritual manipulations (Hostivice - Litovice, Funnel Beaker culture; *Kyselý 2002* – for more references). Horns also had a symbolic meaning in the "religion of bull" known from the early Neolithic in the Near East; see *Cauvin* (*2000*) publication and Çatal Hüyük site for example.

		January	February	March	April	May	June	July	August	September	October	November	December
Sus domesticus	mdb												
Sus scrofa	mdb												
Sus scrofa	mdb												
Sus scrofa	mdb												
Sus scrofa	mdb												
Sus scrofa	max												
Sus f.?	mdb												
Sus f.?	mdb												
Sus f.?	mdb												
Sus f.?	mdb												
Sus f.?	max												
Sus f.?	max												
Sus f.?	max												
***Sus* (TOTAL)**		**7**	**2**	**2**	**3**	**2.5**	**4**	**2**				**3**	**6**
***Sus* f.? (SUBTOTAL)**		**4**	**0**	**0**	**1**	**1.5**	**2**	**1**				**3**	**4**
***Sus scrofa* (SUBTOTAL)**		**2**	**1**	**1**	**1**	**1**	**2**	**1**					**2**
***Sus domesticus* (SUBTOTAL)**		**1**	**1**	**1**	**1**								
***Sus* (TOTAL) - correction, %**		**21**	**5.8**	**5.8**	**8.3**	**6.4**	**18**	**7.7**				**7.7**	**13**
***Sus domesticus* (SUBTOTAL) - correction, %**		**1.9**	**1.9**	**1.9**	**1.9**								
***Sus scrofa* (SUBTOTAL) - correction, %**		**7.7**	**3.8**	**3.8**	**2.6**	**2.6**	**6.4**	**3.8**					**7.7**
***Sus* f.? (SUBTOTAL) - correction, %**		**12**			**3.8**	**3.8**	**12**	**3.8**				**7.7**	**12**

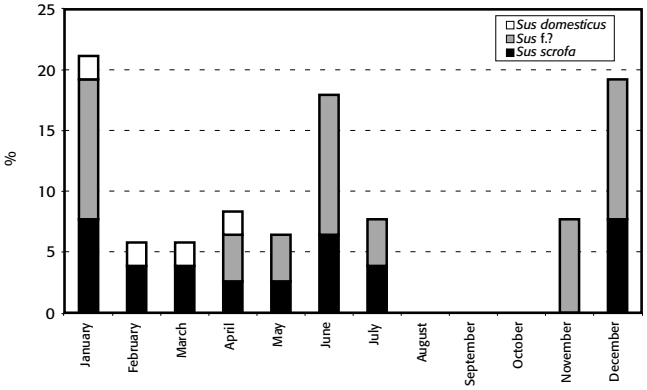
Cervus	antler (not shed)												
Cervus	antler (not shed)												
Capreolus	antler (not shed)												
Capreolus	antler (not shed)												
Capreolus	antler (not shed)												
***Cervus* and *Capreolus* (TOTAL)**		**1**	**1**	**3**	**2**	**4**	**3**	**3**	**2**	**2**	**2**	**1**	**1**
***Cervus* and *Capreolus* (TOTAL) - correction, %**		**4**	**4**	**14.7**	**10.7**	**17.3**	**10.7**	**10.7**	**6.7**	**6.7**	**6.7**	**4**	**4**

Graph 33. *Kutná Hora - Denemark – seasonality of time of death of pig and deer. A single line always means one find. Mdb = mandible, max = maxilla. Corrections – see Section 7.4.5.* — ***Graf 33.*** *Kutná Hora - Denemark – sezonalita doby úmrtí prasat a jelenovitých. Jeden řádek představuje vždy jeden nález. Mdb = mandibula, max = maxilla. Korekce – viz kap. 7.4.5.*

Other parts of the skull, mainly the jaws (mandibles) and isolated teeth, or other fragments from the facial area of a skull, are present in large number. For lucidity here is representation of anatomical parts of cattle skull (not differentiated to domestic or wild):

	NISP
teeth	179
jaws lower	62
jaws upper	17
other facial area	20
braincase	17 (from that 2x frontal bone)
horncores	0
TOTAL (skull)	296

Brain case fragments, including frontal bone, are clearly very rare. Considering the almost total absence of anatomical parts (i.e. frontal bones) connected to horns, it could not be observed how and if the horncores were separated.



Graph 34. *Kutná Hora - Denemark – seasonality of time of death of pig (slaughter/hunt) after corrected data from Graph 33; in percents.* — ***Graf 34.*** *Kutná Hora - Denemark – sezonalita doby úmrtí prasat (porážka/lov) dle korigovaných dat z grafu 33; v procentech.*

7.5.2.10. Seasonality

The character of the settlement suggest that it was occupied continuously for several years, although some hunting and breeding activities could have been limited to a certain time or season. *Graph 33* and *34* summarise the data concerning annual kill periods (i.e. slaughter or hunt) of ungulate mammals (e.g. pigs and red deer) (for methodology see *Section 7.4.5*). Graphs suggest that the slaughter or hunting of pigs usually took place in December and January. On the other hand the period between August and October when many vegetable products ripen (autumn) appears to be killing free. This uneven pattern will probably relate to winter hunt and/or more intensive slaughtering in the most critical, i.e. winter period. Also the possibility that bodies of frozen wild animals were gathered in winter cannot be excluded.

Frogs were probably gathered and consumed in spring (March or April; see *Kyselý 2005a* and *2008a*). Since preservation of their tiny and fragile remnants for a longer period on a ground surface is improbable, therefore the accumulated deposit of these bones in the filling of feature 36, and perhaps all the features of the first building phase (*Section 7.3*), most probably happened in the spring time. Therefore we possibly know the season when the settlement was reconstructed.

7.5.2.11. Ecology

Wild living species can be informative about the character of their surrounding environment. The mammal

finds from Kutná Hora - Denemark however do not bring any extra detailed information, since all the wild species there have relatively wide ecological valence. Also the much represented Common Frog has a wide ecological and geographical span. The low number of hare bones, which usually live in an open landscape, could be taken as evidence for densely forested surroundings. Nonetheless low number of hare bones is quite a regular feature on Eneolithic sites in the Czech Republic (*Kyselý 2005b*) and it could therefore be a widespread phenomenon in the faunal development in Bohemia (compare also with Cimburk; *Peške 2000*). Evidence for forest ecosystems within the environs of the settlement is given by three bones of capercaillie, which currently inhabits usually vast complexes of coniferous and mixed forests with berry bearing herbs and shrubs and anthills (*Hudec – Šťastný /eds./ et al. 2005*), but since they were found in a single context – feature 63, layer 3, they might belong to a single individual and therefore may be less of an environmental indicator. Another inhabitant of the forest environment, *Apodemus flavicolis*, is probably present. In any case, coniferous trees were not detected within archaeobotanical material obtained from the site (*Čulíková – this suppl. – Chap. 3.3.1*).

7.5.3. Human bones

Human bone fragments are present in eight features (see *Tab. 21*). The fragments are quite sporadic and sometimes burnt. Only in the double storage pit 41/ 41a there is a large number of fragments, which belong in minimum to two individuals, with most of them probably belonging to a single individual. Almost all the fragments from this feature are burnt. They are present in both pits and in the whole section (feature 41a), although accumulations of fragments were observed mainly in the lower part of the pit (layer 5). Layer 5 contains even more human than animal bones. Layer 6 in pit 41 contained burnt skull fragments, which could be reconstructed to about 1/3 of the brain case. Differing age characteristics help to identify a minimum two individuals: an adult (with partial brain case) and an adolescent. Interpretation of this find is difficult since the presence of these human bones could be a result of "tidying up". One cannot exclude however, that they were deposited into the pits purposely as placed objects. There were no incisions or cuts on them to suggest cannibalism. Pathology is present on the burnt fragment of the brain case (layer 2, feature 41a), which could be classified as haemangioma (a malignant vascular tumour), but this could not be the cause of death (the pathology assessed by J. Likovský).

7.5.4. Artefacts

Artefacts from the total osteological assemblage (including that material which was not part of the analysis) were determined zoologically and anatomically – *Tab. 22* and then examined for a typological evaluation (see *Chapter 3.2.6* in *Zápotocký – Zápotocká – this suppl.*). No artefact was found in the features of the second building phase and only small number from layers or ditches. Artefacts can therefore be assigned to the Řivnáč horizon. Altogether there was 147 bone artefacts (from which 24 are from the material not included in the analysis) totalling ca. 1 800 grams (from which about 380 grams were artefacts from material not included in the analysis). Almost half of the artefacts were determined anatomically and more than a third also zoologically. Artefacts form 0.86 % of NISP (respectively 1.2 % if tiny fragments of relative size 7 and bones of rodents and amphibians are excluded from the analysis). In weight they form 1.4 % from the material included in the analysis (or 1.1 % from the total amount). The features richest in artefacts (hut 21 and 22) contained 6.1 % and 4.9 % of artefacts within the counted fragments. Typologically the artefacts are relatively multifarious, but awls and spatulas dominate. Most of the artefacts are from long bone diaphysis. Artefacts including the joint part of skeletal elements form 16 % of all artefacts made from long bone diaphysis. This ratio is higher than on other Řivnáč culture sites, for example a hut at Miškovice (*Kyselý 2007a*; *Kyselý – Dobeš 2007*) and Hradenín (*Kyselý 2006a*), where small tools only from diaphysis without epiphysis dominate. The artefacts are made from the bones of the following species: cattle both domestic and wild, red deer, roe deer, dog, pig both domestic and wild and a mustelid (probably marten) – *Tab. 22*. Outstandingly abundant are artefacts from pig bones (20 cases), mainly from incisors and canine teeth. Worthy of observation are the sharp awls from sharpened canine teeth of wild boar males (altogether 8 cases made from *caninus inferior* concentrated mostly in the pit with a kiln 130; *Photo 41*) and an item used for leather

feature	*Homo*	Calcaneus	Carpal or Tarsal	Femur	Costa	Ilium	Maxilla + dens	Metacarpus	Metapodium	Neurocranium	Occipitale	Phalanx I	Radius	Talus	Temporale	Tibia	Undetermined	Vertebra	Vertebra thoracica	TOTAL	burning
1 (ditch)	yes									1										1	burned
32 (storage pit and kiln)	?			1																1	
41a (storage pit)	yes	2	5		4	1		2	5	14		1	1	1		1	37	1	1	76	most of them burned
	?				1												35			36	all burned
41 (storage pit)	yes									7					1					8	most of them burned
65 (hut with kiln)	yes										2									2	
124 (kiln)	yes									1										1	
125 (kiln)	yes						1													1	
126 (kiln)	?									1										1	burned
TOTAL		2	5	1	4	2	1	2	5	24	2	1	1	1	1	1	72	1	1	127	

Tab. 21. *Kutná Hora - Denemark – human bones finds (quantification after NISP).* — ***Tab. 21.*** *Kutná Hora - Denemark – nálezy lidských kostí (kvantifikace dle NISP).*

	Undetermined	Antler	Incisivus 1 inf.	Incisivus inf.	Incisivus/caninus inf.	Canine inf.	Caninus	Caninus sup.	Vertebra	Costa	Scapula	Humerus	Radius	Metacarpus 3	Metacarpus 4	Ilium with acetabulum	Ischium with acetabulum	Femur	Tibia	Fibula	Metatarsus	Metapodium	TOTAL
Bos taurus												1	1										2
Sus domesticus																		1	1				2
Canis familiaris								1															1
Bos f.? (cf. *Bison*)																			1				1
Bos primigenius f.?																		1					1
Bos/Cervus											1											3	4
Sus scrofa f.?			1		1															1			3
Bos primigenius													1										1
Cervus elaphus		5											1				1				1		8
Capreolus capreolus		3														1					1		5
Sus scrofa			1	1		7	1							1	1				2	1			15
cf. *Martes*								1															1
Large mammal	28									6													34
Sus scrofa/Cervus size group	4								1	1													6
Medium mammal	17																		2				19
Small mammal	1																						1
Undetermined mammal	18	1																					19
TOTAL	68	9	2	1	1	7	1	2	1	7	1	1	3	1	1	1	1	2	6	2	2	3	123

Tab. 22. *Kutná Hora - Denemark – zoological and anatomical determination of artefacts (quantification after NISP).* — ***Tab. 22.*** *Kutná Hora - Denemark – zoologické a anatomické určení artefaktů (kvantifikace dle NISP).*

Photo 41. *Kutná Hora - Denemark – feature 102, layer 3 and feature 130, layer 6. Artefacts from lower canine teeth of male wild boars.* — ***Foto 41.*** *Kutná Hora - Denemark – obj. 102, vrstva 3 a obj. 130, vrstva 6. Artefakty z dolních špičáků samců divokého prasete.*

tanning (a so called "beamer"[12], function identified by A. Choyke; feature 36, *Photo 42*).

Relatively abundant are artefacts made from red deer and roe deer antlers. There were 80 antler fragments found on the site, from which 17 belong to roe deer, 47 to red deer and the rest could not be determined. Eight of these fragments are worked. The use of antlers from hunted individuals is indicated by fragments, when the antler is attached to the skull, sheds were found in the surrounding environment. Artefacts of these two types were quantified where it was possible to determine:

antler artefacts:	shed	attached to skull
red deer	1	3
roe deer	0	2

Two teeth, an upper canine tooth, 22.4 mm long, belonging to a dog of smaller size and an upper canine tooth, probably of a marten, were drilled diagonally through the root to be used as pendants. Spatial distribution of artefacts is uneven (see *Section 7.5.1.8*).

[12] definition by Glossary of Archaeological/Anthropological Terms (www.archaeolink.com/glossary_b.htm)

Photo 42. *Kutná Hora - Denemark – feature 36, layer 1. Artefact ("beamer") from a wild boar's tiba.* — ***Foto 42.*** *Kutná Hora - Denemark – obj. 36, vrstva 1. Artefakt ("beamer") z tibie divokého prasete.*

7.6. Summary and conclusion

The convenience (and importance) of the osteozoological material from the fortified Řivnáč culture settlement at Kutná Hora - Denemark comes from the fact, that the settlement was almost completely excavated. This relatively rare situation provides a representative sample covering all the various parts of the settlement, which allows us to study its inner structure and research subjects such as the taphonomic processes and a balanced evaluation could be made on questions concerning morphometry, demography, seasonality, and economic and ritual use of animals. Also another convenience of the material is that it was probably deposited during a narrow time interval, i.e. only a few years, and therefore represents unmixed context specifically accumulated shortly before the reconstruction of the settlement. The amount of material (3 444 bones or bone fragments determined zoologically to species or genus from total 15 611 bones/fragments) can be considered as representative, however any extrapolation of results onto whole Řivnáč culture has to encounter the topographic, period and functional specificity of the site. Comparative studies with other Baden and Řivnáč culture sites, in Bohemia enables us to establish the position of this site within the subsistence situation in the region. Altogether they give relatively good evidence concerning the breeding and hunting ratio during the Baden-Řivnáč cultural period in Bohemia.

The site belongs to the later phase of the Řivnáč culture (i.e. the final part of Baden-Řivnáč complex), which is a period of possible socioeconomic crisis connected perhaps with climatic change. If this is correct then it could greatly influence breeding and hunting activities, and consequently influence the final bone assemblage. The higher ratio of hunted animals here than on other Řivnáč sites and than in earlier periods in Bohemia could reflect this critical state.

Population characteristics (especially the shape of the survivorship curves, i.e. kill-off patterns) normally depend on the use of domestic animals. With the presumption that there was no rapid change in the herd size and that certain age categories were not imported/exported to/from the settlement, the curves for cattle and sheep/goat can then be interpreted as the combined use of primary (meat, fat, skin, etc.) and secondary (labour and/or wool and/or milk) products. However, the stock reduction or import/export could take place, possibly due to presumed instable situation. If the rapid reduction of the stock really took place here, the younger categories would have been emphasised in our mortality curves, as is usual in catastrophe mortality curve (sensu *Lyman 1994*). Logically, in this case the original (i.e. before the reduction) subsistence in Kutná Hora - Denemark would have been orientated mostly on secondary products; which is a chracteristic feature of the developed farming.

No noticeable disproportions were found in the natural anatomical parts of both domestic and wild animals. This indicates that site was not supplied with selected body parts only. And the presence of mature and old domestic animals indicates that the site did not represent a special social class, supplied only with animals of higher meat quality (i.e. calves and lambs). This means that breeding activities are probable, directly on the site or in its vicinity.

Pig is traditionally a source of primary products (as visible from mortality curves). The slaughter and/or hunting of it was undertaken more often in winter as shown by kill-off data. The use of cattle for labour was not reliably ascertained by population characteristics or by pathology on phalanges (usually explained as the result of overloading), but it cannot be excluded and is probable. The status of horses, of which bones were found in various contexts and form 1.2 % of determined finds, is not clear. If it was a domesticant, which is probable, considering the function and location of the settlement has to be taken into account since this animal requires much more attention than for example pig or dog.

The high ratio of hunted animals can be also a reflection of the marginal position of the site within the settlement region of the Řivnáč period and therefore closer contact with the non-domestic 'wild' environment. The non-standard high ratio of aurochs could be an indication that this environment is convenient for local domestication or, more probably, for crossbreeding with domestic cattle. This hypothesis is supported by some arguments based mainly on osteometric analysis. The work on recent DNA by *Götherström et al.* (*2005*) suggests occasional mating of domestic females with wild males. The presented site could be one of such places, possibly with an intentional management. However confirming these activities would require further analysis using genetic methods for example.

The quantity of Common Frog (*Rana temporaria)* bones found in Kutná Hora - Denemark, some of which were burnt, is quite rare within a European archaeological context and altogether unique in Central Europe. This find gives a persuasive argument for the intensive consumption frogs and suggests therefore, that not only large and medium large size animals were hunted. The study of the biology of the frogs indicates, that they had to be gathered in March or April, which therefore also gives a time for the infilling of feature 36 where the bones were deposited. This can then be extended further to indicate the time when the settlement was completely remodelled (i.e. the end of first building stage) connected with the infilling of the sunken features.

The find of a Dalmatian Pelican (*Pelecanus crispus*) bone is unusual and "exotic" in Bohemia, at the present time this species is not resident here. Also this specimen is the only one found in an archaeological context in Bohemia, therefore this degree of rarity could suggest that it is an imported gift or trade item for example. However its natural appearance in the Eneolithic period is also not impossible.

Also very unusual is find of the traumatic pathology, a healing/healed amputation or dislocated fracture above the knee joint of a hind limb of a larger mammal, probably red deer. With such a severe handicap, such an individual would have found it difficult, if not impossible, to survive in the wild.

Absence of horncores can be connected with ritual, religious or cult practices, as can the greater part of a canine skeleton from pit 124 with a number of but-

Tab. 23. *Kutná Hora - Denemark – biometry (in mm). Data sorted after species (as in Tab. 11), and further after anatomy (as in Tab. 13).* — ***Tab. 23.*** *Kutná Hora - Denemark – biometrie (in mm). Data řazena dle druhu (jako v tab. 11), a dále dle anatomie (jako v tab. 13).*

Equus

Molar inf.

Feature	Layer	M-L	M-B	
41a	1	30	13.7	M3, subadult, measured with cementum
41a	1	29.7	15.4	subadult, measured with cementum

Praemolar 2 sup.

Feature	Layer	P2-L	
27	20-40 cm	35.5	measured with cementum

Scapula

Feature	Layer	SD	SLC	GLP	LG	BG
41a	1	20.1	65.8	88.6	57.9	47.6

Radius

Feature	Layer	DD	Bd	Dd
41	3	29.8t	77.6	44.3

Metacarpus

Feature	Layer	Bd	Dd
41a	1	55.6	38.1

Tibia

Feature	Layer	DD
41a	1	33

Talus

Feature	Layer	GH	GB	BFd
41	3	60.8	62m	56.6

Calcaneus

Feature	Layer	GB	SD
41	3	51	20.6

Phalanx I

Feature	Layer	Bp	
27	20-40 cm	48.2t	burned

Phalanx III

Feature	Layer	GL	LF	BF	GB	Ld
28	2	59.6	23	46.5	69	53.1

Bos

BT = *Bos taurus*, BP = *Bos primigenius*, BOS = undetermined *Bos*, BOSB = undetermined *Bos* (*Bison* not excluded), BPB = *Bos primigenius* (*Bison* not excluded)

Maxilla

	Feature	Layer	M3-L	M3-B	M1M3
BT	1-moat	80-100 cm			80.9
BOSB	25	2	30.1		
cf. BP	119	17	36.2	27	
BT	130	4	32		

Nasale

	Feature	Layer	GL (*12)	GB
BOS	125	4	189	35

Occipitale

	Feature	Layer	greatest breadth of occipital condyles (*26)	greatest breadth of f. magnum (*28)	height of f. magnum (-*29)	
BOSB	25	4	134	50.3	48.6	male?

Mandibula

	Feature	Layer	(1)	M3L	M1M3	P2P4	D1D3	D3L	D3B	(2)	(3)	
BP	1-moat	80-100 cm				62.5						
BT	1-moat	2		41.2								
BP	22	3	45.4m									
BOSB	30	2					66.7	38.9				
BT	32	1		39t								
BT	41	2					65.9	37.2	15.1			
BOSB	41a	3	15.7							25.6		burned
BP	65	2	17.3							36		
BT	124	1		35.2	85.5t							
BT	124	2		42t								
BP	130	4									51.1	

(1) smallest breadth of pars diastema, (2) smallest height of pars diastema, (3) greatest breadth of fac. articularis

Atlas

	Feature	Layer	ventral arcus length	
BP	119	17	61.2	burned

Sacrum

	Feature	Layer	HFcr	BFCr
BT	41	2	23.7	53.3
BT	41	3		51.2

Scapula

	Feature	Layer	(1)	SLC	GLP	LG	BG
BOSB	41	2			82.3	67.4	57
BOSB	41	3	26.4	62.3	85.2	69.4	59.2
BT	41a	2			51.4	39.9	34.8
BT	65	1			73.4	57.4t	
BOS	65	2	28.2				

(1) = smallest breadth of collum

Humerus

	Feature	Layer	Bp	BFp	Dp	SD	DD	Bd	BT
BP	22	1				60.5	63.9	124	109.7
BP	22	1	147m	95.4	152.5m				
BP	41a	1				50.7	53.5	107a	95.5t
BP	66	0							115m
BOS	124	1						92.8	83.4

Radius

	Feature	Layer	Bp	BFp	Dp	DD	Bd
BT	1-moat	80-100 cm	88	79.8			
BT	21	5					64
BOS	41a	1	93.3t	87	50.5	29.1	
BP	124	1	113t				
BP	119						103.5

Carpale intermed.

	Feature	Layer	Di	
BP	1-moat	80-100 cm	61	
BP	22	1	55.3	
BP	29a	1	61.1	
BT	125	2	44.4	burned

Carpale radiale

	Feature	Layer	GB	GD	Di	
BOS	7	1			51.2	
BOSB	22		29.9m			
BP	22	1			55.2	
BP	29a	1			63.8	
BP	53	3		53.4	54.8	
BP	119	20	33.3	51.9	57.8	
BT	125	2			44.4	burned

Carpale ulnare

	Feature	Layer	GD	Di	
BP	1-moat	4		55.9t	
BP	27	20-40 cm		60.3	
BP	27	20-40 cm		54.9	burned
BOS	41a	3	36.8	46.5m	burned
BP	53	3		51.9	
BP	65	1		55	

Carpale 2+3

	Feature	Layer	GB	GD	Di
BT	1-moat	2			50.4
BOS	22				45.5
BT	27	20-40 cm	37.3		45.2
BOS	124	3		36.2	52.3
BP	K379		47	46.7	58.9

Carpale 4

	Feature	Layer	Bd	GB	GD	Di
BP	60	4	40.7			48.5
BP	102	2				44.1
BOSB	114	1				40.1
BP	K379			39.4	45.1	48.2

Metacarpus

	Feature	Layer	Bp	Dp	SD	DD	Bd	Dd
BPB	1-moat	4					85.3t	
BPB	1-moat	80-100 cm					77.5t	
BP	29a	1	83.5t					
BOS	33	1	71.5	41.6				
BP	41	3					78.7	
BP	41	4			50.4	32	85.1	
BP	63	1	67.8					
BT	65	2				23.4	63.2	
BP	74	1	87.3					
BOSB	125	4			37.4	28.4		
BPB	127	1					79.3	44.4

Pelvis

	Feature	Layer	LA	SB	SH	
BP	32	1	92.6			male?
BOSB	41	3		25.1	44.1	
BP	102	1	75.6			male?
BT	124	1	57.6t			female
BOS	124	1	78.3			

Femur

	Feature	Layer	DC	LmT
BP	1-moat	4	58.7	
BPB	28	1	63.8t	
BOSB	28	3	56.9	
BOSB	41	3		67.6

Patella

	Feature	Layer	GL	GB	
BT	33	1		47.5m	burned
BT	41	2	64.8t	50t	

Tibia

	Feature	Layer	Bp	SD	DD	Bd	BFd	Dd	
BP	3	4		45.4	34.2	73.6	49.8	58.7	
BP	21	a				86.4	60.5	65.4	
BP	22	1				91.6	61.8	65.5	
BP	41	3				74.1	50.9	55.9	periostitis
BOS	41	3				71.4	51	51.5	burned
BOS	102	3	115						

Talus

	Feature	Layer	(1)	Ll	Lm	Bd	Dl	Dm
BT	29		45.2	59	54.3	36.9		
BP	41	3		81.1	73	51.6	43.9	45.1
BOSB	41	3			74			44.5
BP	41a	3			76.2			46.9
BT	63	1	49.3	63.9	60.7	41.8	37.2	
BT	90	3	49.7	66.8		42.6	37.9	

(1) = minimal length in axial plane

Calcaneus

	Feature	Layer	SD	DD	
BT	65	2	19.3	36.9	burned
BT	65	2	20	38	
BP	102	1	25.7	47.1	
BP	125	2	23.7		

Centroquartale

	Feature	Layer	GB	GD
BP	22	50-80 cm	83.2	79.5
BP	41	2	75.6	74.3
BP	127		73.6	72

Tarsale 2+3

	Feature	Layer	Di
BOS	125	2	45

Malleolus

	Feature	Layer	GD	Di
BP	53	3	39.6	41.5
BOS	84	2	37	39.2

Metatarsus

	Feature	Layer	GL	Bp	Dp	Bd	Dd	
BPB	1-moat	4				76.3a		subadult?
BP	3	4	279.5	65.5	65	74.9	43.3	
BP	21	5		72	68.8t			
BT	22	50-80 cm		47.6	44.9			
BP	60	1		69.6				
BT	63	1		45.8	45.2			

Phalanx I

	Feature	Layer	GLpe	GL (1)	Bp	Dp	SD	DD	Bd	Dd	(1) = GL (axial half)
BT	1-moat	3c	61.6		29.2	33.8	25	19.5			subadult?
BPB	27	1	77.9			49.6					
BOSB	41	2	69.5	70	36		30.8	23.1	35	26.1	
BPB	41	2	75	75	36.7	41.8	31	21.1	33.8		
BOSB	41	3	69.4		34.9	37.9	30.2	22.7			
BOSB	41a	1	68.7		35		32		33.2		
BT	41a	2			28.1	32.1m					burned
BT	41a	2	57.1		30.6		25.7	17.5	28.4	21.6	
BOSB	41a	2	72		42.9m	44.8m					
BOSB	41a	3	63.3	63.1	33.9	40.2	27.3	20.3	32.2	24.2	burned, extended on prox. end
BOSB	41a	3	65.7			37.5	25	20.5		23.5	burned
BOSB	63	1	72.7		35.3						
BOSB	65	1	68.3t				28	20.6	33.4	24.7	
BOSB	65	2							33.4	22.2	
BOSB	65	2							32.6	24.2	
BOSB	65	2	70.9t		36	47.2					small lip by prox. articular facet
BT	74		52.6t		26.2t						
BPB	102	1	79t	80t	38t		35.9	24.8	42	30.2t	
BPB	102	2	73.2	72.8	36	43	29.2	22.8	34.7	26.6	
BT	118	1	59.9		31	35	26.6	18.5	31.5	22	subadult?
BT	125	2	69.7t				27.2	19.8	31.1	23.6	
BOSB	125	2	73.2t						34.3		
BPB	125	4			43.2	43.5					
BOSB	125	4	70.5	70.8	35.9	40.5	28.7	21.1	32.8	24.3	
BOSB	125	4					28.1	20.1	30.6	24.3	
BOSB	130	4	65.8	66.2	37.5	42.4	29.2	23.8	36.1	28.1	

Phalanx II

	Feature	Layer	GL	Bp	Dp	SD	DD	Bd	Dd	
BT	1-moat	3	40.9	29	33.6	22.3	21.5	24.9	27.5	
BP	1-moat	4	50	38.2t		31.7				
BT	21	5	38.5	29.6	29.1	22.3	21.1	25.6	28	
BP	22	30-50 cm	51.5	36.6	39.1	30	27.9	33	35.2	
BOSB	22	3	47.1	35		26.9	25.9	30.2	32	
BP	22	3	55.8	42.4		32.2	33.6	37.6	43.8	incipient exostosis on axial side
BP	27	20-40 cm	53.6	37.2	39.8	29.7	29.2	30.2	37.4	
BOSB	36	1	46.6	36.7	35.8	28.3	25.7	30.1	32.1	
BOSB	41	3	46.4	33.3	31.7	25.7	26.3	28.7	33.8	
BP	41	4	55t	43.6	43.7	32.9	30.8		40.3	
BOSB	41a	3	42.5	32.2	34.2	25.4	24.7	30	31.8	burned
BOSB	41a	3	41.5	34.3	36	26.2	27.8	28.7	33.5	burned
BOSB	41a	3		34.3		26.9	23.2			burned
BOSB	41a	4		29.7	37.2					burned
BT	65	2						24t		
BOSB	65	2			38.7					
BOSB	102	3	48t	36.2		27.1	29.3	31t	36.2	
BOSB	119	16	43	35.5		27.3	25.3	29.5	32.6	
BT	124	3	40.1	31.8	33.1	24	22			
BT	124	3	40.7	32.7	33.6	24.6	22.9		30	
BOSB	124	3		34.7		27	26.6	29.6	33.7	
BP	125	4	50.8	40.1	44.8	29.2	29.3	35.5	39.2	
BOSB	127		44.3	33.7	36.2	25.4	26.7	29.9	34.4	
BT	130	4	44.1	31.7	34.9	25.7	24.3	27.7	29.8	
BOSB	130	4	43	36.2	35.4	28.7	28.3	32.7		
BT	K274			29.2						burned

Phalanx III

	Feature	Layer	DLS	HP	Ld	MBS	
BT	22		76.6		58.3	23.9	
BOSB	27	20-40 cm				27.9	
BOSB	27	20-40 cm	81.6t		58.3	27.9	
BT	41a	2			53.8		burned
BT	41a	2	66				burned
BOSB	41a	3	71.4	37.8	58.5	22.5	burned
BOSB	41a	3	74	36.1	55.6	23.7	burned
BOSB	41a	3		37.8	55.8	24.2	burned
BOSB	41a	3	74.8	38.7	58.5		burned
BP	60	3	106.7t				
BP	125	2	96t			32.5	
BP	125	4	107.2		83.1	35.2	
BP	125	4	99.5t		73.7	34.2	
BP	125	4				35.5	

Sessamoid (Ph1)

	Feature	Layer	GL
BT	65	2	24.6
BOSB	124	3	23.5

Sessamoid (Ph3)

	Feature	Layer	GB
BOSB	90	3	30.1
BOSB	125	4	25.4

Ovis et *Capra*

OC = *Ovis/Capra*, OA = *Ovis aries*, CA = *Capra hircus*

Maxilla + dens

	Feature	Layer	M3-L	M1M3	P2P4	P2M3
OC	22		18.5	42.9	20.4	62.9

Mandibula + dens

	Feature	Layer	M3-L	M3-B	P2P4	*15c
OC	1-moat	3a	23.7			
OC	41	3	22.7	9.3		
OC	41	3	24.5	10.2		
OC	53	3			19.8	18.9
OC	74			9.6		
OC	130	4	22.4			

Scapula

	Feature	Layer	HS	SD	Ld	SLC	GLP	LG	BG
OA	1-moat	3		10.6		19.9	33	26.1	20.8t
OC	1-moat	4				18.5n			
OA	22	1	141.5	10.2	87.9	19.7	31	24.1	19.6
OA	53	3		10.9		21.9	33.7		

Humerus

	Feature	Layer	SD	DD	Bd	BT
OA	22	3		15.1	30.2	28.7
OC	22	3	16.3	14.8		

Radius+ulna

	Feature	Layer	Bp	BFp	SD	DD	LO	SDO	DPA
cf. CA	41	3	34.3	31.1	20.3	10.1	40.7	22.1	26.3

Ulna

	Feature	Layer	BPC
OC	119	16	14.6

Metacarpus

	Feature	Layer	Bp
OC	53	3	22.1

Femur

	Feature	Layer	Bp	DC
OA	124	3	43.4	20

Tibia

	Feature	Layer	SD	DD	Bd	BFd	Dd
OA	124	3			26.2	18.6	19.6
OC	125	2	17.2	13.4			

Centroquartale

	Feature	Layer	GB	GD
OC	22	3	23.5	19.8
OC	65		24	

Metatarsus

	Feature	Layer	Bp
OC	65		20.4

Phalanx I

	Feature	Layer	GLpe	GL (1)	Bp	Dp	SD	DD	Bd	Dd	
OC	127	1							12.7	11.7	(1) = GL (axial half)
OC	K292		39.1	38.6	12.7	15.7	10.4	8	12	10.6	burned

Phalanx II

	Feature	Layer	GLpe	Bp	Dp	SD	DD	Bd	
OA	K360	23.4	11.5	11.8	7.3	7.5	8.6	9.7	burned

Sus

SS = *Sus scrofa*, SSD = *Sus domesticus*, SSX = *Sus scrofa* f.?

Maxilla

	Feature	Layer	M3-L	M3-B	M2-L	M2-B	M1-L	M1-B	P4-L	P4-B	P1P4	P2P4 (*29)	(1)	D3-L	D3-B	
SS	22	3											33			1)
SS	25	2									55	43.7				2)
SS	30		39.6	21.4	24.8	20.2	18.9	16	14.1	14.1						female
SSX	30	2												19.7	15.9	
SS	33	1	40	24.2												
SS	41a	2			26.4	21.7										
SS	60	4					19									
SSX	60	4					20									
SS	60	4	46.6	23.6												
SS	63	3											18.5			female
cf.SS	63	3					20.7	15.8						16.2	13	
SSX	65	1	40.8	21.8												
SS	65	3					19.7	17.3								
SS	65	3	41.1	24.1												
SS	66	2										43.4				
SS	66	3	42.1	22.5												
SSD	74			19.9												
SSD	125	4			24.5	18.1										
SSX	125	4												15.4	13.4	

1) (1) = canine alveolus diameter
2) male, P1 present

Zygomaticum

	Feature	Layer	min. height of zygomatic arc
SS	1-moat	80-100 cm	40.4
SS	22	1	33.5

Mandibula

	Feature	Layer	M3-L	M3-B	D1D3	D3-L	D3-B
SSX	1-moat	2	45.1t				
SS	22	1			44.2	22	10.3
SSX	27	20-40 cm				21.5	9.5
SS	28	3		19.9m			
SSX	32	4	36	16.7			
SSX	53	3				21.6	9.3
SSX	53	3			38.7t	21.6	9.2

Mandibula, cont.

	Feature	Layer	M2-L	M2-B	M1-L	M1-B	P4-L	P4-B	P1P4 (*9)	P2P4 (*9a)	
SS	21	5	22.7	18.2	17.8	14.2	14.8	11.2	82.9	42.8	male, P1 present
SSX	22	4			19.3	13.5					

Mandibula, cont.

	Feature	Layer	M3-L	M3-B	M2-L	M2-B	P1P4	P2P4	M1M3	*3	*14	*16a	
SS	22	3	45.3	19.6	22.3	17.4			83.8	112	140t	68.6t	
SS	65	2	44.9	19.6	25.3	18.4	65.3	40.9	86.9				female, P1 present

Caninus sup.

	Feature	Layer	GB	GD	
SSX	22	1		17.2	female
SS	53	3	10.5	16.5	female

Atlas

	Feature	Layer	H
SS	32	1	59.5

Scapula

	Feature	Layer	SD	SLC	GLP	LG	BG
SSX	1-moat	80-100 cm		27t			
SS	25	2	17.9	32.1	50.3	36.7	32.8
SSD	32	1			37.6	31.4	24.6
SS	41	2	16.1	31.1			
SS	41	2	14.7	30.2			
SS	41	3		30.2			
SSD	57	2	12.6	25.4			
SSD	63	2		25.7			
SSD	119	16	12.7	21.2m			
SSX	124	3			37.2	30.4	27.9
SS	125	4	18.7	35.8	49.7	40.4	36.6

Humerus

	Feature	Layer	Bp	BFp	SD	DD	Bd	Dd	BT
SS	33	1			23.5m				
SS	41	3			21.5m	29.9	51.7	50.8	41.8
SS	41a	2				27.2	47.7		
SS	53	3	55.7t	40.5					
SS	93	1			25.6t	31.1	56.9		42.8
SSD	125	4			17.2	23.1	42.2m		33.1

Radius

	Feature	Layer	Bp	SD	DD
SSD	53	3	30.2		
SSD	53	3	30.8		
SS	60	3	41.1		
SS	65		37.3		
SS	125	4	40	26.3	17.4

Ulna

	Feature	Layer	LO	BPC	SDO	DPA
SS	36	1	73.3		38.4	50.8
SS	60	4		29.3		
SS	63	3			37.3	46.8
SS	124	3				37.9

Carpale intermed.

	Feature	Layer	Di
SSD	30	4	26.7
SS	125	2	37.2

Carpale radiale

	Feature	Layer	Di
SS	53	3	32.7
SS	125	2	31.4
SS	K3		36.5

Metacarpus 2

	Feature	Layer	GL	Bd	Dd
SS	22	50-80 cm	77.1	14.2	18.5
SS	103	5	72.5	15	

Metacarpus 3

	Feature	Layer	Dip	Bp
SSX	53	1		23.3
SS	60	4	28.1	23.9
SS	60	4	30.5	25.8
SS	63	3	30.6	25.8
SS	95	1	26.2	22.9
SSX	124	3	22.9	
SS	125	4	28.5	24.9

Metacarpus 4

	Feature	Layer	Bp
SS	63	3	20.7
SS	125	4	24
SS	125	4	23.2
SSX	125	4	20.7

Metacarpus 3 or 4 (dist.)

	Feature	Layer	Bd	BFd	Dd
SS	1-moat	80-100 cm	25.3	23.3	22.2
SS	60	4	24.2		
SS	60	4	24.5		
SSD	60	4	24.3		

Metacarpus 5

	Feature	Layer	GL	Bd	Dd
SS	22	50-80 cm	77.8	15.5	20.4
SS	60	3	70.8	15.7	

Pelvis

	Feature	Layer	LA	SB	SH
SS	1-moat	4	42.3		38.7
SS	22	1	42.9	15.2	36.1
SS	27	20-40 cm	41.3	15.8	33
SS	32	2		15.1	32.7
SS	41	2		16	29.9

Patella

	Feature	Layer	GL	GB
SSX	22	3	38.9	23.1
SS	65	2		30t
SS	65	3	50.3t	35.6

Tibia

	Feature	Layer	SD	DD	Bd	BFd	Dd	
SSX	22	3			30.6	23.7	27.1	
SSD	22	3			28.5	20.7	24.7	
SS	22	3	25.9	19.6				
SS	36	1		19.9	38.5	27.6	33.1	artefact "beamer"
SS	41	3					36.2m	
SS	53	3			38.2		33.1	
SSD	63	3		13.9	30.1	26		
SS	119	16			38		34.6	
SSD	130	2	18.8	13.7	29.8		26	
SS	K3			20.9	39.4	26.6	33.4	

Fibula

	Feature	Layer	Bd	Dd
SS	30	1	12.4	22.3
SS	115	1		24.8

Talus

	Feature	Layer	(1)	Ll	Lm	Bd	Dl	Dm
SSD	21	5		47.1	44.1	27.2	25.6	27.2
SS	27	20-40 cm	44.4	55.3	48	30.5	28.4	34.2
SS	41	3		55.2	49			32.6
SS	41a	4				31.7		
SS	53	1	42.7	53.6	47.6	30.3		30.6
SSD	90	3	33.5	42.4	37.9	23.6		25.2
SS	125	2	44.2	55.8	49	32.6	30.2	34.1
SS	130	1	42.3	52.8				

(1) = minimal length in axial plane

Calcaneus

	Feature	Layer	GL	SD	DD	GB	GD	
SSD	22	1		10.9n	18.7n		32.2n	
SSD	22	1	80.5	11.2	17.6	23.3	30.2	
SS	22	3	111.7	16.6	27.1	31.8	41	
SS	22	3	98.2	12.1	25	28.8	40	
SS	41	3			27.2			
SS	41a	1	102.2	13.2	25.1	29.1	38	
SS	41a	1		14.5	26.1			
SS	53	3		13.4	25.7		37.9	
SSD	125	4	80.1	10.6	17.7	23.8	30.2	burned

Os tarsi centrale

	Feature	Layer	GB
SSX	1-moat	4	39.6

Os tarsi quartum

	Feature	Layer	GB	GD	Di
SSX	1-moat	2	25.1		
SS	22	30-50 cm			41
SS	K352		27.9	32.1	

Metatarsus 2 or 3 (dist.)

	Feature	Layer	Bd
SSD	90	3	12.3

Metatarsus 2

	Feature	Layer	GL	Bd	Dd
SS	22	3	71.6	10	
SS	30		77	12.3	18.1
SS	57	2	86.6	12.6	18.7
SS	60	4	85t		
SS	63	3	72.9	11.7	
SS	125	3	78.8	13.2	

Metatarsus 3

	Feature	Layer	Bp	Dip
SSX	57	3	18.9	28
SSX	60	3	20	29.8
SS	60	4	22.6	29.3
SS	63	2	24.4	
SS	66	3		30.6

Metatarsus 4

	Feature	Layer	Bp	Dip
SS	9	1	21.2	33.5

Metatarsus 5

	Feature	Layer	GL	Bd	Dip
SSX	41	4			11.7
SS	63	3	78.8	12.3	

Metapodium

	Feature	Layer	Bd	BFd	Dd
SS	1-moat	4	27.1	25.1	
SSD	22	3	16.8		
SS	16-K155		23.2	22.4	23.5

Phalanx I

	Feature	Layer	Ll	Lm	Bp	Dp	SD	DD	Bd	Dd	
SS	1-moat	4							21		
SS	22	3	49.9		21.1	22.6					
SS	29a	1	42.5	41.7	21.5	22.7	16.2	11.8	21.2p	13.3	burned, p = spur
SS	60	1	45.2	43.9	24.4	25.3	17.5	12.2	21.1	14.1	
SS	60	3	48.6	45.6	23.9	25.2	17.7	14.4	20.4		
SS	60	3	49.6		25.3t		18.2	14.2	22.2	15.4	
SS	65	3	52.4		22.7					15.2	
SS	125	4			23.1	24.7					
SSX	125	4			21.1	21.3					
SS	K358		50.7	50.3	22	23.3	17.2	12.2	20.1	13.7	

Phalanx I lateral

	Feature	Layer	GL	Bp
SSD	119	20	24.3	11.3
SSD	124	3	24.4	

Phalanx II

	Feature	Layer	GL	Bp	Dp	SD	DD	Bd	Dd
SS	12	1	31.5	22.5	21.9	18.5	13.5		
SS	22	50-80 cm	32.1	20.8	21.7	16.8	13.1	17.3	17.9
SS	30	1	30	21.6	20.4	17.3	13.1	18.5	19
SS	53	0	35.7	22.5		18.5		19.9	
SSD	57	2	23.8						
SS	60	3	33.4	22.4		16.8	14.7	21	19.1
SS	66	2	33.5	21.3		17.4	13.8	17.7	18.7
SSD	84	2	23	15.5		11.8	9.5		
SS	124	3	30.4						

Phalanx III

	Feature	Layer	GL	DLS	Ld	MBS
SSX	21	a	28.7		26.1	
SSD	53	1	27.6		25	
SS	65	2	40.7	39.1		16.6
SSD	124	3	29.2		28.2	12
SSD	125	3	26.2			
SS	125	4	44.8		41.2	19.4
SS	127	1	49.7	47.4	46.5	20.8

Phalanx III lateral

	Feature	Layer	GL
SS	103	5	24.2

Canis familiaris

Caninus

Feature	Layer	GB	GD
63	2	8.1	13.1

Cranium - skeleton 1

Feature	Layer	*1	*2	*3	*4	*5	*7	*8	*9	*13a	*14a	*15	*16	*17	*22	*23
124	3	168	155.5	147.3	44.2	103.4	82.7	80.3	95.2	77.5	26.4	57.5	16.2	43.8	23	61.9

continuation	*25	*27	*28	*30	*31	*32	*33	*34	*35	*37	*38	*39	*40	
	36	18.3	14.8	102.3	34.8	45.2	31.5	59.5	33	29.1	55.2	52	42.1	skeleton 1

Feature	Layer	P4-L (*18)	P4-B (*18a)	M1L (*20)	M1-B (*20)	M2-L (*21)	M2-B (*21)	M1M2 (*16)	
84	2	18.9	10.7	12.7	15.2			19.1	skeleton 2, dex.
124	3	16.9	9.5	11.4	13.8	6.8	9.3		skeleton 1, sin.

occipitale

Feature	Layer	*25	*27	*28
1 (G14)	1	32.7	16.5	13.4

Mandibula

Feature	Layer	(1)	*7	*8	*9	*10	*11	*12	M1-L (*13)	M1-B (*13)	*14	M2-L (*15)	M2-B (*15)	*18	*19	*20	
21	5	25.7															1)
84	2			66.6		34.7	34.8		21.8	8.7		9.8	6.9				2)
124	3		68.9	63.7	60.7	31.8	33.2	30	20	8	20	8.1	6.3	52.3m	22.7	17.9	3)
124	3						33	29.6	20.3	8	20.3	8.5	6.3		22.5		4)

1) (1) = breadth of facies articularis
2) skeleton 2, dex.
3) skeleton 1, sin.
4) skeleton 1, dex.

Atlas

Feature	Layer	GB	BFCr	BFCd
125	4	71.9t	39.4	31.1

Humerus

Feature	Layer	Bp	(1)	Dp	SD	DD	Bd	BT	Dd	
119	20				11.9	11.5				(1) = breadth of fac. articularis
124	3	28.6	19.8	32		11.2	28.4	19	21.9	skeleton 1, sin.

Radius

Feature	Layer	GL	Bp	SD	DD	Bd	BFd	
124	3	140.2	15.5	11.1	5.2	20.2	16	skeleton 1, sin.
124	3					20.3	15.9	skeleton 1, dex.

Ulna

Feature	Layer	BPC	DPA	SDO	
124	3	15	21.8	19.3	skeleton 1, sin.
124	3	14.9			skeleton 1, dex.

Pelvis

Feature	Layer	GL	LA	SB	SH	Lfo	
124	3	134.1p	18.8	8.3	16.3	25.9	skeleton 1, dex., p = without crista ilii (not fused)

Femur

Feature	Layer	GL	Bp	DD	SD	Bd	Dd	DC	
124	3	169.2	34	12.7	12.4	29.2		17	
124	3	159.1	33.1	11.2	11.6	27.2	29.5	16.3	skeleton 1

Tibia

Feature	Layer	Bp	Bd	BdF	Dd	
124	3	29.7m	18.9	13.8	14.1	skeleton 1, dex.

Metatarsus 5

Feature	Layer	GL
53	3	57.2

Cervus elaphus

antler

Feature	Layer	circumference (beam basis)	circumference (burr)
125	4	208	244

Mandibula

Feature	Layer	(1)	(2)	M3-L	M3-B	M1M3	
41a	1			32	15	82.4	
41a	4	8.2	16.5				(1) = smallest breadth of pars diastema, (2) = smallest height of pars diastema

Scapula

Feature	Layer	SD	SLC	GLP	LG	BG	
1-moat	80-100 cm	18.7	33.4		44.7		
33	1	15.7	30.9			33.3	
41	3	20.2	40.1	62	49.3	45.7	
65	1	17.4	33.7			37.9	
65	2		34.7				burned
92	60-80 cm	21.4	39				
95		16.6	26.8				

Humerus

Feature	Layer	Bd	Dd	BT
41a	4	54.8	55.4	53.9

Radius

Feature	Layer	Bp	BFp	Dp	Bd
1-moat	80-100 cm	56.8	52.6		
1-moat	3c				51.9
22	3/4	55.9	52.3	29.9	
27	20-40 cm	63.9	58.8		
41	3	61.2	57.5	33.8	
41	3	56.7	53.5t	35.3	
41	3	57.7	53.2	34.6	

Ulna

Feature	Layer	BPC
32	3	32.5
53	3	32.3

Carpale 2+3

Feature	Layer	Di
74	1	32.9
127	1	29.7

Carpale radiale

Feature	Layer	GB	GD	Di
27	20-40 cm			38.7
127	1	47	44.4	

Metacarpus

Feature	Layer	DD	Bd	Dd
41a	3	19.5	41.7m	28.2m

Pelvis

Feature	Layer	LA	SB	SH	
127	1	51s	14.9s	30.4s	female

Tibia

Feature	Layer	Bd	SD	DD	BFd	Dd
33	1	53.3			38.9	42
41	1	51.6			36.2	37.4
41	2	58			40.3	41.8
41	3	54.9	35.6	28.4	38.9	40.5
41	3	49		25.8	35.5	37.6
41	3	52.3		29.6	39.1	44.1
41	3	49.8				

Calcaneus

Feature	Layer	GL	SD	DD	GB	GD
27	20-40 cm		13.7	28.6		
33	1	120.9	15.3	30	36.5	44.5

Talus

Feature	Layer	(1)	Dl	Lm	Bd	Dl	Dm	
33	1	44.8	57.5	51.9	34.7	30.3	31.5	(1) = minimal lenght in axial plane
33	1		55					
35	6	42.2	49.2	54.5	34	28.9	29.4	burned
41	2		57.1	51.7	35.5m	30.8		
41	3		57.3	54	34.8	31.8	32.5	
41a	4			57.4	40.7			
65	2	45.4	56.1	52.9	35.2	30.5	32	
114	1	46.8	59.8		39.6			

Metatarsus

Feature	Layer	Bp	
74	1	39.2m	burned

Phalanx I

Feature	Layer	Bd	BFd	Dd
1-moat	3c	23.3	20.4	
41a	1	22.8		20

Phalanx II

Feature	Layer	Ll	Bp	Dp	SD	DD	Bd	Dd
1-moat	80-100 cm						17.7	24.5
22	1	42.6	20.8	27.5	14.8	20	18.2	25.9
63	2	42.8					18.4	
65	2	41.1	20.4	25.3	15.2	17.6	17.6	23.6
126	1	44.9	20.5	26.6	15.4	17.6	17	23.2
127	1	41.7	20.5	26.8	14.3	19	17.3	25.8

Phalanx III

Feature	Layer	GL	Ld	MBS
1-moat	80-100 cm	48.4t		15.7
22	3	51.3	45.6	14

Sessamoid (Ph1)

Feature	Layer	GL
127	1	18

Capreolus capreolus

Mandibula + dens

Feature	Layer	height of mandible P2 (*15c)	height of mandible M1 (*15b)	M3-L	M1M3	P2P4	P2M3
22	3	14.9	16.6	15.5	37.6	28.8	67.7
53	3			16.7	40.5	28.5	69

Atlas

Feature	Layer	GLF	BFCr	BFCd
1-moat	2	41.5	37.8	36

Scapula

Feature	Layer	SD	SLC	GLP	LG	BG
22	3	9.4	17.8	28.6	23	21.1

Radius

Feature	Layer	Bp	BFp	Bd	BFd
90	4	26.1	25.1		
41a	4			27.3	24

Tibia

Feature	Layer	Bd	BFd	Dd
41	3	29	21.5	22
63	4	27.7	20.3	20.8

Talus

Feature	Layer	GLm	Bd	Dm
41	4	29.6	20	17.3

cf. *Capreolus*

Phalanx I

Feature	Layer	Bp	BFp	Dp	SD
1-moat	80-100 cm	13.6	16.4	16.5	8.8

Phalanx II

Feature	Layer	Ll	Bp	Dp	SD	DD	Bd	Dd
30	1	32.1	12.7	15.9	8.3	10.2	8.9	13.5

Phalanx III

Feature	Layer	DLS	Ld
57	2	27	26.3

Castor fiber

Mandibula + dens

Feature	Layer	infradentale -angulus	infradentale -condyl	length (diastema)	height (diastema)	height in front of P4	infradentale -indentation	infradentale -M3	P4M3
60	3		93.5		25.6			65.3	36.7
125	4								39.9
127		114.2	103.9	25.7		31.1	100		36.5
127	1								38.3t

Scapula

Feature	Layer	HS	SLC	GLP	LG	BG
22	3		14.9	23.1	20.5	12.8
36	1		14.3	23.3		13.1
36	1	94.2	14.2	19.7		12.1
36	1		14.9	23.4		14.2
53	3		15.6		20.5	13.1

Humerus

Feature	Layer	GL	Bp	BFp	SD	DD	Bd	BT	
22					10.9		32.3	20.6	prox. epifysis not fused
22	50-80 cm					10.4n	33.6n	20.3n	
36	1				11.6			21.2	prox. epifysis not fused
36	1	96.2	27.8	19.5	10.4			21.3	

Radius

Feature	Layer	GL	Bp	SD	DD	Did	
1 (G14)			12.3t				
36	1	101.9	13.9	8.1	4.2	14.3	
36	1		13.5p				p = dist. epifysis not fused

Ulna

Feature	Layer	GL	LO	BPC	SDO	DPA	
22	3					16.1	DN = dist. epifysis not fused
36	1	115.6	22.6				DN
36	1	103					DN
53	3	115.2	23.2		12.3	16.5	DN
94	2			12.7			prox. epifysis not fused

Naviculare

Feature	Layer	max. diameter
125	4	20.5

Metacarpus 3

Feature	Layer	GL
36	1	24.2

Femur

Feature	Layer	SD	DD	Bd	Dd
22	1	20.8	13.3	42.5	30.8
41a	3	18.1	11.7		
127		20	12.2		

Tibia

Feature	Layer	Bp	Dp
22	P	32.7	28.6t

Talus

Feature	Layer	Di
125	4	29.7

Calcaneus

Feature	Layer	GL	SD	GB	GD
22	1: 0-40 cm	51			
36	1	56.5	11.2	22.2	24

Metatarsus 4

Feature	Layer	GL	SD	Bd
36	1	56	9.2	13.6

Phalanx I post.

Feature	Layer	GL	Bp
125	4	29	13
125	4	29.3	12.2

Phalanx II post.

Feature	Layer	GL	Bp
125	4	14.1	8.6

Ursus arctos

Molar 2 sup.

Feature	Layer	GL	GB
41	1	36.6	19.2

Atlas

Feature	Layer	GLF
22	1	52.6t

Scapula

Feature	Layer	LG	BG
22	1	67.5	45.8

Lutra lutra

Scapula

Feature	Layer	HS	GLP	LG
63	3	61.3	15.8	9.1

Tetrao urogallus

Carpometacarpus

Feature	Layer	GL	Bp	Did
63	3	72.1	24	16.3

mostly measured by *Driesch* (*1976*), other dimensions explained in Tables
anatomical abbreviations: M = molar, M1, M2, M3 = molar 1, 2, 3, P = praemolar, P1, 2, 3, 4 = praemolar 1, 2, 3, 4, D = molar decidual, D1, D3 = molar decidual 1, 3, sup. = superior, inf. = inferior, sin. = sinistra, dex.=dextra
metric acronyms by *Driesch* (*1976*) or see general metric abbreviations and anatomical abreviations
* metric code numbers: explained in *Driesch* (*1976*) or in Tables
general metric abreviations: L = length , B = breadth, D = depth, H = height, SD = smallest breadth of diaphysis, DD = smallest depth of diaphysis, Di = diameter, GL = greatest length, GB = greatest breadth, GD = greatest depth symbols after measurements data: t = nearly accurate, a = approximately, m = minimal, n = maturity not sure, s = probably subadult

chery marks, which was also probably skinned. An assemblage of burnt human bones, including part of pathological skull, may also be ranked to this category, but it could be also a result of cleansing activities.

The size and body proportions of the dog from pit 124 are similar to a medium sized Schnauzer or a Norwegian harrier. The horse bone assemblage corresponds with individuals slightly larger than a Przewalski horse and could all be of a single breed (population).

Quantification shows that the main meat supplier among domestic animals was cattle. Pig is also relatively often represented. Sheep/goat (sheep absolutely dominates over goat) was of less significance. The fragmentation state of the bones shows that the bodies of the animals were intensively economically used. Most fragments are the remnants of human sustenance. Horse bones are fragmented and scattered as are some of the finds of dog. The use of horses and dogs for food is probable but not absolutely confirmed. The most hunted species among wild animals, in descending quantitative order, were: wild pig, aurochs, red deer, beaver and roe deer. The exceptionally high beaver ratio supported by several quantification methods is not a normal situation. Mammals' hunting was aimed at mainly adult individuals. Sporadic finds of birds (*Tetrao urogallus, Pelecanus crispus, Corvus corone/frugilegus*), turtle (*Emys orbicularis*) and fish (*Abramis brama, Leuciscus cephalus, Perca fluviatilis, Anquilla anguilla*), indicate, that these groups were not as important to the human diet as mammals were.

The large and variable assemblage of bone artefacts provides evidence for the further economic use of the material. Among them, tools from wild boar males tusks, pendants from carnivoras canines and tool used for leather tanning (feat. 36) are of particular interest.

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The material is stored in the Institute of Archaeology of Academy of Science of The Czech republic in Prague.

All photographs: R. Kyselý (scale: if not stated otherwise one segment is always one centimetre). X-ray photograph in *Photo 37*: M. Jantač.

Translated by Linda Foster and Patrick Julian Foster

7.7. Souhrn

Velkou předností osteozologického materiálu z opevněného řivnáčského hradiště Kutná Hora - Denemark je to, že sídliště bylo odkryto téměř celé, což je poměrně vzácná situace. Takto máme k dispozici vzorek pokrývající různé prostředí sídliště a umožňující studovat jeho vnitřní strukturu. Materiál umožnil podrobně se zabývat otázkami tafonomickými, morfometrickými, populačními, sezonalitou a dovolil zhodnotit využívání zvířat z pohledu hospodářského i rituálního. Výhodou materiálu také je, že patrně všechen byl nakumulován v úzkém časovém intervalu, tj. v několika málo letech, a vypovídá proto o poměrech v konkrétním „okamžiku", konkrétně krátce před rekonstrukcí sídliště. Množství použitelného materiálu (3 444 do zoologického druhu nebo rodu determinovaných kostí nebo fragmentů kostí z celkového množství 15 611 kostí/fragmentů) můžeme považovat za reprezentativní, nicméně při snahách o extrapolaci výsledků na celou řivnáčskou kulturu je třeba vzít v úvahu topografickou, časovou a funkční specifičnost lokality. Srovnání s ostatními souvěkými lokalitami z Čech nám dává poměrně dobrou představu o poměru chovu a lovu v bádenském a řivnáčském období a umožňuje určit postavení prezentované lokality v rámci ekonomické situace v tomto regionu.

Časově lokalita spadá do mladší fáze řivnáčské kultury (tj. do závěru badensko-řivnáčského komplexu), což je doba, kdy možná došlo k ekonomicko-společenské krizi snad související s prudkou změnou klimatu. To může mít velký vliv na chovatelské a lovecké aktivity, a tedy může ovlivnit výsledný soubor kostí. Například vysoký podíl lovné zvěře zde (o něco více než polovina materiálu), indikující vyšší intenzitu lovu než je běžné na jiných řivnáčských lokalitách v Čechách a než bylo obvyklé i v předcházejících obdobích, může být efektem tohoto kritického stavu.

Populační charakteristiky (zejména věková struktura populace) závisí na způsobu využívání domácích zvířat. Za předpokladu, že nedocházelo k rapidní změně velikosti stáda a že nedocházelo k importům/exportům určitých věkových kategorií z prostoru sídliště, můžeme křivku pro tura i ovce/kozy interpretovat jako kombinovanou užitkovost primárních (maso, tuk, kůže, apod.) i sekundárních (práce a/nebo vlna a/nebo mléko) produktů. Nicméně redukce stáda nebo import/export mohl probíhat, a to obzvlášť v nestabilních podmínkách. Pokud skutečně došlo k redukci stáda, pak by mladší kategorie byly v našich křivkách zdůrazněny, tak jak je běžné v katastrofické mortalitní křivce (sensu *Lyman 1994*). Logicky, v takovém případě by původní chovatelství (tj. před redukcí) bylo orientováno na sekundární produkty, což je znak rozvinutého dodavatelství.

Nebyly nalezeny žádné větší disproporce v zastoupení anatomických částí, a to ani u domácích ani u divokých zvířat. Toto zjištění ukazuje, že lokalita nebyla zásobována pouze vybranými tělními částmi. A přítomnost starších domácích zvířat ukazuje, že lokalita nepředstavovala místo s zvláštní sociální skupinou zásobenou pouze zvířaty s vyšší kvalitou masa (telecí, jehněčí). Proto chovatelské aktivity můžeme předpokládat přímo na lokalitě nebo v jejím bezprostředním okolí.

Prase je tradičně zdrojem jen primárních produktů. Na základě sezonalitních dat byly výraznější porážka a/nebo lov prasat zaregistrovány v zimě. Využívání turů k práci nebylo sice spolehlivě potvrzeno ani výsledky populačních charakteristik ani podílem patologií na prstních článcích (obvykle vysvětlovaných jako výsledek zatěžování), nicméně dané analýzy toto využívání nevylučují. Status koně/koní, jejichž kosti byly nalezeny v různých kontextech a tvoří 1,2 % determinovaných nálezů, není jasný. Šlo-li o domácí formu, což je pravděpodobné, pak v souvislosti s diskutovanou funkcí a postavením sídliště je třeba upozornit, že toto zvíře vyžaduje daleko více péče než např. prase nebo pes.

Vysoký podíl lovné zvěře a další zjištění mohou souviset také s marginální pozicí sídliště v rámci tehdejší oikumeny, kde lidé byli v úzkém kontaktu s „divokou" přírodou. Nestandardně vysoký podíl pratura může indikovat vhodné podmínky pro místní domestikaci nebo, a to pravděpodobněji, pro křížení s domácími tury. Hypotézu místní domestikace/křížení podporují některé argumenty vyplývající zejména z osteometrické analýzy. Práce na recentní DNA (*Götherström et al. 2005*) naznačuje občasné oplodňování domácích krav divokými samci. Prezentovaná lokalita může být právě jedním z takových míst, a to možná s záměrným přístupem. Nicméně potvrzení těchto aktivit vyžaduje další studie, například s pomocí genetických metod.

Z popisované lokality (především z obj. 36, kde se našly i spálené žabí kosti) máme přesvědčivý, v evropském archeologickém kontextu velmi řídký a v středoevropském archeologickém kontextu ojedinělý, doklad intenzivní konzumace žab (skokanů hnědých – *Rana temporaria*). Ukazuje to, že nejen velká a středně velká zvířata byla předmětem lovu. Ze studia biologie skokanů vyplývá, že tito museli být loveni v březnu nebo dubnu, což ukazuje i na dobu zahrnutí objektu 36. A proto celá přestavba sídliště, tj. konec první stavební fáze spojený s plošným zahrnutím zahloubených jam, proběhla asi v jarním období.

Pozoruhodný je nález kosti, v Čechách „exotického" a v současnosti se nevyskytujícího, pelikána kadeřavého (*Pelecanus crispus*) v chatě 22, který je jediným archeologickým dokladem z České republiky. Proto může představovat import (dar, předmět obchodu apod.). Nicméně ani přirozený výskyt v eneolitu není ve střední Evropě vyloučený. Pozoruhodný je i nález rozsáhlé a intenzivní patologie, která asi představuje hojící se/zhojenou amputaci nebo dislokovanou frakturu zadní končetiny velkého savce, pravděpodobně jelena, nad kolením kloubem. Takto postižený jedinec by měl velmi vážné problémy přežít v podmínkách divoké přírody.

S rituálními, náboženskými nebo kultovními praktikami může souviset absence rohových výběžků v materiálu, a popřípadě i z větší části zachovaný skelet psa s hojnými zářezy z objektu 124, který byl pravděpodobně stažen z kůže. Nálezy spálených lidských kostí, zahrnující část patologické lebky, se mohou také řadit do této kategorie. Nicméně může jít také o výsledek úklidových aktivit.

Zmíněný pes z obj. 124 se velikostí a tělními proporcemi velmi podobá střednímu knírači nebo norskému harrierovi. Kosti koní většinou odpovídají jedincům o něco větším než je kůň Převalského a mohou vesměs patřit jednomu plemeni (populaci).

Dle kvantifikací je zřejmé, že hlavním domácím zvířetem a hlavním dodavatelem masa mezi domácími zvířaty byl tur. Poměrně hojně je zastoupeno i prase. Ovce/koza měly menší význam, přičemž zde naprosto převažuje ovce nad kozou. Stupeň fragmentace materiálu svědčí o tom, že těla zvířat byla intenzivně ekonomicky využita. V naprosté většině jde zjevně o zbytky potravy člověka. Fragmentární a roztroušené jsou i kosti koně a některé nálezy psa, z nichž některé nesou intencionální zářezy. Proto je potravní využití koně a psa pravděpodobné, nicméně není spolehlivě potvrzeno. Z divokých zvířat byli nejvíce loveni (v tomto pořadí) prase divoké, pratur, jelen, bobr a srnec. Nestandardní je zejména vysoký podíl bobra, což souhlasně ukazují různé kvantifikační metody. Lov savců byl zaměřen hlavně na dospělé jedince. Ojedinělost kostí ptáků (*Tetrao urogallus, Pelecanus crispus, Corvus corone/frugilegus*), želvy bahenní (*Emys orbicularis*) a ryb (*Abramis brama, Leuciscus cephalus, Perca fluviatilis, Anquilla anguilla*) naznačuje, že v jídelníčku tyto skupiny netvořily zdaleka tak výrazný podíl jako savci.

O tom, že část kostí zvířat byla dále hospodárně využita, svědčí rozsáhlý a variabilní soubor artefaktů. Mezi nimi jsou zvlášť zajímavé nástroje ze špičáků divokých kanců, přívěsky ze špičáků šelem a nástroj k opracování kůží (z obj. 36).

Pozn.: české ekvivalenty latinských jmen zoologických druhů jsou uvedeny v *tab. 7* a *11*.

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8. Tabulky 1–162

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Tab. 133. *Severní předhradí. Vnitřní příkop 3. Východní rameno v sektoru C11. – 7 – kámen. —* ***Taf. 133.*** *Nördliche Vorburg. Innengraben 3. Östlicher Arm in Sektor C11. – 7 – Stein.*

Tab. 134. *Severní předhradí. Vnitřní příkop 3. Východní rameno v sektoru C11. – 7 – kámen. —* ***Taf. 134.*** *Nördliche Vorburg. Innengraben 3. Östlicher Arm in Sektor C11. – 7 – Stein.*

Tab. 135. *Severní předhradí. Vnitřní příkop 3. Západní rameno v sektorech D10–11 (1–9), F6 (10–23). —* ***Taf. 135.*** *Nördliche Vorburg. Innengraben 3. Westlicher Arm in den Sektoren D10–11 (1–9), F6 (10–23).*

Tab. 136. *Východní předhradí a západní terasa. Sonda č. 1 s bermou 142 a středním příkopem 2 (1–12), křížová sonda (13–16). Sběry z l. 1986–7 (17, 18). – 8 – kámen; 12 – kachel; 16 – železo. —* ***Taf. 136.*** *Östliche Vorburg und westliche Terrasse. Sonde Nr.1 mit Wehrmauer 142 und mittlerem Graben 2 (1–12), kreuzförmige Sonde (13–16). Sammelfunde aus den Jahren 1986–7 (17, 18). – 8 – Stein; 12 – Kachel; 16 – Eisen.*

Tab. 137. *Východní předhradí. Sonda č. 1. – 9 – silex. —* ***Taf. 137.*** *Östliche Vorburg. Sonde Nr. 1. – 9 – Silex.*

Tab. 138. *Východní předhradí. Sonda č. 5. —* ***Taf. 138.*** *Östliche Vorburg. Sonde Nr. 5.*

Tab. 139. *Východní předhradí. Sonda č. 5. —* ***Taf. 139.*** *Östliche Vorburg. Sonde Nr. 5.*

Tab. 140. *Severní předhradí a severní okraj akropole. Jáma 4 (1–12). Jáma / skalní deprese 6 (13). Jáma 19 (14–30). Šachta / cisterna 20 (31, 31). – 13, 31 – kámen. —* ***Taf. 140.*** *Nördliche Vorburg und Westrand der Akropolis. Grube 4 (1–12). Grube / Delle im Felsen 6 (13). Grube 19 (14–30). Schacht / Zisterne 20 (31, 31). – 13, 31 – Stein.*

Tab. 141. *Severní předhradí. Polozemnice 10. —* ***Taf. 141.*** *Nördliche Vorburg. Grubenhaus 10.*

Tab. 142. *Severní předhradí. Polozemnice 10. —* ***Taf. 142.*** *Nördliche Vorburg. Grubenhaus 10.*

Tab. 143. *Severní předhradí. Polozemnice 10. —* ***Taf. 143.*** *Nördliche Vorburg. Grubenhaus 10.*

Tab. 144. *Severní předhradí. Polozemnice 10 (1–15). Jáma 17 (16–19). Grubenhaus 18 (20, 21). – 4, 13 – kámen. —* ***Taf. 144.*** *Nördliche Vorburg. Grubenhaus 10 (1–15). Grube 17 (16–19). Grubenhaus 18 (20, 21). – 4, 13 – Stein.*

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Tab. 146. *Západní předhradí. Polozemnice 21. —* ***Taf. 146.*** *Westliche Vorburg. Grubenhaus 21.*

Tab. 147. *Západní předhradí. Polozemnice 21. —* ***Taf. 147.*** *Westliche Vorburg. Grubenhaus 21.*

Tab. 148. *Západní předhradí. Polozemnice 21. —* ***Taf. 148.*** *Westliche Vorburg. Grubenhaus 21.*

Tab. 149. *Západní předhradí. Polozemnice 22. —* ***Taf. 149.*** *Westliche Vorburg. Grubenhaus 22.*

Tab. 150. *Západní předhradí. Polozemnice 22. —* ***Taf. 150.*** *Westliche Vorburg. Grubenhaus 22.*

Tab. 151. *Západní předhradí. Polozemnice 22. —* ***Taf. 151.*** *Westliche Vorburg. Grubenhaus 22.*

Tab. 152. *Západní předhradí. Polozemnice 22. —* ***Taf. 152.*** *Westliche Vorburg. Grubenhaus 22.*

Tab. 153. *Západní předhradí. Polozemnice 22. – 13 – kámen. —* ***Taf. 153.*** *Westliche Vorburg. Grubenhaus 22. – 13 – Stein.*

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Tab. 155. *Severní předhradí. Polozemnice 53. – 18 – železo. —* ***Taf. 155.*** *Nördliche Vorburg. Grubenhaus 53. – 18 – Eisen.*

Tab. 156. *Severní předhradí. Polozemnice 53. – 3 – kámen. —* ***Taf. 156.*** *Nördliche Vorburg. Grubenhaus 53. – 3 – Stein.*

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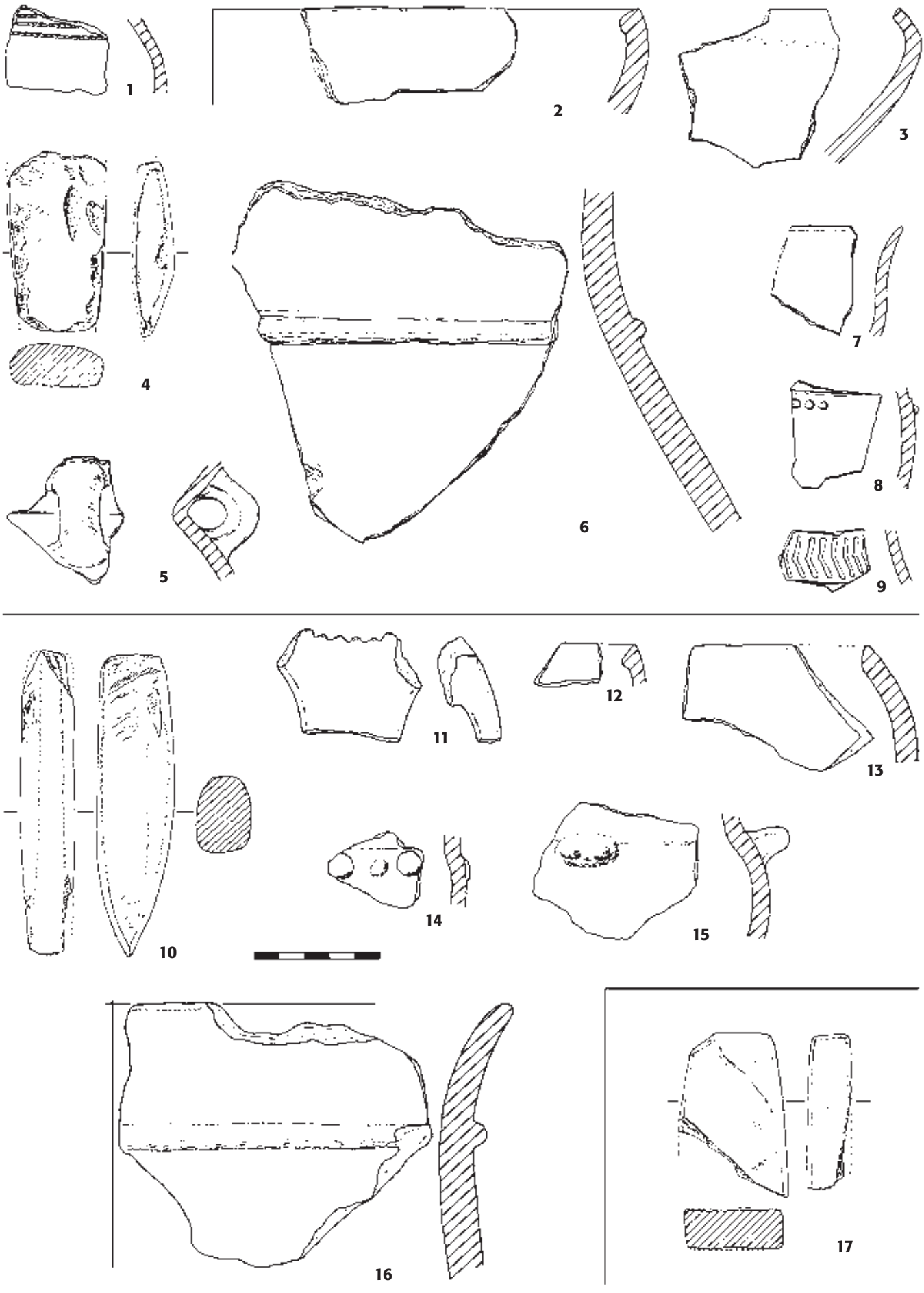

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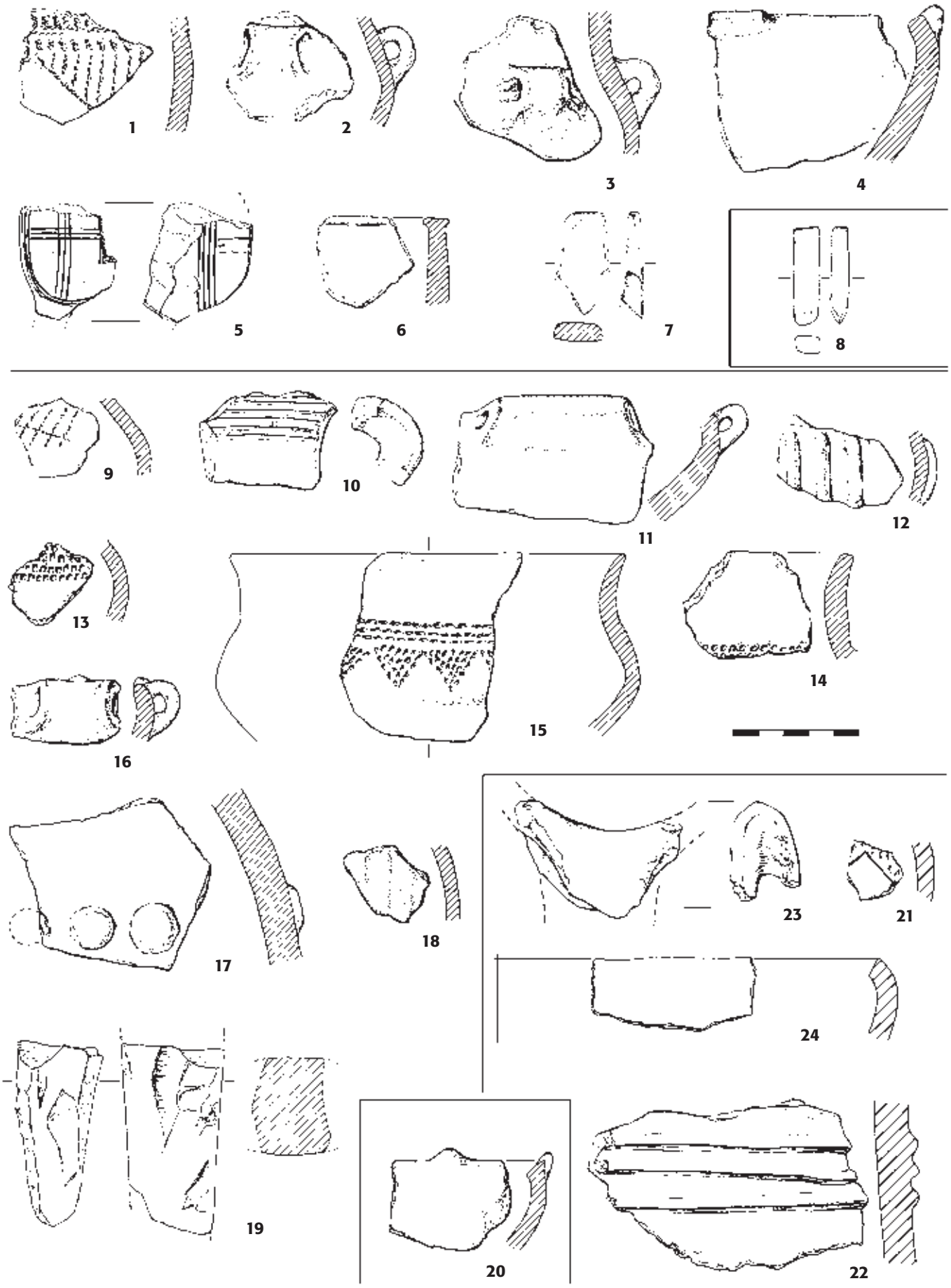

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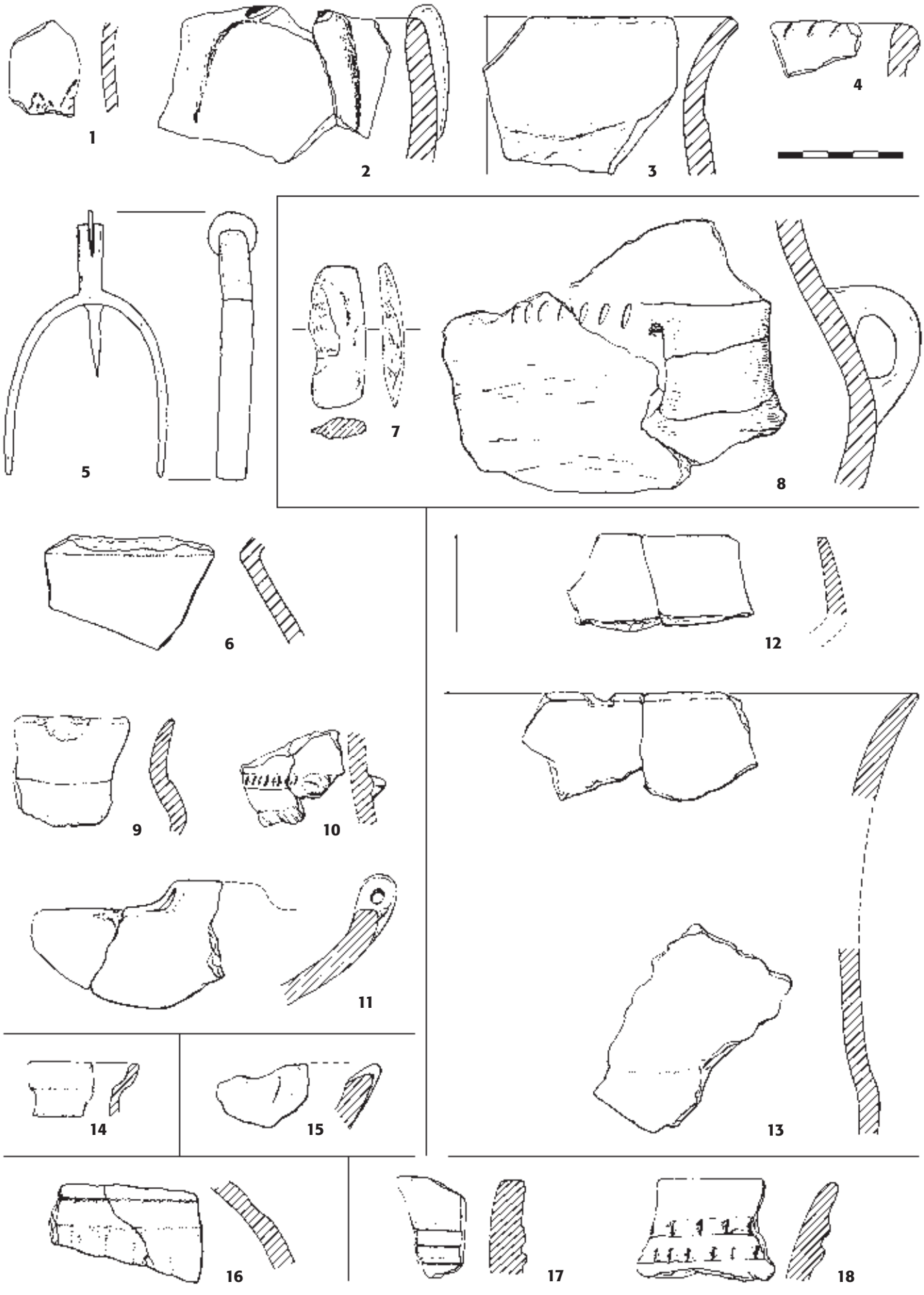

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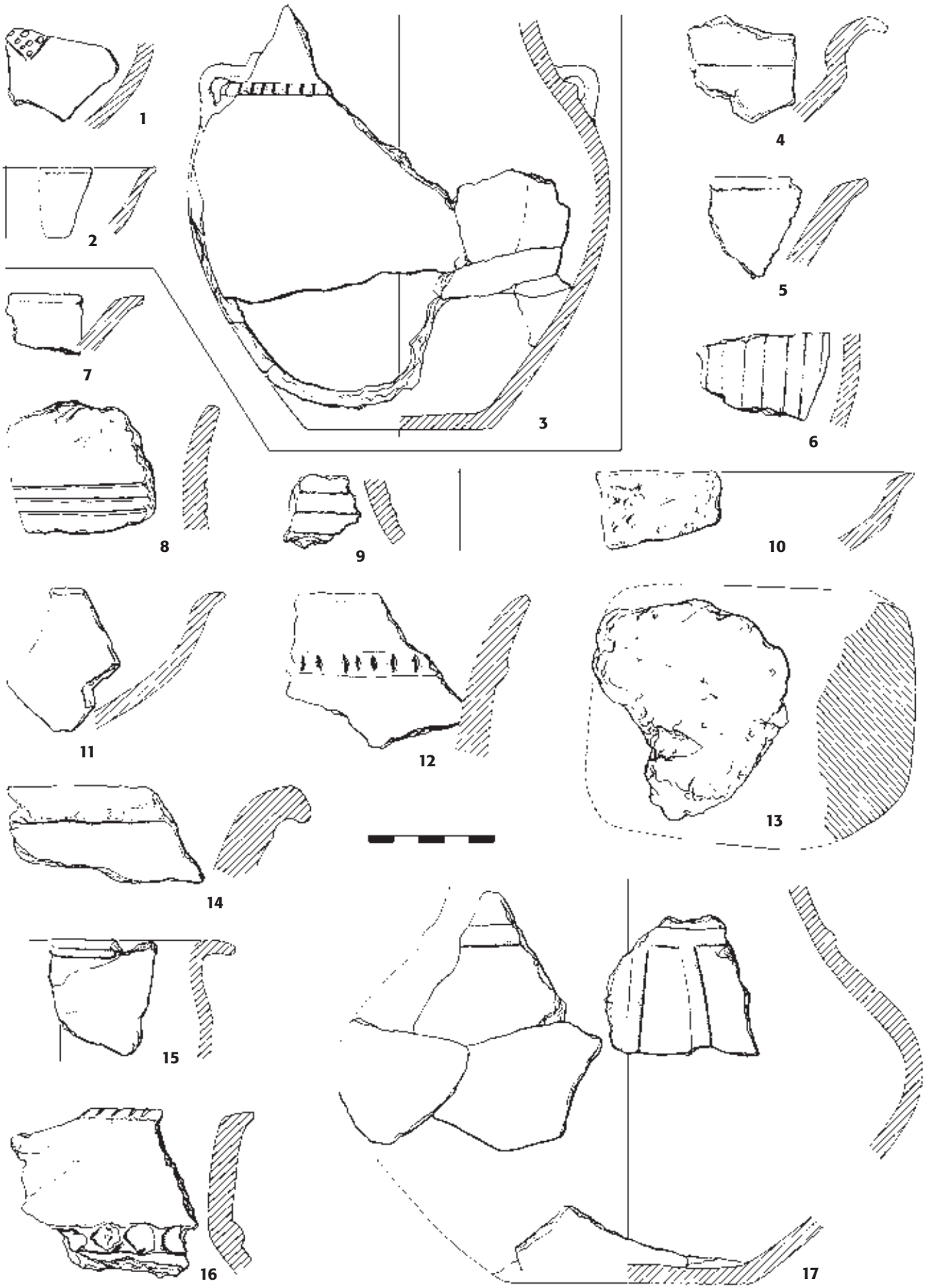

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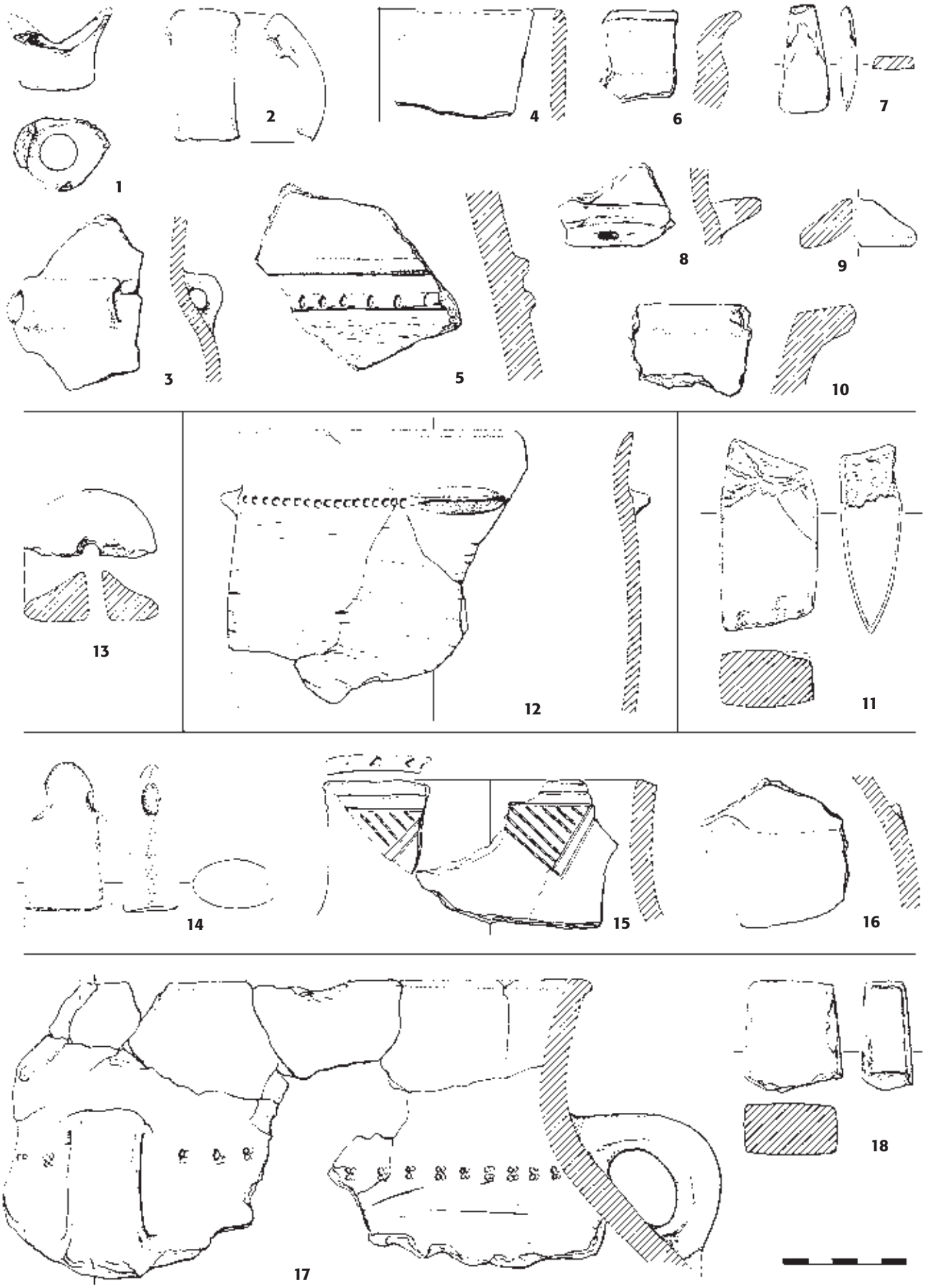

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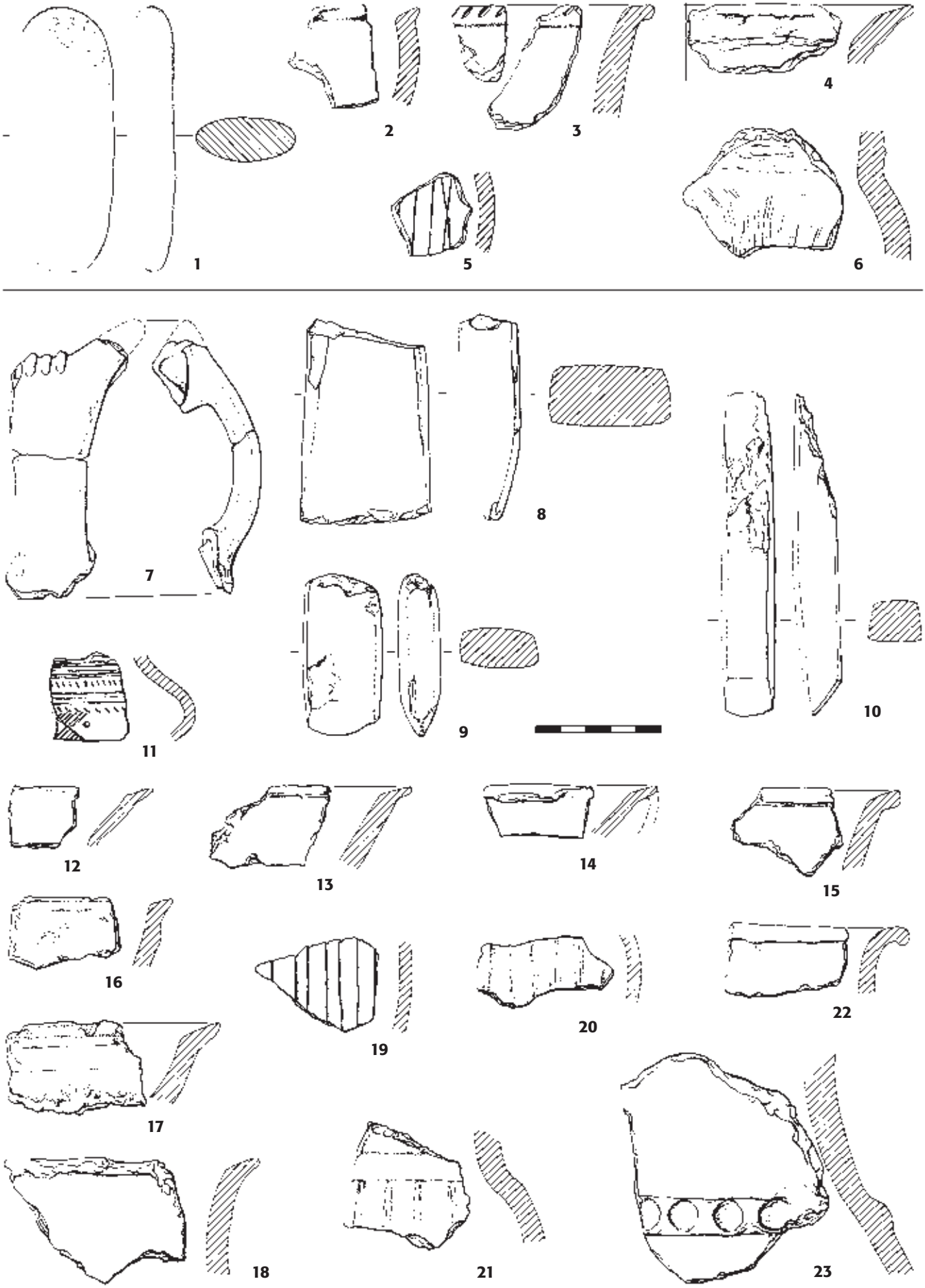

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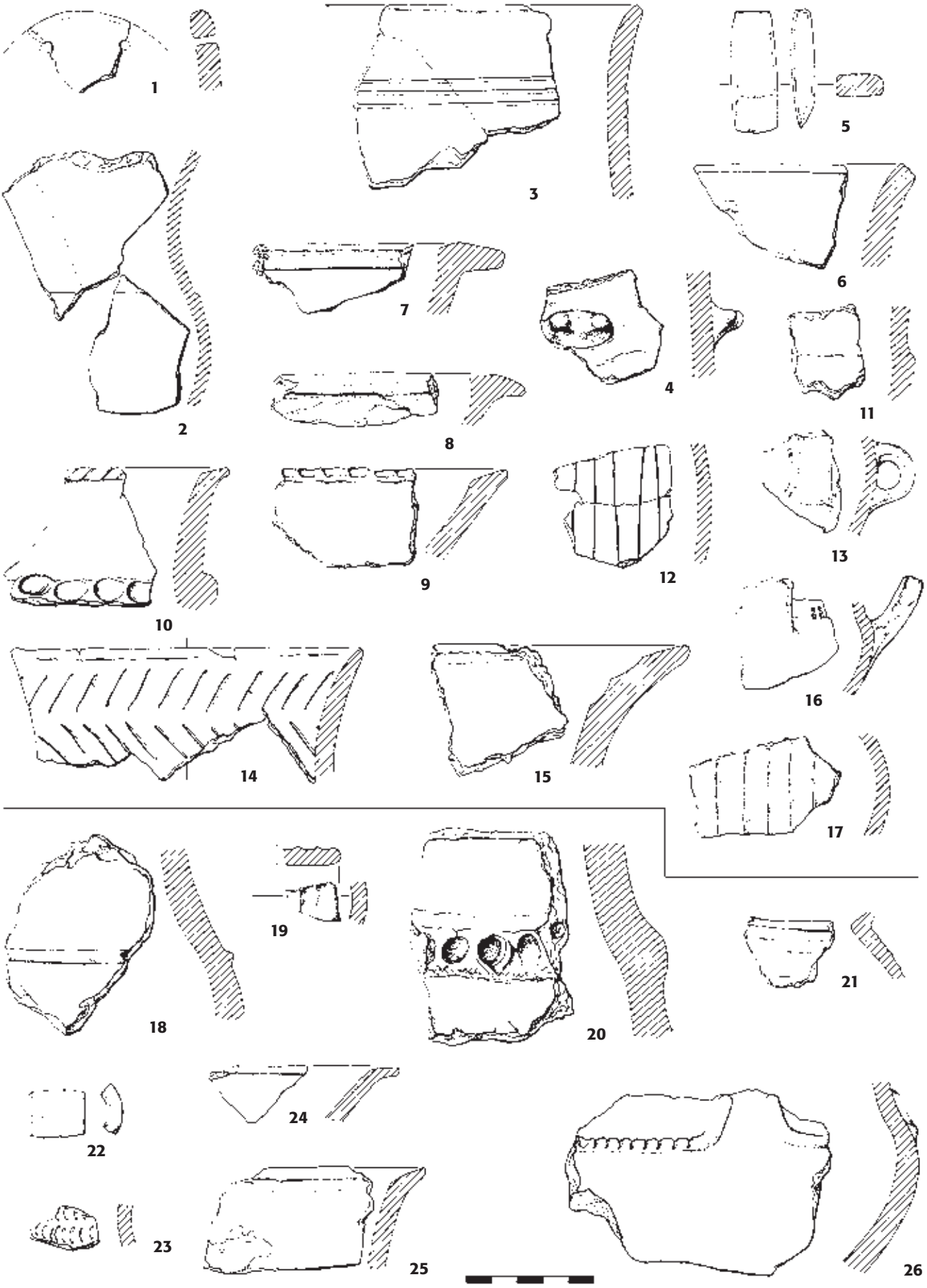

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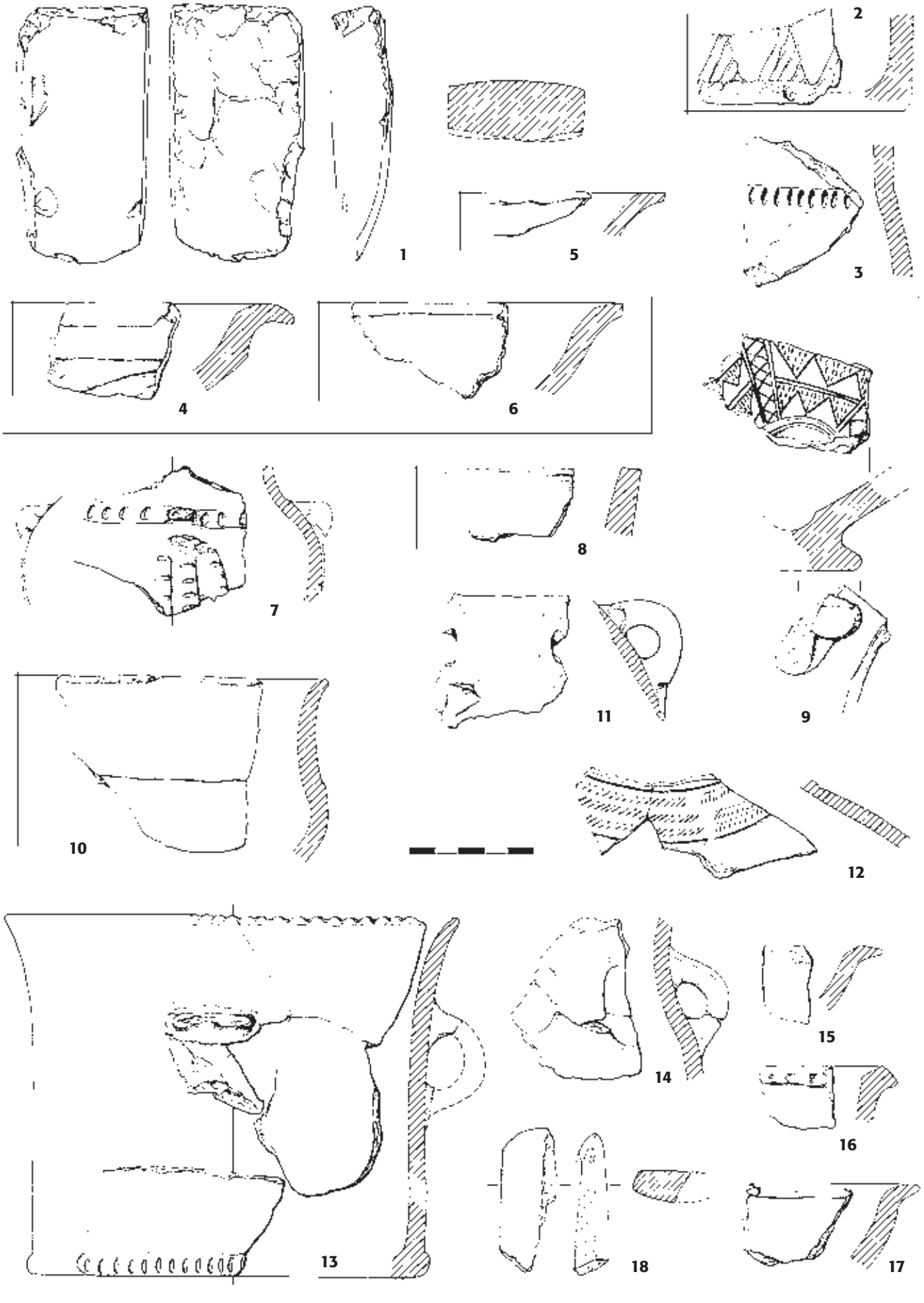

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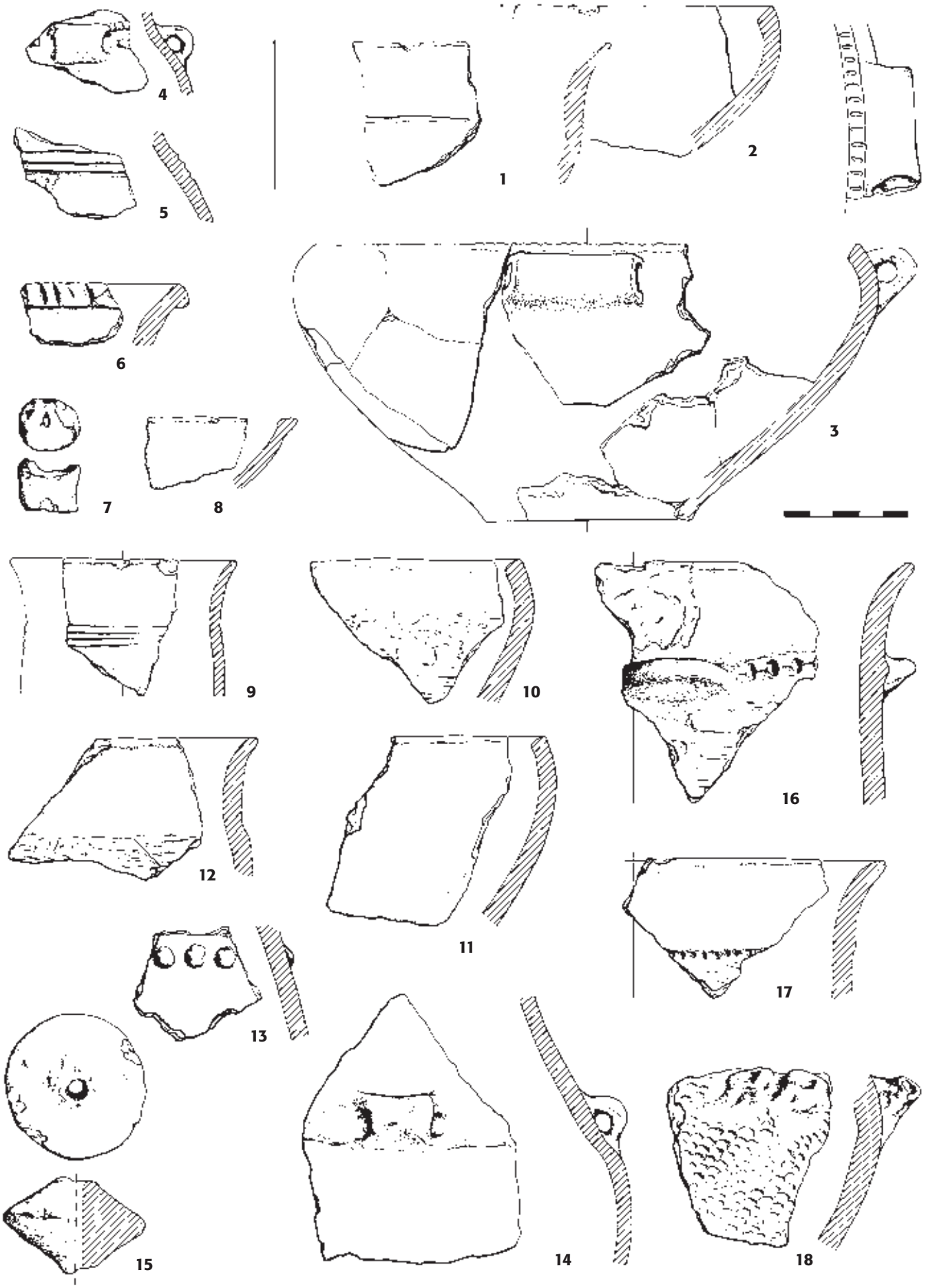

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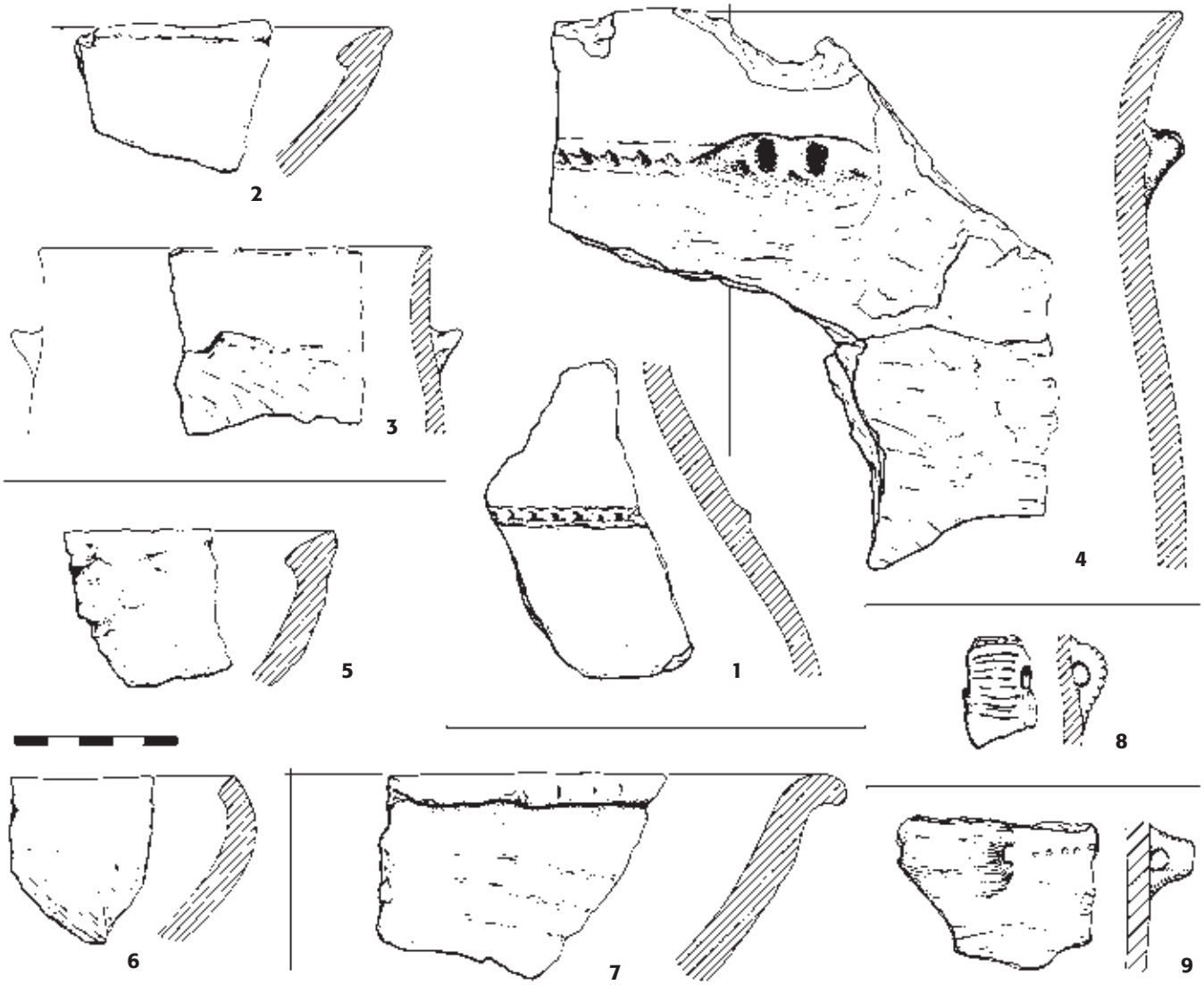

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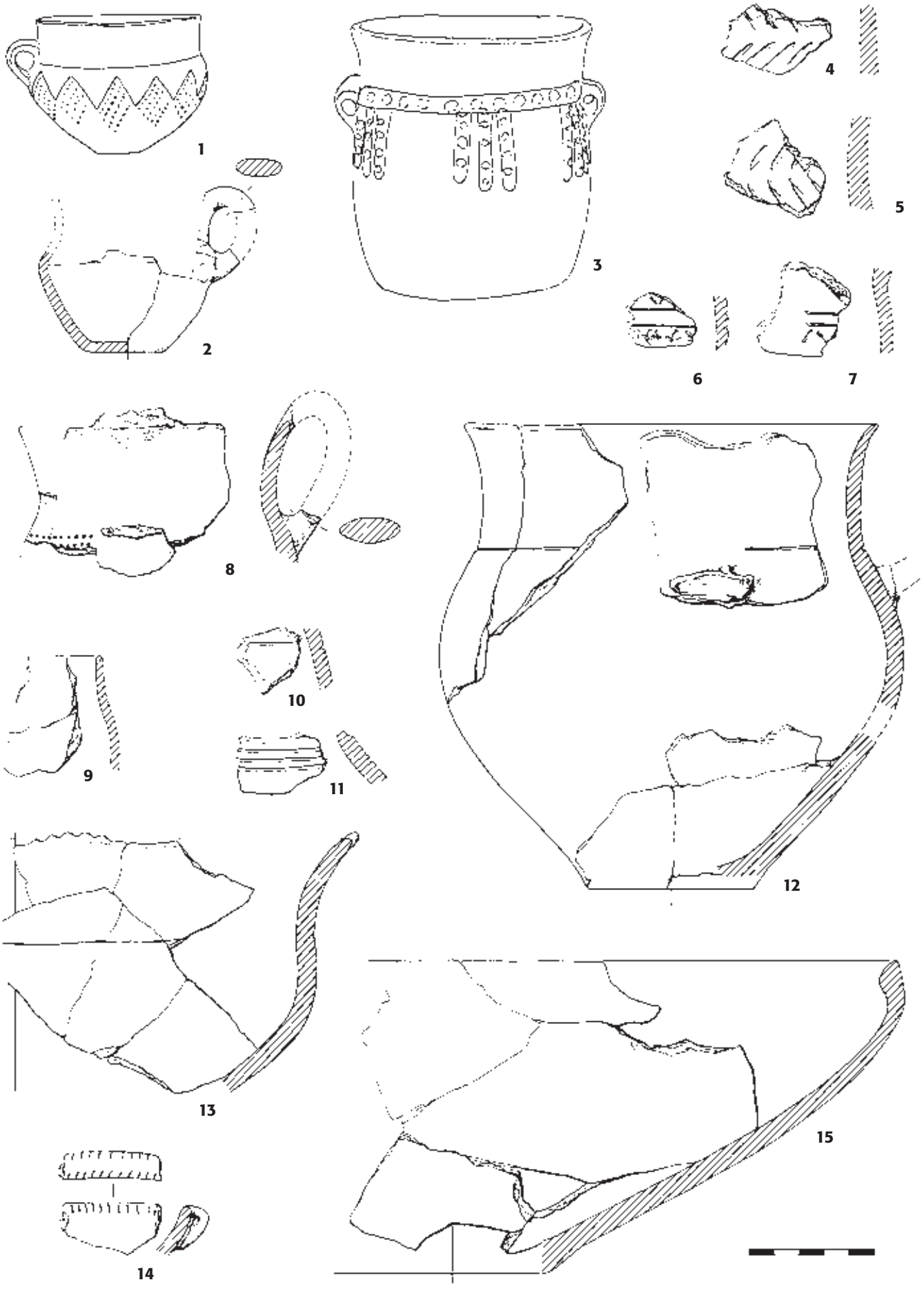

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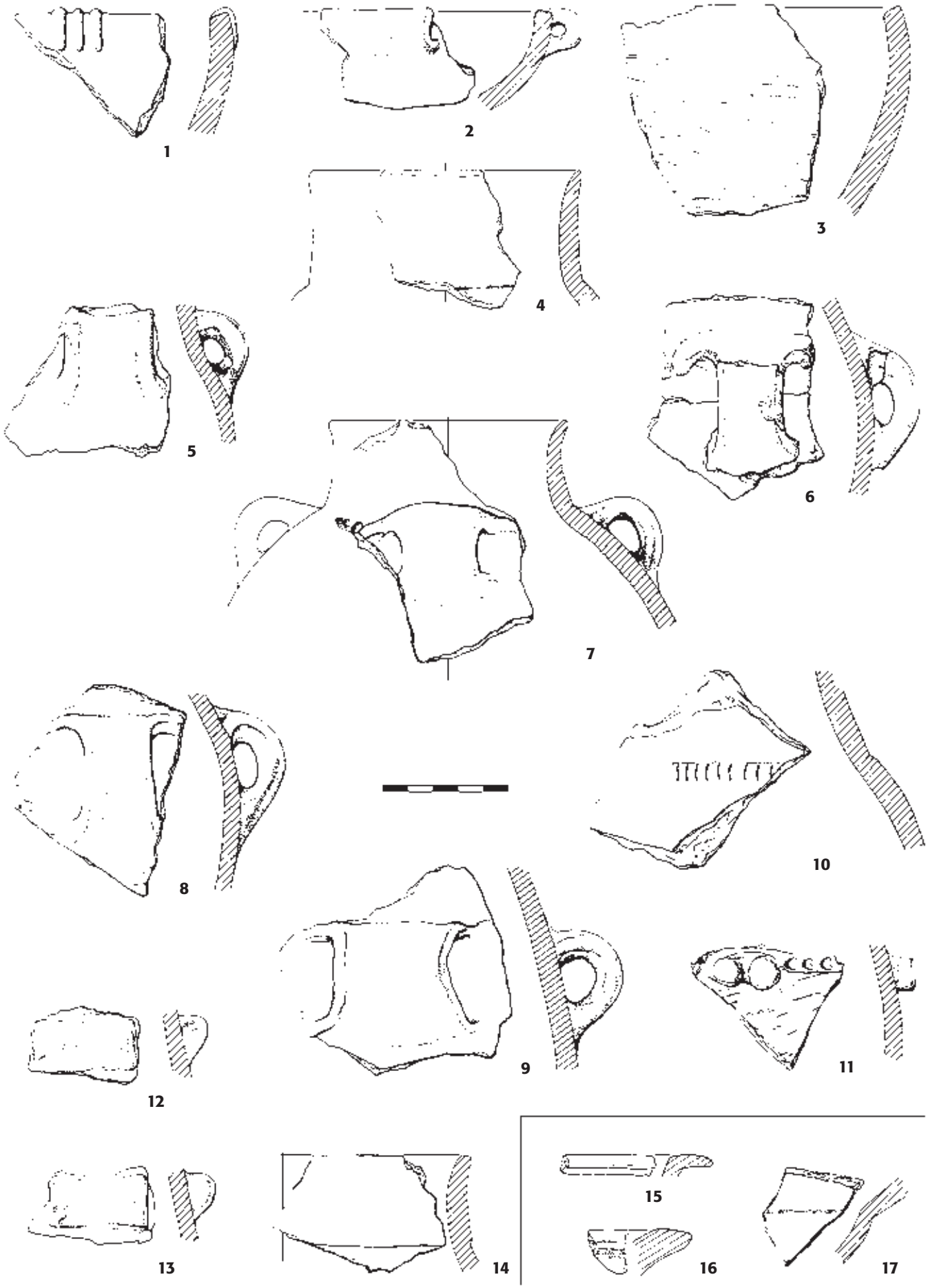

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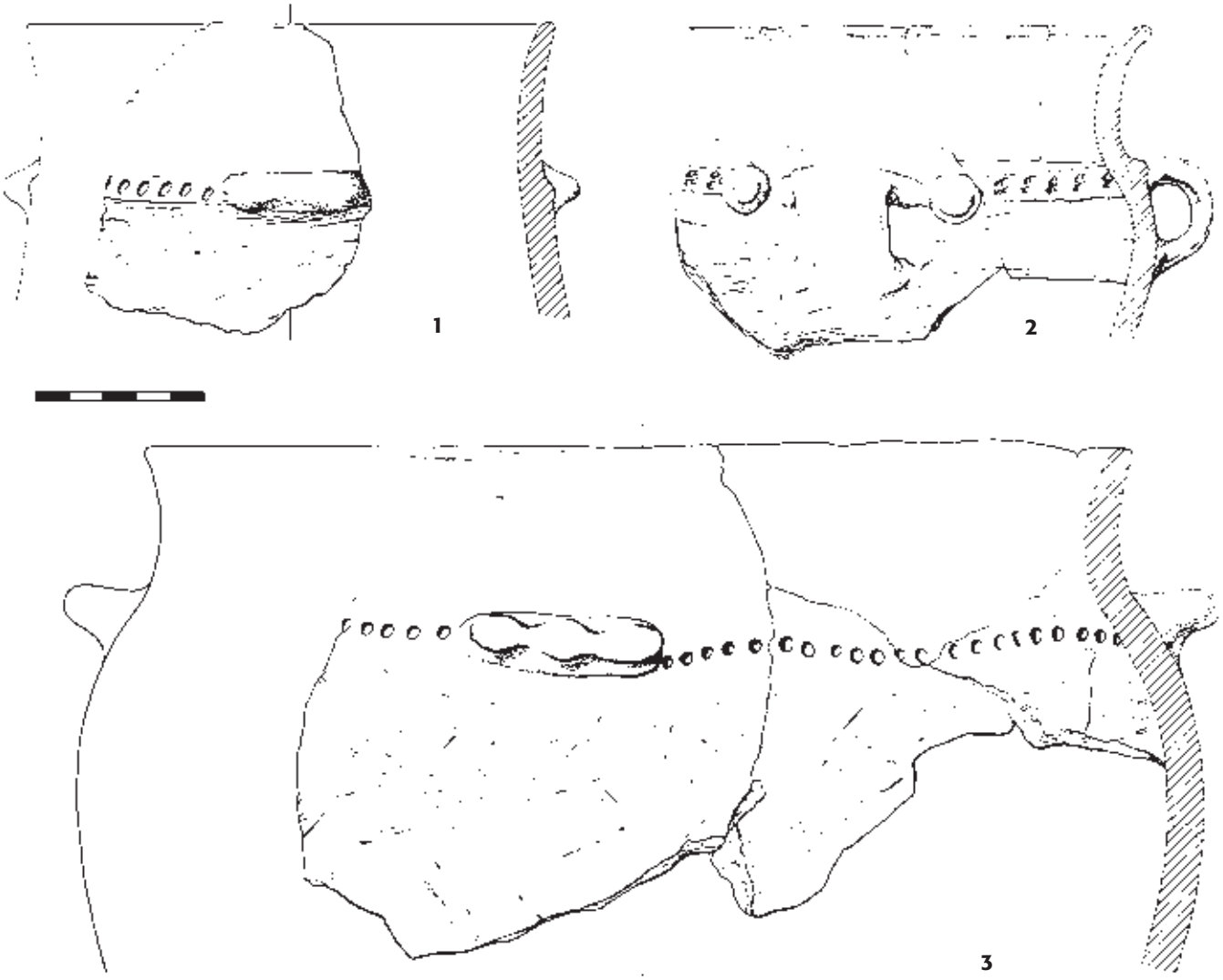

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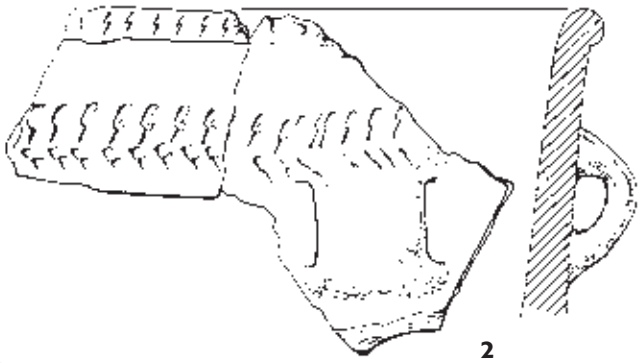
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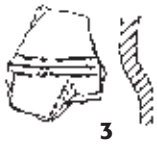
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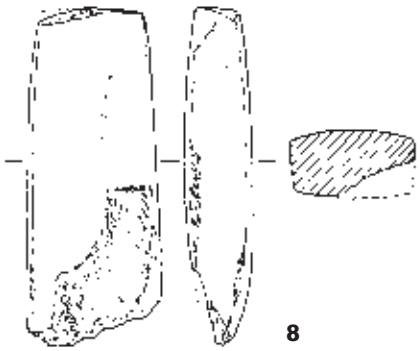
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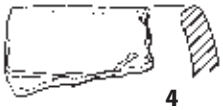
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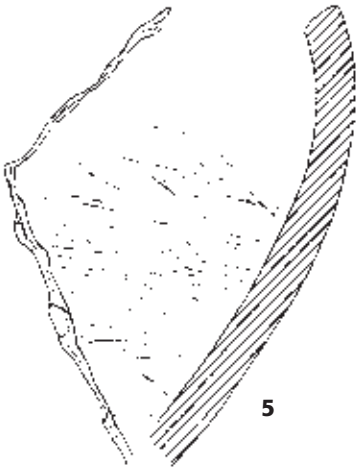
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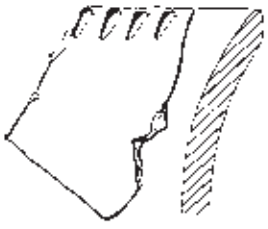
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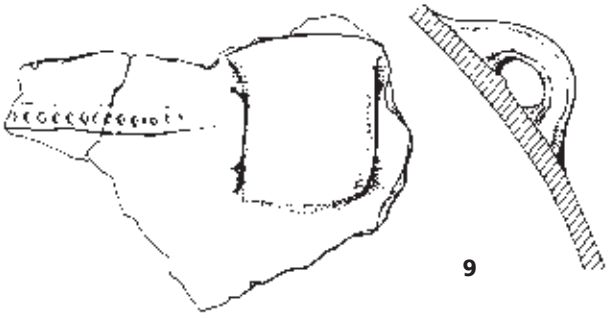
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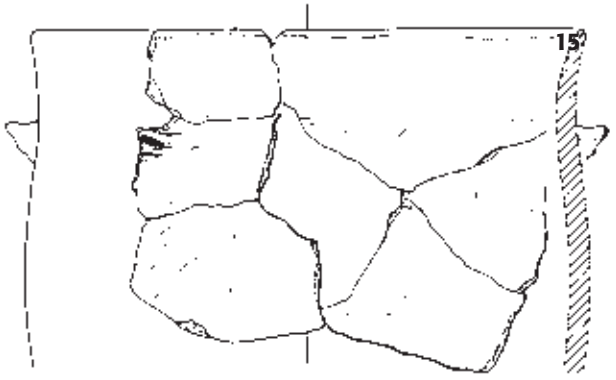
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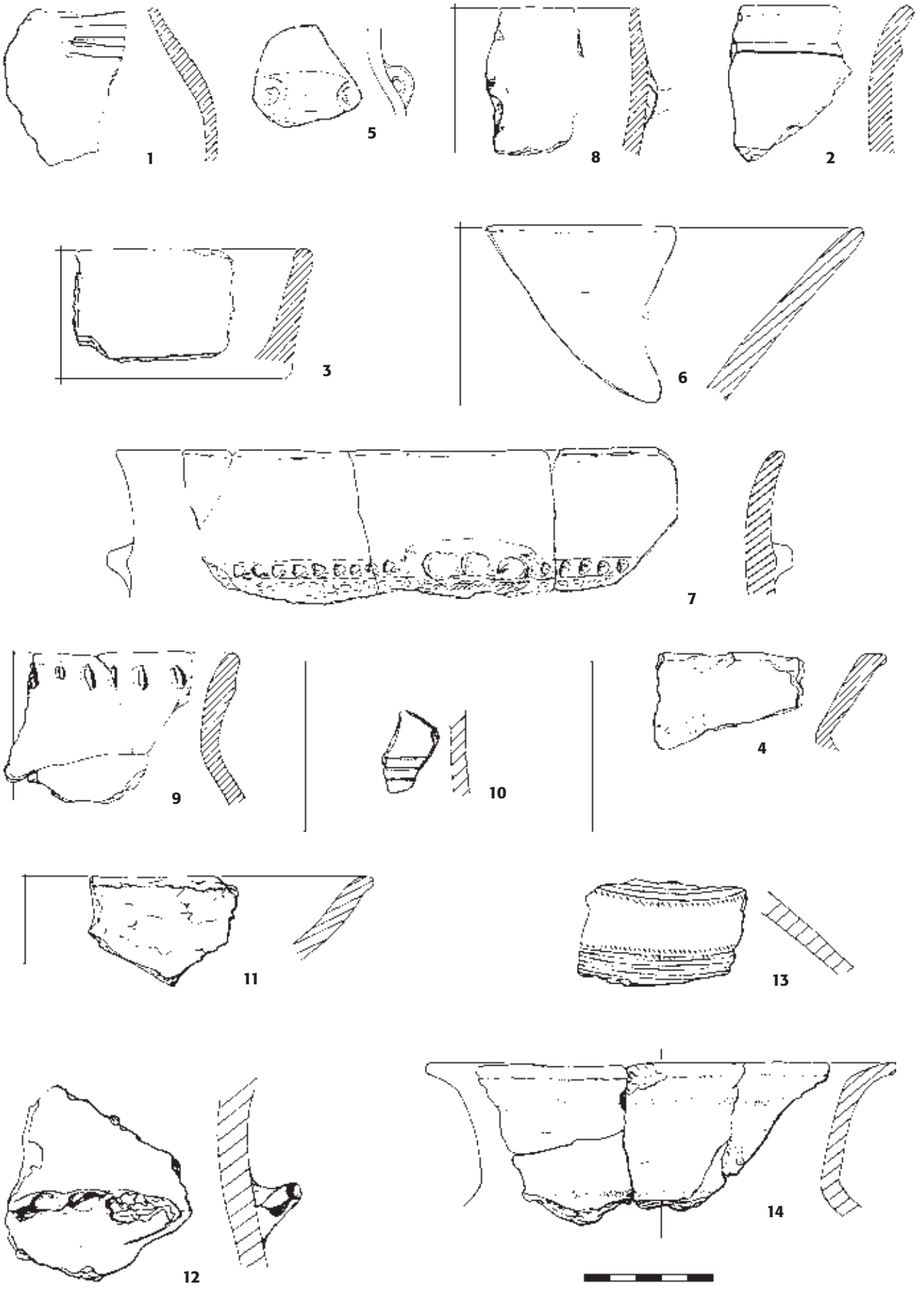

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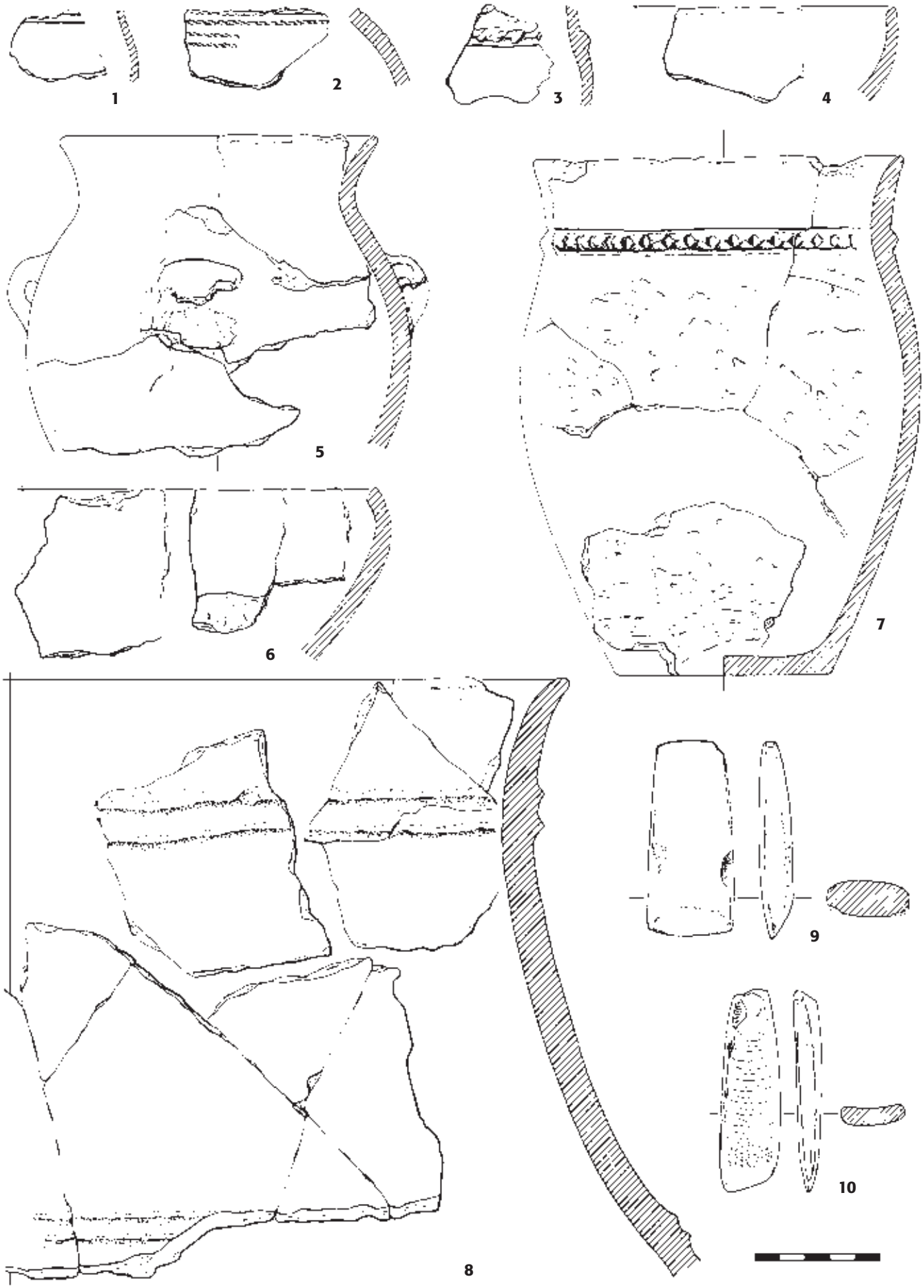

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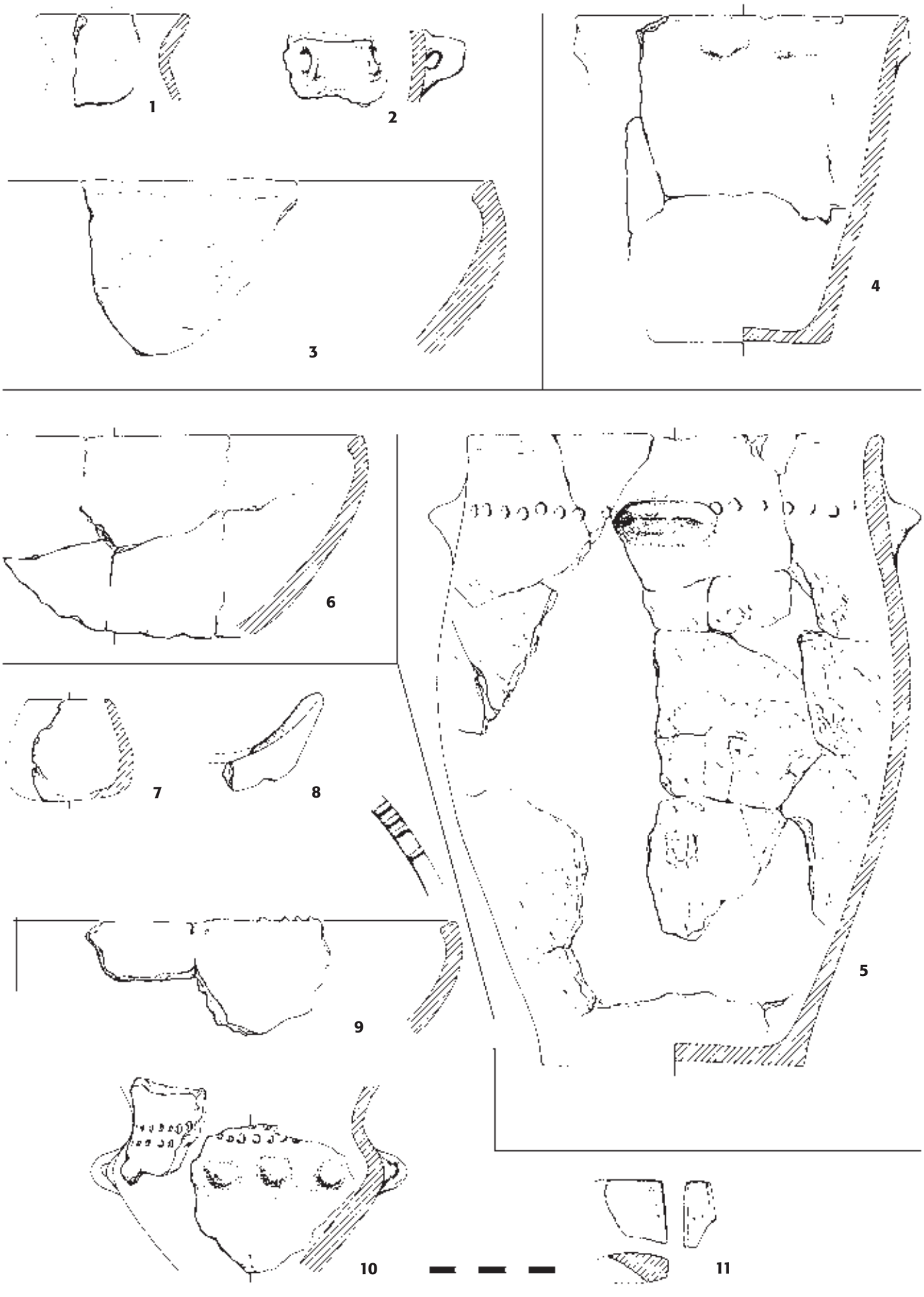

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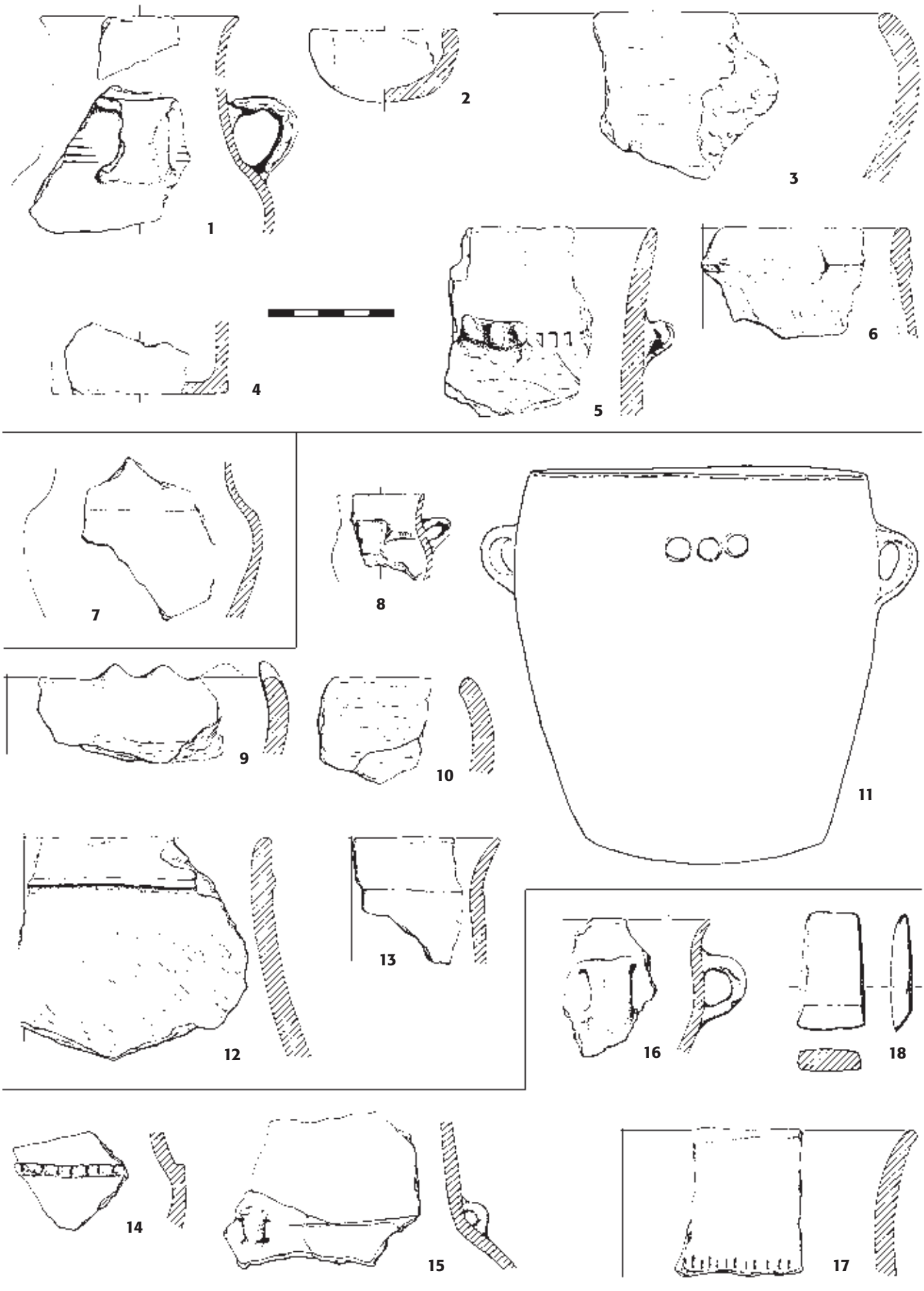

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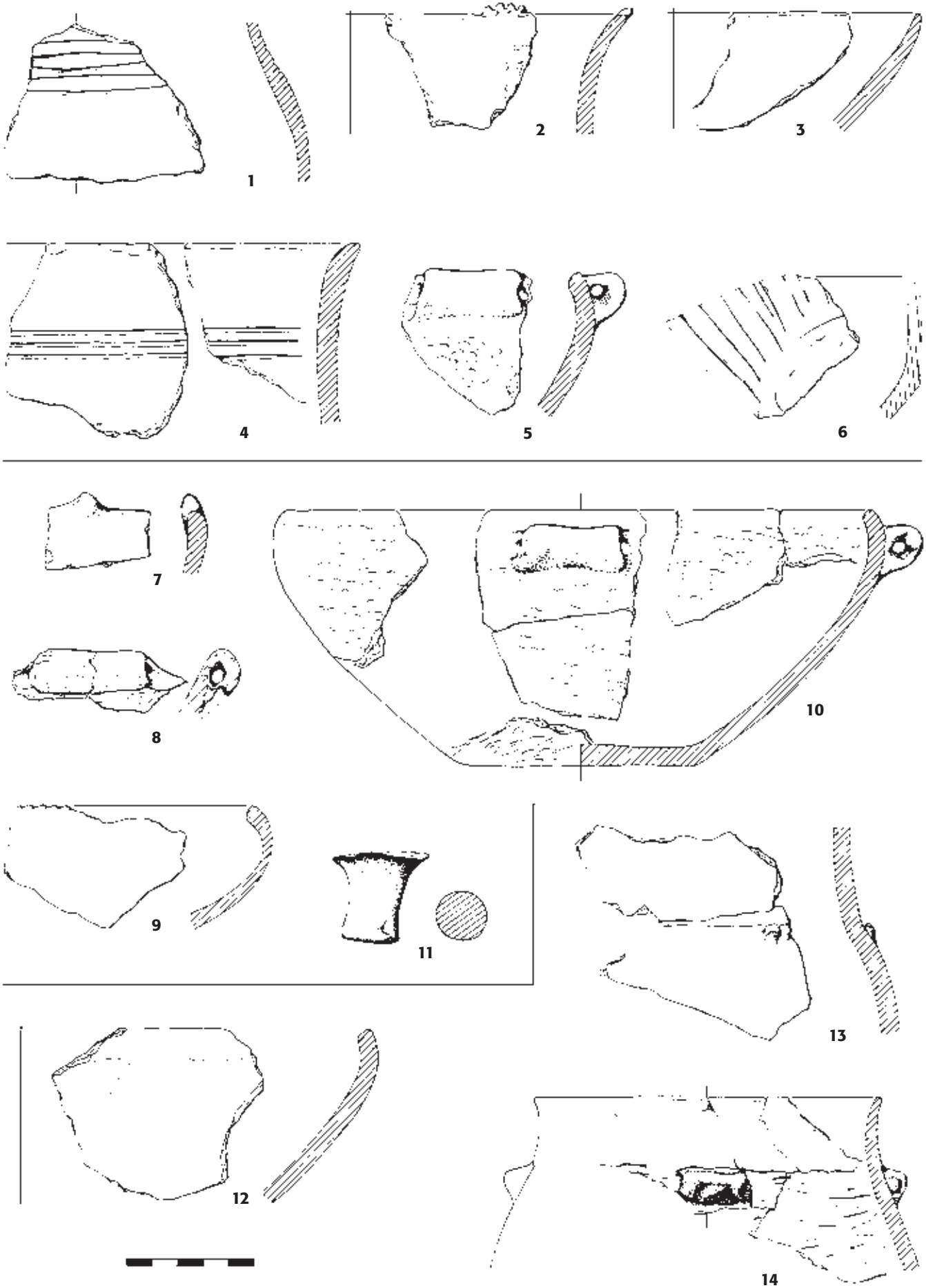

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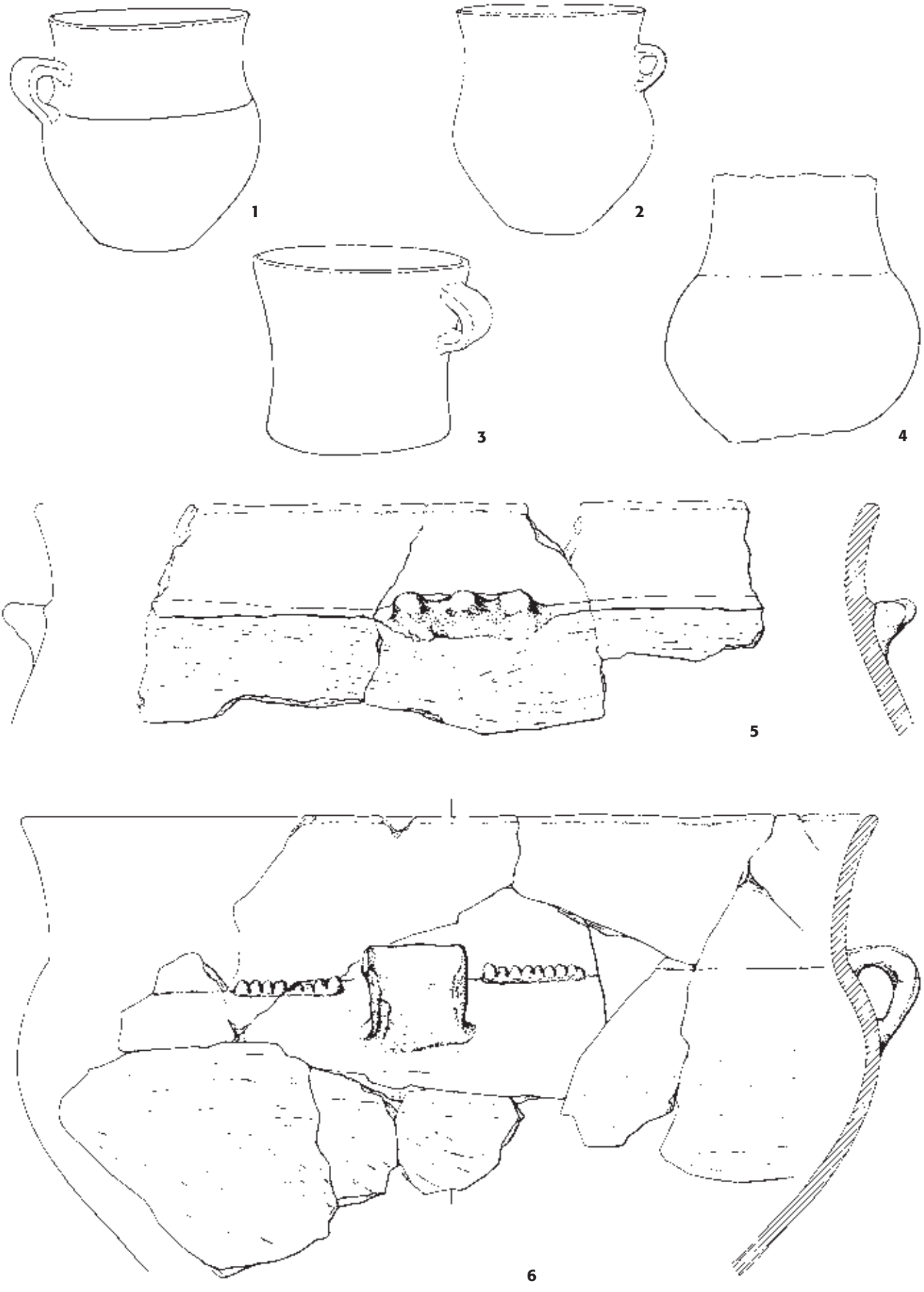

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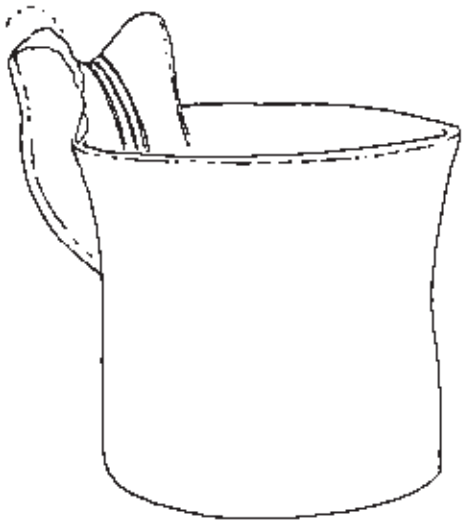

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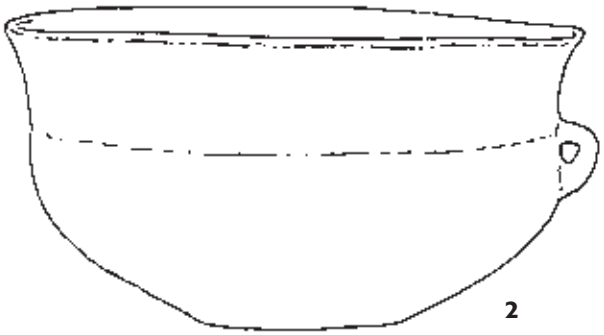

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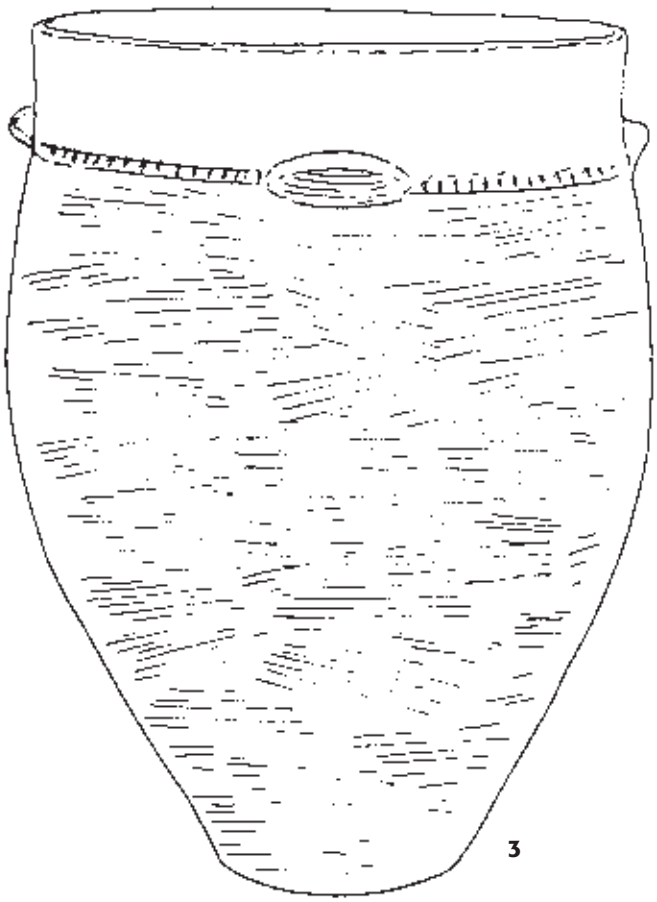

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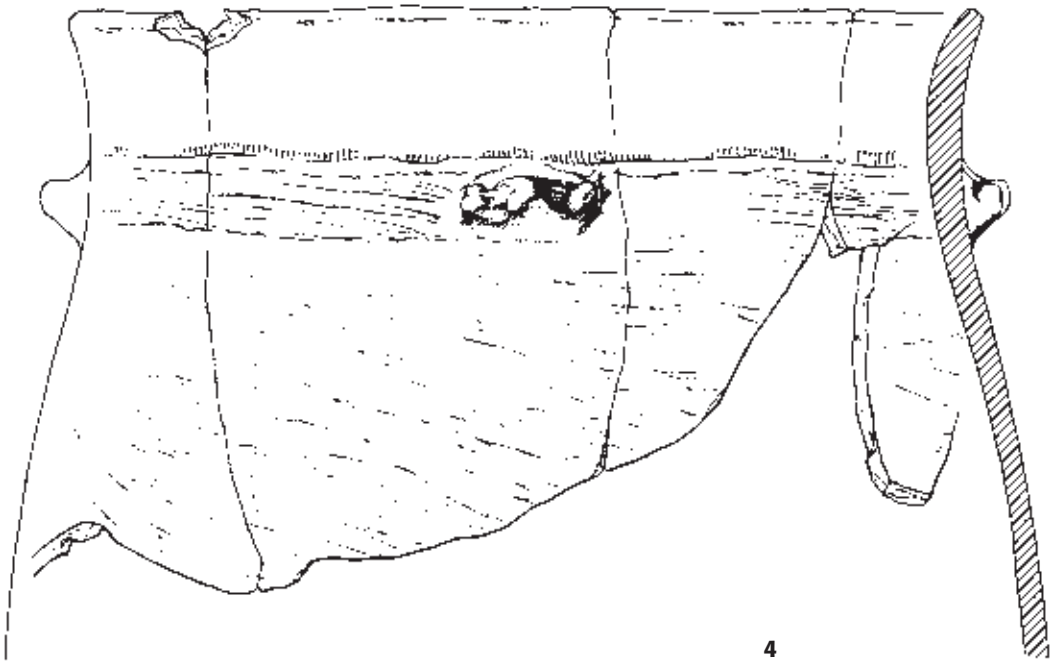

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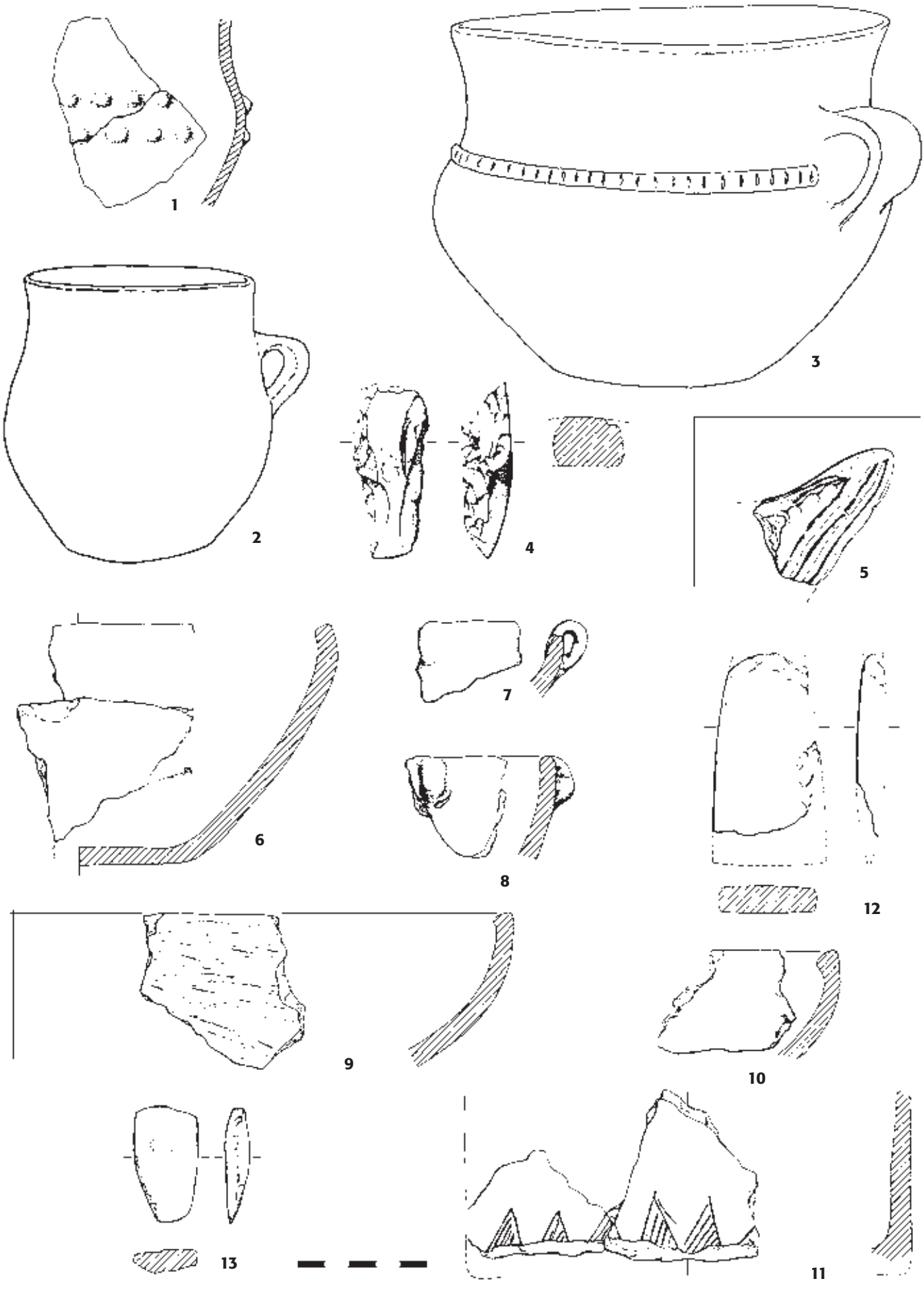

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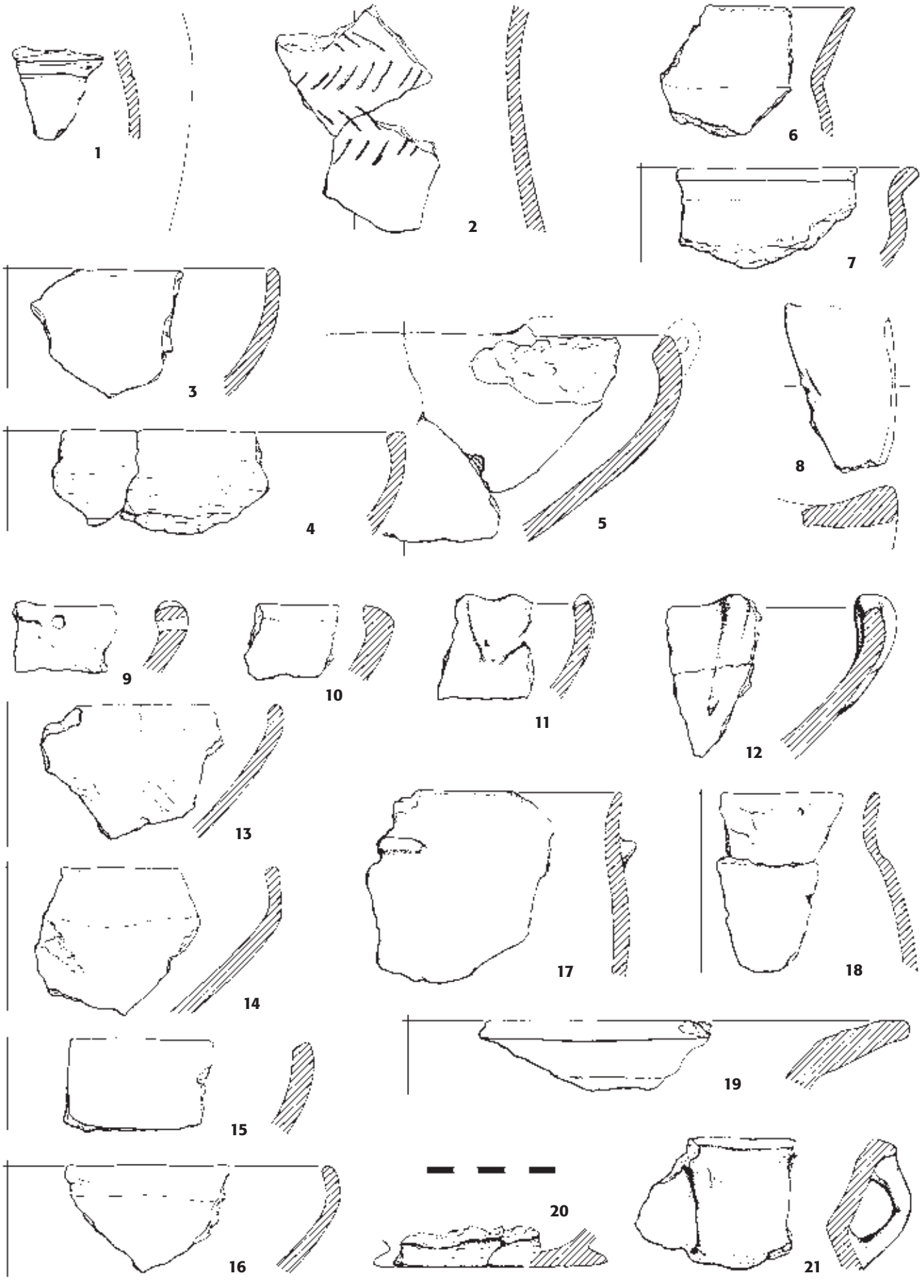

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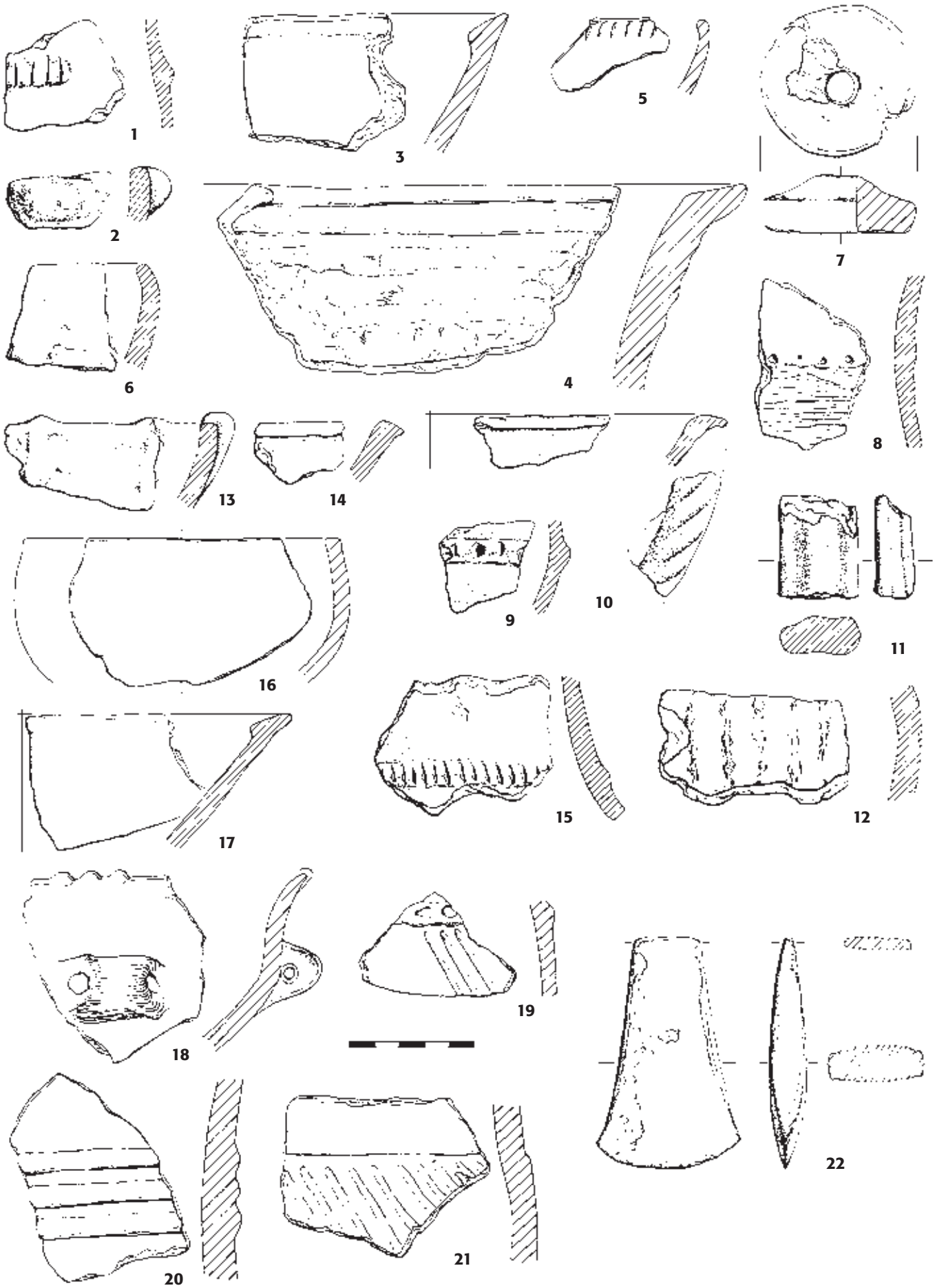

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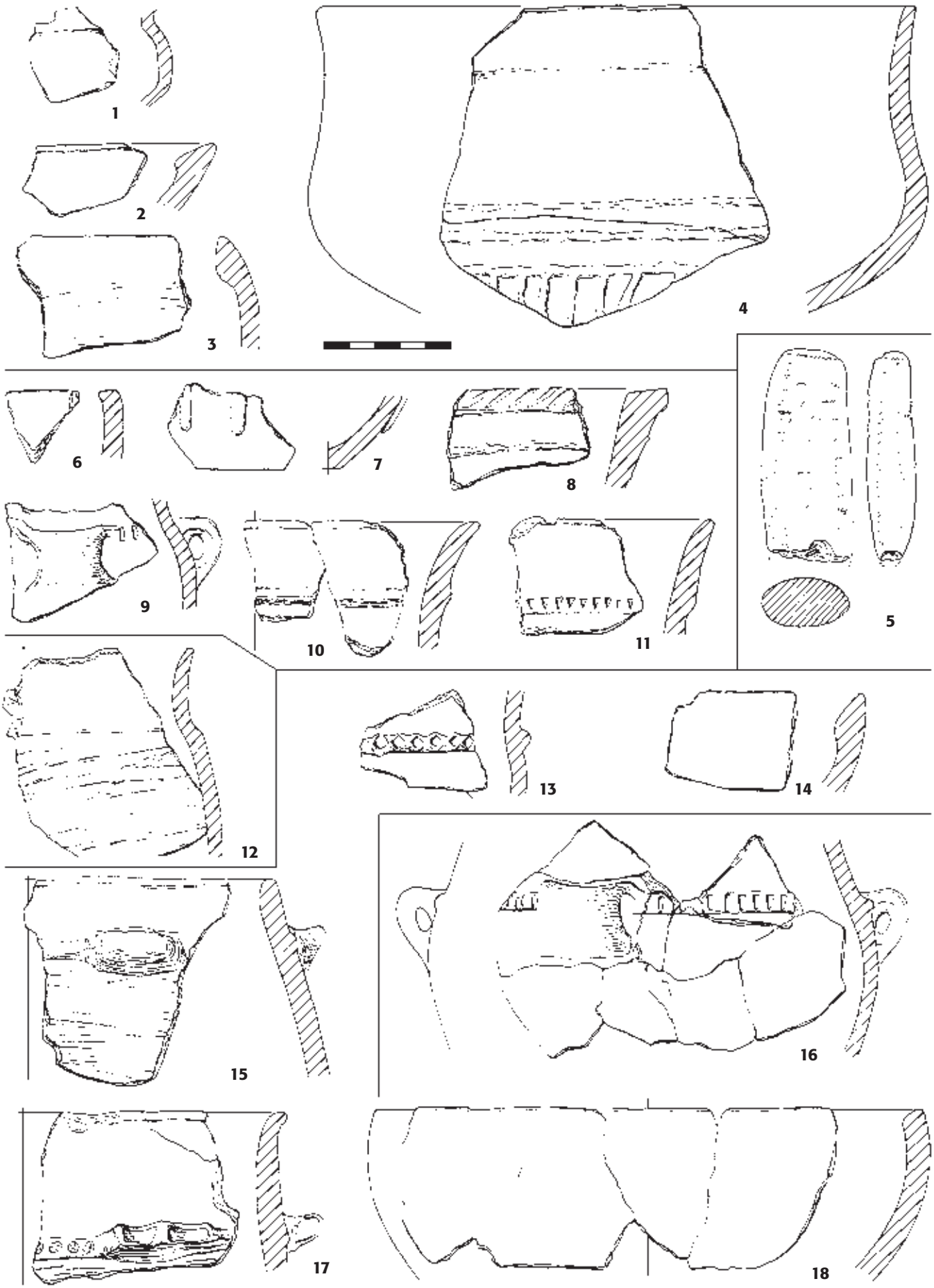

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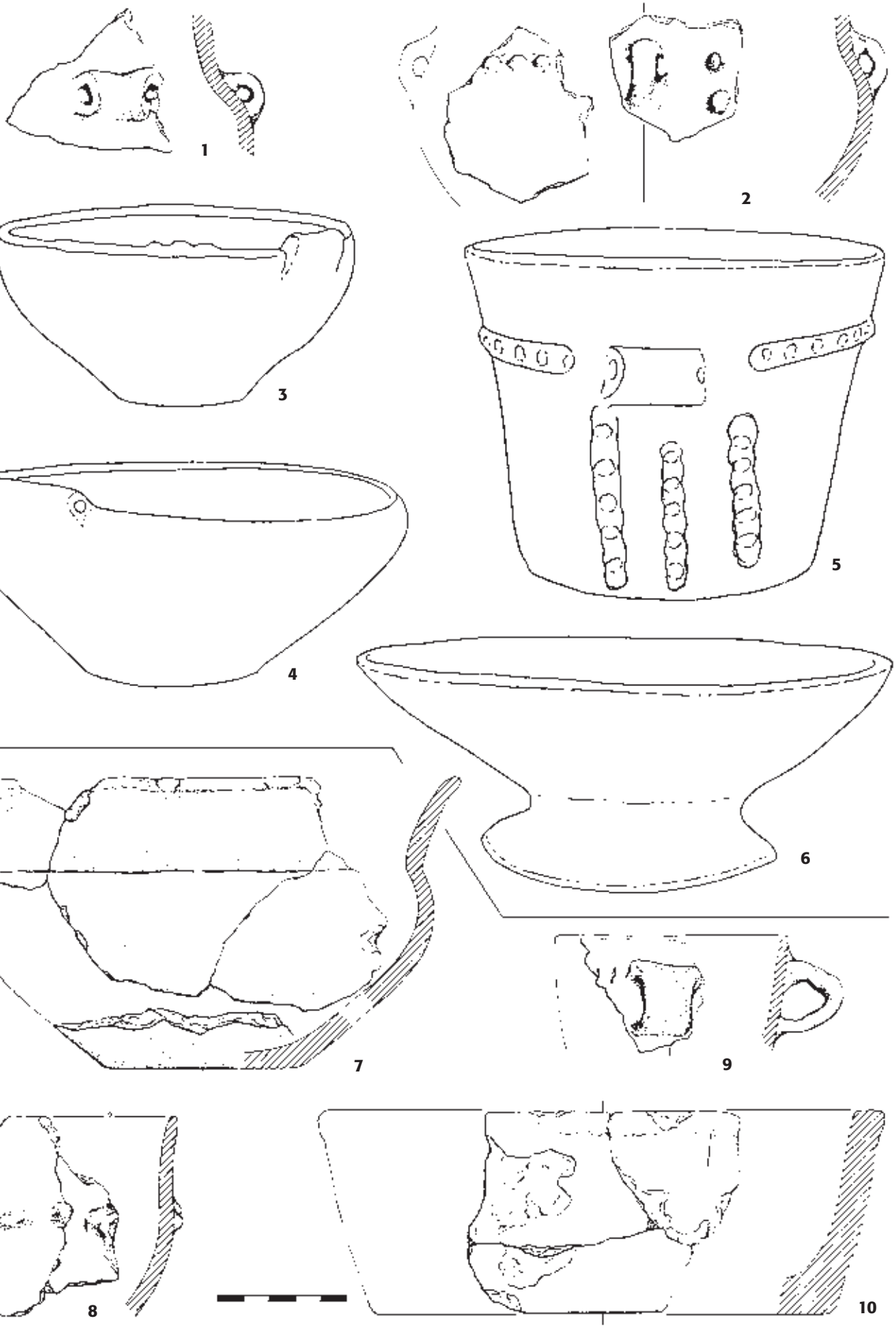

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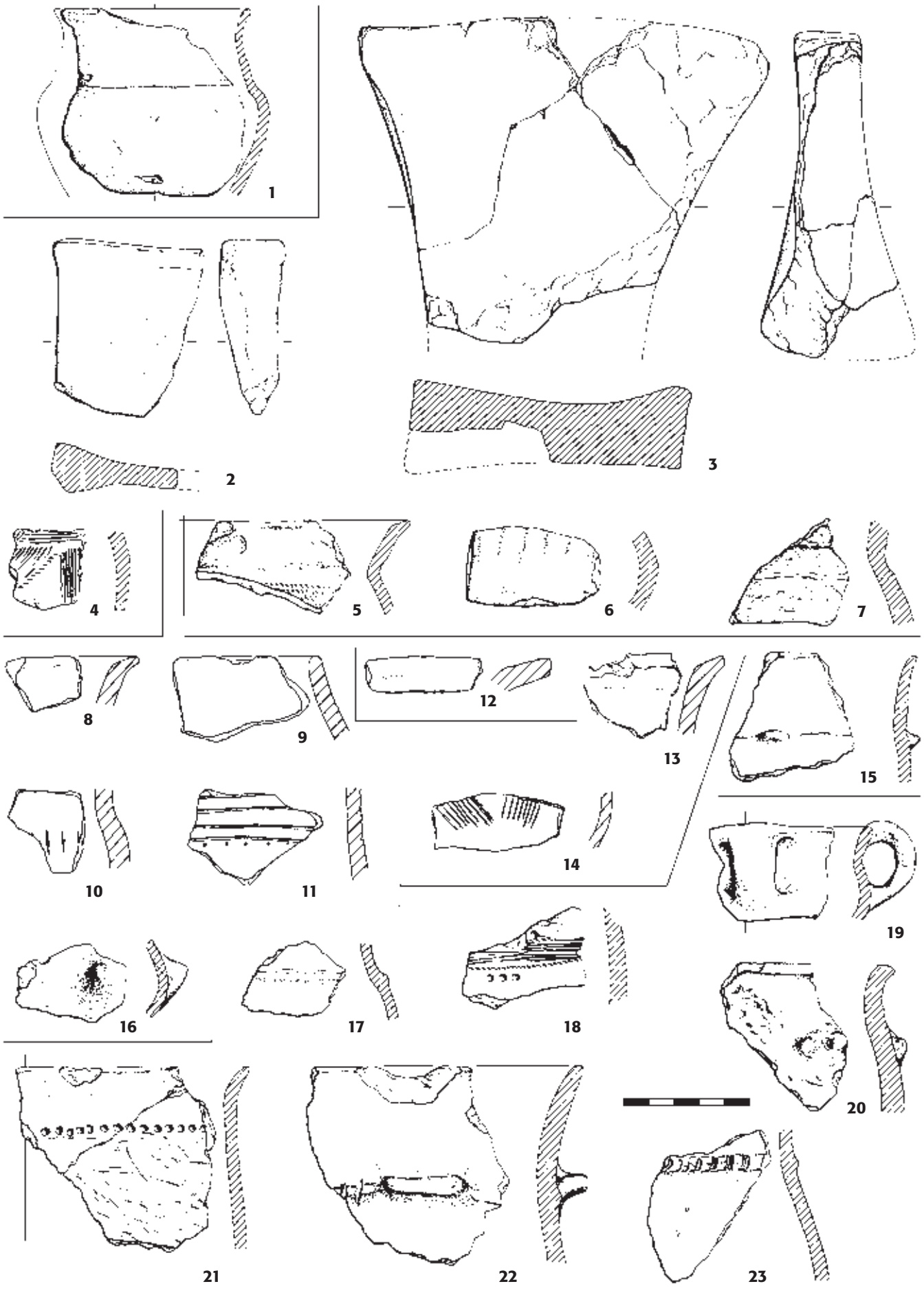

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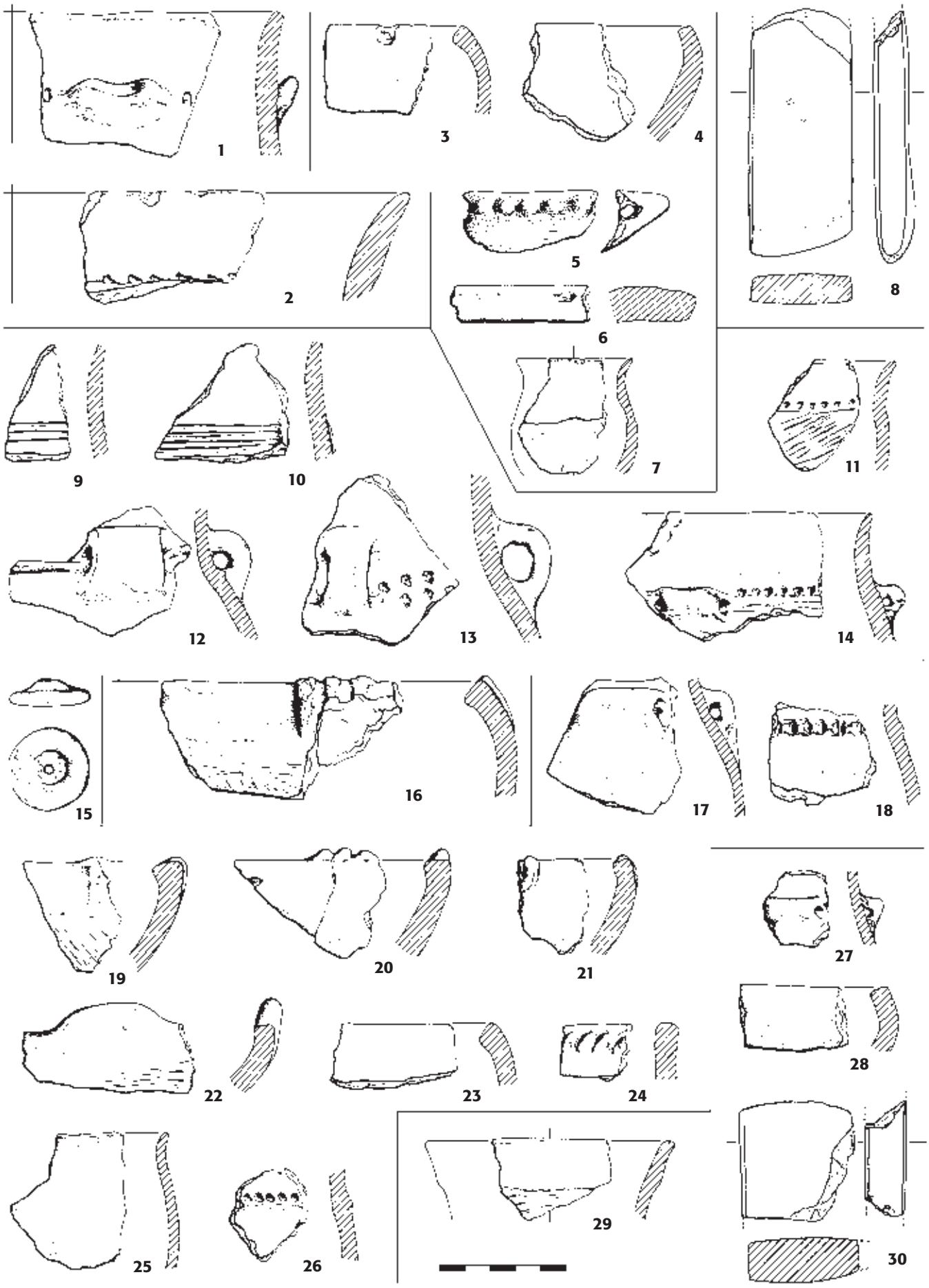
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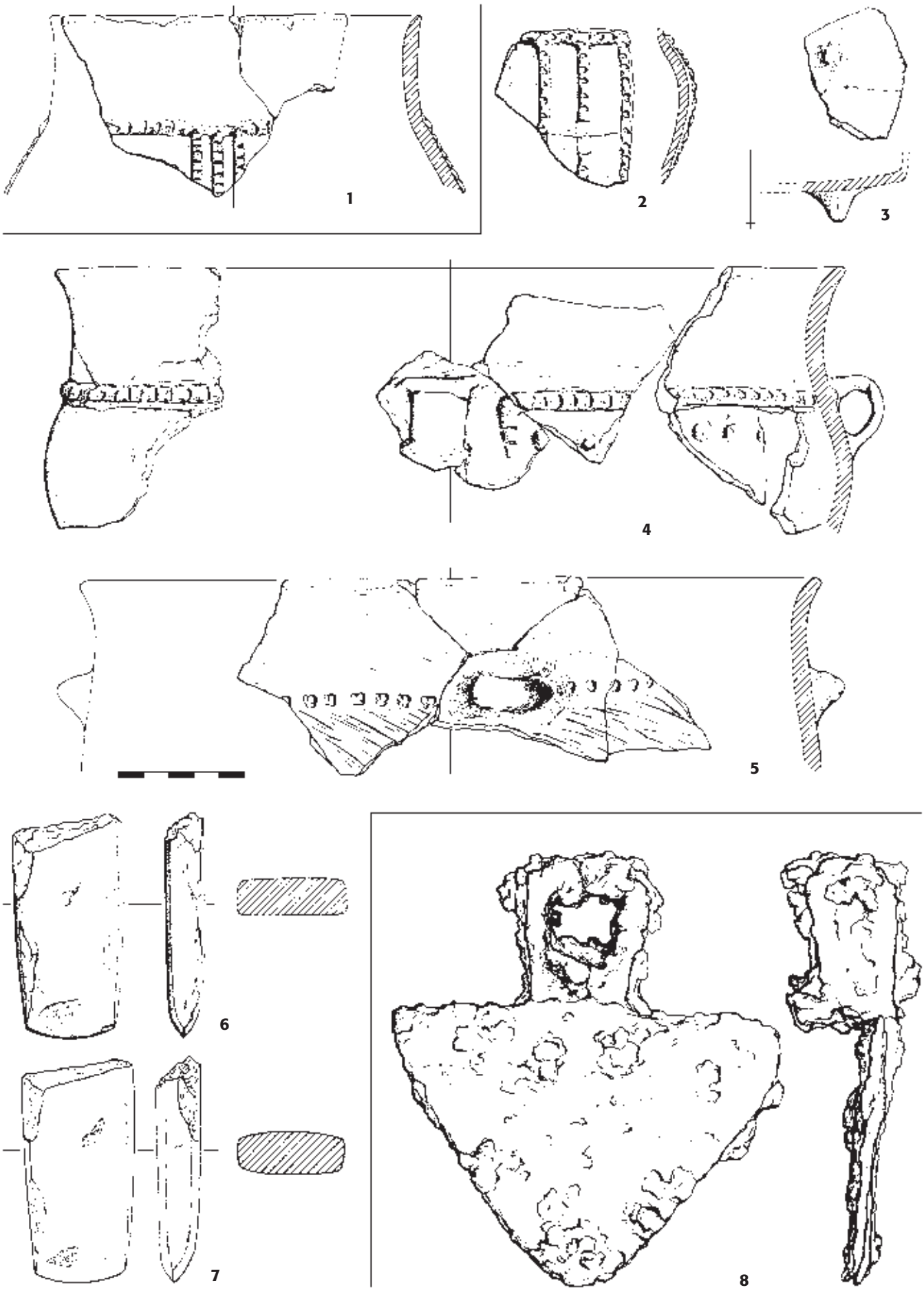

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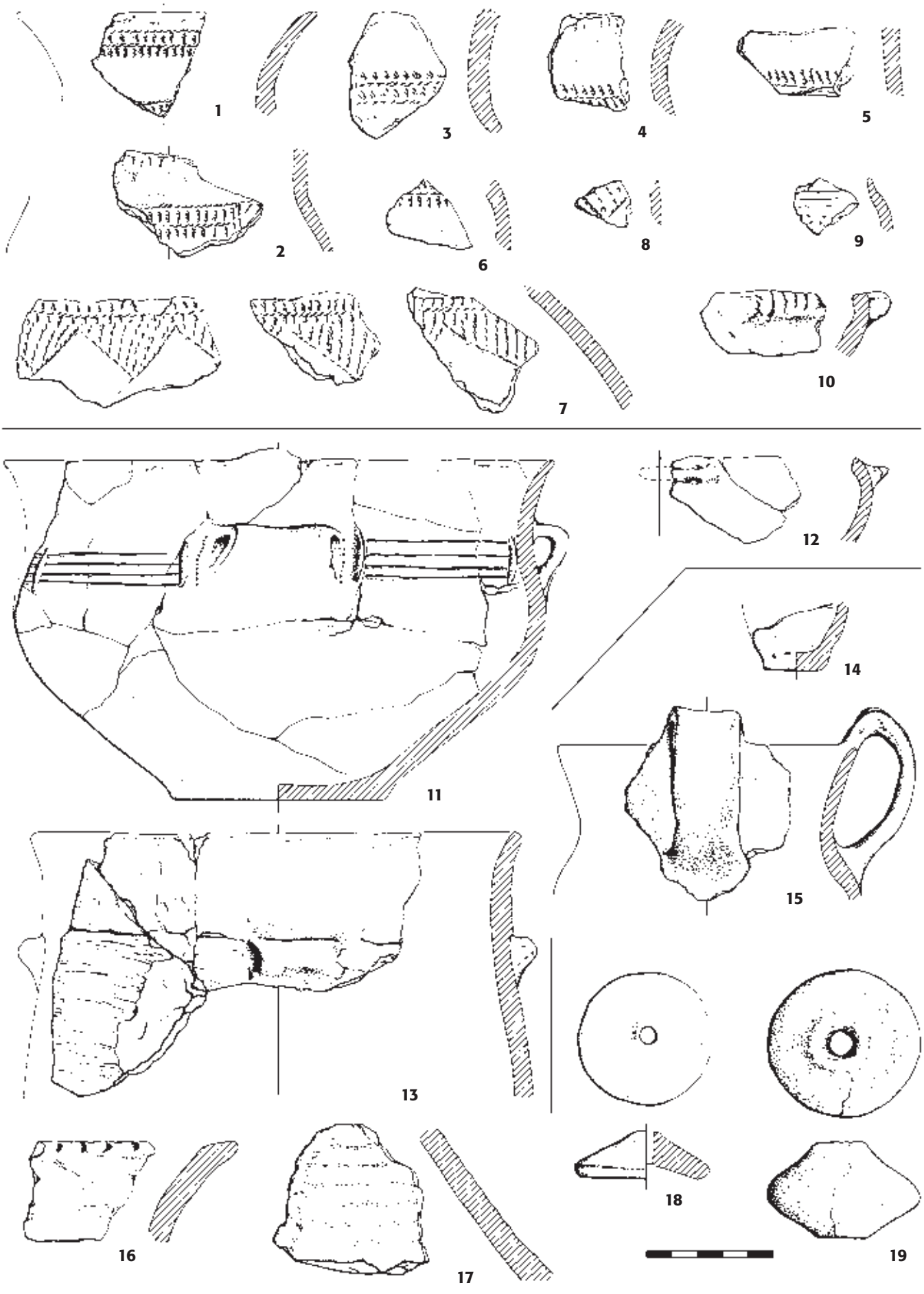

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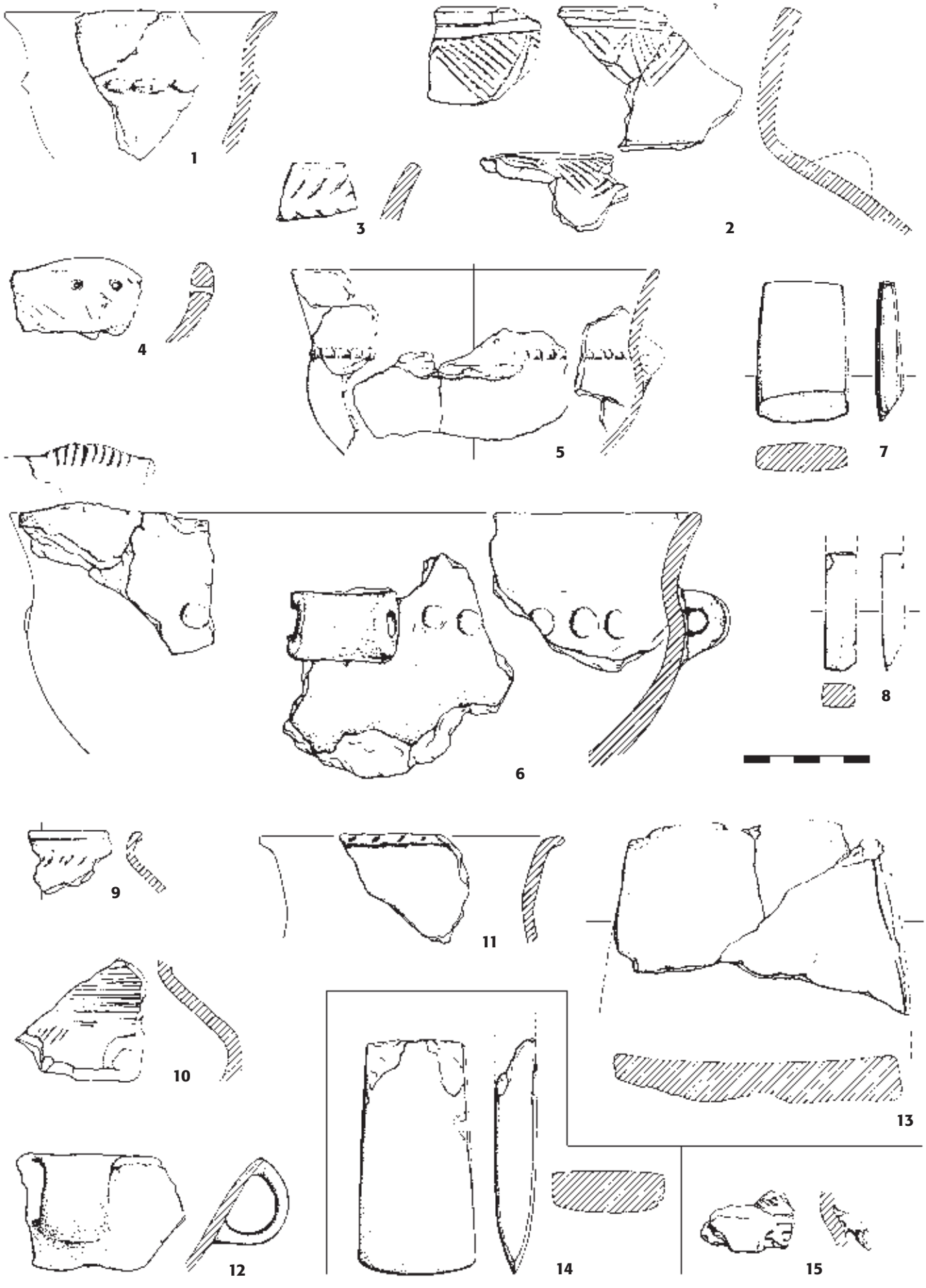

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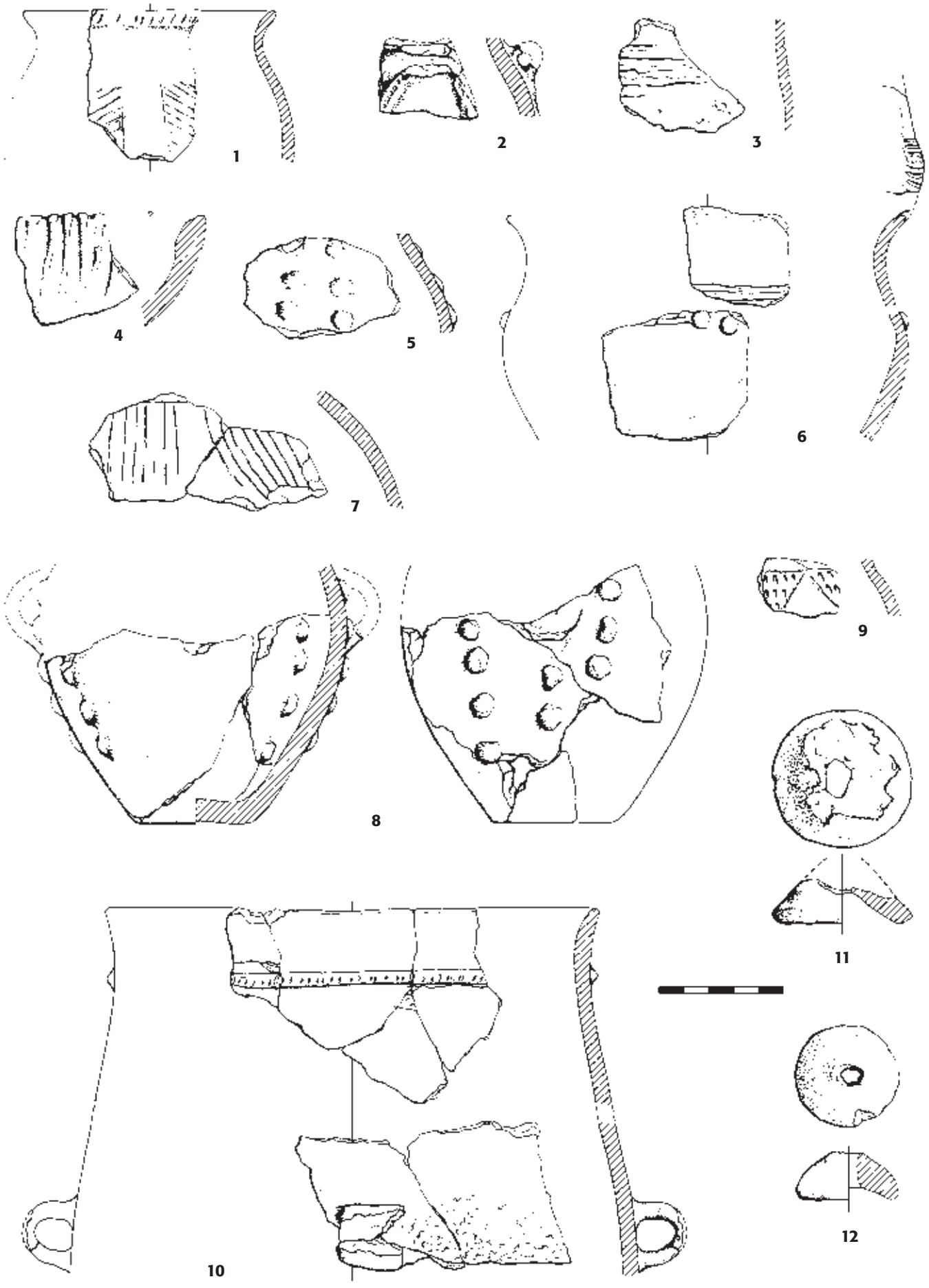

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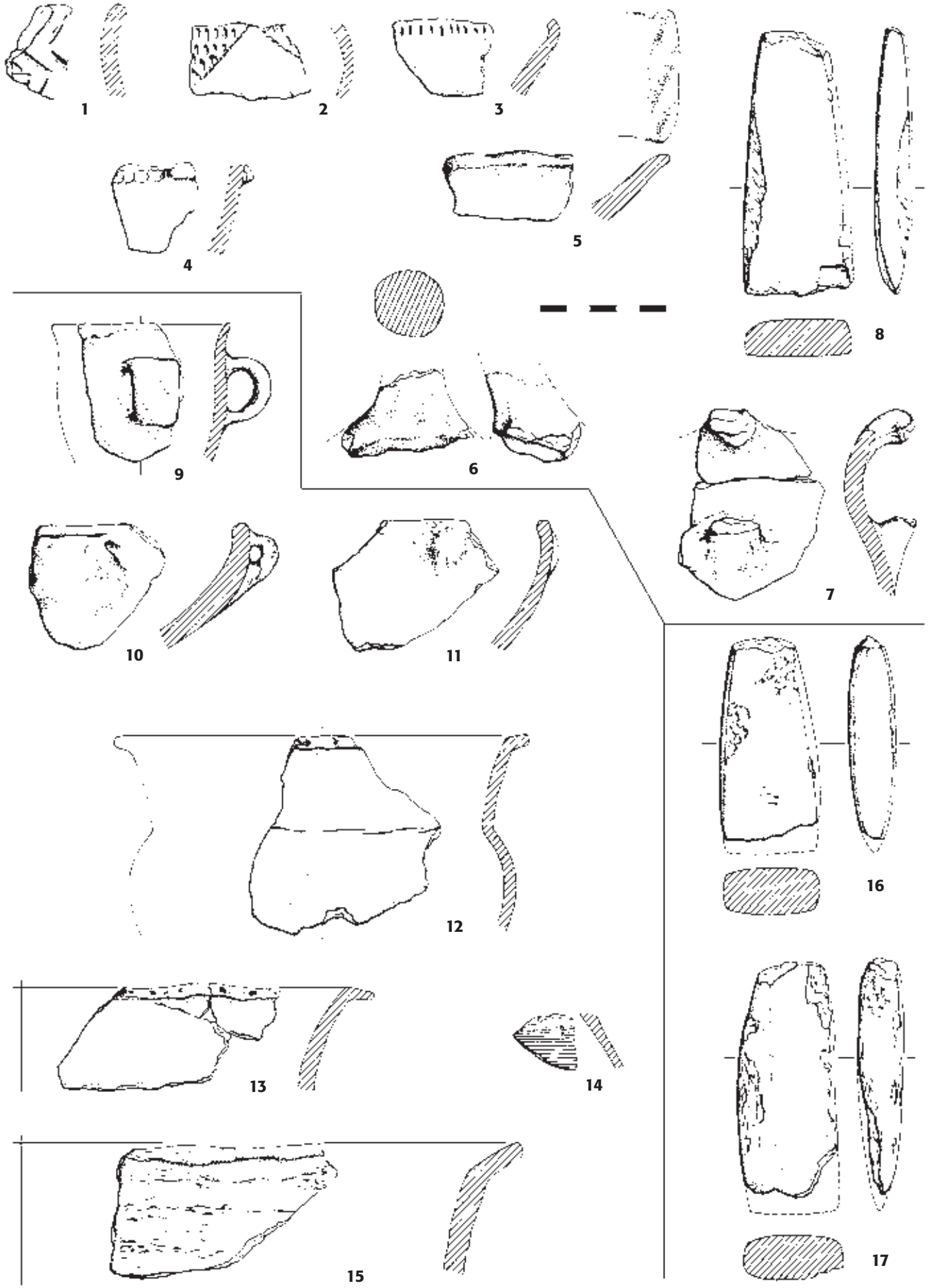

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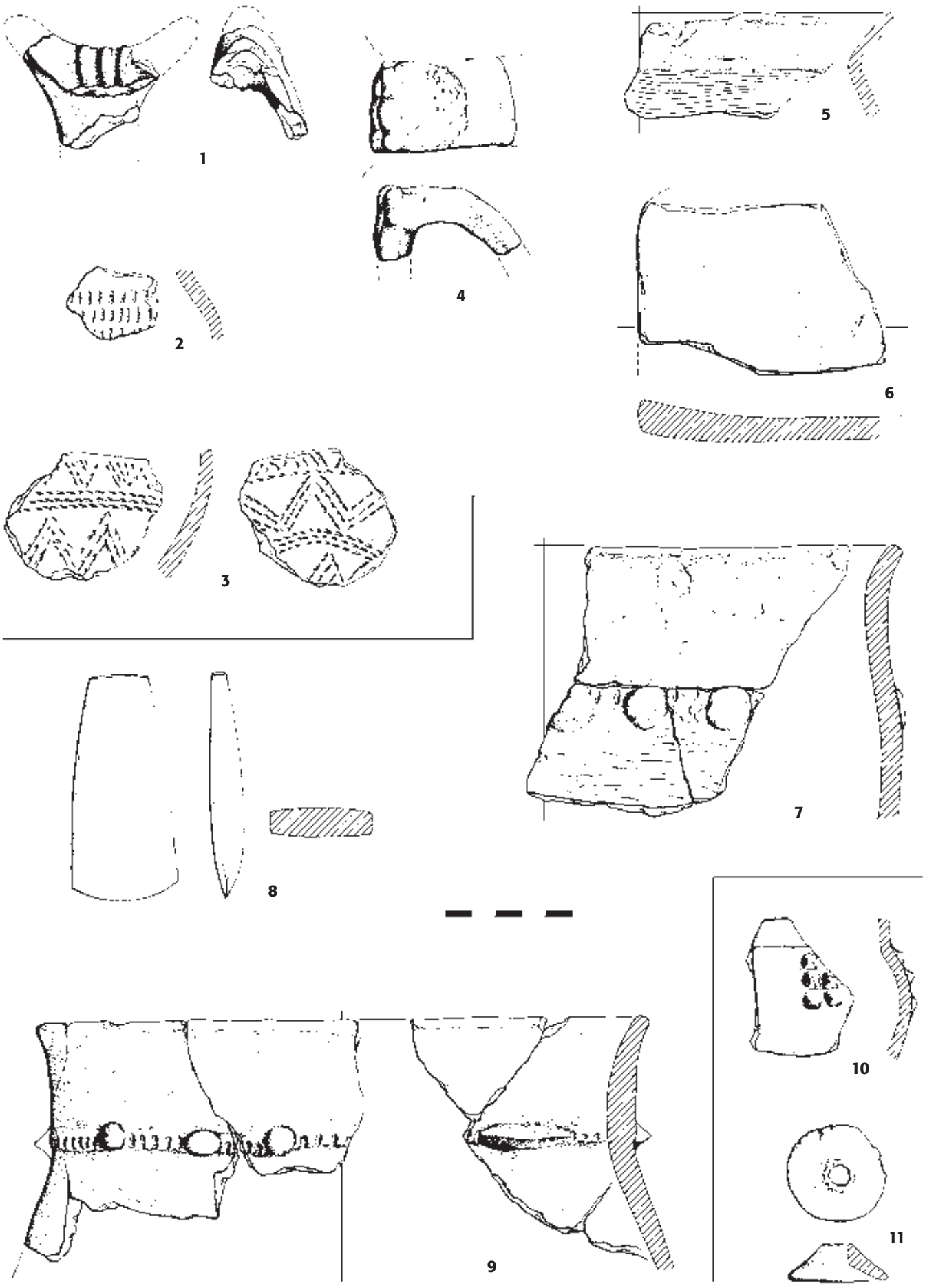

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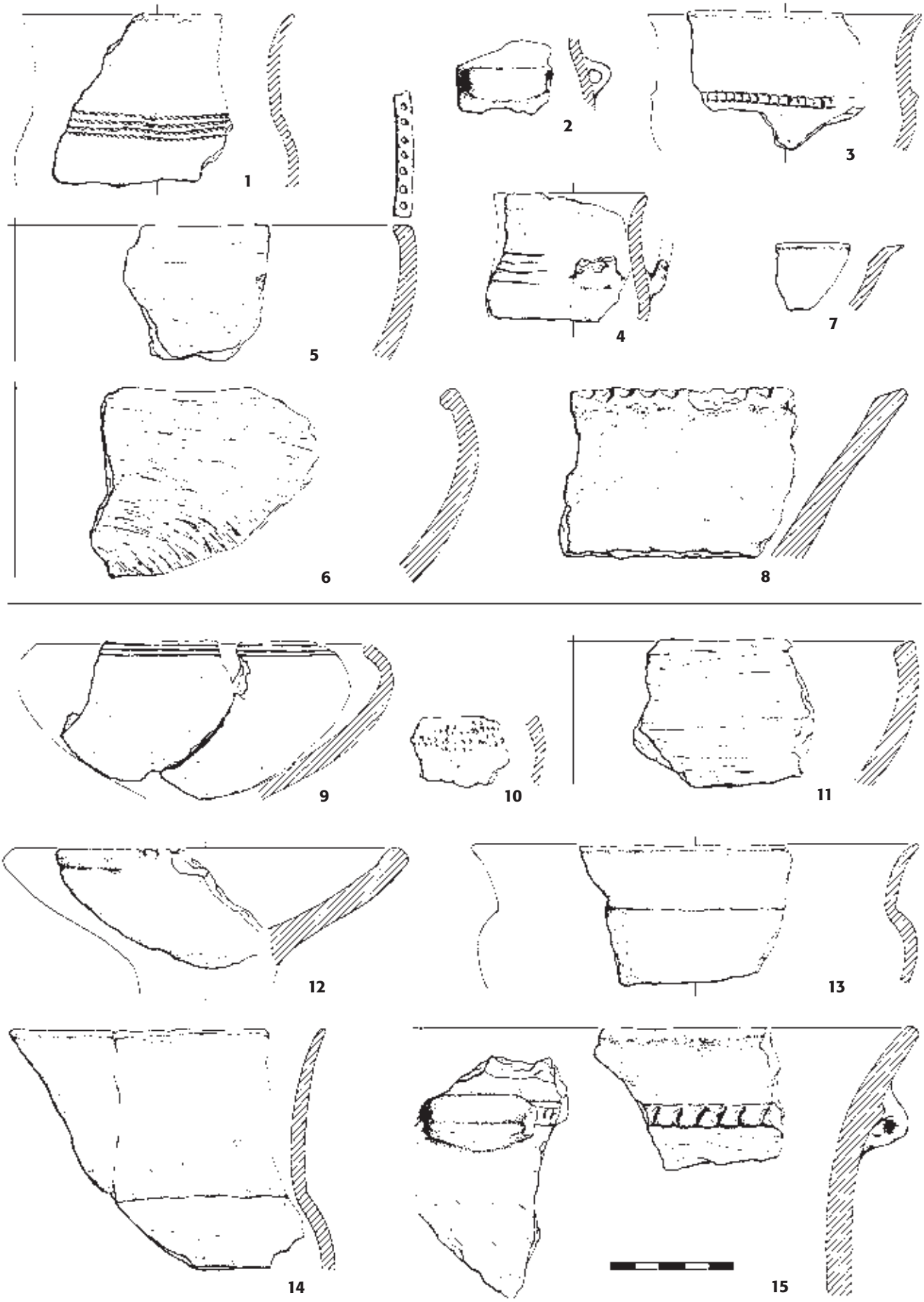

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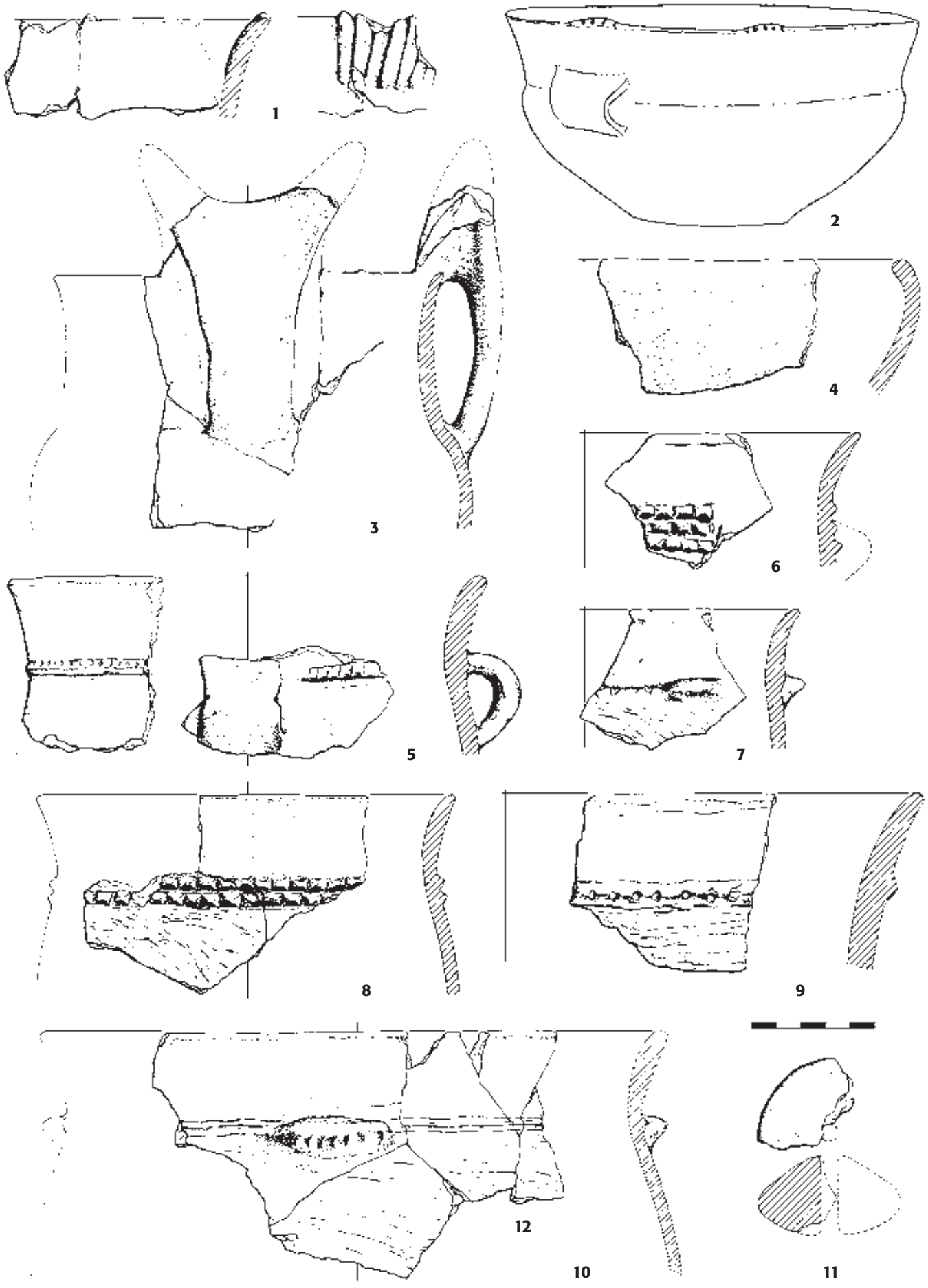

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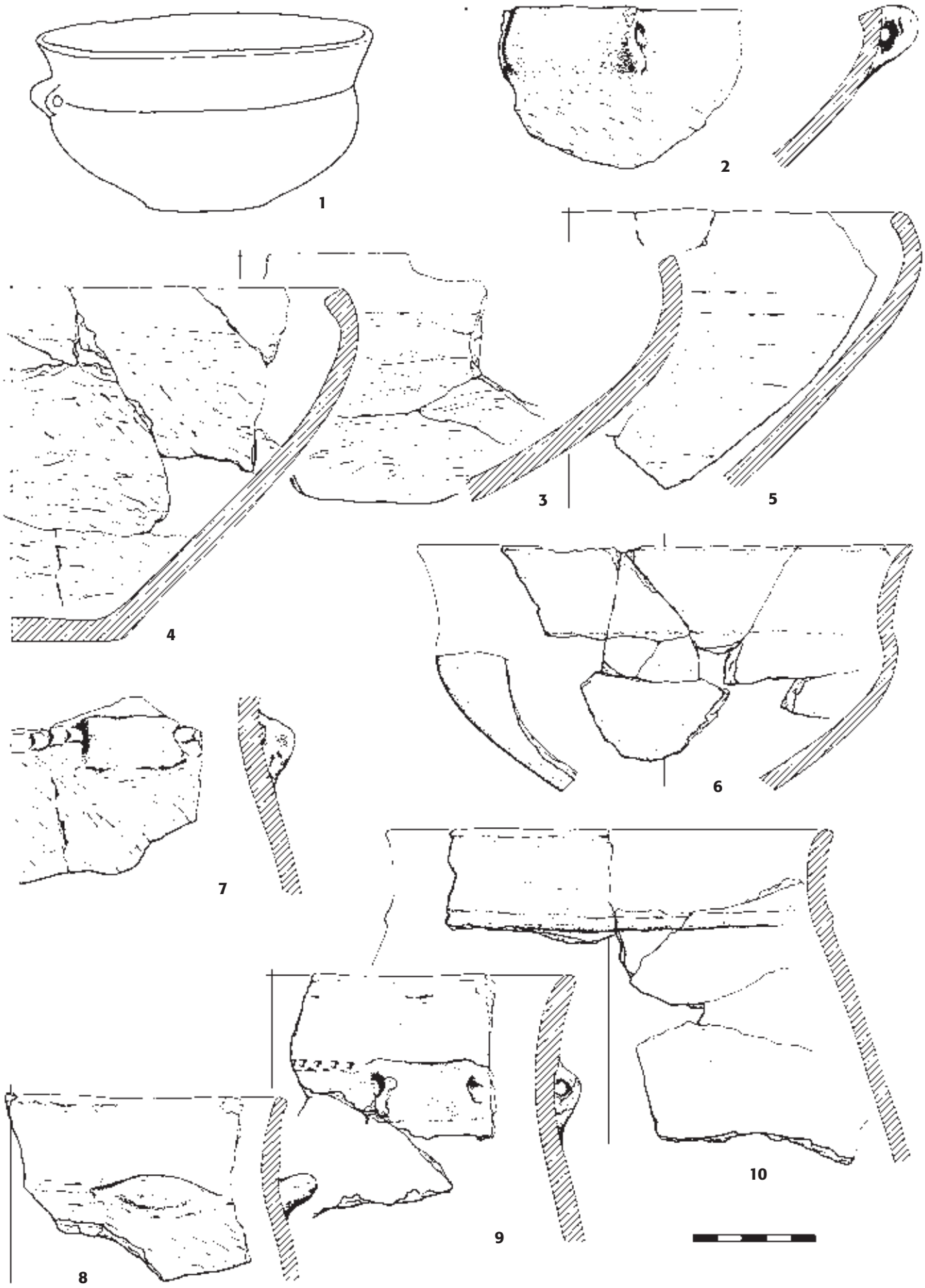

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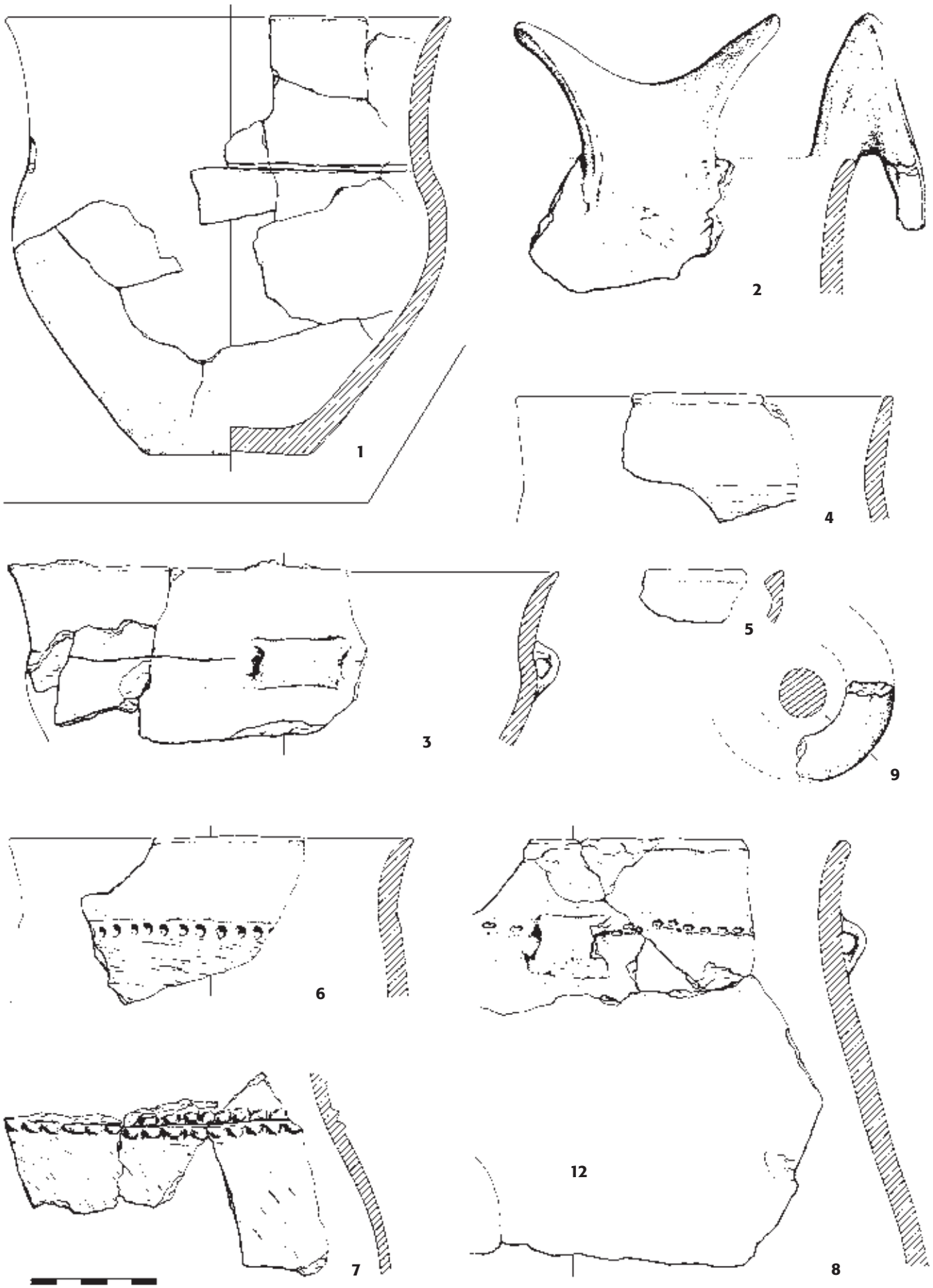

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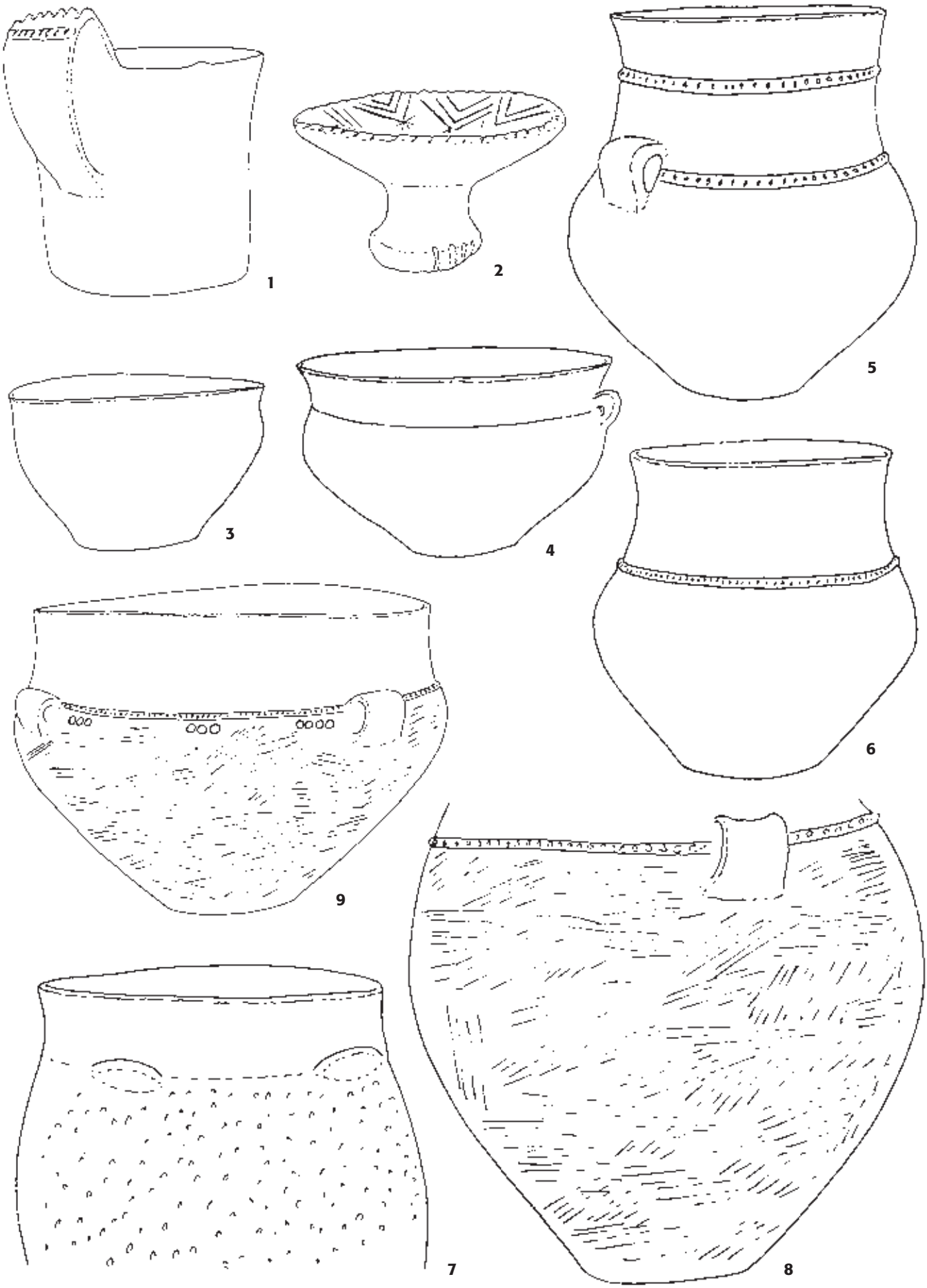

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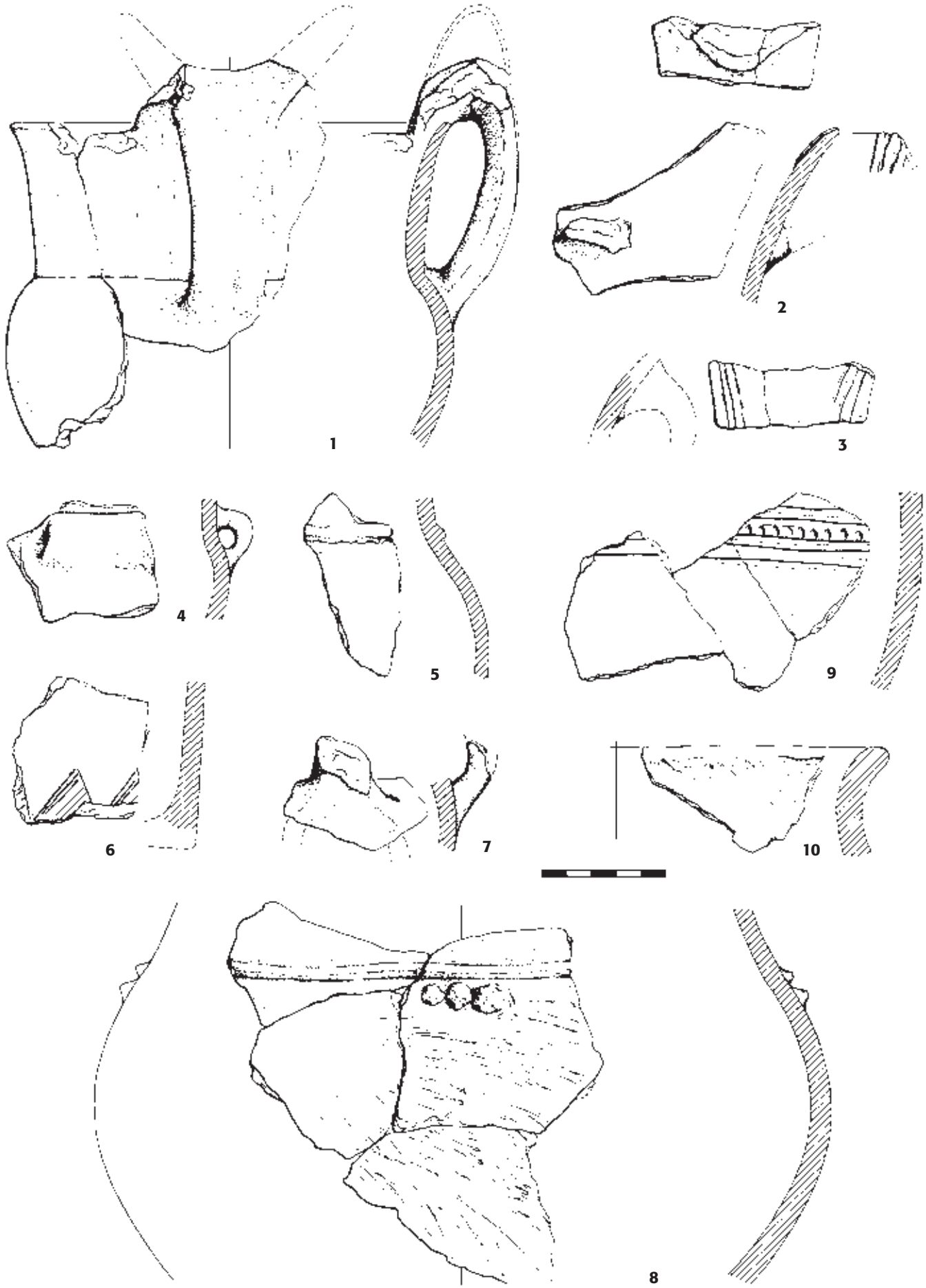

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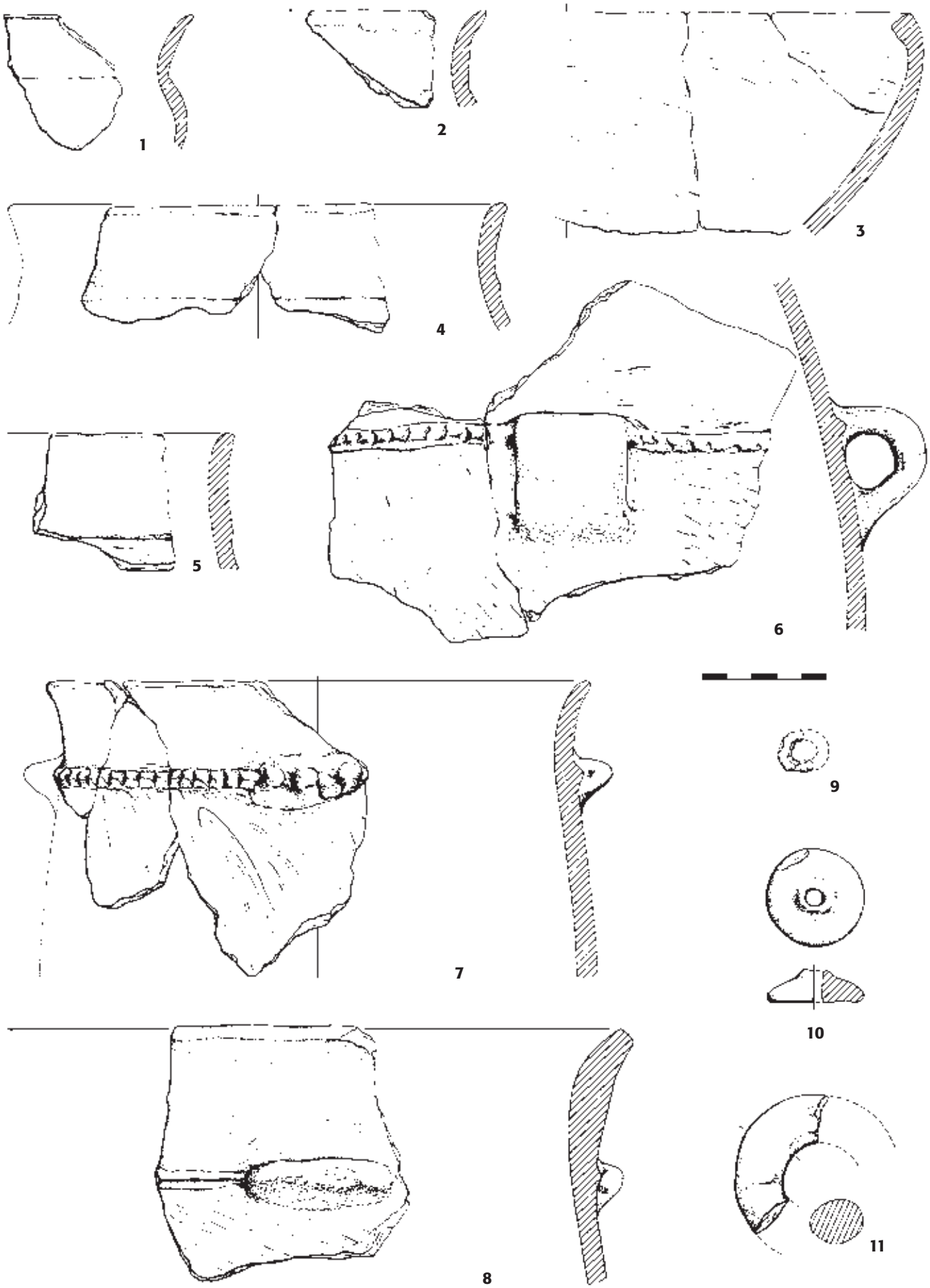

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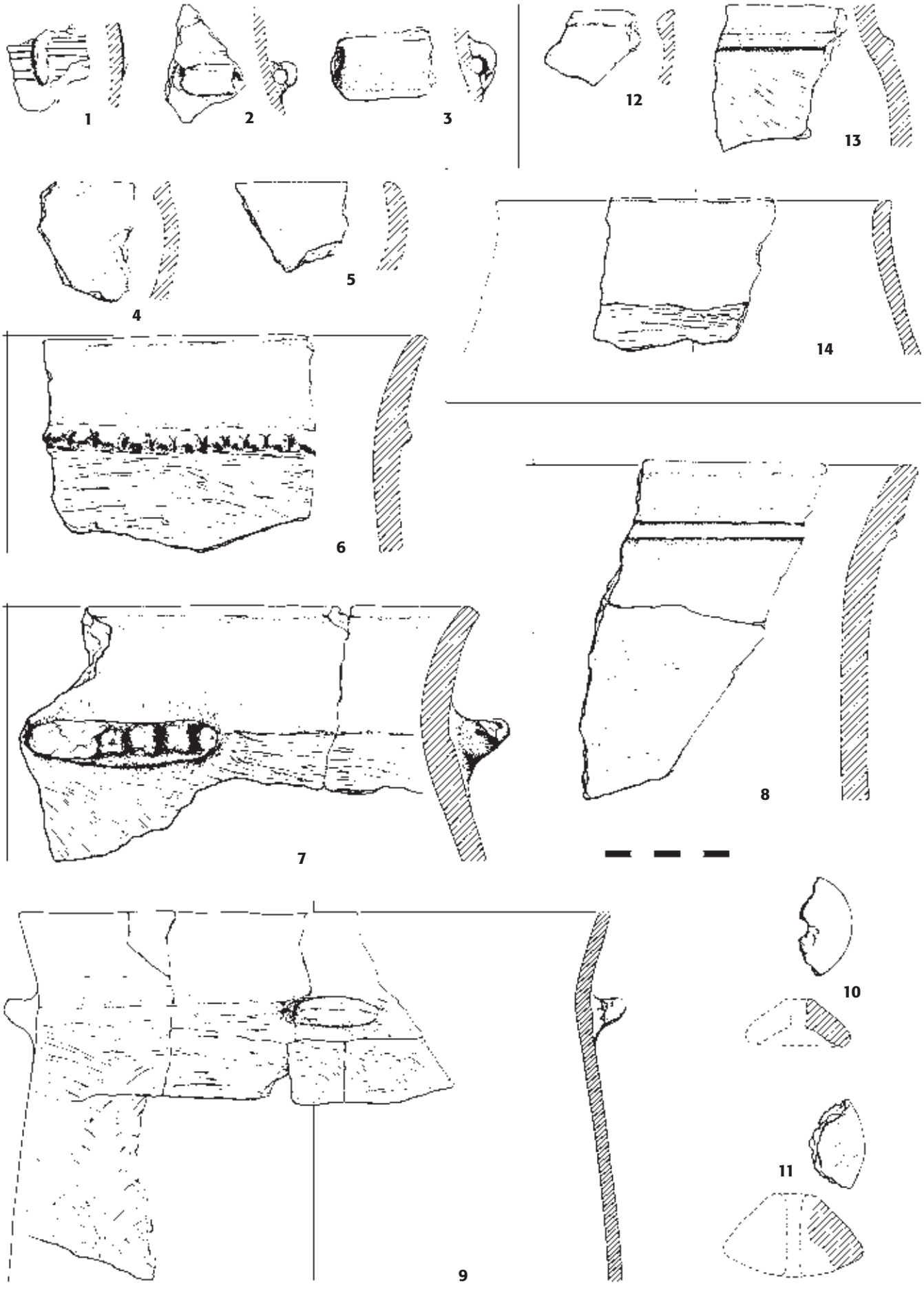

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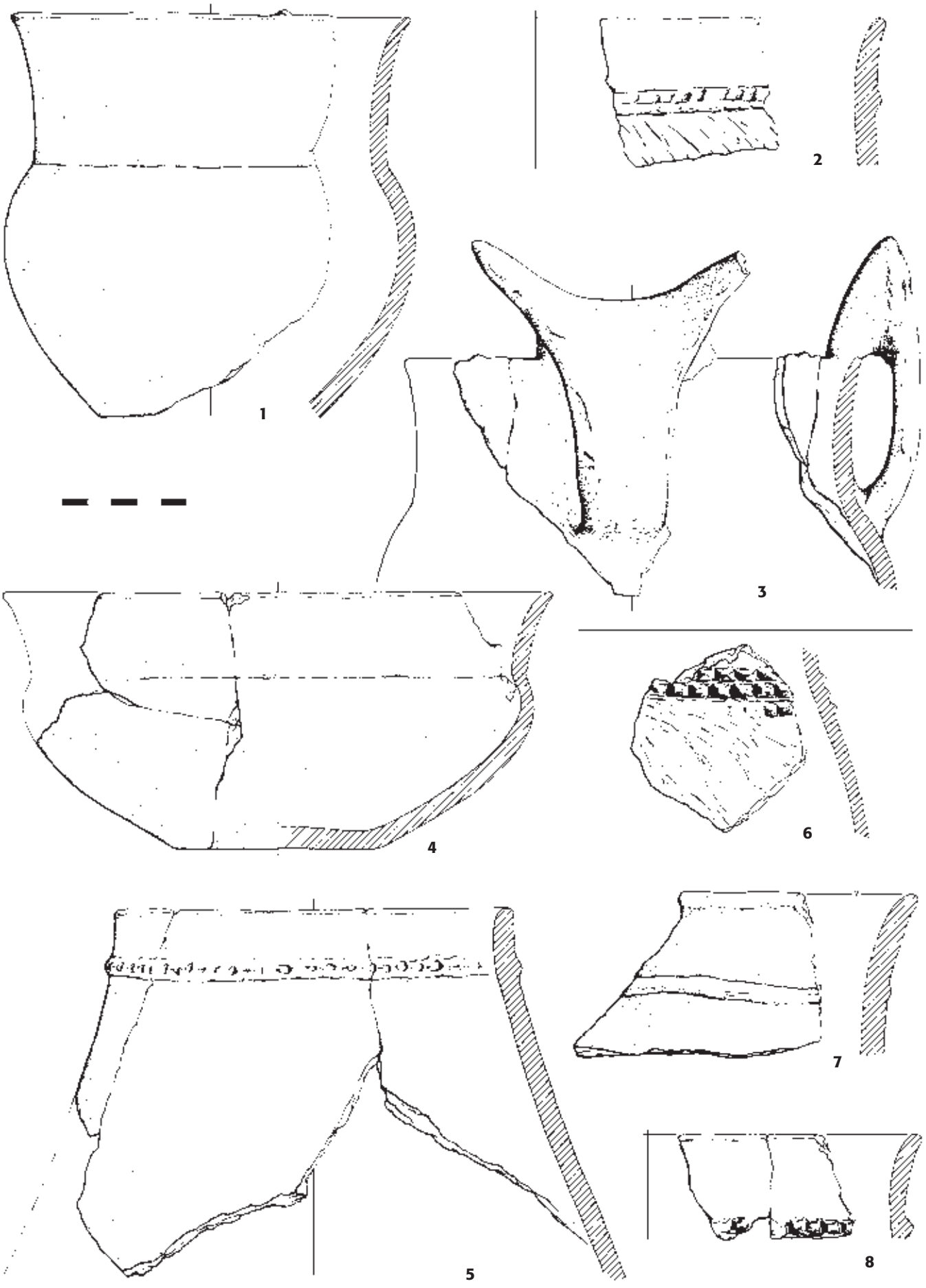

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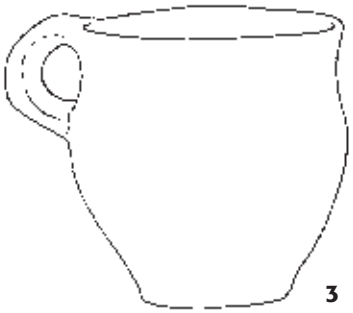
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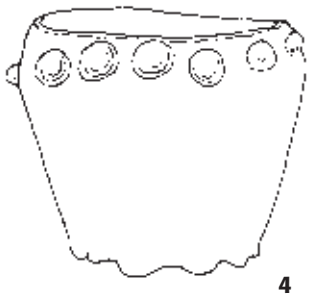
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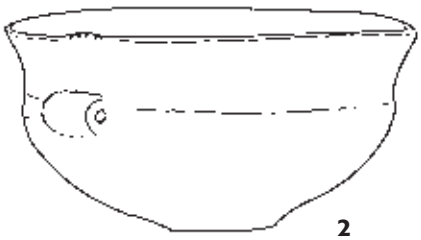
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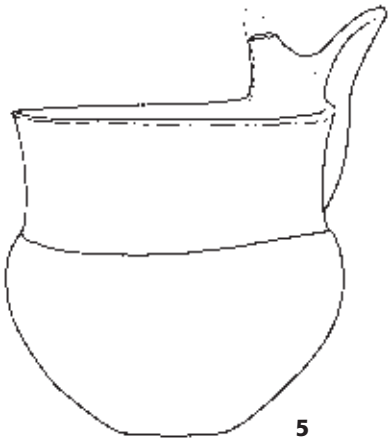
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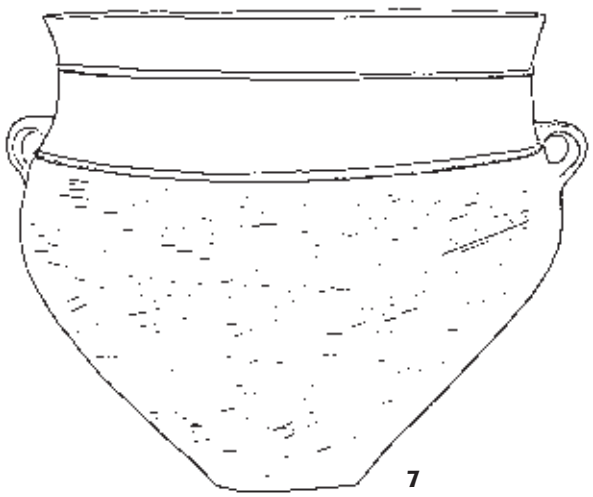
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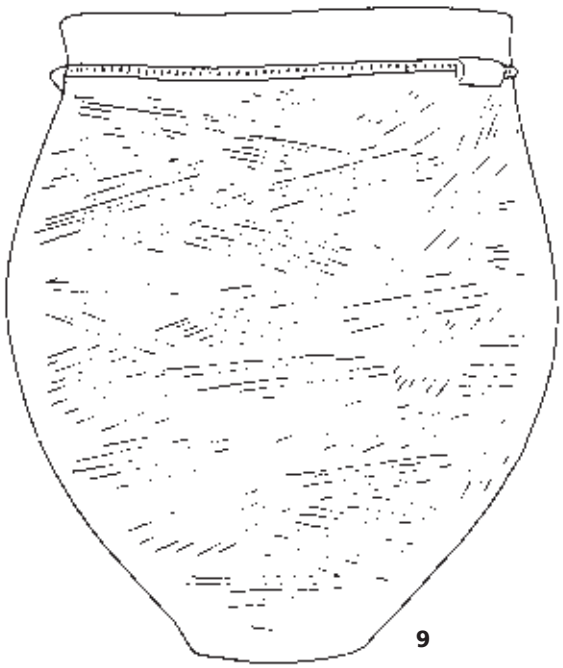
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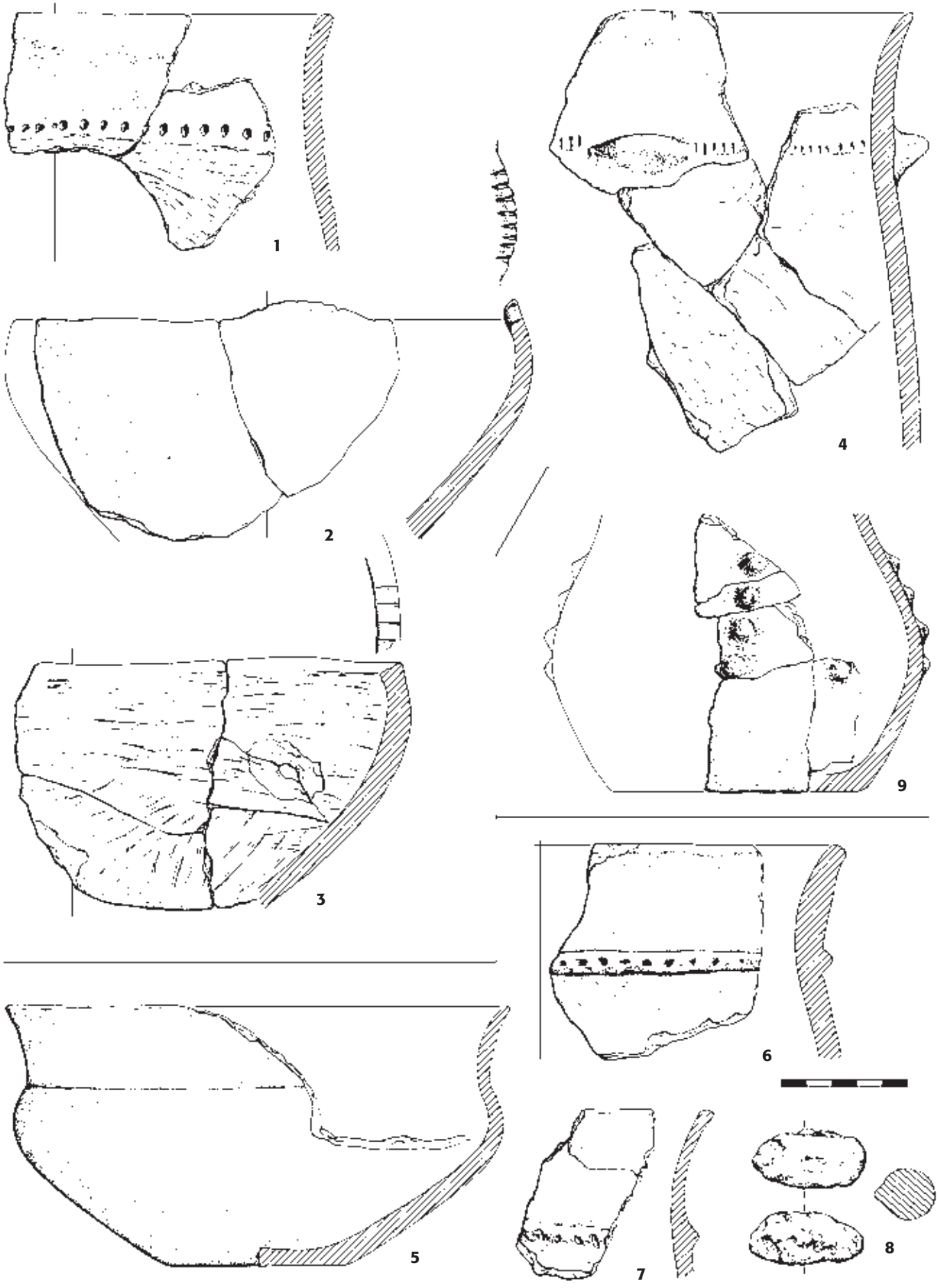

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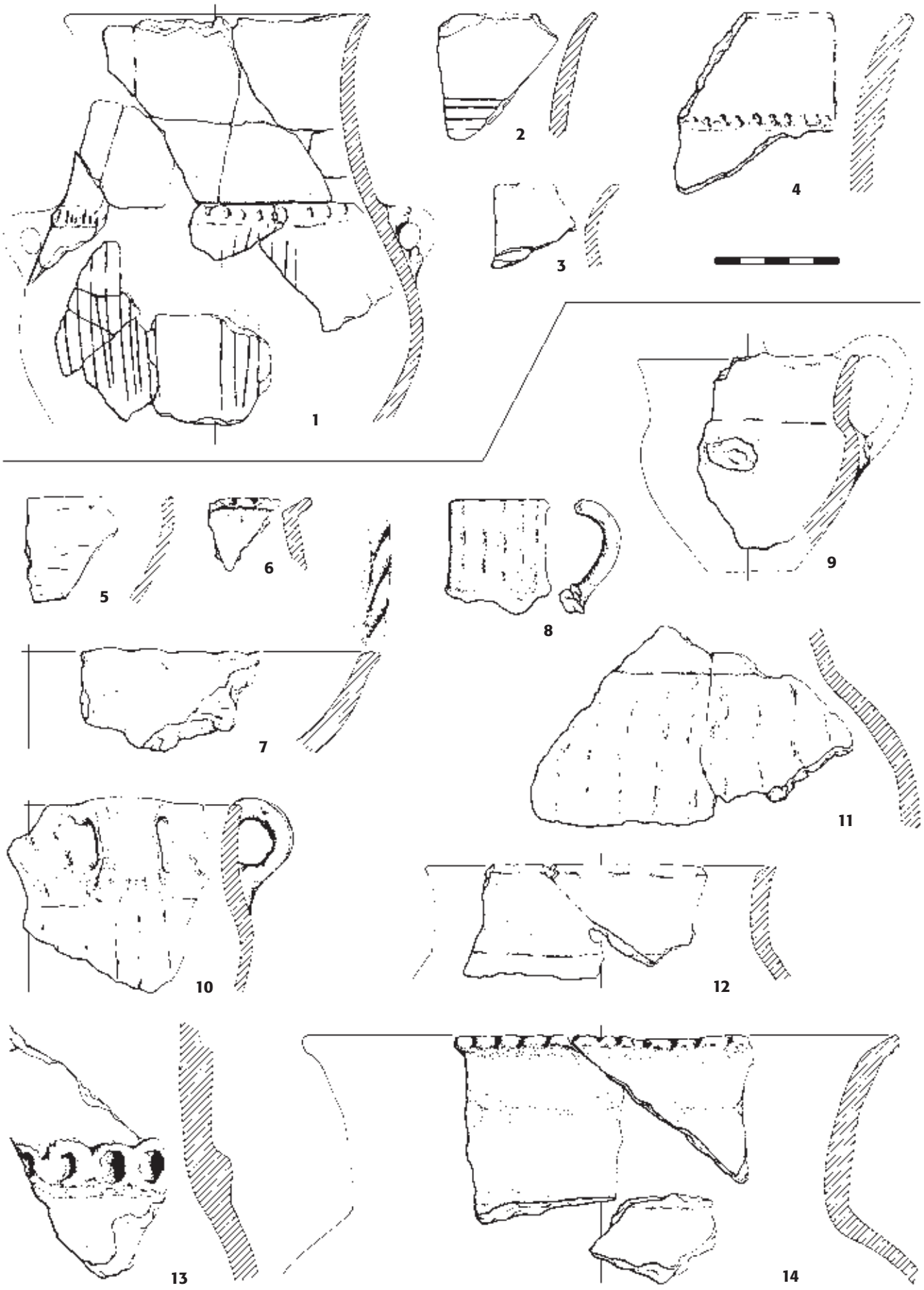

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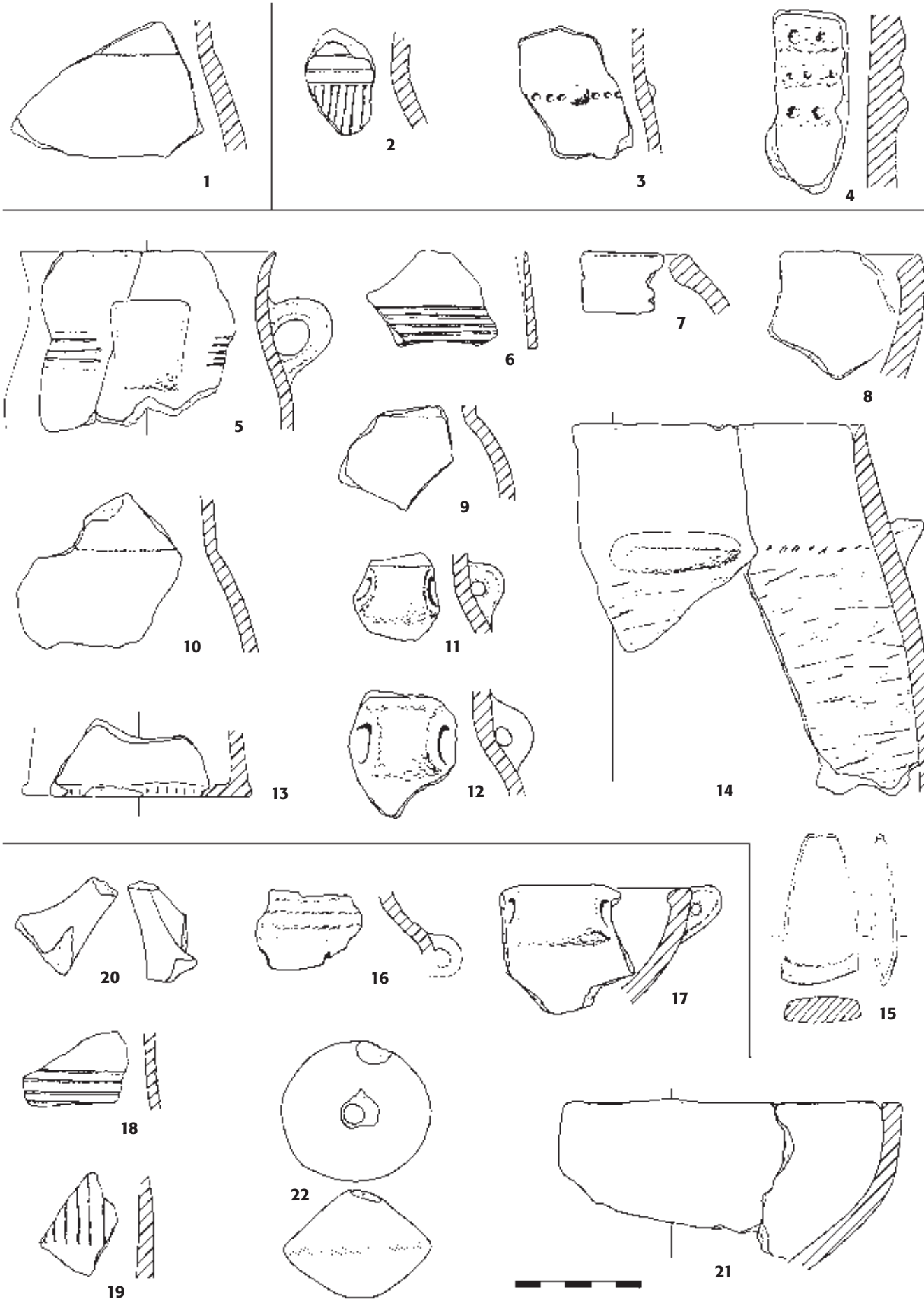

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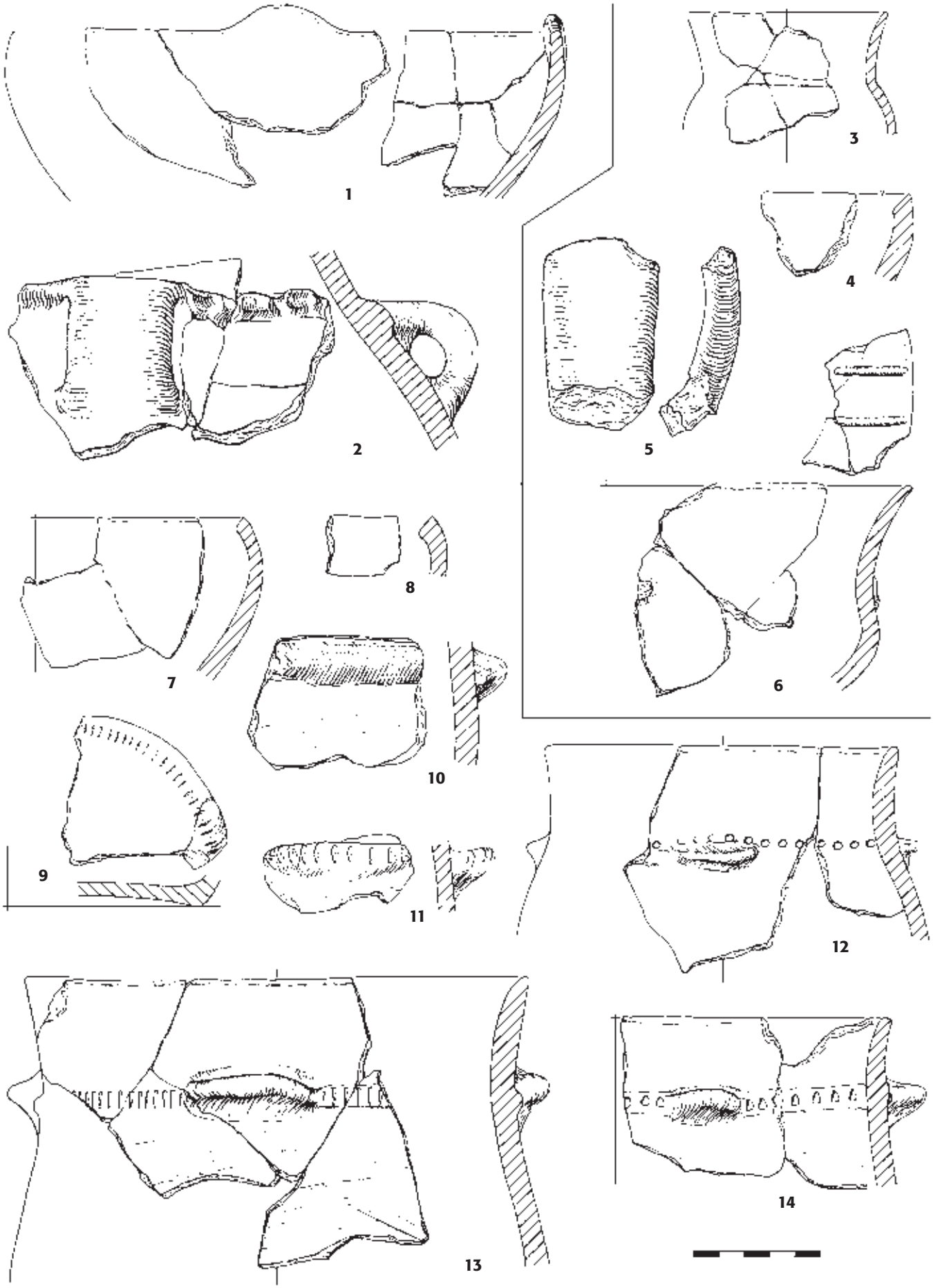

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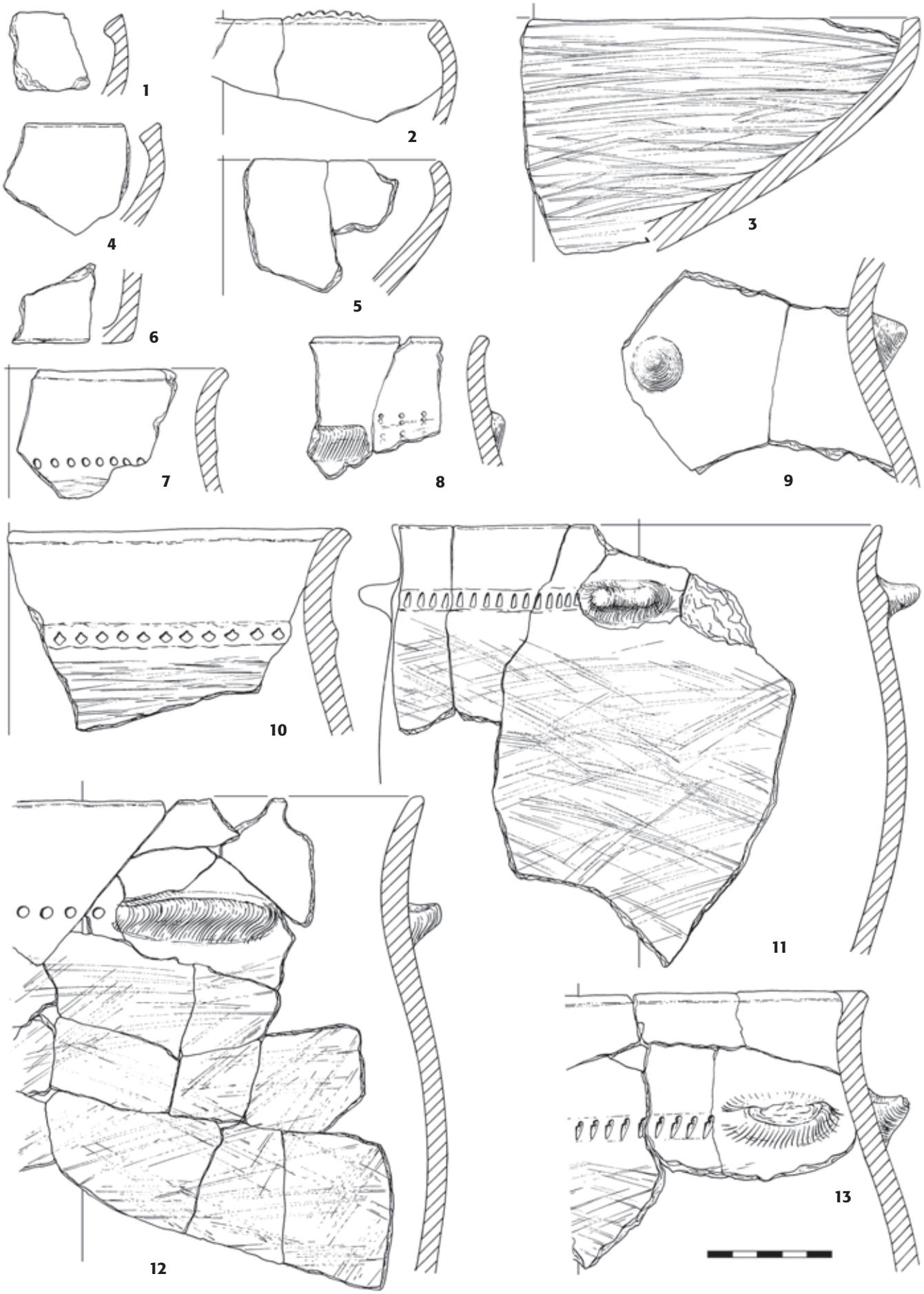

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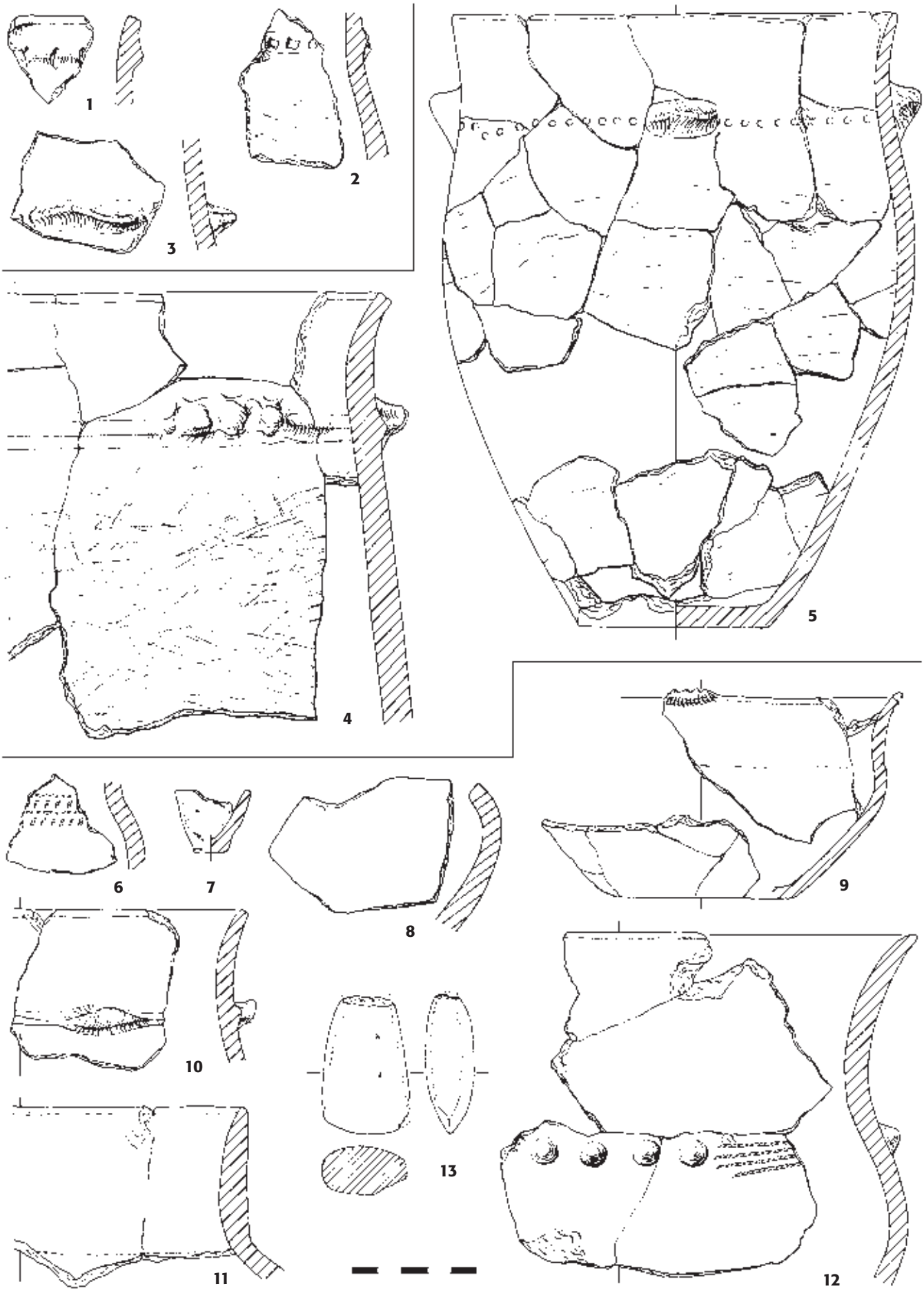

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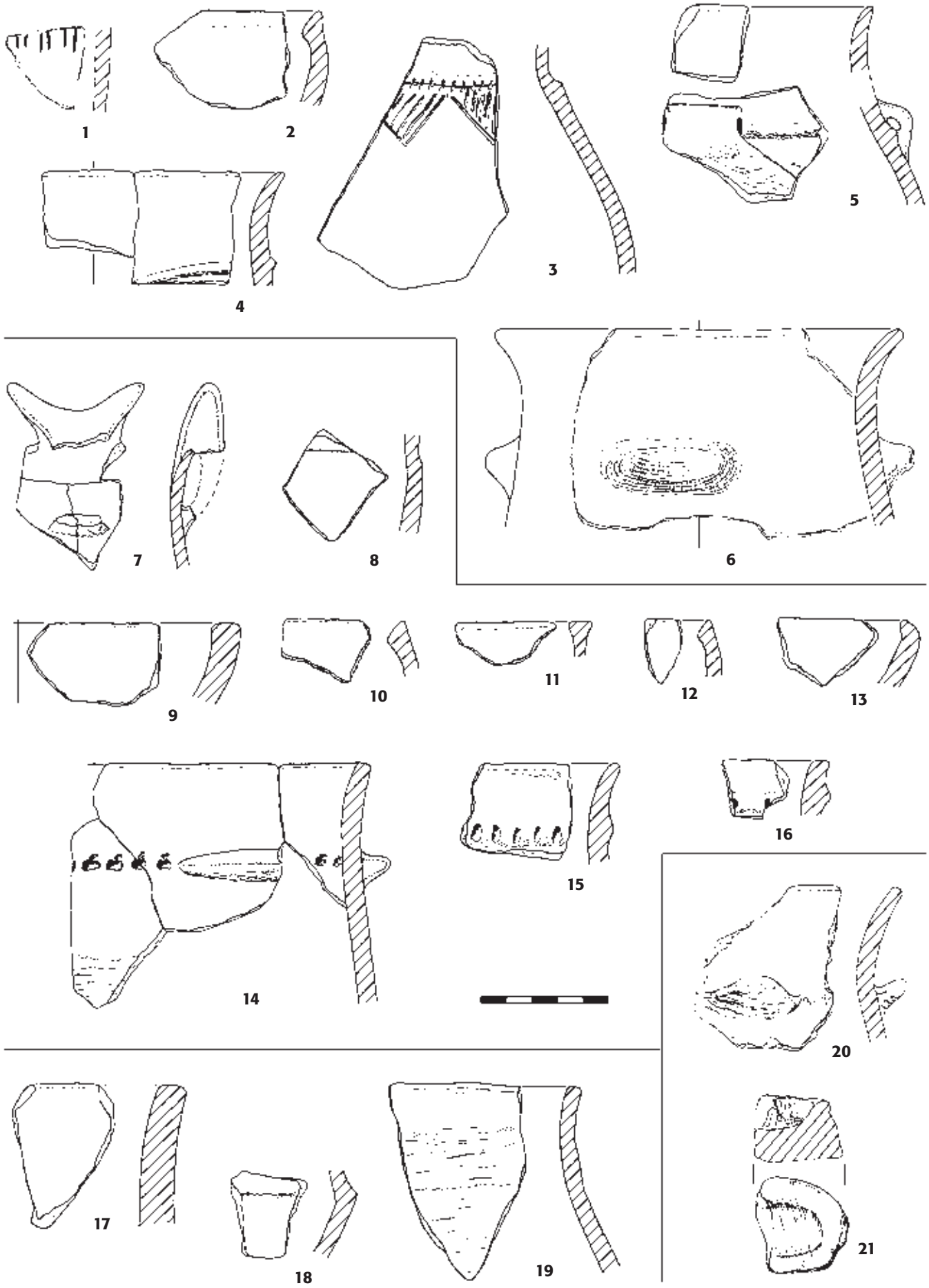

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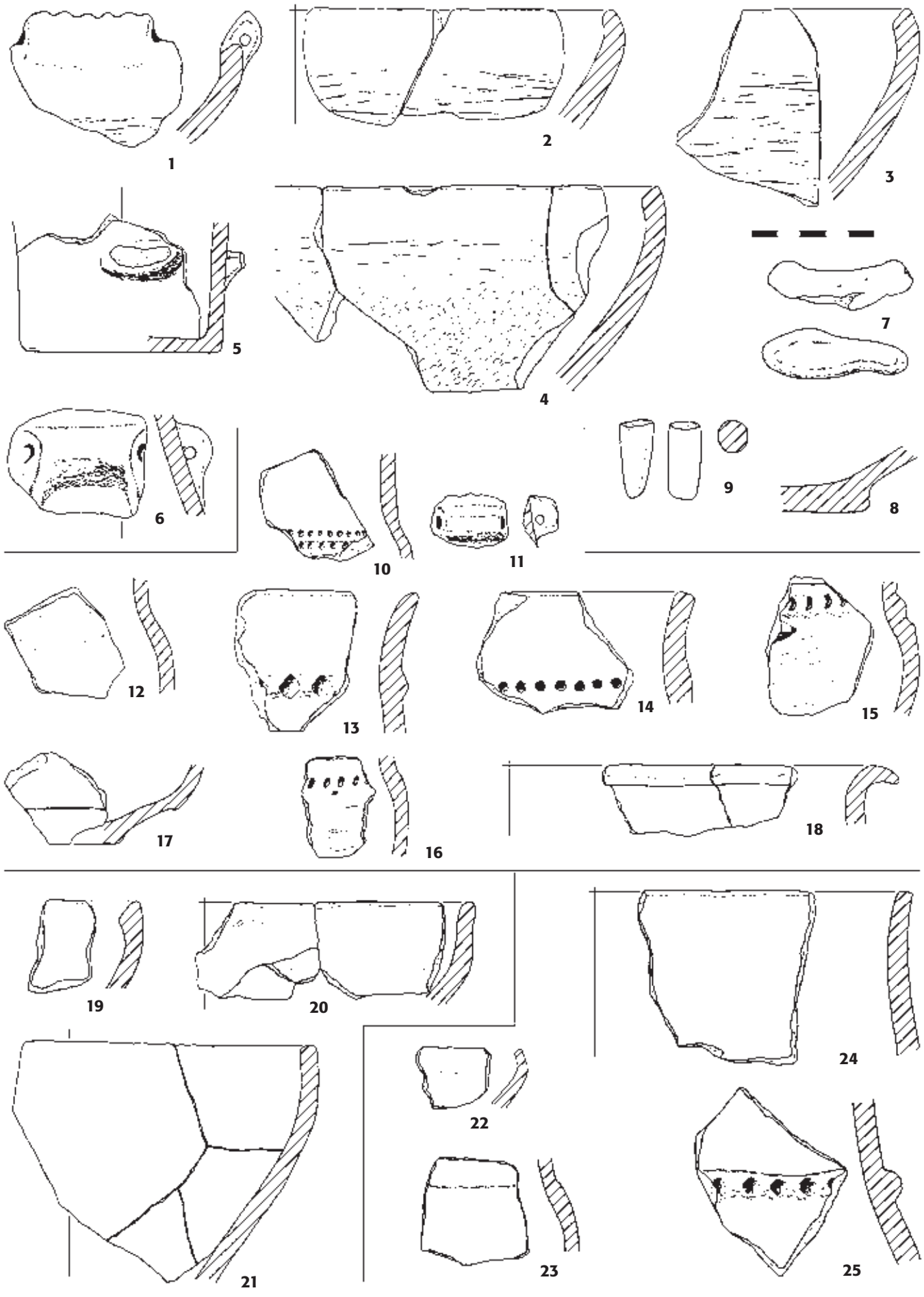

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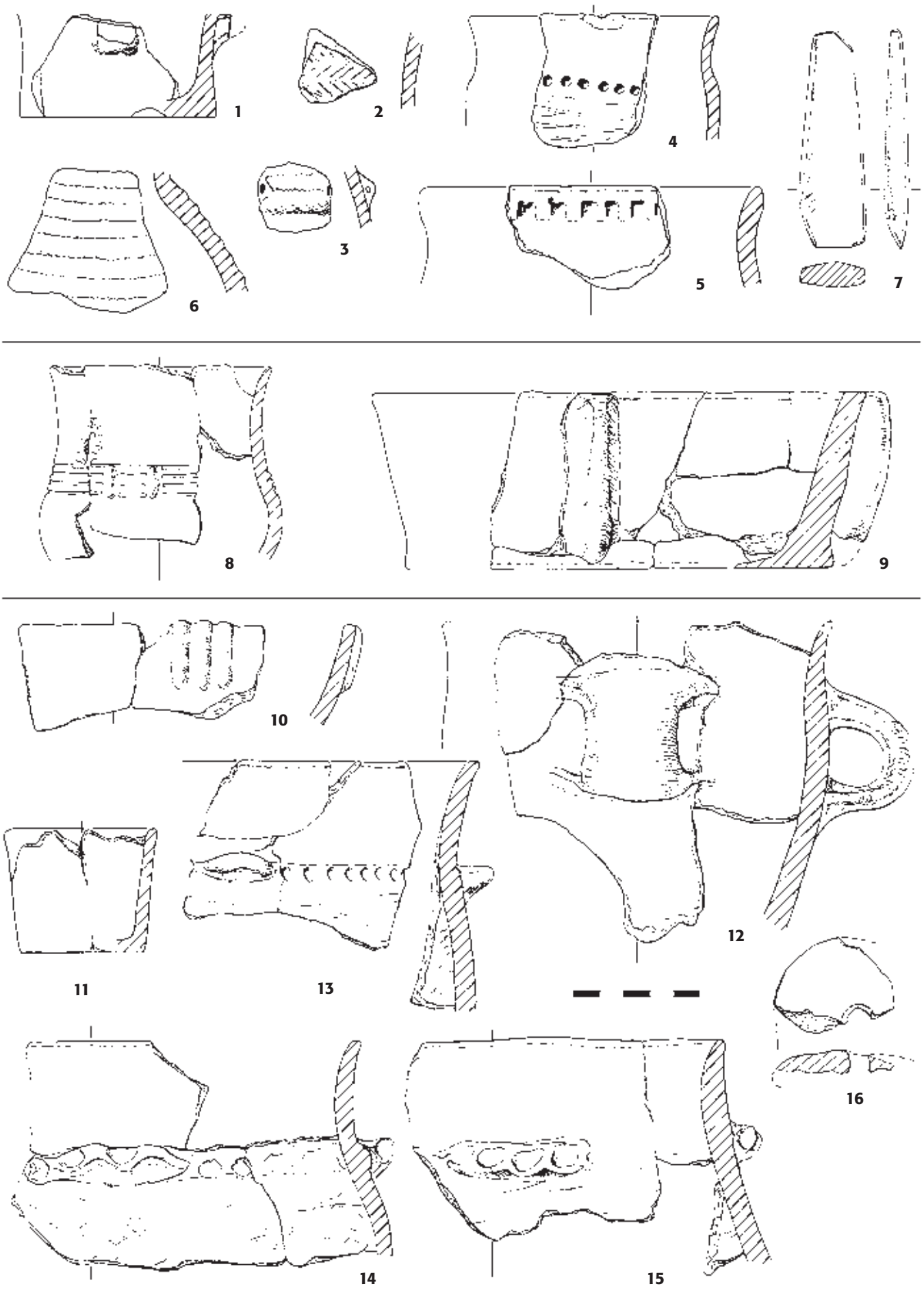

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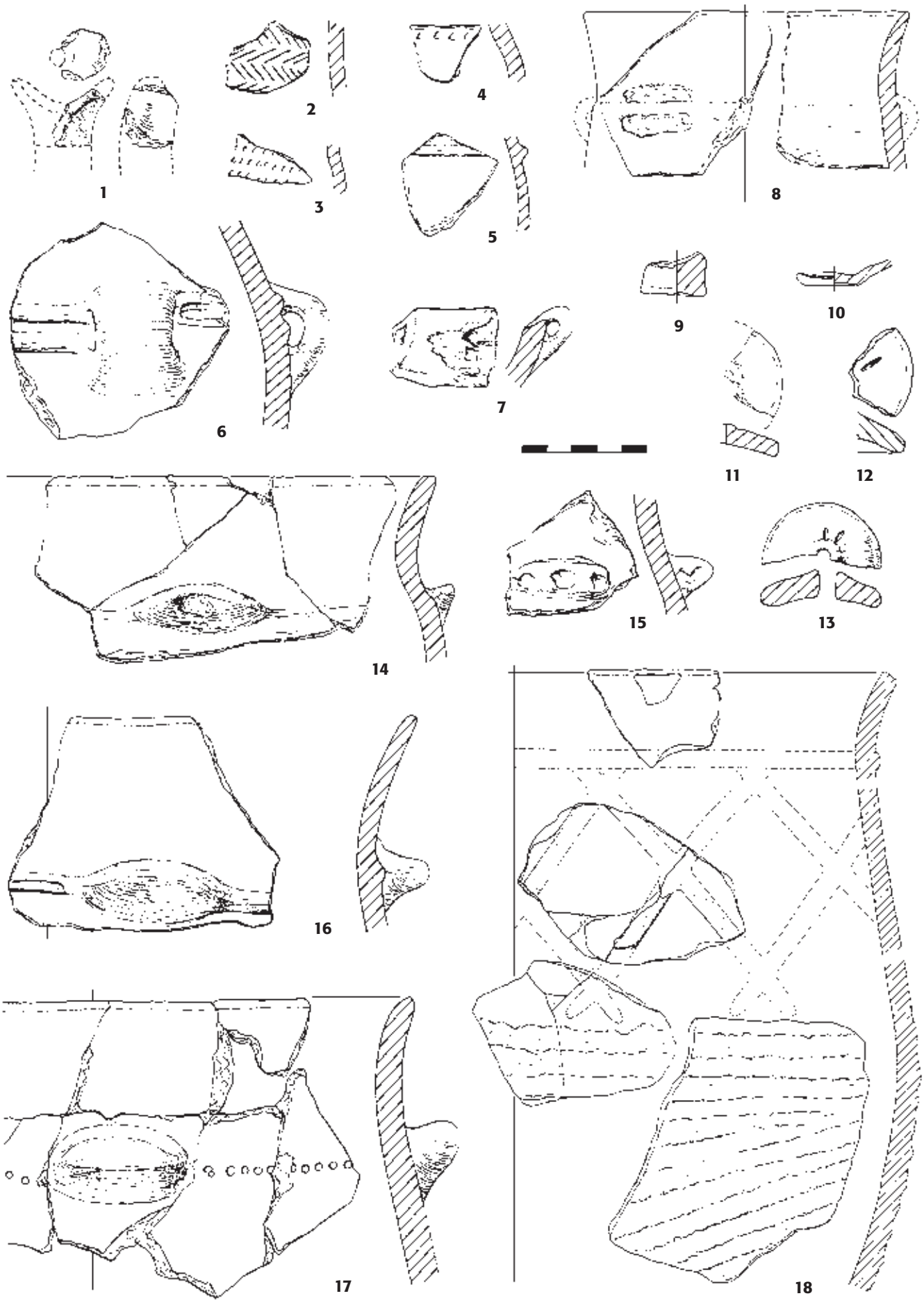

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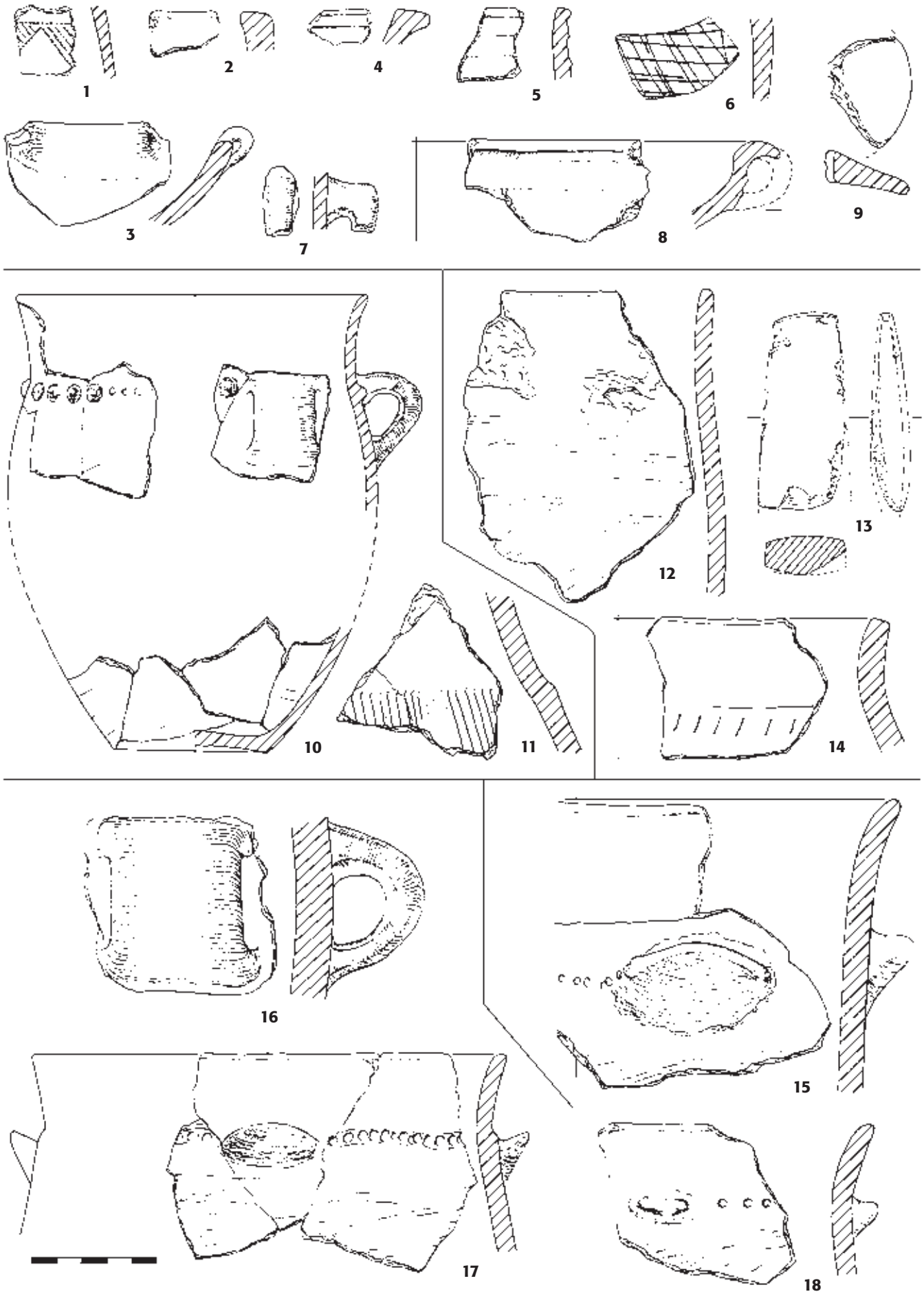

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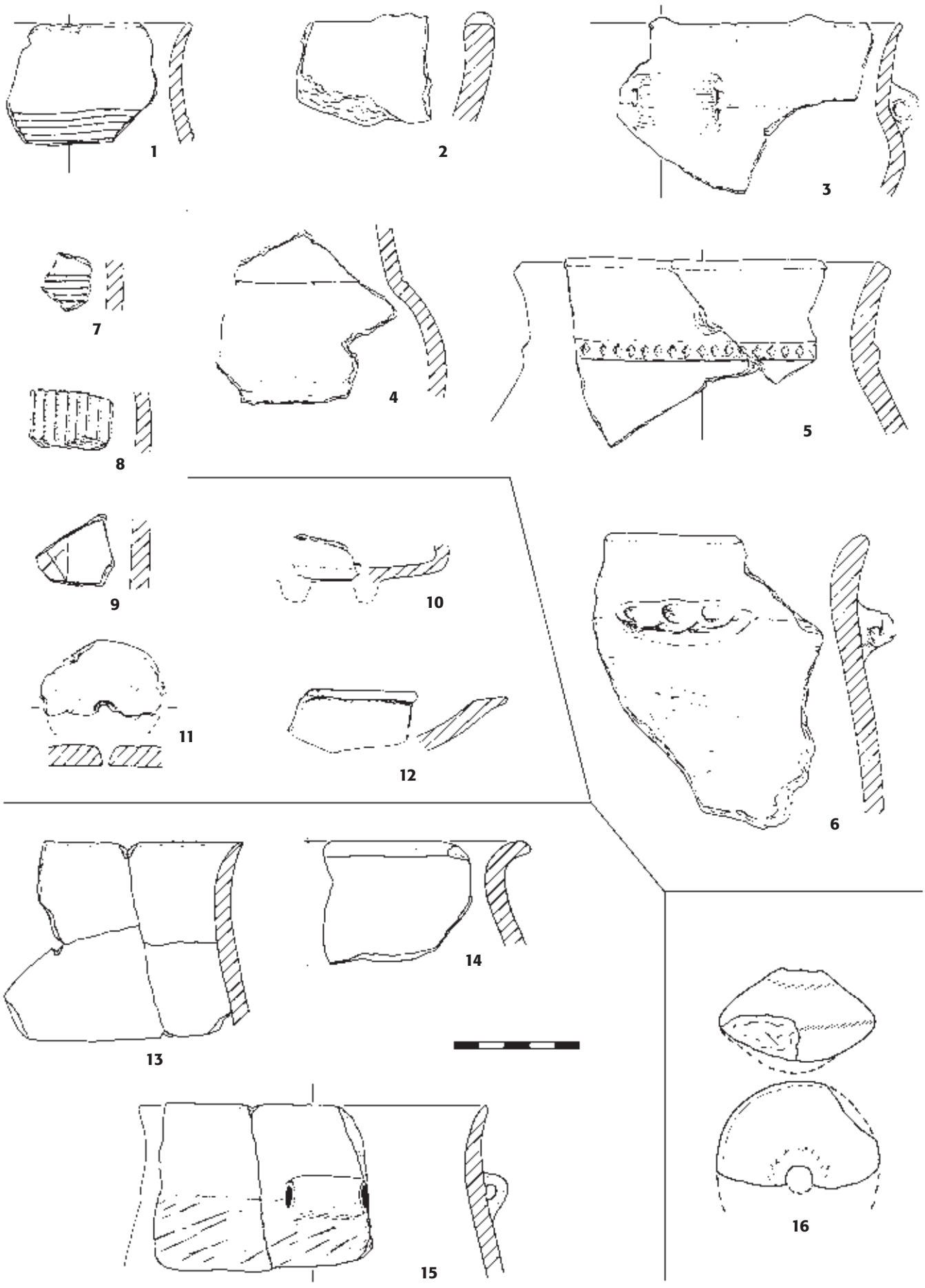

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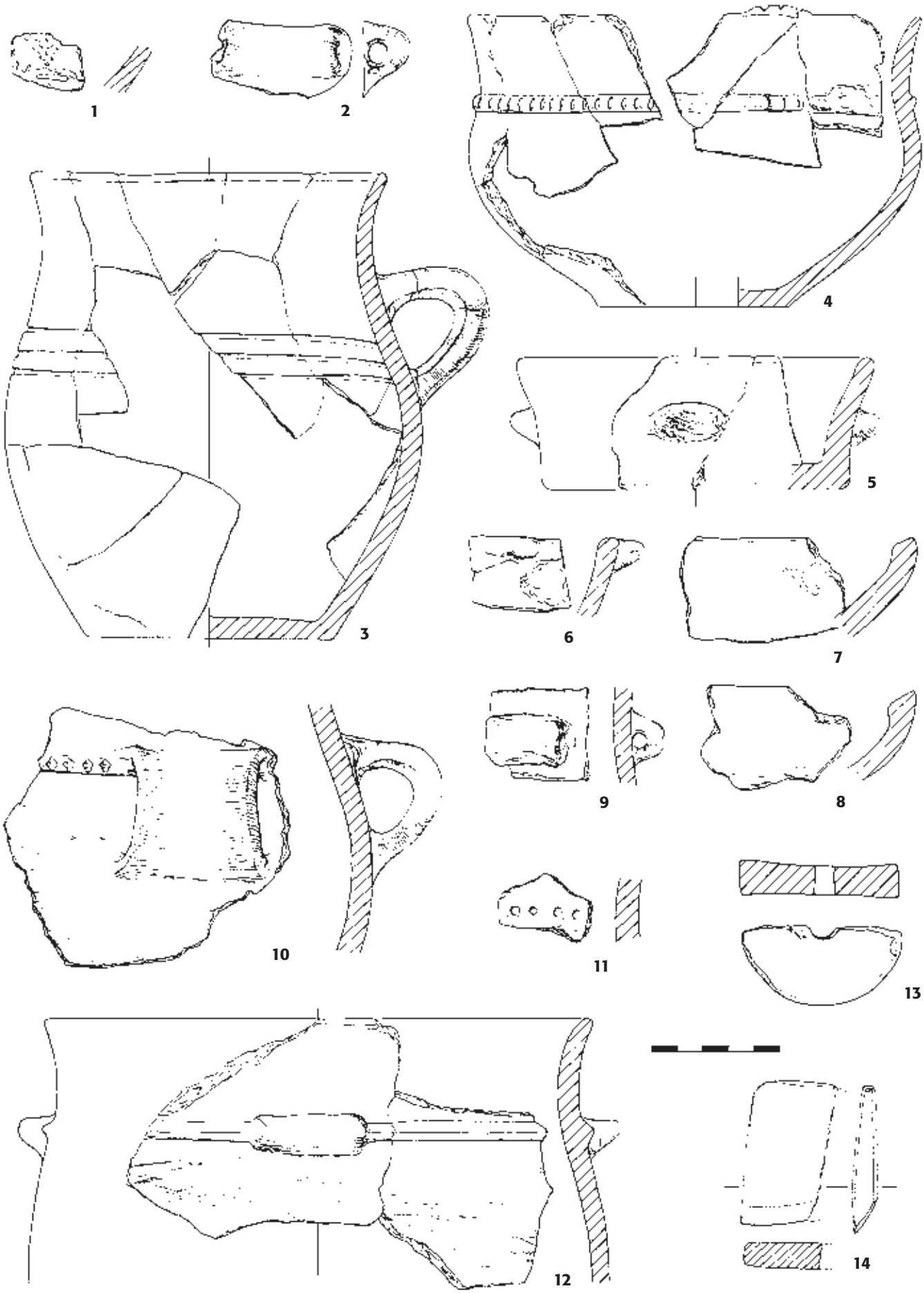

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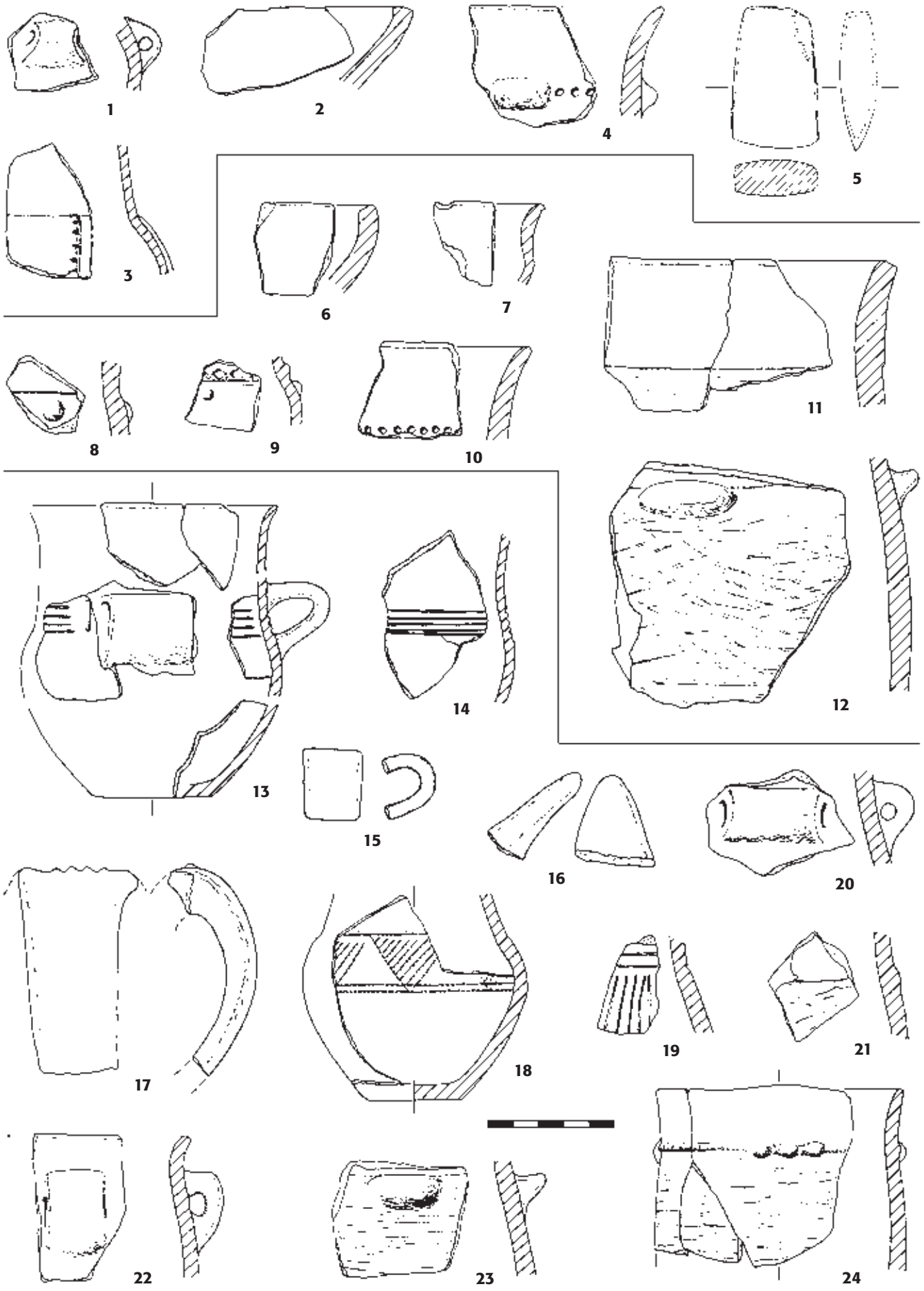

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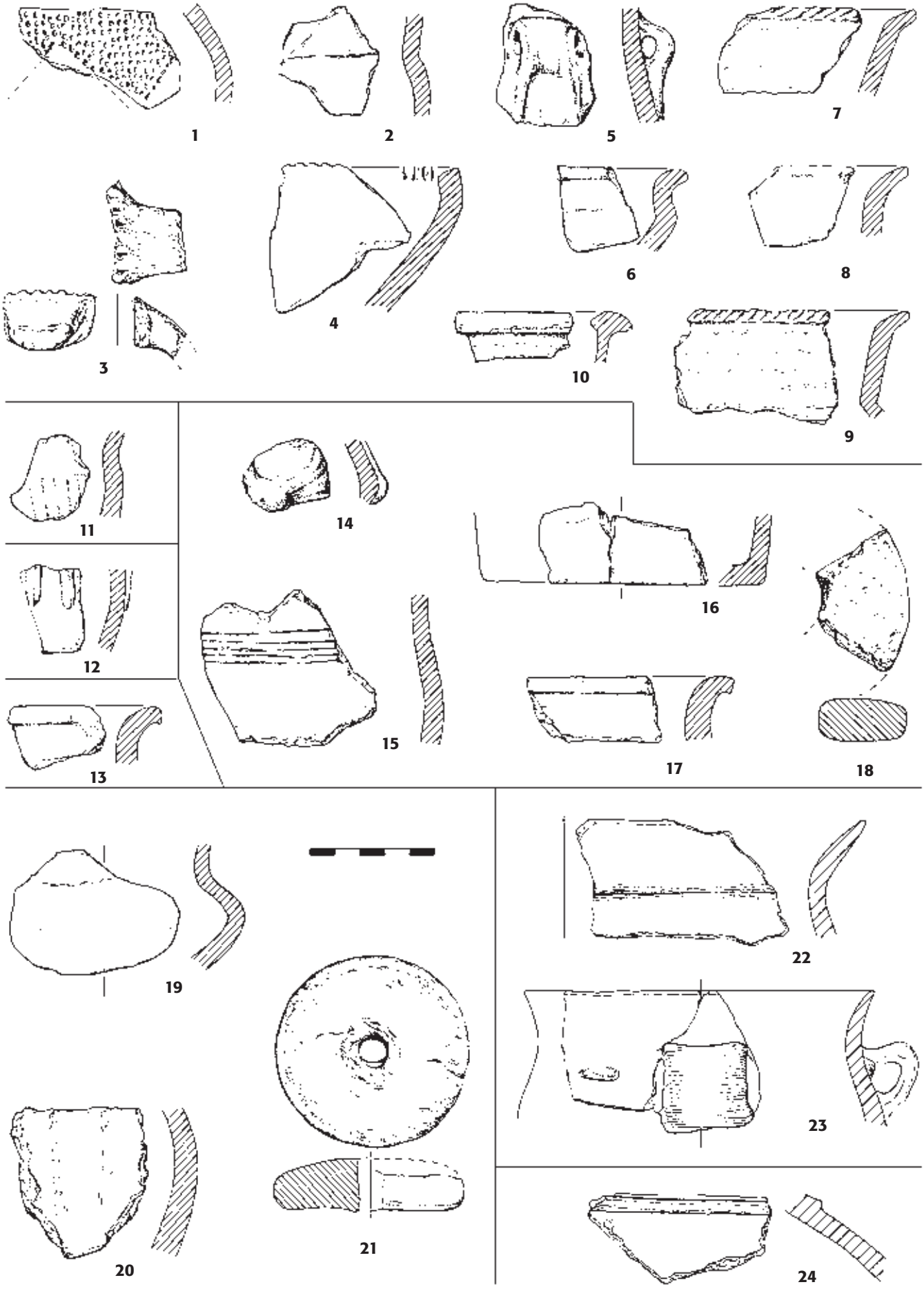

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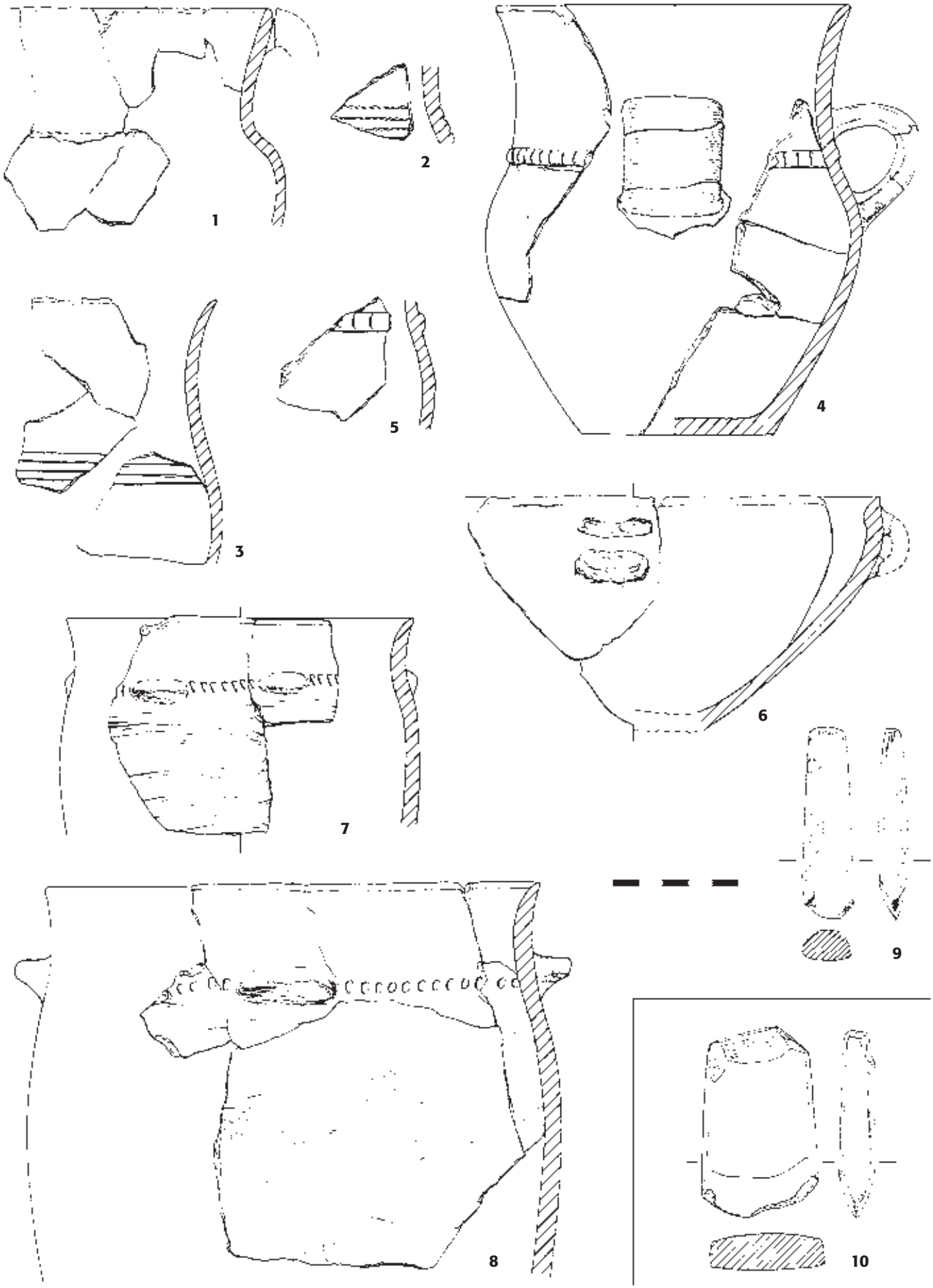

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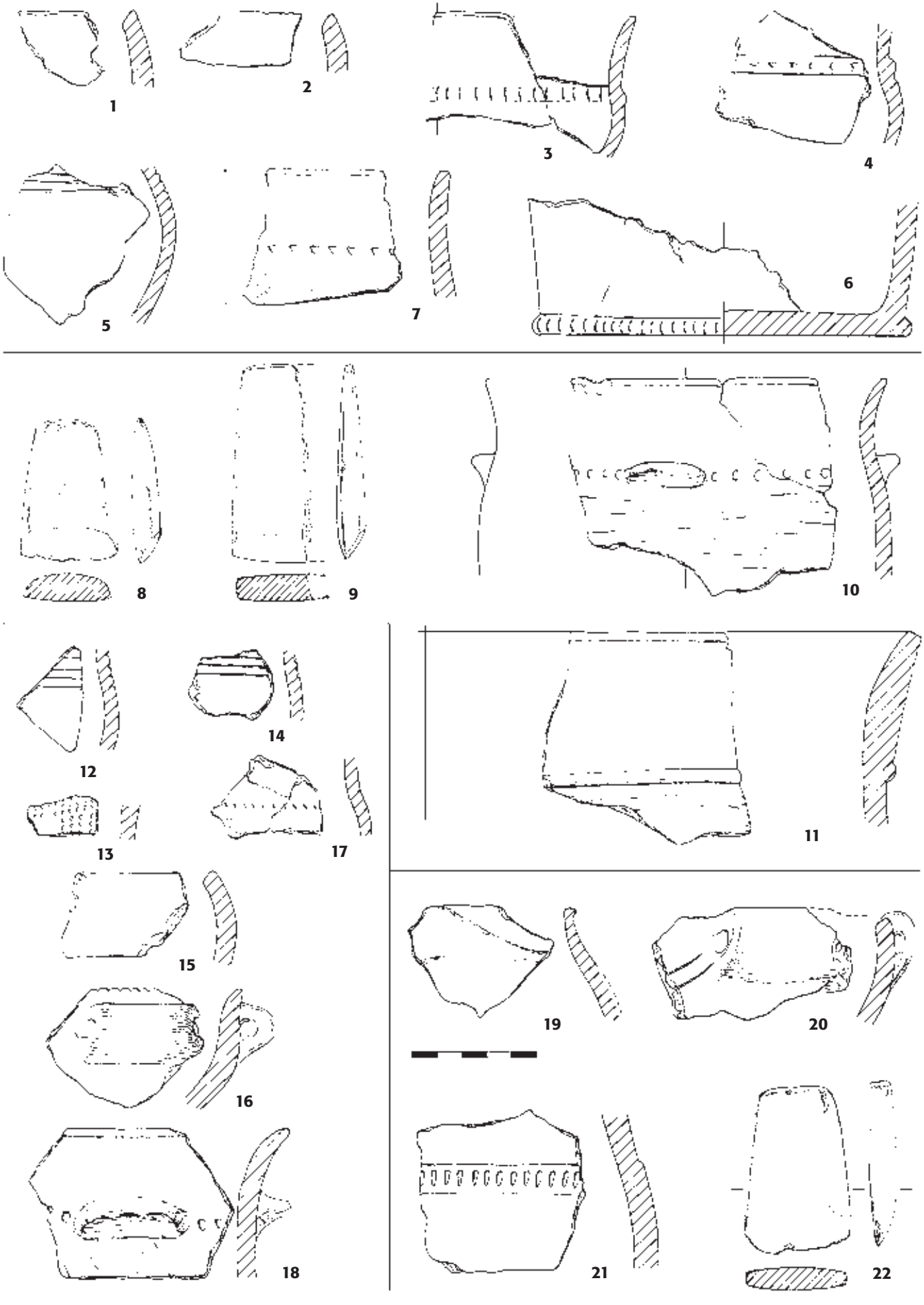

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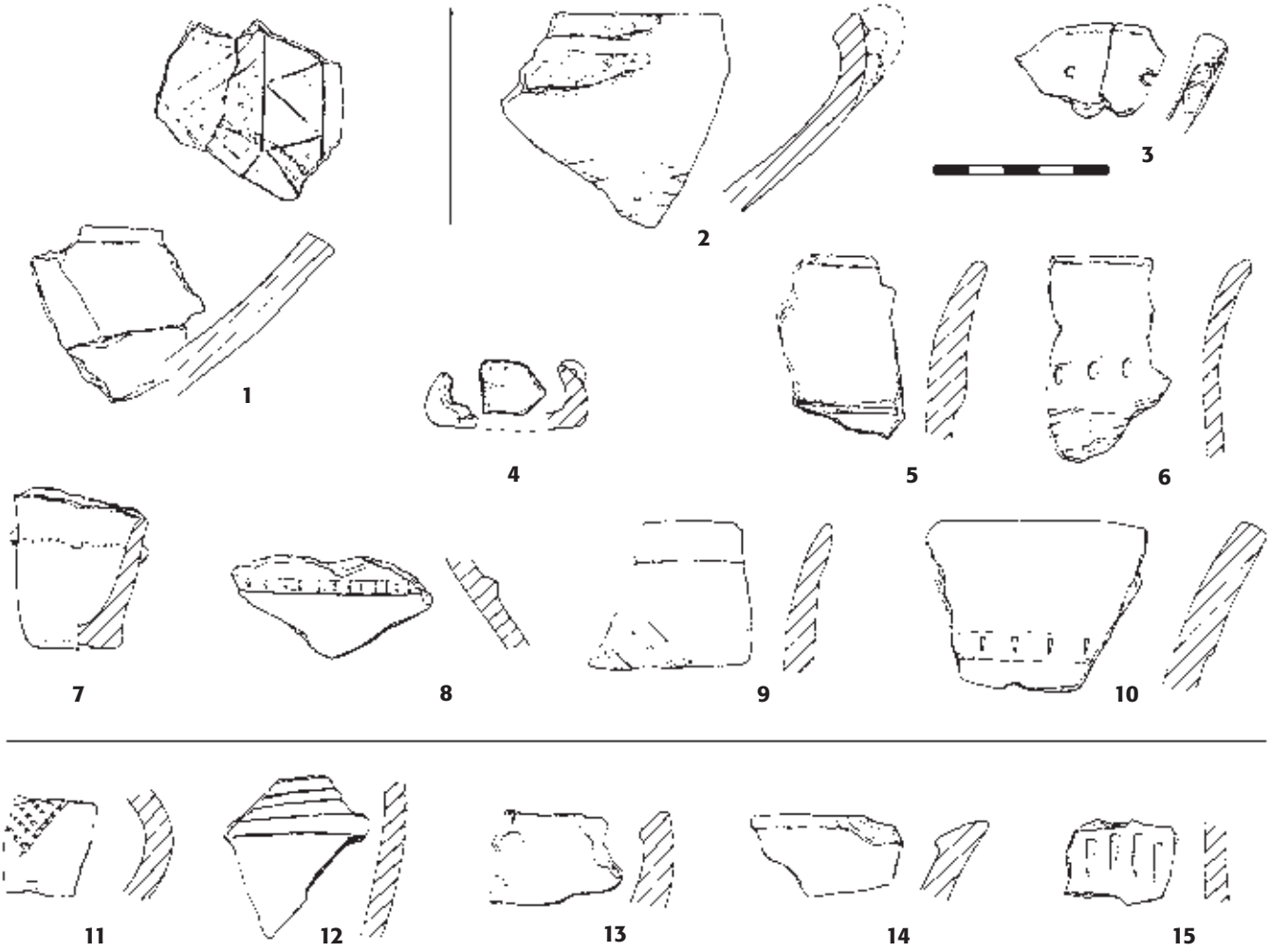

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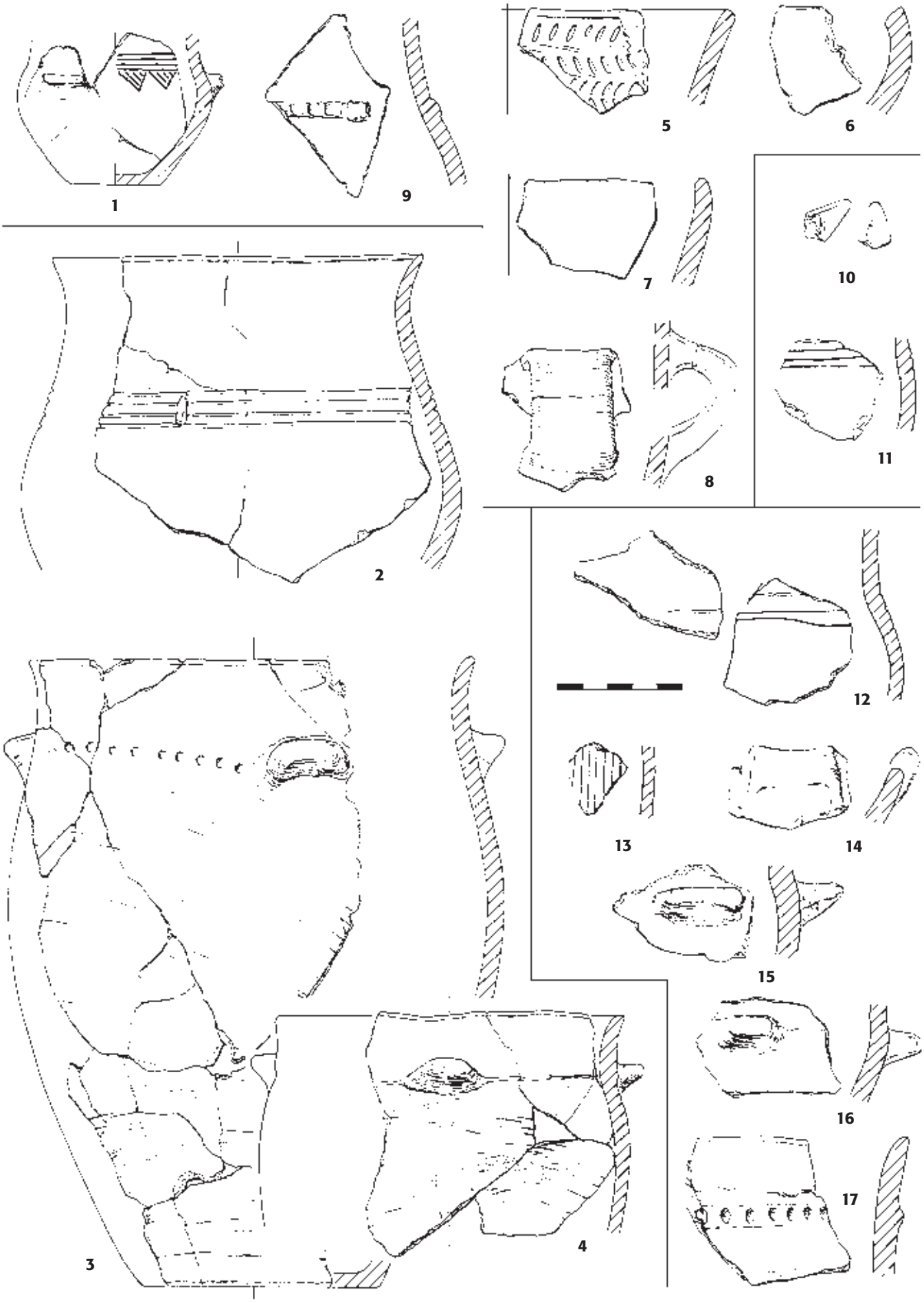

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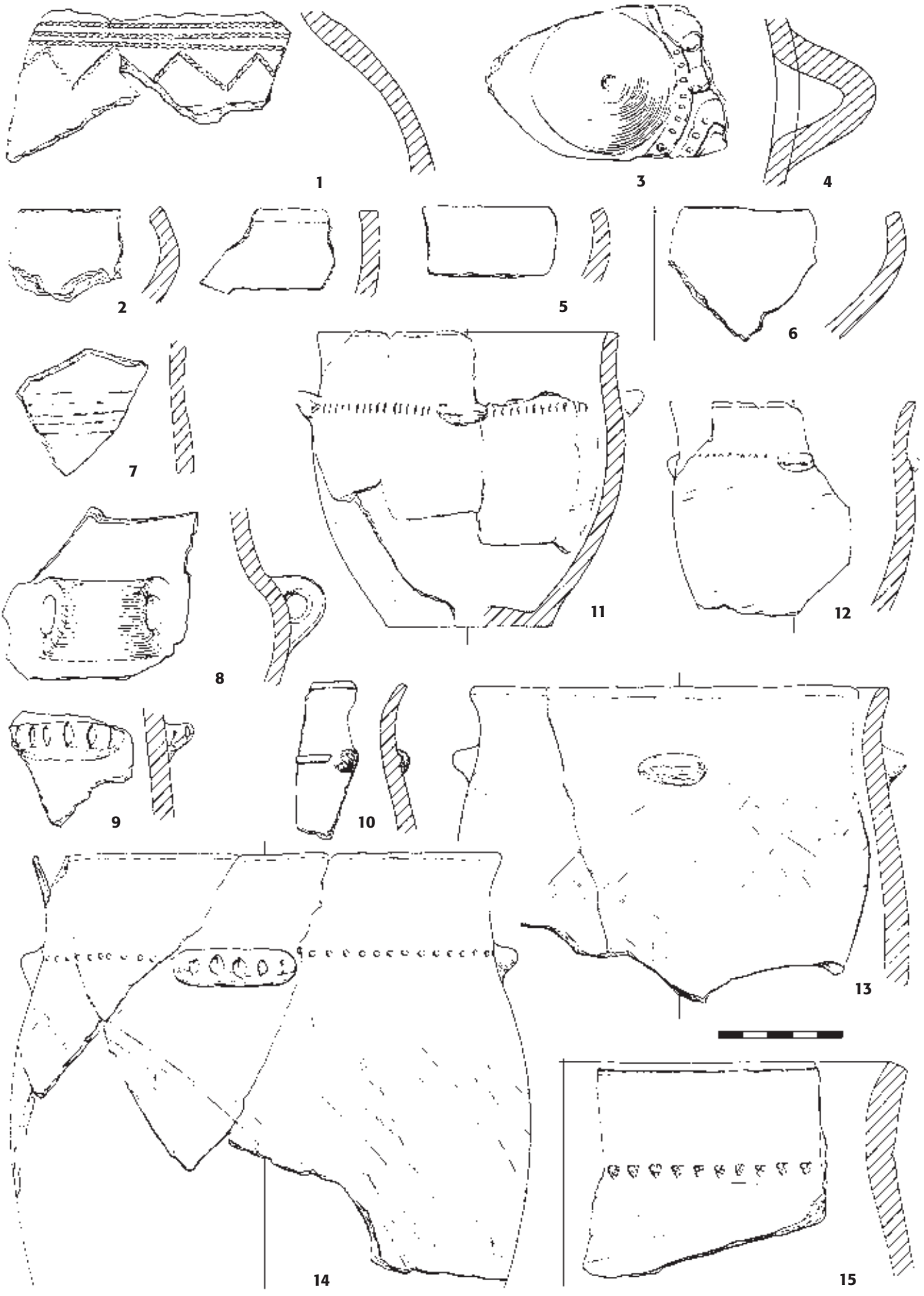

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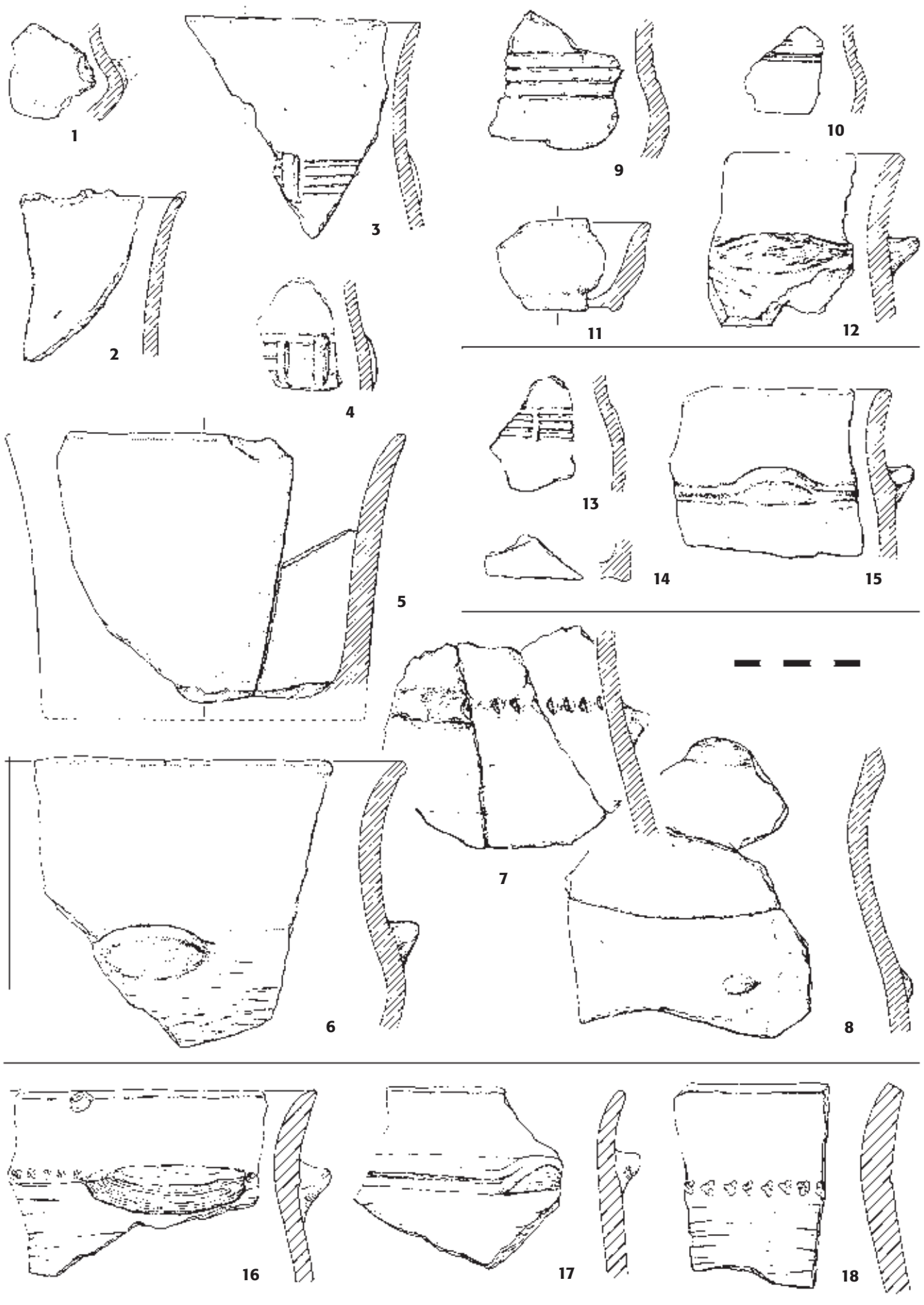

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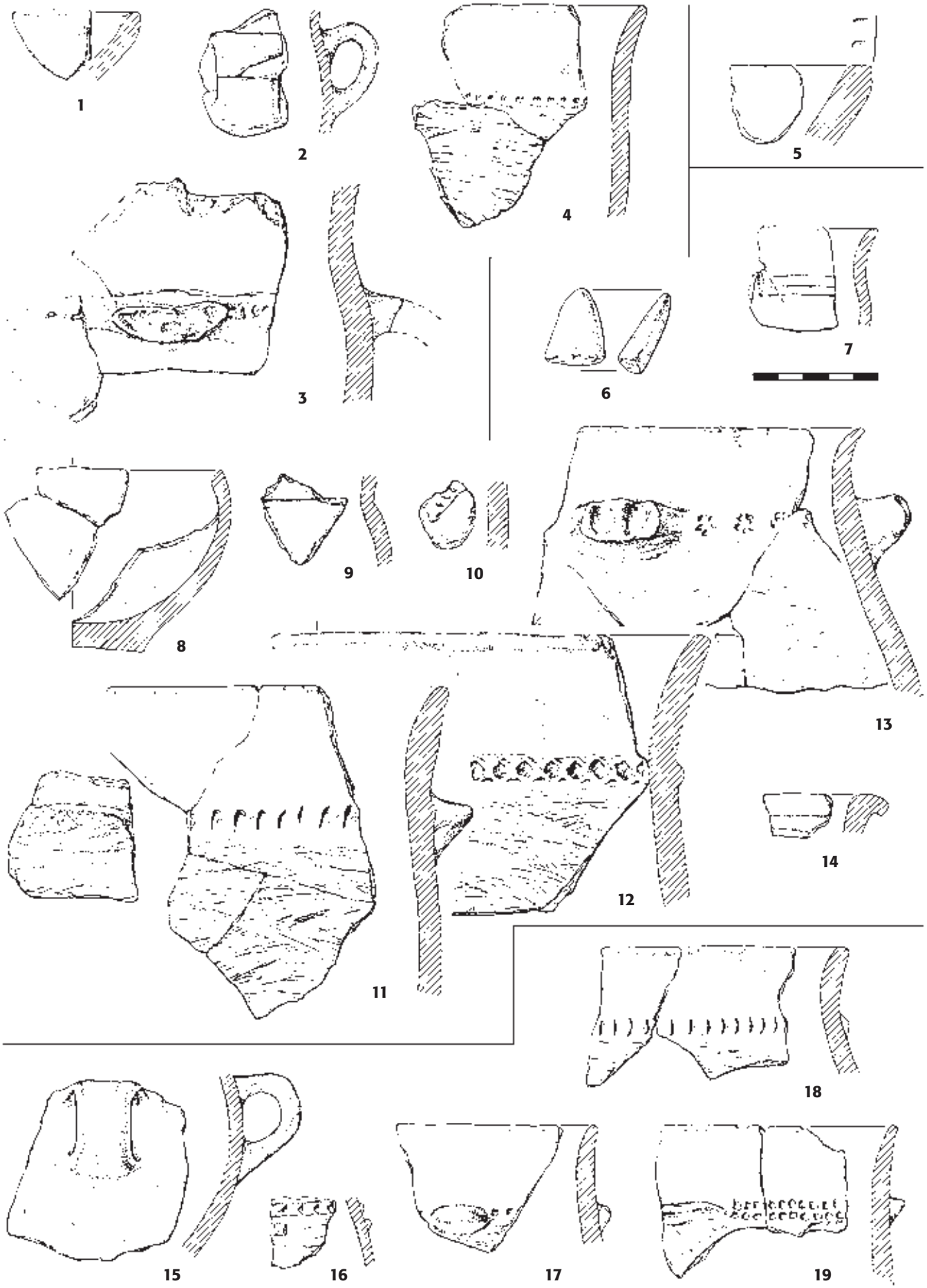

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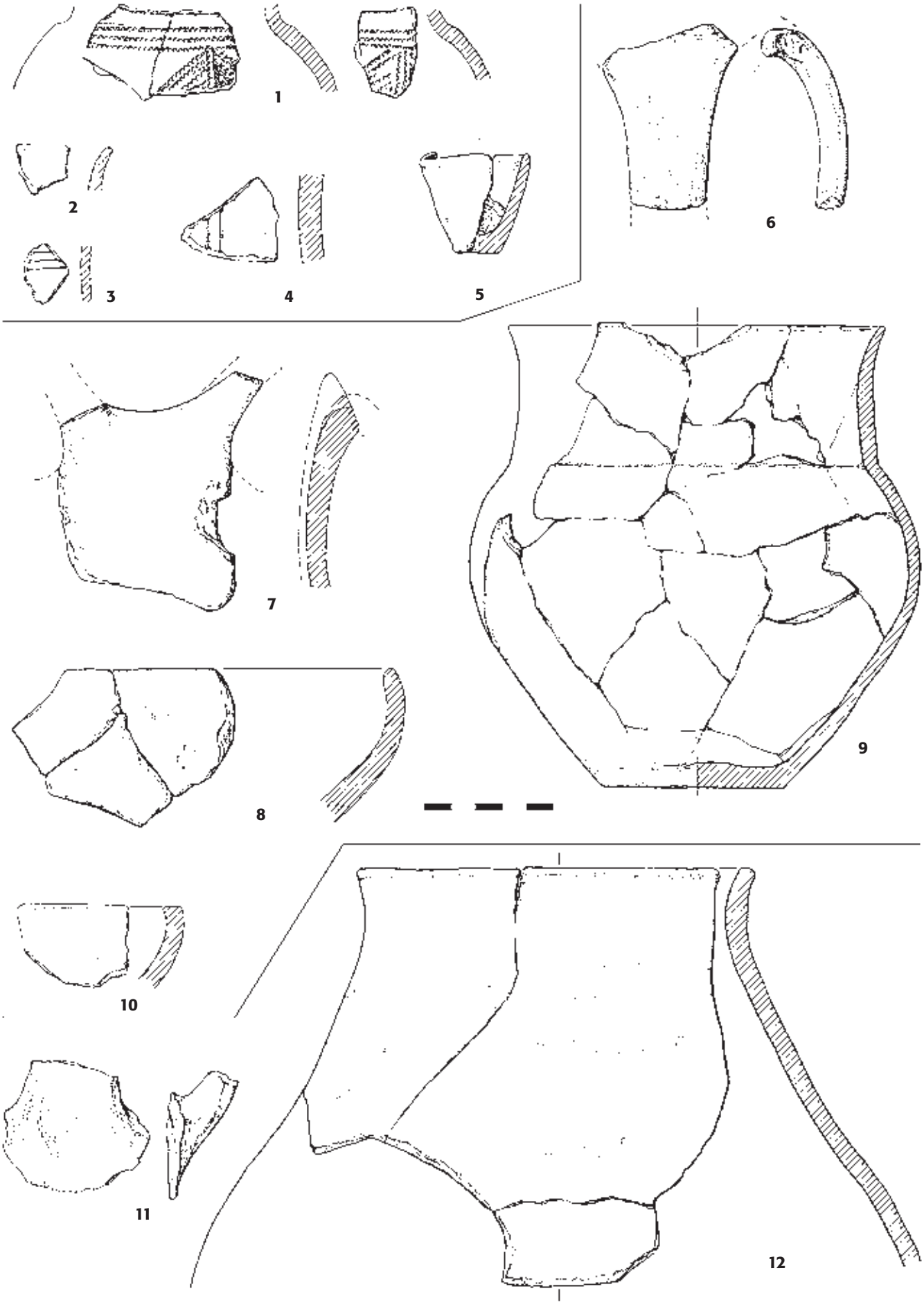

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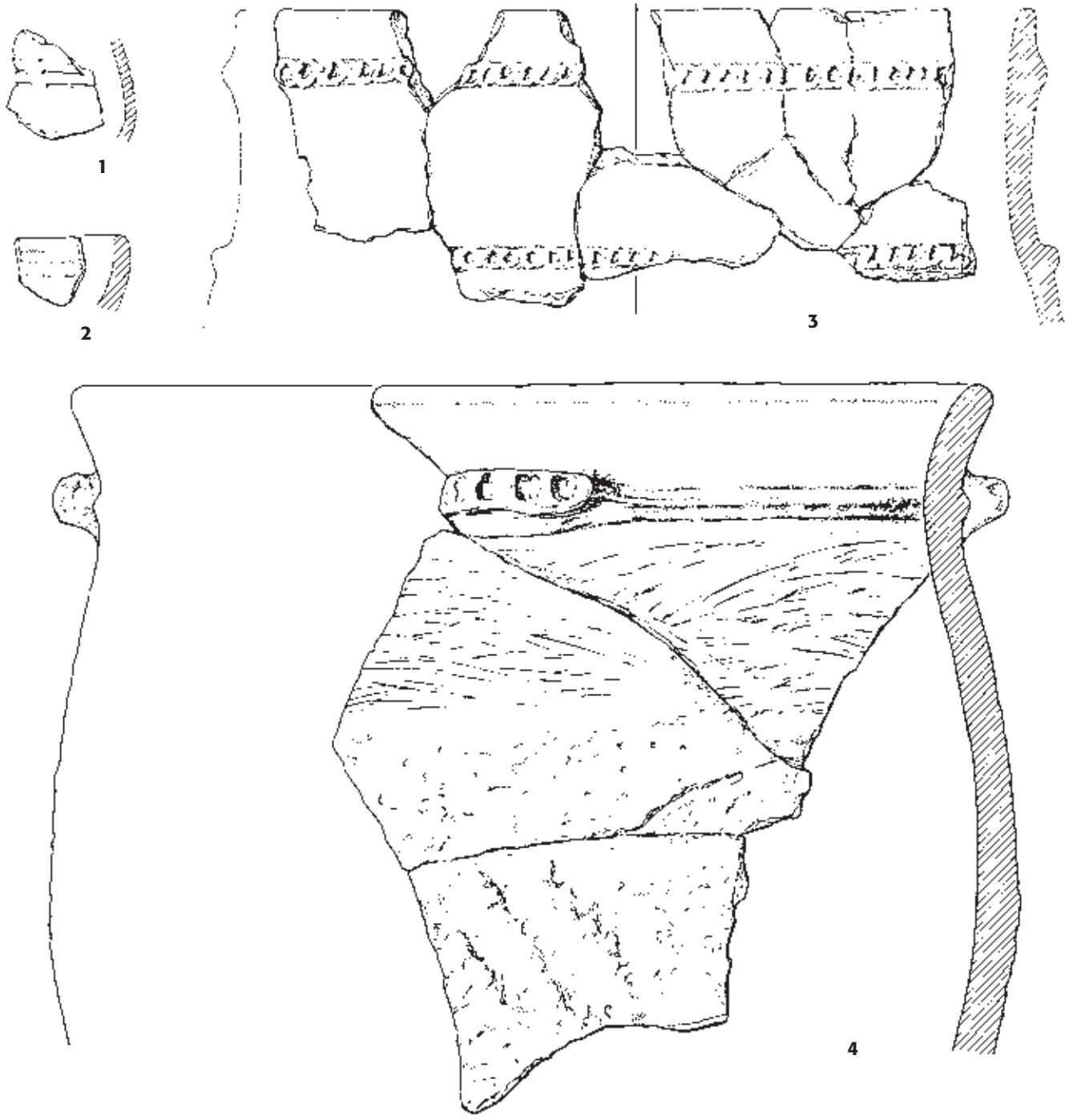

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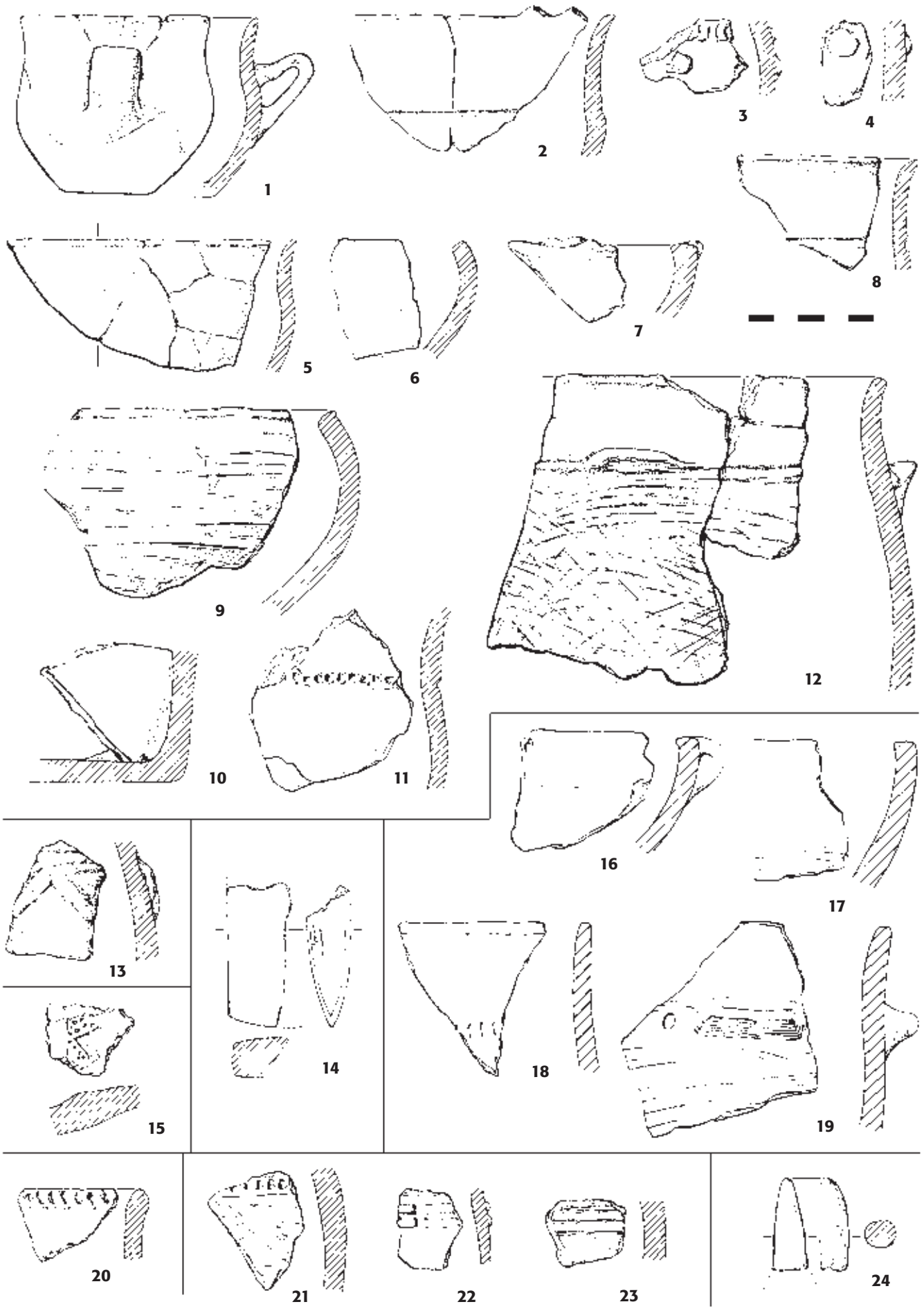

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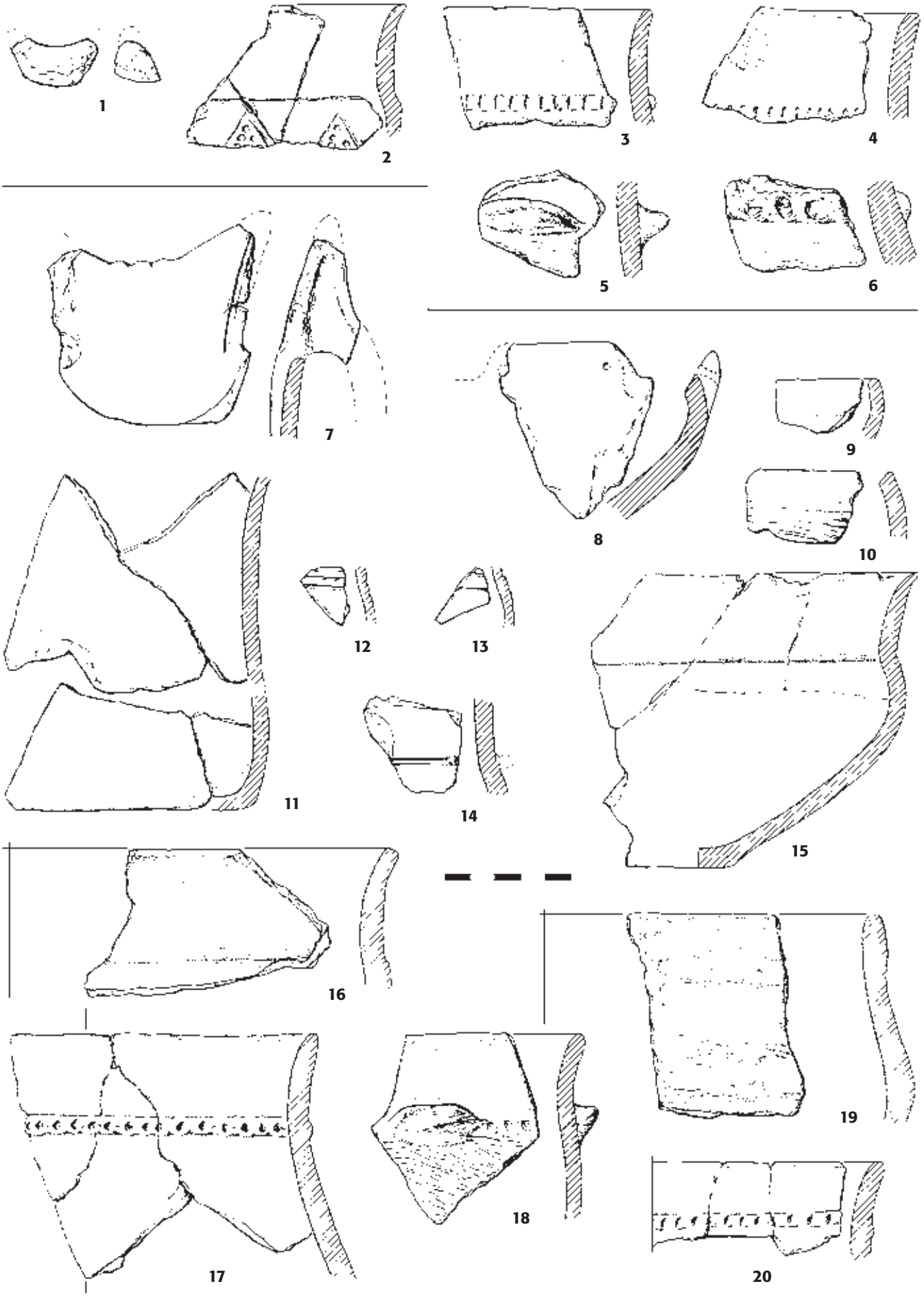

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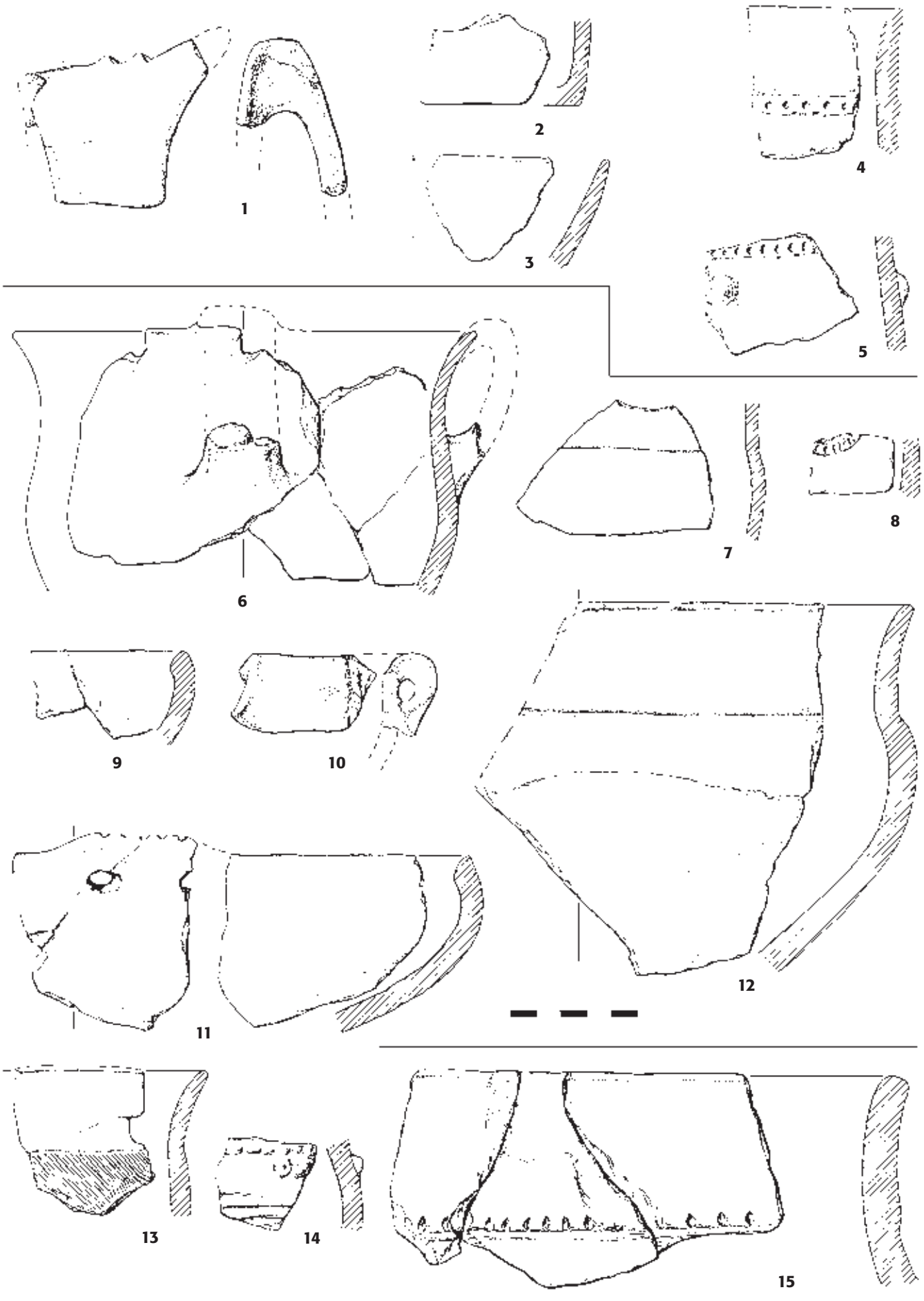

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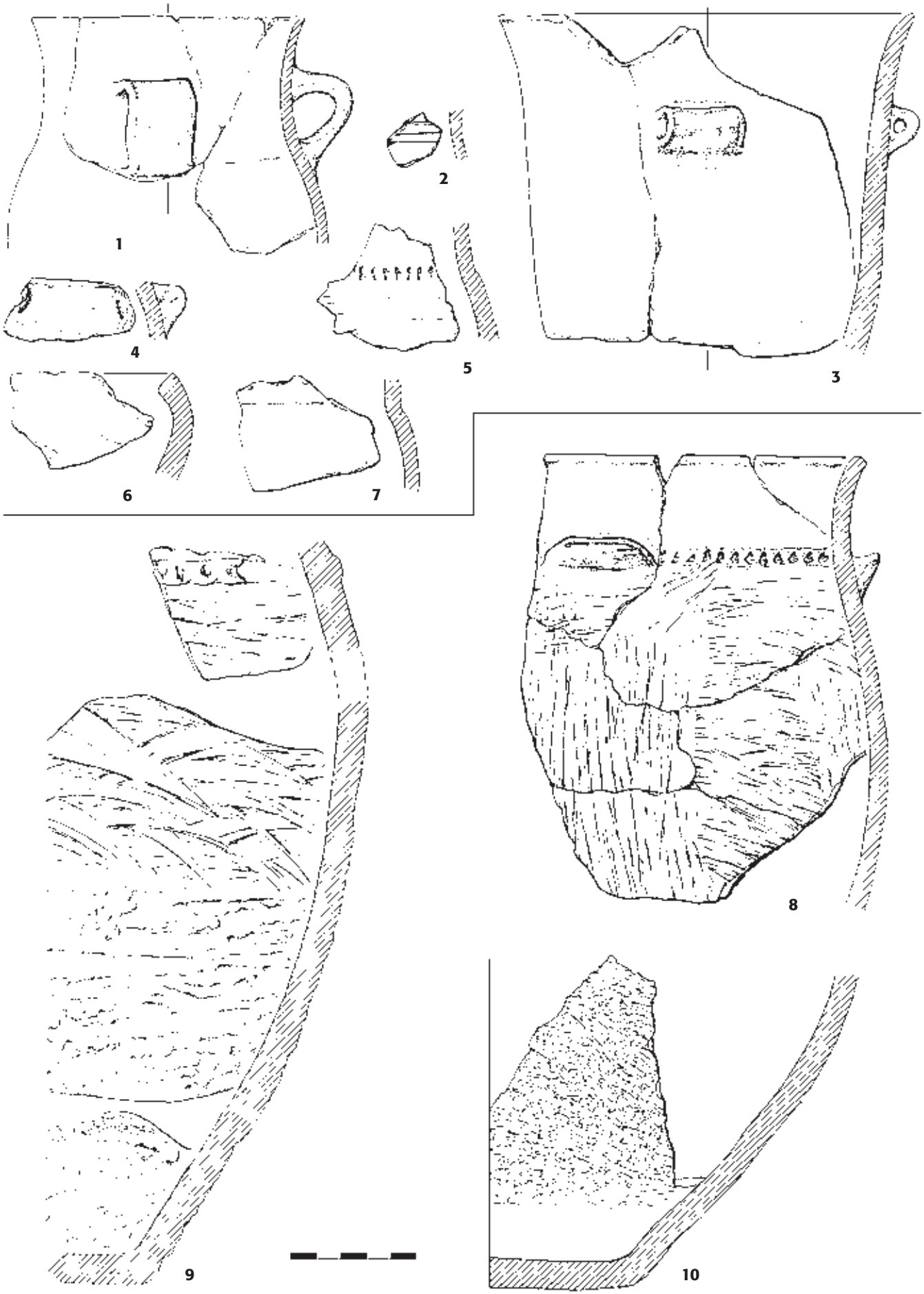

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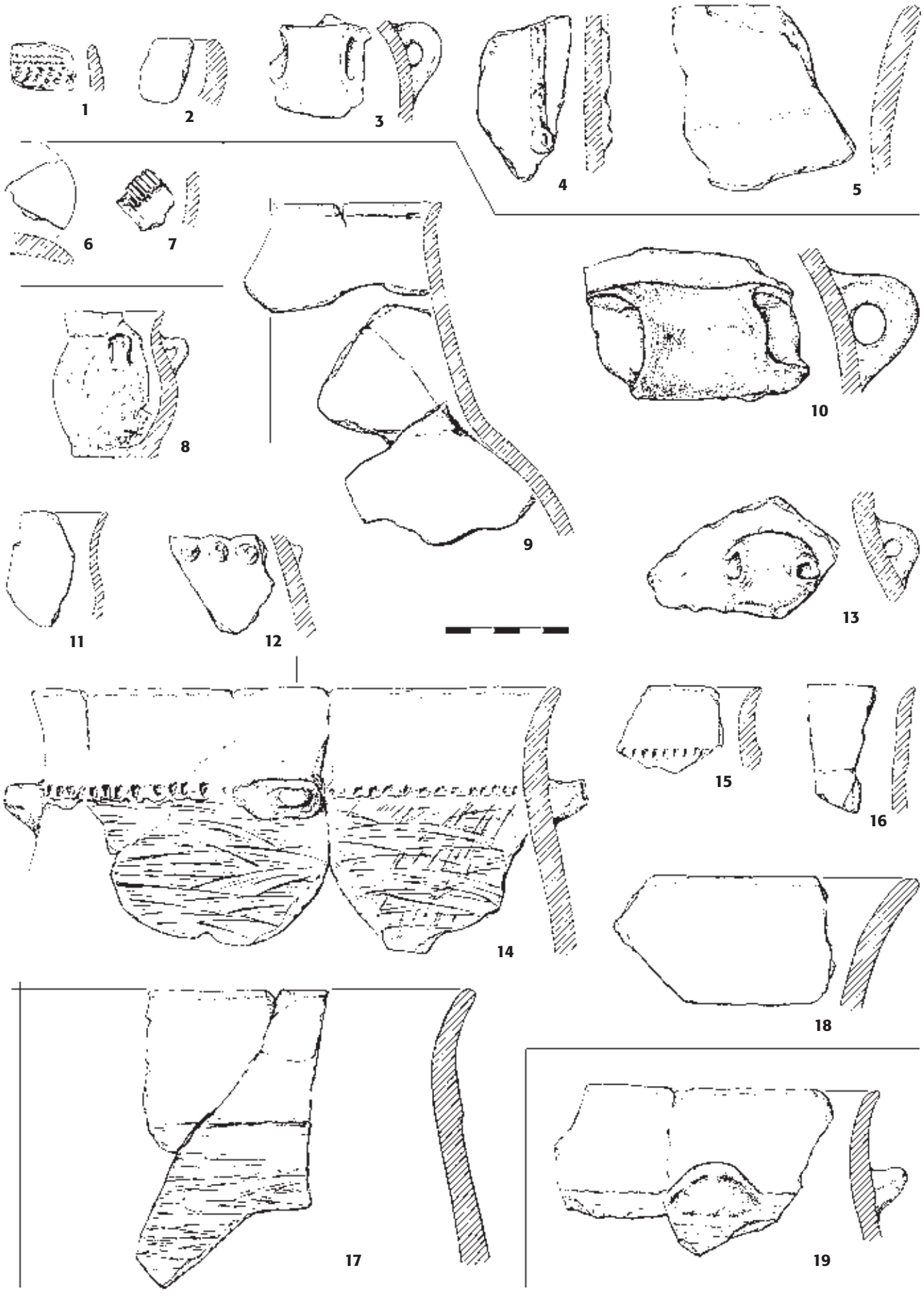

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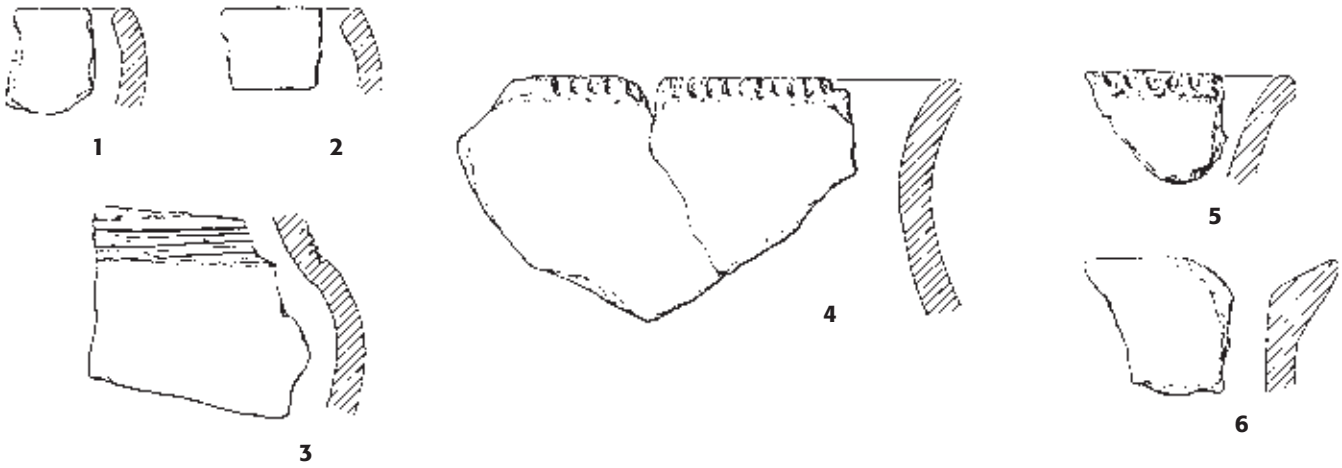

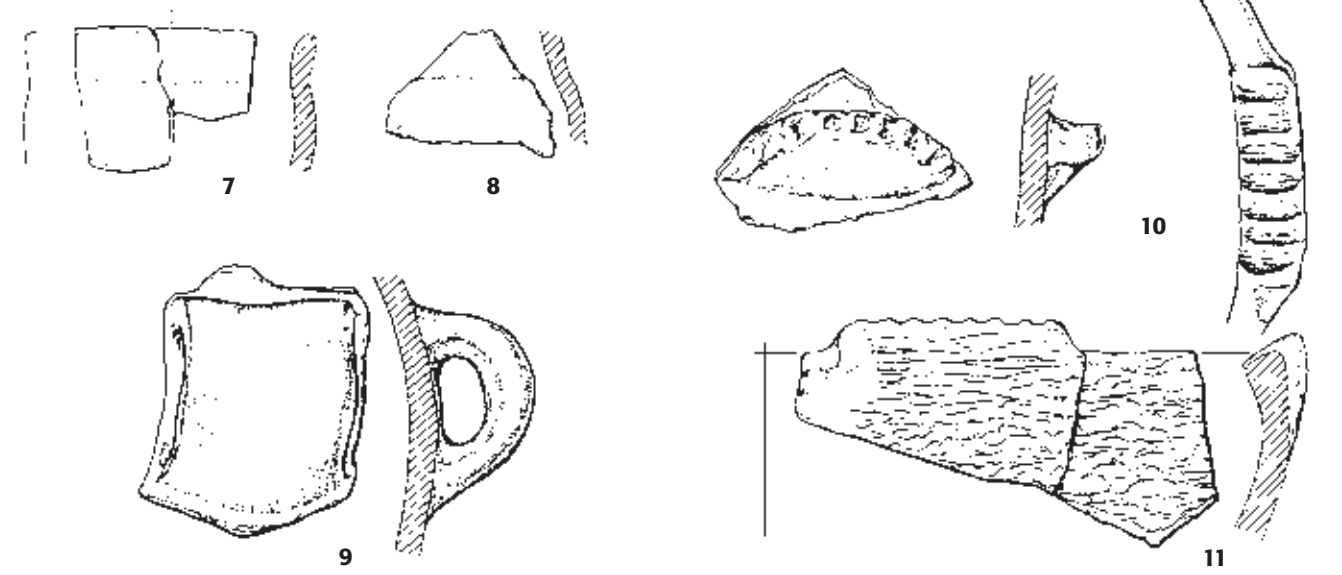

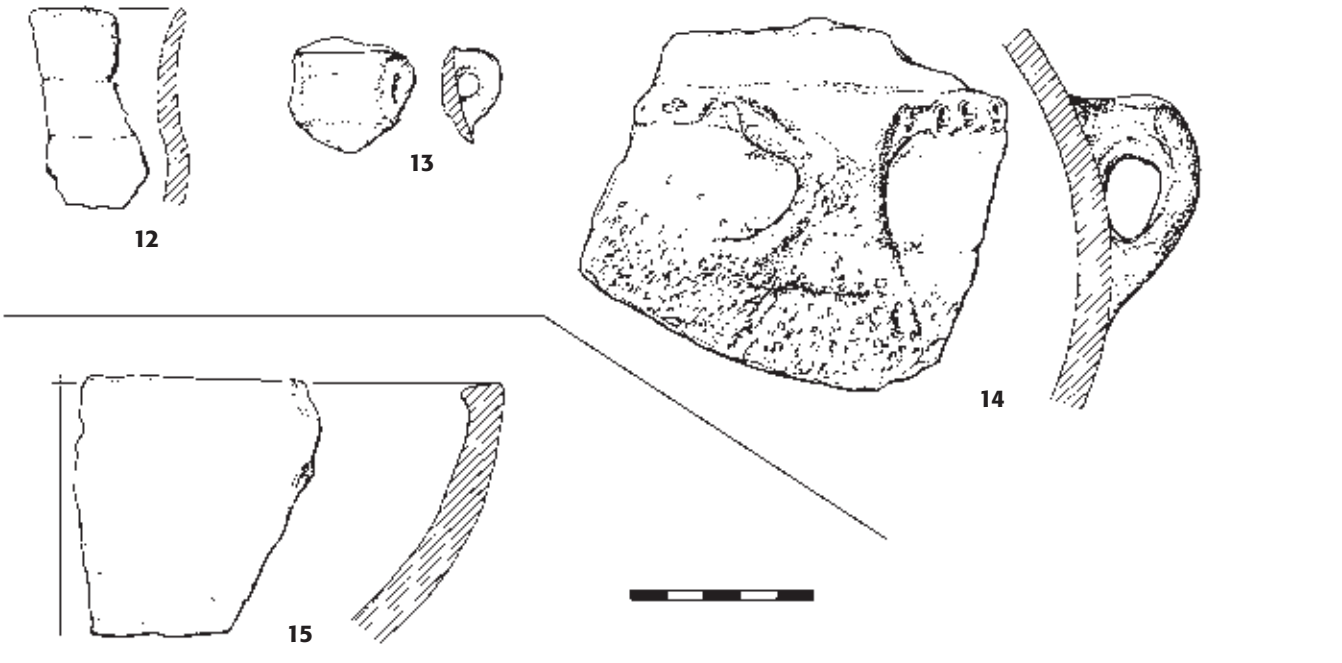

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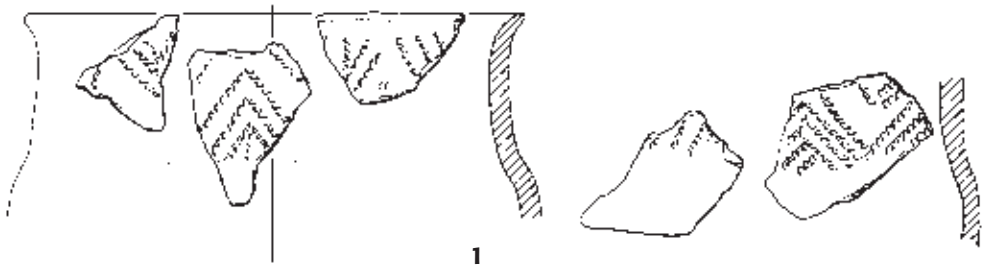
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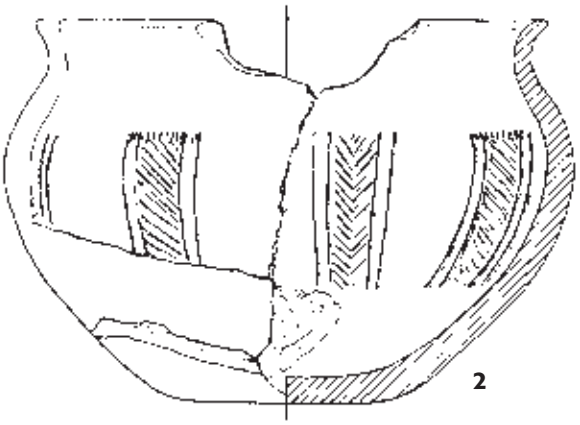
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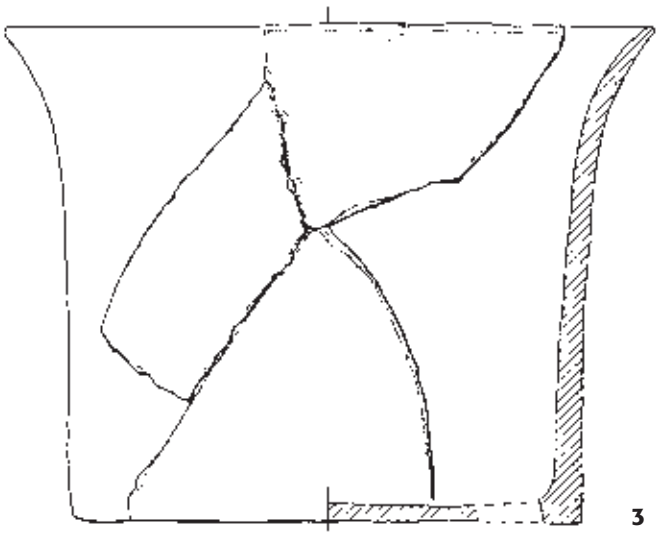
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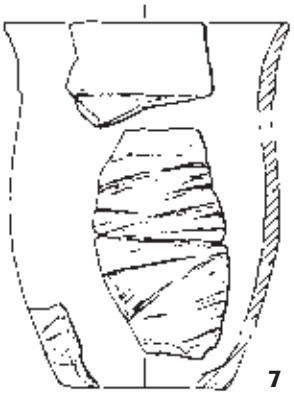
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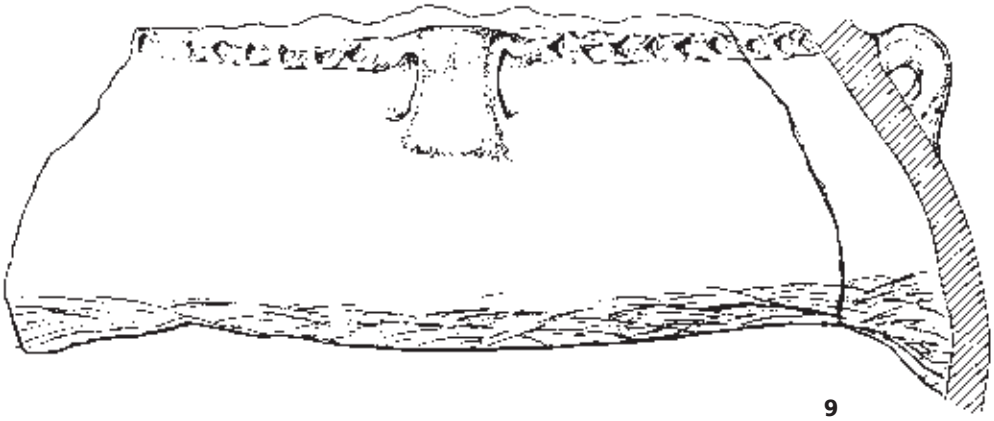
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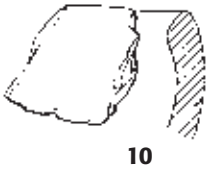
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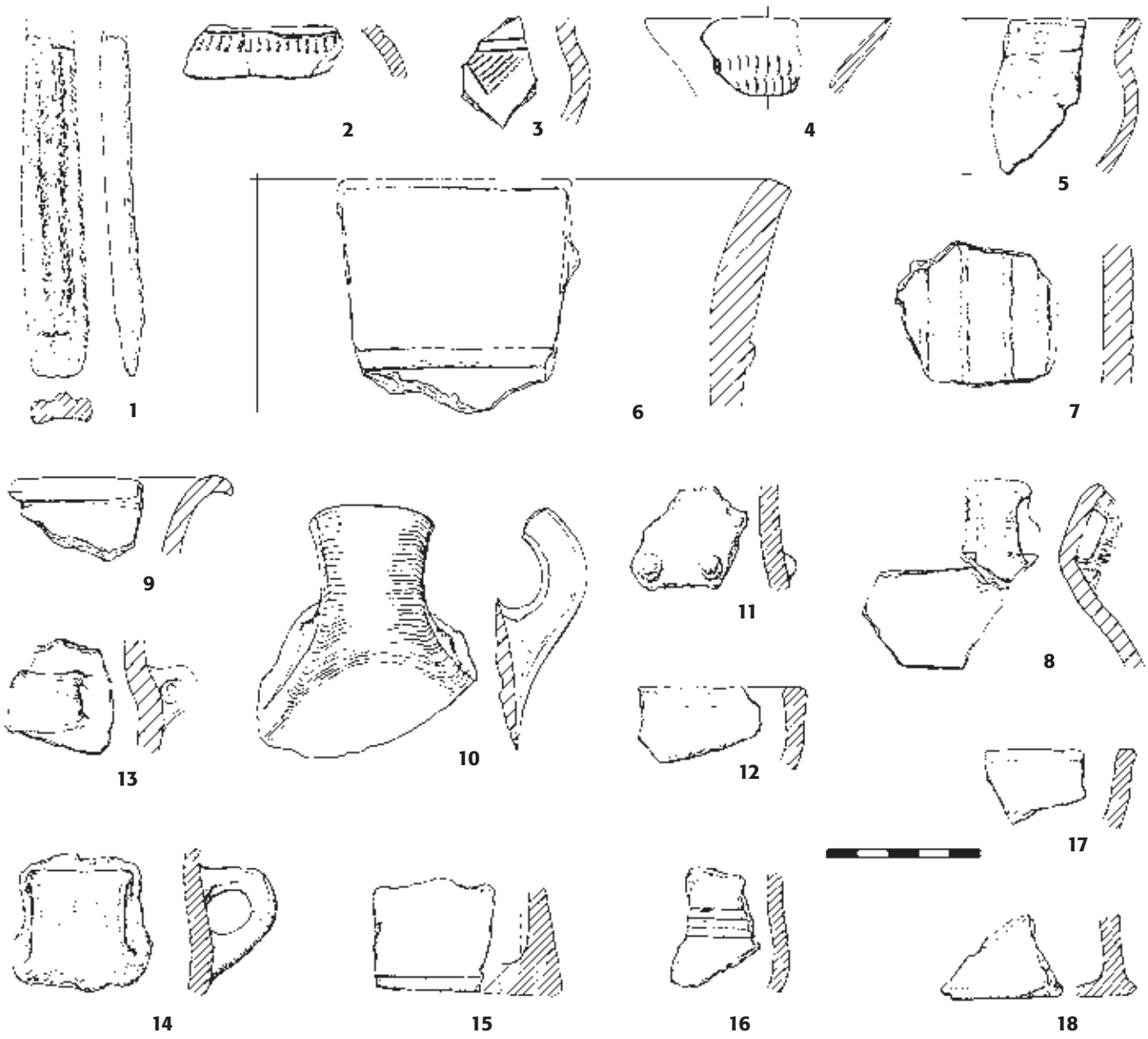

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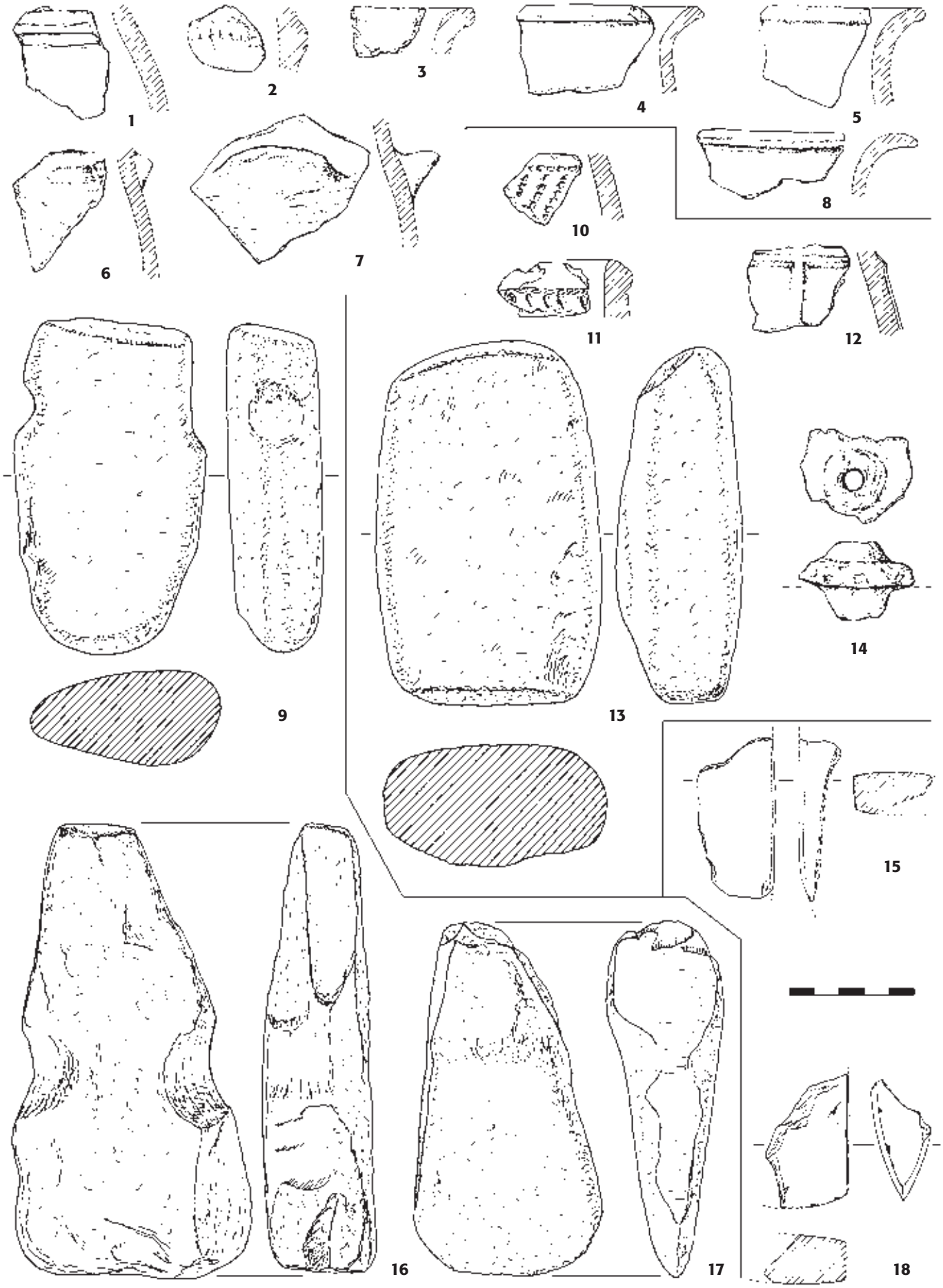

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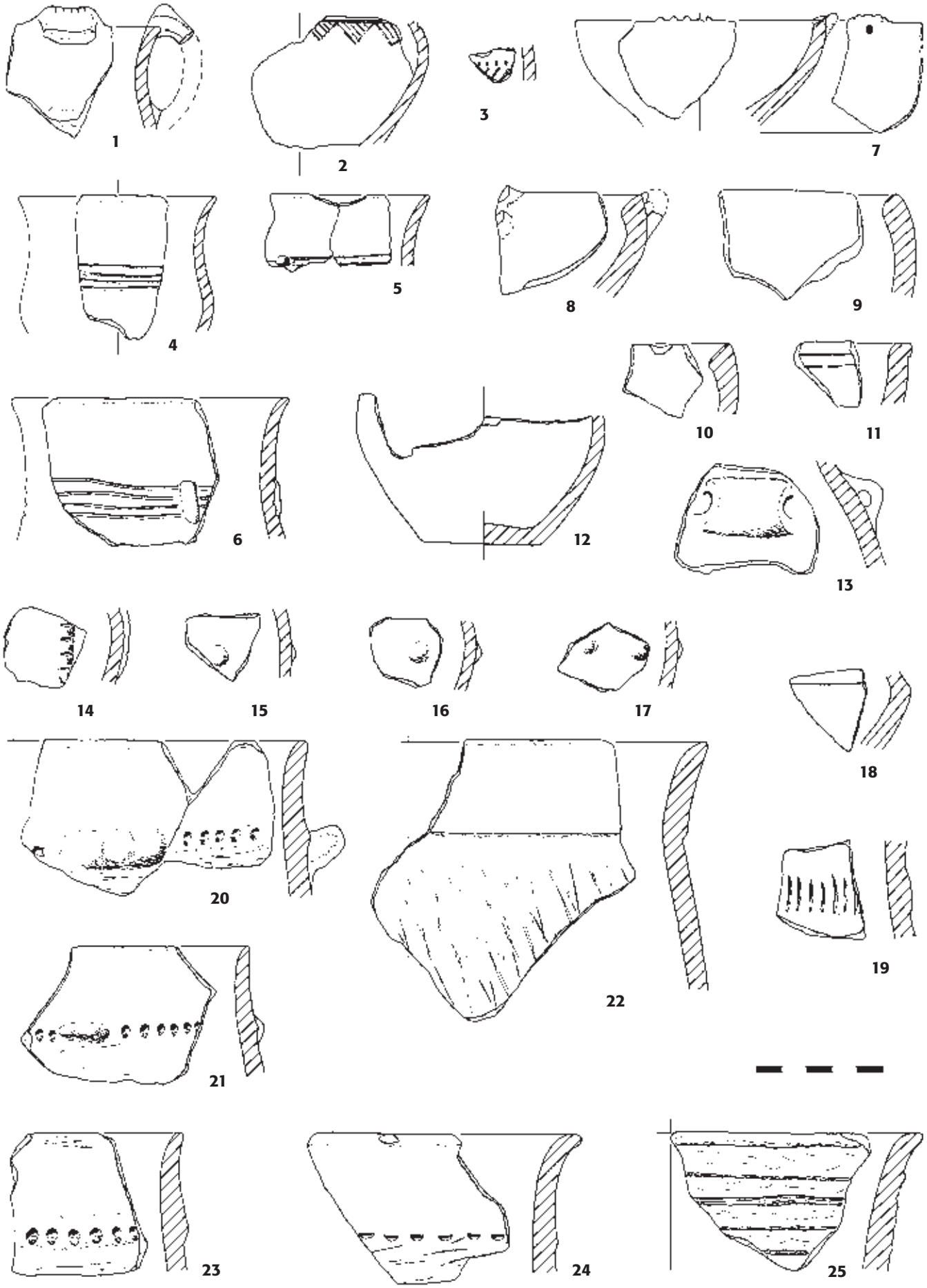

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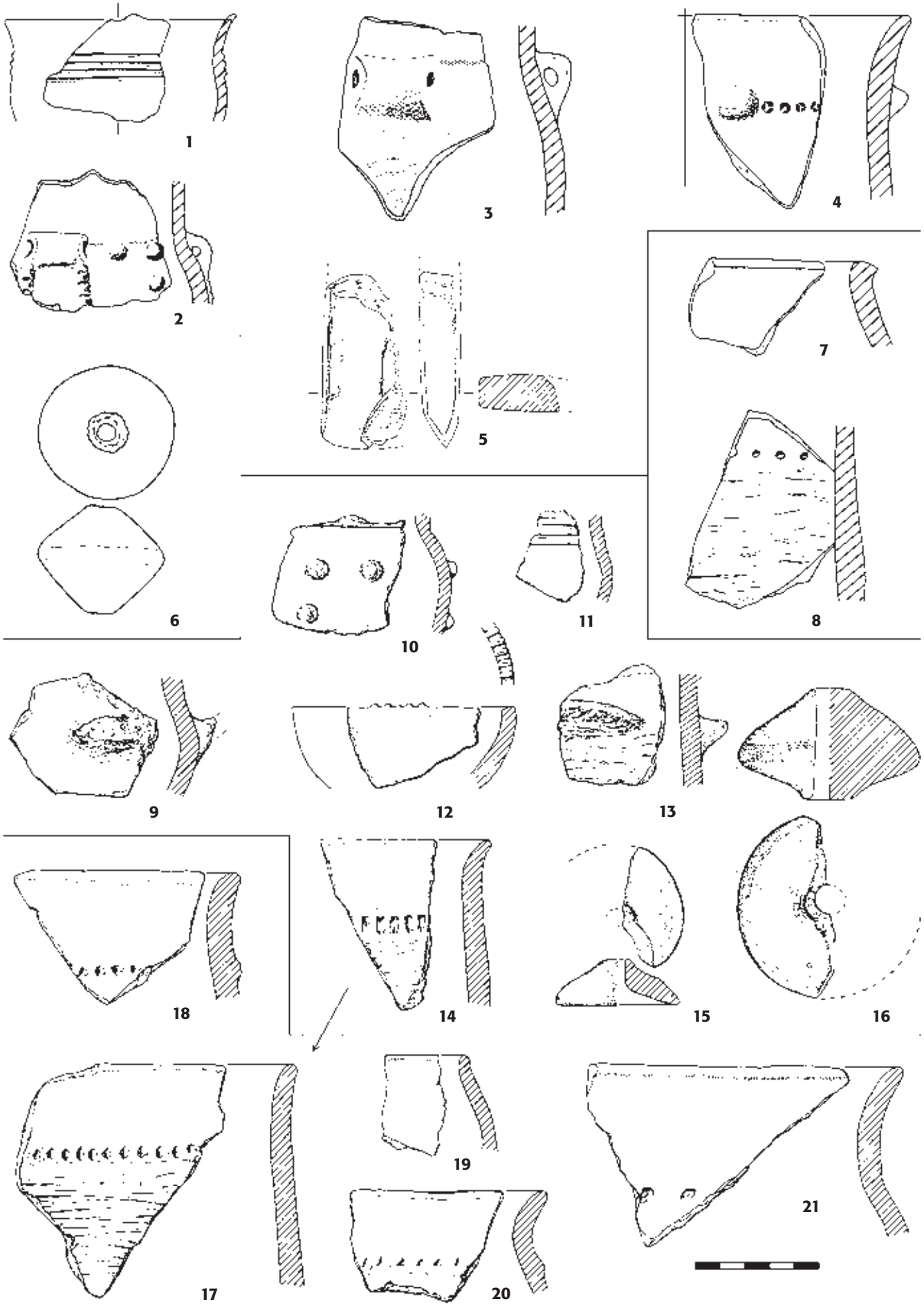

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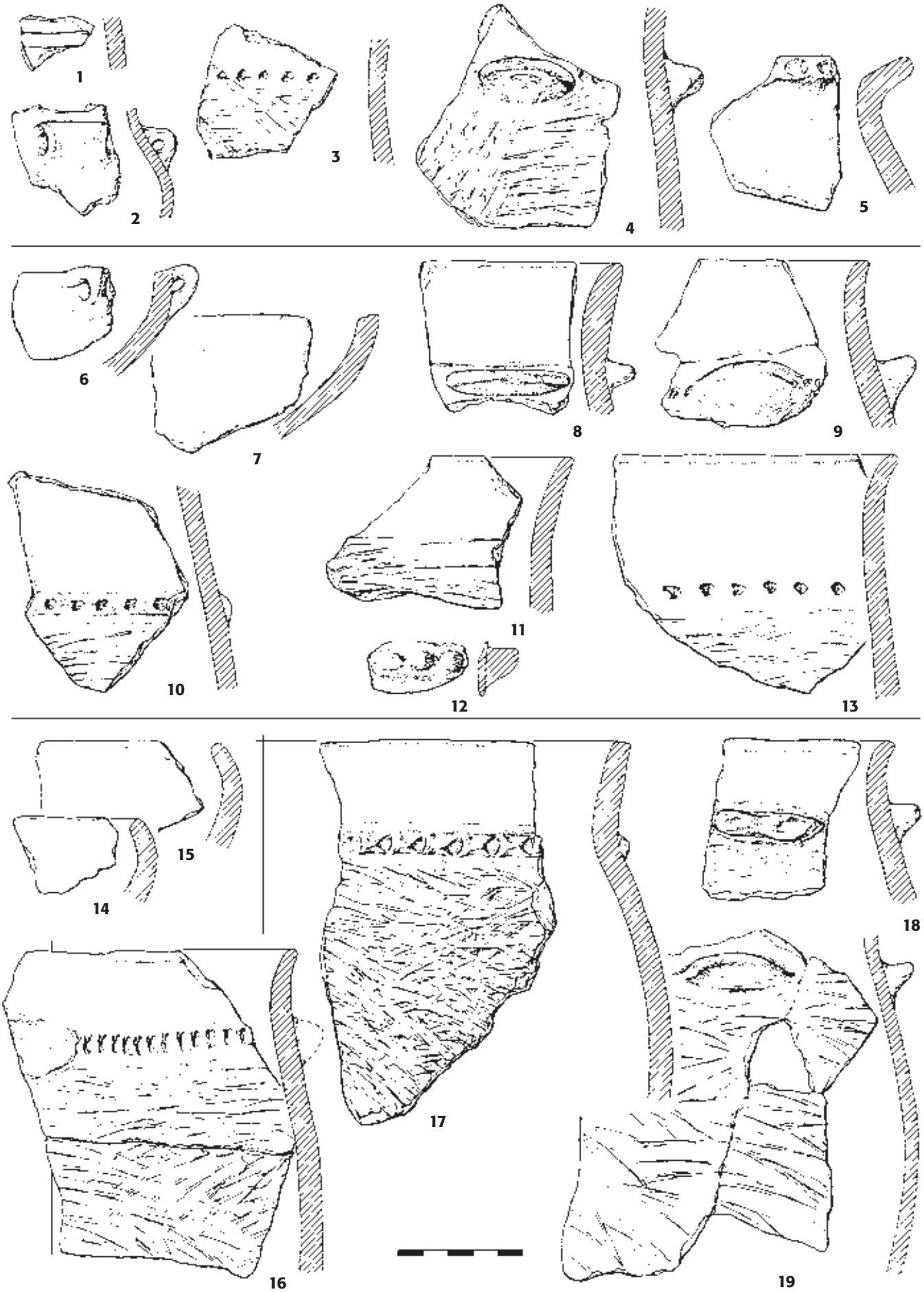

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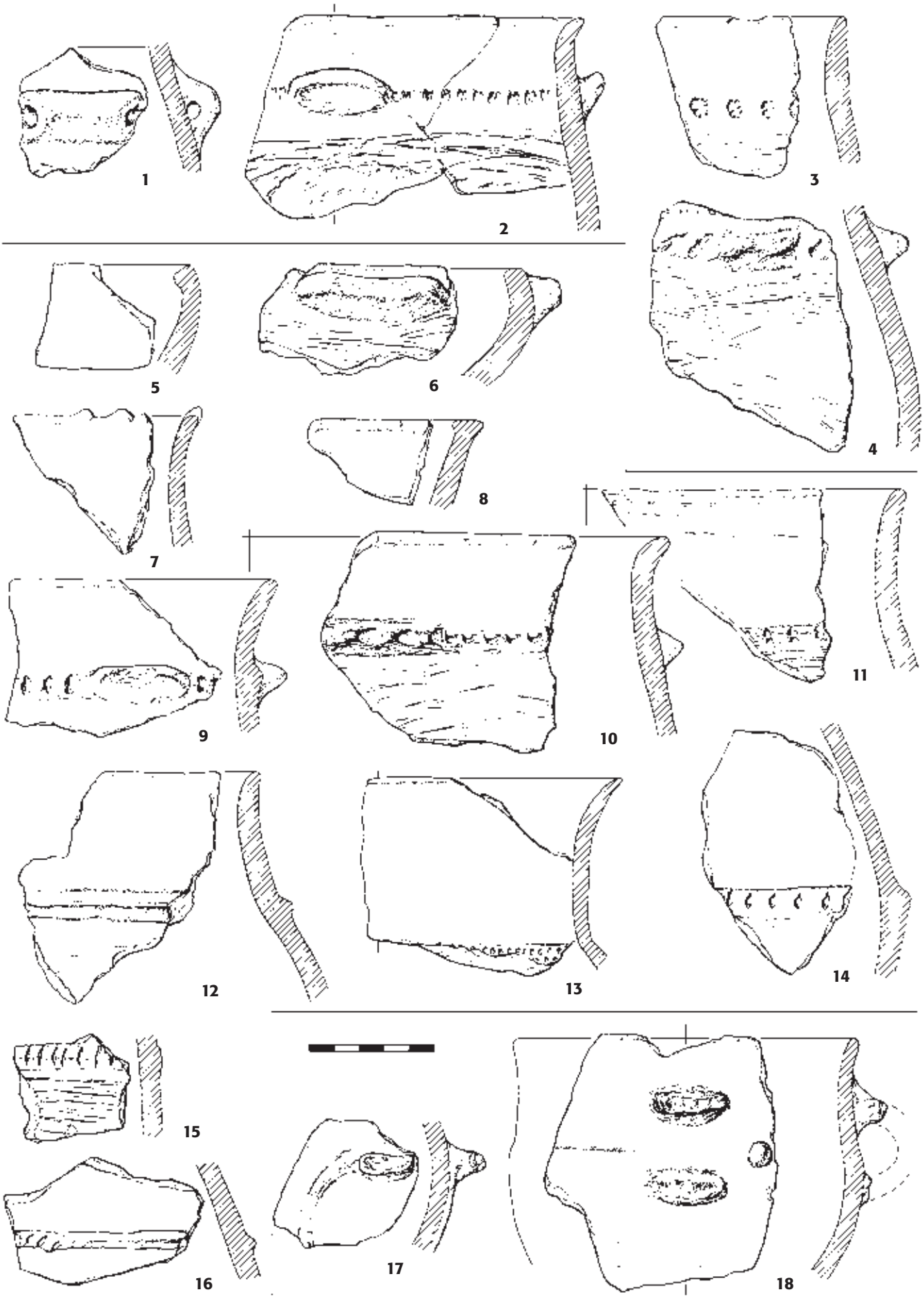

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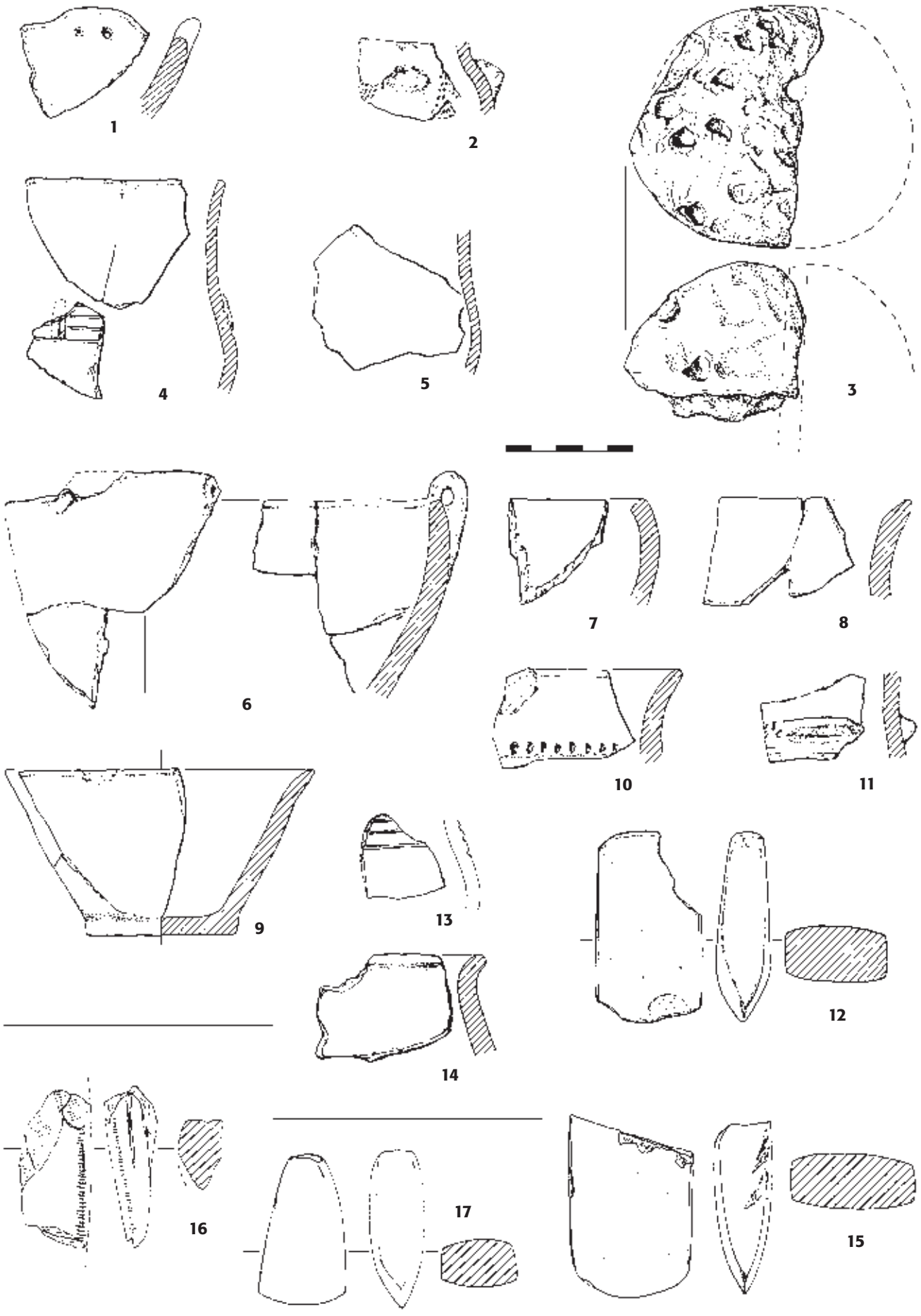

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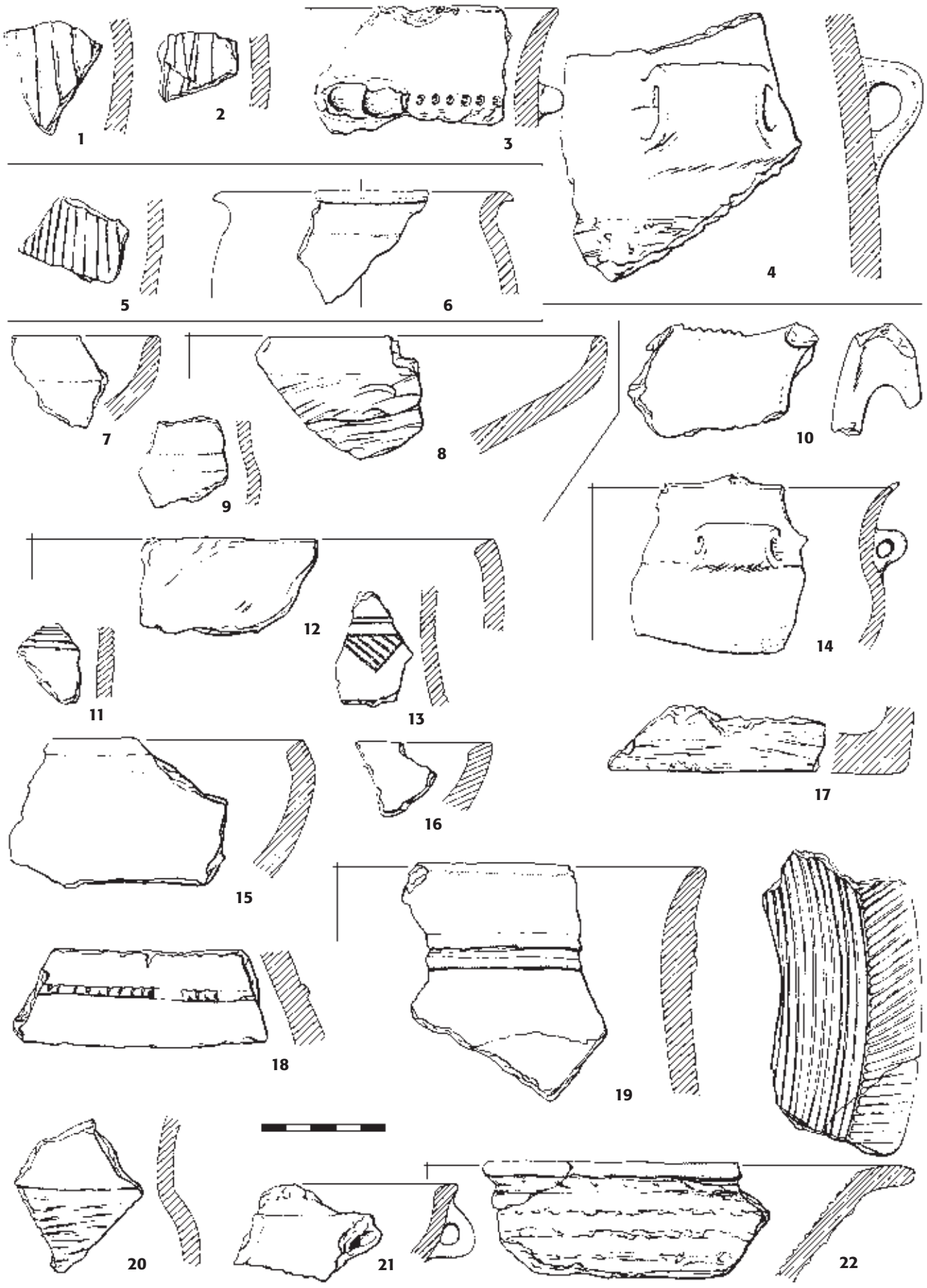
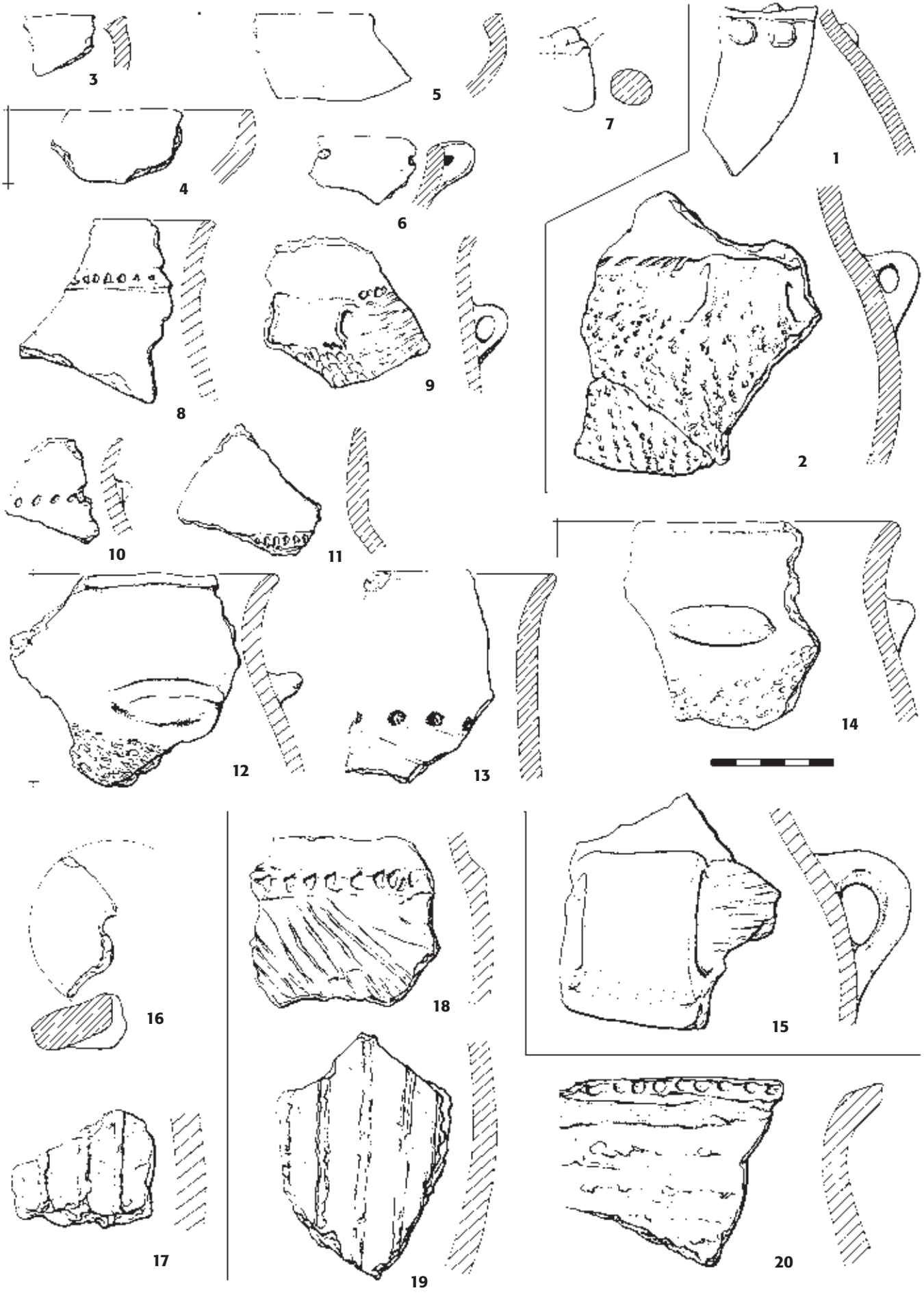


Tab. 87



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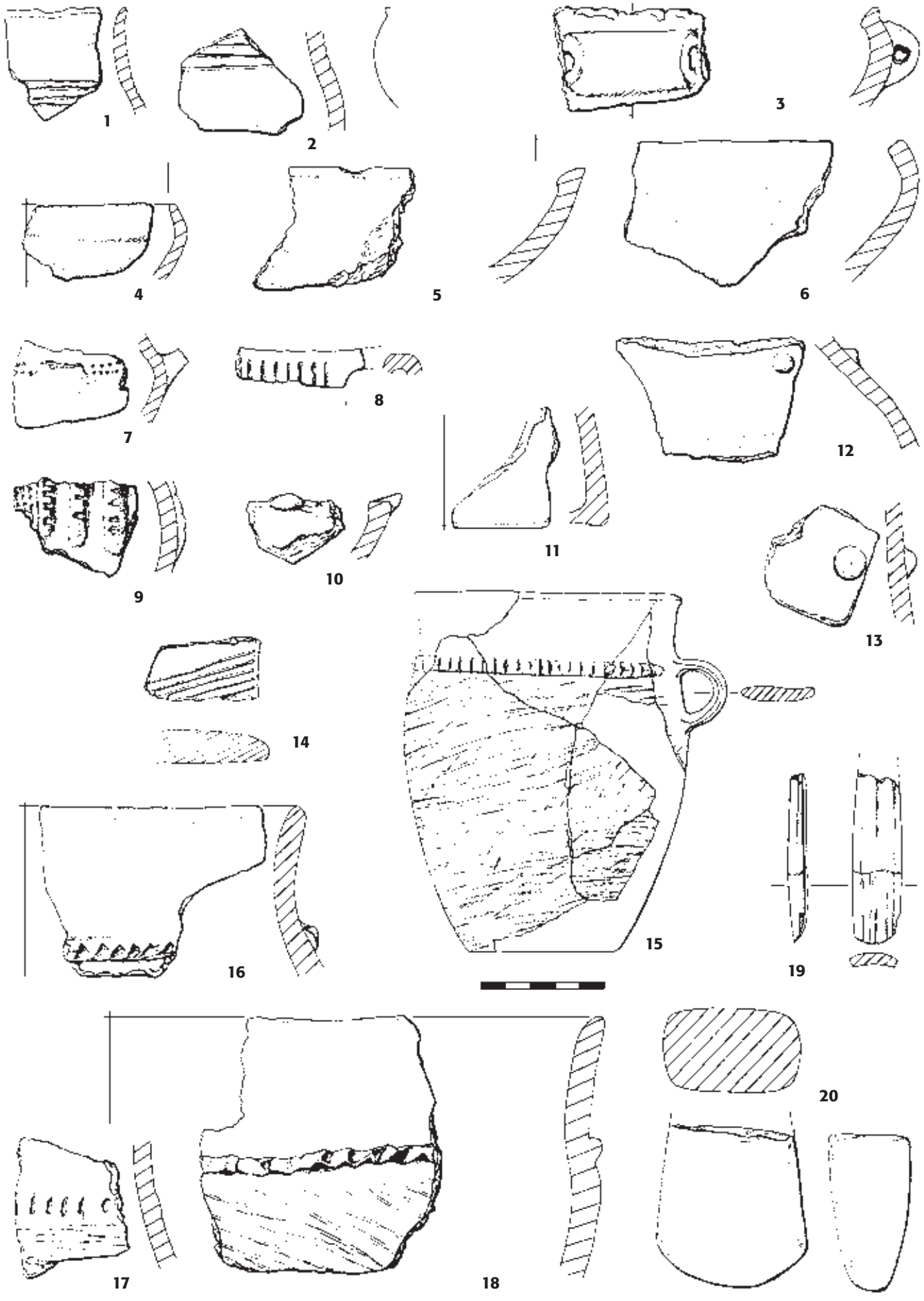

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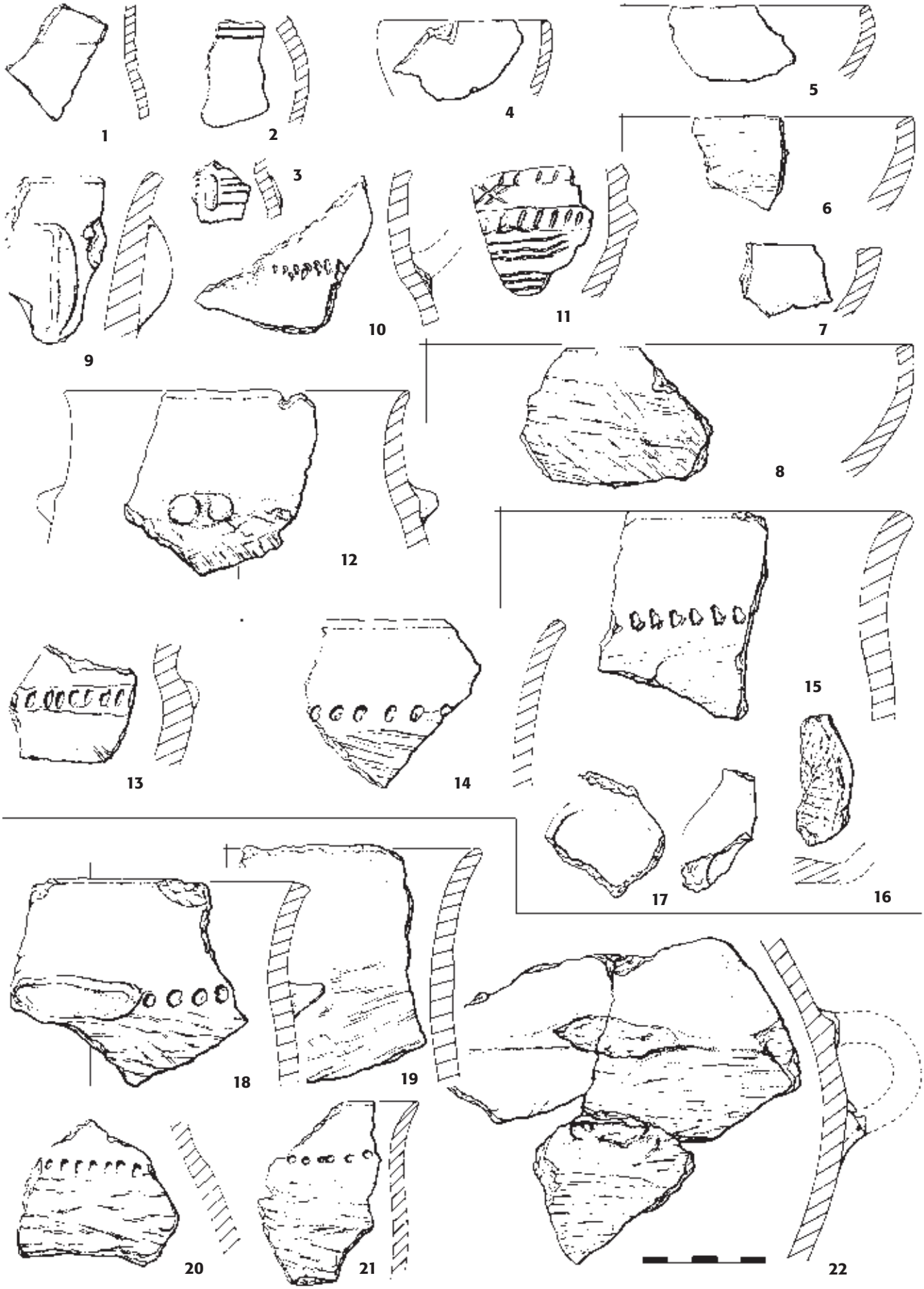

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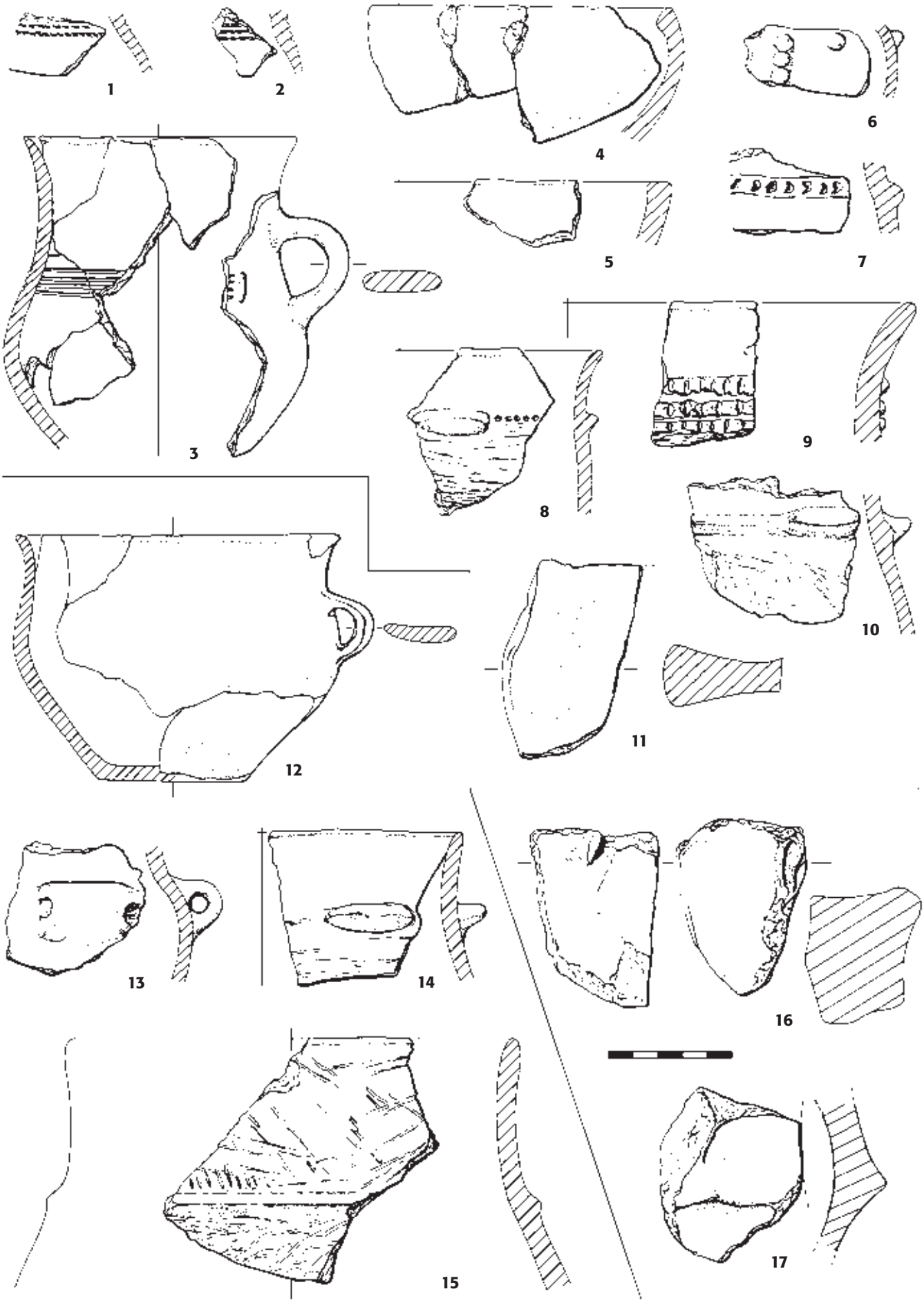

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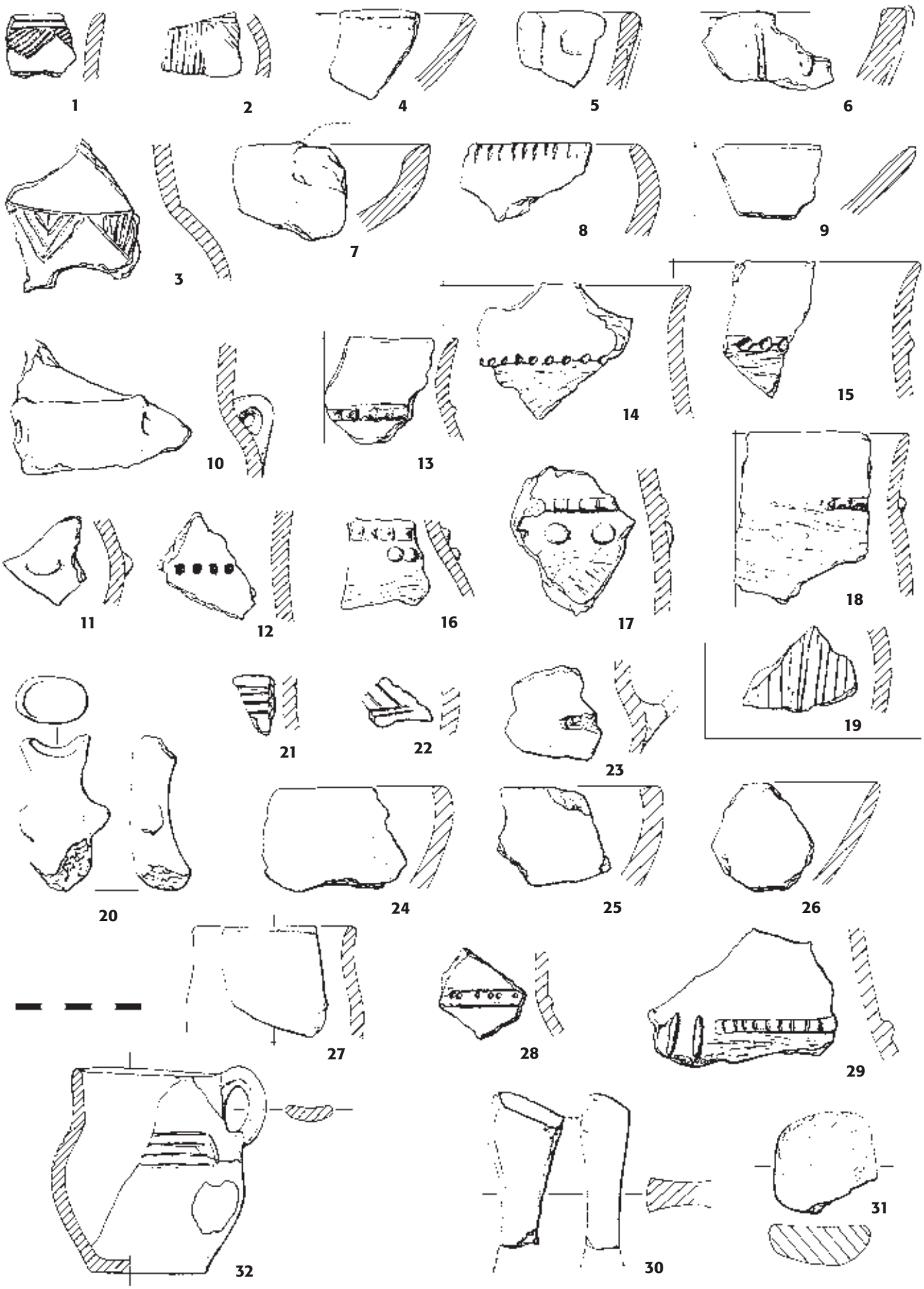
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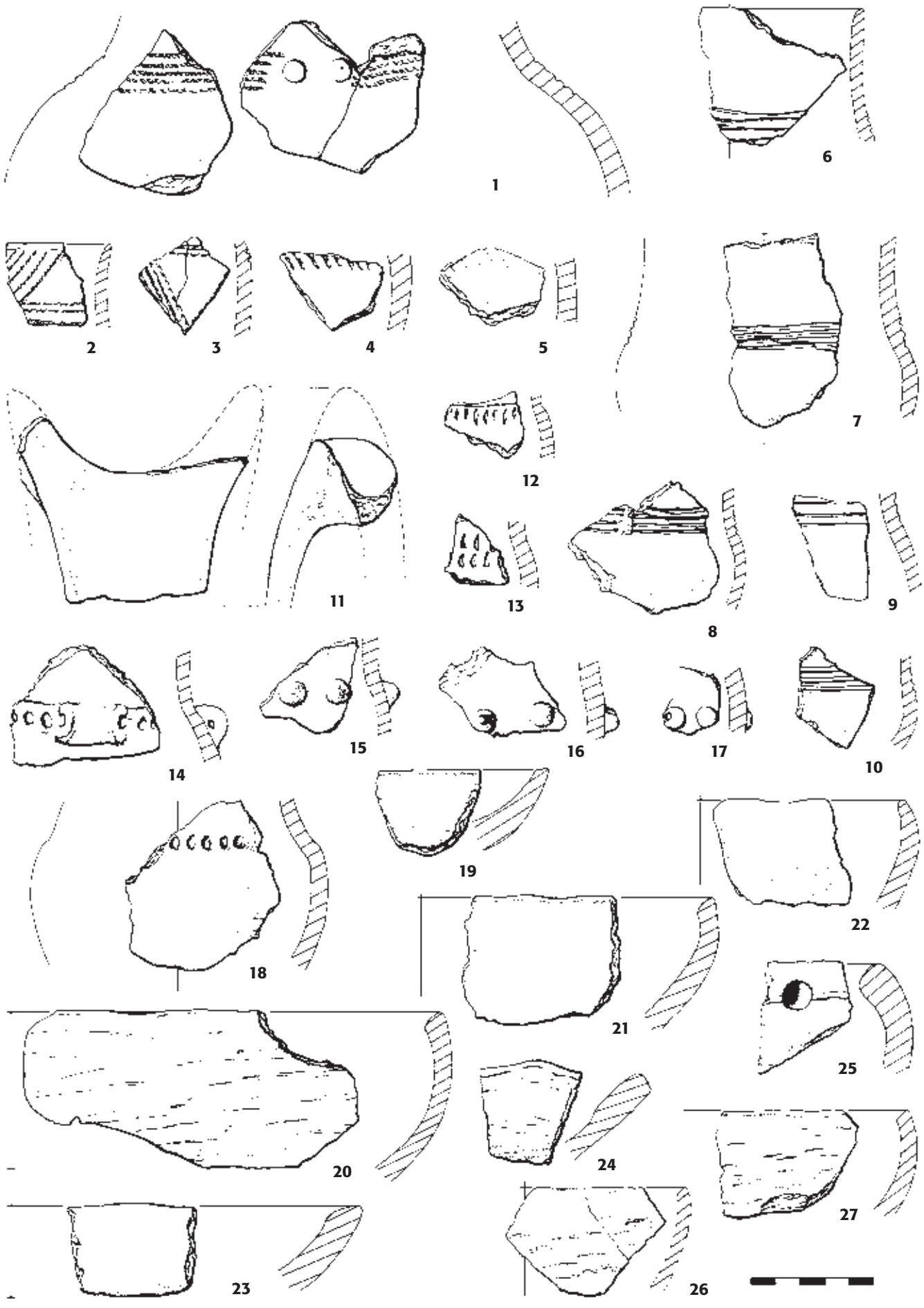

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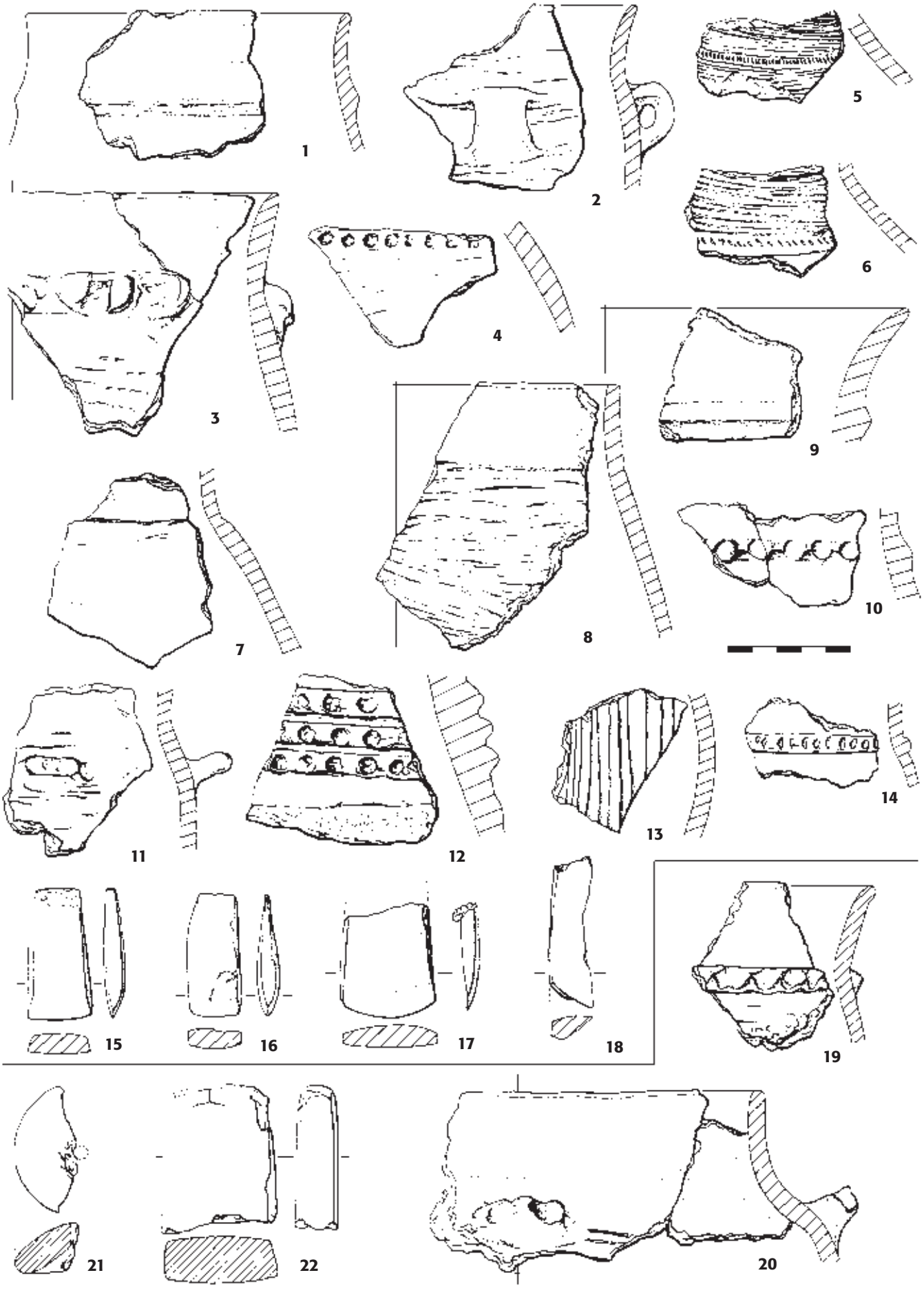

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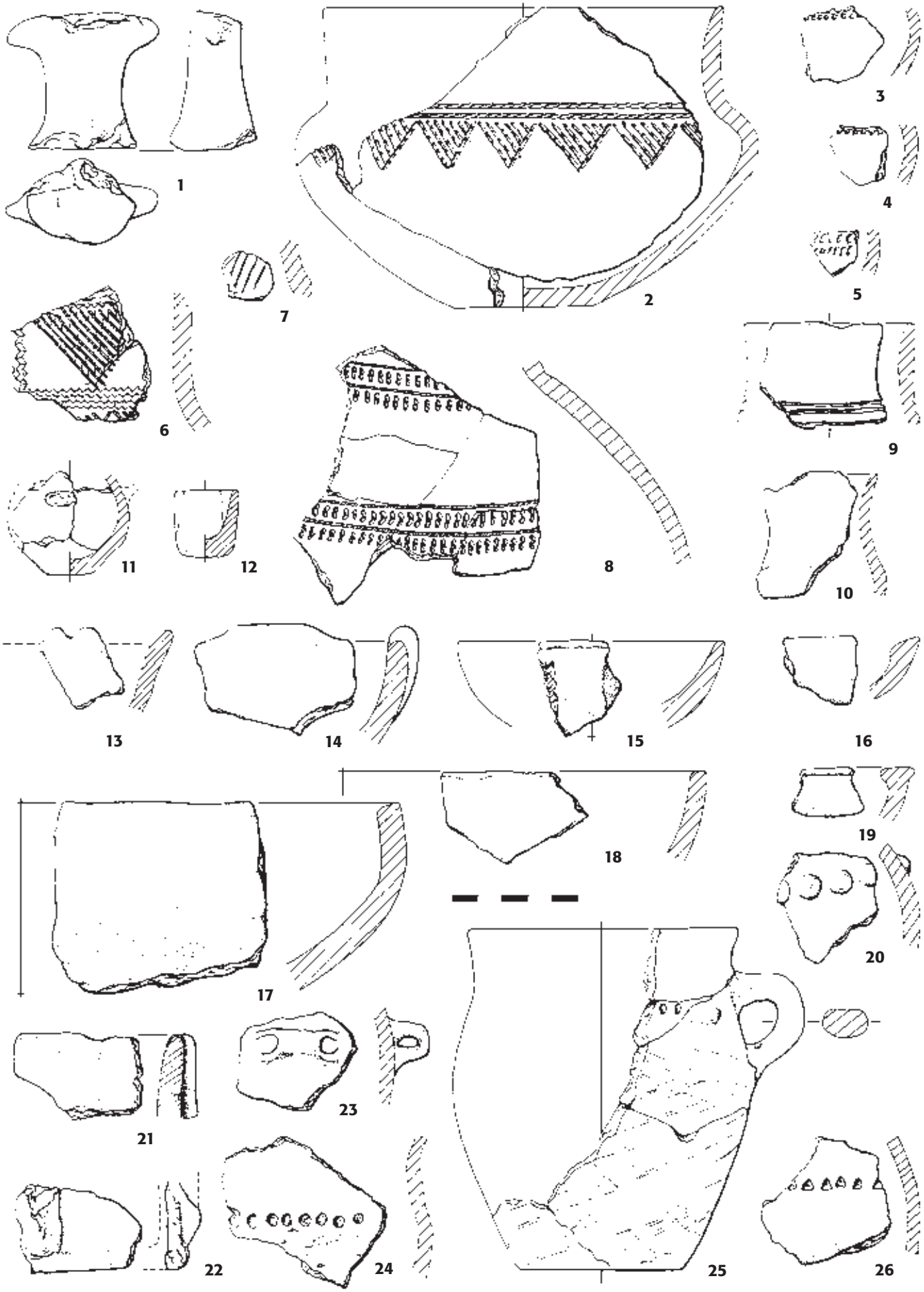

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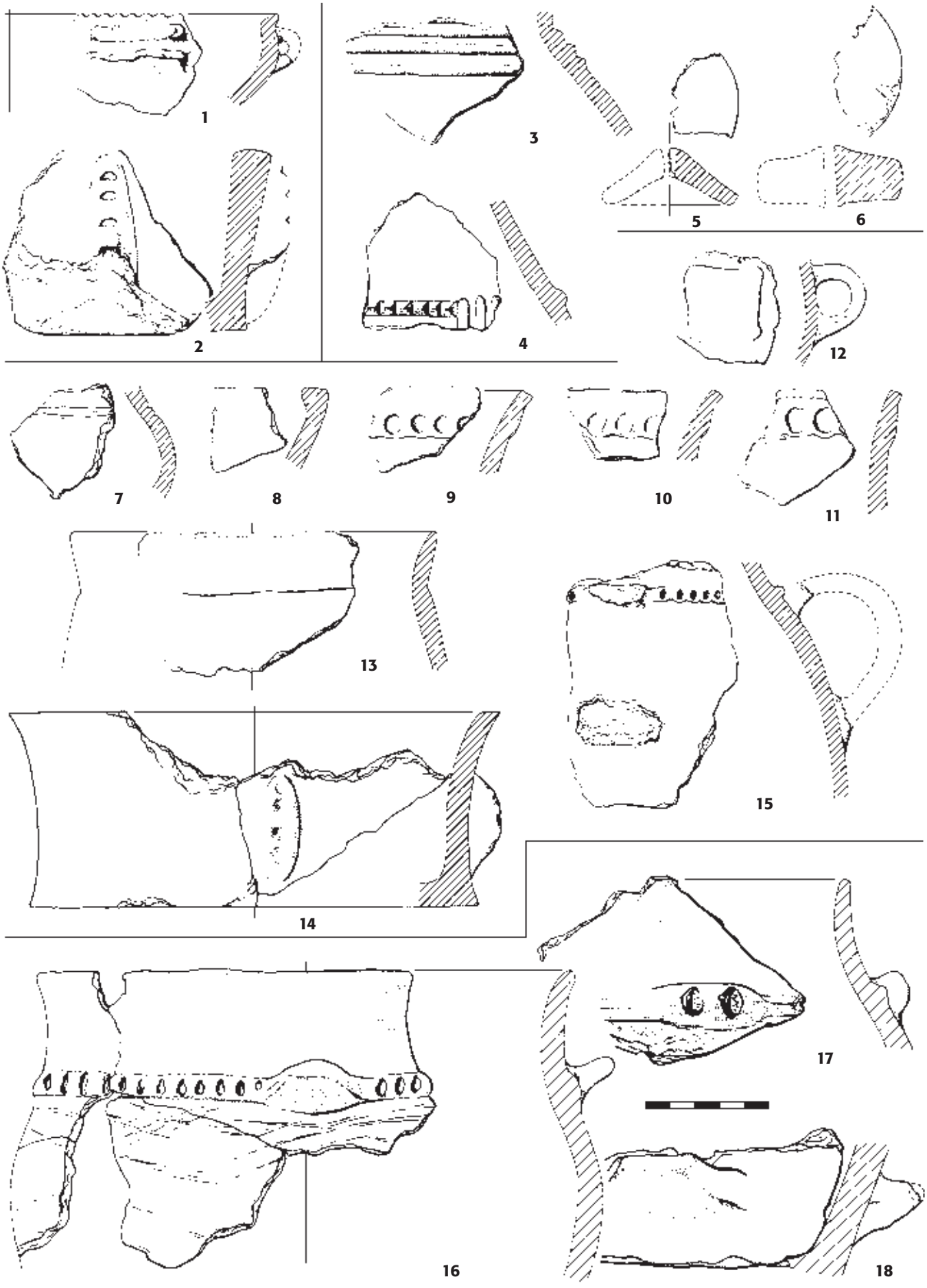

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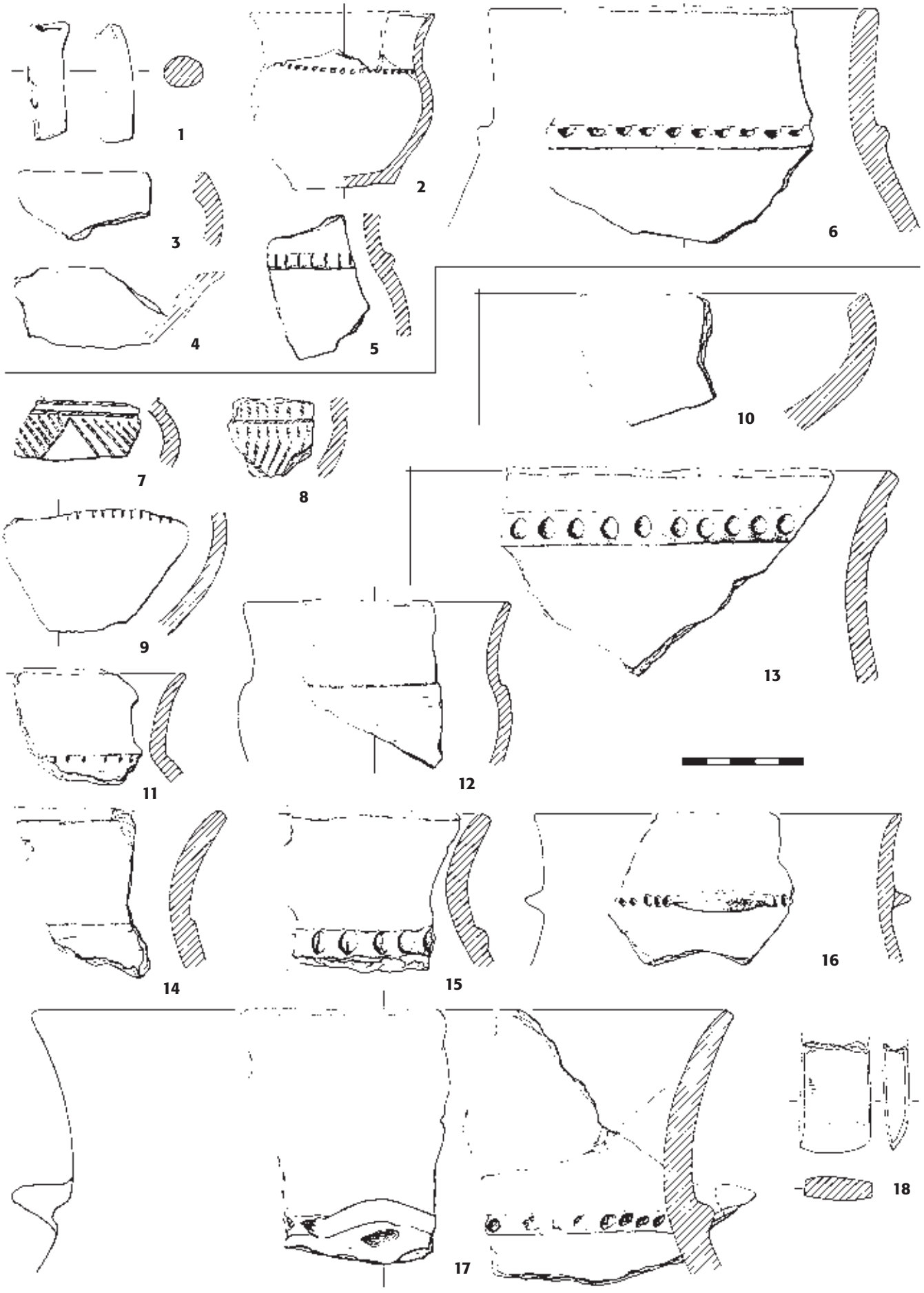

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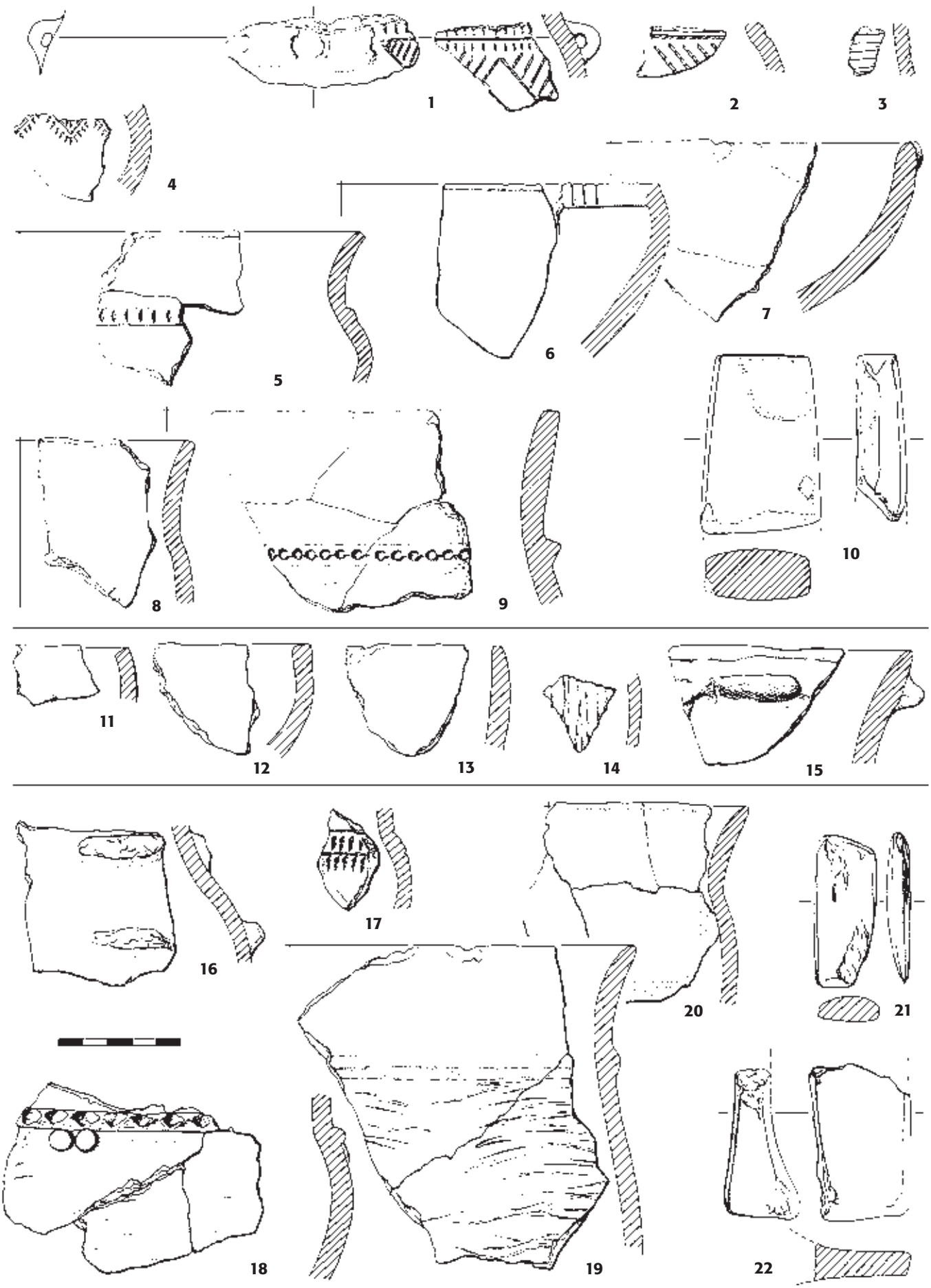

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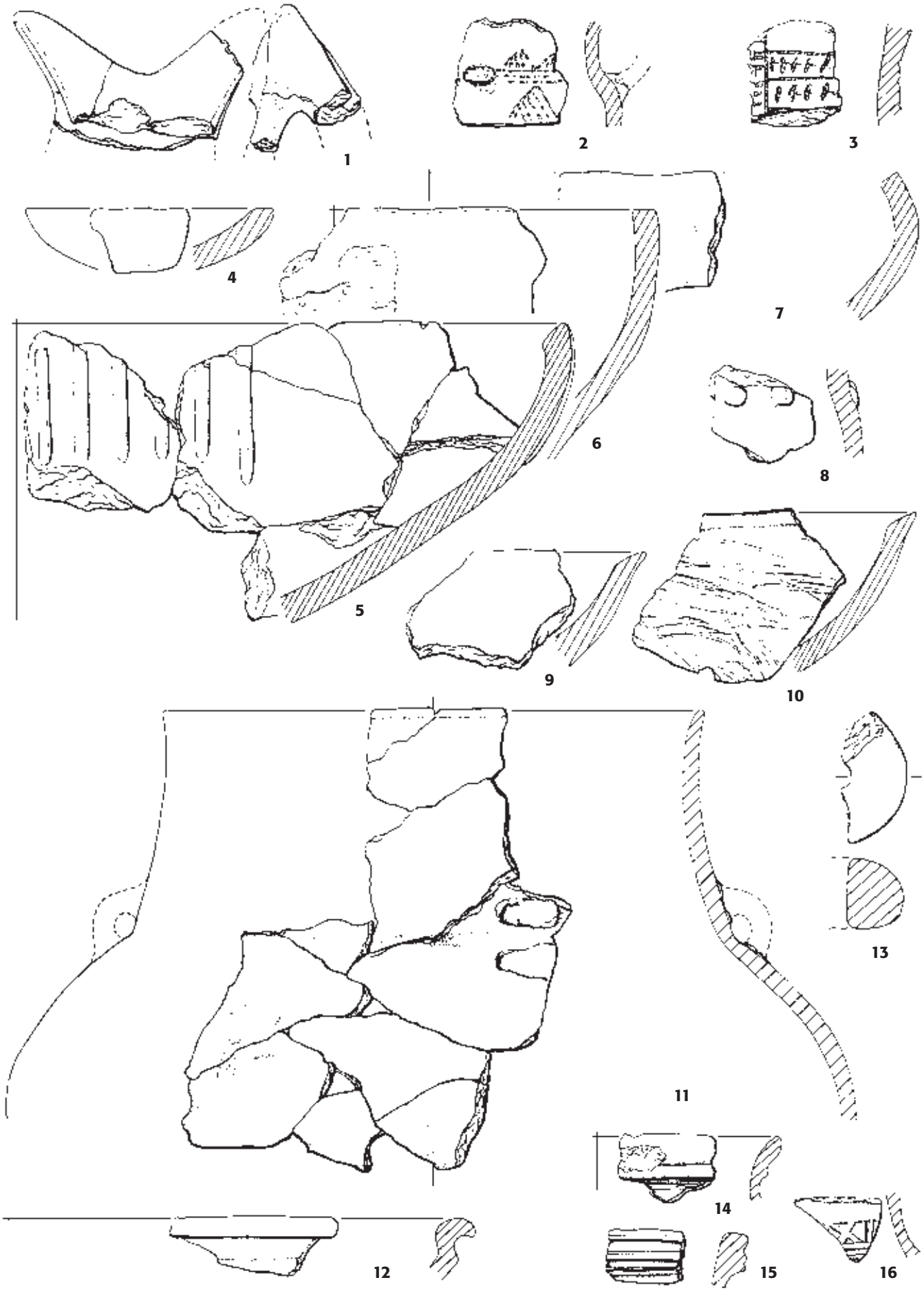

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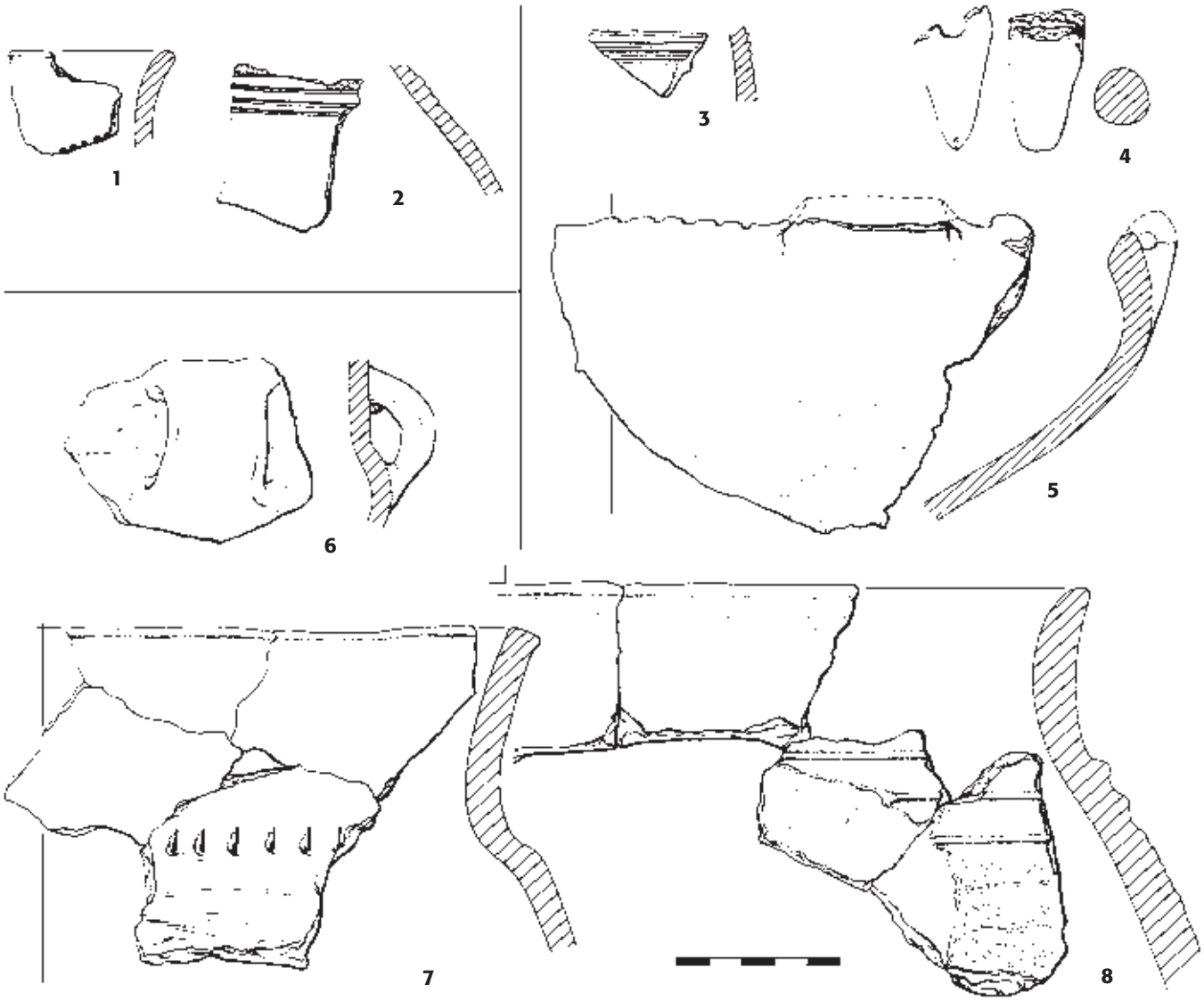

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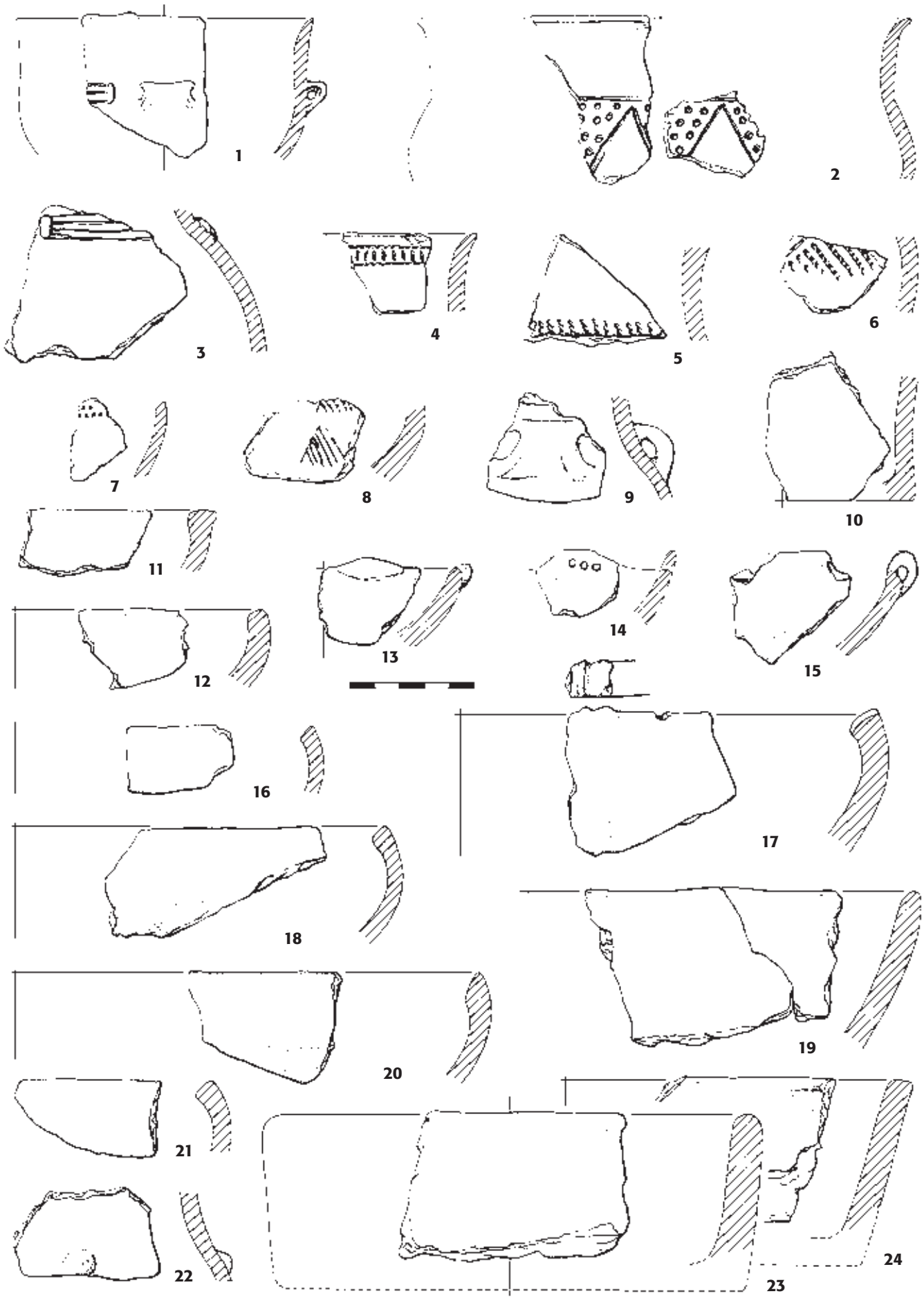

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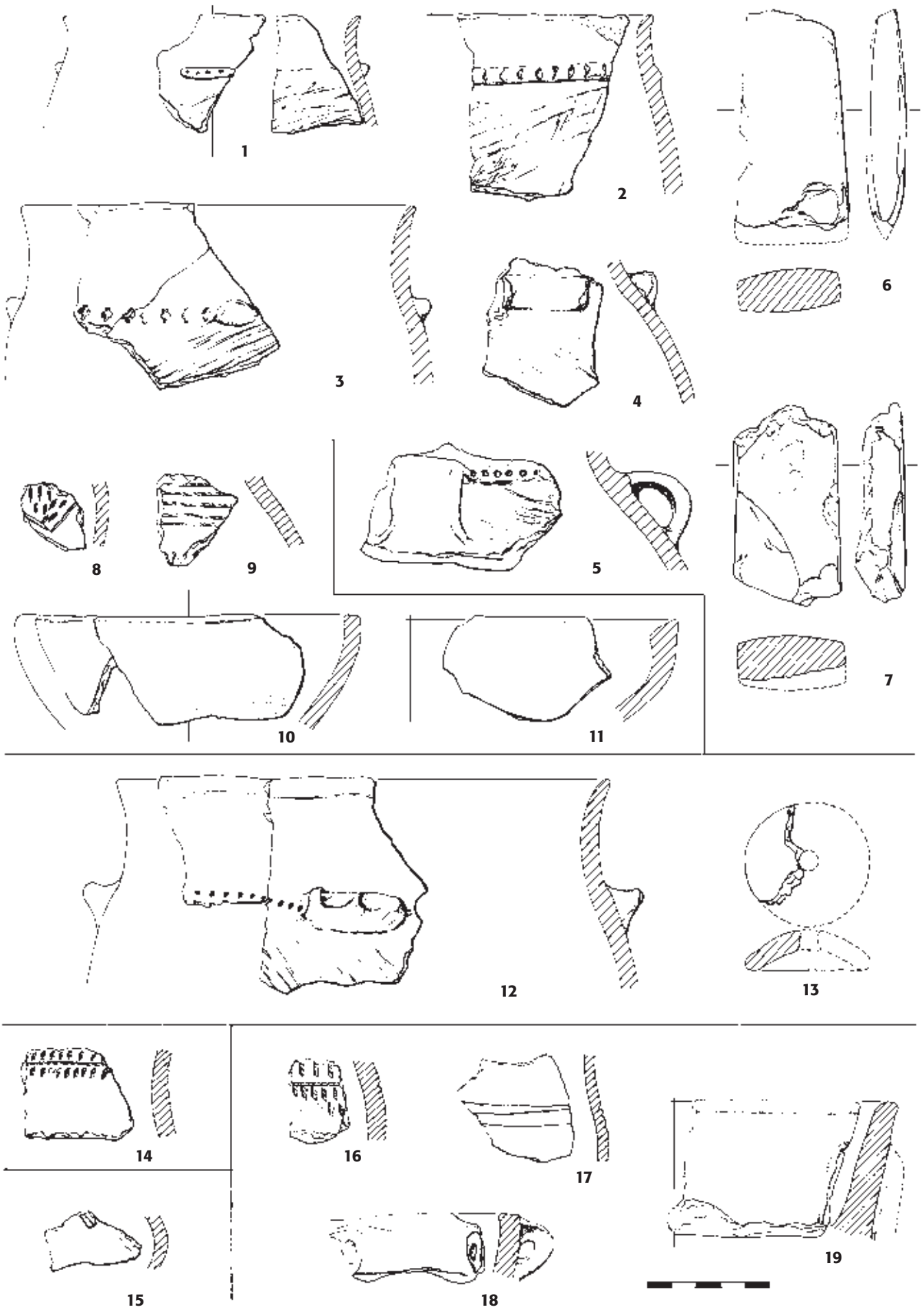

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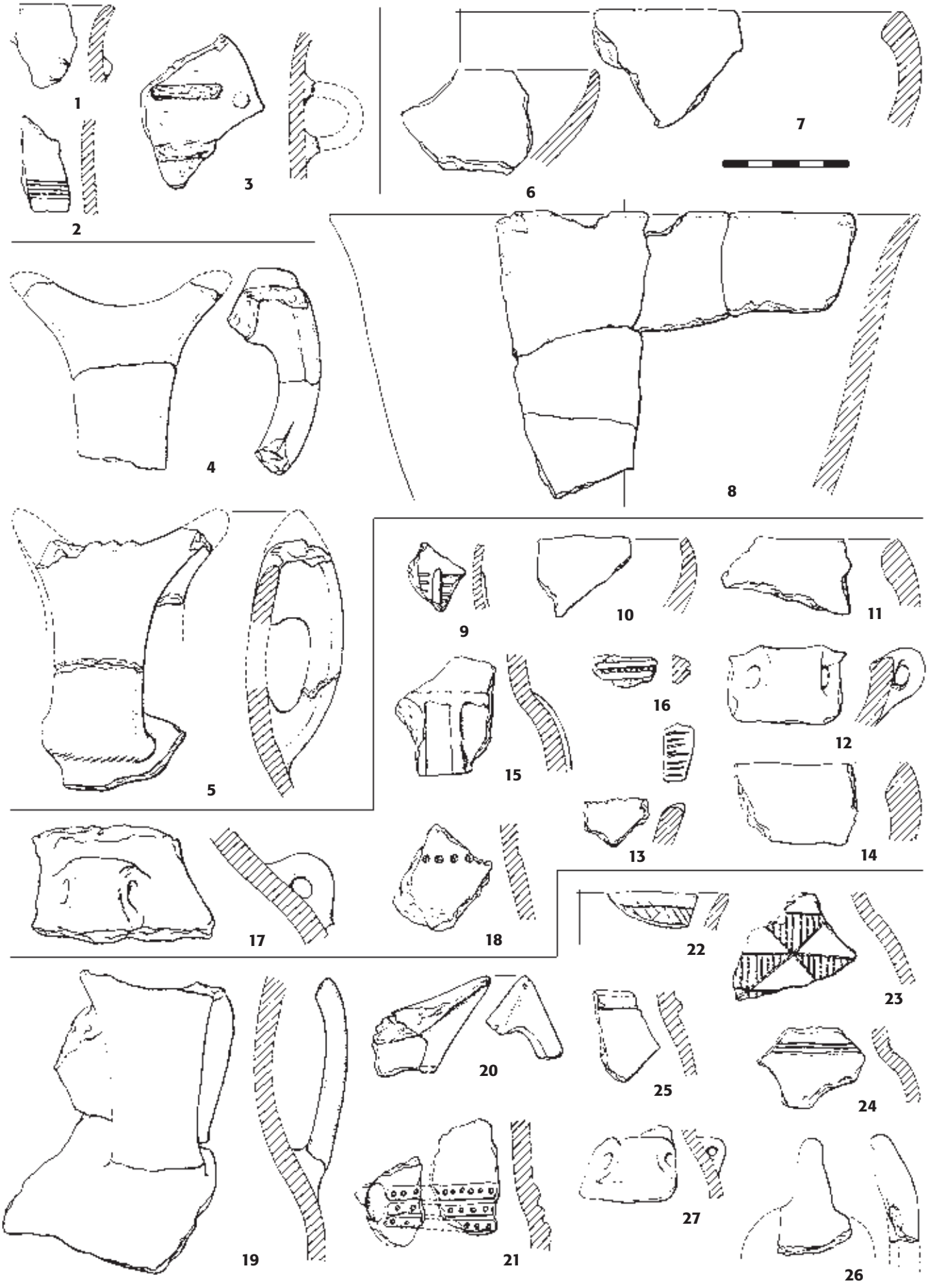

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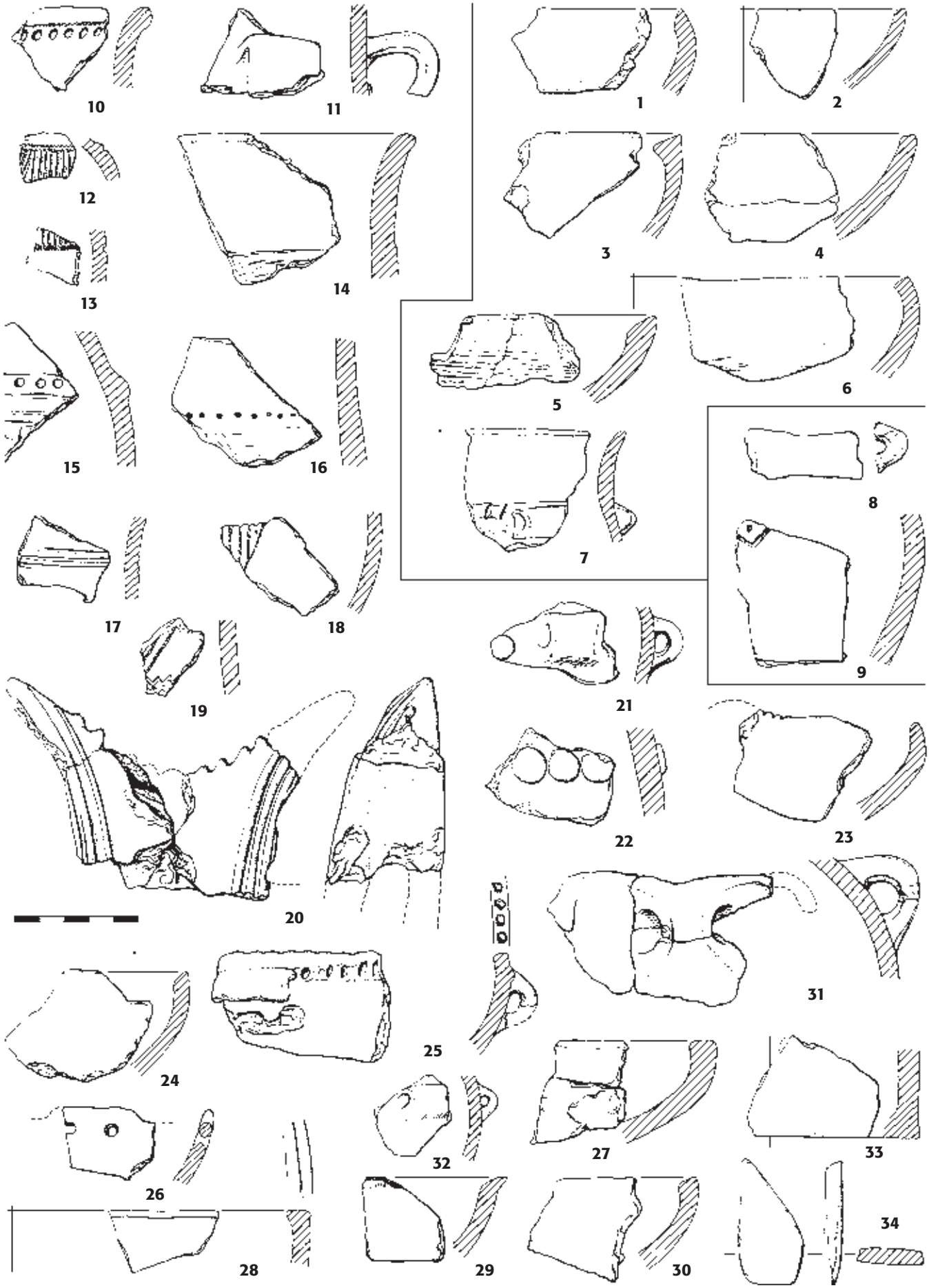
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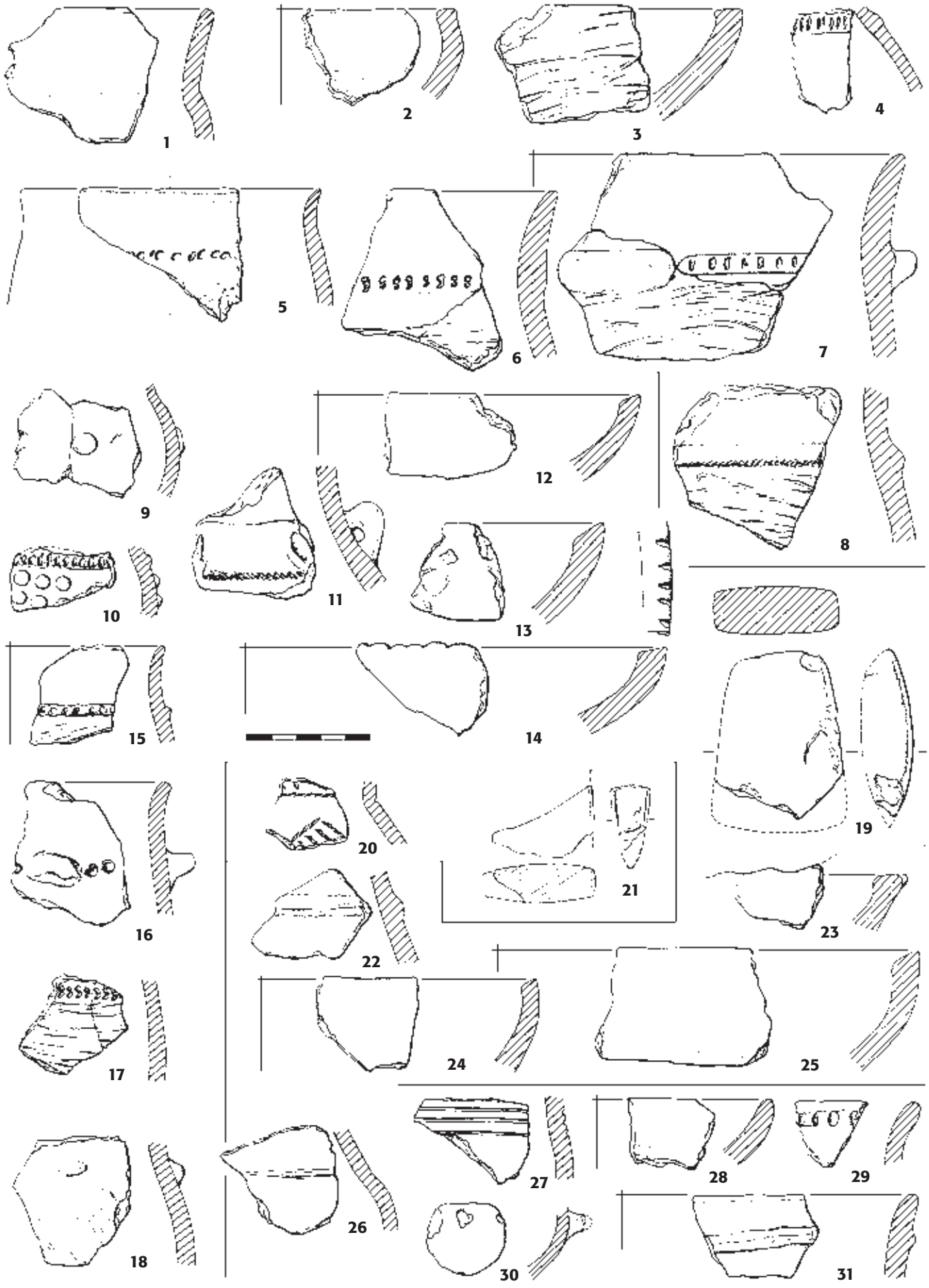
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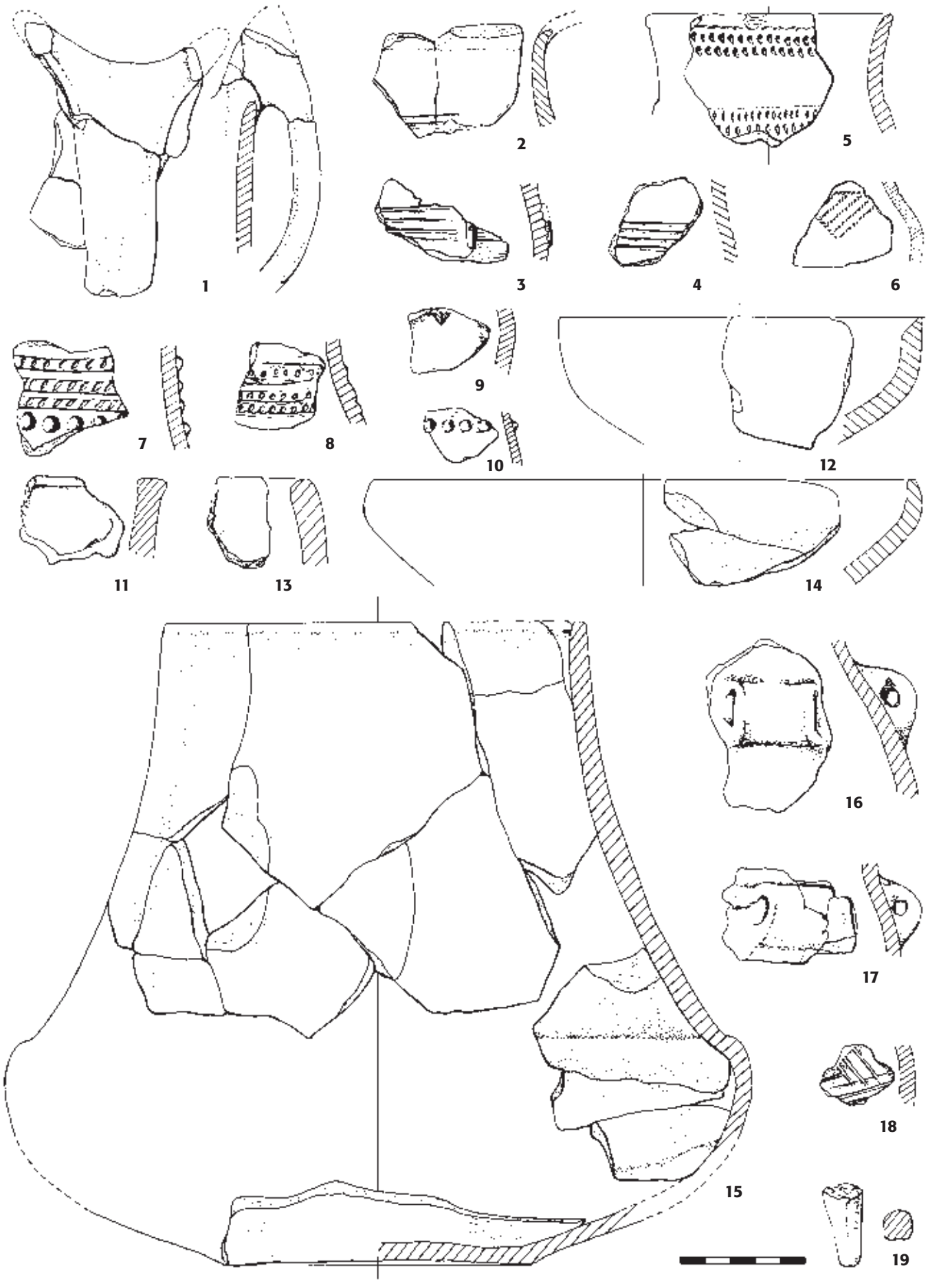

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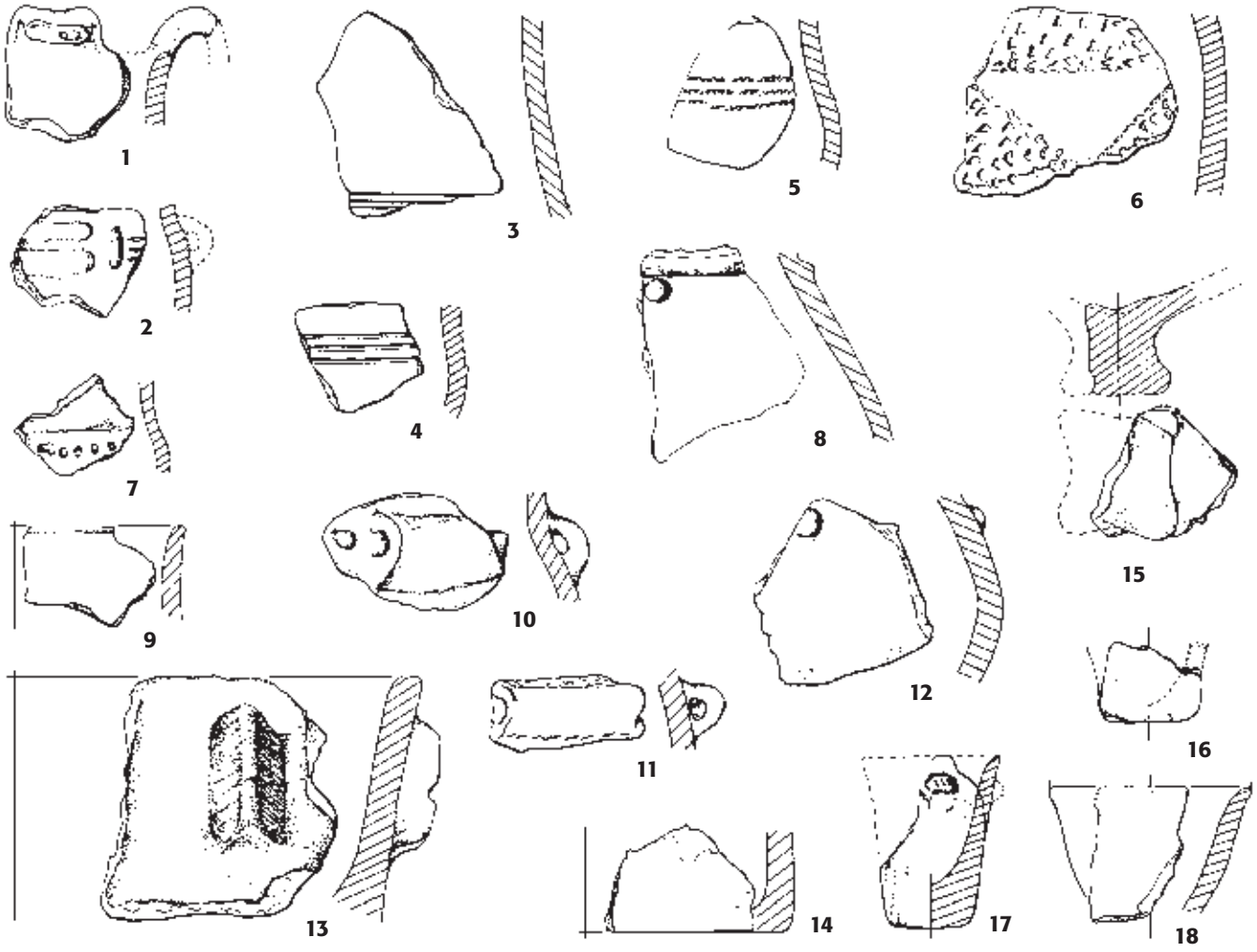

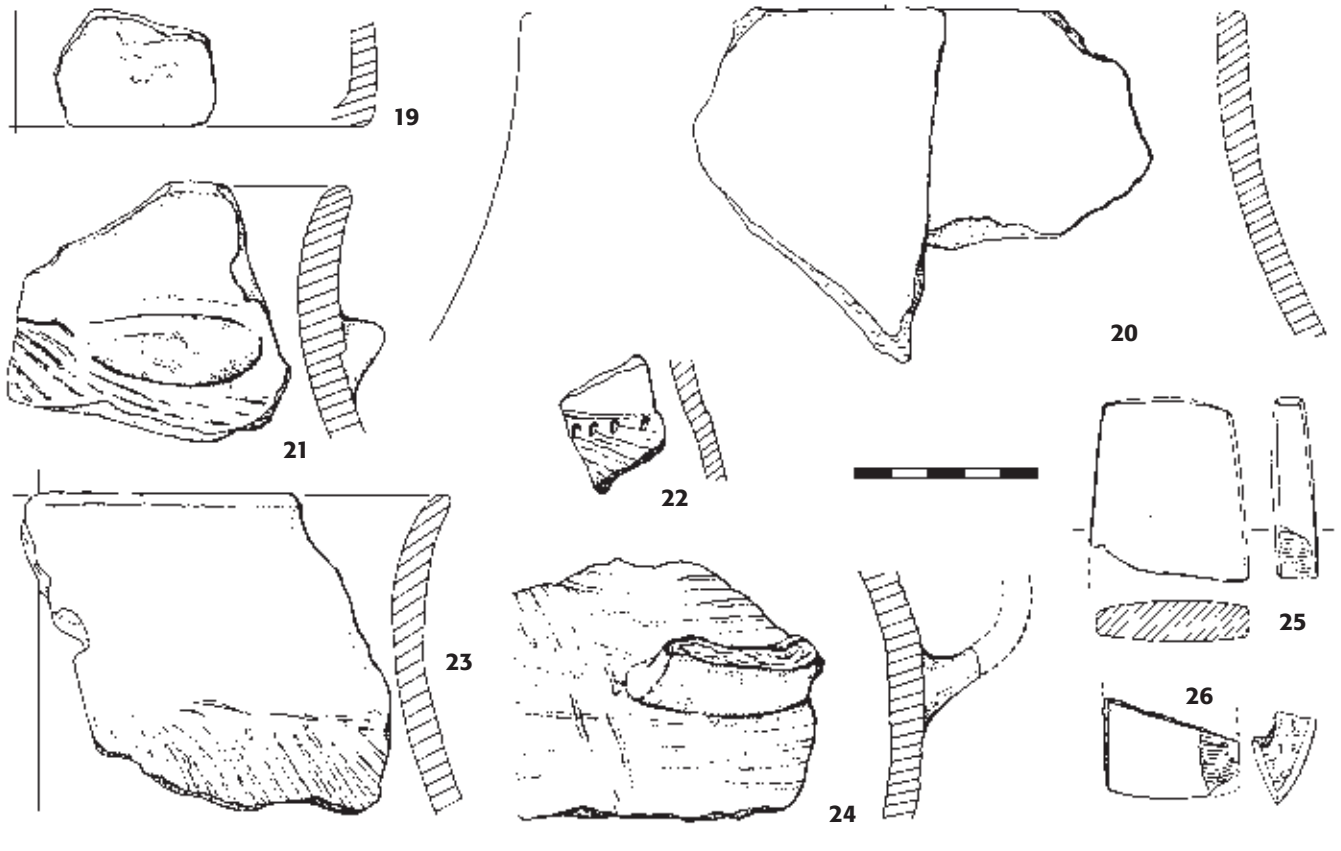

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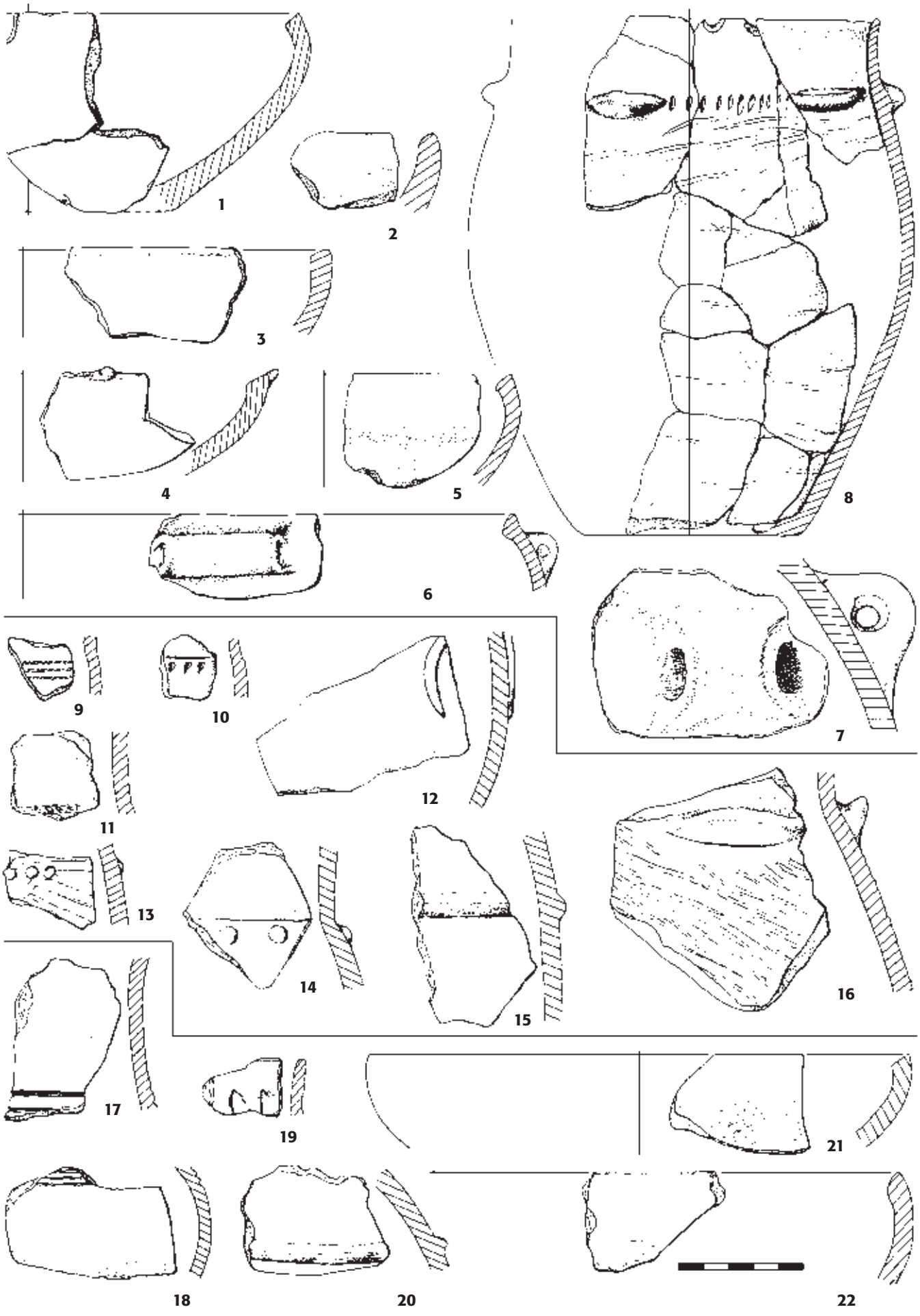

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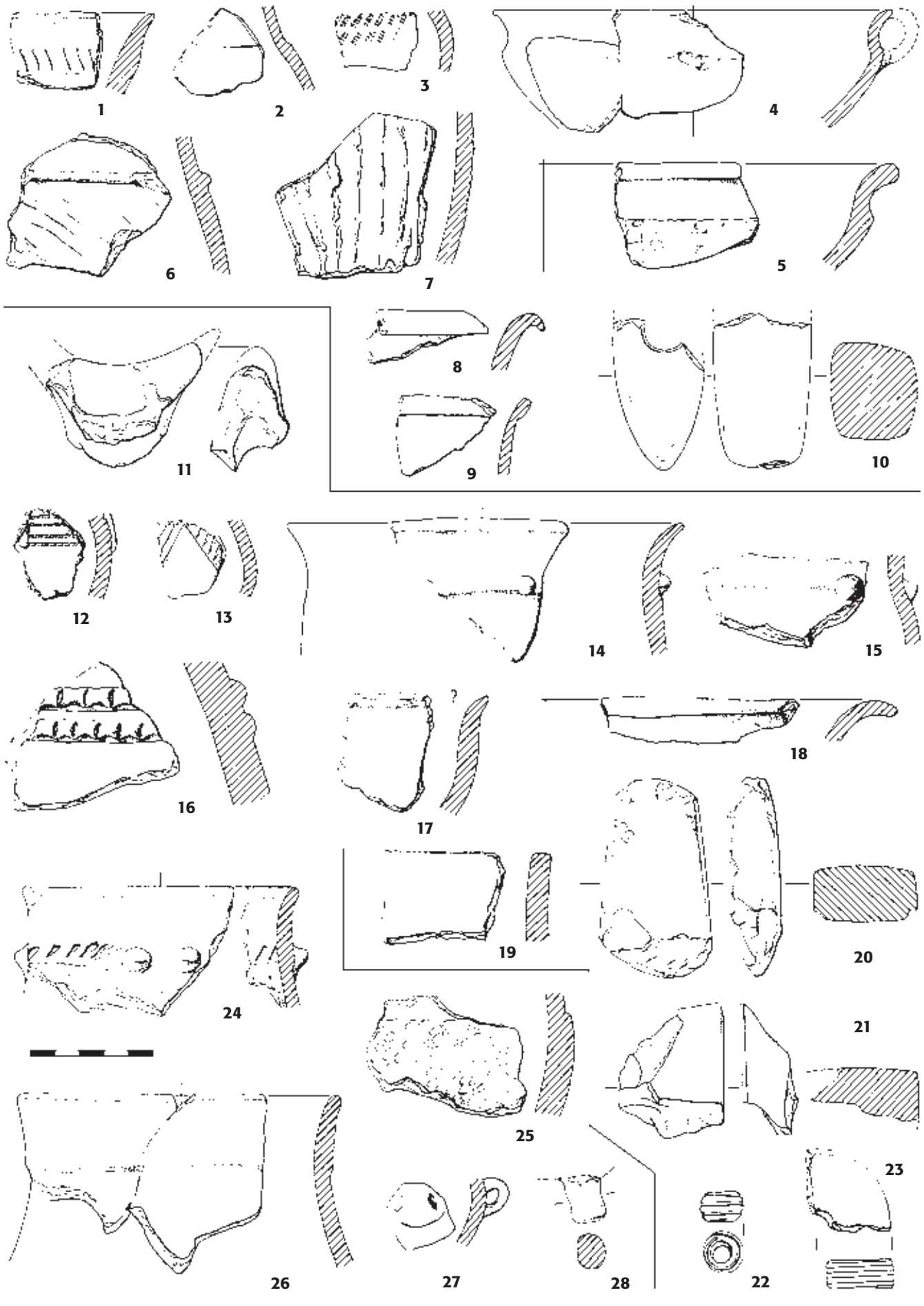

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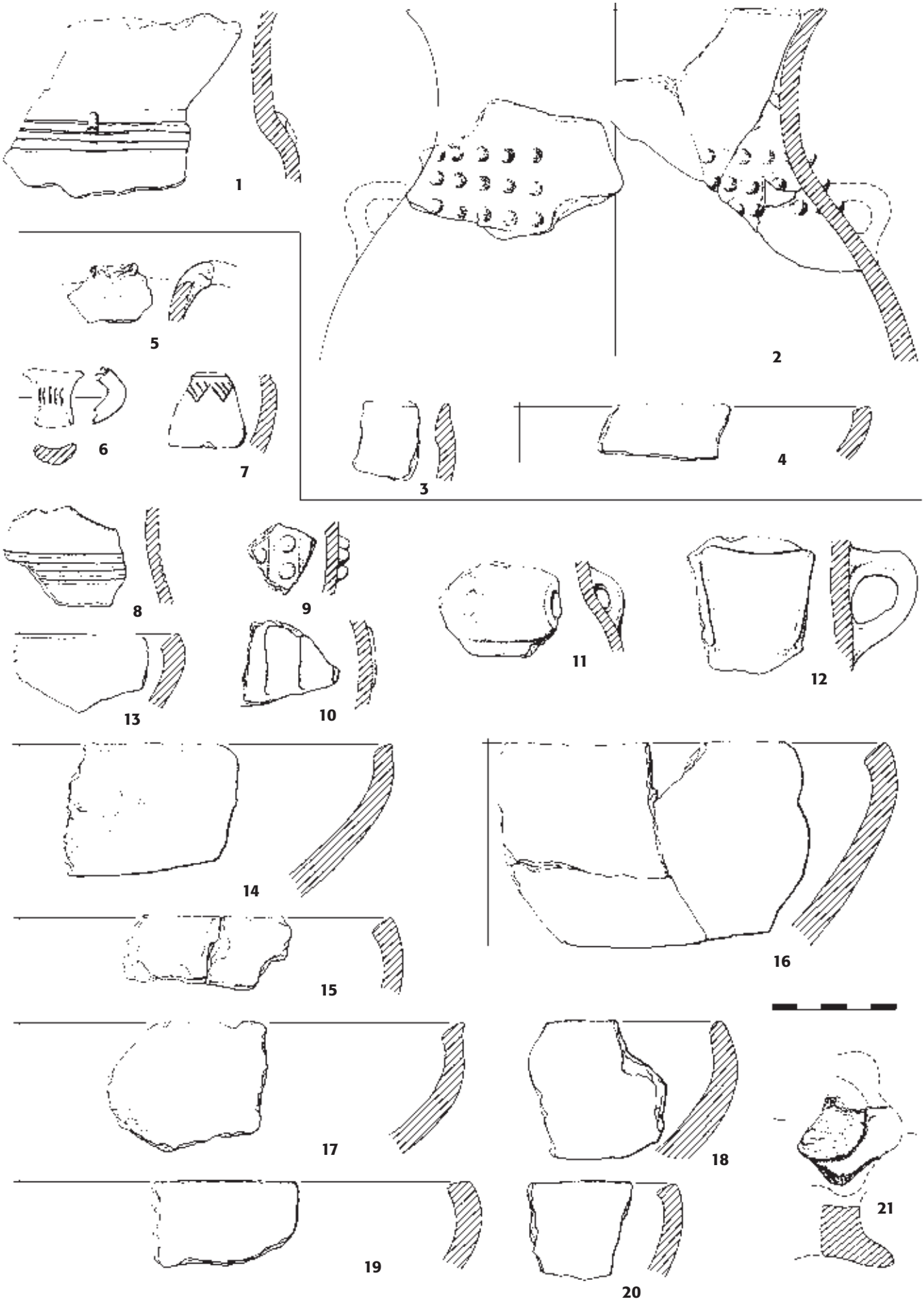

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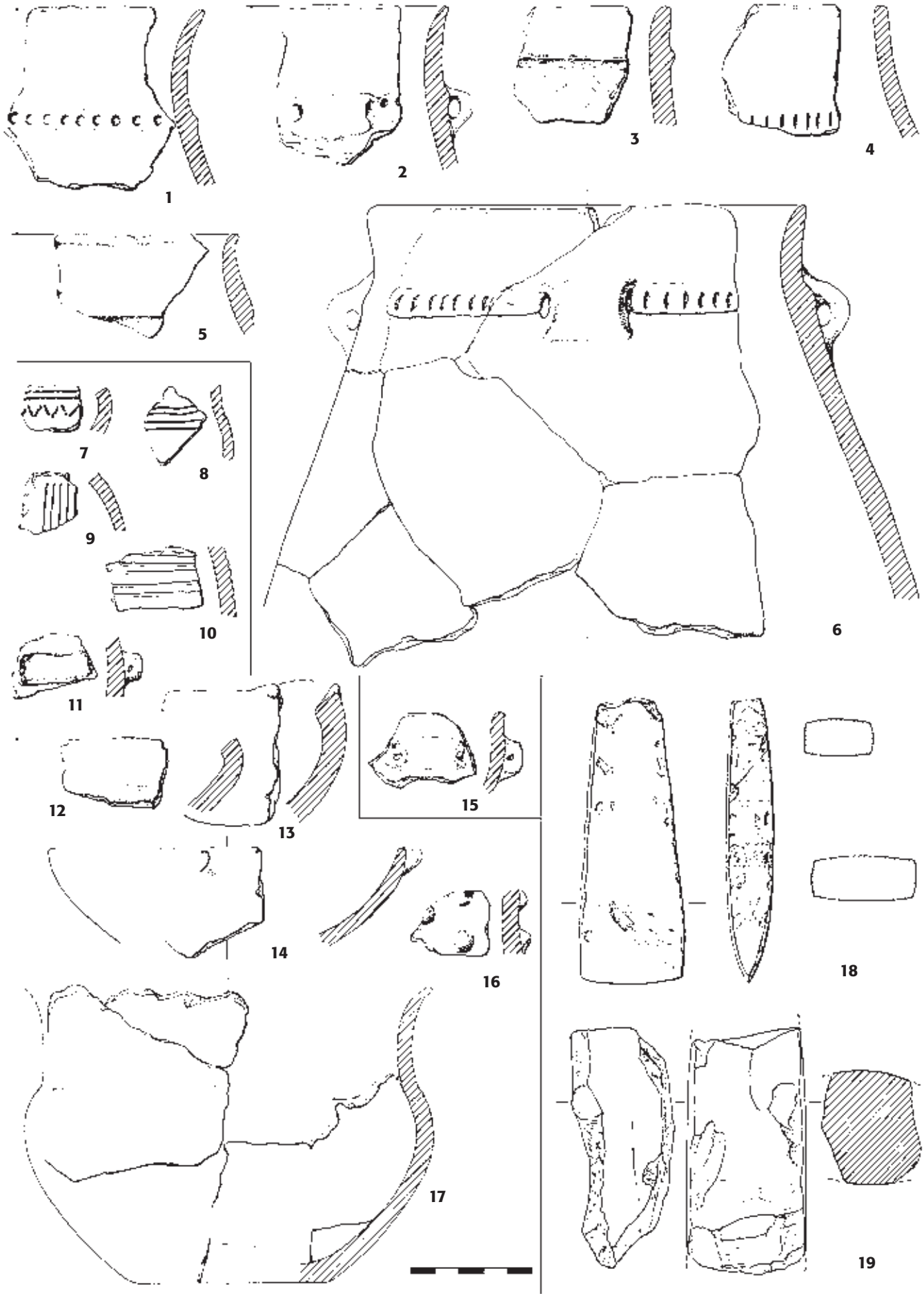

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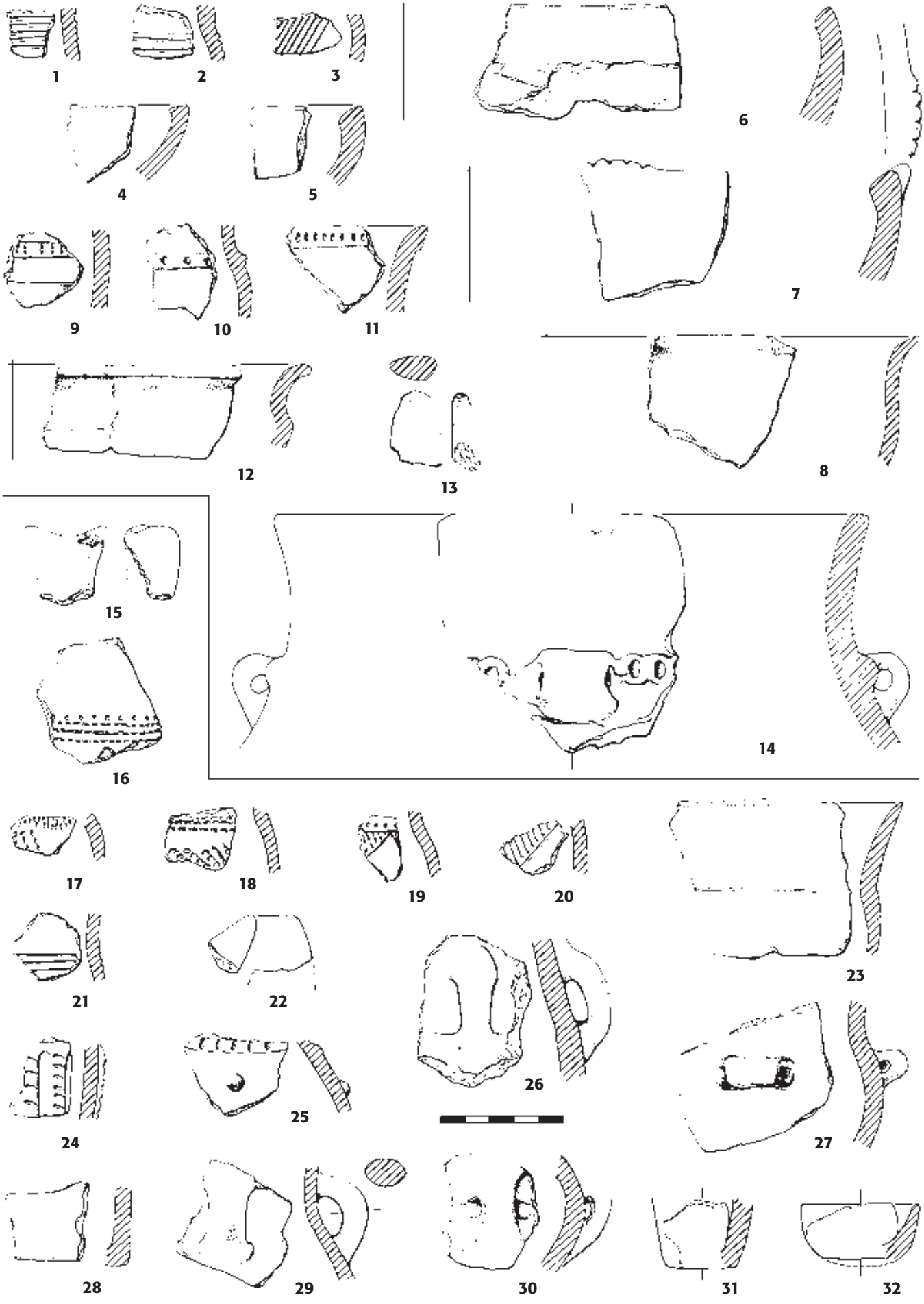
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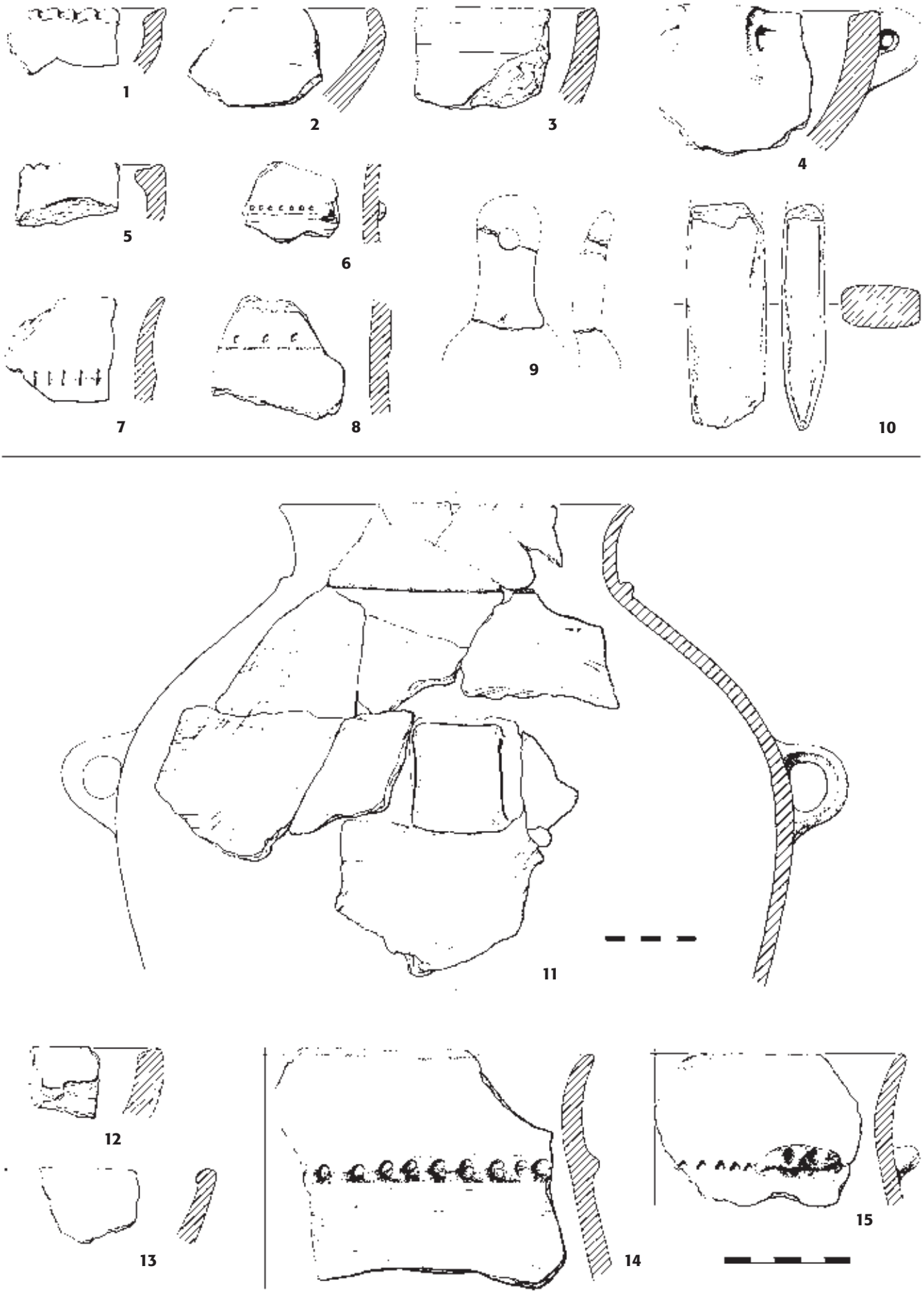

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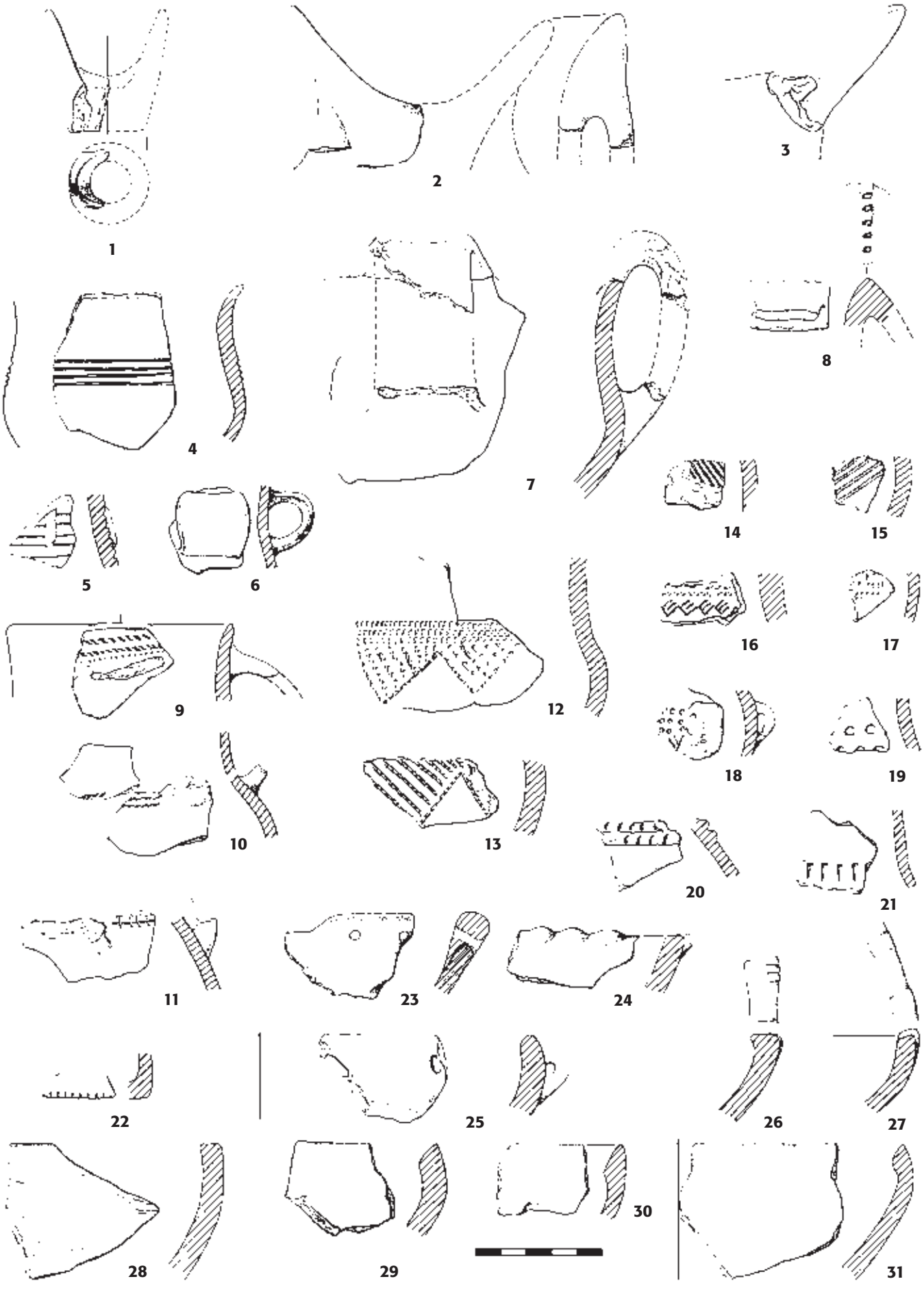
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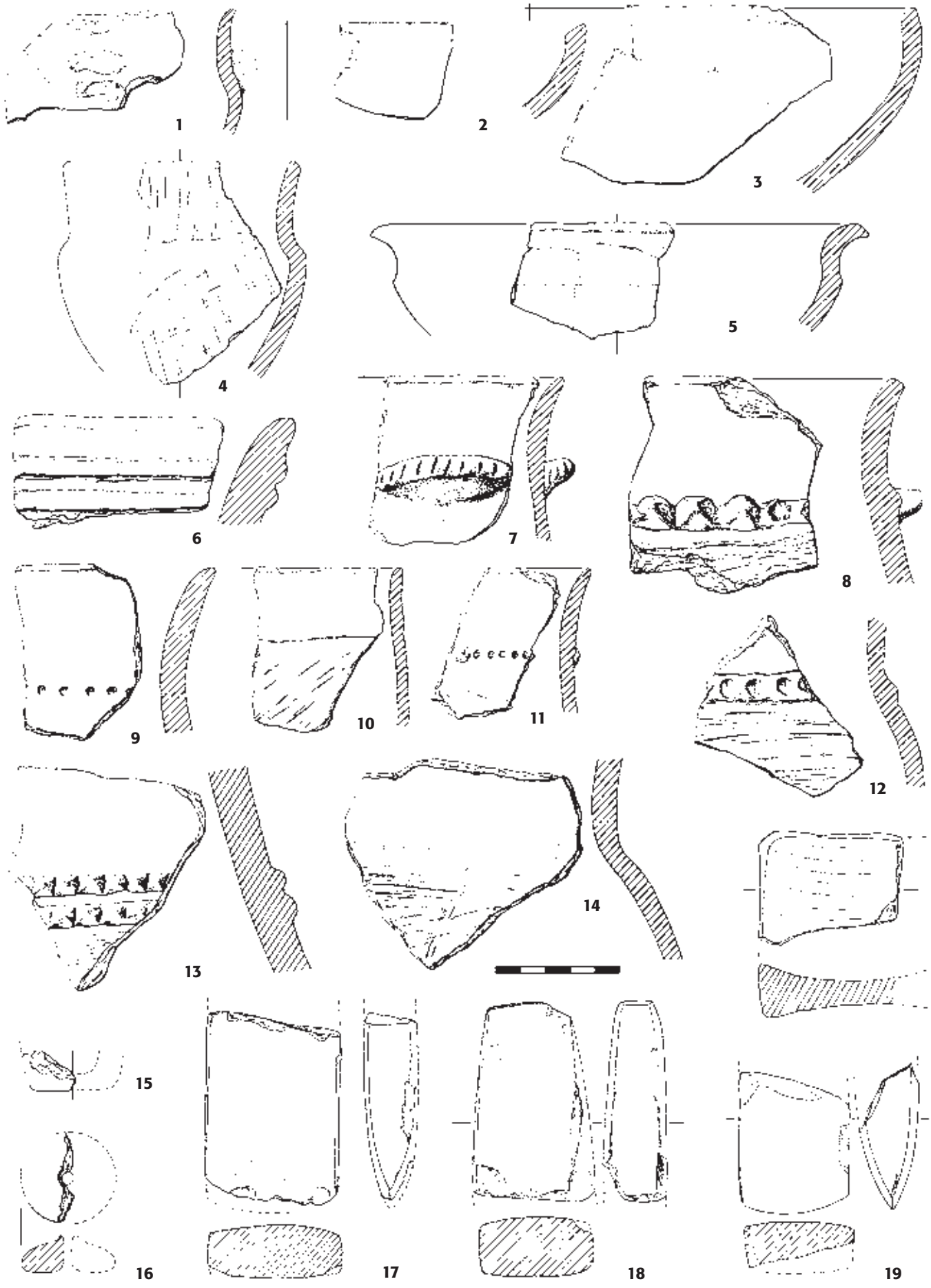

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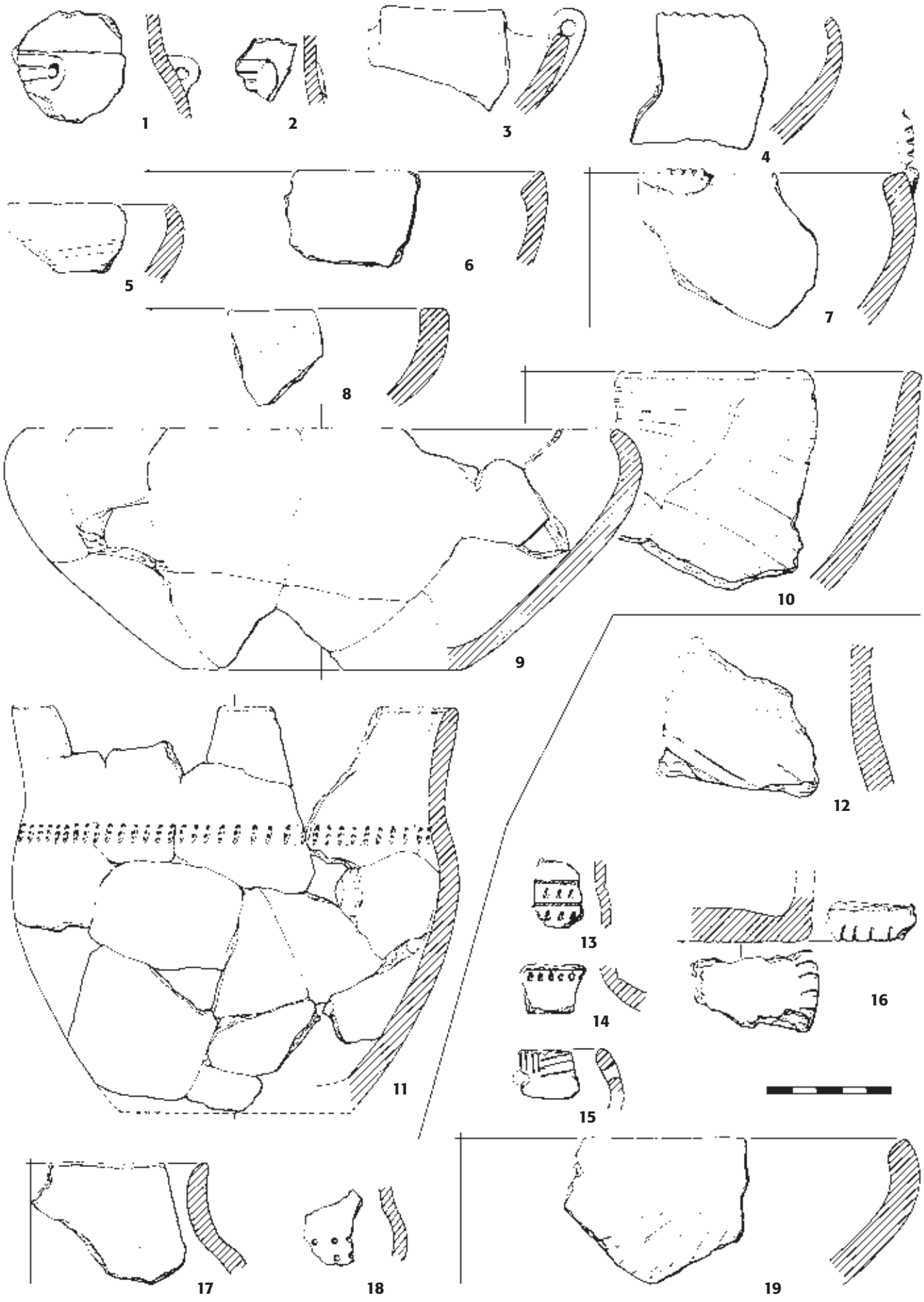

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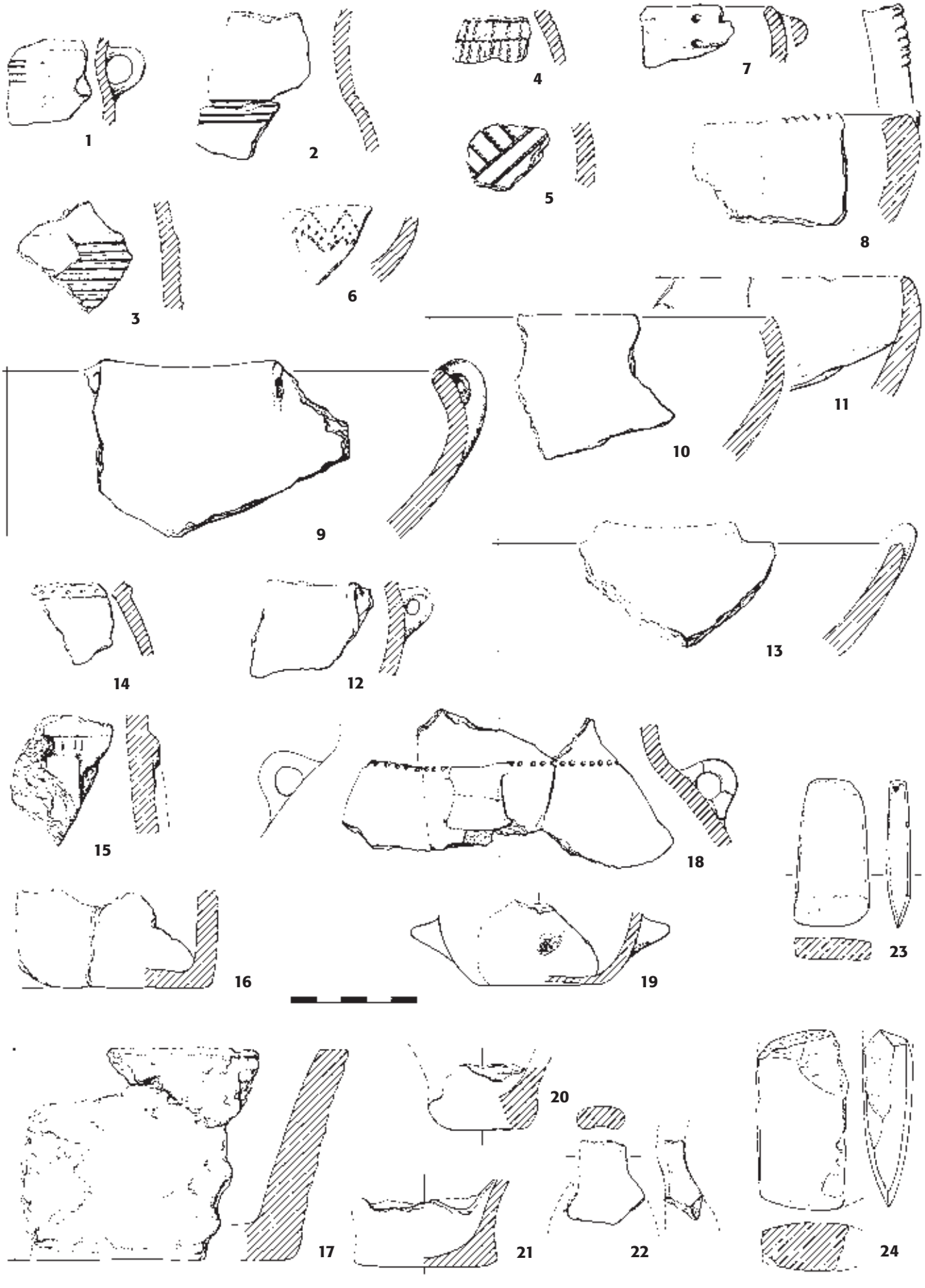

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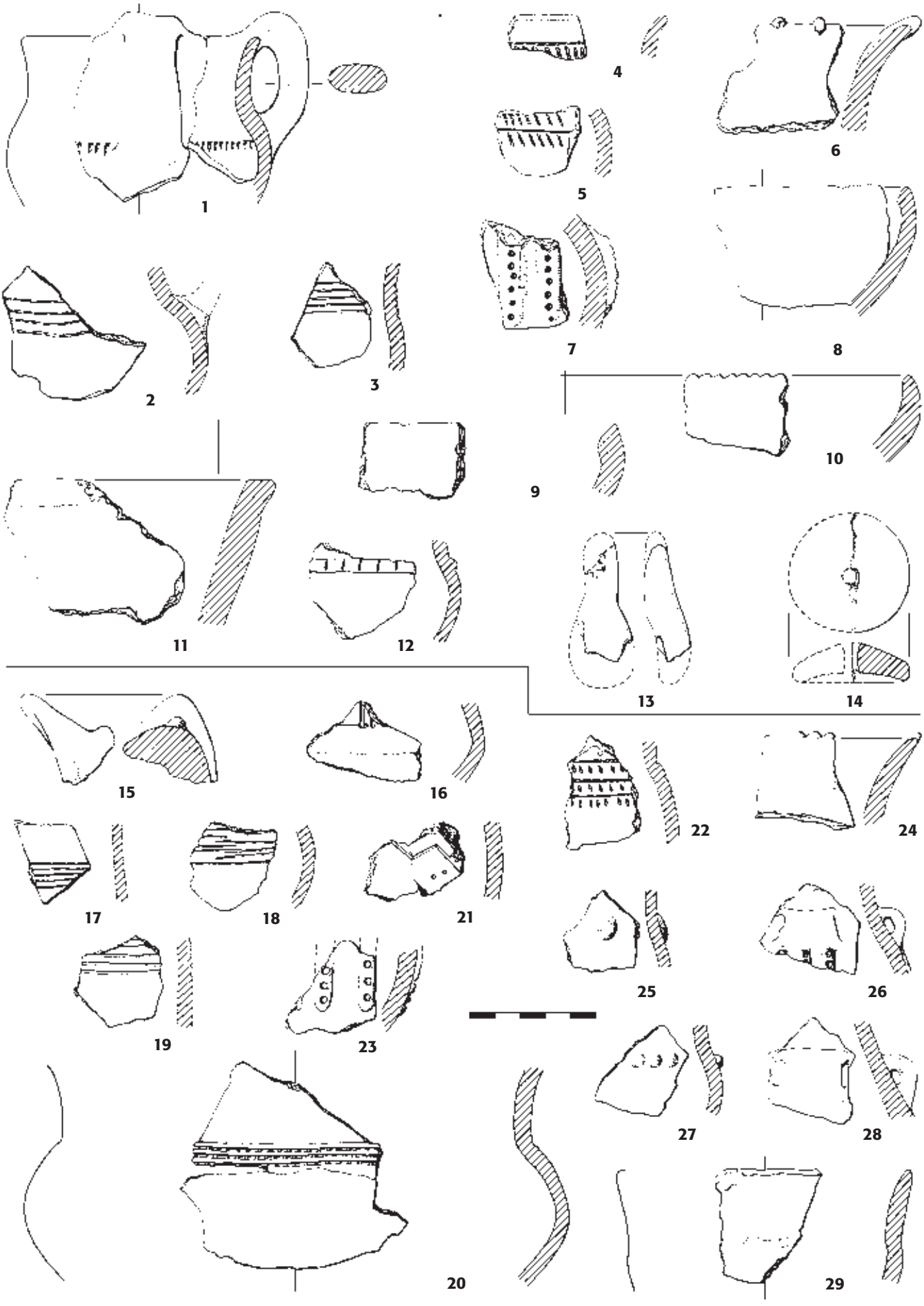

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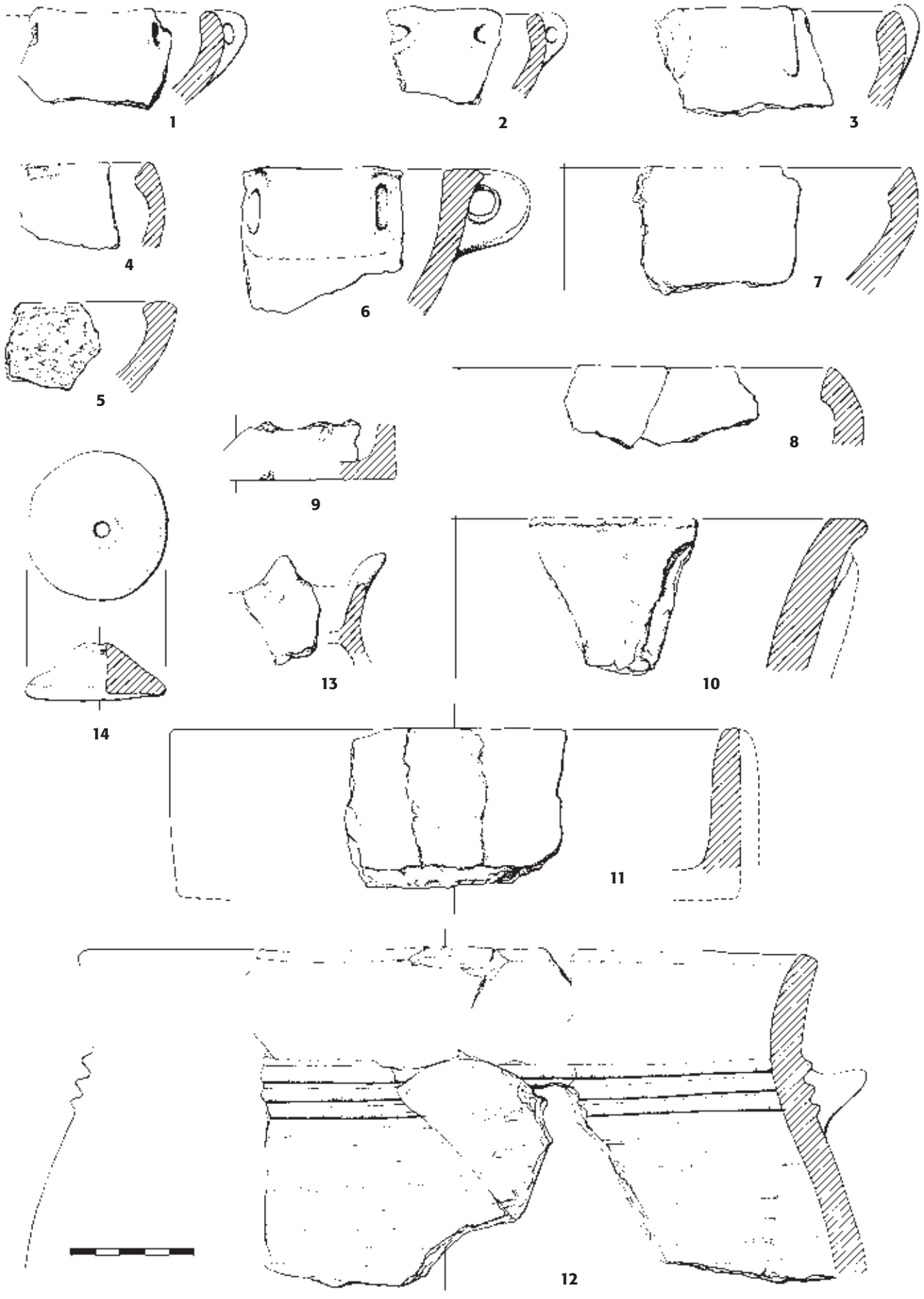

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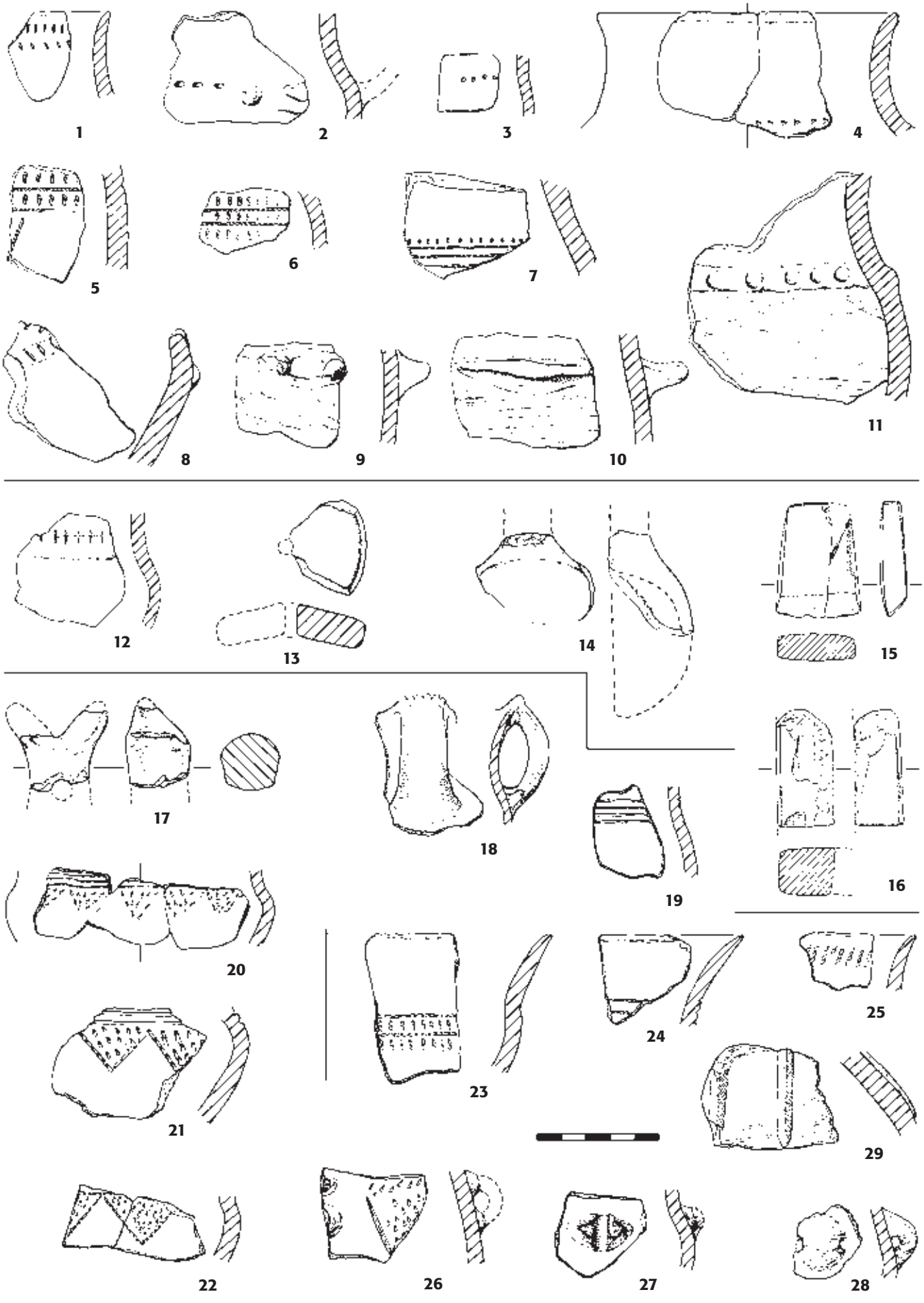

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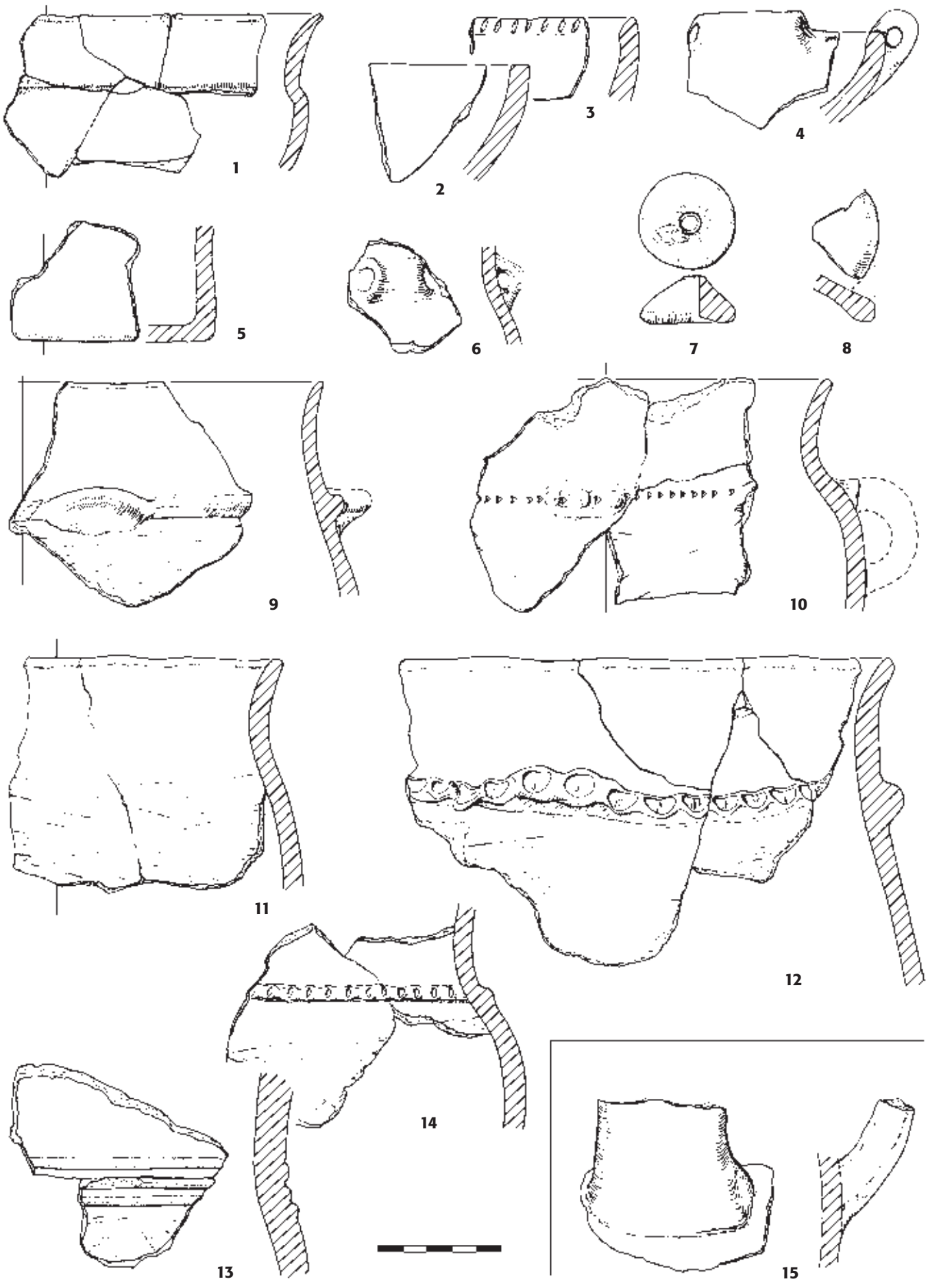

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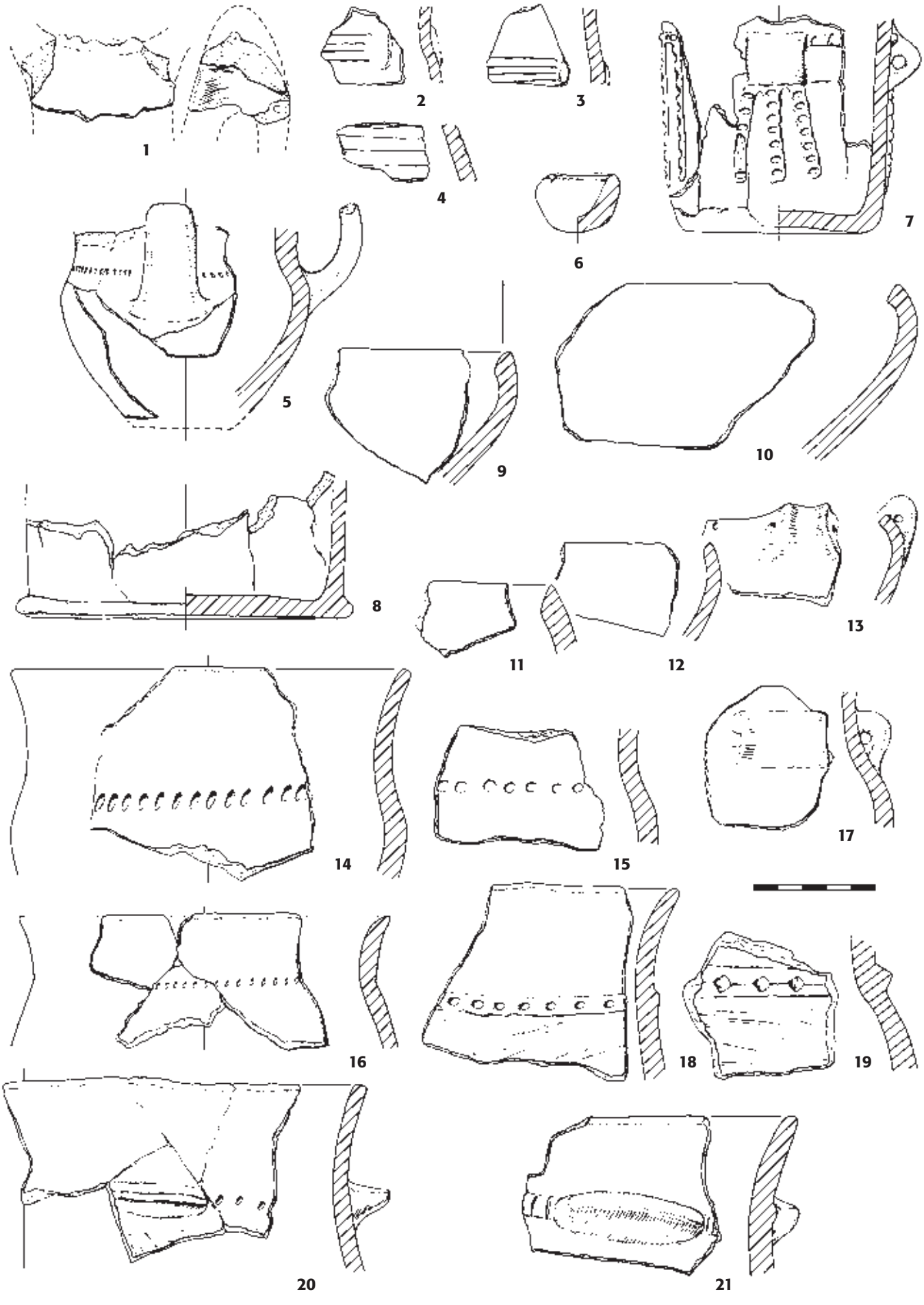

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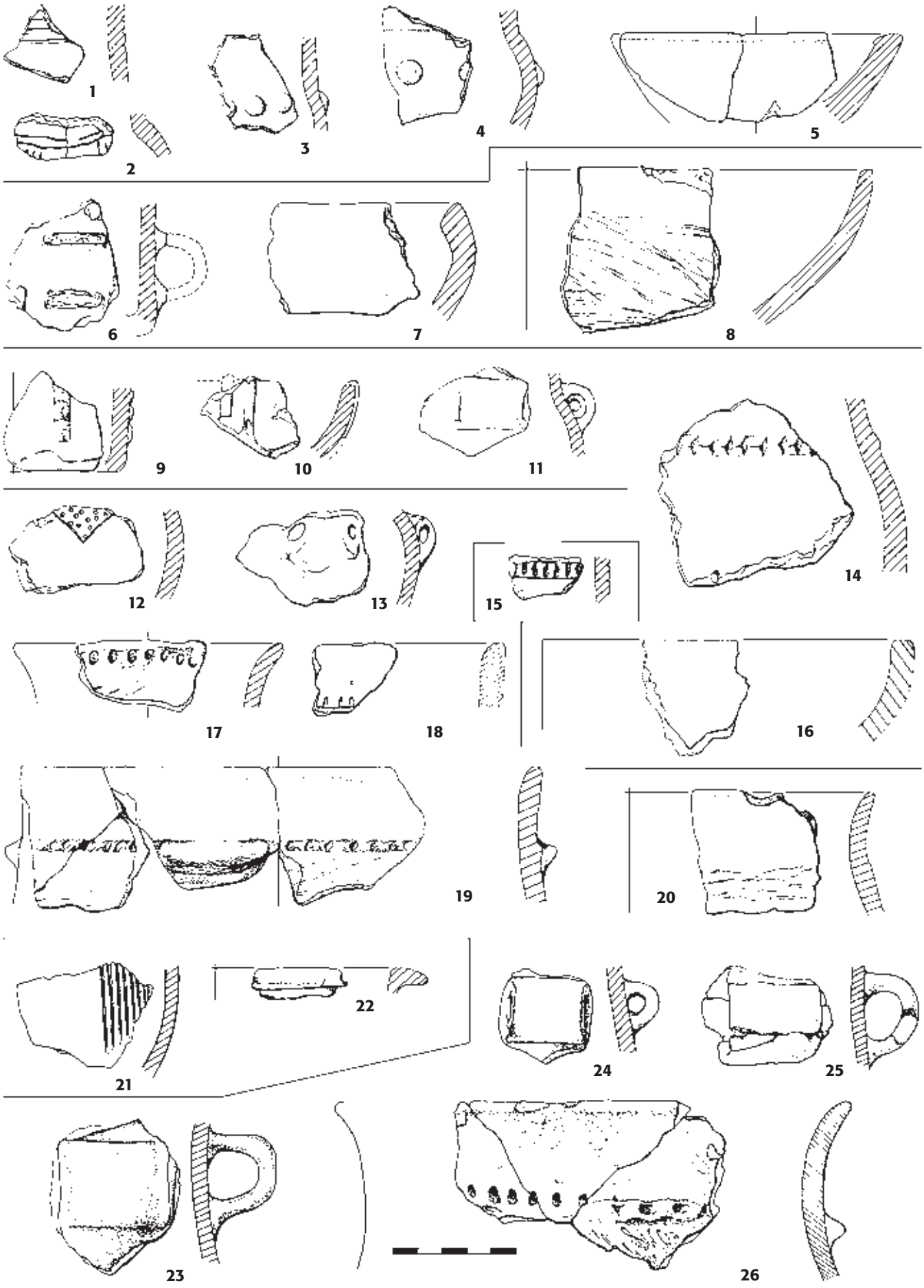

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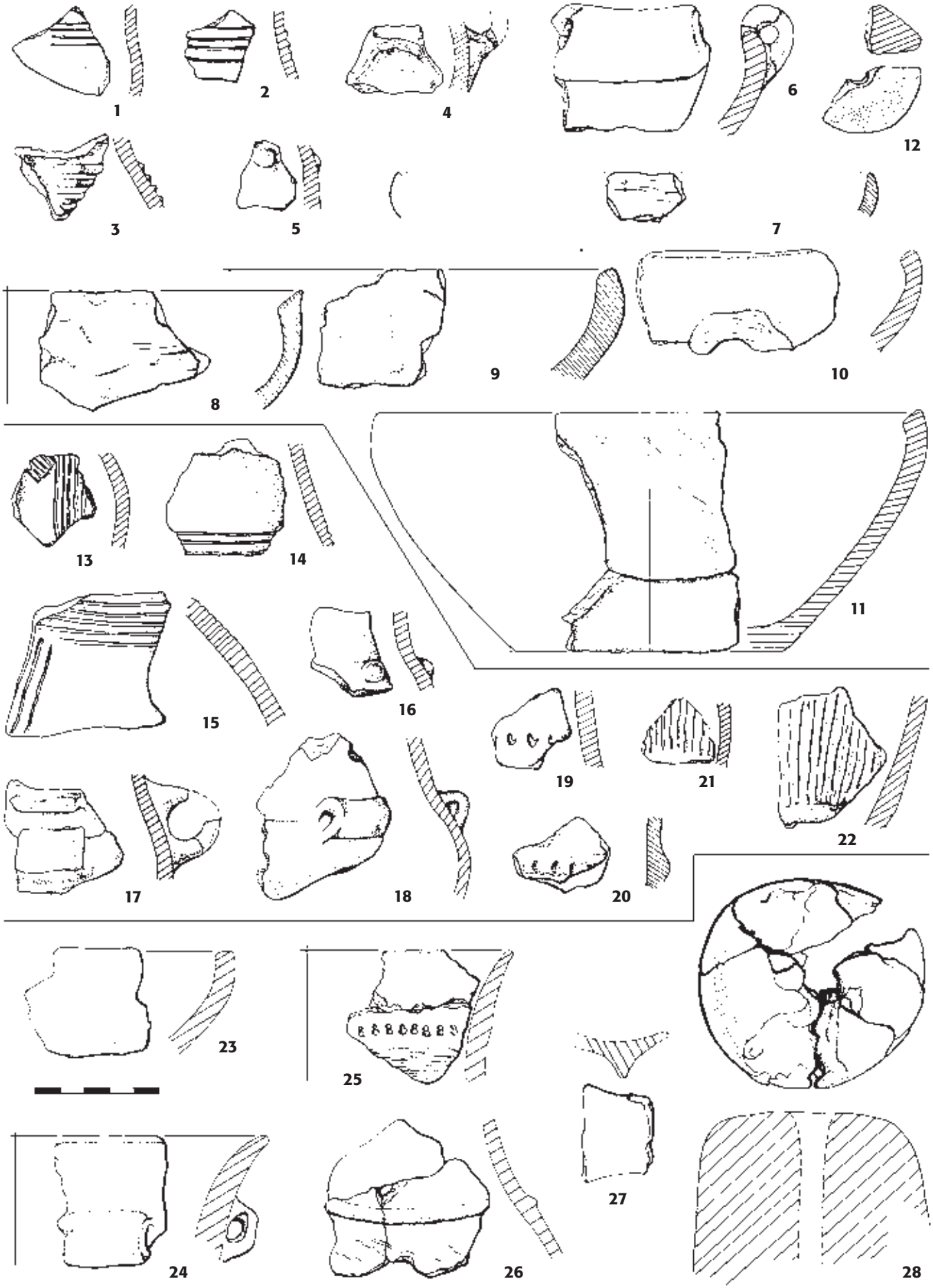

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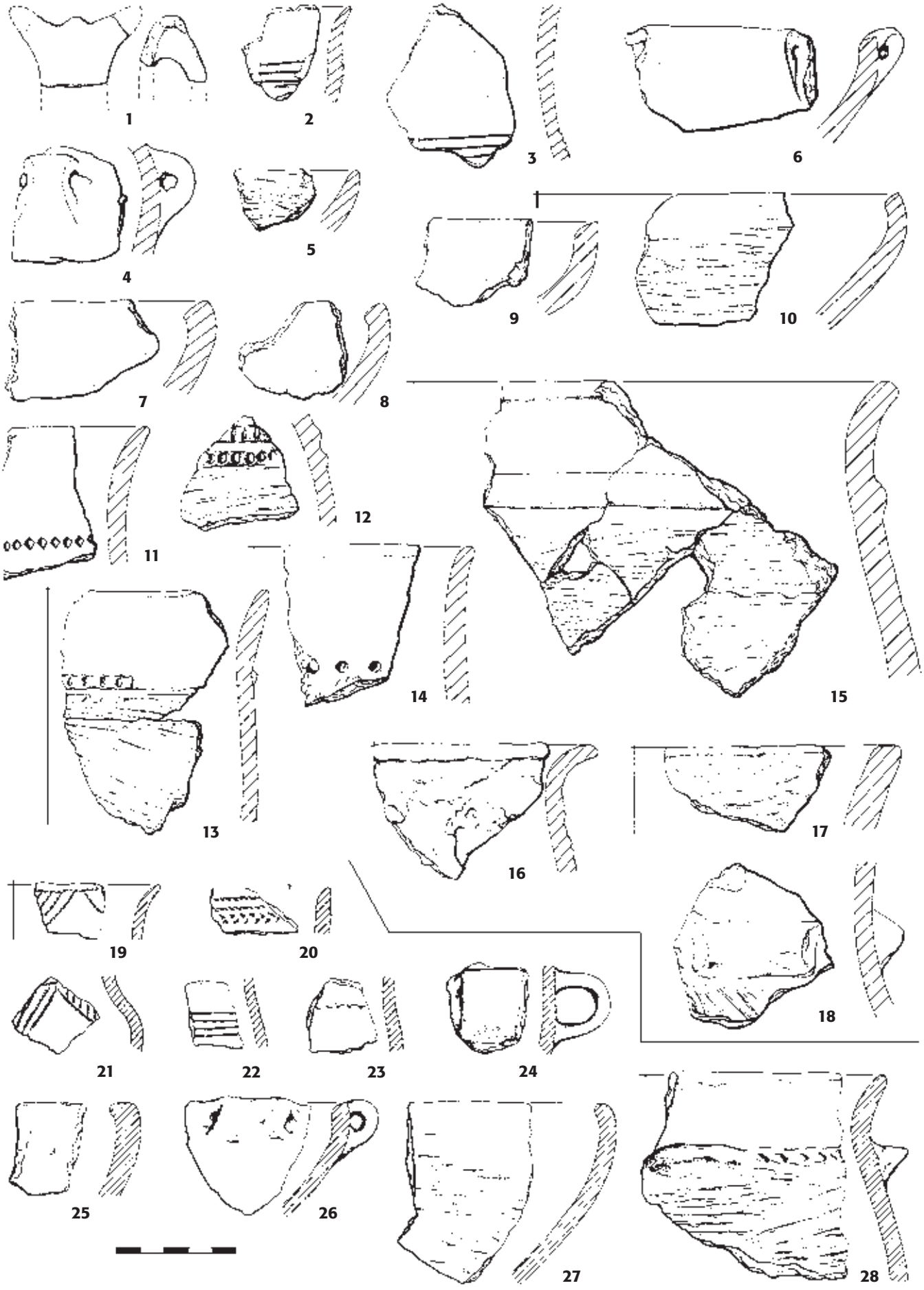

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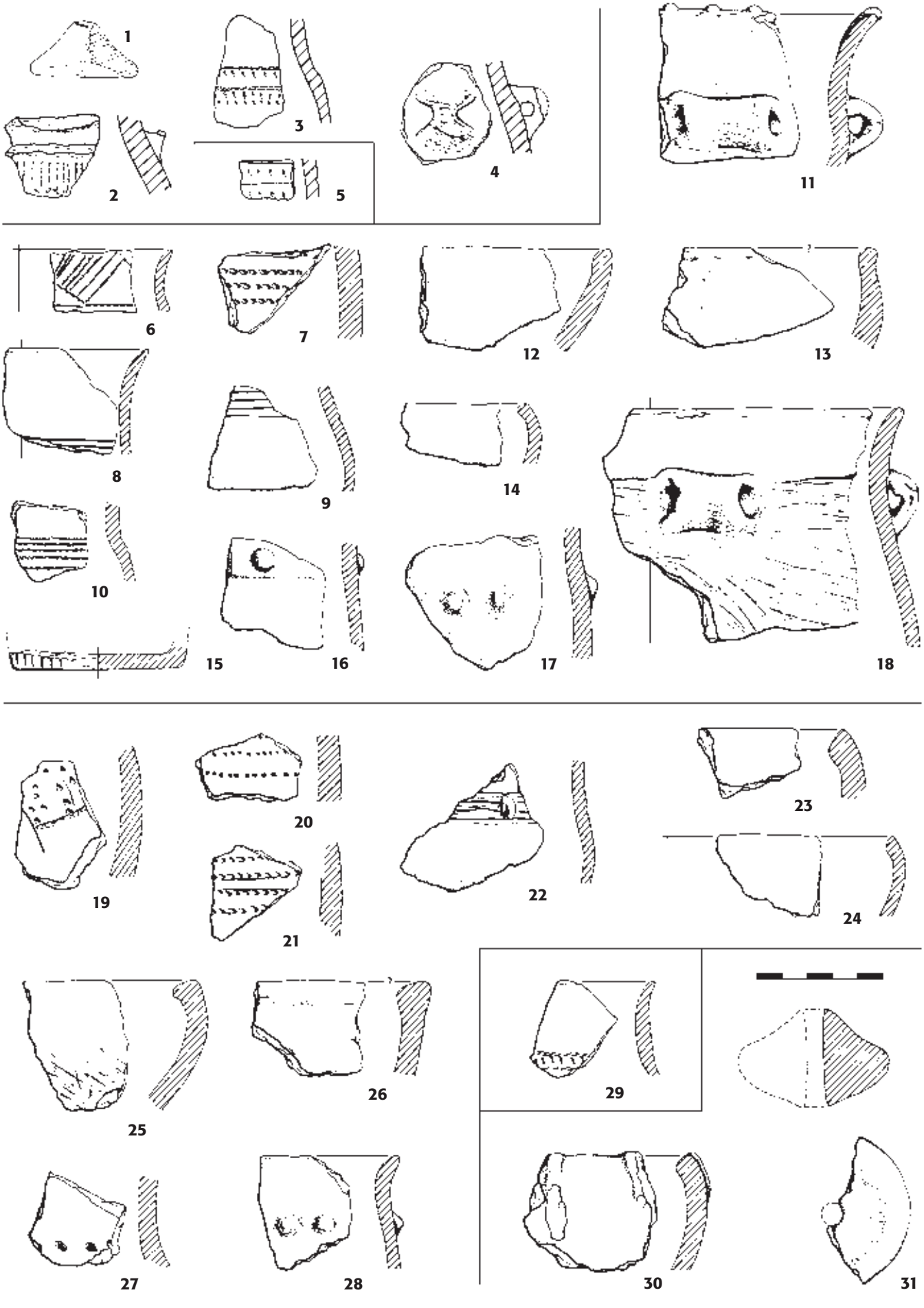
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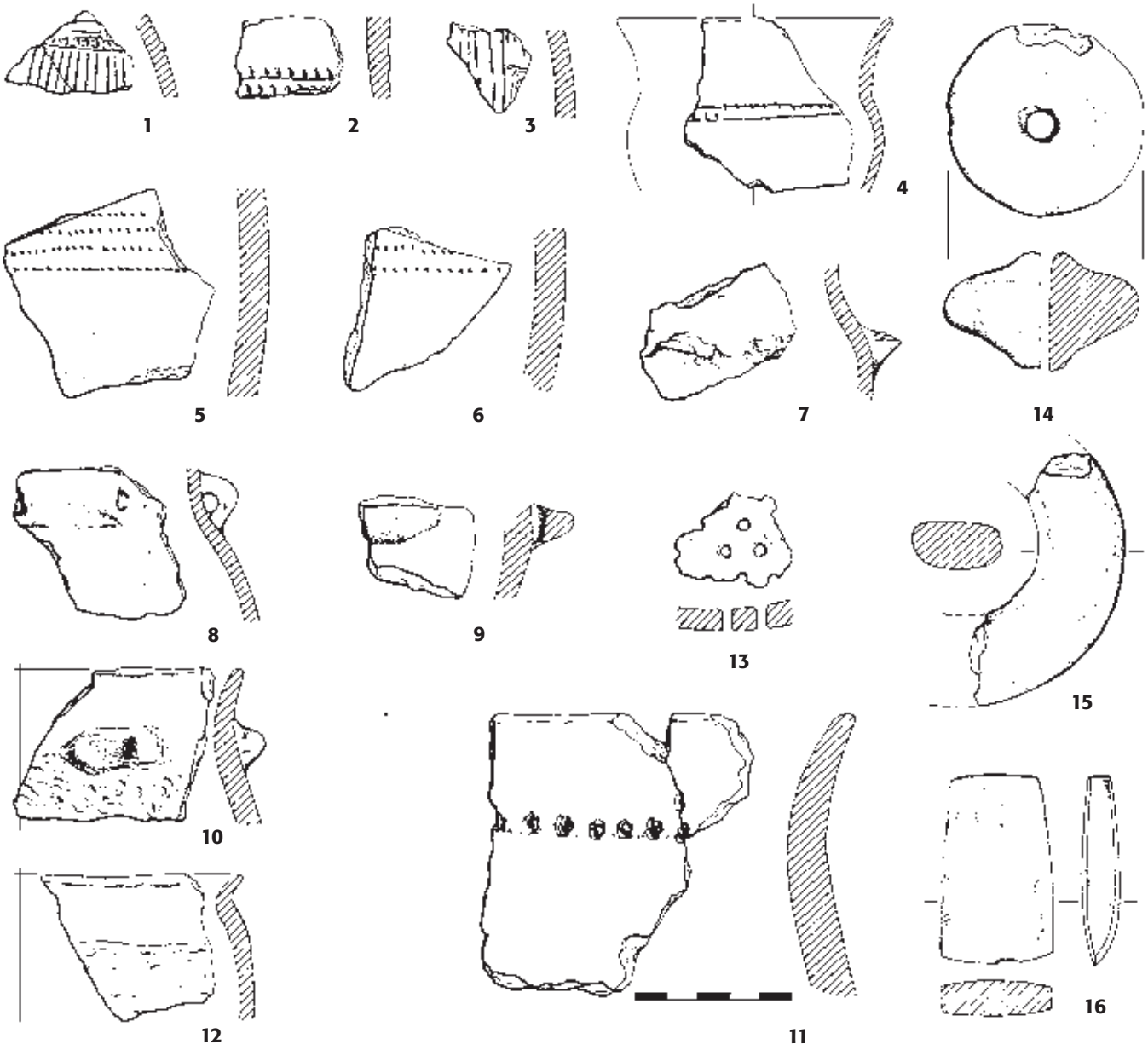

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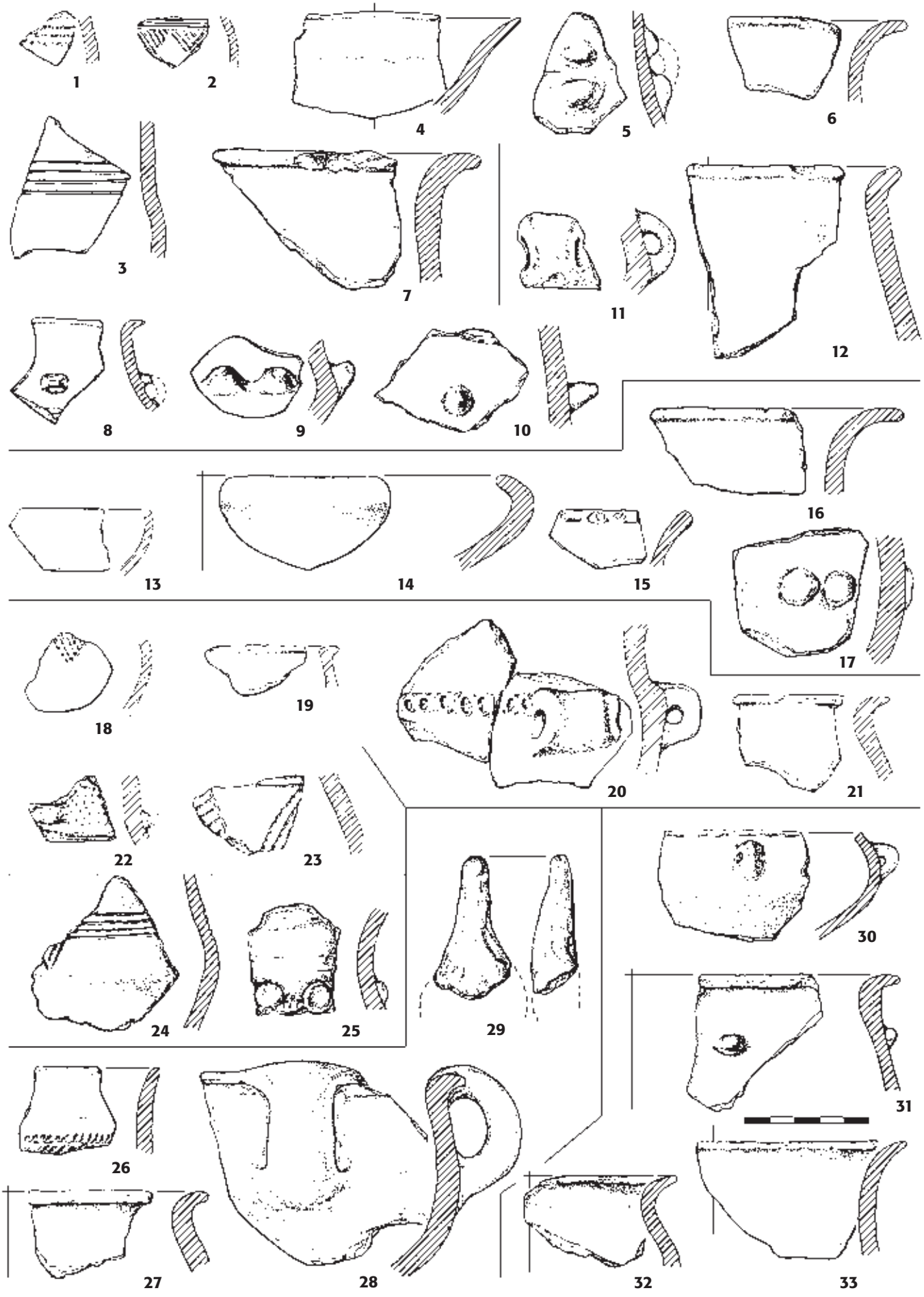
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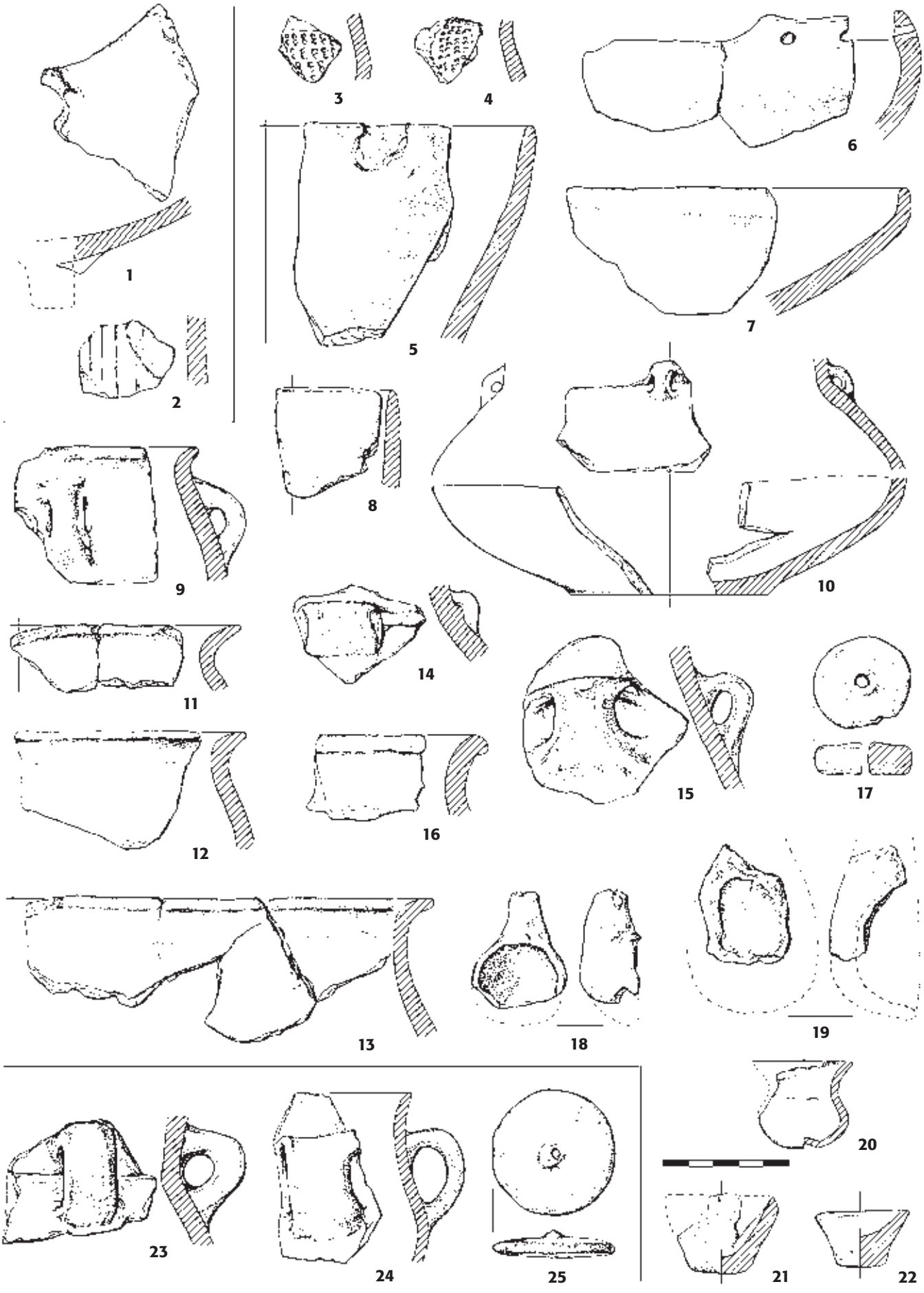

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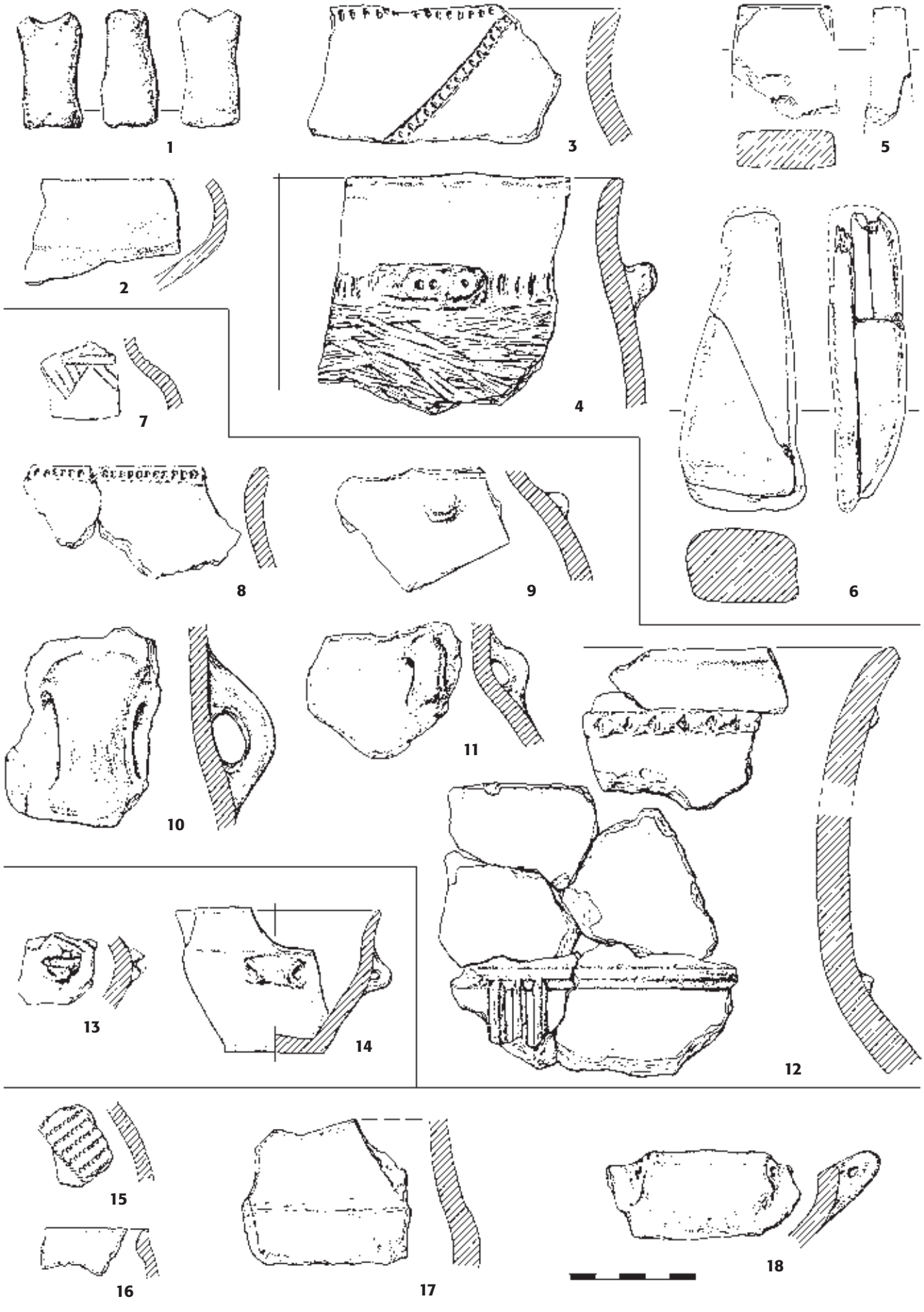

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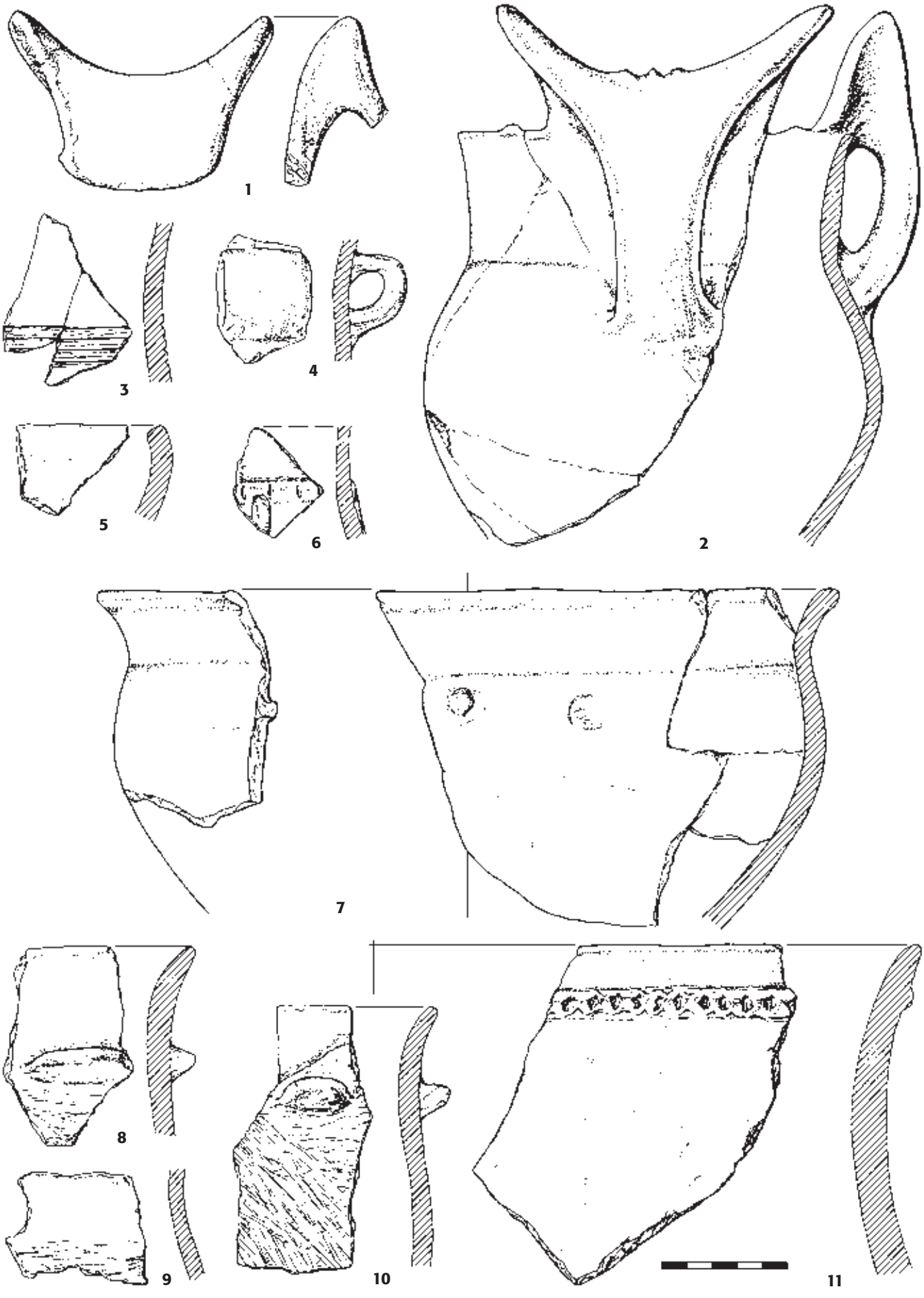

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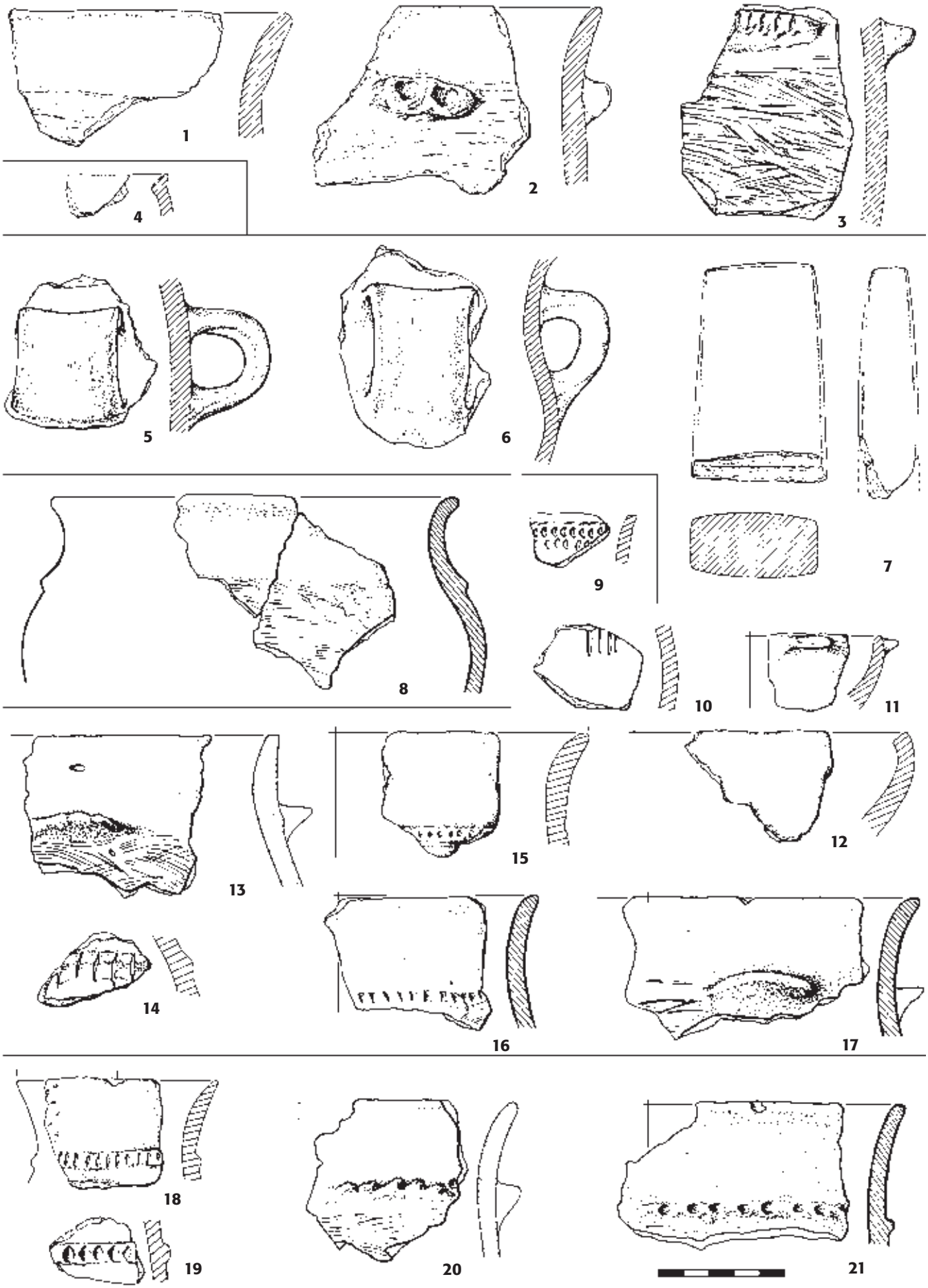

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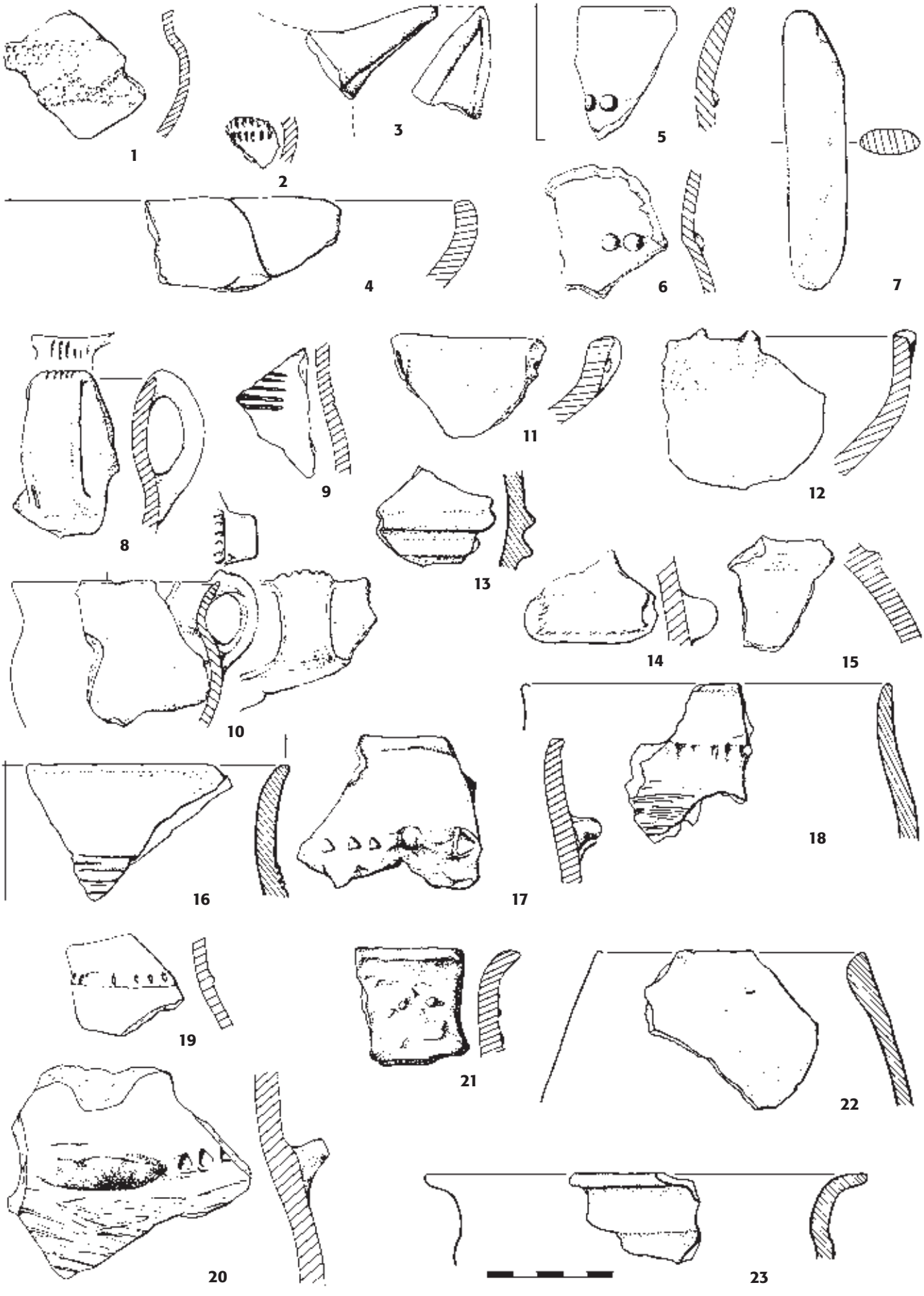

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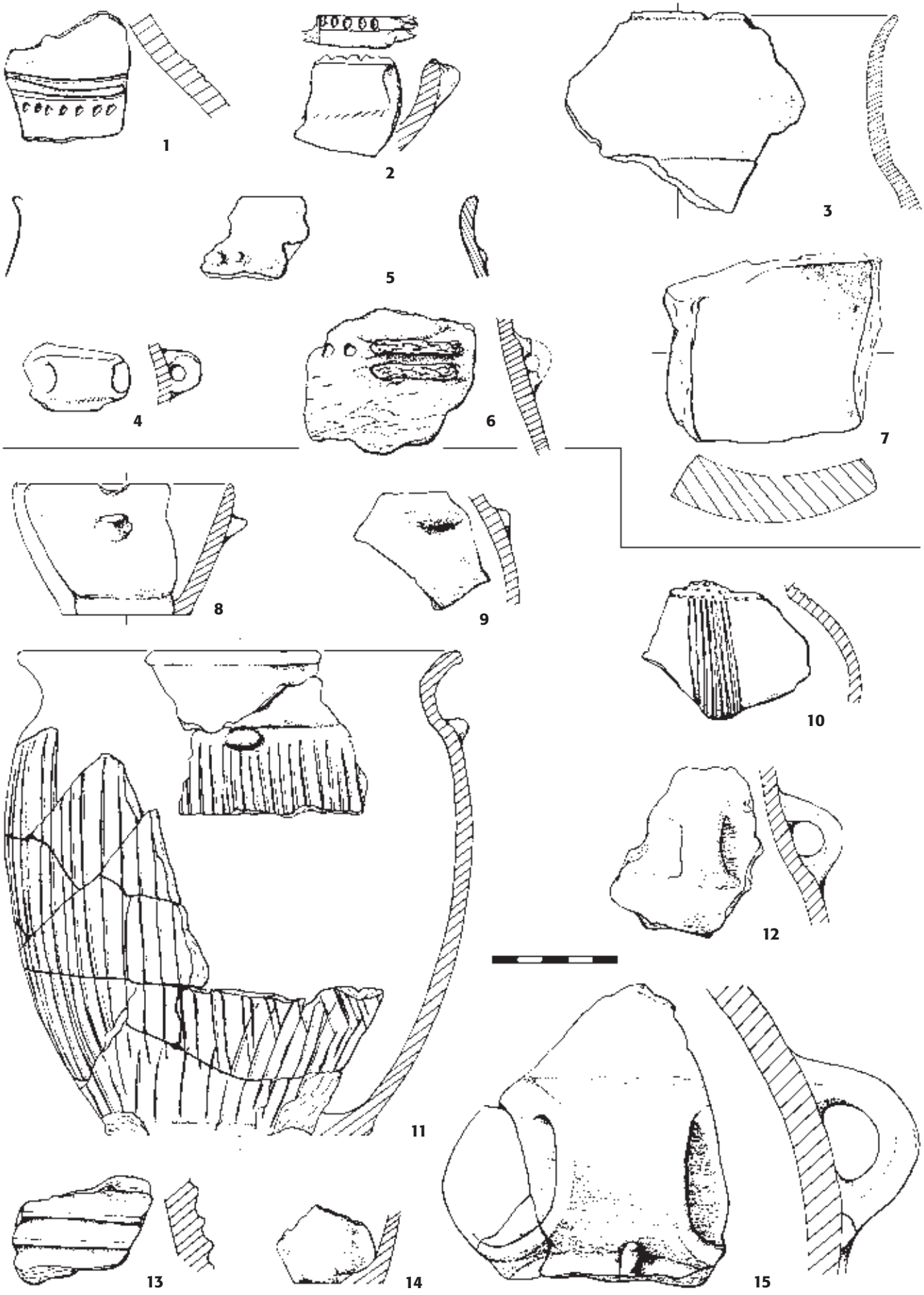

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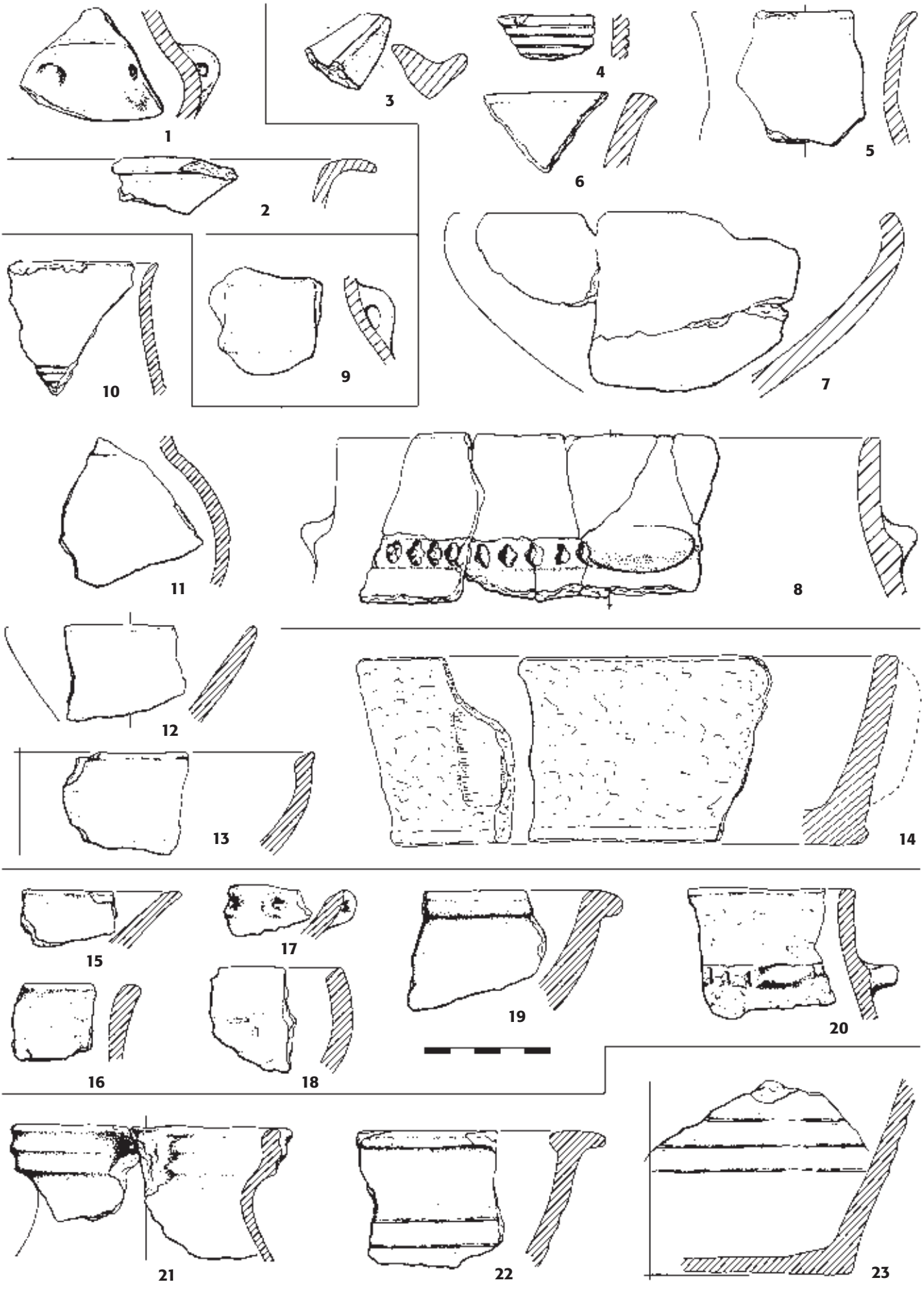

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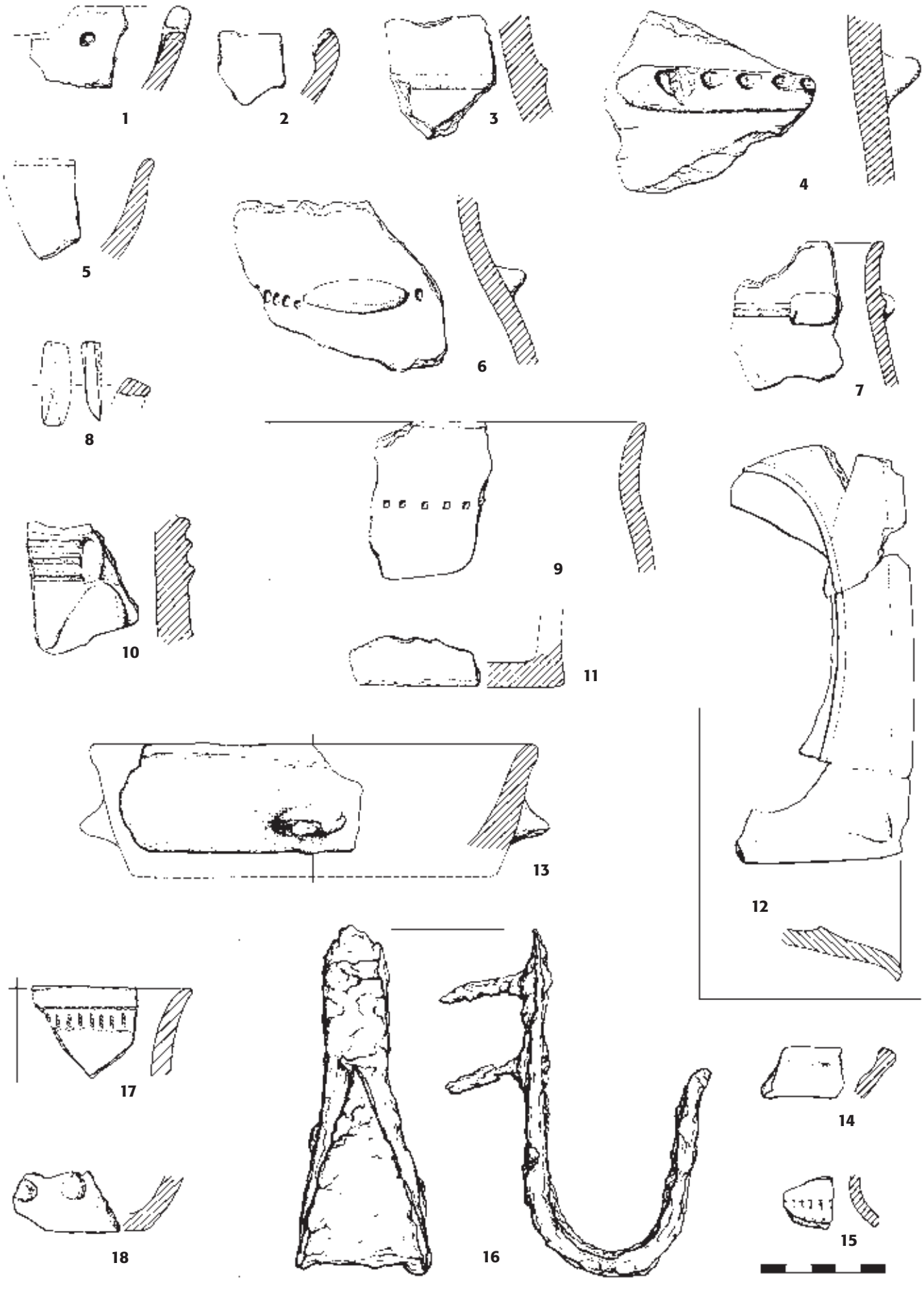

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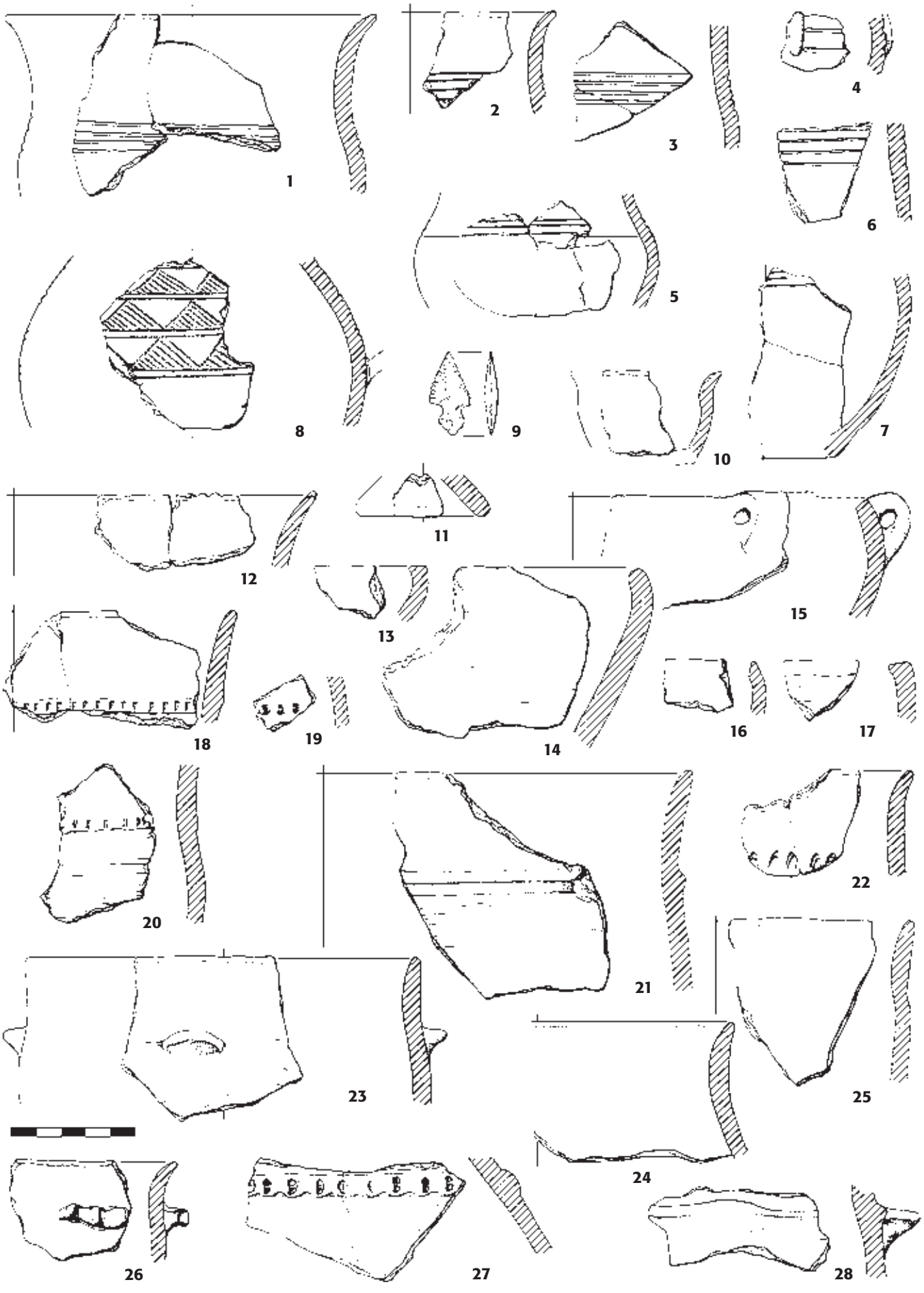

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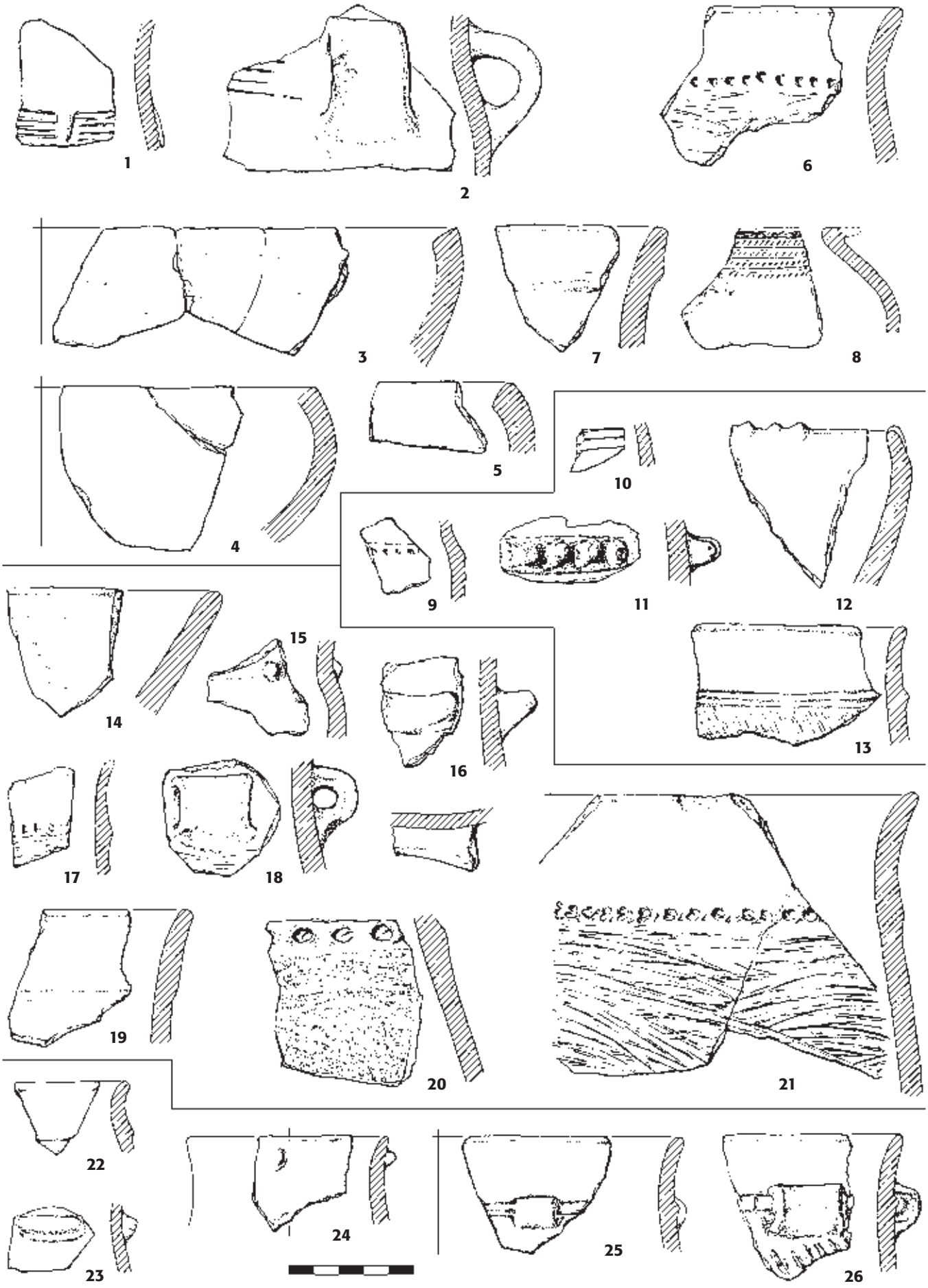

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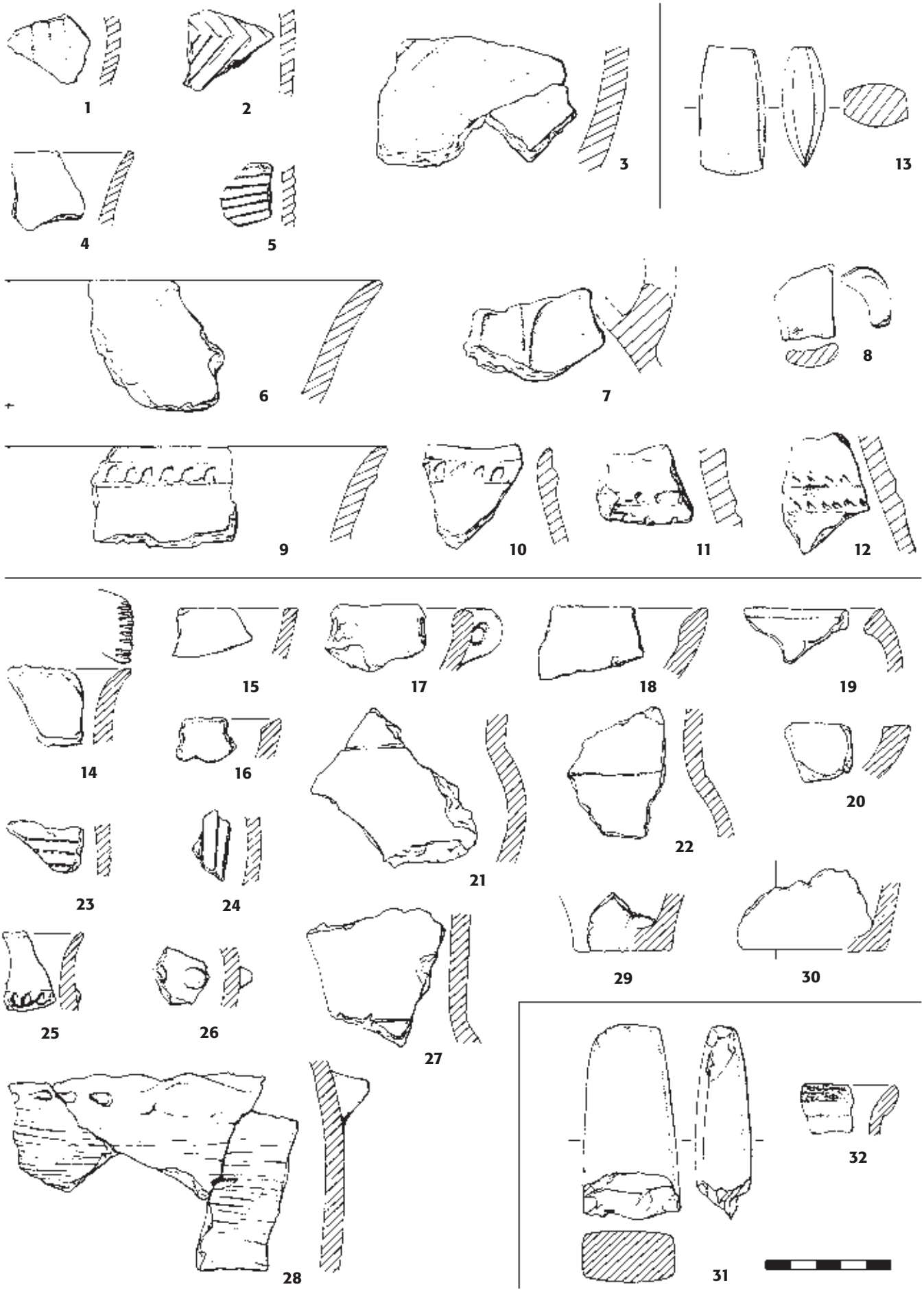
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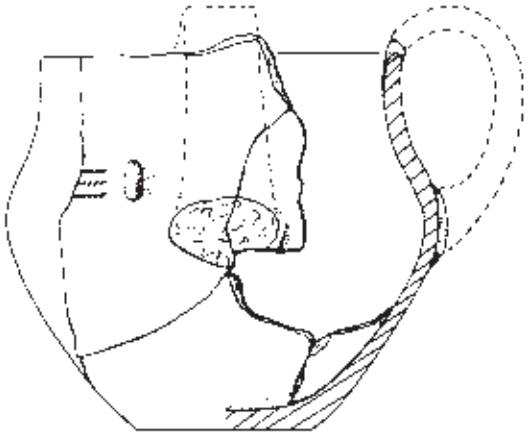

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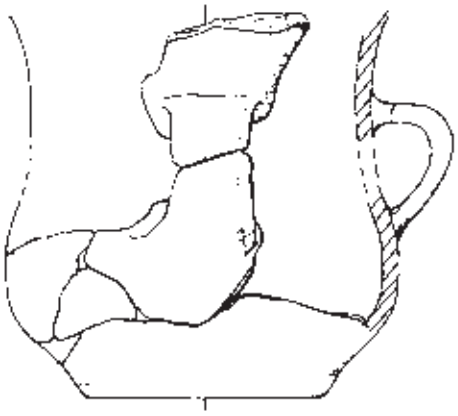

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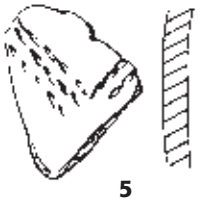

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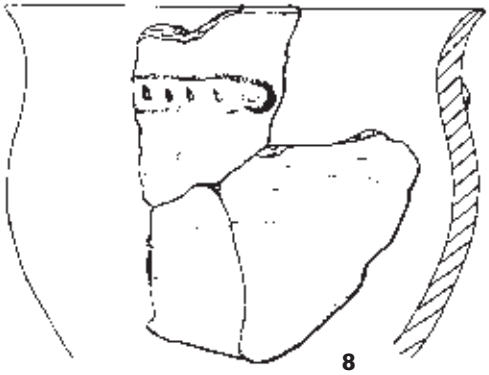

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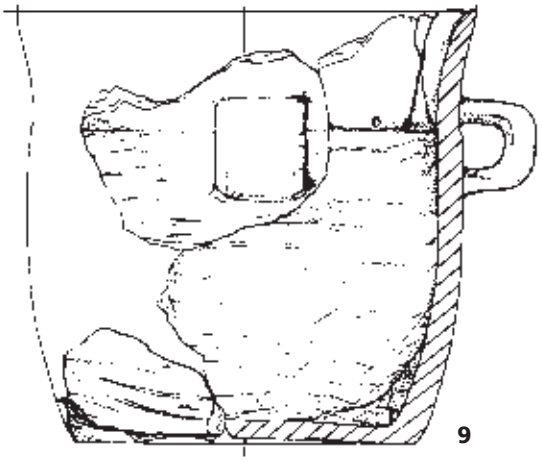

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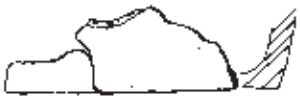

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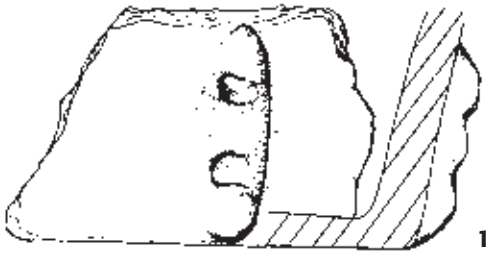

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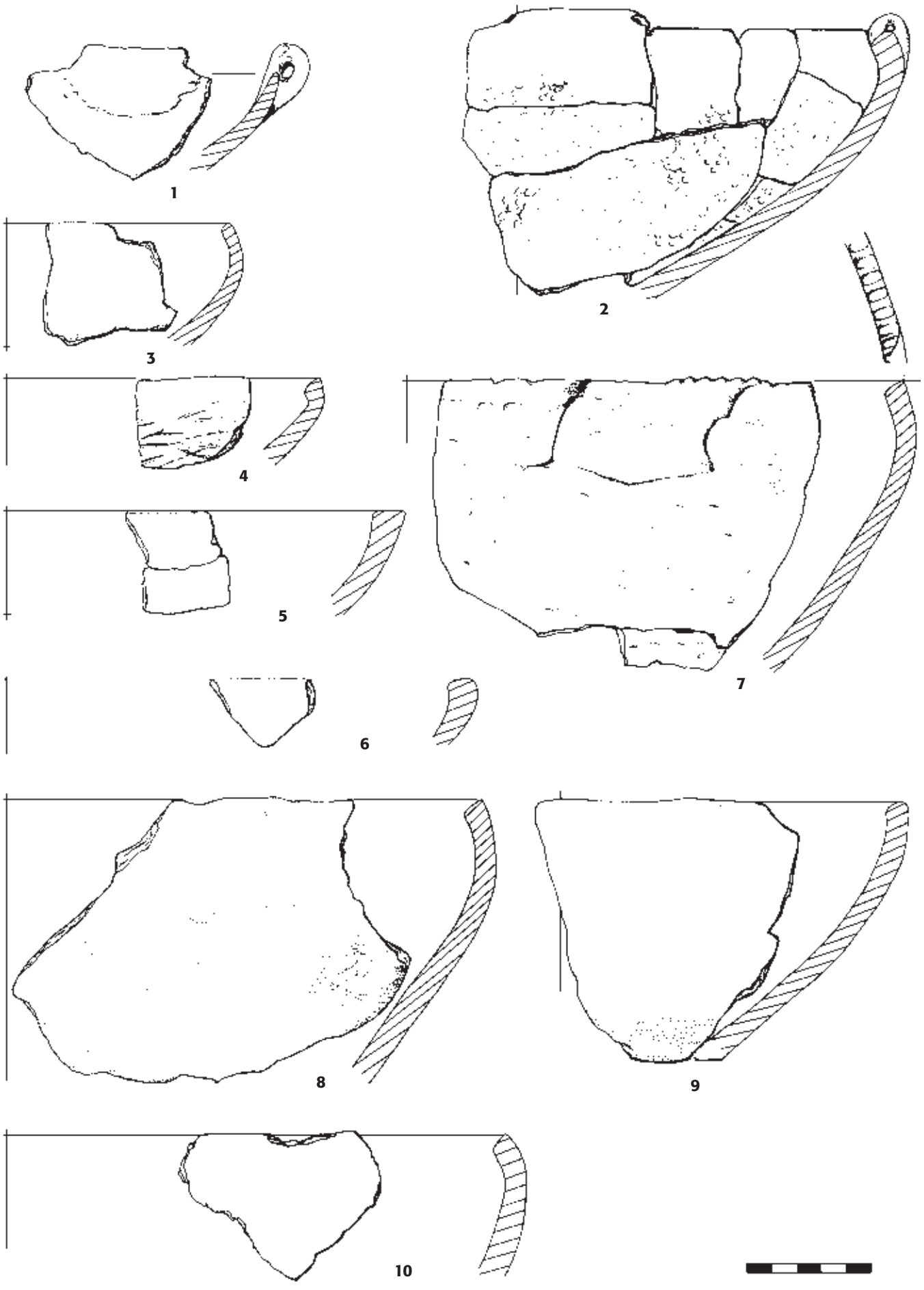
Tab. 142



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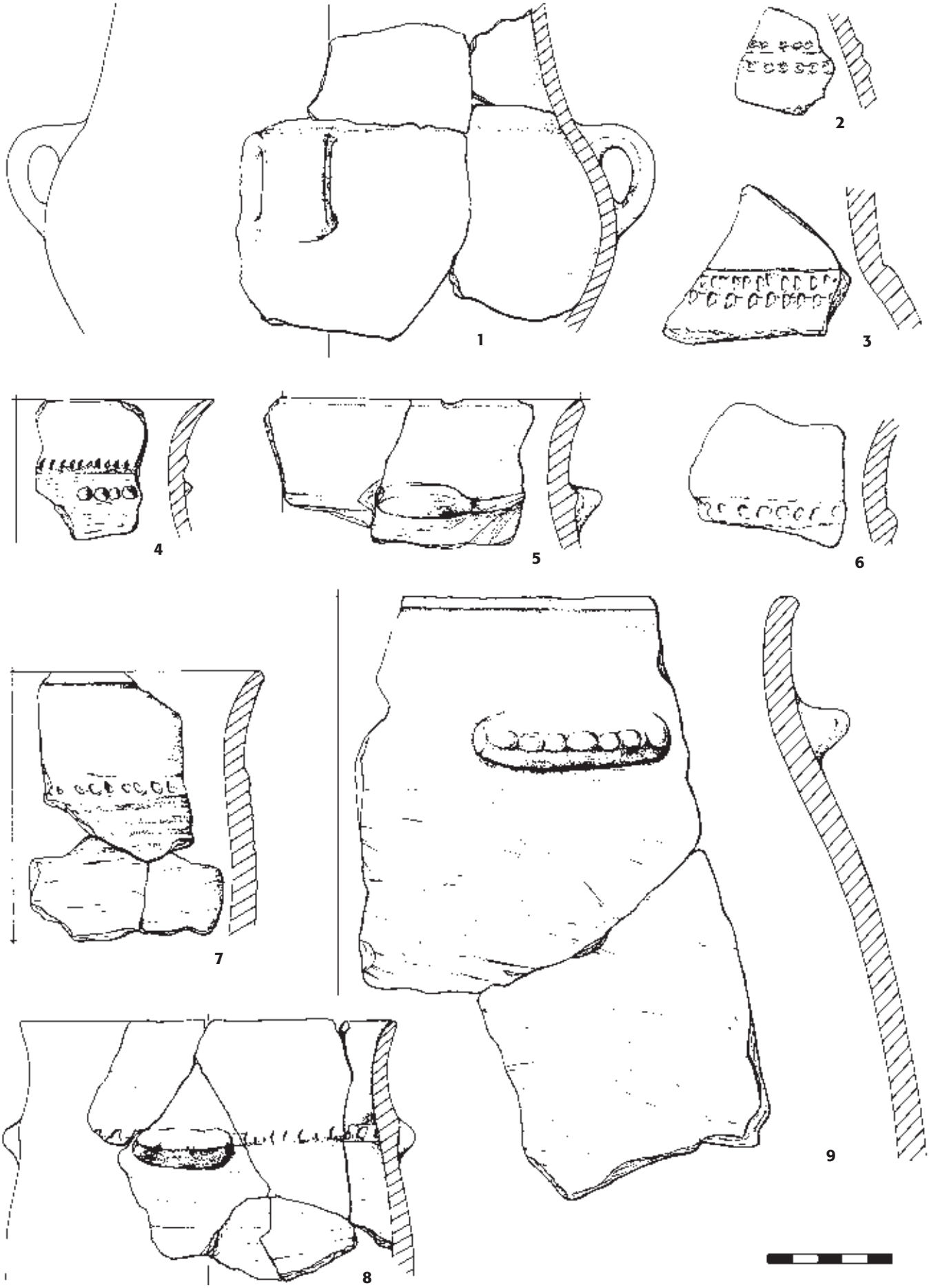

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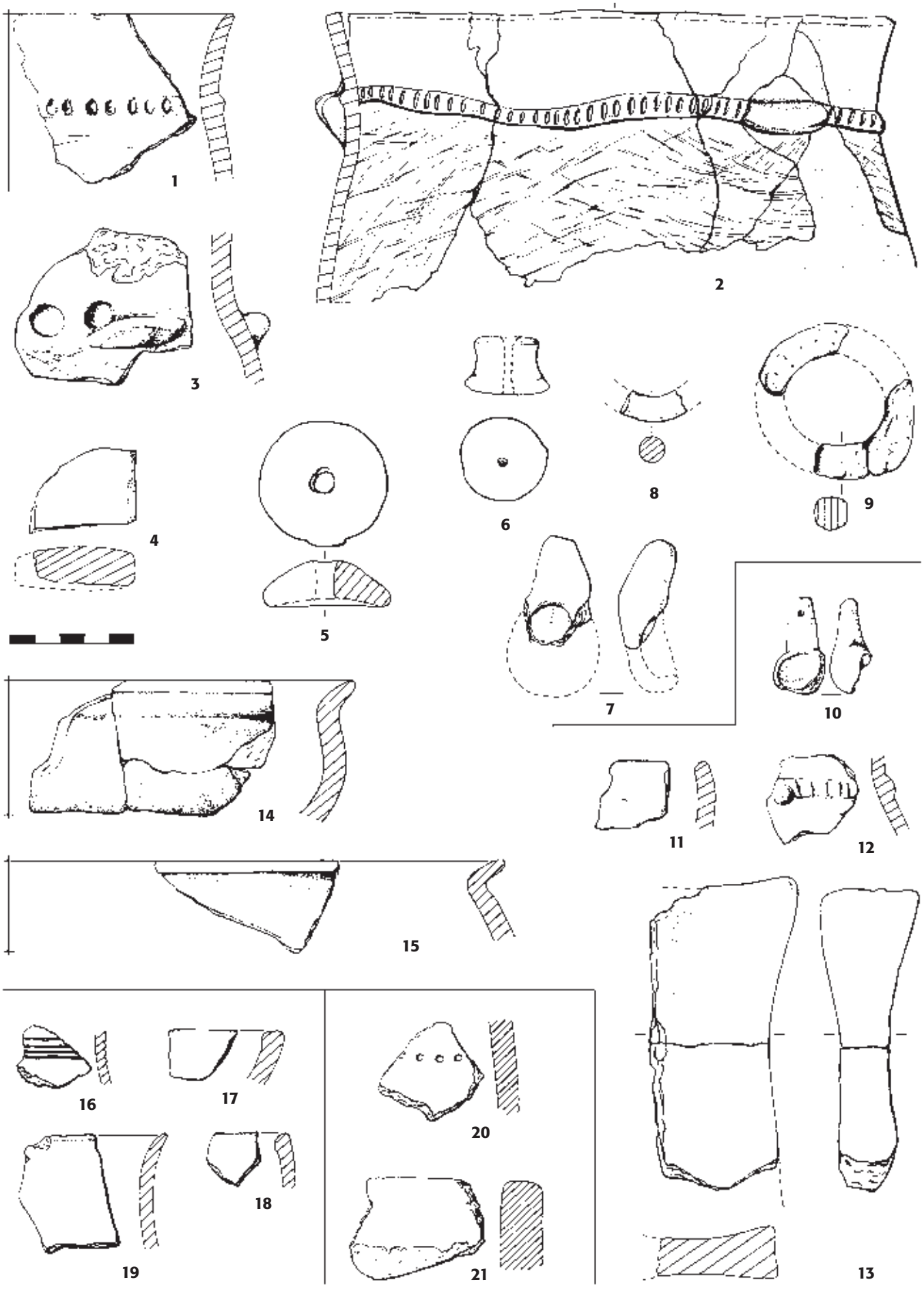

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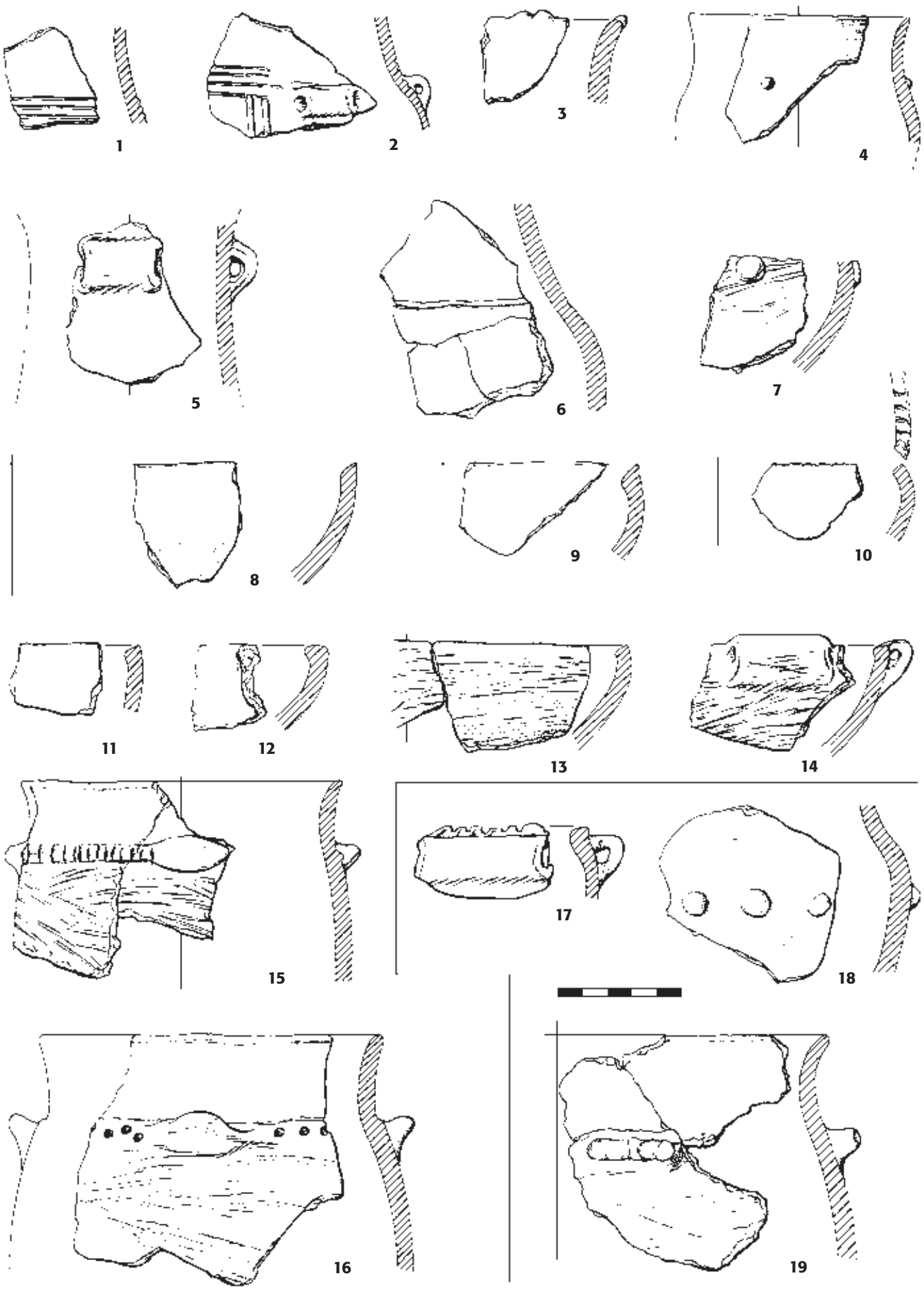

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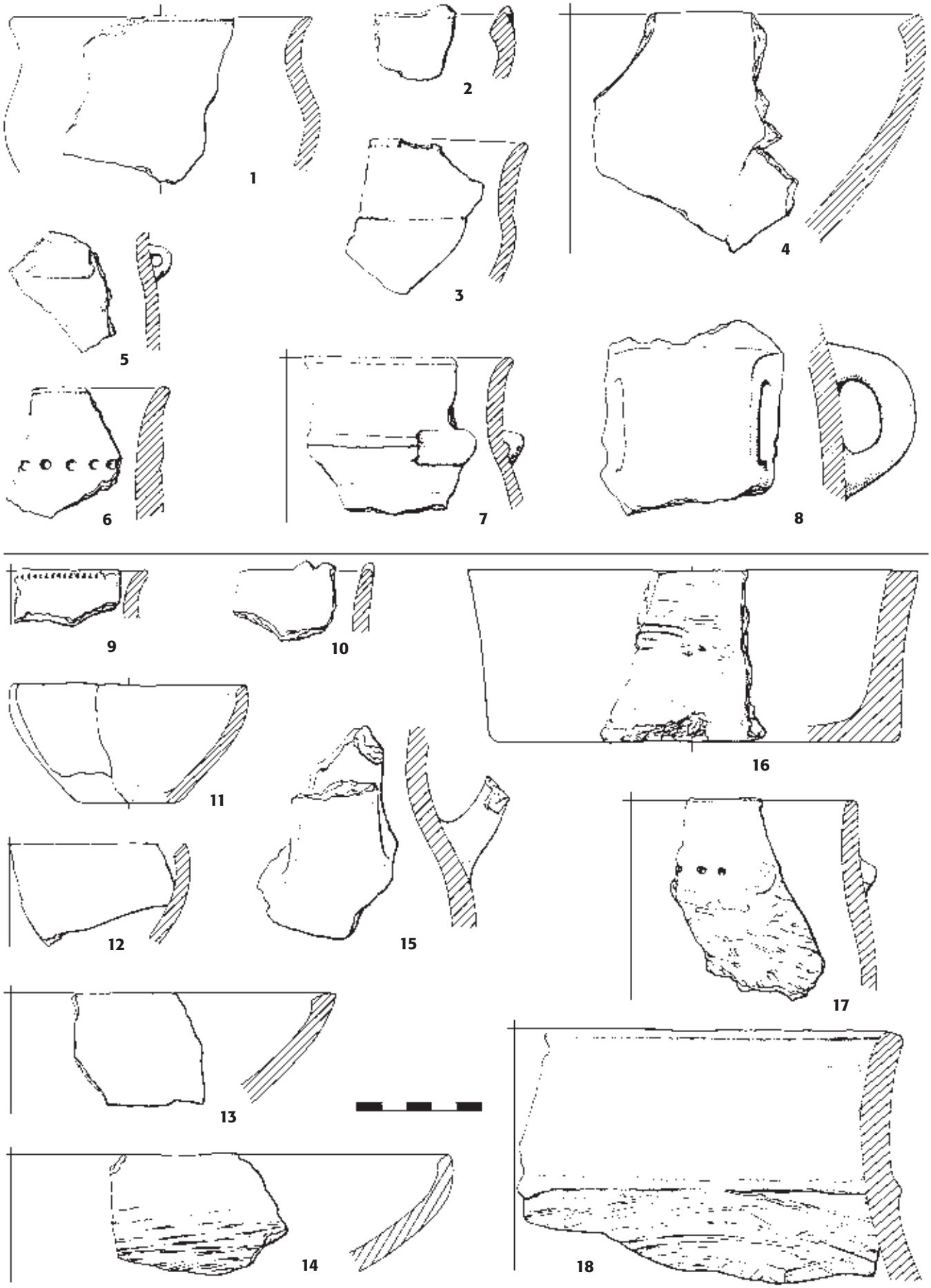

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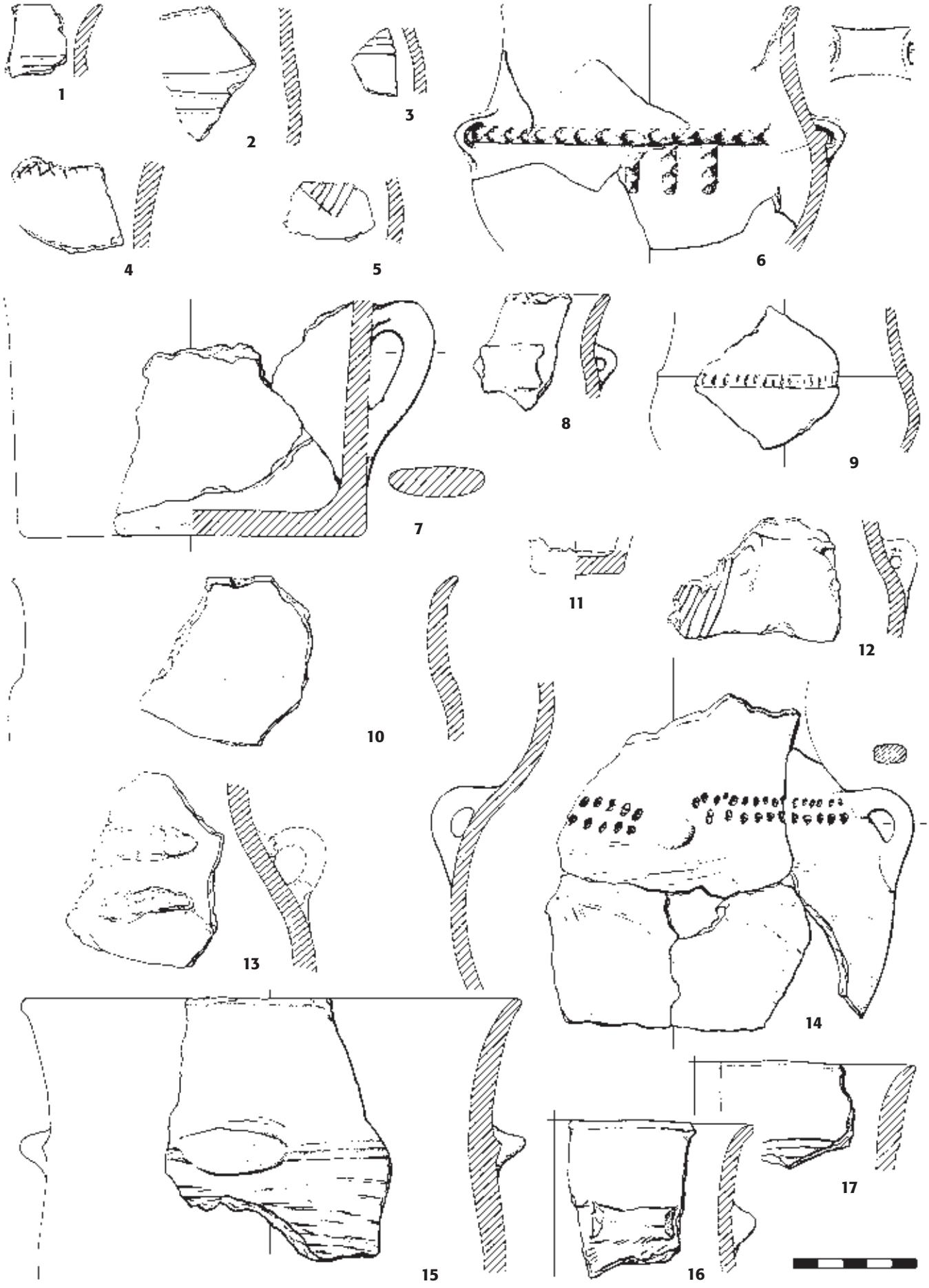

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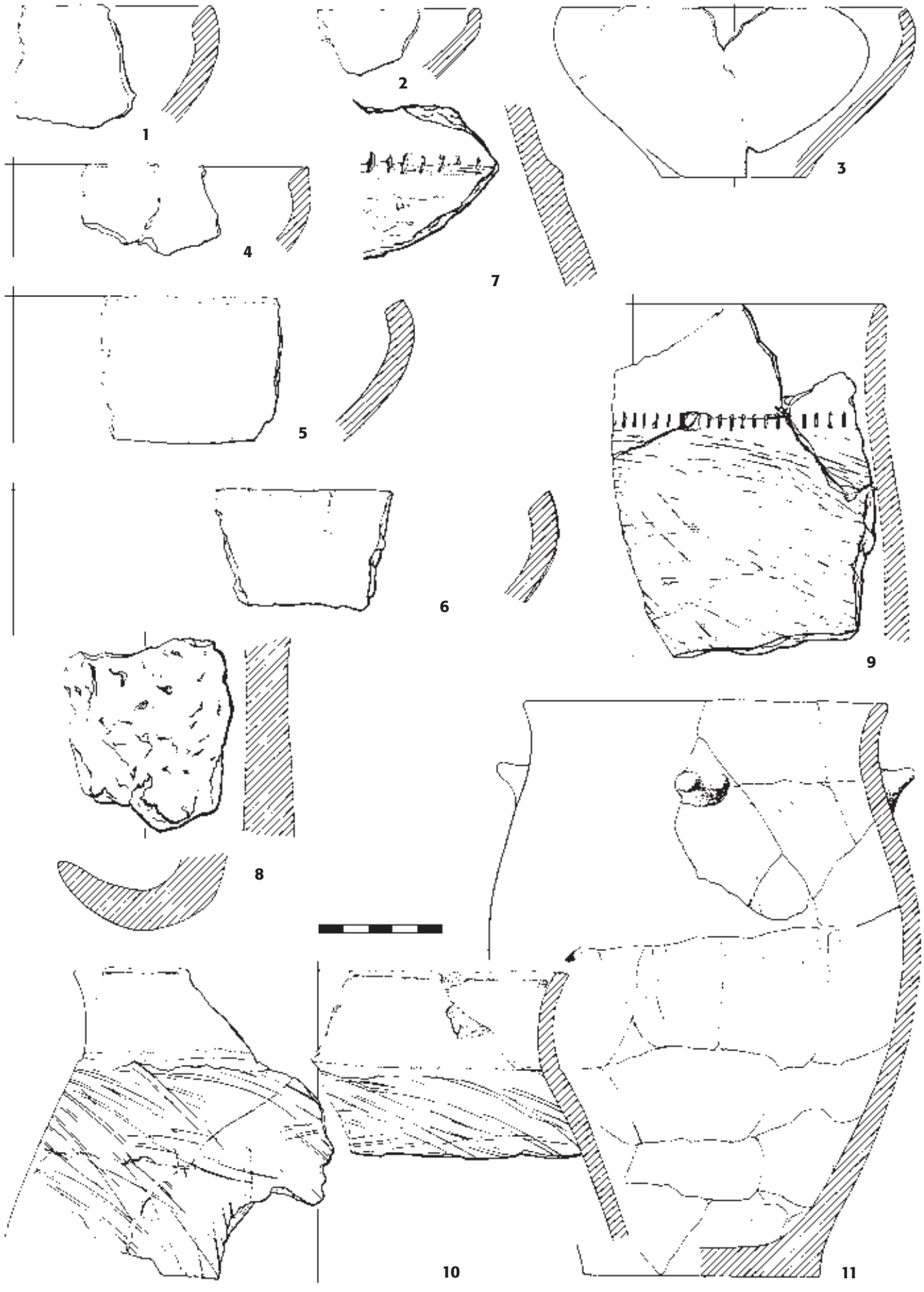

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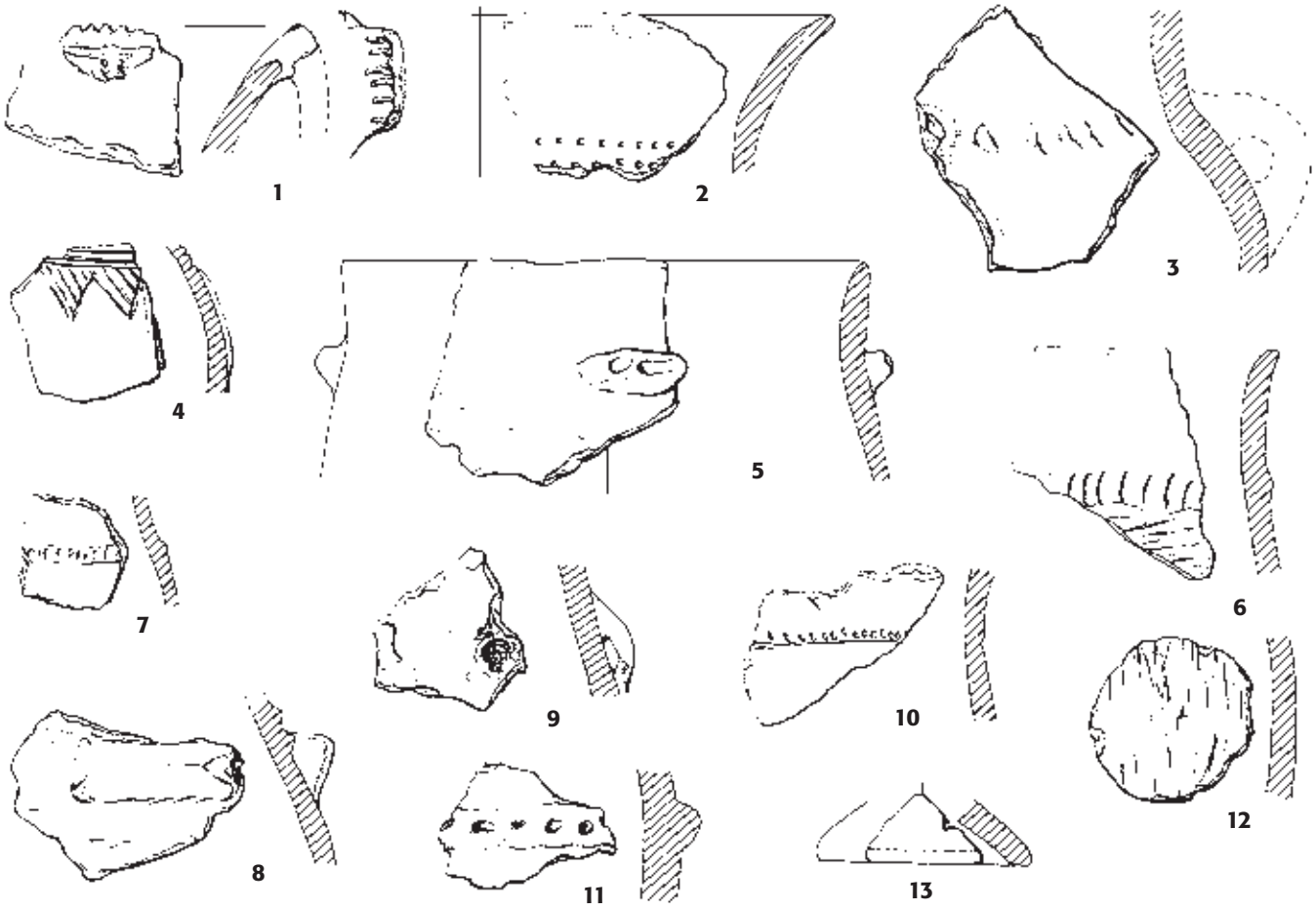

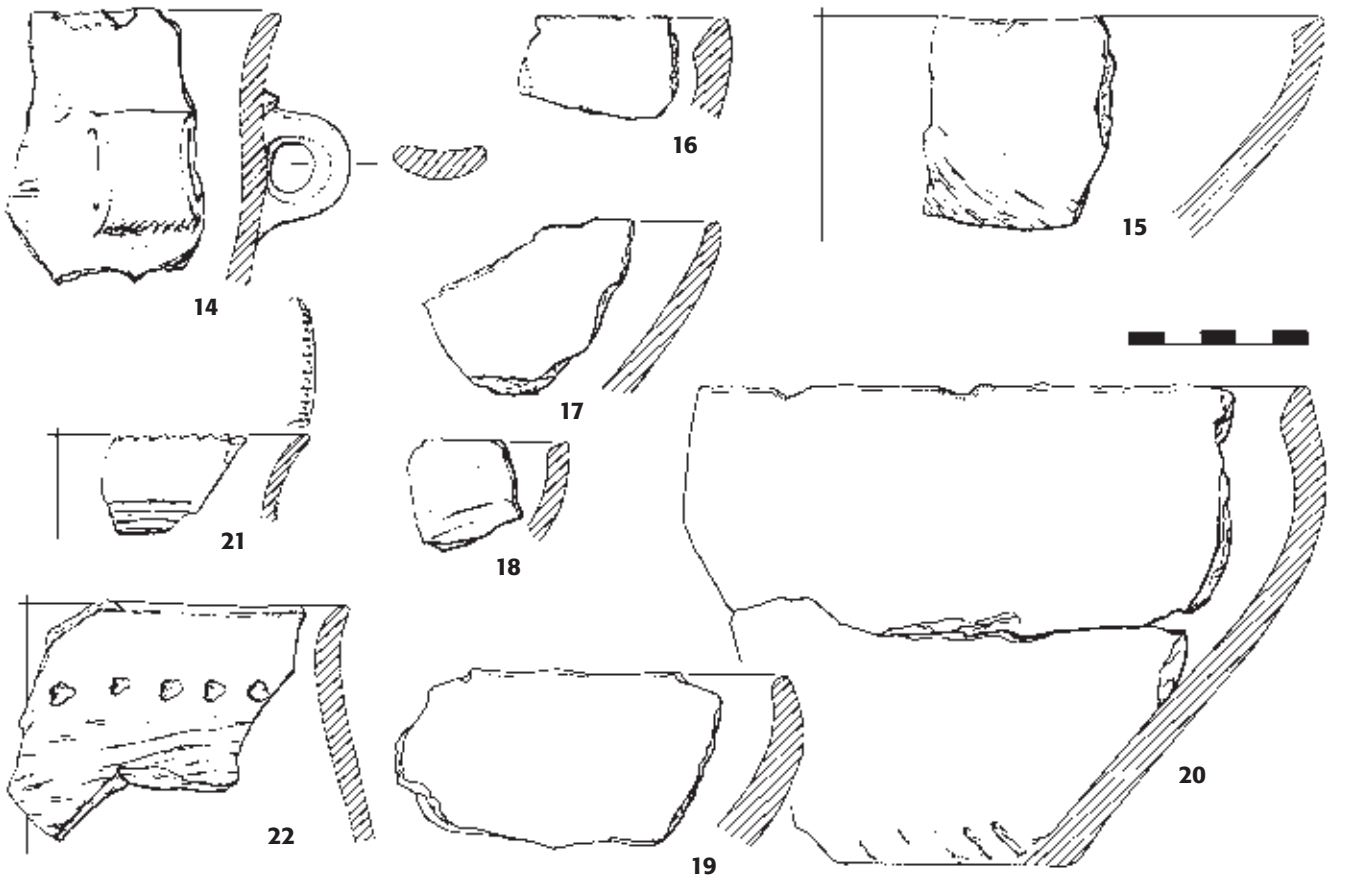

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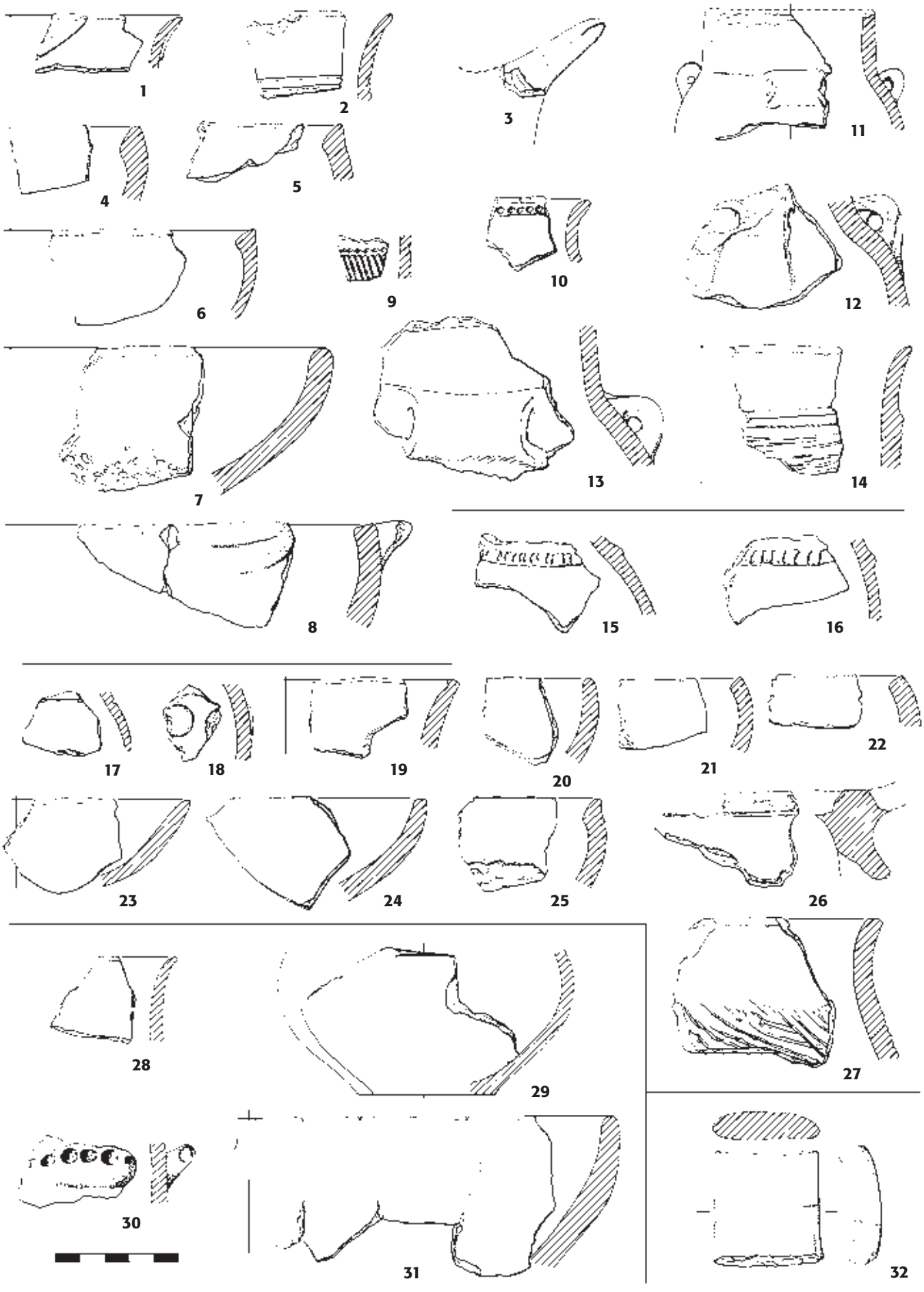
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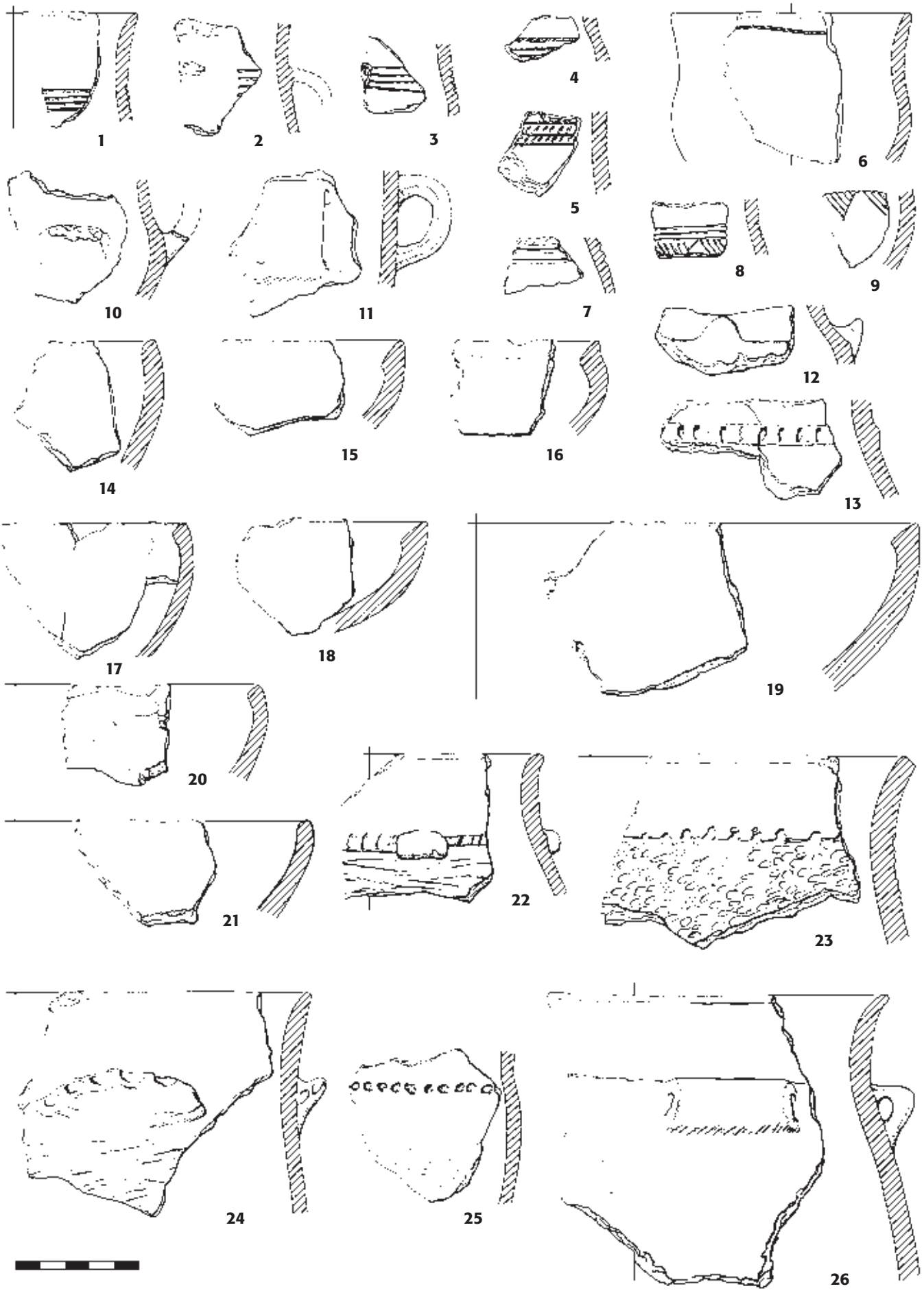
Tab. 151



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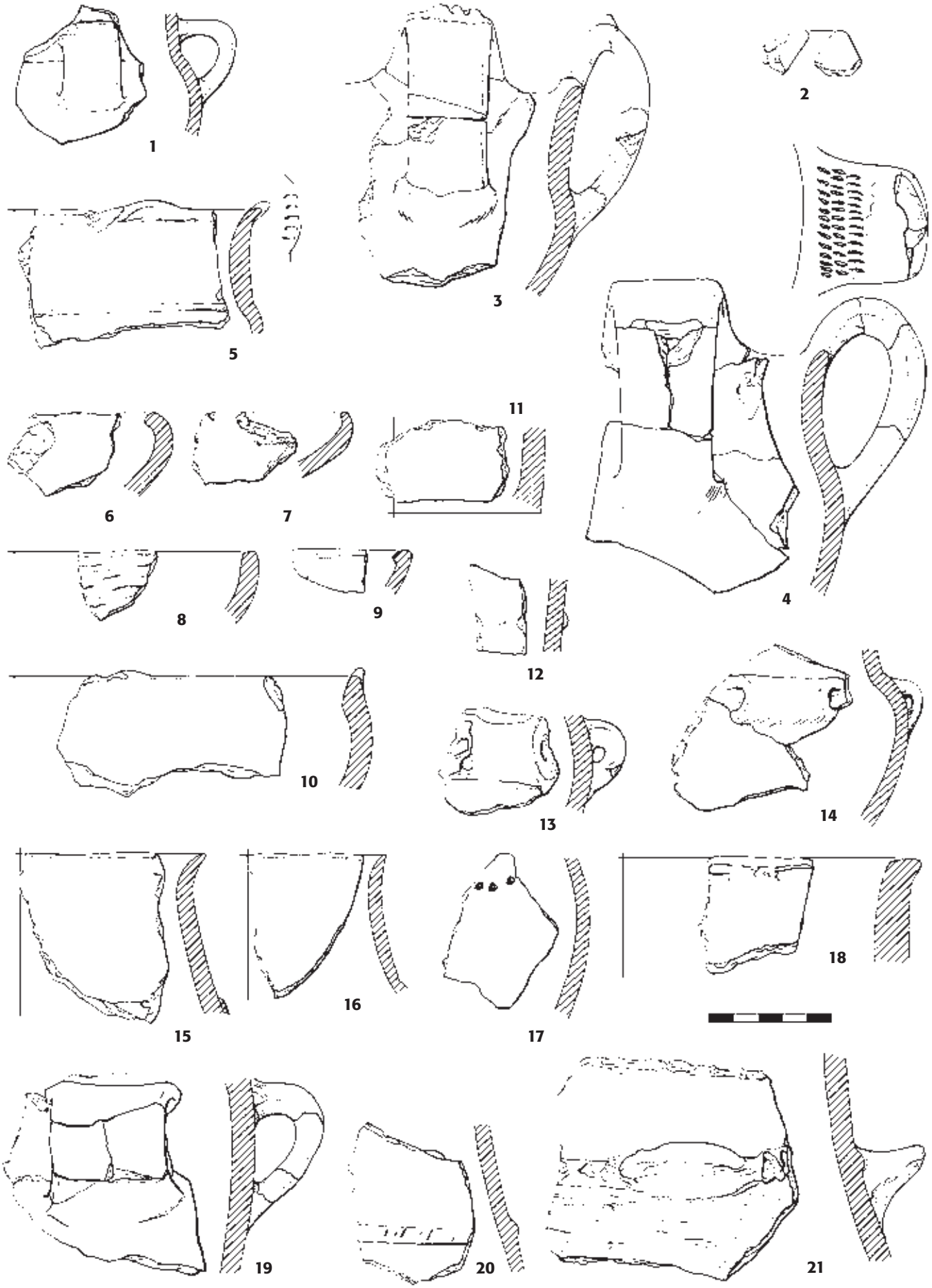

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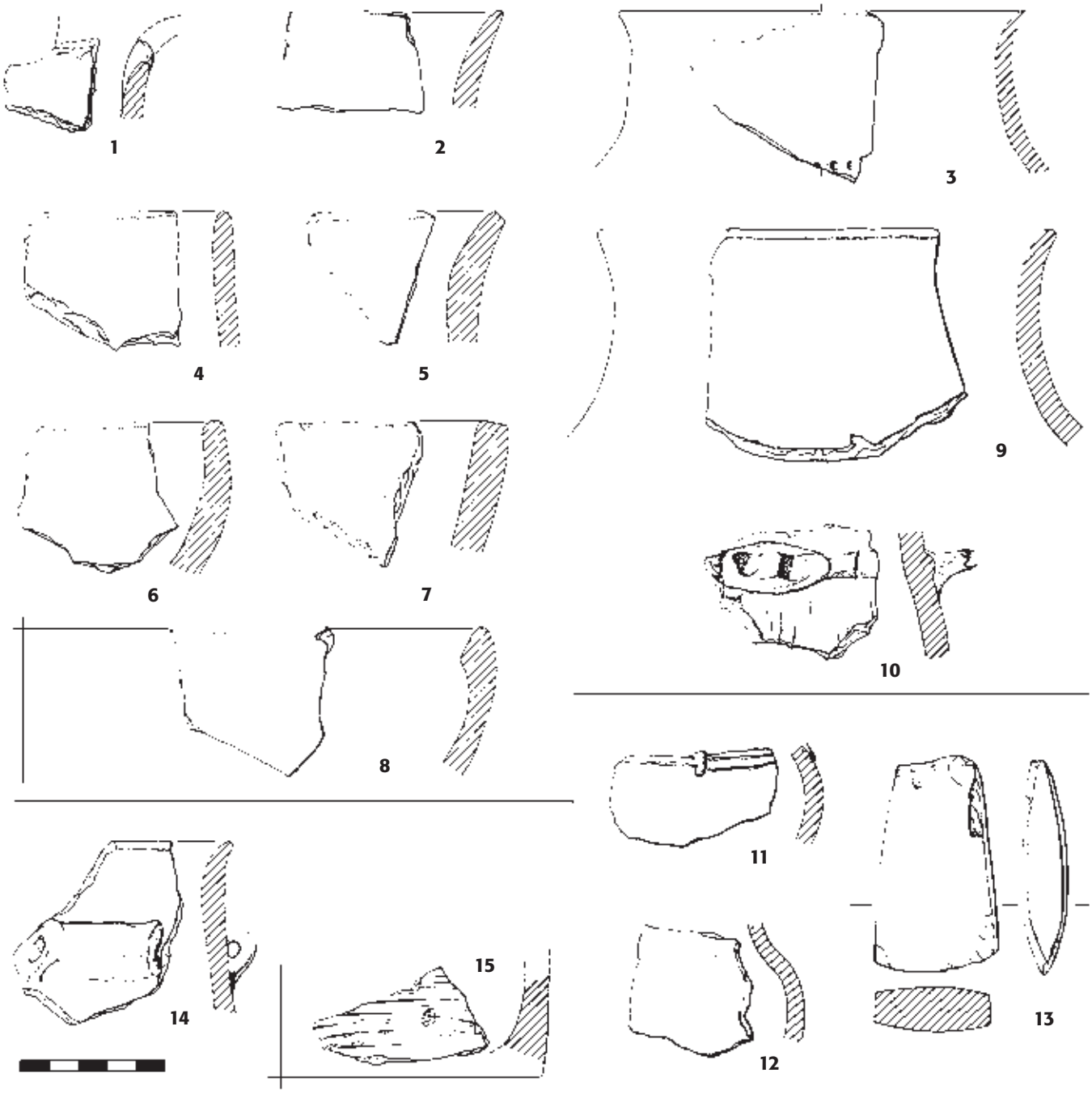
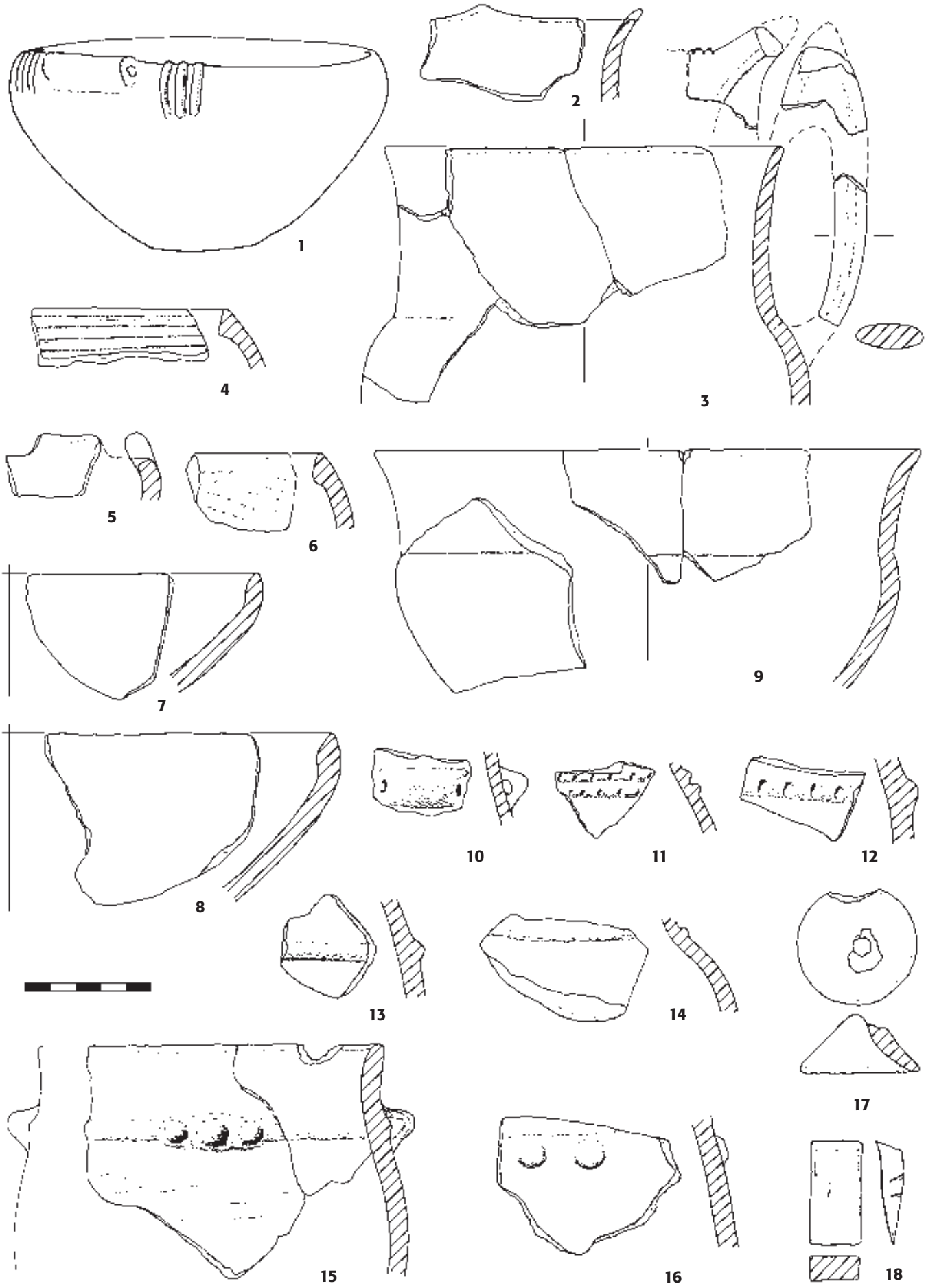


Tab. 154

Tab. 155



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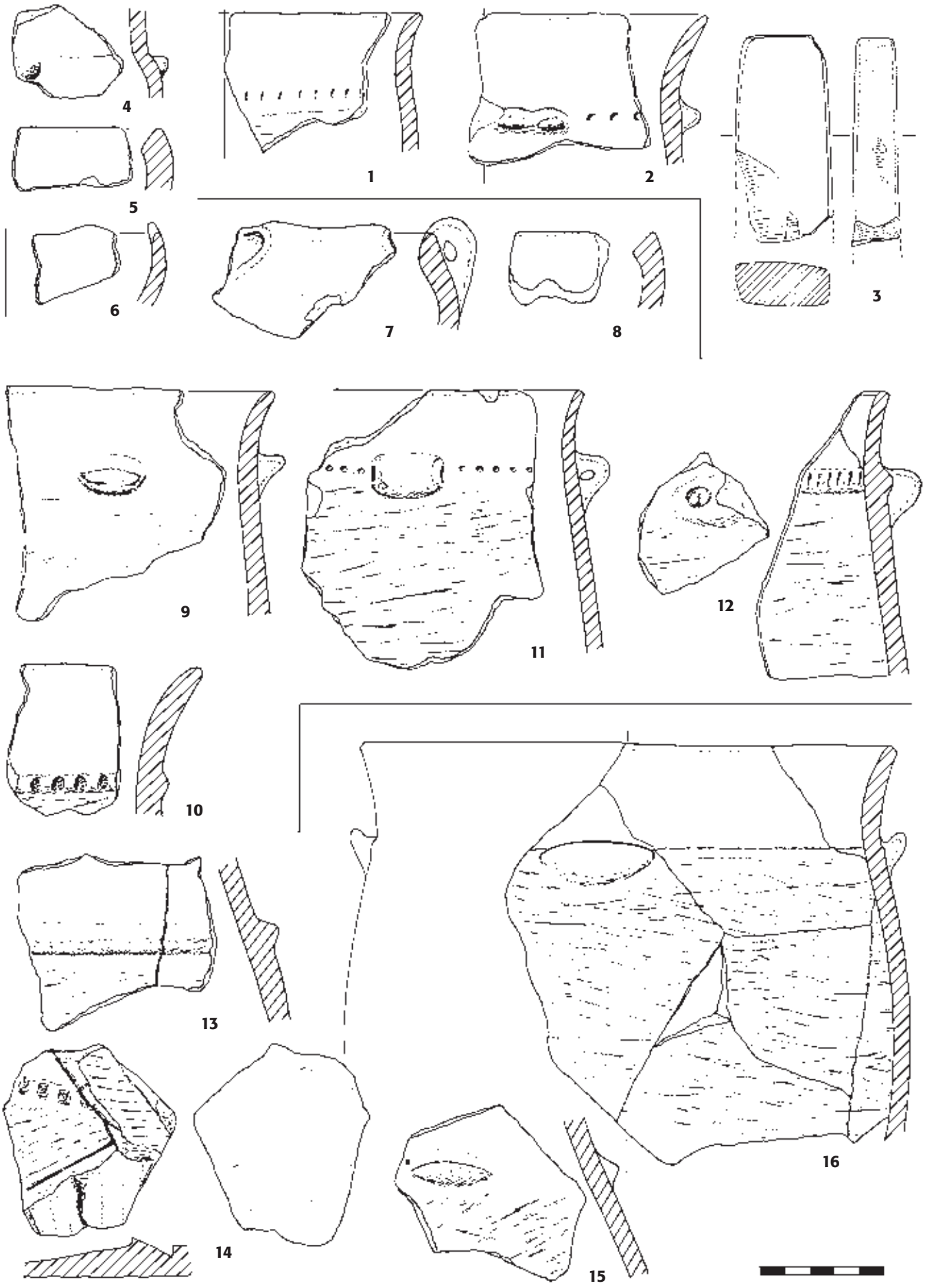

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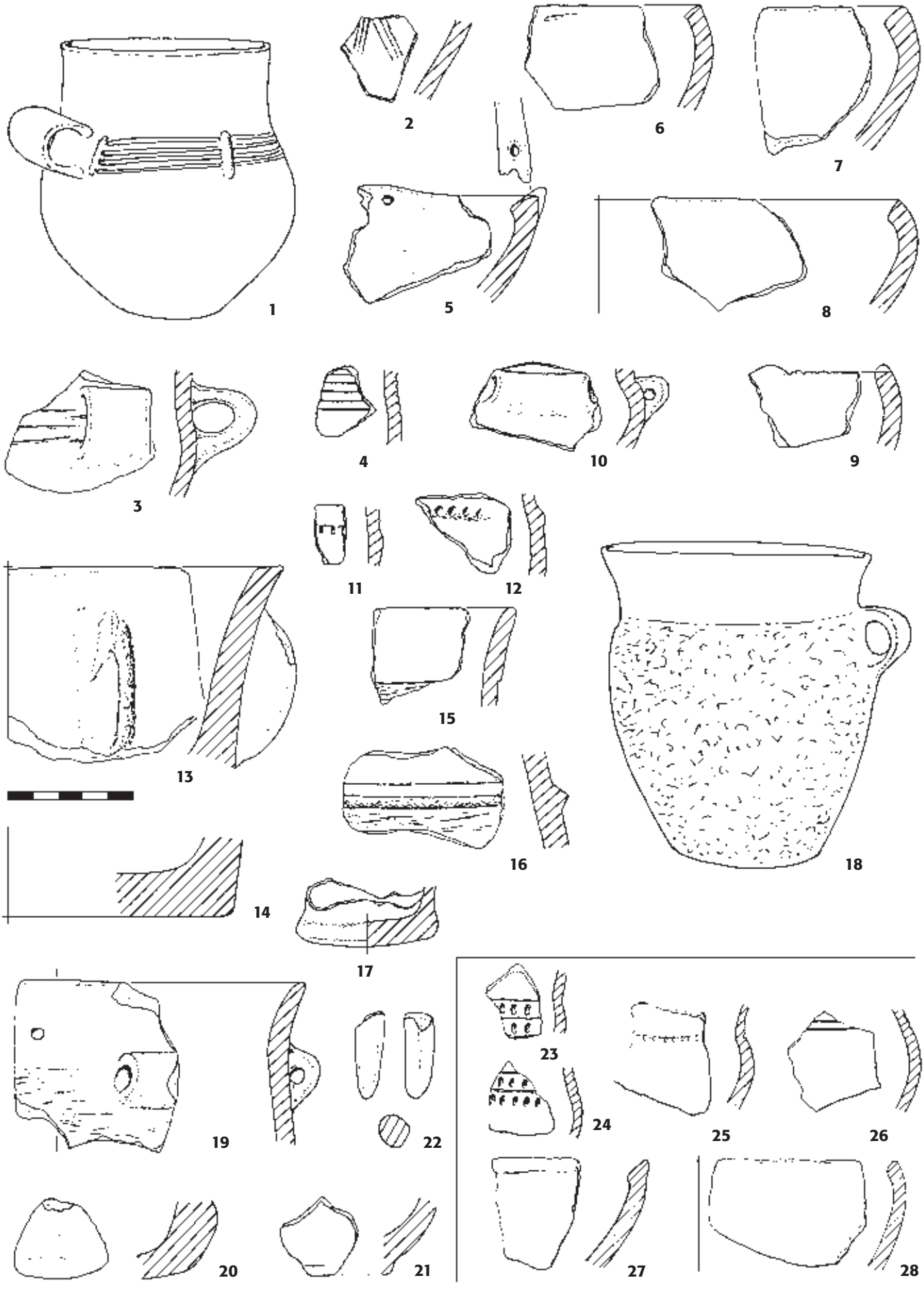

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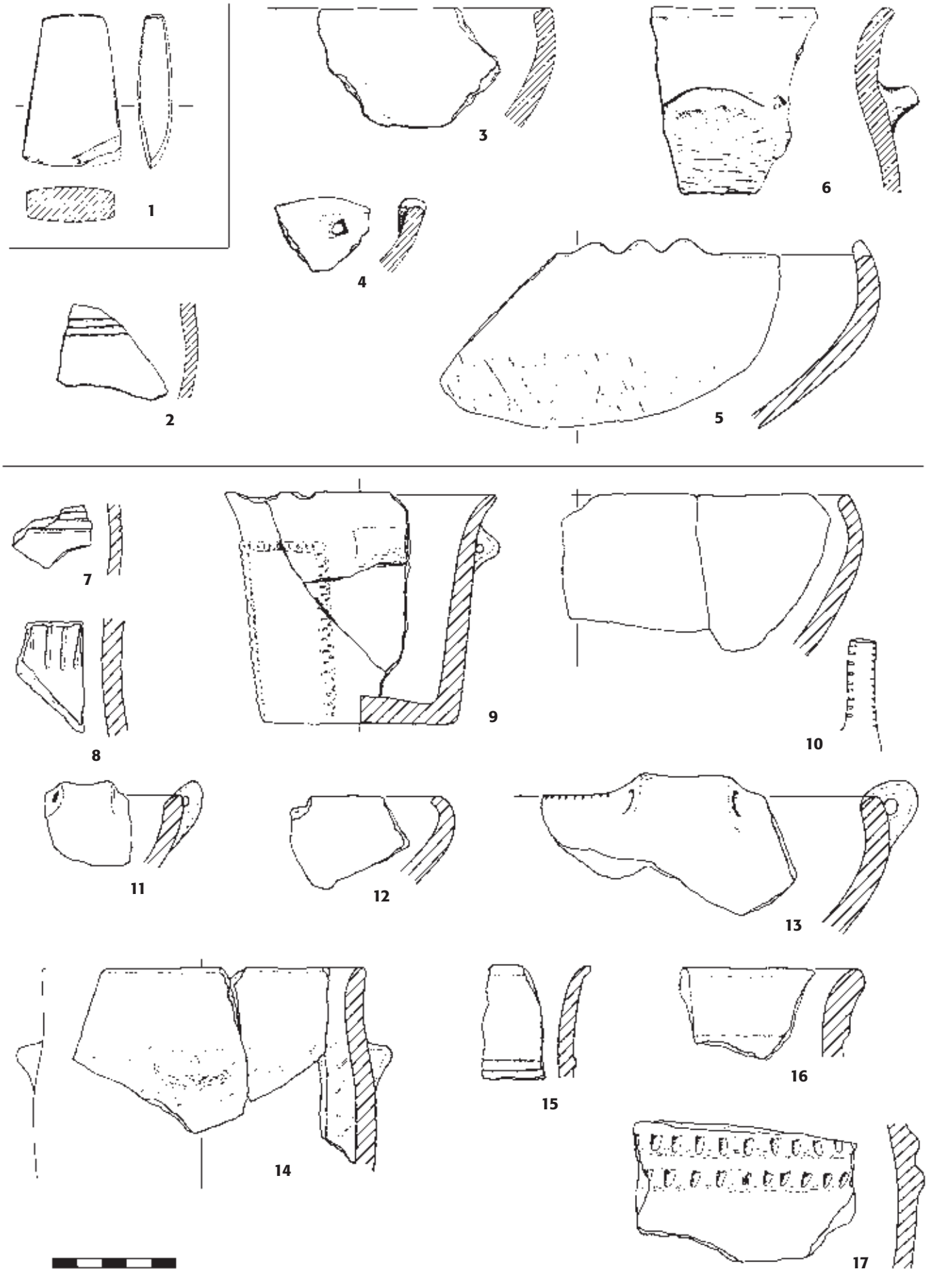

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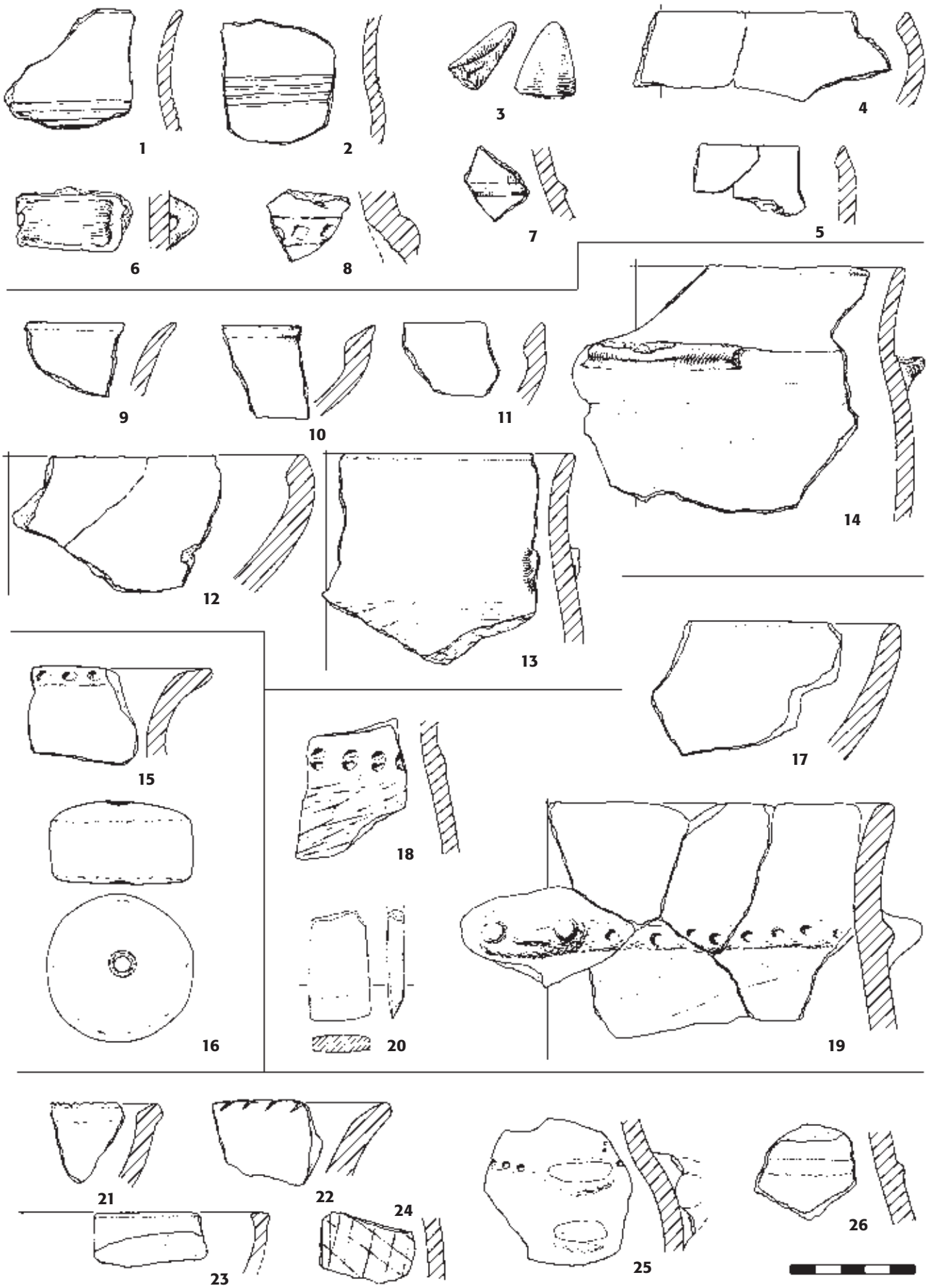
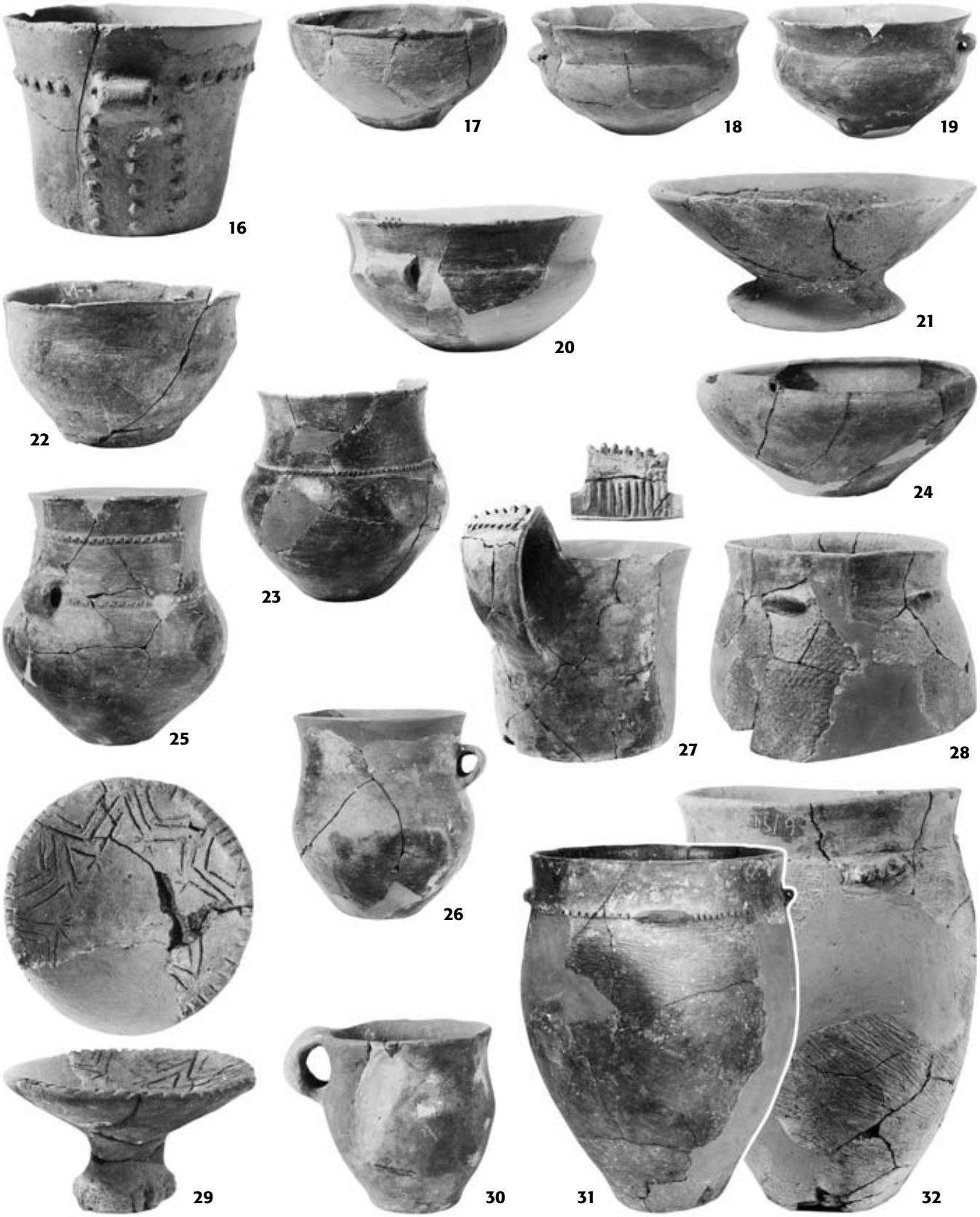


Tab. 160. *Silo a pec s předpecní jámou 32: 1, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15 (v. 71, 220, 116, 142, 104, 101, 105, 173, 192, 400, 150, 215 mm). – Kůlová chata 27: 2, 5 (v. 102, 105 mm). – Jáma – část kůlové chaty 33: 10 (v. 62 mm). —* ***Taf. 160.*** *Silo und Ofen mit Vorofengrube 32: 1, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15 (Höhe 71, 220, 116, 142, 104, 101, 105, 173, 192, 400, 150, 215 mm). – Haus 27: 2, 5 (Höhe 102, 105 mm). – Grube – Teil vom Haus 33: 10 (Höhe 62 mm).*



Tab. 161. *Pec s předpecní jámou 35: 16, 17, 21, 24 (v. 92, 94, 55, 101 mm). – Sila 41, 41a: 18, 19, 20, 22, 23, 25, 27, 28, 29, 30 (v. 92, 106, 102, 69, 166, 201, 167, 145, 65, 74). – Silo a pec s předpecní jámou 32: 26, 31, 32 (v. 185, 410, 315 mm). —* ***Taf. 161.*** *Ofen mit Vorofengrube 35: 16, 17, 21, 24 (Höhe 92, 94, 55, 101 mm). – Silos 41, 41a: 18, 19, 20, 22, 23, 25, 27, 28, 29, 30 (Höhe 92, 106, 102, 69, 166, 201, 167, 145, 65, 74). – Silo und Ofen mit Vorofengrube 32: 26, 31, 32 (Höhe 185, 410, 315 mm).*

Tab. 162. *Sila 41, 41a: 33, 34, 35, 36, 37, 38, 39, 40, 41 (v. 186, 150, 92, 107, 401, 330, 520, 168, 67 mm). – Polozemnice 53: 42, 43 (v. 171, 105 mm). – Střední příkop 2 v sektorech H9–10: 44, 45, 46, 47 (v. 120, 81, 142, 139). – Polozemnice 22: 48 (zach. v. 95 mm). —* ***Taf. 162.*** *– Silos 41, 41a: 33, 34, 35, 36, 37, 38, 39, 40, 41 (Höhe 186, 150, 92, 107, 401, 330, 520, 168, 67 mm). – Grubenhaus 53: 42, 43 (v. 171, 105 mm). – Mittlerer Graben 2 in den Sektoren H9–10: 44, 45, 46, 47 (Höhe 120, 81, 142, 139). – Grubenhaus 22: 48 (erh. H. 95 mm).*