

# Glass-production Workshop of the Hunnic Times Near Komariv on the Dnister River

Oleh Petrauskas<sup>a</sup> and Ruslan Shyshkin<sup>b</sup>

The article presents materials from the glass-production workshop of the Hunnic times found near Komariv on the middle Dnister, which was the only such workshop on the territory of European *Barbaricum*. In 2021, we investigated a buried structure, where remains of mostly semi-finished glass products, production waste, and finished vessels were found. Fragments of Cherniakhiv culture wheel-made pottery and hand-made vessels; Roman amphorae; coins; fibulae; a mirror; an arrowhead, etc. also come from the building. The nature of the glass finds indicates that the structure, dated to the mid-5th century AD, was associated with glass production. The workshop, built in the same period as a building on a stone foundation, could have formed a single complex. The finds and the object's dating are evidence that glass processing was practiced also in the Hunnic times in the Cherniakhiv culture.

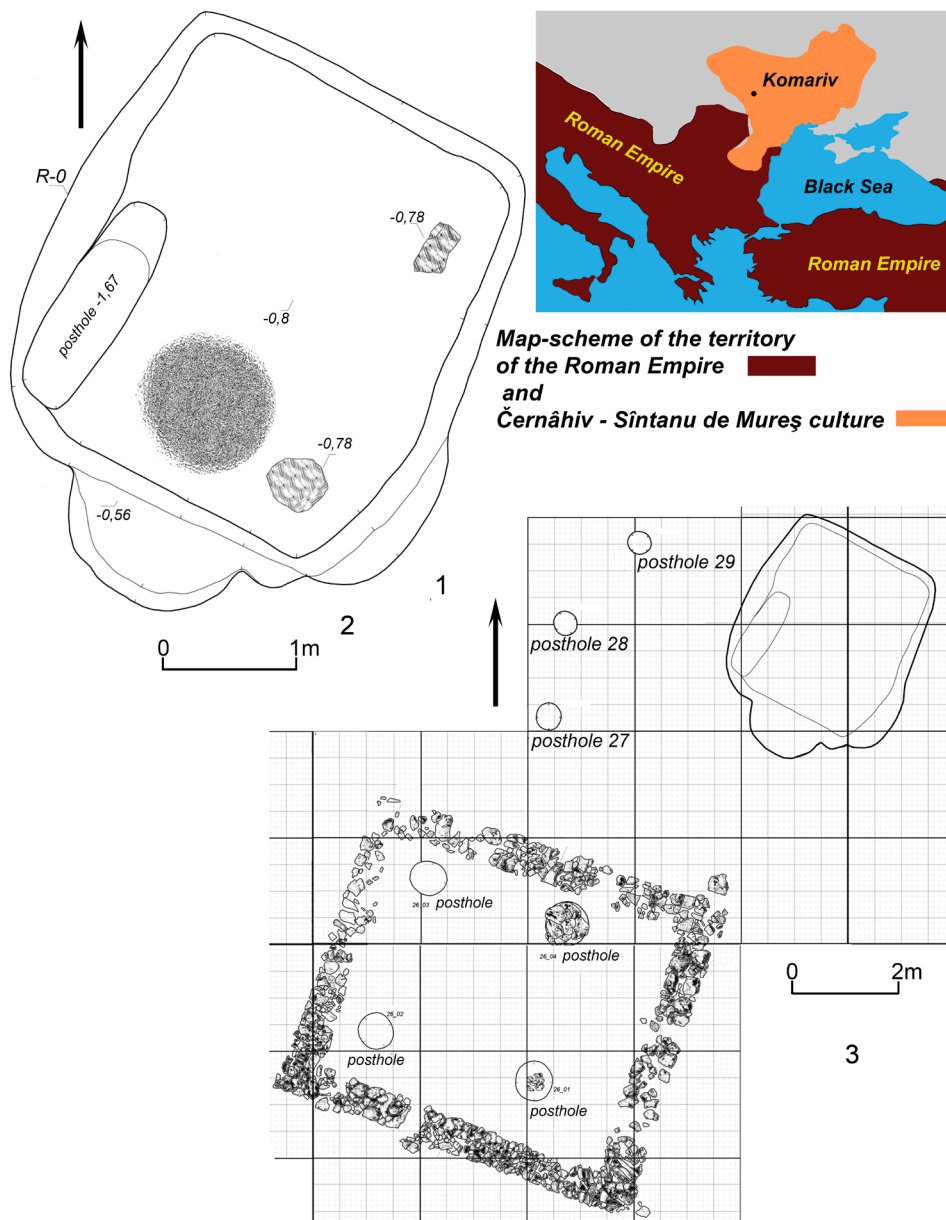
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The complex of Cherniakhiv culture sites near the village of Komariv (Dnister district, Chernivtsi region) with the remains of glass production consists of a settlement (“Komariv”) and a cemetery of the same period (“Komariv-1”). The settlement is located on the right bank of the middle course of the Dnister river and in cultural terms lies on the center of the Cherniakhiv – Sântana de Mureş culture (Fig. 1). In terms of proximity of the Komariv material complex to provincial Roman material culture, it should be noted that it is 250–300 km from the borders of the Danubian provinces of the Empire.

The settlement has total area about 30–35 hectares (Fig. 2:3) and occupied both banks of a stream that 5 km lower flows into the Dnister River. A cemetery of the same period as the settlement is located on the southern bank of the stream.

<sup>a</sup> Institute of Archaeology of Ukrainian National Academy of Sciences, Early Slavs Department, Volodymyr Ivasiuk Av., 12, 04210 Kyiv, Ukraine; e-mail: petrauskasoleg1963@gmail.com; ORCID: 0000-0001-9117-4265

<sup>b</sup> Dragomanov Ukrainian State University of Kyiv, Archaeological Research Laboratory, Osvita street 6, Kyiv, Ukraine; e-mail: ruslan.shishkin.kiev@gmail.com; ORCID: 0009-0000-8341-6623



**Fig. 1.** Map of Sântana de Mureș – Cherniakhiv culture (Ukraine, Moldova, Romania) – (1), construction plan of object 30 (2), and plan of the objects studied in the central part of the settlement (3). Authors: O. Petrauskas and R. Shyshkin.

The investigated areas were occupied in previous archaeological periods (Palaeolithic, Bronze, and Early Iron Age), but most of the archaeological finds date back to the Late Roman period, that is from the third century AD to the first half of the 5th century (Petrauskas 2014a: 165–184).

The presence of the Cherniakhiv culture sites near the village of Komariv was discovered by Oleksandr Chernysh in 1950. In 1956–1957, 1962, 1965, and 1969, excavations at the settlement site were conducted by the archaeological expedition led by Markiiian Smishko. In 1974, the excavations were carried out by Yuliia Shchapova. The results of these studies have only partially been published (Smishko 1964: 67–80; Shchapova 1978: 230–242). According to these reports, about 4000 m<sup>2</sup> of the settlement area was examined during six seasons and 40 objects of the Late Roman period were found (Petrauskas 2014b: 87–116).

From 2010 to 2021, a joint expedition of the Department of Archaeology of the Early Slavs and the “Rescue Archaeology Service” of the Institute of Archaeology of the National Academy of Sciences of Ukraine continued archaeological research of the site. After 2014, the work was carried out within the framework of a Ukrainian-German project with the participation of the Free University of Berlin, and since 2017, the University of Rostock has been a project partner.

Over these years, geophysical measurements carried out on an area of more than 13 hectares have made it possible to record anomalies of archaeological origin both in the settlement and in the cemetery. As a result of excavations, more than 30 objects of various types have been researched at the settlement together with 12 inhumation burials in the cemetery.

The analysis of the data from the archaeological and geophysical surveys suggests the division of the settlement into industrial and residential parts. The production part occupies the northern bank of the stream, where also most finds and objects related to glass production are concentrated. The southern part of the settlement was most likely occupied exclusively by residential and household buildings. The focus of the archaeological research was determined based on the results of M. Smishko’s excavations and the results of the geomagnetic investigation were also considered. In 1957, the remains of a house on a stone foundation within the limits of the central part of the settlement had been excavated and examined. Next to it, there was also found a small part of a buried structure where more than 200 fragments of glass were excavated (Smishko 1964: 71–72).

In 2019 and 2021, an additional survey of the structures discovered by M. Smishko was conducted in this part of the settlement. The re-discovery of the remains of the stone structure made it possible to significantly clarify the plan and nature of the feature and define more closely its date. In particular, it was established that the structure probably had two construction horizons. The first one is dated the second

half of the third century and is represented by the remains of four solid wooden posts (about 0.5 m in diameter). The dimensions of this structure were about 3.6 × 3.6 m, and it was oriented in the same direction as the later building in this place. This was built of stones and bricks in its place, possibly in the middle of the 4th century. The stone structure had a rectangular shape of 6 × 6.9 m, and its angles were oriented in the cardinal directions. The foundation was made of limestone with no mortar in a foundation trench. At the time of our archaeological research, the stone walls were 0.75 m high and 0.7 m wide. M. Smishko believed that the structure, at least its foundation, was built with no mortar used. However, the recent research showed small fragments of limestone mortar inside the structure. Its presence may indicate the usage of mortar in masonry of the above ground part of the building. The final construction is dated to the second half of the 4th – first half of the 5th century, as evidenced by the concentration found on the floor near the western wall of fragments of a Delakeu type amphora, variant C of Snp I–1 according to Dominique Kassab Tezgörs (Didenko 2018: 113, fig. 106.5).

As mentioned above, in 1957, M. Smishko excavated nearly a quarter of an object next to the stone building where many glass finds were discovered.<sup>1</sup> In 2021, we completed the final uncovering and recording of the object.<sup>2</sup> Below, we summarise the form of the structure, the nature of its filling, and the composition of the finds.<sup>3</sup>

The building is located at 3.3 m from the north-eastern corner of the stone structure. The contour of the upper filling is recorded at a depth of 0.3 m from the present-day surface. After excavation of the buried part of the structure, it was found that it was of a rectangular form measuring 3.3 × 3.6 m with its corners oriented in the cardinal directions with a slight deviation. The floor of the structure was flat and was at a depth of 1.4–1.45 m from the present-day surface (0.8–1.0 m from the bedrock level).<sup>4</sup> The walls were vertical, with a slight slope outwards. Steps 0.3 m high and 0.5 m wide were cut near the southern wall. A sandstone slab of 0.1 × 0.4 × 0.4 m was laid in the southern corner, while a limestone stone of 0.2 × 0.3 ×

1 In the report and diary about M. Smishko's field research, the object is marked as Structure 6\_1957. It is not known for what reasons; the same number was used to mark the stone structure. Since 2012, a consecutive numbering of the objects excavated in the settlement of Komariv has been applied by our expedition. Accordingly, the stone house was marked as No. 26, the buried structure with the remains of glass production – No. 30.

2 The research area was 48 m<sup>2</sup>, within this area five objects of the Cherniakhiv culture were discovered (nos 30–34). Four of them were pits (post pits or utility pits) of 1.0 m in diameter and up to 0.5 m depth.

3 Information about the excavations of a part of the structure and the findings was recorded in the 1957 diary and the report by M. Smishko (Smishko 1957; 1956–1957). The drawings of the part of the studied structure could not be found. Also, based on the additional objects, it is possible to state that individual glass fragments collected during the previous excavations were associated with this structure.

4 According to M. Smishko, the bottom was dense and was peeling off from the bedrock.

0.5 m was on the floor in the western corner. Near the southwestern wall, a flat pit with vertical walls was dug. The pit had a narrow – 0.6 × 1.8 m – rectangular form and a depth of 0.87 m from the level of the floor of the structure. At 0.25 m from the step, and 0.2 m above the floor of the structure, an ash layer 0.1–0.2 m thick with a round ground plan about 1.0 m in diameter, was recorded. Many glass fragments were recorded around the ash layer (Figs 1:2; 2:1, 2).

The structure's stratigraphy had at least two layers. According to M. Smishko, the upper layer contained a highly humus-rich 0.75 m thick black loam, and the lower layer (closer to the floor) was a blended yellow clay and ash layer. The lower layer up to the middle of the area of the structure had an interlayer consisting of pieces of light brown clay coating with one flat side and the other having traces of wooden structures. In the filling areas (not excavated in 1957), we investigated three filling layers with blurred boundaries and approximately the same thickness (0.2–0.3 m): the upper and lower layers consisted of brown loam with a layer of humus-rich dark grey loam in between. All layers were approximately horizontally stratified. Here there was no occurrence observed of the usual “funnels” of gradual filling flow unlike the examples recorded in other features in previous years (Fig. 2:1).

The distribution of the finds in the object depends mostly on the level of the floor of the southwestern quarter of the structure. The stratigraphy of different categories of glass items is of special interest. Most of them came from the floor level of the structure (1.2–1.4 m below the present-day surface) and the level of the trench along the wall. Individual glass fragments were found only in the upper layers (0.6–0.8 m – small pieces of the walls and fragments of semi-finished products). At the floor level of the structure, the following fragments of glass items were found. According to M. Smishko: a thick-walled vessel with wheel-cut ovals; thin-walled vessels with a wavy ornament made of blue glass threads; thin-walled vessels with slightly curved and thickened rims; a round flat foot of a vessel and a fragment of the same foot; a fragment of a large bead made of transparent greenish glass; more than 40 fragments of glass mass (semi-finished products?) mostly green in colour; lumps of sintered glass. During the reported work, fragments of semi-finished products of green and blue colours, jug handles, flasks made of transparent glass, a fragment of a bowl made of blue glass, wall fragments with blue threads in a reticulate pattern, a concentration of fragments of almost completely preserved vessels (a cup with medallions, a phial with horizontal blue threads; a conical cup), and pieces of window glass were found at the floor level. In the “trench” along the western wall of the structure, mainly glass items, a fragment of the bottom of the wheel-made ceramic pithos, and a grinder were found. Among the glass products there was a bowl-beaker with a lobed base, plus vessel wall fragments with a wheel-cut oval. There were also numerous fragments of semi-finished product



1



2



3

**Fig. 2.** Komariv, object 30. Stratigraphy of the object (1), top view after the final clearing of the object (2), and view of the eastern section of the settlement and excavation (3).  
Authors: O. Petrauskas and R. Shyshkin.

of blue and green colours, and also “caps” from glass blowing with the broken-off attachment to a blowpipe, and walls with an wheel-cut oval.

Other material came from the filling of the building pit: fragments of Cherniakhiv culture wheel-made pottery and hand-made ware; separate fragments of Roman amphorae and two coins; two fibulae; a mirror; an arrowhead; a clay sinker; an unidentified object made of bone; an iron knife; a fragment of a sickle(?); a curved iron object; two stone grinders and animal bones.<sup>5</sup>

The “assemblage of glass” of the structure is of the greatest interest. It consists of lump glass for melting, production waste, and finished products. According to M. Smishko, several lumps of sintered glass, which can be regarded as waste from glass melting, were also found there. The weight of the glass finds from object 30 of the recent research was about 2 kg. Taking into account these finds as well as more than 200 glass fragments discovered by M. Smishko, the total weight of the glass could have been about 3 kg. A detailed description of some these finds is given below.

*The semi-finished glass products* in the form of “lump” glass of different sizes are divided into two groups – glass of green (Fig. 3) and blue colours (Fig. 4). The morphological features of semi-finished products of the blue glass group differ from the other group, as besides glass lump fragments, it includes pieces of melted pieces in the form of threads, plates, lumps, etc. The group of melted fragments shows traces of strong decay (Fig. 4). The largest fragments in these two groups are sized up to 10 cm. The weight of the green glass group is about 1.0 kg, and that of the blue shades glass group is about 0.2 kg.<sup>6</sup>

Lumps of raw glass of different colours (green, olive, ruby, or blue) are regularly found in the fillings of the objects or in the settlement layers. However, none of the other structures studied so far in Komariv had such an amount of raw glass. Lumps of raw glass are a typical find in secondary workshops in the Roman provinces (Amrein 2001:19, fig. 10), they are also known in the form of “hoards of glass” (Höpken and Schäfer 2006: 80, fig. 17). Komariv is the only place in European Barbaricum where lumps of raw glass have been recorded. In other barbarian settlements, cullet was used for production of glass, e.g., in Klein Köris (Gustavs 1989: 147–180).

Several groups of finds from this feature represent the remains of the technological process of vessel blowing. Such intermediate forms from a glass drop to a finished product made by the free-blowing technique are conventionally divided into so-called “caps” (the connection point to the blowpipe), the body itself (the side part of a rounded shape), and the backside (the place of the pontil attachment).

Several examples of the so-called “caps” were recognised, all made of transparent colourless glass (Fig. 5). Concentric traces of the flow of the mass of glass and small air

<sup>5</sup> The list of the finds is given including those made in 1957.

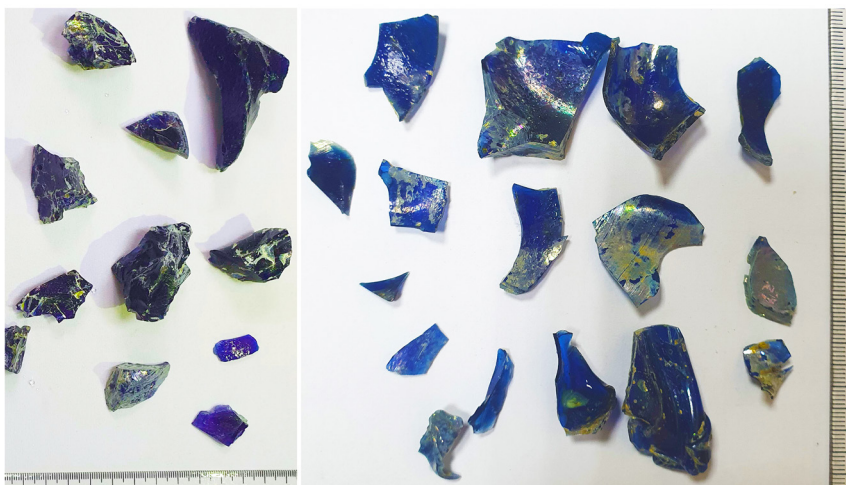
<sup>6</sup> The weight is indicated only for material from the recent excavations.



**Fig. 3.** Komariv, object 30. Semi-finished glass of green colour.  
Authors: O. Petrauskas and R. Shyshkin.

bubbles are visible on the surface and fractures of these items. Three large fragments with traces of broken connection to a blowing iron are preserved. One fragment has a clearly distinguished rim of the glass mass thickening (Fig. 5:3). The outer diameter of the tube was 1.5–2 cm, the inner diameter was 1.2–1.6 cm. On the edges of two “caps”, traces of cuts at the places of separation from the finished product are clearly seen. The diameter of the vessel rims could be 9.5 cm and 9 cm (Fig. 5:1). By their morphological features (blowpipe diameter, rim of finished products) and traces





**Fig. 4.** Komariv, object 30. Semi-finished glass of blue colour.  
Authors: O. Petrauskas and R. Shyshkin.

of technological processes, the “caps” from Komariv do not differ from similar finds in glass workshops in the Roman provinces (Amrein 2001: 24, 27–30, figs 15, 20–23).

The finished products found in the structure are almost completely preserved vessels or fragments of beakers, bowls, phialae, and possibly, jugs.

*Conical beaker with overlapping ovals and applied base.* The colour of the vessel’s glass is transparent with a slight greenish tinge. Decoration of the vessel is made of blue glass (ovals, drops inside ovals, threads) in different tinges. The base bottom is formed from a twisted glass thread applied laid in spirals. The rim is straight and has a teardrop section. Three large ovals with large drops in the centre were applied on the walls and at different heights. Two glass threads were applied below the rim. Dimensions of the restored vessel are: total height – 14 cm, rim diameter – 12 cm, base diameter – 3 cm (Figs 6, 7). The vessel belongs to Type 195 according to H.-J. Eggers (1951: 94, 178, N392, Salthammer).<sup>7</sup>

<sup>7</sup> The vessels of the described type, including those coming from the Cherniakhiv culture, were studied by I. A. Gavritukhin, who recognized them as a separate series of Salthammer group of vessels of the Kosino type, according to his classification, and dated them to the 5th century (Gavritukhin 1999: 57–59, fig. 11). Over time, a new “typology” of the same author appeared, and these beakers were consolidated into the Izvoare type and divided into the Kholmske and Kosino series. The Kholmske series was dated to phase D<sub>1</sub>, while the second series remained in phase D<sub>2</sub>/D<sub>3</sub> and D<sub>3</sub> (Gavritukhin 2017: 93, fig. 6). An attempt to replace the classification of these beakers developed by H.-J. Eggers with the new typology does not look successful. Besides, the date proposed by I. A. Gavritukhin did

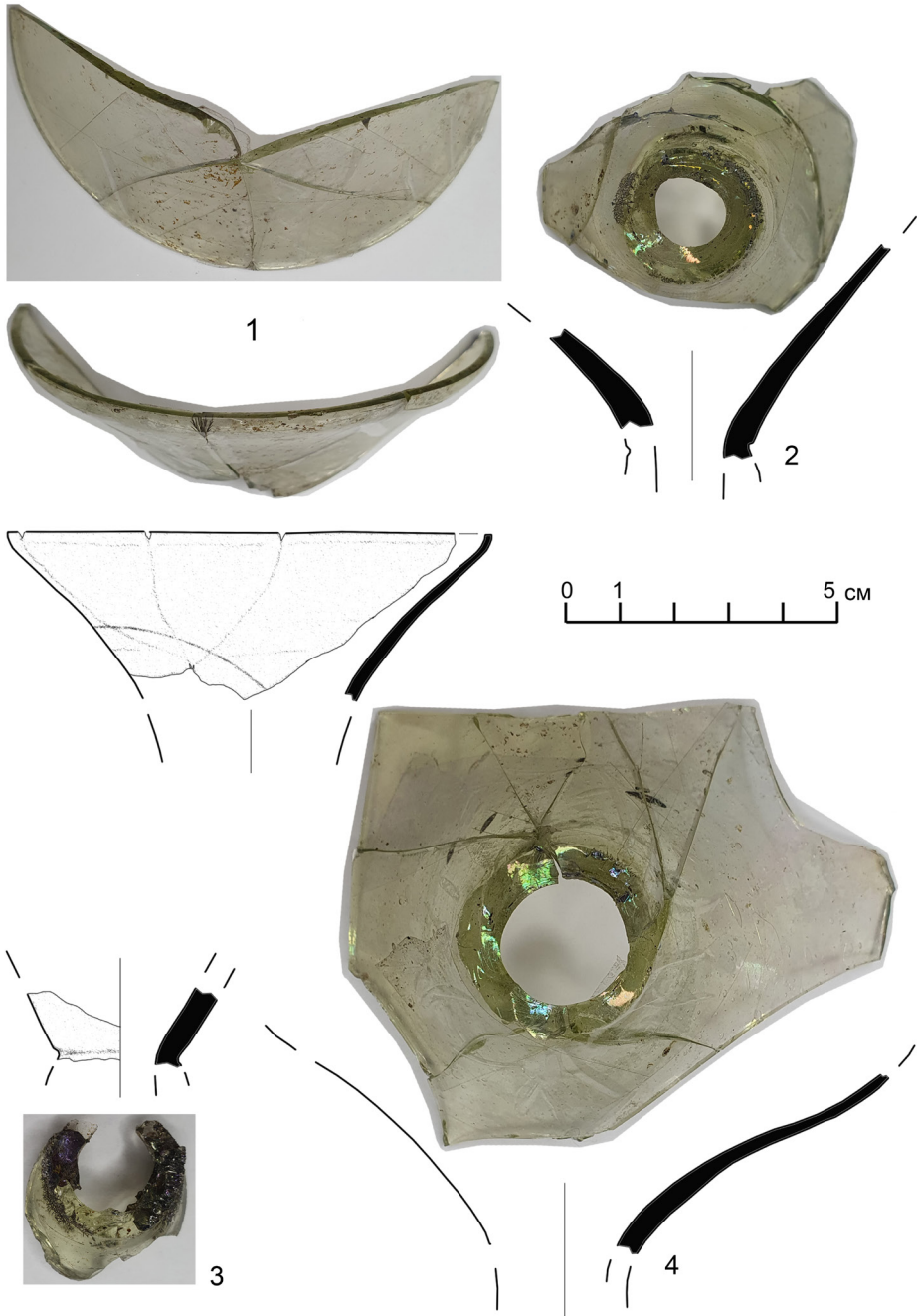


Fig. 5. Komariv, object 30. Fragments of glass caps. Authors: O. Petrauskas and R. Shyshkin.

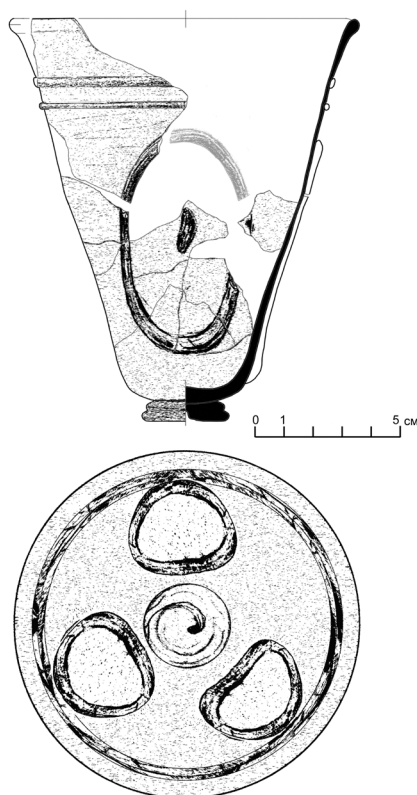
These beakers are distinguished by their unique specific form, structure, and decoration: a conical body, an applied foot and base, and large applied ovals. Additional elements are drops inside ovals and circular cordons. All known specimens are made of one-colour glass – the body and the decoration. Similar beakers in the Cherniakhiv culture complexes have been found in Izvoare, Burial VIII – single-colour, greenish (Vulpe 1957: 300, figs 319–320), Independența, Burial 20 – single-colour, drops between the ovals, circular ribbed band below the rim (Rau 2008: figs 4:6; 7:9); Kholmske, Burial 51 – monochrome, brown, vertical decorative ridges between ovals (Gudkova and Fokeev 1984: 70–71). The materials from Izvoare, Burial VIII contained accompanying items – plate fibulae, Thomas type / III comb, two small-sized amphorae<sup>8</sup> and other items that are confidently synchronized with the same final stages of the Cherniakhiv culture. Fragments of a beaker of a similar type possibly come from Burial 264 in Cherneliv-Russkyi. The thin-walled vessel was probably conical with blue threads in the form of cordons and part of an oval. The burial with accompanying items belongs to the final phase of the cemetery (Gereta 2013: 80, fig. 155. 5–7).

According to G. Rau, the replacement of the wheel-cut medallions technique with applied glass trails should be attributed to the “horizon of Attila”, that is, the 5th century. Based on this, the glass beaker from Izvoare was dated accordingly (Rau 1975: 482–483, fig. 5.2). Typologically similar beakers (olive, single colour) come from Kosino/Koson.<sup>9</sup> By analogy, Joachim Werner dates the assemblage of fibulae in hoards with coins to the second half of the 5th century (Werner 1959: 427). Jaroslav Tejral narrowed somewhat the date of the complex referring to the transition phase D<sub>2</sub>/D<sub>3</sub>: AD 440–460/470 (Tejral 2007: 86, fig. 19). The new drawing of the beaker was made and the new name to the site was given in the work by István Bona and Margit Nagi, who also dated the burial to the Hunnic times (Bona and Nagi 2002: 17, fig. I). An almost similar glass beaker (green, single-colour, transparent) comes from a burial in Tarnaméra, which is also dated to the mid-5th

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not fundamentally introduce anything new to the justified dates in the works by I. Werner, G. Rau, and others.

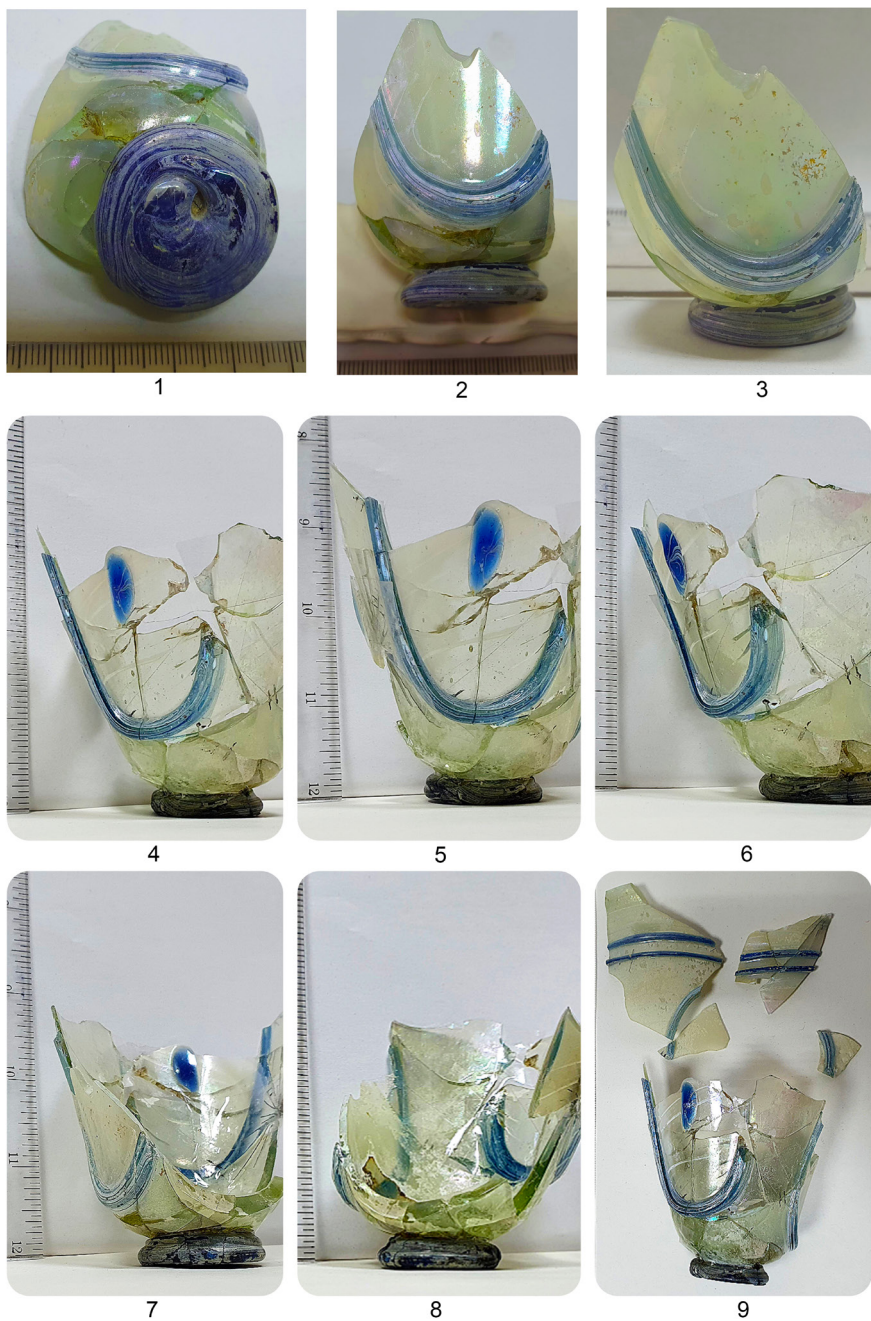
- 8 One of them may be dated back to the late Roman period. The second vessel is very similar in morphological and dimensional characteristics to the amphorae of subtypes 1 and 2 of the type Shelov F, which are dated by S. Didenko to AD 350–380. (Shelov 1978: 16–21; Didenko 2018: 51–78, figs 52–58). However, a different design of the vessel foot from Izvoare allows us to consider it a derivative of these subtypes and, in general, date it back to the second half of the 4th century. The types were defined, and the dating of the amphorae was carried out by S. Didenko, and we take this opportunity to express our sincere gratitude to him.
- 9 The site has received several names in the literature: Mező-Kaszony (Hampel 1905: 51–53, fig. I), Kosino /Mezőkaszony (Werner 1959: 424.), and Barabás-Bagolyvár (Bona and Nagi 2002: 17), Barabás / Cosino (Tejral, J. 2007: 86). The modern, correct spelling of the Ukrainian and Hungarian border settlement is: Ukr., Koson, Hung., Mezőkaszony.



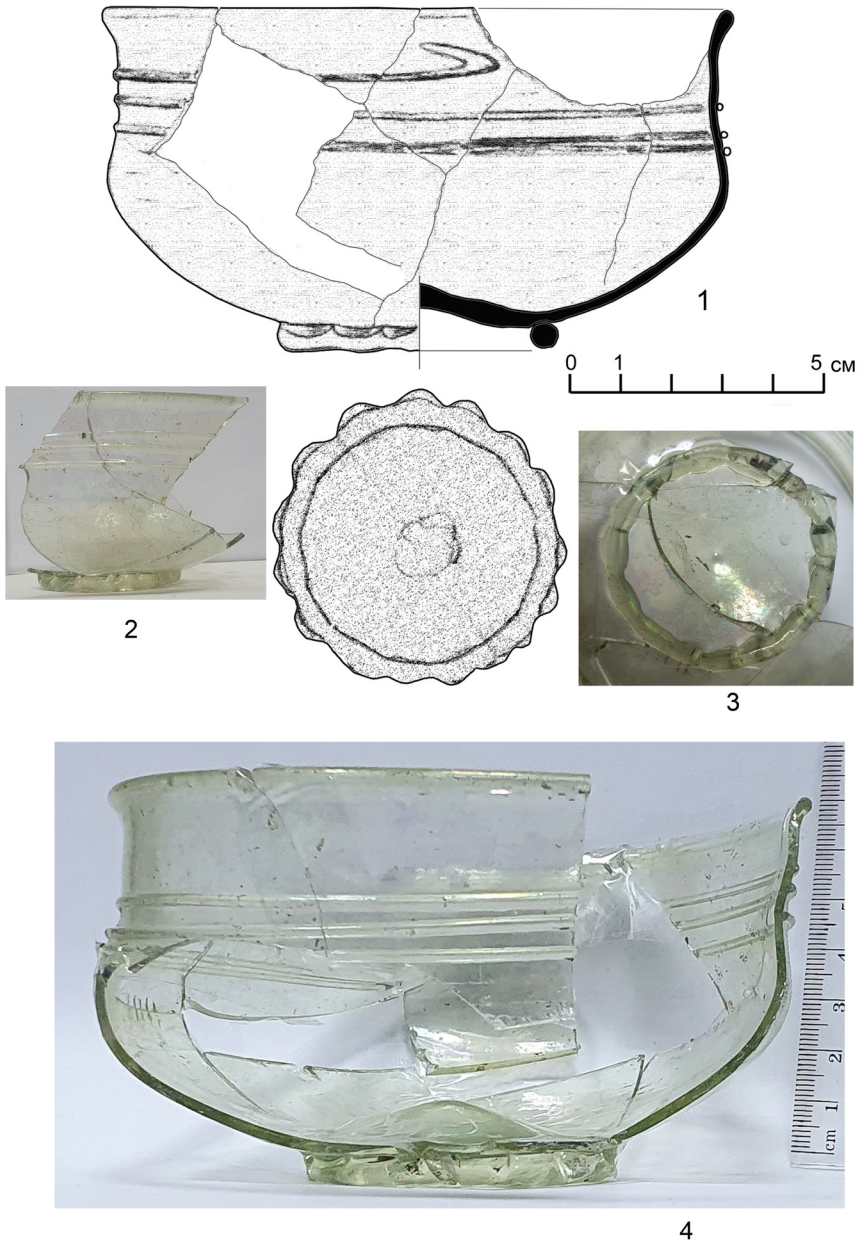
**Fig. 6.** Komariv, object 30. Beaker with applied decoration – horizontal trails and ovals.  
Authors: O. Petrauskas and R. Shyshkin.

century (Bona and Nagi 2002: 20, 241). Summing up, the beakers of Eggers type / 195 of the Salthammer / Koson' form are undoubtedly dated to the 5th century, and most likely to the middle of that century.

*Glass cup-bowl with an almost straight neck, rounded rim slightly bent outwards, globular wall, a ring base, and circular threads applied under the rim (Figs 6 and 7). The glass of the vessel, including the body, base, and overlapping threads is transparent with a slightly greenish tinge. A thin thread is applied in three lines between the rim and the ridge around the body with one end curving back on itself and the other one merging with the lower row. The base is formed of an applied thick glass roll, given a “frilled” upper edge by shallow impressions. The traces of a pontil are visible on the base.*



**Fig. 7.** Komariv, object 30. Beaker with applied decoration. Authors: O. Petrauskas and R. Shyshkin.



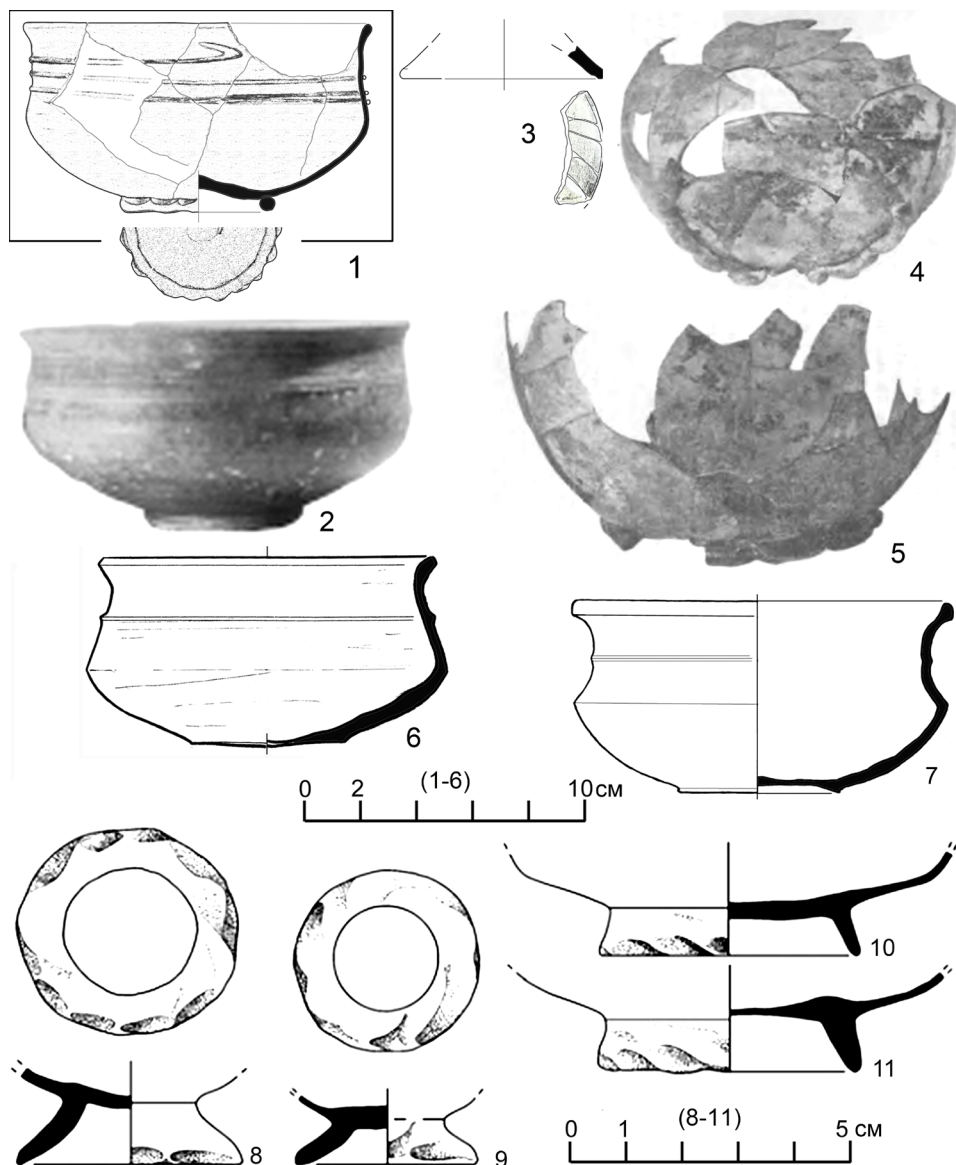
**Fig. 8.** Komariv, object 30. Glass bowl. Authors: O. Petrauskas and R. Shyshkin.

The diameter of the rim is 12 cm, and the base is 5.6 cm in diameter (Fig. 8). No direct analogies to this form have been found among Roman and later glassware. Some similarities can be seen in the design of the footring bases of glass vessels of the Byzantine period (Fig. 9:8–11), dated to the 5th–6th centuries (Harden 1936: N 89, 91, 358; Kucharczyk 2007: 52, fig. 3:6–12).<sup>10</sup> From the Roman period finds in Ukraine, a glass vessel with a similar design of the base comes from a burial site near the village of Gleshchava (Terebovlia district), about 100 km northwest of Komariv in an inhumation burial (Figs 4, 5). Here, the body was laid with its head to the east in a stone cist under a barrow (2.5 m high, about 10 m in diameter). A broken glass “cup” was placed at its feet, and two flints were placed near its right palm. The lower part of the vessel only can be restored: the rounded body (jug or deep bowl), the base has the form of a twisted cord applied to the body (Demetrykiewicz 1900: figs 24, 25, 132). Similar forms, but made of clay, are known from the cemeteries of the Cherniakhiv culture: Berzhanka / Burial 5 (Volianyk 1974: 73, fig. 7:2), Velyka Bugaivka / Burial 28, 55 (Petrauskas and Shyshkin 2013: 175, 188, figs 93:6; 106:3) and others (Fig. 9:2, 6, 7). The ceramic analogies have the features of bowls and beakers of the early stages of the Cherniakhiv culture – high proportions, an elongated neck, a ridge near the middle of the vessel height, a globular wall, and plastic circular cordons.

*Thin-walled conical beaker* (Fig. 10:3). Three wheel-cut horizontal lines survived on the external side of the wall. The vessel glass is transparent and colourless, and small air bubbles are visible. The wall fragment diameter is 12 cm, and its thickness is up to 0.2 cm (Fig. 10:3). There is no doubt that beakers of this type belong to the final phase of Cherniakhiv culture and are typical for the period D<sub>1</sub> (Rau 1972: 167, fig. 52; Gorokhovskiy 1988: 45–46; Kasanski and Legoux 1988: T. XVIII, pl. IV, 56; Tejral 1997: fig. 11).

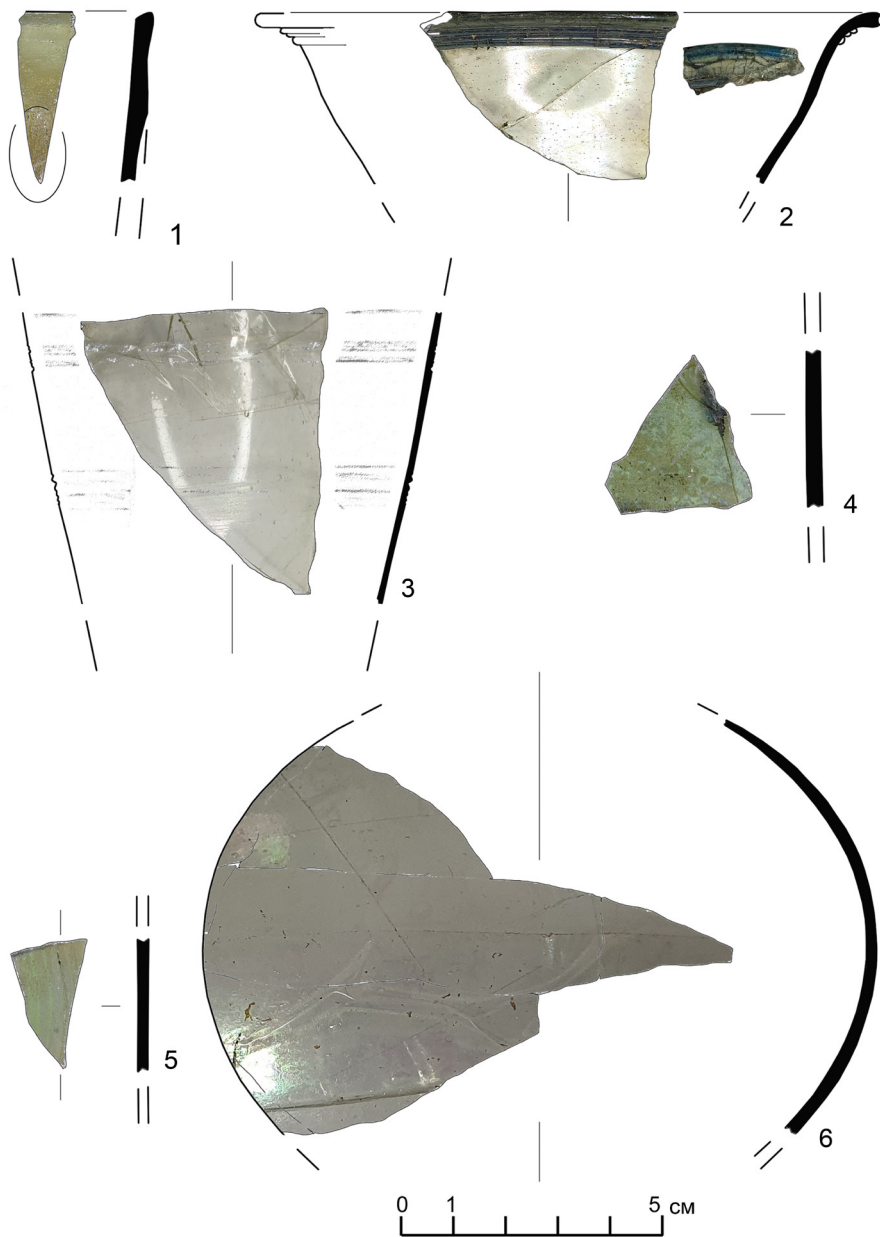
*Beaker with wheel-cut ornament* (Fig. 10.1 and 10.3). The form is close to cylindrical and has straight rims. A shallow wheel-cut band encircles the body below the rim, the remains of a wheel-cut oval are visible still lower. The surface of the oval has vertical grooves later altered. The transparent glass is colourless. The wall thickness is 0.35/0.4 cm, and that of the rim is 0.35 cm. The fragment could have belonged to the vessels of the IA or IB series according to Eldrid Straume (Straume 1987: figs 2, 3). Considering the shallowness of the incisions, the fragment most likely belonged to vessels of the first series, known as Eggers 230 or Kovalk type (Eggers 1951: 180–181, Beilage 98, fig. 16; Rau 1972: 109–214). The appearance of these beakers in the Cherniakhiv culture is confidently associated with the phase C<sub>3</sub>, and the main time of their distribution falls in the phase D<sub>1</sub> (Petrauskas 2018: 536–563).

<sup>10</sup> In the collection of glass items from M. Smishko's excavations, there are fragments very similar to items of the early Byzantine period (Fig. 9:3).



**Fig. 9.** Glass bowl from Komariv (1), and some analogous finds: Berezhancka (Ukraine, Khmelnytskyi region; 2), Komariv (Ukraine, Chernivtsi region; 3), Gleshchava (Ukraine, Terebovlianskyi district; 4, 5); Velyka Buhaivka (Ukraine, Kyiv region; 6, 7); Kom el-Dikka in Alexandria (Egypt; 8-11). 1, 3, 6, 7 by O. Petrauskas and R. Shyshkin; 2 by Volianyk 1974: 73, figs 7: 2; 4, 5 by Demetrykiewicz 1900: figs 24, 25, 132; 6, 7 by Petrauskas and Shyshkin 2013: 175, 188, figs 93: 6; 106: 3; 8-11 by Kucharczyk 2007: 52, fig. 3:6-12.





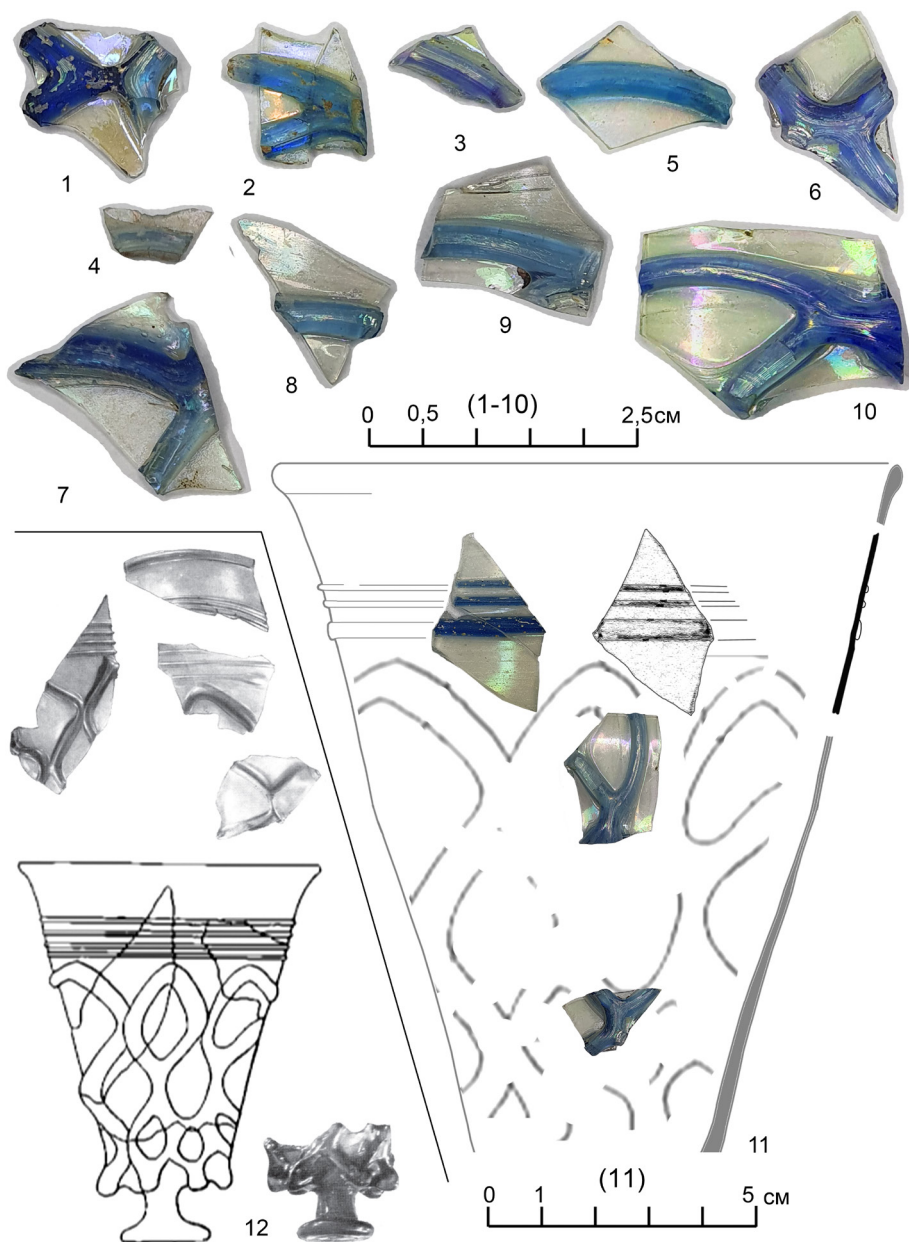
**Fig. 10.** Komariv, object 30. Glass ware (1–3), window glass (4, 5), glass ball fragment (6).  
Authors: O. Petrauskas and R. Shyshkin.

*Fragments of ball-like glass objects.* Several wall fragments of 3–4 unidentified forms have been found. The wall is 0.2 / 0.4 cm thick, and the vessel diameter is about 12–13 cm. The glass is transparent and colourless or with a pronounced green tinge, showing horizontal traces of flow of glass mass, and small air bubbles. Similar elements can be found in well preserved forms – flasks, phialae, balsamaria, or jug-shaped vessels. The missing profile parts of both edges make it difficult to identify the vessels precisely. The only fragment of the handle that may have belonged to a jug has other visual glass characteristics. Therefore, we consider these fragments are parts of the so-called “glass bubbles” / Glasblase, which represent intermediate stages in the production of glass vessels.<sup>11</sup> Such intermediate forms from a glass drop to a finished product made by the free-blowing technique are conventionally divided into so-called caps (the connection point to the blowpipe), the body itself (the side part of a rounded shape), and the backside (the place of the pontil attachment). Fragments from similar forms are regarded as waste from the technological process resulting from end product manufacture, and in most works, such fragments are referred to as production waste or glass cullets intended for recycling (Rütti 1991:158, fig. 101: 031, 034, 037–044; Seibel 1998: 64, fig. 25; Amrein 2001: 23, 43, figs 12, 43:1–3).

*Window glass* is represented by two fragments with flat surfaces and uniform thickness (the larger fragment is 3 × 3 cm; Fig. 10:4, 5). Considering glass thickness and colour, we can talk about two different windowpanes. The transparent glass has a weak and strong greenish tinge. The thickness of one is 0.23 cm, and of the other – 0.34 cm. In late Antiquity, glassworkers knew two main methods of such glass manufacture: cylinder-blowing followed by cutting and casting (Seibel 1998: 65). In Komariv, there are a lot of finds of window glass, and most of the specimens were made by casting. Ol’ga Rummyantseva believes that window glass fragments are secondary raw materials for further melting (Rummyantseva 2017: 159). However, the direct use of window glass in Komariv’s structures is not excluded, which may be evidenced by finds in the residential part of the settlement, where glass was not processed.

*Glass vessel – a bowl or phiale in the form of low hemisphere with widely outwards flared rims.* The glass of the bowl is transparent and colourless, and the glass of the overlain threads is light blue. The walls near the rim have a visible bend outwards. The rims are teardrop-shaped in cross-section and have a thin applied layer on the outside – a blue

<sup>11</sup> We believe that the use of the term “glass bubble” for this type of findings is the most successful. A ball – or sphere-like shape implies a certain symmetry of the vessels. The shape of the bubble, as of a volume filled with a substance, in this case with air, was formed of a rounded shell of various, usually asymmetric, shapes during free-blowing.



**Fig. 11.** Komariv, object 30: fragments of thin-walled glass vessel with applied reticulate ornament (a beaker?; 1–11). Nova Maiachka, Kherson region, Ukraine Vessel (not to scale; 12).

1–11 by O. Petrauskas and R. Shyshkin; 12 by Kropotkin 1970: 109, figs 73:6, 70:1–5;  
Zasetskaya 1994: 100–103, figs 10:1–7, 48:3.

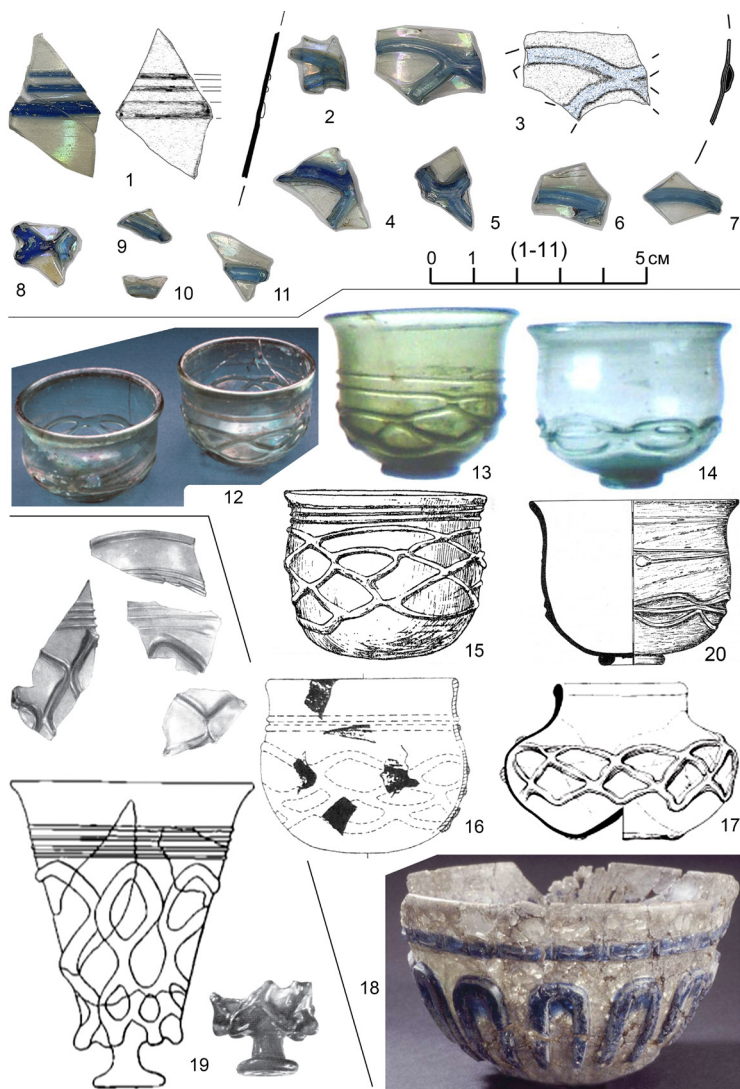
glass overlay along the entire length. Below the rim, there is a fused band of three blue threads placed close to each other and uniform in their thickness. The rim is 12 cm in diameter, 0.25 cm thick, and the thickness of the wall is 0.19/0.2 cm (Fig. 10:2). The most similar forms and features of decoration were found in the vessels of the 4th–early 6th centuries in Great Britain and Bulgaria. These are vessels with wide rims and multi-row band of thin glass threads of blue or light blue colour under them and bands of the same colour on the rims (Evison and Marzinzik 2008: 93, fig. 1:7; Cholakova 2015: 265, fig. V.16).

*Glass vessel with applied reticulate ornament, probably a beaker.* Several fragments that could have belonged to such a thin-walled vessel have survived. The fragments are characterized by the uniform thickness of the body, the colour of the glass of the vessel (transparent, colourless) and the decoration (blue, transparent), as well as by the decoration applied in the form of circular horizontal threads and trails in a reticulate pattern. The fragments preserved are part of the wall of the upper part of the vessel with three circular cordons (Fig. 11:1) and several body sherds with applied threads (Fig. 11:2–11). The diameter of the preserved parts varies in range from 10 to 15 cm. The wall thickness is 0.09 to 0.22 cm. The diameter of the overlapping bands is 0.1 cm (circular cordons) and 0.3 cm (reticulate threads).

Due to the small size of the fragments, it is impossible to restore the original form of the vessels and its type, unless based on the known analogies.

The reticulate pattern, horizontal cordons, and wall thickness are significant. The combination of such features is known to be specific for the vessels of the Late Roman and early Byzantine times, among which the vessels of the Arnswalde and Nova Maiachka type are the most similar to the described fragments.

Vessels of the Eggert type 199, 200, or Rau / Arnswald are small cylindrical beakers with slightly convex walls, and straight or slightly curved rims, most of them have a ring-like base, and the body is decorated with horizontal cordons and bands in a reticulate pattern. Their body and the overlaying decoration are made of the same glass (colourless or greenish). Average dimensions are: height and diameter of about 10 cm, rim thickness 0.5 cm, wall thickness – 0.3 cm, bottom part thickness – 0.7 cm. These vessels are dated to the phase C<sub>2</sub> (Eggert 1951: 178; 1955: 202, fig. 4; Rau 1972: 172, fig. 57), although a later date is not excluded (Petrauskas 2017: 123–154). As it turns out, archaeologically not many whole forms are known (Fig. 12.12–15): Brøndsager, Burial 2000 (Lund Hansen 2011: 155, fig. 3:b); Rudka (Lund Hansen 2011: 155, fig. 3:l); Arnswalde-Choszczno (Stawiarska 1999: 268, no. 94); Södra Kvinneby (Rau 2008: 235, fig. 2:13; fig. 11:12–15), Mohyliany–Khmilnyk, Burial 5 (Kasparova and Shchukin 1979: 164–165, fig. 7:4); Teremtsy (Likhter and Hopkalo 2007: 189), Igołomia, House 70A (Stawiarska 1999: 268, No. 95). The only case where the form of the vessel is determined by small fragments as Eggert type 199–



**Fig. 12.** Glass vessels with the fused decoration dated to the Roman and early Byzantine times: Komariv (Ukraine, Chernivsti region), object 30 (1–11); Brøndsager (Denmark), Burial 2000 (12); Södra (Sweden; 13); Rudka (Ukraine, Ternopil' region; 14); Arnswalde-Choszczno (Poland, West Pomeranian Voivodeship; 15); Opatów (Poland, Świętokrzyskie Voivodeship), Burial 935 (16); Broomfield (England, Essex; 17); Uppåkra (Sweden; 18); Nova Maiachka (Ukraine, Kherson region; 19). Not to scale – 12–19. 1–11 by O. Petrauskas and R. Shyshkin; 12 by Lund Hansen 2011:155, fig. 3:b; 13 by Rau 2008, 235, fig. 2:13; fig. 11:12–15; 14 by Lund Hansen 2011: 155, fig. 3:I; 15 by Stawiarska 1999: 268, no. 94; 16 by Stawiarska 1999: 271, no. 102; 17 by Evison and Marzinzik 2008: 26, fig. 26, no. 150; 18 Stjernquist 2004: 103–151; Fig. 11:16, 18; 19 by Kropotkin 1970: 109, figs 73:6, 70:1–5; Zasetskaya 1994: 100–103, figs 10:1–7, 48:3.

200 and which had a reticulate design of blue threads (Fig. 12.16) is Burial 935 in Opatów (Stawiarska 1999: 271, no. 102). However, the burial complex itself belongs to the IV phase of development of the cemetery, which is synchronized with the phases C<sub>3</sub>–D (Madyda-Legutko *et al.*, 2011: 10, 213). Decoration of the vessels' walls with a reticulate pattern is also typical for vessels (of various shapes) known from the Roman provinces, e.g., in Cologne, where they mainly date to the 3rd century (Fremersdorf 1959: figs 110, 115–117).

The vessel from Nova Maiachka (Fig. 12.19) represents another type of thin-walled vessels with a reticulate pattern. The vessel has a bell-shaped body, with an applied tall foot. Decoration is composed of horizontal thin threads applied under the rim and massive threads all over the body, forming a reticulate pattern (Kropotkin 1970: 109, figs 73:6, 70:1–5; Zasetzkaya 1994: 100–103, figs 10:1–7, 48:3). According to the description, the glass of the vessel and the decoration are the same – transparent and colourless. The complex dates to the Hunnic period. The use of overlapping cords in compositions of multi-row waves is also known in glassware of the 4th–6th centuries in Britain, as exemplified by the vessel from Broomfield (Fig. 11:17) made of glass of a rich blue colour (Evison and Marzinzik 2008: 26, fig. 26, no. 150).

The described fragments of the vessel from Komariv are similar to the vessels of the Hunnic times in Europe. The style of sloppily applied blue threads is typical for thin-walled glass vessels of the Hunnic period. Such specimens were found in the Cherniakhiv culture sites – in Kosanove and Zhuravka (Petrauskas 2021: 21), and are also known in Western Europe sites of the 4th–5th centuries, for example, the beaker from Opatów mentioned above, the bowl from Uppåkra (Stjernquist 2004: 103–151; Fig. 11:16, 18) etc.

In addition to the glass products, other materials were found in the excavated structure making it possible to determine the period of its existence and functional purpose.

The mirror fragment is close to products with concentric circles, which are connected by radial cordons and a loop on the reverse side used to hang it. I. Werner categorized such mirrors as the Chmi–Brigetio type and dated them to the 5th century (Werner 1956: 19–22, fig. 45). Mirrors of this type are known from the area of the Cherniakhiv culture: Vilshanka, Lesky, Maslova, and Dmytrivka, which belong to its latest phases (Petrauskas 2021: 17–18).

The two Roman coins are a denarius of Hadrian (117–138) and a bronze coin of Constantine the Great (330–335).<sup>12</sup> The latter marks the *terminus post quem* of the absolute date of the complex in Komariv. Finds of copper / bronze Roman coins of the 4th century within the Cherniakhiv culture are typical for the Dnister river catchment. Their distribution there is associated with the inhabitants

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<sup>12</sup> The coins were identified by K. V. Myzgin. We take this opportunity to express our gratitude to him.

of the Cherniakhiv culture, who served as *foederati* in the Roman army (Magomedov 2006: 48–50).

The bronze fibulae with upturned foot and with a triangular (trapezoidal) section stem, which is decorated with stripes of zigzag ornament on the long sides is a distinctive form. Similar fibulae are common in the western and southern regions of the Cherniakhiv culture, including the Dnister River catchment. The zigzag-like pattern on the fibula stem is known in the fibulae of the Dnister Basin and in the area to the west thereof (Kazanski 2022: 39–54). To date, the largest collection of fibulae of this type consisting of eight specimens has been found in Komariv. The earliest typologically similar items come from Werbkowice and Ryzhavka, dated to the end of phase C<sub>2</sub> – beginning of C<sub>3</sub> (Kietlińska and Piętka-Dąbrowska 1961: fig. 34:1; Kropotkin 1962: 4, fig. 26; Petrauskas 2017: 125), other ones, from burials in Mykolaivka, are dated to the phase C<sub>3</sub> / D<sub>1</sub> (Petrauskas 2016: 96–98), and the latest version presented among the described materials is dated to the phase D<sub>1</sub> / D<sub>2</sub>. The evolution of these fibulae follows the general principles of development of a large group of fibulae with upturned foot of the Cherniakhiv culture. This is demonstrated by changes in the proportions of the body cross-section (from bars to plates), additional processing of the body (facets, body casting, etc.), additional decorative elements (extensions), etc. The lamellar body and the presence of zigzag-like stripes certainly refer the specimen to later forms of fibulae of this type. The second bronze fibula has an upturned foot and a ribbon-like body of over 5 cm in height. It also belongs to the latest variants of this group of fibulae of the Cherniakhiv culture (Gorokhovskiy 1988: 34–46).

Thus, the results of the works carried out in Komariv in 2019 and 2021 give us the possibility to draw some conclusions about the objects studied in the investigated part of the settlement.

The structure with the remains of glass production (object 30) is located in the production part of the settlement. This is a second type of structures which can be evidently associated with the glass production – it is the buried design structure. The first type is the glass melting furnace studied by M. Smishko in 1965. To determine the original form of the structure undoubtedly associated with glass processing in Komariv is impossible without complete publication of the materials of the previous studies. The glass finds presented above can be divided into two groups – glass prepared for further melting (semi-finished products and production waste) and finished products (beakers, bowls, phialae). The dating falls in phases D1 and D2, that is, the Hunnic times. The glass-making workshop belongs to the same period as the building on the stone foundation (object 27) and they could have formed a single complex. The nature of the finds and the dating of object 30 show that glass processing in the Cherniakhiv culture was practiced also in the Hunnic times.

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