

ONE LAST FOR THE ROAD.

A GLASS BEAKER WITH SNAKE-THREAD DECORATION FOUND IN THE NECROPOLIS FROM BARBOȘI (ROMANIA)

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Abstract: The paper discusses a recently discovered glass stemmed beaker with snake-thread decoration, Isings form 86, recovered during rescue excavations in 2024. The glass beaker was part of the grave goods of a cremation burial under tumulus, dated to the 2nd – 3rd c. AD, in the necropolis from Galați (Galați county, Romania), on the Danubian limes. The find, remarkable for this part of the Roman Empire, is discussed from a typological and technological point of view, in the context of glass vessels with snake-thread decoration from other regions of the Roman world.

Rezumat: Articolul discută o descoperire recentă, un pahar de sticlă cu picior, cu decor serpentiform, forma Isings 86, descoperit în cursul unor cercetări arheologice preventive în 2024. Paharul de sticlă era parte a inventarului funerar dintr-un mormânt de incinerare sub tumul, datat în sec. II-III p.Chr., din necropola de la Galați (jud. Galați, România), pe *limes*-ul danubian. Descoperirea, remarcabilă pentru această parte a Imperiului Roman, este discutată din punct de vedere tipologic și tehnologic, în contextul veselei din sticlă cu decor serpentiform cunoscute din alte zone ale lumii romane.

Keywords: glass beaker, Isings form 86, snake-thread decoration, funerary context, Danubian limes, chemical composition, PIXE, Roman glass recycling

Cuvinte cheie: pahar de sticlă, forma Isings 86, decor serpentiform, context funerar, *limes*-ul danubian, compoziție chimică, PIXE, sticlă romană reciclată

INTRODUCTION

The present paper discusses a recent find, a glass stemmed beaker with snake-thread decoration, Isings form 86, recovered during rescue excavations in 2024. The glass beaker was part of the grave goods of a cremation burial under tumulus, dated to the 2nd – 3rd c. AD, in the necropolis from Galați (Galați county, Romania), on the Danubian limes. The find, remarkable for this part of the Roman Empire, is discussed from a typological and technological point of view, in the context of glass vessels with snake-thread decoration known from other regions of the Roman world.

FIND CONTEXT

The archaeological site of Barboși (Bârboși) is situated south-west of the present-day city of Galați (Galați county, Romania), on the banks of a former meander of the Siret River, west of its confluence with the Danube River. The archaeological remains include a Dacian fortress, a Roman *castellum* and *castrum*, as well as a civilian settlement with its corresponding necropolis, dated to the 2nd – 3rd c. AD. The strategic advantages of the area were exploited from the antiquity until the late Middle Ages, as it was an important crossroad for commercial routes, part of a network connecting the land, the rivers, and the sea (Fig. 1)¹.

The Roman necropolis was identified on the plateau of the Galați Steelworks, in the northern part of the archaeological site placed on the Tirighina hill, which was used during Roman times for the military camp and the civilian settlement. Due to massive anthropic interventions, at least from the 19th century – when the area was used as a stone quarry, inclusively for the construction of a railroad around 1870, which crossed the Roman civilian settlement – and continuing during the 20th century with the expansion of the modern city, the large Roman necropolis suffered a lot of damage. The parts that survived consist of both tumuli and a large number of flat graves. The disposal of the bodies comprised both inhumation and cremation (Fig. 2)².

The archaeological excavations conducted since the 1980s offered important information regarding the funerary habits of the community/communities living in this area during the Roman period.

During 2024, in the place identified as Metalhard III, in the south-eastern part of the necropolis from Tirighina – Barboși, the rescue excavation covered 2930 square meters (Fig. 3).

¹ Adamescu et al. 2023, 198.

² Adamescu et al. 2023, 198-199.

the bottom of the grave, reached at -1.20 m, were identified cremated bones and four vessels (three ceramic vessels and one glass vessel). The pottery was found in secondary position in the north-western part of the pit. The only item found in its original position was the glass vessel, identified in the south-eastern part of the grave.

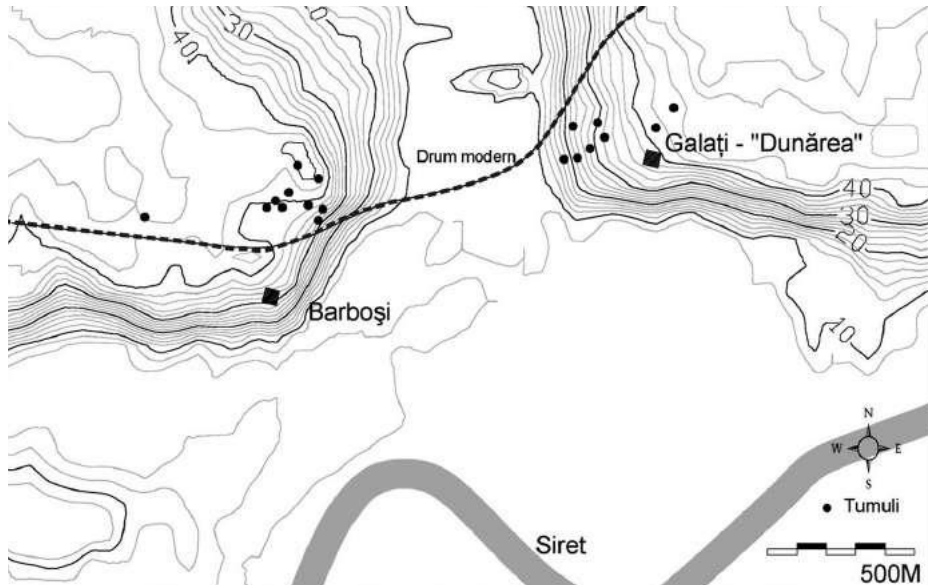


Fig. 2. The archaeological area of Barboși with the identifiable tumuli (Tentea, Oltean 2009, Fig. 1)

The grave goods consisted in total of five ceramic vessels and one glass vessel. One ceramic vessel is a jug with pinched mouth and a high-swung handle of Popilian 1976, type 12, variant 1³ (Fig. 7/1). Two of the ceramic vessels are trefoil-mouth pitchers/carafes, very similar to Rădulescu 1975, type 10⁴, a frequent presence in the funerary contexts of the region during the 2nd – 3rd c. AD (Figs. 7/2-3). The fourth ceramic item is a small one-handle cup, similar to the “a collarino” type, but coarser, with a ringed base, of Popilian 1976, type 1⁵ (Fig. 7/4). The fifth ceramic item is a fragmentary amphora with small handles, large mouth, and finely channelled body, possibly a variant of type Camulodunum 189, dated to the first half of the 2nd c. AD⁶ (Fig. 7/5).

³ Popilian 1976, 100, 193, cat. no. 525, pl. XLIX/525.

⁴ Rădulescu 1975, type 10, 341-343, pl. VIII/1.

⁵ Popilian 1976, 104-105, 196, cat. nos. 570, 574, pl. LII/570, LIII/574.

⁶ Bertoldi 2017, 146.



Fig. 5. The excavated precinct with the location of the funerary structures (drawing by A. Adamescu)

THE GLASS BEAKER WITH SNAKE-THREAD DECORATION

Dimensions

The vessel has a maximum height of 16.7 cm, the diameter at the rim (measured on the exterior of the mouth) of 5.8 cm, and the diameter of the base of 5.4 cm. The maximum diameter of the stem is 1.6 cm. The diameter of the constriction between stem and body, and between stem and base is 1.4 cm. The height of the body is 15.2 cm, and of the base and stem 1.5 cm. The thickness of the glass is 0.4 cm at the rim, 0.2 cm at the base, and 0.6 cm at the ring of the base. The accommodated volume of liquid would have been approximately 430 ml, calculated with the vessel filled up to the brim.

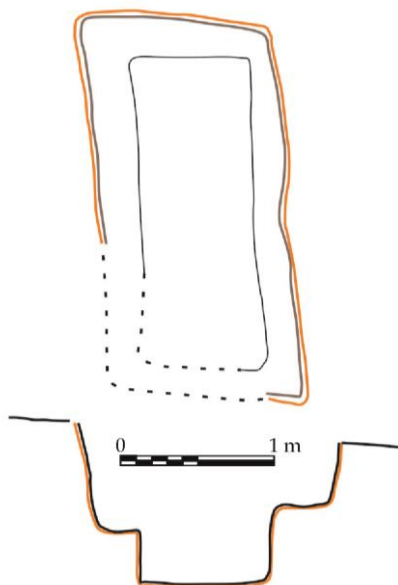


Fig. 6. Plan and profile of burial T1-M1 (drawing by A. Adamescu)

The present paper will focus on the glass vessel, identified as a cylindrical stemmed beaker with snake-thread decoration, Isings form 86, a remarkable find for this part of the Roman Empire.

Description

The vessel is a tall beaker with stemmed foot. It has a cracked-off, fire-rounded, slightly everted rim. It is characterised by a cylindrical body, tapering towards stem. The beaker has a solid slightly beaded stem and a flaring concave ringed base, with annular pontil. The diameter of the pontil is 1.4 cm.

The decoration of the vessel separates the body into three registers. A turquoise glass thread marks the separation between the upper register, beneath the rim, left undecorated, and the central register. A similar turquoise glass thread is used to separate the central register from the lower register, also left undecorated. The main register is decorated in the snake-thread technique, with several glass threads in two colours, opaque white and turquoise, forming relatively thin and prominent trails. One end of each trail is widened and flattened, creating a shape reminding of a vegetal motive – leaf or flower; the other end finishes in a spiral. The wide flattened ends present a pattern of ribs/grooves. The width of the upper register is 1.9 cm, that of the central (main) register is 11.4 cm, and that of the lower register is 2.1 cm.



Fig. 7. Grave goods of burial T1-M1 (photos by A. Adamescu)

The beaker presents weathering crust and iridescence. It was found broken in situ and it was mended in the museum. Several small fragments could not be replaced in their original position. The snake-thread decoration was also affected, missing some segments.

The illustration consists of photos showing the typological and decorative details of the beaker, the technological solution indicated by the details of the base, the small fragments of glass left after mending (Figs. 8/1-8), and a 3D reconstruction (Figs. 9/1-4). As a rule, the 3D reconstruction with the help of photogrammetry cannot be conducted successfully in the case of glass items, due to their transparency. In this specific case, the weathering calcareous crust present on the almost entire surface of the vessel allowed for the creation of the tridimensional model, which summed more the ten million polygons. The removal of the resulted texture and the visualisation of the model in clay render mode offer a better base for the observation of the application technique used for the snake-thread decoration and the degree of preservation of the vessel.

Glass composition

Several small fragments from the beaker (Fig. 10), which remained detached after the restoration process, were analysed in order to identify the chemical type of glass and to obtain clues regarding raw materials and manufacturing procedures. The shards were analysed using the external PIXE (Particle Induced X-ray Emission) method at the 3 MV Tandatron™ accelerator, Măgurele, IFIN-HH. The experimental parameters were similar to those indicated in a previous publication⁷.

Prior to the PIXE experiment, all fragments were washed in an ultrasonic bath with distilled water. Subsequently, they were wet polished on their most regular section with a silicon carbide paper to remove the thin layers of weathering products that are inherently present on the surface of any archaeological glass find.

In order to get quantitative results, PIXE analyses were performed on two small zones of two colourless glass fragments that, according to the preparation procedures described above, were free of weathered glass.

For obtaining qualitative information about the chromophores and opacifiers, PIXE spectra were also acquired on the turquoise and opaque white glass decorations. These analyses were performed without any preliminary preparation of the glass – measurements performed on corroded glass.

Table 1 provides the chemical composition of the colourless glass. All concentrations are given in wt%. Further discussion of the analytical results is based on the average of the PIXE data on two cleaned areas of colourless glass fragments, as the concentrations of all oxides were relatively similar – within the uncertainty limits.

⁷ Bugoi et al. 2023.



Fig. 8. 1-8. The glass beaker with snake-thread decoration: 1-7. lateral view (covering 360°); 8. ringed base with pontil mark; 9. shards from body and foot (photos by L. Cliaante)

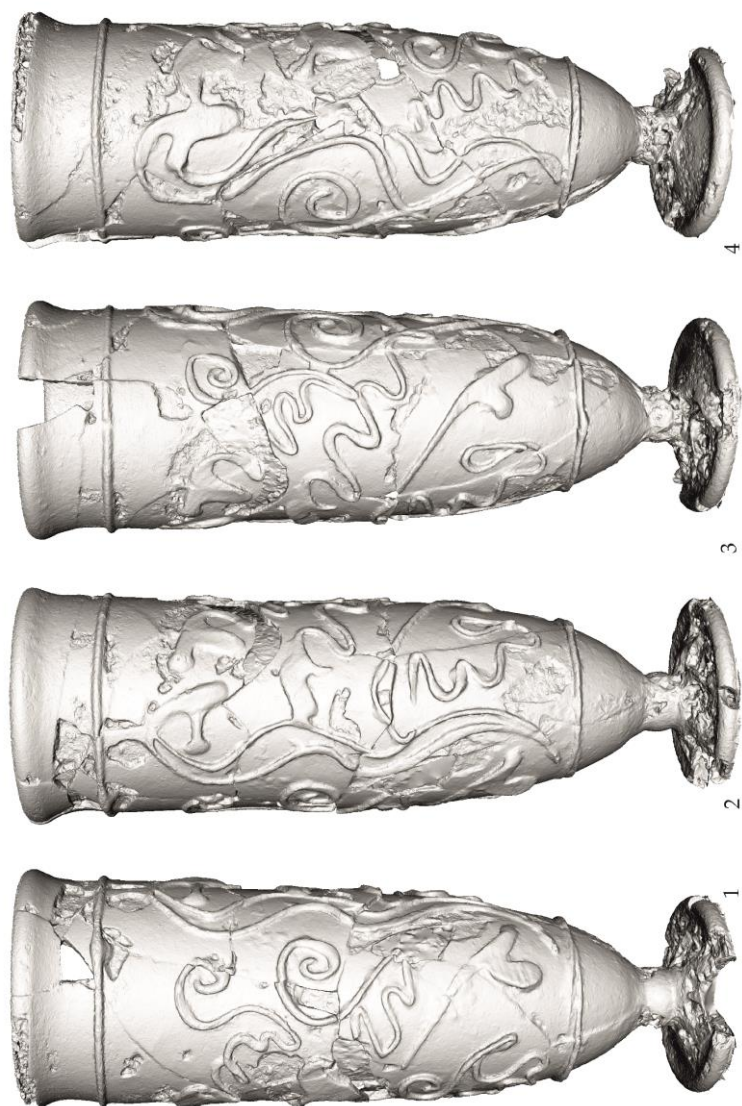


Fig. 9. 1-4. The 3D reconstruction of the glass beaker with the use of photogrammetry (by L. Cliante)

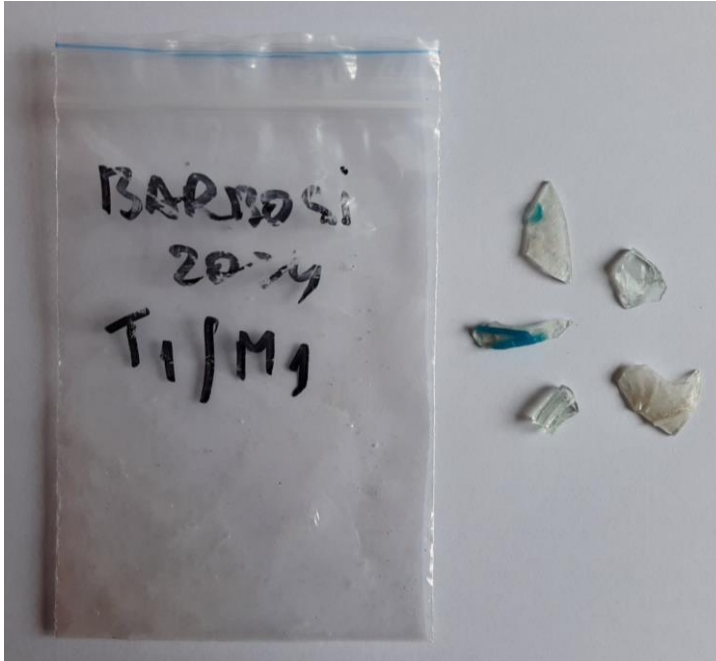


Fig. 10. The glass shards subjected to the PIXE analysis (photo by R. Bugoi)

The Early Roman glass had a remarkably homogeneous chemical composition compared to glass from other historical periods⁸. It was a soda-lime-silica glass manufactured in primary workshops located on the Levantine or Egyptian shores of the Mediterranean Sea, using relatively pure coastal sands and the mineral *natron* as flux. The shells naturally present in the maritime sands act as stabilizer for the glass, limiting its deterioration. The raw glass produced in these primary workshops was dispatched as small chunks to the numerous secondary workshops functioning all over the Roman Empire and in the commercially and culturally related areas. In these secondary workshops, the raw glass was remelted, and fashioned into vessels, beads, windowpanes, or *tesserae*⁹.

Given its qualities and uses, the Roman glass was copiously recycled¹⁰. In consequence, alongside with the raw glass chunks, broken glass (the so-called cullet) was melted in the secondary workshops in order to manufacture various kinds of vitreous items.

⁸ Freestone 2021; Rehren, Freestone 2015.

⁹ Freestone 2021.

¹⁰ Freestone 2008; Freestone 2015; Freestone 2021.

Table 1. The chemical composition of the colourless glass of the beaker
(concentrations expressed in wt%)

	ZONE 1	ZONE 2	AVERAGE
Na₂O	17.2	15.7	16.4
MgO	0.52	0.79	0.65
Al₂O₃	1.80	1.84	1.82
SiO₂	70.9	72.0	71.4
SO₃	0.34	0.37	0.36
Cl	1.367	1.37	1.37
K₂O	0.63	0.65	0.64
CaO	6.1	6.2	6.1
TiO₂	0.06	0.06	0.06
MnO	0.25	0.23	0.24
Fe₂O₃	0.52	0.50	0.51
CuO	0.005	0.005	0.005
ZnO	0.005	0.005	0.005
SrO	0.057	0.057	0.057
SnO₂	0.034	0.035	0.034
Sb₂O₃	0.270	0.290	0.280
PbO	0.008	0.008	0.008

The compositional PIXE data indicate that the colourless glass fragments from the beaker found at Barboşı were made of soda-lime-silica glass produced using *natron* as a flux. This statement is supported by the relatively high content of soda (16.4 wt% Na₂O), as well as by the moderate content of lime (6.1 wt% CaO) and strontium (0.057 wt% SrO), the last two components resulting from the shells naturally present in the glass making sands. The concentrations of both magnesia (MgO) and potash (K₂O) are less than 1.5 wt%, being also accompanied by relatively high amounts of chlorine (1.37 wt% Cl) and sulphur (0.36 wt% SO₃), features typical for *natron*. All these findings point towards the use of mineral *natron* to lower the melting point of silica (SiO₂), the main constituent of sands.

The concentrations of alumina (1.82 wt% Al₂O₃) and titanium oxide (0.06 wt% TiO₂), characteristic for the accessory minerals in the sand, are relatively small, indicating the use of high purity sands.

During the Roman period, glass was decolourized through the intentional addition during the primary stage of glassmaking of some compounds based on two chemical elements: antimony (Sb) or manganese (Mn). The Egyptian primary workshops were specialized in producing colourless glass by the use of Sb minerals – the so-called *Alexandrian* glass, while the Levantine primary workshops employed Mn minerals – in higher amounts – in order to obtain a similar decolourizing effect – producing the so-called *Judaean* glass¹¹.

The simultaneous presence of comparable amounts of antimony (0.28 wt% Sb₂O₃) and manganese (0.24 wt% MnO) is suggestive for obtaining the colourless glass by recycling Mn-decolourized and Sb-decolourized glass¹².

As the colourless glass of this vessel resulted from melting and mixing colourless/intentionally decolourized glass fragments originating in various primary workshops (Sb-decolourized and Mn-decolourized glass, made in Egyptian and Levantine primary workshops, respectively), it is impossible to make any speculation about the origin of the raw material.

The overall compositional pattern is typical for the Early Roman glass¹³. Chemically speaking, it fits well with the Sb-Mn colourless Roman glass type as previously defined by Gliozzo¹⁴, or the NE-I/Sb-Mn-colourless glass type previously defined by Silvestri et al.¹⁵.

The turquoise glass thread was produced by adding a copper compound – possibly bronze scale – as demonstrated by the figure below (Fig. 11). The graph shows the superposition of the PIXE spectra of the turquoise glass and that of a colourless glass zone, indicating a higher copper X-ray signal in the turquoise glass data, induced by high amounts of copper (~1 wt% CuO), much higher than in the colourless glass that contains copper at trace level (0.005 wt% CuO). Producing pale blue glass in various shades by using copper alloys/minerals was one of the oldest and most often encountered technological solutions in glass making, being evidenced from the Bronze Age until the modern period¹⁶.

The opaque white glass contains a calcium antimonate compound, as suggested by the relatively high content of antimony (~ 0.66 wt% Sb₂O₃) detected in this thread decoration, approximately twice than that in the colourless or turquoise glass (~ 0.30

¹¹ Freestone 2008; Gliozzo 2017.

¹² Gliozzo 2017; Silvestri et al. 2018.

¹³ Freestone, 2021; Silvestri et al. 2018.

¹⁴ Gliozzo 2017.

¹⁵ Silvestri et al. 2018.

¹⁶ Rehren, Freestone 2015.

wt% Sb_2O_3). Using an antimony-based compound to obtain opaque white glass was a recipe typical for the Early Roman period.

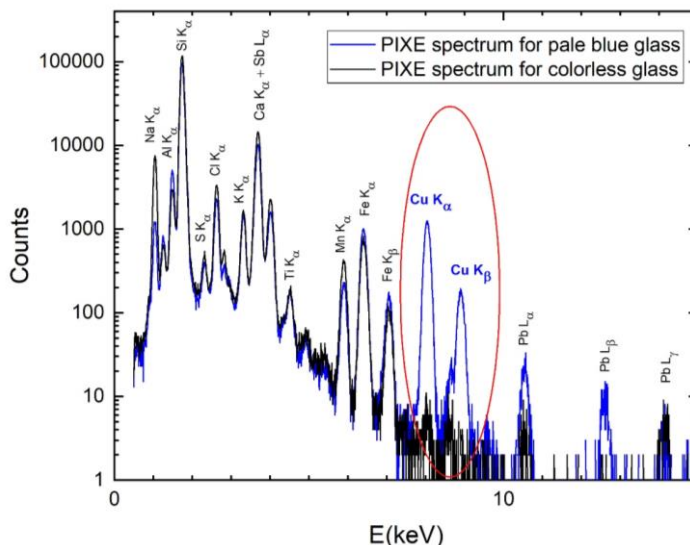


Fig. 11. Superposition of the PIXE spectra for the turquoise glass and the colourless glass

Resembling compositional patterns (for colorless white, turquoise blue and opaque white glass) were published for a similar find, that is a glass beaker with floral decoration made in the snake-thread technique, a unique find discovered in a grave dated to the 2nd – mid 3rd c. AD in the Frontovoye 3 cemetery in south-western Crimea¹⁷.

In conclusion, PIXE data on several glass fragments from the Barboşi vessel are indicative for the use of raw materials and technological solutions typical for the Early Roman period (1st-3rd c. AD).

The vessel: typological and technological details

The observation made by D.B. Harden almost a century ago is still valid; the commonest shapes characterised by snake-thread decoration are jugs, trullae or casseroles, flasks on base rings or on stemmed foot, deep bowls, tall beakers, also on stemmed foot, and carchesia (drinking cups).¹⁸

Still, among them, there are clearly favourites, shapes produced in greater numbers by the various workshops. For example, it was determined that the beakers Isings form 86 and the flasks Isings form 93 represent the most attested forms both at Cologne, and in

¹⁷ Rumyantseva 2022.

¹⁸ Harden 1934, 50, note 1.

Belgium¹⁹, and they are to be found frequently in the western provinces²⁰. There are even find contexts indicative of a workshop focusing exclusively on the production of a specific type of vessel, such as the workshop from Brigetio²¹. Although decorations using a glass thread were used early on various vessels²² and stemmed goblets, either on twisted or blown foot, are frequent finds in the eastern provinces, the presence of items with snake-thread decoration remains extremely sparse²³. Other types of vessels, such as sprinklers, on the contrary, are considered as a typical eastern production²⁴. The invention of this technique is considered prevalently as an eastern one, with glassmakers travelling to the west and putting bases of a flourishing activity²⁵. The idea of the development of several tradition regions in the working of vessels with snake-thread decoration is frequently discussed in the dedicated literature, incorporating over time new finds. It is considered that the decoration with trails appeared in the Syro-Palestinian region during the 2nd c. AD, the concept spreading in the Near East and leading to the creation of regional groups. In Syria, Egypt and Cyprus there are mainly greenish or colourless vessels, with the decoration in the same glass²⁶. The decoration is characterised by trails flattening at ends and becoming leaf-shaped. The shapes produced are beakers (goblets and kantharoi), flasks, and sprinklers. The fragments of vessels with snake-thread decoration recovered from Dura Europos are considered as extremely important, as the end of the settlement in 256 AD ensures a good dating of the finds²⁷.

A second group, from the Danube region, consists of finds from Intercisa, Aquincum, Carnuntum, and Gorsium, with other finds known from present-day Croatia and Slovenia. The glass is often colourless, sometimes greenish. The decoration is frequently made with threads in various colours, mostly white and blue. The threads often end in leaves, decorated either with a chequered pattern or with a domed shaped pattern. Some vessels are decorated with plants and birds, similar to Eastern decorations. The shapes are mostly narrow cylindrical goblets and flasks with spherical body²⁸.

¹⁹ Hanut 2006, 89.

²⁰ Sanchez de Prado 2004, 91, cat. no. 5.2, fig. 4.12; Lepri 2021, 102-104.

²¹ Dévai 2019: a workshop from Brigetio producing snake-thread decorated beakers.

²² Antonaras 2017, 21.

²³ Harden 1934; Clairmont 1963.

²⁴ Constable-Maxwell 1979, cat. nos. 274; Israeli 2003, cat. no. 427; Stern 2001, cat. no. 62.

²⁵ Harden 1934; Matheson 1980, 70-71.

²⁶ Höpken 2010, 383-384.

²⁷ Höpken 2010, 385.

²⁸ Höpken 2010, 385.

In the Lower Germany, the famous production from Cologne had several phases. There are vessels made of naturally coloured or colourless glass with threads made of the same glass, as well as vessels decorated with coloured threads. The vessels are frequently decorated with heart-shaped leaves and "Kölner Schnörkel"²⁹.

The vessel from Barboşi belongs to a type of beaker most frequently referred to in the dedicated literature as beaker Isings form 86, or tall beaker Isings form 86. In fact, Isings defined the type as "goblet on beaded stem", a form contemporary with the flask on beaded stem (her form 93), both often decorated in the snake-thread technique³⁰. The shape and proportions of the vessel from Barboşi, with a tall cylindrical body and the maximum diameter reached at the rim, make it includable into Type G1b, as defined by Hanut³¹.

In fact, there is not a homogeneous treatment of this type from the point of view of employed terms. Such vessels are present as either "beaker"/"tall beaker"³² or "goblet"³³, with reference to the same Isings form 86.

The frequent use of the formula "tall beaker" is justified by the existence of numerous items with impressive height. The beaker found in the necropolis of Czarnówko has a height of 22.4 cm, with a rim diameter of 9 cm and a base diameter of 7.3 cm; it could hold approximately 1-1.1 l of liquid³⁴. The beaker from Worms, decorated with dolphins, has a height of 20.4 cm, with a rim diameter of 7.4 cm, and a base diameter of 6.3 cm³⁵. The beaker decorated with shells from Cologne has a height between 20.2 and 20.6 cm, and a diameter at the rim of 7 cm³⁶; another beaker from Cologne, with a simpler, ribbed, snake-thread decoration, has a height of 19 cm³⁷. The beaker from the Ernesto Wolf collection has a height between 18.8 and 19.3 cm, with a diameter at the rim of 8 cm, and the base diameter of 6.55 cm³⁸. A monochrome beaker from Bonn has a height of 20 cm³⁹.

²⁹ Höpken 2010, 386.

³⁰ Isings 1957, 103, form 86.

³¹ Hanut 2006, 89, fig. 1.

³² Harden et al. 1987, 139, cat. no. 67; 252, cat. no. 143; Doppelfeld 1966, cat. nos. 122-123; Follmann-Schulz 1992, 54, cat. no. 30; Follmann-Schulz 2004, 96, pl. 2; 98, pl. 4; Dévai 2019.

³³ Harden 1934; Harden 1936; Isings 1957, form 86; Isings 1971, 18, cat. no. 47; Stern 2001, 165, cat. no. 61; Höpken 2010, 385; Schuster, Andrzejewski 2023, 101-102.

³⁴ Schuster, Andrzejewski 2023, 101-102.

³⁵ Harden et al. 1987, cat. no. 67.

³⁶ Harden et al. 1987, cat. no. 143.

³⁷ Doppelfeld 1966, cat. no. 123.

³⁸ Stern 2001, cat. no. 61.

³⁹ Follmann-Schulz 1992, 54, cat. no. 30.

In comparison, the beaker from Barboși – with a height of 16.7 cm, rim diameter of 5.8 cm, base diameter of 5.4 cm, and an estimated volume of 430 ml – is less impressive. In the same time, beakers of the same type, with a relatively similar height, or in some cases even quite smaller, are known. A beaker from Hamburg has a height of 17.4 cm⁴⁰. A beaker from Ptuj, in Slovenia, has a height of 14.8 cm and a diameter at the rim of 6 cm⁴¹. Two fragmentary beakers from Intercisa were estimated to heights of 14 cm and 12.2 cm⁴². Two complete beakers from Cologne are even shorter, with heights of 11 cm and 9.5 cm⁴³.

Therefore, it can be considered that the beaker under discussion here falls somewhere in the middle of the range of heights reached by this type of vessels.

The beaker from Barboși is characterised by typological and technological traits shared by the representatives of this type. It has a free blown body. The rim was thickened and smoothed in flame (fire-rounded), and it is slightly out turned. This characteristic can be noticed both in the case of beakers Isings form 86⁴⁴ and in the case of flasks with snake-thread decoration Isings form 93⁴⁵. The solid stem is slightly beaded, as is again frequent in the case of beakers and flasks with snake-thread decoration⁴⁶, which have either a short cylindrical stem or a slightly beaded one⁴⁷. The base is wide and concave, surrounded by a ring, and presents pontil mark (Fig. 8/8). Although many stemmed beakers and flasks with snake-thread decoration have the base with the rim fire-rounded/thickened⁴⁸, the presence of a base with tubular ring in the case of our beaker is not that unusual (Fig. 8/3-4)⁴⁹.

The vessel: fabric and colour

The aspects regarding the type(s) of glass used for creating vessels with snake-thread decoration were discussed in various publications, especially in connection with the

⁴⁰ Follmann-Schulz 2004, 115, cat. no. 19.

⁴¹ Lazar 2003, 115, cat. no. 3.8.4.

⁴² Barkóczy 1988, cat. nos. 174-175.

⁴³ Doppelfeld 1966, cat. no. 122 (two vessels).

⁴⁴ Schuster, Andrzejowki 2023, 101; Stern 2001, cat. no. 61; Harden et al. 1987, cat. no. 143; Harden et al. 1987, cat. no. 67 (but with the rim flaring out sharply); Dévai 2019, 329.

⁴⁵ Israeli 2003, cat. nos. 425-426.

⁴⁶ Isings 1971, 18, cat. no. 47; Stern 2001, 165, cat. no. 61.

⁴⁷ Arveiller-Dulong, Arveiller 1985, 134, cat. no. 299; Dévai 2019, 329 – both variants found in Brigetio.

⁴⁸ Israeli 2003, cat. no. 425; Stern 2001, cat. no. 61; Harden et al. 1987, cat. no. 143; Dévai 2019, 329, for finds from Brigetio.

⁴⁹ See, for example, Israeli 2003, cat. no. 426 – snake-thread decorated stemmed flask with base with tubular ring.

attempts of identifying workshops or directions of propagation of the new style of decoration.

Discussing the finds of vessels with snake-thread decoration from the eastern provinces of the Roman Empire, Harden separated them into two groups: one formed by monochrome vessels (both flasks and goblets)⁵⁰ and one formed by polychrome vessels (goblets)⁵¹. As, from the point of view of the decoration, it was difficult to detect any differences between the examples from the eastern and western sites, the most important characteristic, in his opinion, for separating centres/areas of production, was the fabric of these vessels. He differentiated between two types of fabric, a greenish or olive-green glass typical of Syrian glass of the first three centuries AD and a colourless with a greenish tinge glass, of which great quantities were produced in Egypt during the 2nd c. AD (Karanis fabric 2⁵²). In his opinion, the goblets with polychrome decoration found in the east were made of this second fabric. He also considered that the earliest and finest western pieces were made of an almost colourless similar glass, and only late and debased examples were of such a green tint as the Syrian production⁵³.

Harden's observations are still valid⁵⁴, and received more recently also the confirmation of the compositional analyses, which determined the differences between the Egyptian primary workshops, producing colourless glass by the use of Sb minerals – the so-called *Alexandrian* glass, and the Levantine primary workshops employing Mn minerals – producing the so-called *Judaeen* glass⁵⁵.

Still, such a thorough separation does not work very well in reality, as it does not take into account the essential aspect of massive glass recycling during the entire Roman period. The beaker from Barboşi represents from this perspective a good cautionary tale. It belongs to the category of vessels, present in various shapes, made of colourless or almost colourless glass with polychrome snake-thread decoration. The glass of which the vessel itself was made is colourless (Fig. 8/8-9; Fig. 10), while the threads are present in two colours, opaque white and turquoise (Fig. 8/3-5; Fig. 10). The fact that the vessel was found broken *in situ*, while very sad in itself, represented in the same time a very good opportunity to subject the glass to compositional analysis. As already discussed in detail above, the composition shows that it was

⁵⁰ Harden 1934, 50-51.

⁵¹ Harden 1934, 51-52; Harden 1936, cat. no. 490.

⁵² Harden 1936, 22.

⁵³ Harden 1934, 53.

⁵⁴ The situations in which such beakers were made themselves of coloured glass are quite rare; an interesting example is the beaker from Hamburg, made of pink glass, with decoration in white, yellow, and turquoise (Follmann-Schulz 2004, 115, cat. no. 19).

⁵⁵ Freestone 2008; Gliozzo 2017.

made of a mixture of Sb-decoloured and Mn-decoloured glass; in other words, we deal in this case with **recycled glass**.

In conclusion, regardless of the location of the workshop where this beaker was produced, the glassmakers used cullet (shards of glass gathered for recycling), combining the two types of decoloured glass. This technological detail is interesting as it is considered that the snake-thread vessels represented without doubt luxury tableware⁵⁶. It seems that as long as glass of a certain colour (in this case, lack of colour) was obtained for such vessels, respecting some criteria regarding the transparency and quality of fabric, the chemical composition of glass itself had little importance.

The decoration: colour and technological details

Matheson expressed the opinion that this type of decoration is one of the most original and strictly glass oriented to be produced by Roman glassmakers⁵⁷. The experiments at duplicating snake-thread decoration, discussed by Stern, made it clear that this type of decoration required technical expertise and specialised tools; the author saw this circumstance as suggesting that migrating artisans were responsible from carrying the technique from one area to another, rather than local artisans copying vessels made elsewhere⁵⁸.

The snake-thread decoration of Barboși vessel is bicoloured: opaque white and turquoise, thus making it a typical example of this kind of vessels. Most polychrome vessels tend to be decorated with a combination of colours, usually a lighter one with a darker one. Most often the decoration is in two colours, although there are quite numerous items decorated with trails in three colours; the rule is that each trail is monochrome⁵⁹. The lighter ones are white or yellow⁶⁰ (in some instances threads in both these colours are present on the same vessel⁶¹). The darker ones are most often nuances of blue, either a deep strong vivid blue⁶² or turquoise⁶³. In the first case, the colour indicates, even for the naked eye, the use of cobalt-coloured glass, while, in the second case, the colour is typical for copper-coloured glass. This technical distinction was

⁵⁶ Hanut 2006, 96.

⁵⁷ Matheson 1980, 70, cat. no. 184.

⁵⁸ Stern 2001, 139.

⁵⁹ Hanut 2006, 92.

⁶⁰ Foy et al. 2018, 231, ass. 085, no. 143 – decoration with parallel impressions in yellow thread.

⁶¹ Isings 1971, 13, cat. no. 24; Harden et al. 1987, cat. no. 143; Follmann-Schulz 2004, 115, cat. no. 19.

⁶² Doppelfeld 1966, cat. no. 122; Harden et al. 1987, cat. nos. 63, 67, 143; Dévai 2019, 329, for example, cat. nos. 3 and 6; Schuster, Andrzejowski 2023; Foy et al. 2018, 375, ass. 134, cobalt blue.

⁶³ Harden 1934, 51-52; Harden 1936, cat. no. 490; Clairmont 1963, 46, cat. no. 175, pl. XXII; Dévai 2019, 329, for example, cat. nos. 25 and 29.

proved for the turquoise decoration of the vessel from Barboşi by the compositional analysis, most probably with bronze scale used for obtaining the colour.

To the best of our knowledge, the two types of blue threads/glass do not appear together on the same vessels: the decoration is made either with cobalt-blue glass or with copper-blue (turquoise) glass. On the other hand, the white and yellow threads appear sometimes simultaneously on the same item.

The vessels produced or attributed to western workshops tend to be decorated with cobalt-blue (either as trails, or as figurative patterns, such as shells, dolphins or birds⁶⁴), and this colour seems to be more frequently employed in the west. Unfortunately, in the case of very interesting finds, as for example the pink beaker decorated with turquoise, white and yellow, from the Museum in Hamburg, the find place and find context are unknown⁶⁵.

The vessels, usually represented only by shards, with polychrome decoration from the eastern provinces or attributed to eastern workshops are decorated with turquoise (copper-blue), although the number of finds continues to be so low as to impede drawing definite conclusions. This is the case of the finds from Egypt: the fragment of beaker from Old Cairo combines trails in white, yellow, and turquoise, possibly in a floral design⁶⁶; the fragment of beaker from Karanis combined white and turquoise trails⁶⁷. The fragment of flask (?) from Dura-Europos was decorated with a turquoise trail, said to be "of excellent quality"⁶⁸.

The situation of the workshop from Brigetio is very interesting from this perspective, as the recovered beaker fragments reflect practically the entire range of possibilities, from fragments decorated with trails and patterns in the same colour with the vessel (therefore monochrome vessels) to fragments decorated with trails or various patterns in white, yellow, cobalt-blue, and turquoise. Although there are fragments combining bicoloured decoration that survived, the two shades of blue are never together. Still, in such an instance, taking into account the degree of fragmentation of the surviving items, again no irrefutable conclusion could be drawn⁶⁹.

⁶⁴ For example, Isings 1971, 18, cat. no. 47 (blue and white shells); Harden et al. 1987, cat. no. 67 (dolphins) and cat. no. 143 (shells); Schuster, Andrzejowski 2023 (blue and white birds).

⁶⁵ Follmann-Schulz 2004, 115, cat. no. 19; for decoration with turquoise thread, see also Follmann-Schulz 2004, 100, pl. 7.

⁶⁶ Harden 1934, 51.

⁶⁷ Harden 1934, 51-52; Harden 1936, cat. no. 490.

⁶⁸ Clairmont 1963, 46, cat. no. 175, pl. XXII.

⁶⁹ See Dévai 2019, catalogue of fragments recovered from Brigetio: decorated with opaque blue (cat. nos. 3, 6, 39, 45) and decorated with turquoise (cat. nos. 25, 29-30, 36, 43).

Regardless of their colour, the snake-treads are applied in slender trails on the vessel's body, and as a rule they are not further impressed – except on small distances, resulting in thin but prominent lines, with a spiral at one end. The other end is flat and wide, creating the impression of vegetal motives (leaves or flowers/flower buds). These wider ends are decorated with parallel lines on their entire surface, resulting in a ribbed/grooved pattern. The term of "ribbed"⁷⁰ or "grooved"⁷¹ pattern seems more appropriate for using in this specific case, in contrast to other terms used in the dedicated literature, such as "slashed"⁷². The reason is that the impressed lines are not only extremely parallel, but the width of the ribs/grooves is very constant. Their aspect gives the impression that they were not created freehand, but a ribbed tool was pressed on the end of each glass trail, with the double objective of flattening it into its vegetal shape and decorating it with this specific pattern (Figs. 8/2-4).

The turquoise thread was used to create the horizontal trails separating the central decorated register from both ends of the beaker's body. A single, carefully made wound was placed under the rim. A similar situation, a small fragment, is known from Brigetio, where turquoise trail was used for creating the horizontal line beneath the beaker's rim⁷³. Near the bottom, the wound seems to have trailed on, becoming double for a small part (Fig. 8/4-5). As there are breaks in the glass exactly in that area, and fragments of the snake-thread are missing, it is impossible to say if this trailing-on was in fact the starting point of the turquoise trail going vertically and bifurcating in order to create part of the pattern (Fig. 8/6).

The trails forming the decoration have the tendency to evolve vertically, a trait of the snake-thread decoration characteristic for vessels with tall/elongated shapes⁷⁴.

There are instances in which a trail crosses itself or a trail made of a colour touches or even superposes a trail in the other colour. For example, a white trail makes a loop near the bottom of the vessel and turns back (Fig. 8/2). The consultation of a larger corpus of finds shows that such instances are not so rare⁷⁵.

A turquoise trail touches and partially superposes a white trail, while itself was previously superposed by a white trail (Fig. 8/1). Such an approach was considered as uncharacteristic for this type of decoration, and the rule was perceived as rather to avoid crossing an already applied trail. Discussing the fragments with snake-thread decoration from Dura-Europos, Clairmont emphasised this aspect, considering one of

⁷⁰ Israeli 2003, cat. nos. 425-427.

⁷¹ Stern 2001, 139.

⁷² Dévai 2019.

⁷³ Dévai 2019, cat. no. 36, fig. 5.18.

⁷⁴ Hanut 2006, 92.

⁷⁵ Follmann-Schulz 1992, 57 – variants of the so-called "Kölner Schnörkel"; Hanut 2006, Fig. 2/8-9.

the shards with such a superposition of trails as unusual⁷⁶. Still, finds that are more recent indicate that such instances are not exactly rare. An example can be also noticed among the items produced at Brigetio, in Pannonia⁷⁷. Therefore, it is possible that workshop traditions played a role, with various degree of “relaxation” in the treatment of the snake-thread application. It cannot be disregarded the fact that such an approach to the application of trails enhances the “naturalness” of the decoration, making it seem more fluid and vivacious, closer to the vegetal/animal source of inspiration. The “creative freedom”, mentioned as a characteristic of this type of decoration⁷⁸, is certainly visible in this specific case. In fact, the decoration of this item seems to reflect a rather early stage of production of the type, second half of the 2nd c. AD – first part of the 3rd c. AD⁷⁹. In the case of later productions, the beakers are more often made of glass with stronger greenish or yellowish-greenish tinges⁸⁰, more frequently decorated applied pre-formed motifs⁸¹, which in some extreme cases create a truly “baroque” impression of the decorated items⁸². Even in the case of freely applied trails, they become much more repetitive, lacking in general the vivacity of earlier snake-threads.

Final remarks

The characteristics of the beaker from Barboşi – from the colourless glass, technological details, general shape, to the style and colours of decoration – make it with great probability an early representative of the vessels Isings form 86 with snake-thread decoration. Unfortunately, while the ceramic vessels associated with this vessel as grave goods confirm a dating to the 2nd-3rd c. AD, they do not help in narrowing this interval.

Regarding the possible production workshop, the typological characteristics are not exactly conclusive, as the beakers/goblets Isings form 86 were among the most

⁷⁶ Clairmont 1963, 43-44, cat. no. 161 – colourless threads described as extraordinarily delicate, two of them superposing partially.

⁷⁷ Dévai 2019, cat. no. 43, Fig. 6/44 – a turquoise trail partially superposes a white trail.

⁷⁸ Hanut 2006, 92.

⁷⁹ For similar shapes, see Doppelfeld 1966, 52-61, Figs. 122-123; Stern 2001, 165, cat. no. 61, dated to the end of 2nd – beginning of 3rd c. AD.

⁸⁰ Harden et al. 1987, cat. nos. 67, 143; but see Isings 1971, cat. nos. 24 and 47, dated to the end of the 3rd c. AD, made of colourless glass.

⁸¹ See Harden 1934, and Harden et al. 1987, cat. nos. 67, 143, for beakers dated to the late 3rd – early 4th c. AD.

⁸² For example, in the case of Harden et al. 1987, cat. no. 143, the beaker decorated with shells, the vessel itself is extremely similar in shape with the beaker for Barboşi, if one manages to look beyond the vertical straps of shells or plaited glass lavishly applied and forming a network partially masking the vessel's body; also, Isings 1971, 18, cat. no. 47, decorated with white and blue shells, dated based on context to the end of the 3rd c. AD.

successful representatives of the snake-thread decorated vessels for as long as this “fashion” existed, and it is clear that they were produced by several glassmaking centres/ateliers, from different areas of the empire. In our opinion, the decoration details bring the beaker from Barboși closer to the Eastern Mediterranean finds and to the production of the workshops from Pannonia.

The beaker with snake-thread decoration from Barboși (Galați county, Romania) is a remarkable find so further east along the Danubian limes. The lucky circumstances of its find, in a clear funerary context and in a state of preservation allowing an almost complete restoration, combined with the possibility of conducting compositional analyses of the glass, permitted a detailed discussion of the item. It is to be hoped that further similar finds will help completing the image of this interesting category of glass vessels produced during Roman times.

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