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The secondary glass workshop in the civil town of Brigetio

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Abstract

In 2006 the Klapka György Museum of Komárom together with the Institute of Archaeological Sciences at Eötvös Loránd University carried out an excavation in the less researched area of the civil town of Brigetio, at 13 Vásártér, Komárom/Szőny. The conductors were Á. Gelencsér and E. Számadó. During the excavation of an area of 153 m², the living quarters of a striphouse constructed in different time periods, and a glass workshop related to one of these periods were discovered. The building had a five constructions period and a secondary glass workshop related to one of these. Some remains of two kilns were found in the workshop. One of them was rectangular with an apsis on one side and it was divided into two separate parts. The other kiln was circular, which must have been the melting furnace, while the rectangular one was the annealing furnace and they might have been connected to each other. In the courtyard of the striphouse four big rubbish pits consisting of cylindrical moiles, spoiled pieces, raw materials as chunks, additives used for coloring, almost the whole amount of the spoiled glass beads, glass rods, glass trails and glass drops with tool-marks on them were found. One hundred and twenty-one partly fragmentary and partly complete beads were uncovered in the pits. Spherical, cylindrical, biconical, shape of forms are represented among the glass beads. Our glass workshop operated within the limits of the civil town just in a short period in the first half of the 3rd century AD.

Introduction

Brigetio (Komárom/Szőny) is located on the right bank of River Danube, oppositely to the estuary of River Vág.[1] It is difficult to clarify the situation of the civil town, as the modern settlement of Szőny has been built on the ancient site covering it completely. The centre of the civil town could have been the present Vásártér, where excavations have been carried out under the leadership of László Borhy since 1992.[2] The Vásártér has not been built up as it used to be a market place, so the remains of the city could survive. The pottery workshop and the military fortress of the *legio I Adiutrix*, which was adjacent to the *canabae* on its east side, were to the west from the civil settlement. The two sections of the town were separated by cemeteries and by the amphitheatre of the town *(Fig. 1.1)*.[3]

The construction periods of the striphouse

The building discovered at 13 Vásártér, Komárom/Szőny had five construction periods, of which the first one can be dated back to the end of the 1st century AD.[4] The last period was in

1 Barkóczi 1951, 5.
2 Borhy 2005, 75.
3 Barkóczi 1951, 6–10; Borhy 2009, 67.
4 Dévai – Gelencsér 2012, 59–63.

the mid-3rd century AD. The building must have had the shape of a typical striphouse in the second period. Later in this period it was formed to be a trade house, which was well known in other cities in Pannonia and in the Northern provinces.[5] The living area was located in the first part of the building, while on the east side, in the backyard a glass workshop operated for a short time during the third construction period *(Fig 1.2)*.[6] During the Severan age the glass workshop had been shut down and the building was extended, and underfloor heating and fresco decoration were added. The building was destroyed in the middle of the 3rd century AD, this was followed by the fifth period which was a slight attempt of re-establishment.[7]

Finds related to glass workshops in Pannonia

Besides the Brigetio workshop there was only one glass workshop uncovered in Pannonia in the territory of present day Hungary, but unfortunately this has not been published yet. In Intercisa 30 m southwest from the camp a glass workshop was uncovered in 1973. Five kilns and about 200 kg of batch were revealed. This workshop must have been used till the 260's AD. After the *cohors I Aurelia Antoniniana milliaria Hemesenorum,* which was a Syrian archer troop, had been moved to Intercisa, several eastern civilians came and settled down here.[8] They were likely to introduce the trend of new style beakers with applied trails, so called snake-thread glass in Pannonia. Eastern masters could have been working in Brigetio and in Aquincum as well.[9] Apart from the two towns mentioned above we have only some indirect proofs of glass manufacturing in other towns. For example both a stamped clay tablet, which was used to make mould-blown bottles and a glass fragment with the positive image of the same stamp were found in Aquincum.[10]

The glass workshop in Brigetio

Some remains of two kilns were found in the workshop at 13 Vásártér, Komárom/Szőny *(Fig. 2.1)*.[11] One of them was rectangular with an apse on one side and it was divided into two separate parts. The other kiln was circular *(Fig. 1.2)*. Only the layout of the kilns could be identified and we know nothing about the upper parts of the kilns *(Fig. 2.1)*. No *tegulae* were found in the walls of the kilns, except for one fragment in the rectangular kiln. The walls of the kilns were formed by burnt red clay. Their widths were about 60 cm, the distance between the two kilns is 30 cm.[12] A black, charred layer was found next to the circular one. It must have been the ash of the wood used for heating the kiln. The fire hole of this circular kiln was facing the rectangular kiln.

There are two possible analogies for the reconstruction of the rectangular kiln. One of them presumes that it could have been an annealing kiln since it was similar to the rectangular one with a semi-circular apse found in Hambacher Woods near Cologne. According to F. Seibel, the

5 Dévai – Gelencsér 2012, 61, Fig.4.
6 Dévai – Gelencsér 2012, 96, Pl. 3.
7 Dévai – Gelencsér 2012, 62–63, 97–98.
8 Visy 1974, 316.
9 Barkóczi 1988, 32.
10 Barkóczi 1988, 29.
11 Dévai – Gelencsér 2012, 66.
12 Dévai – Gelencsér 2012, 66–67.

kiln found in Germany was an annealing oven with a fire place within the rounded part, which was built a bit lower.[13] Another cooling unit found in Kaiseraugst have a similar placement. A. Fisher accepted F. Seibel's theory, so the rectangular kilns with semi-circular fire place were identified as annealing units.[14] The kiln found in Poetovio had a similar shape as well.[15]

The other option is that this rectangular kiln with two separate parts could have been connected to the circular one and could have operated like the kiln reconstructed by M. Taylor and D. Hill. The circular one is the melting furnace while the connected rectangular one is the lehr.[16] The small distance between the two units provides some evidence to accept this theory, although we do not know anything about the construction of our furnaces.

Thus, our conclusion is that the circular kiln must have been the melting furnace, while the rectangular one was the annealing furnace and they might have been connected to each other. A big piece of raw materials was found in the circular kiln, which means that it was a melting furnace, but other finds were not uncovered.

In the courtyard of the striphouse four big rubbish pits consisting of cylindrical *moiles*, spoiled pieces, raw materials as chunks, additives used for colouring, almost the whole amount of the spoiled glass beads, glass rods, glass trails and glass drops with tool-marks on them were found. The waste of the glass making procedure must have been put into these pits *(Fig. 2.2)*.[17] It is not certain whether the pits were used for the temporary storage of waste materials before their recycling, or final dumps. One of them located nearby the circular furnace, includes almost the whole amount of the spoiled glass beads. It was might have been the last productions of the workshop.

Glass chunks were found in the courtyard in a hole for a timber, which might have been the part of some kind of construction, probably a roof protecting the workshop *(Fig. 1.2)*.[18] The well in the middle of the courtyard was also used during the operation of the workshop, although it had been dug in an earlier construction period. Some fragments of eight glass vessels and five pieces of melted glass were revealed in the inner ring of the well.

In the rubbish pits a huge amount of raw materials (20–30 kg) was found.[19] The colours of the pieces of this raw materials are quite similar: due to the colouring they vary from translucent dark green to opaque dark blue or blackish. It is important to mention that the colour of the pieces includes transition, as they did not melt homogeneously, some of them are translucent, and some of them are opaque. These raw materials were deliberately smashed into splinters with sharp fractural surfaces during the melting process so as to make the portioning easier *(Fig. 2.2)*. Most glass beads seem to be made of this material. We have also analysed the composition of a lump of raw material.

Furthermore, during the production of the glass beads some pieces of glass drops, some melted glass and some glass trails were found *(Fig. 2.3)*. Colourless or naturally coloured curved and cylindrical *moiles* with sharp edges, which are the waste from around the end of the blowing

13 Seibel 1998, 142–144.
14 Fischer 2009, 80.
15 Korošec 2004, 67–69.
16 Taylor – Hill 2008, 249–270.
17 Dévai – Gelencsér 2012, 67.
18 Dévai – Gelencsér 2012, 68.
19 On the chemical composition of raw materials, see Fórizs et al. 2012, 103–114.

iron, were found among the finds.[20] These give us evidence for producing not only glass beads but also glass vessels. Most glass drops and glass trails found in the pits have tool-marks on them, probably caused by different pincers, which were either triangular, rounded or ended in a hook *(Fig. 2.6)*. Amongst the finds there is a glass disc cut into two pieces *(Fig. 3.3)*.

Moreover, we found three different tools in the pits: a bronze tool, a marvered block, and a roughly-carved disc, the last two are made of metamorphic chalkstone. The depression of the bronze tool can be seen on many fragments *(Fig. 3.1)*. It has a hook on its end, which might have been used in the decorating process. After having rolled the different coloured trails on the beads, they pulled them with this tool before rolling the beads on the marvered block *(Fig. 3.2)*. By this method a so-called bird feather pattern was made.

The fragment of marvered stone slab has a burnt splash in the middle of its flat surface. This marvered block was used for modelling and decorating the beads and vessels and also cooling their surfaces *(Fig. 2.4)*. The thin glass trails and flecks were pressed into the beads while they were being rolled on this slab.

A roughly curved tool is also worth mentioning *(Fig. 2.5)*. This object with 5 cm diameter and a thickness of 1,5 cm was found with the marvered block together. There is a thin glass layer on its upper part which arose from to the sand originating from the rock, while the tool was constantly used at high temperature (around 1000 [2DA?]C). Concentric circles can be seen on its surface, which could have been a result of turning the tool round and round while it was touching the glass object. The glass layer makes us sure that the tool must have been used for glass making. It might have been used as a base-form of the cylindrical, mould-blown vessels or to form simple blown vessels. No analogy of the disc has been found yet.

Glass beads

One hundred and twenty-one partly fragmentary and partly complete beads were uncovered in the pits, of which 107 pieces can be identified by their forms. There are only eight complete beads altogether; the others are faulty, defected ones. Most pieces are deformed, traces of sharp fractures and cuts can be seen on them. Spherical, cylindrical, and biconical shapes are represented among the glass beads *(Fig .4–7)*.[21]

Most beads are made of multi-coloured and opaque glass (69,42%). Only a few translucent, green fragments were found (33 pieces). They are mostly decorated, there are only ten glass beads without any decoration – eight of them are opaque. Regarding their colours there are 63 dark blue, 15 dark green, 12 glass green, 3 colourless, 2 white and light blue, 1 sea blue and 1 grass green. The colours used on the decoration are always opaque; there is white decoration on 56 beads, yellow on 27 pieces, red and turquoise blue on 3–4 pieces or the combination of these.

Considering the shape of the beads, there are 40 pieces of small and big cylindrical ones *(Fig. 4.1–2, 4–7, 11, 14–15, 17, 21–22; Fig. 5.5–8,11–12, 15, 19–20, 22–23, 29–31; Fig. 6. 2–3, 5, 8, 13, 15, 18, 20–22; Fig. 7.7, 9, 11, 15, 17, 20)*. The cylindrical glass beads occurred in Pannonia between 1st century AD and the beginning of the 5th century AD. They are usually opaque, black and decorated with yellow, white, or blue, or green applied trails. We know two opaque, white beads

20 Price – Cool 1991, 26.
21 Dévai – Gelencsér 2012, 59–93.

with turquoise blue decoration, which is very rare, though similar ones appears in Pannonia.[22] The white feather pattern on opaque, cylindrical, black beads, which are typical along the river Danube and the Rhine,[23] are numerous in our workshop. To achieve this decoration the tool with a hook on its end mentioned above was used.

The second frequent shape is the sphere *(Fig. 4.9, 13, 16, 18–19, 24; Fig. 5.1, 3, 5, 9– 10, 13–14, 16–17, 21, 24–27; Fig. 6.4, 9–12, 14, 16, 19; Fig. 7.1, 5, 10, 16, 19).* Altogether we have 37 pieces; apart from a few translucent pieces they are opaque ones; mostly decorated with glass trails, or with multi-coloured flecks.

There are also eight long rod shaped beads with six or seven ribs on their surface *(Fig. 4.3; Fig. 5.32; Fig. 6.6, 23; Fig. 7.2, 18, 21, 23).* Their cross-sections are flower shaped. These beads were made of translucent, naturally coloured material or opaque, dark blue. This type of beads are not known from any other sites in Pannonia. It is possible that they are unfinished products since they were not cut into smaller pieces. The small glass beads with 4–6 petals were used by the Sarmatians and they are also known from Gepid graves.[24] Based on these facts these glass beads could have been produced in Brigetio for the Sarmatians. On the other hand the long rod shaped beads with ribs may be finished products since their analogy from the Western part of Poland in the area of Wielbark culture and Przeworsk culture is well-known.[25] This long type of beads existed only in the short period of time, from the end of the 2nd century AD to the first decades of the 3rd century AD. The production of this type in the workshop of Brigetio and their occurrence only in a short period of time affirm the operation of the workshop in the first decades of the 3rd century AD. The long beads type existed also in the area of Chernyakhov culture.[26]

We have 12 biconical, large glass beads *(Fig. 4.20; Fig. 5.2, 4, 18, 28; Fig. 6.1, 7, 17, 24; Fig. 7.13, 14, 22).* Their decoration is similar to the cylindrical ones'.

The only one polyhedral bead, with a square section and diamond shape facets was an isolated found, so its connection to the workshop is doubtful *(Fig. 5.33).* It was made of translucent dark blue glass; this type of beads occurred in the Barbaricum from the 2nd century AD, then they spread all over the Empire as well during the 3rd century AD.[27]

There is a unique, so-called gold sandwich bead with a thin gold film between the two layers of translucent glass *(Fig. 4.10).*

Fragments of glass vessels

The several fragments of glass vessels are not direct proves of their production since vessels were systematically collected and recycled in Roman times, so the fragments found in the rubbish pits might not have been products of the workshop, but they might have been cullet. However there are some fragments of *moiles* with the curved impression of the blow-pipe attesting making glass vessels in this workshop.

22 Swift 2000, 98.
23 Swift 2000, 112.
24 It is known from a Gepid assemblage in Hajdúnánás-Fürj-halom-dűlő, Hungary. I'm very grateful to Zs. Rácz for this unpublished data.
25 Tempelmann-Maczyńska 1985, 39.
26 Likhter 1998, 193, Fig. 2.
27 Swift 2000, 102; Riha 1990, 90–91; Bartus 2003, 25–26.

Some cylindrical beakers with flower and bird ornaments having Syrian origins[28] were also uncovered *(Fig. 3.5)*. On their colourless body different colours vary, from colourless trails to opaque yellow, or white and blue ones. The same white and the same yellow can be seen on the decoration of the beads. There were some other white and yellow pieces discovered, which are supposed to be colouring additives. The same colouring additives and the same colours dominate the decoration of both the beads and the beakers with Syrian origins, which proves the production of this type in the workshop. Another proof of manufacturing vessels is the annealing furnace, which was not needed to make glass beads in case they did not contain copper.

There is a bottom of a colourless bowl of extremely good quality with an applied base ring. The base includes some facet-cutting: a square of double lines standing on one of its angle, with an oval shape in the middle of the square and some ovals around *(Fig. 3.4)*.[29] The fragment can be originated from the period after shutting down the workshop.

Fragments of window glass

Several fragments of windowpanes were found in the rubbish pits. They were not made of blown glass, they were made of cast glass, which was poured into a wooden frame scattered with sand. So one side of the pane is harsh and getting thicker by the edges. They were produced on local demand.

Conclusions

Our glass workshop operated within the limits of the civil town just in a short period. Both glass beads and vessels were made in two furnaces, which could have been a circular melting furnace with an attached lehr. However there is not enough evidence for that. Both the fragments of colourless cylindrical beakers with flower and bird pattern and with chequer design and the fragments of vessels with oval facets decoration proved that this production was active in the first half of the 3rd century AD. It is worth mentioning that some other little workshops must have existed in the Hungarian part of Pannonia including Intercisa, Aquincum, and maybe Arrabona.

28 Barag 1967, 63–65; Barkóczi 1981, 35–62; Stern 2001, 138–139.

29 Barkóczi 1986, 166-189; Stern 2001, 137. Bowls with facett-cutting from Pannonia were classified by L. Barkóczi and these could have been manufactured also in a pannonian workshop.

Catalogue

1. Cylinder bead with round section (Fig. 4.1)
Inv. no. KGYM 2006.V13.B4.84.
Long cylinder bead with round section. Opaque, dark blue with marvered yellow spiral band. Unfinished, faulty, on one edge is not performed.
axis: 2,122 cm, basis: 1,213 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98. 3.

2. Cylinder bead with round section (Fig. 4.2)
Inv. no. KGYM 2006.V13.B4.85.
Long cylinder bead with round section. Opaque, dark blue with opaque red and white trails and cutting edges.
axis: 3,095 cm, basis: 1,111 cm, diameter: 1,059 cm
Riha 1990, 11.17.

3. Rod shaped bead with ribs (Fig. 4.3)
Inv. no. KGYM 2006.V13.B4.86.
Long rod shaped bead with 6 ribs, its cross-section have a shape of petal. Translucent, green.
axis: 3,476 cm, basis: 0,928 cm, diameter: 1,207 cm
Tempelmann-Maczyńska 1985, Taf. 3/183.

4. Cylinder bead with round section (Fig. 4.4)
Inv. no. KGYM 2006.V13.B4.87.
Long, cylinder bead with round section. Translucent, green with opaque,white feather trail.
axis: 3,564 cm, basis: 0,939 cm, diameter: 1,164 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

5. Cylinder bead with round section (Fig. 4.5)
Inv. no. KGYM 2006.V13.B4.88.
Long cylinder bead with round section. Opaque, dark blue with marvered white band. Unfinished, faulty, on one edge is not performed.
axis: 1,673 cm, basis: 1,041 cm, diameter: 1,246 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4.

6. Cylinder bead with round section (Fig. 4.6)
Inv. no. KGYM 2006.V13.B4.89.
Long cylinder bead with round section. Opaque, dark blue with marvered white band.
basis: 1,169 cm, diameter: 1,229 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, 98.3.

7. Cylinder bead with round section (Fig. 4.7)
Inv. no. 2006.V13.B4.90.
Long, cylinder bead with round section. Opaque, dark blue with opaque,white/yellow feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

8. Rod shaped bead (Fig. 4.8)
Inv. no. KGYM 2006.V13.B4.91.
A fragment of long, rod shaped bead with round section. Opaque, dark blue with thin, opaque, white trails.
basis: 1,262 cm, diameter: 1, 24 cm
Riha 1990, 11.17; Swift 2000, Fig. 98.3.

9. Spherical bead (Fig. 4.9)
Inv. no. KGYM 2006.V13.B4.92.
A fragment of spherical bead. Translucent, dark green with opaque, white trails.
basis: 0,954 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.nv; Swift 2000, Fig. 98.2.

10. Gold sandwich bead (Fig. 4.10)
Inv. no. KGYM 2006.V13.B4.93.
Fragmentary gold sandwich bead. Spherical bead with a thin gold film between the two layers of translucent, colourless glass.
axis: 1,133 cm

11. Cylinder bead with round section (Fig. 4.11)
Inv. no. KGYM 2006.V13.B4.94.
Fragmentary, deformed, long cylinder bead with round section. Opaque, dark green with opaque, yellowish white bands.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

12. Rod shaped bead (Fig. 4.12)
Inv. no. KGYM 2006.V13.B4.95.
A fragment of long, rod shaped bead with round section. Opaque, dark blue with white, opaque, white bands.
diameter: 0,951 cm
Riha 1990, 11.17.

13. Spherical bead (Fig. 4.13)
Inv. no. KGYM 2006.V13.B4.96.

Fragmentary, deformed spherical bead. Opaque, dark blue with opaque, white trails.
axis: 1,5 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

14. Cylinder bead with round section (Fig. 4.14)
Inv. no. KGYM 2006.V13.B4.97.
Fragmentary, deformed cylinder bead with round section. Translucent, dark green with opaque, white feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

15. Cylinder bead with round section (Fig. 4.15)
Inv. no. KGYM 2006.V13.B4.98.
Fragmentary, long, cylinder bead with round section. Opaque white with opaque, yellow and turquoise flecks.
diameter: 1, 61 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

16. Spherical bead (Fig. 4.16)
Inv. no. KGYM 2006.V13.B4.99.
Fragmentary, spherical bead. Opaque, dark blue with opaque, yellow bands.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

17. Cylinder bead with round section (Fig. 4.17)
Inv. no. KGYM 2006.V13.B4.100.
Fragmentary, long, cylinder bead with round section. Translucent, colourless with opaque, yellow feather trail.
diameter: 2,227 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

18. Spherical bead (Fig. 4.18)
Inv. no. KGYM 2006.V13.B4.101.
Fragmentary, deformed spherical bead. Opaque, dark blue with opaque, white trails.
axis: 1,846 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

19. Spherical bead (Fig. 4.19)
Inv. no. KGYM 2006.V13.B4.103.
Fragmentary, spherical bead. Opaque, dark blue with opaque, red and yellow flecks.
diameter: 1,953 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

20. Biconical bead (Fig. 4.20)
Inv. no. KGYM 2006.V13.B4.102.
Fragmentary, biconical bead. Opaque dark blue with opaque white trail.
axis: 4,6 cm, diameter: 1,667 cm
Guido 1978, Fig. 37.14.

21. Cylinder bead with round section (Fig. 4.21)
Inv. no. KGYM 2006.V13.B4.104.
Cylinder bead with round section, fragmentary. Opaque, dark blue with opaque white trail.
basis: 1,405 cm, diameter: 1,445 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

22. Cylinder bead with round section (Fig. 4.22)
Inv. no. KGYM 2006.V13.B4.105.
Cylinder bead with round section, fragmentary. Opaque dark blue with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

23. Rod shaped bead with round section (Fig. 4.23)
Inv. no. KGYM 2006.V13.B4.106.
Short, rod shaped bead with round section. Opaque, dark blue, with marvered opaque yellow trail.
axis: 2, 41 cm, basis: 0,985 cm, diameter: 1,202 cm

24. Spherical bead (Fig. 4.24)
Inv. no. KGYM 2006.V13.B4.107.
Spherical bead. Opaque dark blue with marvered opaque white and yellow band.
basis: 1,911 cm, diameter: 2,042 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

25. Spherical bead (Fig. 5.1)
Inv. no. KGYM 2006.V13.B4.108.
Spherical bead, fragmentary. Translucent dark green with opaque red and white flecks.
axis: 1,74 cm, basis: 1,29 cm, diameter: 1,867 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

26. Biconical bead (Fig. 5.2)
Inv. no. KGYM 2006.V13.B4.109.
Fragmentary, biconical bead. Traslucent dark green with opaque white spiral trail.
diameter: 1,346 cm
Guido 1978, Fig. 37.14.

27. Spherical bead (Fig. 5.3)
Inv. no. KGYM 2006.V13.B4.110.
Spherical bead. Opaque dark blue.
basis: 1,076 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

28. Biconical bead (Fig. 5.4)
Inv. no. KGYM 2006.V13.B4.111.
Fragmentary biconical bead. Opaque dark blue with opaque with trail.
basis: 0,816 cm, diameter: 1,505 cm
Guido 1978, Fig. 37.14.

29. Cylinder bead with round section (Fig. 5.5)
Inv. no. KGYM 2006.V13.B4.112.
Cylinder bead with round section. Opaque, dark blue with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

30. Cylinder bead with round section (Fig. 5.6)
Inv. no. KGYM 2006.V13.B4.113.
Cylinder bead with round section. Opaque dark blue whit opaque white trail.
basis: 1,548 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

31. Cylinder bead with round section (Fig. 5.7)
Inv. no. KGYM 2006.V13.B4.114.
Cylinder bead with round section, fragmentary. Translucent, blue with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

32. Cylinder bead with round section (Fig. 5.8)
Inv. no. KGYM 2006.V13.B4.115.
Cylinder bead with round section, fragmentary. Opaque, dark blue with opaque yellow trail.
basis: 0,771 cm, diameter: 1, 22 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

33. Spherical bead (Fig. 5.9)
Inv. no. KGYM 2006.V13.B3.26.
Fragmentary, spherical bead. Opaque, dark blue with opaque white trail.
basis: 1,310 cm, diameter: 2,000 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

34. Spherical bead (Fig. 5.10)
Inv. no. KGYM 2006.V13.B3.27.
Spherical bead. Opaque, dark blue with opaque yellow trail.
axis: 1,294 cm; basis: 0,906 cm, diameter: 1,759 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

35. Cylinder bead with round section (Fig. 5.11)
Inv. no. KGYM 2006.V13.B3.28.
Cylinder bead with round section, fragmentary. Opaque, dark green with opaque red and yellow trails.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

36. Cylinder bead with round section (Fig. 5.12)
Inv. no. KGYM 2006.V13.B3.29.
Cylinder bead with round section, fragmentary. Opaque, dark green with opaque red and yellow trails.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

37. Spherical bead (Fig. 5.13)
Inv. no. KGYM 2006.V13.B3.30.
Spherical bead fragment. Translucent blue with thin opaque white trails.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

38. Spherical bead (Fig. 5.14)
Inv. no. KGYM 2006.V13.B3.31.
Spherical bead fragment. Opaque dark blue with opaque red, yellow and white flecks.
axis: 1,706 cm, basis: 1,378 cm, diameter: 2,202 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

39. Cylinder bead with round section (Fig. 5.15)
Inv. no. KGYM 2006.V13.B3.32.

Cylinder bead with round section, fragmentary. Translucent dark green with opaque white and yellow trails.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

40. Spherical bead (Fig. 5.16)
Inv. no. KGYM 2006.V13.B4.116.
Spherical bead fragment. Opaque dark blue with thin opaque yellow trail.
basis: 1,314 cm, diameter: 1,857 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

41. Spherical bead (Fig. 5.17)
Inv. no. KGYM 2006.V13.B4.117.
Spherical bead fragment. Opaque dark blue with opaque white trail.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

42. Biconical bead (Fig. 5.18)
Inv. no. KGYM 2006.V13.B4.118.
Biconical bead fragment. Opaque dark blue with opaque white feather trail.
Guido 1978, Fig. 37.14.

43. Cylinder bead with round section (Fig. 5.19)
Inv. no. KGYM 2006.V13.B4.119.
Cylinder bead with round section. Opaque light blue with opaque yellow trail between opaque red bands.
Riha 1990, 11.21; Guido 1978, Fig. 37.4.

44. Cylinder bead with round section (Fig. 5.20)
Inv. no. KGYM 2006.V13.A1.4.
Fragmentary cylinder bead with round section. Translucent dark green with opaque white feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

45. Spherical bead (Fig. 5.21)
Inv. no. KGYM 2006.V13.B4.120.
Spherical bead fragment. Opaque dark blue with opaque white fleck.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

46. Cylinder bead with round section (Fig. 5.22)
Inv. no. KGYM 2006.V13.B4.121.
Fragmentary cylinder bead with round section. Translucent dark green with opaque white feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

47. Spherical or cylindrical bead fragment (Fig. 5.23)
Inv. no. KGYM 2006.V13.B4.122.
Spherical or cylindrical bead fragment. Translucent dark green with thin opaque white trails.

48. Spherical bead (Fig. 5.24)
Inv. no. KGYM 2006.V13.B4.123.
Spherical bead fragment. Opaque light blue with thin opaque white trail.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

49. Spherical bead (Fig. 5.25)
Inv. no. KGYM 2006.V13.B4.124.
Spherical bead fragment. Translucent greenish with opaque yellow trails.
axis: 1,476 cm, basis: 1,247 cm, diameter: 1, 730 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

50. Spherical bead (Fig. 5.26)
Inv. no. KGYM 2006.V13.B3.36.
Spherical bead fragment. Opaque dark blue with opaque yellow trail.
axis: 1,515 cm, diameter: 1,844 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

51. Spherical bead (Fig. 5.27)
Inv. no. KGYM 2006.V13.A4.52.
Whole spherical bead. Opaque dark blue with opaque white feather trail.
axis: 1,575 cm, basis: 0,925 cm, diameter: 1,987 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

52. Biconical bead (Fig. 5.28)
Inv. no. KGYM 2006.V13.A4.53.
Biconical bead fragment. Opaque dark blue with opaque yellow trail.
basis: 0, 67 cm, diameter: 1,279 cm
Guido 1978, Fig. 37.14.

53. Cylindrical bead with round section (Fig. 5.29)
Inv. no. KGYM 2006.V13.A4.54.

Cylindrical bead fragment with round section, fragmentary. Translucent dark green with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

54. Cylindrical bead with round section (Fig. 5.30)
Inv. no. KGYM 2006.V13.B5.55.
Cylindrical bead with round section, fragmentary. Opaque dark green with opaque white feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

55. Cylindrical bead with round section (Fig. 5.31)
Inv. no. KGYM 2006.V13.A4.56.
Cylindrical bead with round section. Opaque dark blue with opaque white feather trail.
axis: 4,125 cm, basis: 1,028 cm, diameter: 1,388 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

56. Rod shaped bead with ribs (Fig. 5.32)
Inv. no. KGYM 2006.V13.B5.22.
Long rod shaped bead with 6 ribs, its cross-section have a shape of petal. Translucent, green.
axis: 1,101 cm, diameter: 1,267 cm
Tempelmann–Maczyńska 1985, Taf. 3/183.

57. Bead with square section and diamond shaped facets (Fig. 5.33)
Inv. no. KGYM 2006.V13.SZ.1.
Bead with square section and diamond shaped facets.Translucent dark blue.
axis: 1,372 cm, basis: 0,621 cm, diameter: 0,809 cm
Riha 1990, 11.23; Guido 1978, 37.20; Swift 2000, Fig. 98.6.

58. Rod shaped bead (Fig. 5.34)
Inv. no. KGYM 2006.V13.B5.23.
Long rod shaped bead. Opaque dark blue with white, marvered opaque yellow bands.
axis: 3,051 cm, basis: 0,847 cm, diameter: 1 cm

59. Cylindrical segmented bead (Fig. 5.35)
Inv. no. KGYM 2006.V13.B5.24.
Cylindrical segmented bead. Opaque dark blue.

60. Rod shaped bead (Fig. 5.36)
Inv. no. KGYM 2006.V13.A4.57.
Rod shaped bead fragment. Opaque dark blue with opaque yellow trails.
diameter: 1,089 cm
Riha 1990, 11.17.

61. Biconical bead (Fig. 6.1)
Inv. no. KGYM 2006.V13.A4.58.
Biconical bead fragment. Opaque dark blue with opaque white trail.
Guido 1978, Fig. 37.14.

62. Cylindrical bead with round section (Fig. 6.2)
Inv. no. KGYM 2006.V13.B4.125.
Cylindrical bead with round section, fragmentary. Opaque dark blue with opaque yellow trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

63. Cylindrical bead with round section (Fig. 6.3)
Inv. no. KGYM 2006.V13.B4.126.
Cylindrical bead with round section, fragmentary. Opaque dark blue with opaque yellow trail.
diameter: 1,323 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

64. Spherical bead (Fig. 6.4)
Inv. no. KGYM 2006.V13.B4.127.
Spherical bead fragment. Opaque dark blue with thin opaque white trail.
axis: 1,524 cm, basis: 1,350 cm, diameter: 1,984 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

65. Cylindrical bead with round section (Fig. 6.5)
Inv. no. KGYM 2006.V13.B4.128.
Cylindrical bead with round section, deformed with toolmark. Opaque dark blue with opaque white feather trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.15.

66. Rod shaped twisted bead with ribs (Fig. 6.6)
Inv. no. KGYM 2006.V13.B4.129.
Rod shaped twisted bead with ribbs. Translucent green.
basis: 1,163 cm, diameter: 1,247 cm
Tempelmann–Maczyńska 1985, Taf. 3/183.

67. Biconical bead (Fig. 6.7)
Inv. no. KGYM 2006.V13.B4.130.

Biconical bead fragment with a toolmark (Inv. no: KGYM 2006.V13.651). Opaque dark blue with opaque white feather trail.
basis: 0,904 cm, diameter: 1,284 cm
Guido 1978, Fig. 37.14.

68. Cylindrical bead with round section (Fig. 6.8)
Inv. no. KGYM 2006.V13.B4.131.
Cylindrical bead with round section, fragmentary. Opaque dark blue with opaque yellow trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

69. Spherical bead fragment (Fig. 6.9)
Inv. no. KGYM 2006.V13.B4.132.
Deformed spherical bead fragment. Translucent blue with opaque yellow trail.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

70. Spherical bead (Fig. 6.10)
Inv. no. KGYM 2006.V13.B4.133.
Spherical bead fragment. Translucent green with opaque white and yellow flecks.
axis: 1,763 cm, basis: 0,639 cm, diameter: 2,018 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

71. Spherical bead (Fig. 6.11)
Inv. no. KGYM 2006.V13.B4.134.
Spherical bead fragment. Translucent green with opaque red, yellow and white flecks.
axis: 1,7 cm, diameter: 0,89 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

72. Spherical bead (Fig. 6.12)
Inv. no. KGYM 2006.V13.B3.37.
Spherical deformed bead fragment. Opaque dark blue with opaque red and yellow flecks and trails.
axis: 1,497 cm, basis: 1,359 cm, diameter: 2,116 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

73. Cylindrical bead with round section (Fig. 6.13)
Inv. no. KGYM 2006.V13.B3.38.
Cylindrical bead with round section, fragmentary. Opaque dark blue with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

74. Spherical bead (Fig. 6.14)
Inv. no. KGYM 2006.V13.B3.39.
Spherical bead fragment. Opaque dark blue with opaque yellow trail.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

75. Cylindrical bead with round section (Fig. 6.15)
Inv. no. KGYM 2006.V13.B4.135.
Short cylindrical bead with round section, fragmentary. Opaque dark blue with opaque yellow trail.
basis: 0,718 cm, diameter: 1,233 cm
Riha 1990, 11.19; Guido 1978, Fig. 37.4.

76. Spherical bead (Fig. 6.16)
Inv. no. KGYM 2006.V13.B4.136.
Spherical bead fragment. Opaque dark blue.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

77. Biconical bead (Fig. 6.17)
Inv. no. KGYM 2006.V13.B4.137.
Biconical bead fragment. Opaque dark blue.
basis: 0,921 cm, diameter: 1,807 cm
Guido 1978, Fig. 37.14.

78. Cylindrical bead with round section (Fig. 6.18)
Inv. no. KGYM 2006.V13.B3.33.
Cylindrical bead with round section. Opaque dark blue with opaque white trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

79. Spherical bead (Fig. 6.19)
Inv. no. KGYM 2006.V13.B3.34.
Spherical bead fragment. Opaque dark blue with opaque yellow trail.
Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

80. Cylindrical bead (Fig. 6.20)
Inv. no. KGYM 2006.V13.B3.35.1.
Cylindrical bead fragment, deformed. Opaque dark blue with opaque yellow feather pattern.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

81. Cylindrical bead (Fig. 6.21)
Inv. no. KGYM 2006.V13.B4.138.
Cylindrical bead fragment. Opaque dark blue with opaque turquoise band.

Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

82. Cylindrical bead with round section (Fig. 6.22)
Inv. no. KGYM 2006.V13.B4.139.
cylindrical bead with round section. Translucent greenish with opaque white and yellow trail.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

83. Rod shaped bead (Fig. 6.23)
Inv. no. KGYM 2006.V13.B4.140.
Long rod shaped bead with 6 ribs, its cross-section have a shape of petal. Translucent, green.
Tempelmann–Maczyńska 1985, Taf. 3/183.

84. Biconical bead (Fig. 6.24)
Inv. no. KGYM 2006.V13.B4.141.
Biconical bead fragment. Opaque dark blue.
basis: 1,063 cm
Guido 1978, Fig. 37.14.

85. Spherical bead (Fig. 7.1)
Inv. no. KGYM 2006.V13.B3.40.
Spherical bead fragment. Opaque dark blue with thin opaque white trails.
basis: 1,301 cm
Riha 1990, 11.11; Guido 1978, Fig. 38; Swift 2000, Fig. 98.2.

86. Rod shaped bead with ribs (Fig. 7.2)
Inv. no. KGYM 2006.V13.B3.41.
Long rod shaped bead with 6 ribs, its cross-section have a shape of petal. Opaque dark blue with opaque white trail.
diameter: 0,965 cm
Tempelmann–Maczyńska 1985, Taf. 3/183.

87. Rod shaped bead (Fig. 7.3)
Inv. no. KGYM 2006.V13.B3.42.
Rod shaped bead fragment. Opaque dark blue with opaque yellow trail.
diameter: 1,16 cm
Riha 1990, 11.17.

88. Rod shaped bead (Fig. 7.4)
Inv. no. KGYM 2006.V13.B3.43.
Long rod shaped bead fragment. Opaque dark blue with thin opaque yellow trail.
axis: 2,905 cm, basis: 0,492 cm, diameter: 0,472 cm
Riha 1990, 11.17.

89. Spherical bead (Fig. 7.5)
Inv. no. KGYM 2006.V13.B3.44.
Spherical bead fragment. Opaque dark blue with opaque white trail.
basis: 1,111 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

90. Rod shaped bead (Fig. 7.6)
Inv. no. KGYM 2006.V13.B3.45.
Rod shaped bead fragment. Opaque dark blue with opaque yellow trail.

91. Cylindrical bead (Fig. 7.7)
Inv. no. KGYM 2006.V13.B3.46.
Cylindrical bead with round section, fragmentary. Translucent green with opaque white band.
Riha 1990, 11.17; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

92. Rod shaped bead (Fig. 7.8)
Inv. no. KGYM 2006.V13.B3.47.
Rod shaped bead fragment. Opaque dark blue with opaque white and yellow trails.
diameter: 1,482 cm
Riha 1990, 11.17.

93. Cylindrical bead with round section (Fig. 7.9)
Inv. no. KGYM 2006.V13.B3.48.
Cylindrical bead with round section, fragmentary. Opaque dark blue.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

94. Spherical bead (Fig. 7.10)
Inv. no. KGYM 2006.V13.B3.49.
Spherical bead fragment. Opaque dark blue with opaque yellow, white, red and blue flecks.
axis: 1,823 cm, basis: 1,098 cm, diameter: 1,925 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

95. Cylindrical bead with round section (Fig. 7.11)
Inv. no. KGYM 2006.V13.B3.50.
Cylindrical bead with round section. Opaque white with opaque turquoise band.
Riha 1990, 11.15; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

96. Rod shaped bead (Fig. 7.12)
Inv. no. KGGYM 2006.V13.B3.51.

Rod shaped bead fragment. Opaque dark blue with opaque white trail.
diameter: 1,173 cm
Riha 1990, 11.17.

97. Biconical bead (Fig. 7.13)
Inv. no. KGYM 2006.V13.B4.142.
Biconical bead fragment. Translucent green with opaque white trails.
basis: 0,770 cm, diameter: 1,232 cm
Guido 1978, Fig. 37.14.

98. Biconical bead (Fig. 7.14)
Inv. no. KGYM 2006.V13.B4.143.
Biconical bead fragment. Opaque dark blue with marvered opaque yellow bands.
basis: 0,872 cm, diameter: 1, 840 cm
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

99. Cylindrical bead with round section (Fig. 7.15)
Inv. no. KGYM 2006.V13.B3.52.
Cylindrical bead with round section. Opaque dark green with thin opaque white trail.
basis: 1,009 cm, diameter: 1,253 cm
Guido 1978, Fig. 37.14.

100. Spherical bead (Fig. 7.16)
Inv. no. KGYM 2006.V13.B3.53.
Spherical bead fragment. Opaque light green with opaque white trail.
diameter: 1, 900 cm
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

101. Cylindrical bead with round section (Fig. 7.17)
Inv. no. KGYM 2006.V13.B3.54.
Cylindrical bead with round section, fragmentary. Opaque dark blue with opaque yellow bands.
Riha 1990, 11.15; Guido 1978, Fig. 37.4; Swift 2000, Fig. 98.3.

102. Rod shaped bead with ribs (Fig. 7.18)
Inv. no. KGYM 2006.V13.B3.55.
Long rod shaped bead with 7 ribs, its cross-section have a shape of petal. Translucent, green.
axis: 1,165 cm, basis: 0,926 cm, diameter: 1,167 cm
Tempelmann–Maczyńska 1985, Taf. 3/183.

103. Spherical bead (Fig. 7.19)
Inv. no. –.
Spherical bead fragment. Opaque dark blue.
Riha 1990, 11.11; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

104. Cylindrical bead with round section (Fig. 7.20)
Inv. no. –
Cylindrical bead with round section, fragmentary. Translucent green with opaque yellow, white and red flecks.
basis: 1, 400 cm
Riha 1990, 11.15; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

105. Rod shaped bead with ribs (Fig. 7.21)
Inv. no. –
Long rod shaped bead with 3ribs, its cross-section have a shape of petal. Translucent, green.
Tempelmann–Maczyńska 1985, Taf. 3/183.

106. Biconical bead (Fig. 7.22)
Inv. no. –
Biconical bead fragment. Translucent dark green with opaque yellow trail.
basis: 0,875 cm, diameter: 1,151 cm
Guido 1978, Fig. 37.14.

107. Rod shaped bead (Fig. 7.23)
Inv. no. –
Long rod shaped bead fragment. Opaque dark blue with opaque yellow trails.
axis: 2,5 cm, basis: 0,6 cm, diameter: 0,6 cm
Riha 1990, 11.15; Guido 1978, Fig. 38.2; Swift 2000, Fig. 98.2.

References

Barag, D. 1967: Flower and Bird' and Snake-Thread Glass Vessels. *Annales AIHV* 4, 55–66.

Barkóczi, L. 1951: *Brigetio.* Dissertationes Pannonicae Ser. II. No.22. Budapest.

Barkóczi, L. 1981: Kelche aus Pannonien mit Fadenauflage und Gravierung.. *Acta Archaeologica Academiae Scientiarum Hungaricae* 33, 35–70.

Barkóczi, L. 1986: A 3. század első feléből származó vésett díszű üvegek Pannoniában. *Archaeologiai Értesítő* 113, 166–189.

Barkóczi, L. 1988: *Pannonische Glasfunde in Ungarn.* Studia Archaeologica 9. Budapest.

Bartus, D. 2003: Bone Hairpins from Brigetio. *Anodos* 3, 23–32.

Borhy, L. 2005: Militaria aus der Zivilstadt von Brigetio (FO: Komárom/Szőny-Vásártér. In: Borhy, L. – Zsidi, P. (ed.): *Die norisch-pannonischen Städte und das römische Heer im Lichte der neuesten archäologischen Forschungen. II. Internationale Konferenz über norisch-pannonische Stadte Budapest-Aquincum 11-14. September 2002.* Aquincum Nostrum II.3. Budapest, 75–81.

Borhy, L. 2009: *Brigetiói amphiteatrumok?.* Budapest.

Dévai, K. – Gelencsér, Á. 2012: Római kori lakóépület és üvegyártó műhely Brigetióból. *Komárom-Esztergom Megyei Múzeumok Közleményei* 18, 59–93.

Fischer, A. 2009: *Vorsicht Glas! Die römischen Glasmanufakturen von Kaiseraugst.* Forschungen in Augst 37. Augst.

Fórizs, I. – Dévai, K. – Tóth, M. – Nagy, G. – May, Z. 2012: A Brigetiói üveggyártó műhely néhány jellemző üveglelete műszeres analatikiai vizsgálata. *Komárom-Esztergom Megyei Múzeumok Közleményei* 18, 103–114.

Korošec, P. 2004: Sledovi steklarske delavnice v Rabelčji vasi na Ptuju. In: Lazar, I. (ed.): *Drobci Antičnega Stekla/Fragments of ancient Glass.* Koper, 67–69.

Likhter, A. J. 1998: Glass of the Chernyakhov Culture. *Annales AIHV* 14, 192–195.

Price, J. – Cool, H. E. M. 1991: The Evidence for the Production of Glass in Roman Britain. In:Foy, D. (ed.): *Ateliers de verriers. De l'Antiquité á la période pré-industrielle.* Rouen, 23–30.

Riha, E.1990: *Der römische Schmuck aus Augst und Kaiseraugst.* Forschungen in Augst 10. Augst.

Seibel, F. 1998: *Technologie und Fertigungstechniken römischer Glahütten. Am Beispiel der Ausgrabungen im Hambacher Forst: aktualistische Vergleiche und Modelle.* Berlin.

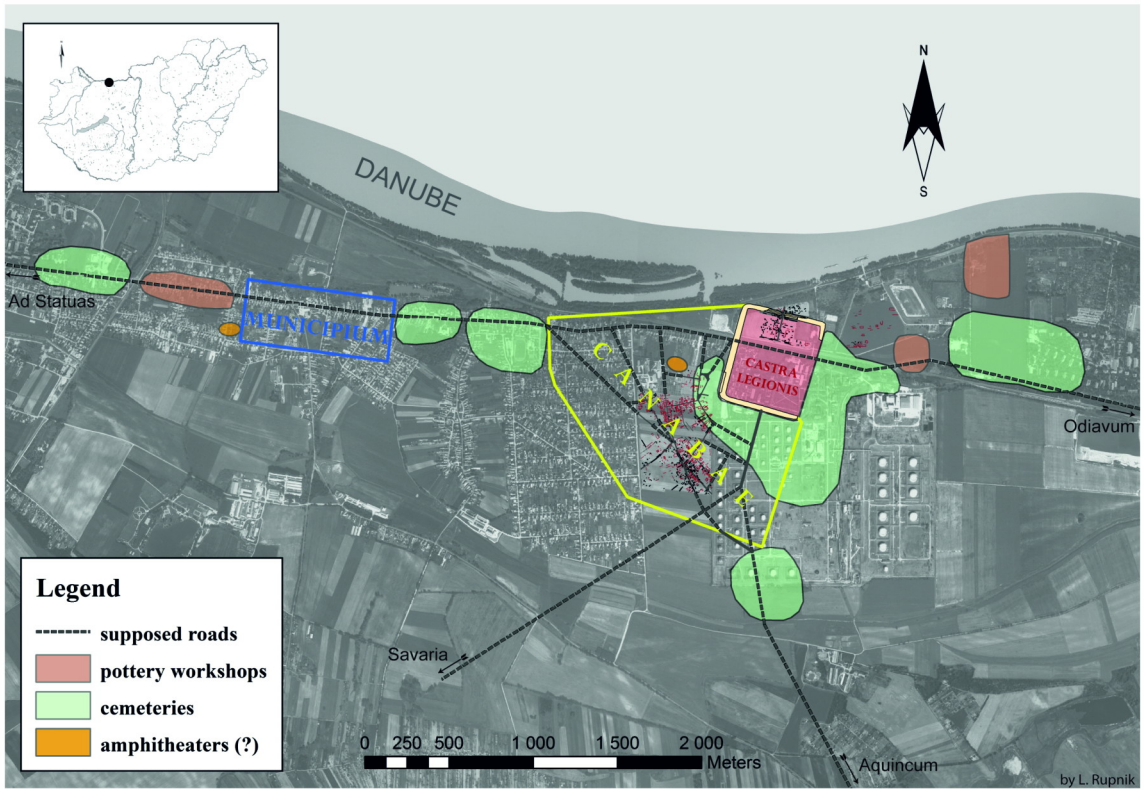
Stern, E. M. 2001: *Römisches, byzantinisches und frühmittelalterliches Glas. 10 v. Chr.-700 n. Chr. Sammlung Ernesto Wolf.* Stuttgart.

Swift, E. 2000: *Regionality in Dress accessories in the late Roman West.* Monographies Instrumentum 11. Montagnac.

Taylor, M. – Hill, D. 2008: Experiments in the reconstruction of a Roman Wood-Fired Glassworking Furnaces. *Journal of Glass Studies* 50, 249–270.

Tempelmann-Maczyńska, M., 1985: *Die Perlen der römischen Kaiserzeit und der frühen Phase der Völkerwanderungszeit im mitteleuropäischen Barbaricum.* Mainz.

Visy, Zs. 1974: Archäologische Forschungen im Jahre 1973. *Archaeologiai Értesítő* 101, 316.



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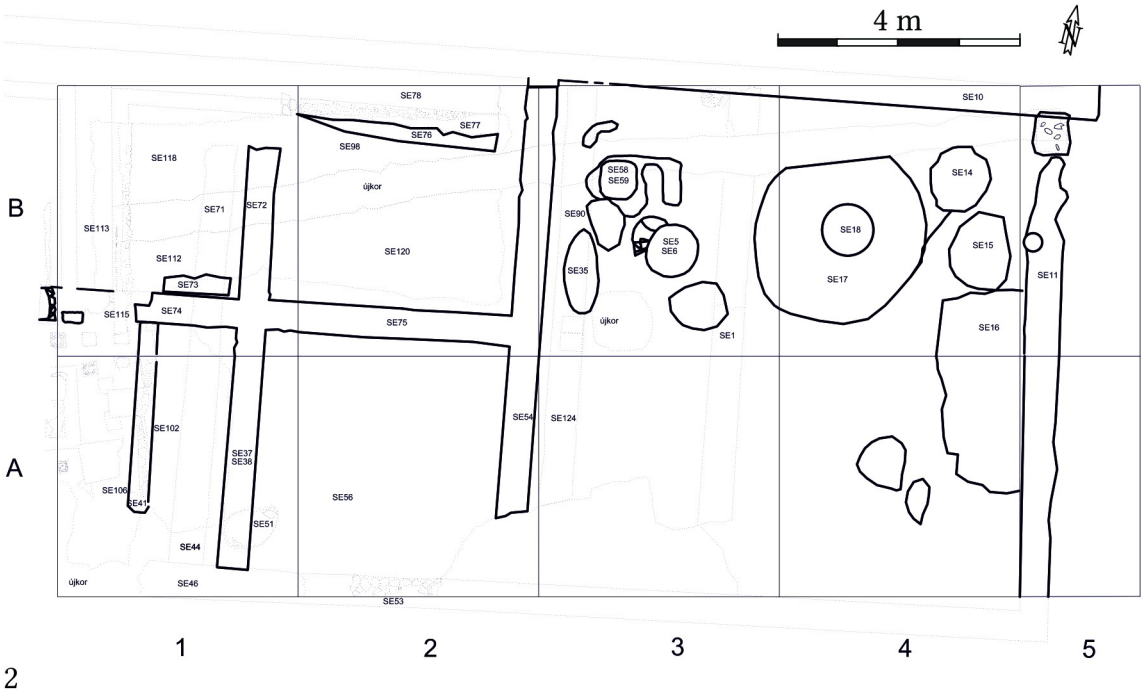

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Fig. 1. 1. Ground plan of Brigetio (L. Rupnik). 2. Ground plan of the striphouse and the glass workshop (Á. Gelencsér).

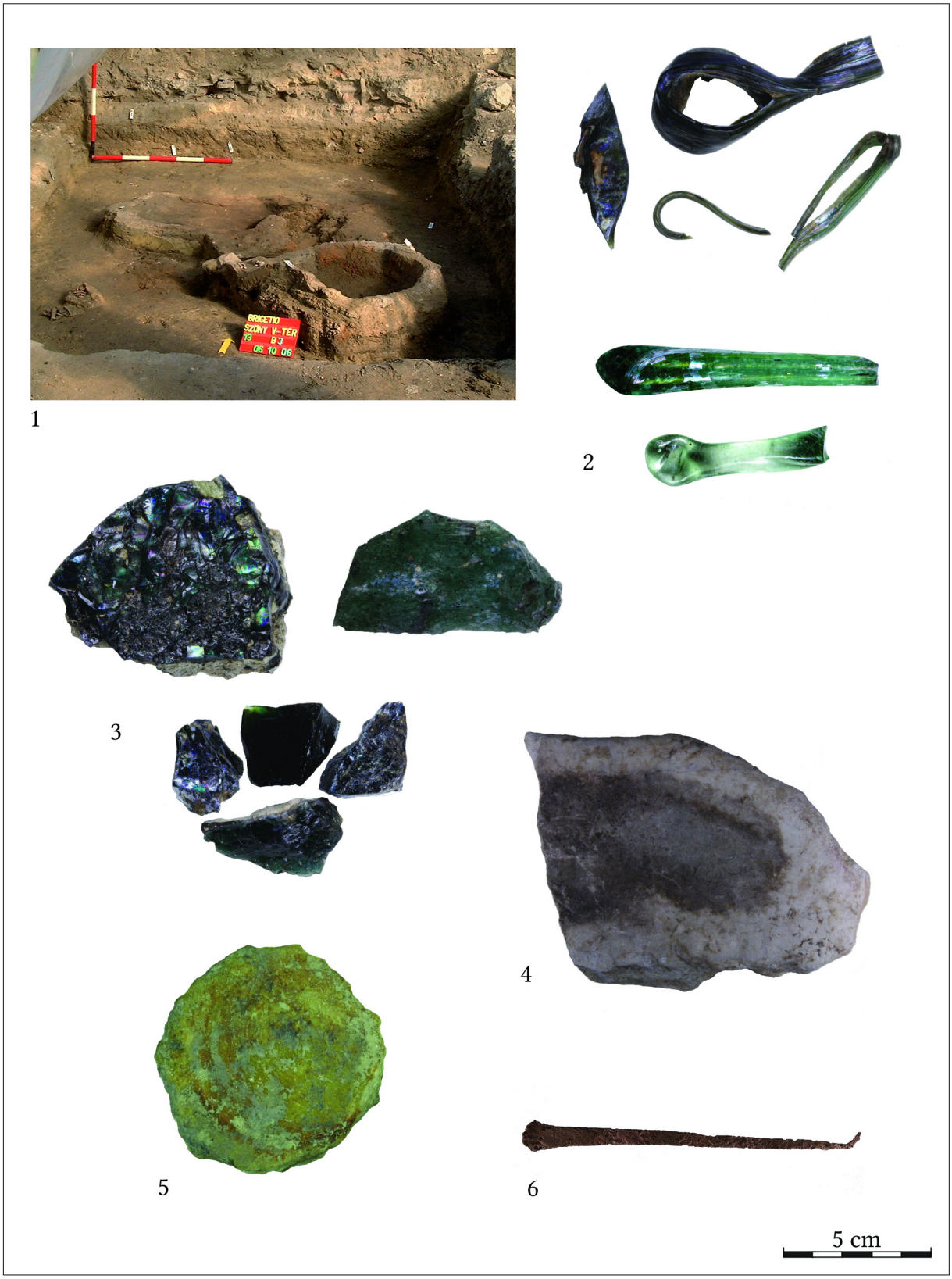

Fig. 2. 1. The remains of the two furnaces (Photo: Á. Gelencsér). 2. The waste of glass making procedure (Photo: D. Bartus). 3. The chunks of raw materials (Photo: D. Bartus). 4. The fragment of a marvered block (Photo: D. Bartus). 5. The roughly curved stone tool (Photo: D. Bartus). 6. The bronze tool with a hook (Photo: D. Bartus).

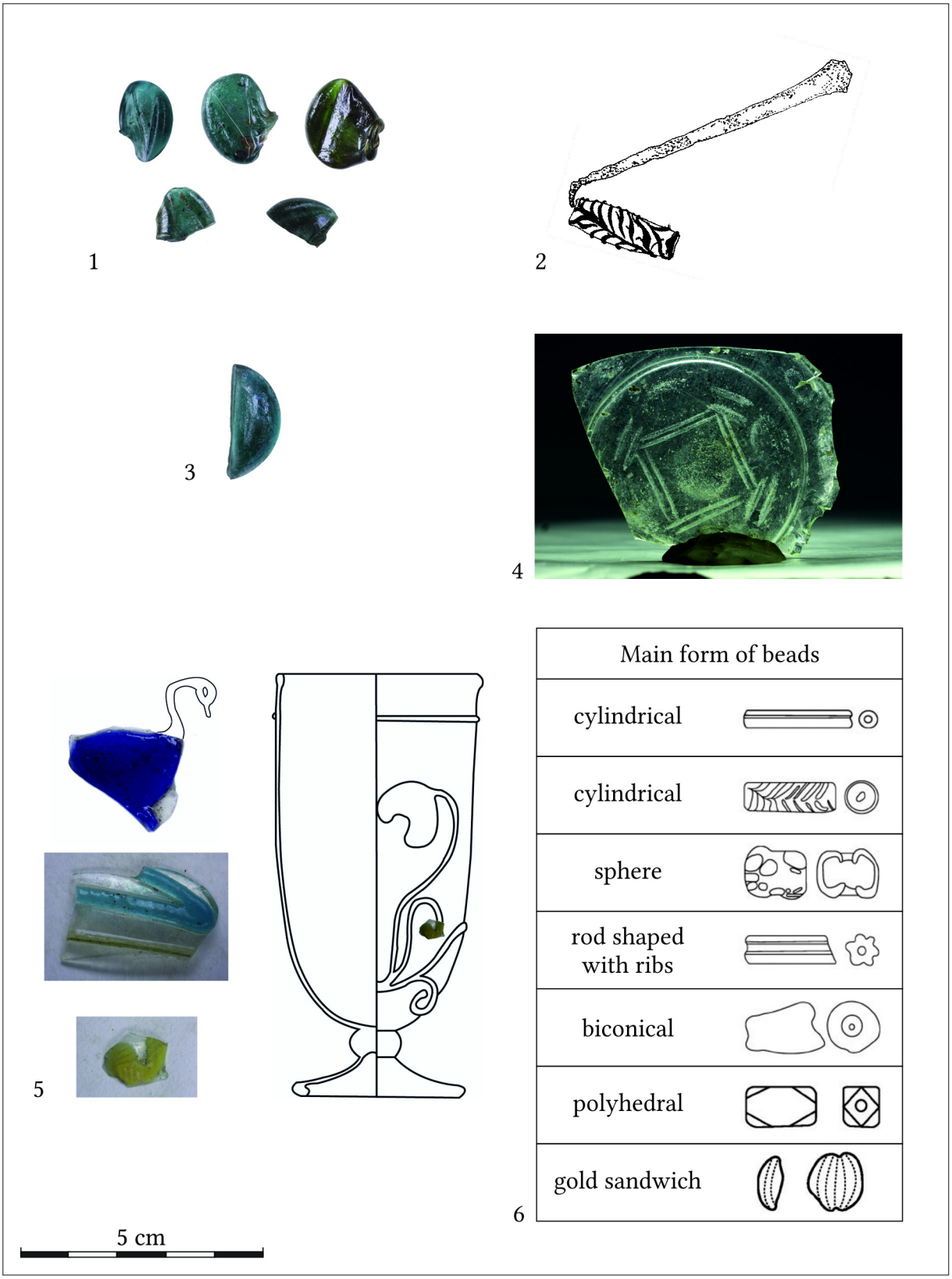

Fig. 3. 1. Glass drops with a toolmarks (Photo: D. Bartus). 2. Decoration method with the bronze tool (K. Dévai). 3. The cutted glass disc (Photo: D. Bartus). 4. The base of a bowl with facett-cutting decoration (Photo: D. Bartus). 5. Fragments of cylindrical beakers with flower and bird decoration (Photo: D. Bartus). 6. The main forms of glass beads.

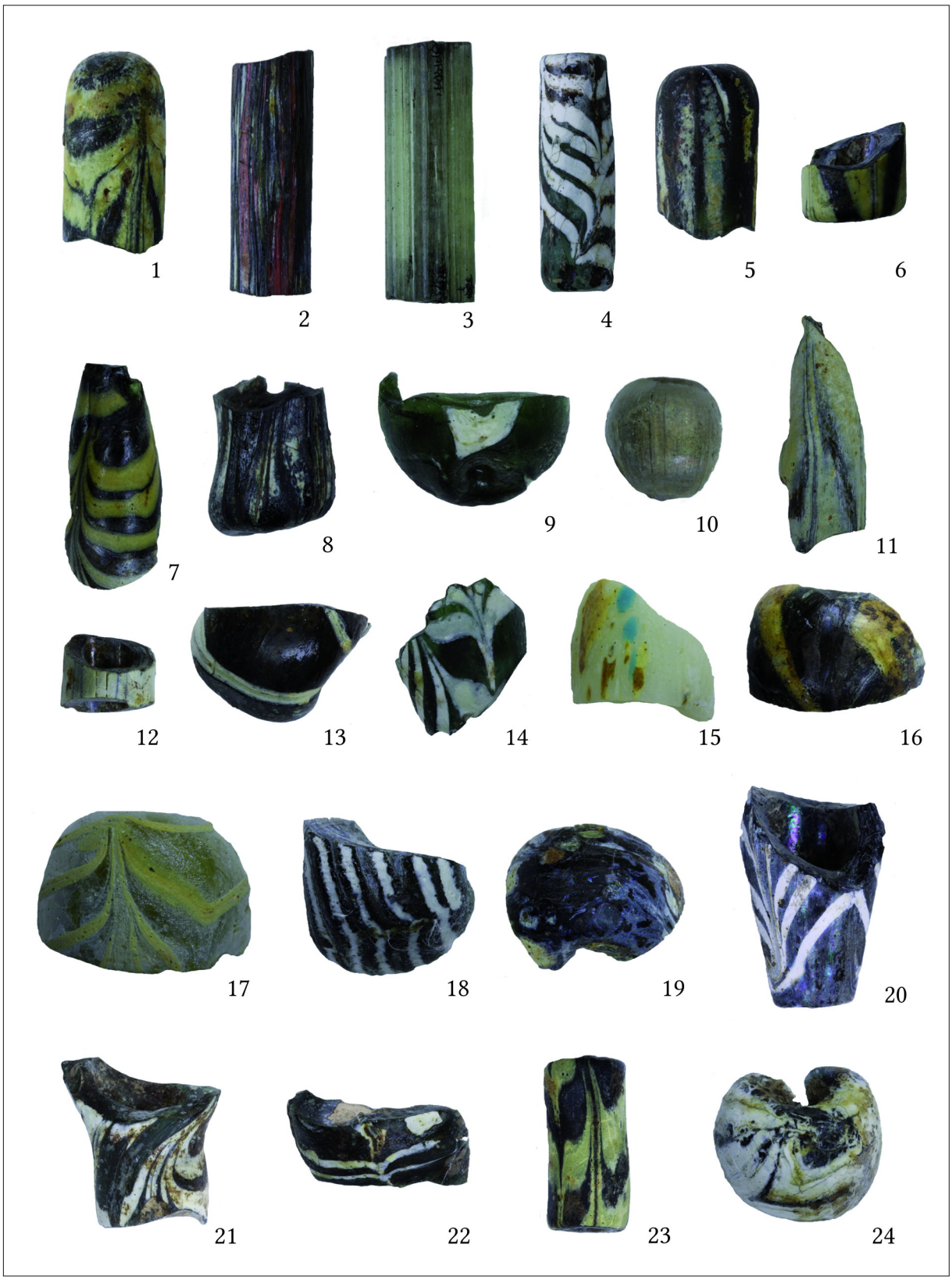

Fig. 4. Glass beads (Photo: D. Bartus).

Fig. 5. Glass beads (Photo: D. Bartus).

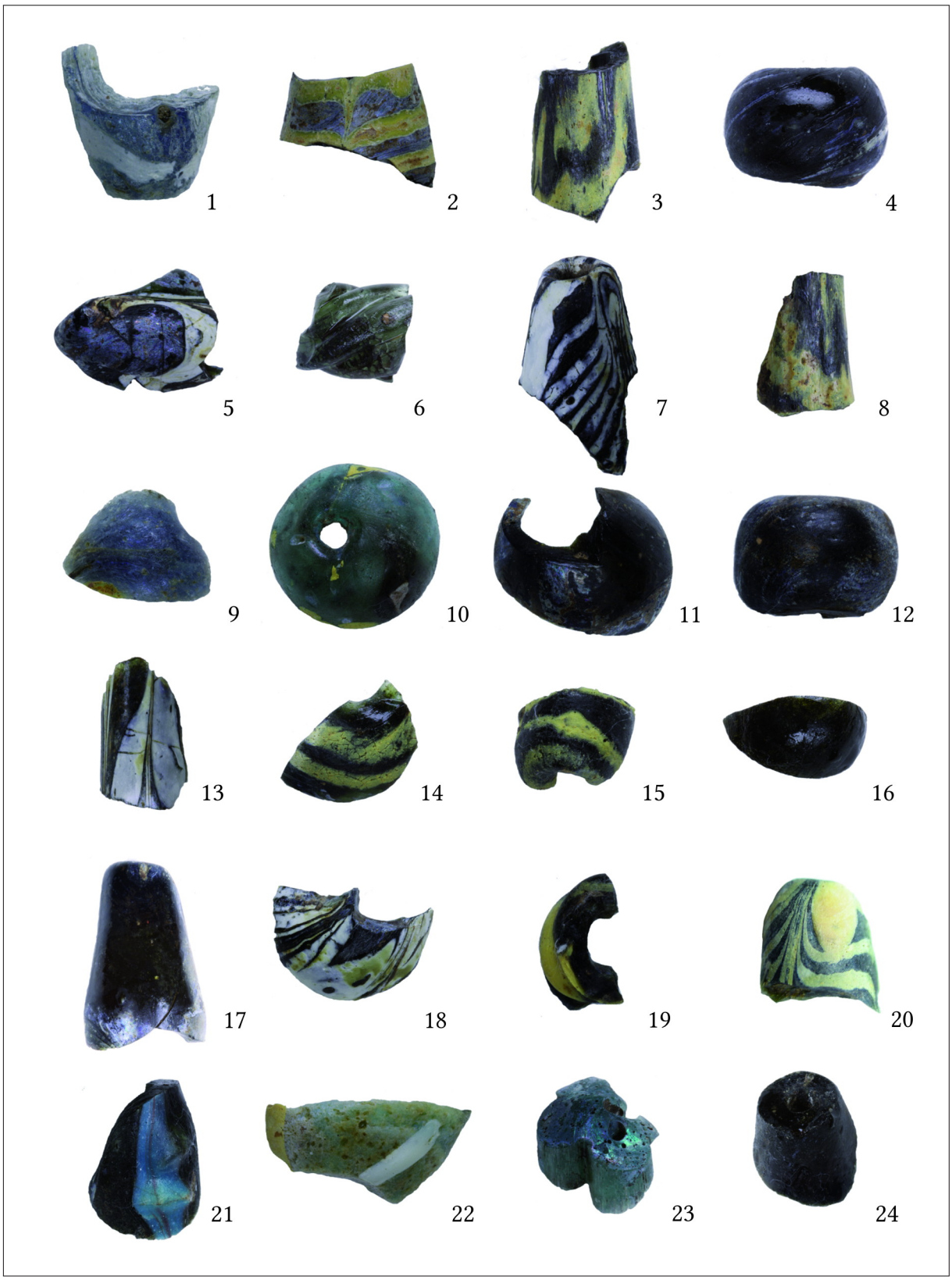

Fig. 6. Glass beads (Photo: D. Bartus).

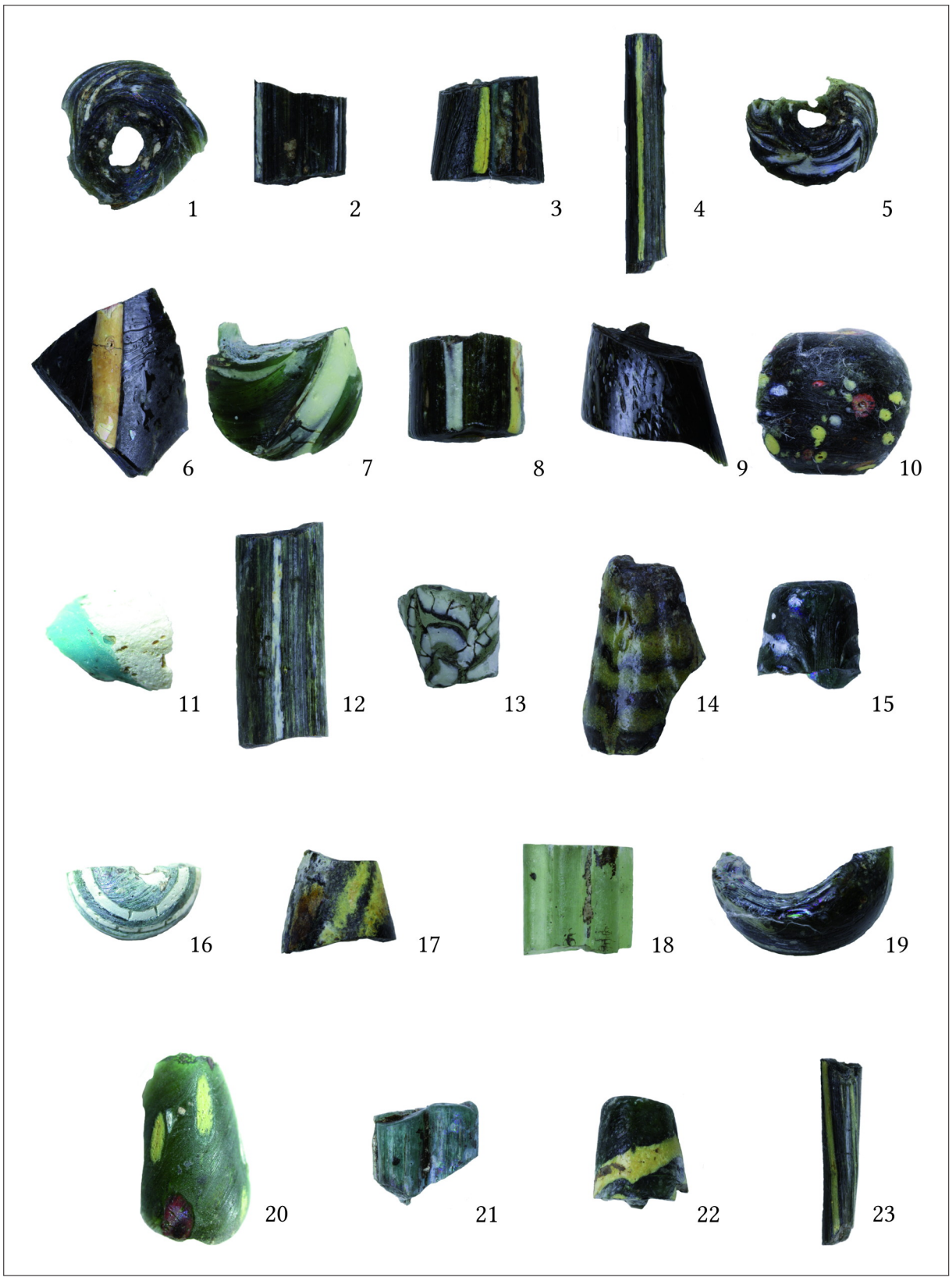

Fig. 7. Glass beads (Photo: D. Bartus).