

KAROL ŻOŁĘDZIOWSKI

State Archaeological Museum, Warsaw

karol.zoledziowski@gmail.com

ORCID: 0000-0003-4580-5622

DE INSTRUMENTIS – ON METALWORKING TOOLS FROM THE EARLY MEDIEVAL YATVINGIA

ABSTRACT

The paper presents a comprehensive synthesis of early medieval tools used in Yatvingian craftsmanship, with particular emphasis on non-ferrous metalworking. The study is based on new data obtained from excavations at sites in Krukówek, Judziki, Jegliniec, and the settlement complex in Szurpiły. Among the discussed artefacts is a small, asymmetrical hammer from Krukówek, the size of which suggests its use in a jewellery workshop rather than a blacksmith's workshop. Also identified was an anvil in the shape of a truncated pyramid from Szurpiły, used for the manufacture of small items, and sheet metal shears from Judziki, adapted for cutting soft materials. A significant part of the analysis is devoted to decorative

tools, such as iron and copper punches and dot punches, used for applying ornaments in the form of lines, knobs, or circles. A unique find is a massive copper alloy bar from Jegliniec, interpreted as a die for embossing convex decorations on sheet metal. Conducted analyses indicate that the Yatvingian tool kit is similar to workshop equipment known from other regions of Europe, although it shows some local differences in terms of ornamentation tools. Despite numerous proofs of local bronze production, the author highlights the still insufficient quantity of foundry ceramic finds, such as crucibles or moulds, which remains a research gap.

Keywords: Yatvingia, early Middle Ages, metalworking, tools, jewellery, punches.

In 2018, I presented an initial attempt to characterise Yatvingian craftsmanship associated with the processing of non-ferrous metals.¹ That study also discussed a small assemblage of tools then known from the Yatvingian area – primarily punches, chisels, and a poorly preserved anvil – which required broader comparative analysis with analogous artefacts from the Baltic region. Recently, fieldwork at sites such as Krukówek 1 (Raczk commune) and Judziki 1 (Olecko commune), together with renewed examination and reinterpretation of assemblages from well-known sites including Jegliniec 1 (Krasnopol commune) and the Szurpiły settlement complex (Jeleniewo commune), has yielded new data that significantly expand our understanding of metalworking in the Yatvingian region during the early medieval period. This paper presents a comprehensive synthesis of both newly discovered and previously known finds, and considers the implications of the still-missing elements of workshop equipment for reconstructing local craft traditions.

In September 2015, Jerzy Siemaszko, head of the Archaeology Department at the District Museum in Suwałki, was asked by the Provincial Office for the Protection of Monuments to participate in a police investigation concerning the illegal acquisition of archaeological artefacts in the Suwałki region. As a result of police action and cooperation with one of the perpetrators, who revealed the location of the excavations near Krukówek, numerous artefacts dating back to the Early Middle Ages were recovered. Traces of looting were found in the indicated area, and the perpetrator's testimony indicated that over 3,000 artefacts had been excavated from approximately 70% of the area. The artefacts were secured by the police as evidence and then transferred to the Museum in Suwałki.

Among the materials in question was also a small hammer, approximately 6 cm long² (Fig. 1:1). Both ends are heavily hammered, indicating intensive use. Despite clear signs of wear, the artefact can be classified as an

¹ Żołądzowski 2018.

² The artefact was scaled based on documentation provided by the Regional Museum in Suwałki. Since the hammer is part of

the 'Jaćwieskie Eldorado' exhibition, it was not possible to take direct measurements.

asymmetrical type with a characteristic thickening near the hole, ending on one side with a face and on the other with a peen. Artefacts of this type in various sizes are common in the Early Middle Ages.³ A large series of them is also known from the Baltic region. Among others, finds from Tērvete, Mežotne and Kalnelis II should be mentioned here⁴ as well as massive specimens from the tool deposit in Doles Rauši.⁵ The small size of the hammer found in Krukówek indicates that it was used for lighter work that did not require a heavy tool, and therefore we can associate it with a jewellery workshop rather than a blacksmith's workshop. The find from Tērvete can be considered its closest analogue in terms of both shape and size.⁶

Another item that can be classified as a tool related to metalworking is an anvil (Fig. 1:2) found at the 'Targowisko' settlement in Szurpiły site 4.⁷ It has a shape similar to a pyramid with a quadrangular base. The dimensions of the anvil are approximately 2.5 × 4.5 cm, which suggests that it was used in the production of smaller items. Due to severe corrosion and only locally preserved surfaces of the artefact, it is impossible to determine whether it was a flat anvil or a profiled one. Anvils in the form of a truncated pyramid with a rectangular base were a relatively popular type of tool in Europe from pre-Roman times until the Middle Ages.⁸ Examples of such artefacts dating back to the Early Middle Ages include those from Tjele,⁹ and Doles Rauši.¹⁰ The closest analogy in terms of shape and size to the anvil from Szurpiły is the anvil discovered in Janowo Pomorskie.¹¹

Another tool that can be linked to the Yatvingian workshop is a pair of sheet metal shears found during field research in Judziki (Fig. 1:3). Their total length is 18.5 cm, and the length of the working edge is approximately 3 cm. One of the arms is straight, while the other is curved to ensure better ergonomics. An iron rivet connects them. The small cross-sections of the arms and their length indicate that they were used primarily for working with soft materials, e.g., for cutting non-ferrous metal sheets. Furthermore, they may have been used for cutting thin iron sheets.

The context of the discovery is also noteworthy. At the site in Judziki, in addition to the aforementioned

shears, numerous semifinished products and waste were found, which may indicate local non-ferrous metalworking. These include, among others, cast semifinished products of penannular brooches, raw material ingots, and fragments of crushed copper sheets. As evidenced by the relatively low saturation of finds and the very homogeneous chemical composition of the artefacts,¹² this was a settlement that existed for a short period of time. The type VII cross denarius discovered at the site allows us to establish the general chronology as the mid-11th century.¹³ The most numerous finds of shears come from Haithabu, where five pairs of different sizes were discovered. Among them were both massive specimens intended for cutting thick sheets and smaller ones used in the processing of non-ferrous and precious metals.¹⁴ Artefacts of this type are also often found at other sites associated with the activities of Scandinavian craftsmen,¹⁵ including the aforementioned finds from Tjele¹⁶ and Stara Ladoga.¹⁷ However, these items usually have either both arms bent or straight. The lack of combined examples among them indicates that the pair of shears from Judziki may have been specially adapted to the needs or preferences of the craftsman who used them.

Another group of tools, which includes various types of punches, comes largely from the settlement complex in Szurpiły, where, as indicated by the findings to date, a non-ferrous metalworking workshop operated.¹⁸ Among the metal finds from the 'Targowisko' site in Szurpiły, two iron punches with lengths of 5.1 cm and 10.3 cm (Figs. 1:4-5), and ending with a tang were identified. The objects are similar in form to a chisel, but their working edges have been rounded, which distinguishes them from classic cutting tools. The technique of working with this tool consisted of gently tapping its tip while moving it along the surface of the material being worked on. The rounded edges of the punch ensured smooth movement and prevented the tool from digging in too deeply, which could lead to uncontrolled damage to the decorated surface. The result of using this type of punch was lines with a V-shaped cross-section and slightly raised edges. The effect was achieved because the tool did not cut the material, but only displaced it within the surface layer. This type of decoration was also

³ Ohlhaber 1939, Fig. 20; Pleiner 2006, Fig. 30, 31; Heindel 1993, 358; Strobin, Żołądziowski 2021, 84; Westphalen 2002, Fig. 2; Sedov 1985, 58; Zakharov 2004, Fig. 140.

⁴ Brivkalne 1964, 94; Gričuvienė 2005, 144-145; Anteins 1960, 32.

⁵ Zemītis 2015, 92-93, 134-136.

⁶ Brivkalne 1964, 94.

⁷ Żołądziowski 2018, 218; 2015, 148.

⁸ Pleiner 2006, 93-99.

⁹ Munksgaard 1984, 85.

¹⁰ Zemītis 2015, 92-93, 134-136.

¹¹ Strobin, Żołądziowski 2021, 222.

¹² The research was conducted by the author in the Conservation Department of the State Archaeological Museum in Warsaw. Work on the publication is currently underway.

¹³ Engel *et al.* 2024, 73-74.

¹⁴ Westphalen 2002, 13-17, Fig. 4.

¹⁵ Ohlhaber 1939, 69-70.

¹⁶ Munksgaard 1984, 85.

¹⁷ Sedov 1985, 57.

¹⁸ Żołądziowski 2015.



Fig. 1. Metalworking tools from the Yatvingia: 1 – Krukówek site 1 (photo by R. Maskowicz); 2, 4-7, 9-10 – Szurpiły site 4; 3 – Judziki site 1; 11-12 – Szurpiły site 8 (photo by K. Żołędziowski; compiled by K. Żołędziowski).



Fig. 2. Example of the use of a lining punch at the end of a bracelet from Jegliniec site 1 (after Żołądziowski 2022, fig 24).

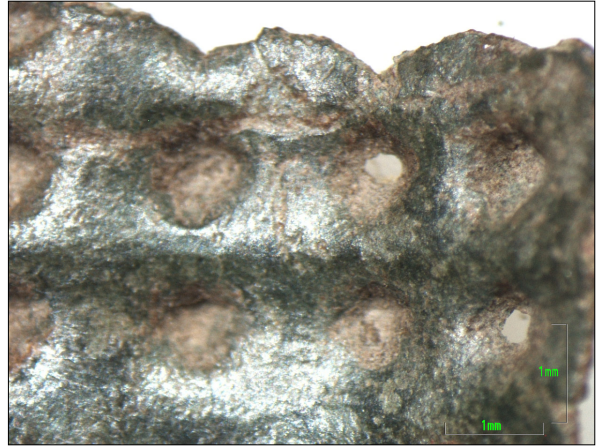


Fig. 3. Microscopic photo of the underside of bumps embossed with a punch on a metal strip from the 'Mosiężysko' cemetery, site 8, in Szurpiły (photo by K. Żołądziowski).

described by E. Coatsworth and M. Pinder¹⁹ in the context of decorative techniques used in Anglo-Saxon metalwork. After sharpening the working edge, these tools could also be used to cut sheet metal.

Examples of the use of this type of tool in Yatvingian craftsmanship include finds from Jegliniec, where this method was used to create ornaments such as parallel lines, crosses (Fig. 2), rafters or herringbone patterns, as well as imitation twisting.²⁰ The closest analogies for this type of punch with a tang come from Serensk, where they are associated with jewellery production,²¹ while further examples come from the port of trade in Haithabu.²² Similar tools, but without a tang, are also published by I. Heindel in his study on tools used by the Western Slavs.²³

Within the analysed collection of artefacts from the 'Targowisko' related to ornamentation techniques, two punches with rounded ends can be identified. The first is approximately square in cross-section, with a length of c. 4.2 cm and a diameter of the working end of approximately 0.3 cm (Fig. 1:6). The upper part of this tool is heavily hammered, indicating intensive use of a hammer during processing. The second artefact (Fig. 1:7) has not been preserved in its entirety, which makes a full analysis of its dimensions and function difficult. The preserved fragment is 5.1 cm long, and the diameter of the working end is approximately 5 mm. Despite its fragmentary state of preservation, it may be assumed that the original form of the tool was similar to that of the first, suggesting that both served a comparable function.

Interpreting these tools in the context of decorative techniques, it can be concluded that they were used to make ornaments in the form of knobs, which were a common decorative element on metal products (Fig. 3), especially in Yatvingian craftsmanship, as exemplified by various types of pendants, a large series of which comes from Jegliniec.²⁴ Tools of this type could also have been used together with the dies discussed below.

Among the finds from Yatvingia, two artefacts interpreted as punches used to stamp circular ornaments were also identified. Both artefacts differ in terms of material, construction, and technological details, but most likely served similar functions. The first artefact is a fragment of an iron punch with a cross-section similar to a square, originating from the 'Mosiężysko' site 8 in Szurpiły (Fig. 1:8). The tool has been preserved in a broken state; its current length is 4.1 cm. The working part, corresponding to the working end, has a diameter of about 2.5 mm and was intended for spot stamping of small ornaments in the form of regular circles popular in Baltic ornamentation (Fig. 4). The design of the tool suggests that it was held directly in the hand and struck from above, probably with a hammer.

The second artefact is a punch made of copper alloy, with a total length of 5.2 cm (Fig. 1:9). The working part, as in the case of the iron punch, takes the form of a convex disc with a diameter of 4 mm, thus enabling the stamping of ornaments with a slightly larger diameter. Unlike the first tool, this punch is finished with a tang, to which a handle made of wood or another organic material was most likely

¹⁹ Coatsworth, Pinder 2002, 46–50.

²⁰ Żołądziowski 2022, 456–457.

²¹ Zaytseva, Saracheva 2011, 50–51.

²² Westphalen 2002, 15–21, Fig. 23.

²³ Heindel 1993, 340–356.

²⁴ Iwanowska *et al.* 2022, 301–306.



Fig. 4. Example of an eyelet ornament made with a punch on a fragment of a bracelet from the 'Mosiężysko' cemetery, site 8, in Szurpiły (photo by K. Żołędziowski).



Fig. 5. Example of a hole and dot ornament made with a punch on a rhomboidal pendant from the 'Mosiężysko' cemetery, site 8, in Szurpiły (photo by K. Żołędziowski).

attached. Such a construction facilitates the use of the tool and ensures a more comfortable grip. Given that the object was made of copper alloy, it may be assumed that it was intended for working thin sheets of metal or wax casting models. Its use for decorating objects made of organic materials, such as leather or birchbark, cannot be ruled out. A comparable tool was also found at Serensk;²⁵ however, as evidenced by the large number of artefacts decorated with eyelet ornaments, tools of this type were very popular in Baltic craftsmanship both in the Early Middle Ages and in earlier periods. Nevertheless, due to the highly corrosive nature of iron, the identification of such objects in the archaeological assemblages remains difficult.

The last tool in this group is an iron punch with a conical working end (Fig. 1:10). It is 11.4 cm long and has a shaft diameter of 1.2 cm. The opposite end of the tool is heavily hammered, which indicates intensive use with a hammer as the impact tool. Morphometric analysis indicates that the punch could be used to make holes with a diameter of approximately 0.5 to 1.2 cm, depending on the thickness and mechanical properties of the material being worked on. With moderate impact force, the tool could also be used as a punch to apply ornamentation in the form of regular dots (Fig. 5). Its solid construction and clear signs of wear suggest that this tool was adapted to work in hard materials and under heavy loads. Therefore, it should be classified as a blacksmith's rather than a jeweller's tool. Similar tools are often found at sites associated with metallurgical production. Numerous series of them come, among others, from the Tērvete for-

tified settlement in Latvia²⁶ and from the port of trade in Haithabu.²⁷

One of the interesting finds discovered in Jegliniec is a massive bar made of copper alloy (Fig. 1:11). This artefact has nine hemispherical indentations arranged in the form of a cross on one side, and two similar indentations arranged in a line on the other side. This object may be interpreted as a type of matrix or pad used to emboss convex bumps on thin metal sheets. A similar interpretation was also proposed by Grażyna Iwanowska and Agnieszka Niemyjska.²⁸ The cross-shaped arrangement of the indentations is similar to the arrangement of the bumps observed on pendants from the same site. This suggests that this side of the bar could have been used to schematically mark the location of points, which were then embossed using the indentations on the opposite side of the object. The other side of the artefact, with indentations arranged in a row, could have been used for similar activities, which is confirmed, among other things, by the arrangement of decorations on a ring also found in Jegliniec.²⁹ The embossing process consisted of pressing a thin plate against a die using an iron punch similar in form to the finds described above. The functionality of the artefact is also confirmed by experiments (Fig. 6), which indicated that its dimensions are similar to those of the fragments of pendants from Jegliniec, which could have facilitated the creation of more complex ornamental motifs. The experiments also confirm the effectiveness of using antler tools as punches, as these do not scratch the worked surface.

²⁵ Zaytseva, Saracheva 2011, 59.

²⁶ Brivkalne 1964, 96.

²⁷ Westphalen 2002, 21–40, Fig. 6.

²⁸ Iwanowska, Niemyjska 2004, 93.

²⁹ Iwanowska *et al.* 2022, 295.

³⁰ Armbruster 2002, 239–242.



Fig. 6. Embossing of knobs on thin sheet metal using a reconstructed die from Jegliniec and an antler punch (after: Żołądzowski 2022, fig 22).

Comparable production techniques were also used in the embossing of decorations using dies, as described by B. Armbruster.³⁰ Examples of dies and matrices used in the production of sheet metal products have been discovered, among others, in Kernavė, Lithuania³¹ and in the already mentioned Serensk.³² Alternatively, the artefact in question could have been used to form hemispherical rivet heads, but the absence of such elements in the collection of finds from Jegliniec weakens this hypothesis. A similar function could also have been performed by the second bar discovered at this site – a small object with a trapezoidal cross-section, bearing traces of breakage and covered with hemispherical depressions of varying diameters (Fig. 1:12). This artefact was discovered during field survey research conducted in the autumn of 2021.

An analysis of the set of tools discovered at the Yatvingian sites indicates that their general character does not differ significantly from the equipment of early medieval workshops known from other regions of Europe. This similarity applies in particular to basic tools used in everyday craftsmanship, such as hammers, anvils, and shears. However, certain differences can be observed in the range of specialised tools used for ornamentation, which may indicate local technological variations or different decorative traditions. These tools are difficult to identify in archaeological material, as exemplified by punches. Their working edges are generally in poor condition, which makes it difficult to directly interpret their

function and method of use, especially for researchers who are not familiar with the details of jewellery production. In such cases, research methods such as microscopic analysis of production marks and experimental archaeology prove particularly useful. Thanks to their use, it is possible to more precisely identify the processing techniques and specific activities performed with a given tool, as well as to reconstruct the outline of the working edge of the tool based on the stamp impression.³³

The finds discussed here are dominated by small tools, whose morphological features indicate that they were adapted for working with non-ferrous metals such as bronze or brass; the only exception is the massive punch from Szurpiły (Fig. 1:10), intended rather for ironworking. This allows most of them to be classified as jewellery workshop equipment rather than blacksmith's tools. Despite the systematic supplementation of the picture of the Yatvingian workshop with further examples of tools, such as hammers and sheet metal shears, there is still a lack of tools related to foundry production. Particularly noticeable is the shortage of foundry ceramics such as crucibles, casting moulds, and fragments of bellows nozzles. This is puzzling, as production waste and semifinished products clearly associated with foundry activities are increasingly being identified at many sites, such as in Judziki. The lack of such tools, therefore, remains a significant research gap and points to the need for further targeted archaeological research.

³¹ Bitner-Wróblewska 2002, 161.

³² Zaytseva, Saracheva 2011, 59.

³³ Żołądzowski 2022.

Bibliography:

- Anteins A. 1960, Dzeles un tērauda izstrādaājumu struktūras īpašības un izgatavošanas tehnoloģija senāja Latvijā (līdz. 13 gs.), *Archeoloģija un etnogrāfija* 2, 3–60.
- Armbruster B. 2002, *Die Pressmodel von Haithabu*, in: K. Brandt, M. Müller-Wille, C. Radtke (eds), *Haithabu und die frühe Stadtentwicklung im nördlichen Europa. Schriften des Archäologischen Landesmuseums* 8, Neumünster, 219–280.
- Bittner-Wróblewska A. (ed.) 2002, *Kernave Kernavė – litewska Troja – katalog wystawy*, Warszawa.
- Brivkalne E. 1964, Daži amatniecības amatniecības darinājumi Tērvetes pilsalnā, *Archeoloģija un etnogrāfija* 6, 85–104.
- Coatsworth E., Pinder M. 2002, *The art of the Anglo-Saxon Goldsmith: Fine metalwork, Anglo-Saxon England, its practice and practitioners*, Anglo-Saxon Studies 2, Woodbridge, 21–293.
- Engel M., Sobczak C., Iwanicki P. 2024, *The New Yatvingian site at Judziki in northeast Poland. Preliminary results of archaeological research*, in: G. Zabiela (ed.), *Prakalbinta priedistorė. Leidinys, skirtas Audronės Bliujienės suakčiai*, Klaipėda, 68–82.
- Griciuvienė E. 2005, *Žiemgaliai. Baltų archeologijos paroda. Katalogas – katalog wystawy*, Rīga.
- Heindel I. 1993, Werkzeuge zur Metallbearbeitung des 7./8. bis 12./13. Jahrhunderts zwischen Elbe/Saale und Bug, *Zeitschrift für Archäologie* 27, 337–379.
- Iwanowska G., Niemyjska A. 2004, Pendants from the earthwork at Jegliniec. Jatving links with North and North-Eastern cultural environment, *Archeologia Litwana* 5, 92–108.
- Iwanowska G., Sobczak C., Engel M. 2022, *Grodzisko w Jeglińcu. Jaćwieskie centrum osadnicze w świetle badań archeologicznych i przyrodniczych*, Seminarium Bałtyjskie 5, Warszawa.
- Munksgaard E. 1984, A Viking Age smith, his tools and his stock-in-trade, *Offa* 41, 85–91.
- Ohlhaber H. 1939, *Der germanische Schmied und seine Werkzeug*, Leipzig.
- Pleiner R. 2006, *Iron in Archaeology. Early European Blacksmiths*, Praha.
- Sedov V. V. 1985, *Srednevekovaja Ladoga. Novye archeologičeskie otkrytija i issledovanija*, Leningrad.
- Strobin J., Żołędziowski K. 2021, *Wytwórczość metaloplastyczna z osady w Janowie Pomorskim. Wyniki specjalistycznych badań artefaktów z metali kolorowych i szlachetnych pozyskanych w sezonach badawczych 1984-1991 oraz 2000-2008*, Studia nad Truso 4, Elbląg.
- Westphalen P. 2002, *Die Eisenfunde von Haithabu*, Die Ausgrabungen in Haithabu 10, Neumünster.
- Zakharov S. D. 2004, *Drevnerusskij gorod Beloozero*, Moskva.
- Zajtseva I. E., Saracheva T. G. 2011, *Yuvelirnoe Delo „Zemli Vyatichey” vo Vtoroy Polovine XI – XIII v.*, Moscow.
- Zemītis G. 2015, *Baltic and Baltic-Finnic Antiquities in the collection of Turaida Museum Reserve. The 3rd millennium BC – the 1st half of the 13th century*, Turaida.
- Żołędziowski K. 2015, Was there a bronze workshop at the “Targowisko” (site 4) settlement at Szurpiły near Jeleniewo?, *Novensia* 26, 141–153.
- Żołędziowski K. 2018, Metalurgia kolorowa Jaćwieży na tle znalezisk z rejonu Morza Bałtyckiego, in: S. Wadył, M. Karczewski, M. Hoffman (eds), *Materiały do archeologii Warmii i Mazur* 2, Warszawa – Białystok – Olsztyn, 213–226.
- Żołędziowski K. 2022, Aneks 5. Technologia produkcji zabytków z metali kolorowych i szlachetnych z grodziska w Jeglińcu, stan. I, gm. Szypliszki, in: G. Iwanowska, C. Sobczak, M. Engel (eds), *Grodzisko w Jeglińcu. Jaćwieskie centrum osadnicze w świetle badań archeologicznych i przyrodniczych*, Seminarium Bałtyjskie, Warszawa, 439–470.

