

Archaeology of Conflicts

edited by
Pavel Drnovský – Petr Hejhal

Kniha je vydána v rámci dotace Ediční rady FF UHK pro rok 2020

The book is published as part of a grant from the Editorial Board
of the Faculty of Arts, University of Hradec Králové for 2020

Published by Pavel Mervart Publishing,
P. O. Box 5, 549 41 Červený Kostelec,
2020

Translation Jana Kličová, Urszula Baron

Printed H.R.G., spol. s r. o.

www.pavelmervart.cz

Reviewed:

prof. PhDr. Václav Matoušek, CSc.

Mgr. Petr Žákovský, Ph.D.

© Univerzita Hradec Králové, 2020

© Miloš Bordáč, Pavel Drnovský, Eduard Droberjar, Martin Gojda, Aneta Gołębiowska-Tobiasz,
Petr Hejhal, Jiří Hofman, Matouš Holas, Jiří Juchelka, Balázs Komoróczy, Sławomir Konik,
Martin Krůl, Radosław Liwoch, Łukasz Miechowicz, Klára Andresová Skoupá, Piotr Strzyż,
Pavol Šteiner, Marek Vlach, 2020

© Pavel Mervart 2020

ISBN 978-80-7465-469-5

Content

Introduction	9
Remarks on the possibilities of studying armed conflicts between the Romans and Germans during the Marcomannic Wars in Moravia	
<i>Eduard Droberjar – Balázs Komoróczy – Marek Vlach</i>	11
Medieval fortification systems in the form of linear embankments in present-day Poland	
<i>Łukasz Miechowicz</i>	27
Weapon imports in the burials of the Polovtsian elites in the Black Sea – Caspian Steppe	
<i>Aneta Gołębiowska-Tobiasz</i>	41
The Mongols in Poland in the 13th century. Traces of the Invasions	
<i>Radosław Liwoch</i>	55
The use of firearms in siege operations in medieval Poland. New discoveries and interpretations	
<i>Piotr Strzyż</i>	69
How to build a redoubt? Instructions from military manuals of the Thirty Years' War	
<i>Klára Andresová Skoupá</i>	83
The forms of defence of the Silesian-Hungarian border and their development in the Early Modern Period	
<i>Martin Krůl</i>	99
Eighteenth-century military camps in the light of written sources	
<i>Jiří Hofman</i>	115
The Austro-Prussian Wars in the territory of East Bohemia and their reflection in archaeological sources	
<i>Pavel Drnovský – Petr Hejhal – Matouš Holas</i>	123
Austrian military camp on the battlefield at Wagram in the light of archaeological sources	
<i>Ślawomir Konik</i>	133
Identification of components of the 1813 fortification line in the Lower Ohře Valley through aerial landscape survey	
<i>Martin Gojda</i>	149
Second phase of non-destructive archaeological survey of field fortification features in the neighbourhood of the Smolkov Artillery Fort	
<i>Jiří Juchelka</i>	171
Historical and archaeological evidence of a crashed American B-24 Liberator bomber near Trenčín	
<i>Miloš Bordáč</i>	195
Possibilities of archaeological research on the World War II battlefields in Slovakia 205	
<i>Pavol Šteiner</i>	207
Conclusions	223

The use of firearms in siege operations in medieval Poland

New discoveries and interpretations

Piotr Strzyż

Firearms, which appeared in Europe in the first half of the 14th century, started quickly to play an important role in the military operations, both during the battles and sieges. The new invention reached Central Europe in the second half of the 14th century. Concerning the territory of Poland, to which this paper is devoted, the first source reference is related to the siege of the city of Pyzdry in Greater Poland in 1383. A bronze barrel from which a stone ball was fired was mentioned there. The bullet pierced the city gate, killing the vicar – Mikołaj from Biechów – standing behind it (Joannis de Czarnkow, 726; Szymczak 2004, 13–14). Starting with the Great War with the Teutonic Order in 1409–1411, its role in the Polish military system had been growing enormously, which is confirmed by both the preserved written sources and the material remains obtained by archaeologists. The most valuable information on the use of firearms is provided primarily by research on medieval siege sites. So far, operations near Bolesławiec and Wieluń in 1391–1396, Malbork in 1410 or Chojnice in 1433 and 1454 have been more widely discussed (Haftka 2010; Strzyż 2011, 77–112; 2014, 201–206). However, archaeological research has been providing new finds all the time, which allow us learn more about old siege techniques, as well as the range of means used for this.

Regarding the territory of the Kingdom of Poland, researchers of old firearms have had at their disposal very little terrain remains of siege sites. This situation is definitely different from the one that can be observed for the territory of the Kingdom of Bohemia. Here, more than ten premises were examined, where the remains of fortifications and positions for siege engines and artillery were discovered (Strzyż 2014, 190–201; Koscelnik – Jukl 2016, 270–271, Fig. 3 – further reading there). For this reason, each new discovery in Poland is very important. One of such sites is the remains of the small castle of Barwałd, located on the top of Żar Mountain, about 1 km west of the monastery in Kalwaria Zebrzydowska, near Bielsko Biała (Fig. 1: a–b).

The present state of knowledge about this site is very modest, because it has not been the subject of archaeological research so far. Field reports allow only to state that the stone fortifications of the castle, located on the oval, flattened top of the hill, have dimensions of 50 x 20 m. A dry moat up to 10 m deep was dug around the walls, and additionally a 6 m high embankment was built outside of it. The stronghold was mentioned in written sources for the first time only in 1440, when the dukes of Oświęcim handed it over to Vladislaus III of Varna in return for Zator. Thus, at that time the construction of the castle had probably been completely finished. It was presumably built around the mid-14th century, because it was only in 1327 that John of Luxemburg granted possession of these lands to Jan of Oświęcim. The document confirming this grant mentions only the castle in Oświęcim. Barwałd may have been built by Jan I the Scholastic between 1335 and 1360. An interesting fact from the history of the castle is that Jan Čapek of Sán, hetman of the orphan troops, commander of the Hussite

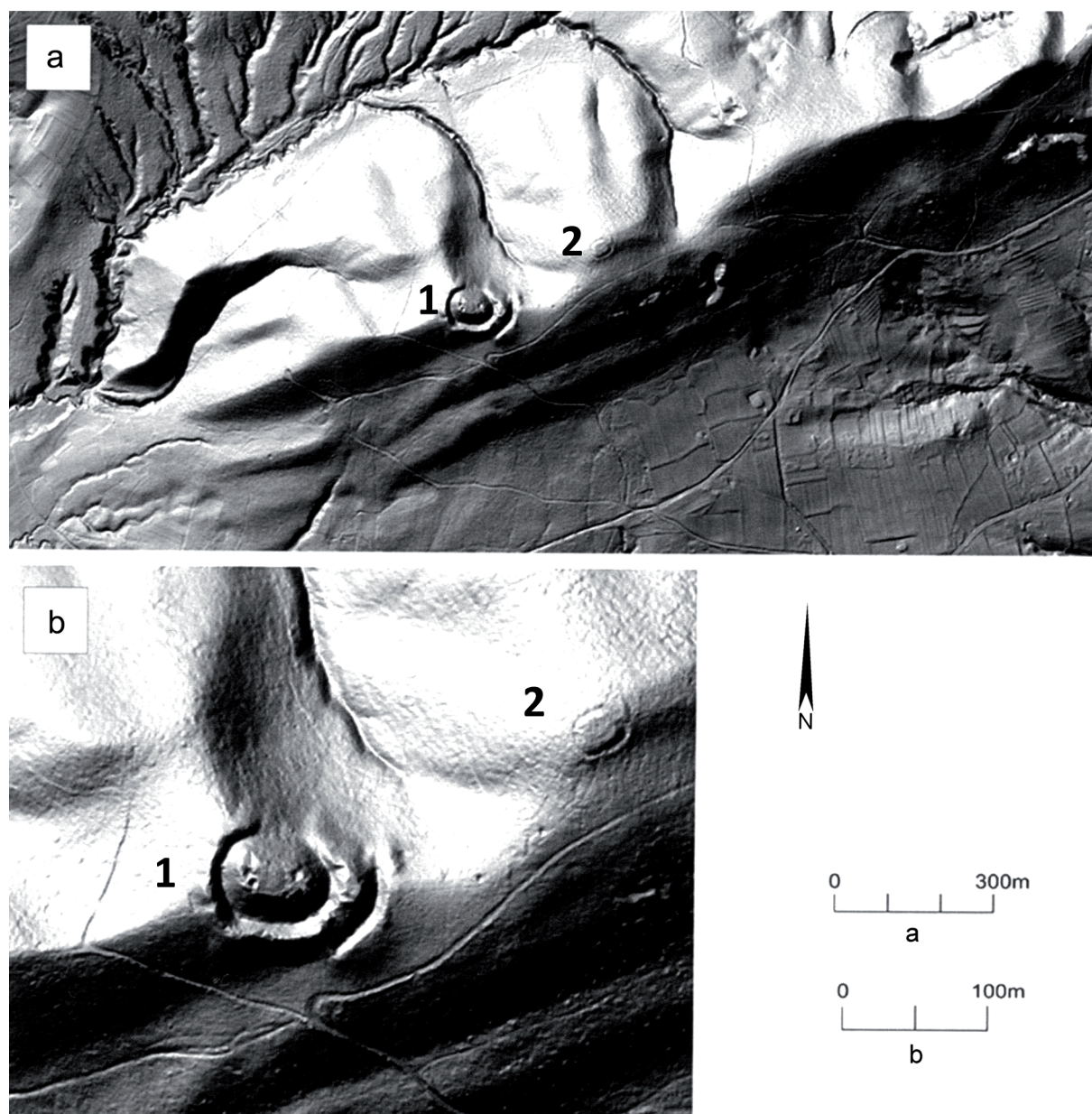


Fig. 1: a–b. Barwałd i Bugaj. Sites localization. 1 – Barwałd; 2 – Bugaj. Wojenka 2019, fig. 2.

expedition to Prussia in 1433 was also among its numerous owners. Repeatedly pledged to various tenants, the castle was probably demolished in 1477 and its ruins were again described in the inspection from 1564 (Leńczyk 1983, 13, 39; Kajzer – Kołodziejski – Salm 2001, 85; Strzyż 2011, 406; Wojenka 2019, 254–255). The destruction of Barwałd Castle was related to the events of 1471–1474. At that time, the Kingdom of Poland was engaged in long-term military operations with the Kingdom of Hungary and their king Matthias Corvinus aimed at placing the son of Casimir Jagiellon – Vladislaus on the Czech throne. During the ongoing battles, neither side managed to reach a decisive settlement and at the end of 1474, on December 8, a truce was concluded, which was to be in force until May 1477 (Plewczyński 2005, 56–58, 85–86). At that time, the leaseholder of the Barwałd castle – Mikołaj Komorowski – wanted to hand it over, together with the fortresses in Szaflary and Żywiec, to King Matthias Corvinus. Jan Długosz states that “Therefore, on the king’s order, as soon as possible, the voivode of Sandomierz and the starost of Cracow, Jakub Dębieński, having prepared an army of his own and mercenary soldiers and besieging the aforementioned castles, captures them within seven

weeks, striking them with the heaviest cannons. At that time, the king of Poland, Casimir, having left the New Town of Korczyn, came to Cracow and stayed there for four months to make the voivode Jakub to prepare for the defense as soon as possible against any invasion which, as was said, would come from Hungary. When the surrender took place, Barwałd castle, although it had thick and strong walls, and was in a safe location, was demolished and razed to the ground at the king's order. Żywiec was also burnt to the ground, and Szaflary castle was returned to Ratold's son, Marek, as a financial obligation from the king" (Jan Długosz, księga XII, 413)¹.

The order to demolish the fortress was carried out very conscientiously in June 1477 and the castle was never rebuilt. In 2007, two cannon balls were found during the first search in the ruins. The first one, 6,6–7,6 cm in diameter, was forged from iron and weighs 1,5 kg. The production method was clearly visible on its outer surface – traces of hammer blows, as well as not very regular shape, as it looks more like a cube with rounded corners than a sphere (Fig. 2). The second of the surviving missiles is especially rare among artillery ammunition from Poland. It has a cubic iron core, 4,3–4,5 cm long, originally coated with lead to the spherical shape (Fig. 3). The initial diameter of the projectile was at least 6 cm, and the core now weighs about 0,5 kg (Strzyż 2011, 406–407). In both described cases, it seems that the diameter of the bullets corresponds best to the ammunition intended for trestle-guns. Together with the described projectiles, the remains of a hand-held firearms barrel made of a copper alloy were also discovered (Fig. 4). The preserved fragment is in the form of a rectangular pipe with three side walls preserved, twisted along its axis during the explosion. The preserved length is 6,4 cm and the width is 3,8 cm. Unfortunately, the barrel is so badly damaged that it is impossible to determine its caliber (Kawka – Imińczuk 2017, 43, catalog number 64). It can be assumed that these are the remains of an arquebus. Regrettably, the exact location of the excavated items is currently unknown. The projectiles can be a trace of bombardment of the castle by the Polish army, and the barrel itself is most likely a part of the defenders' equipment. It is known that old firearms were very likely to burst when shot (cf. Strzyż 2014, 238–244).

Further discoveries were made in the vicinity of Barwałd Castle in 2015. A research reconnaissance of the alleged stronghold in Bugaj was then carried out (Wojenka 2019, 256–257). It occupies the highest part of the Żar mountain peak, which makes it tower over the above-mentioned Barwałd castle (Fig. 1: a–b). As part of the research, two trenches were excavated, the longer of which (25x2 m) crossed the embankment and the courtyard in its south-eastern part. Among others there were found: a spear or javelin head, two bolt heads with a socket and a dagger scabbard shoe. Two more bolt heads were discovered near northern part of this trench. To the west of it, in the pit of the moat, a lead, cylindrical projectile was found, measuring 1,8x1,65x1,65 cm and weighing 39 grams (Fig. 5: 1–7).

Its parameters indicate that it may be related to hand-held firearms. The lack of a cultural layer or utility immovable objects on its yard is a very important piece of information obtained during the research on the settlement in Bugaj. On the other hand, the remains of burnt-out poles, about 25 cm in diameter, spaced about 50 cm apart, have been recorded. They could have been the skeleton of the wattle structure of the fortifications. Based on the layout of objects of this type known from areas such as the Czech Republic or Slovakia, they were considered to be a relic of the Polish troops camp besieging the Barwałd castle in 1477. The command post might have been located here and perhaps also artillery. This seems to be the most likely interpretation. It is important that both structures (Barwałd castle and the site in Bugaj) are about 220 m apart. Therefore, it can be assumed that the cylindrical

¹ Joannis Długossi, liber XII, 398; "Itaque quam celerrime Iacobus Dambyenski palatinus Sandomiriensis et capitaneus Cracoviensis a rege iussus exercitu de propriis et mercenariis gentibus comparator, consurgit et castra prefata obsidione cingens, illa sub septem hebdomadarum spacio bombardis maximis quacientis conquirat. Sub quoquidem tempore Casimirus Polonie rex Nova Civitate egressus in Cracoviam advenit et illie quatuor mensibus mansit, defensionem Iacobo palatino contra impressionem quamlibet, que ferebatur ex Hungaria superventura, celerime oppositurus. Berwalth castrum, deditione secuta, quamvis spissum et optimum murum situm insuper munitum habuisset, iusu Regis usque ad solum ruinatum est; Szywyecz incendio deletum, Schefflari Marco Ratholdi, quod pecunias a rege habebat in eo inscriptas, restitutum".



0 5cm

Fig. 2. Barwałd. Iron ball. Photo P. Strzyż.



0 5cm

Fig. 3. Barwałd. Iron core of a lead ball. Photo. P. Strzyż.



Fig. 4. Barwałd. Hackbut barrel. Kawka – Imiolczyk 2017, 43.

lead projectile is a trace of the fire carried by the defenders of the castle towards the attacking positions. Establishment in Bugaj is dated back to the second half of the 15th century, which is confirmed by both movable materials (ceramics) and the results of radiocarbon dating (Wojenka 2019, 259–260, Fig. 8: 1). The time of operation of the command post in Bugaj is also indirectly confirmed by data from the Czech Republic. It was found that there were no such facilities during the sieges of the Hussite Revolution (1419–1436). They appeared on a larger scale only in connection with the siege activities

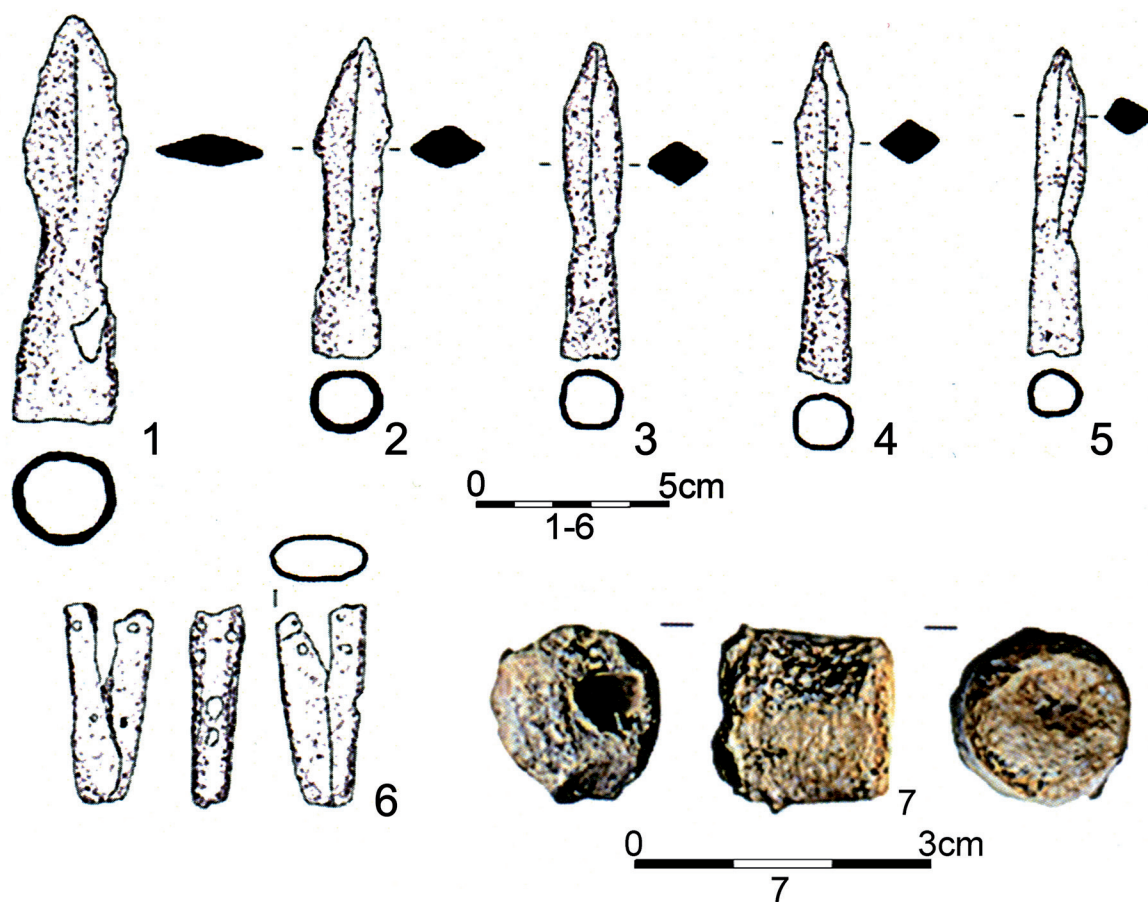


Fig. 5. Bugaj. 1 – a spear or javelin head, 2–5 – bolt heads, 6 – scabbard chape, 7 – lead projectile. Wojenka 2019, fig. 8.

carried out during the reign of George of Poděbrady (1458–1471) (Koscelník – Jukl 2016, 270). The structure in Bugaj was surrounded by a not very big embankment, the efficiency of which was increased by adding a dry moat. The short period of its operation – according to Jan Długosz, the entire campaign did not last longer than seven weeks – did not provide enough time for deposition of the cultural layer. After the siege was over, these provisional fortifications were probably set on fire so that they would not become a support for bands of robbers, etc., as evidenced by the burned-out pillars of the supporting structure of the fortifications. The location of light artillery (trestle guns) on the examined object did not have to leave easy to identify objects in the field, such as those observed during the survey at Lopata castle, besieged in the years 1432–1433 (Novobilský 2008, 49, 50, 64–65, Fig. 60, 77). So far, the search at Barwałd Castle has provided only information about possible firing from lighter guns (bullet caliber about 6–8 cm), which could certainly be positioned behind provisional fortifications, without the need to place them in structures embedded in the ground.

The site in Bugaj is only the second identified by archaeological research a siege site from the territory of Poland. The first object is related to the siege of Bolesławiec on the Proсна River. It happened at the end of the war between Vladislaus II of Opole and the Kingdom of Poland in the years 1391–1396. Besides six stone balls, 15 to 45 cm in diameter, an earthwork was also documented, which served as a platform for a cannon (bombard) firing against the castle walls in Bolesławiec. The fire post was located on the road which led from the bridge to the castle, almost directly in front of the gate (Fig. 6). Its dating at the end of the 14th century was confirmed by the part of a plate gauntlet found there (Maik 1997, 22–23, fig. 5).

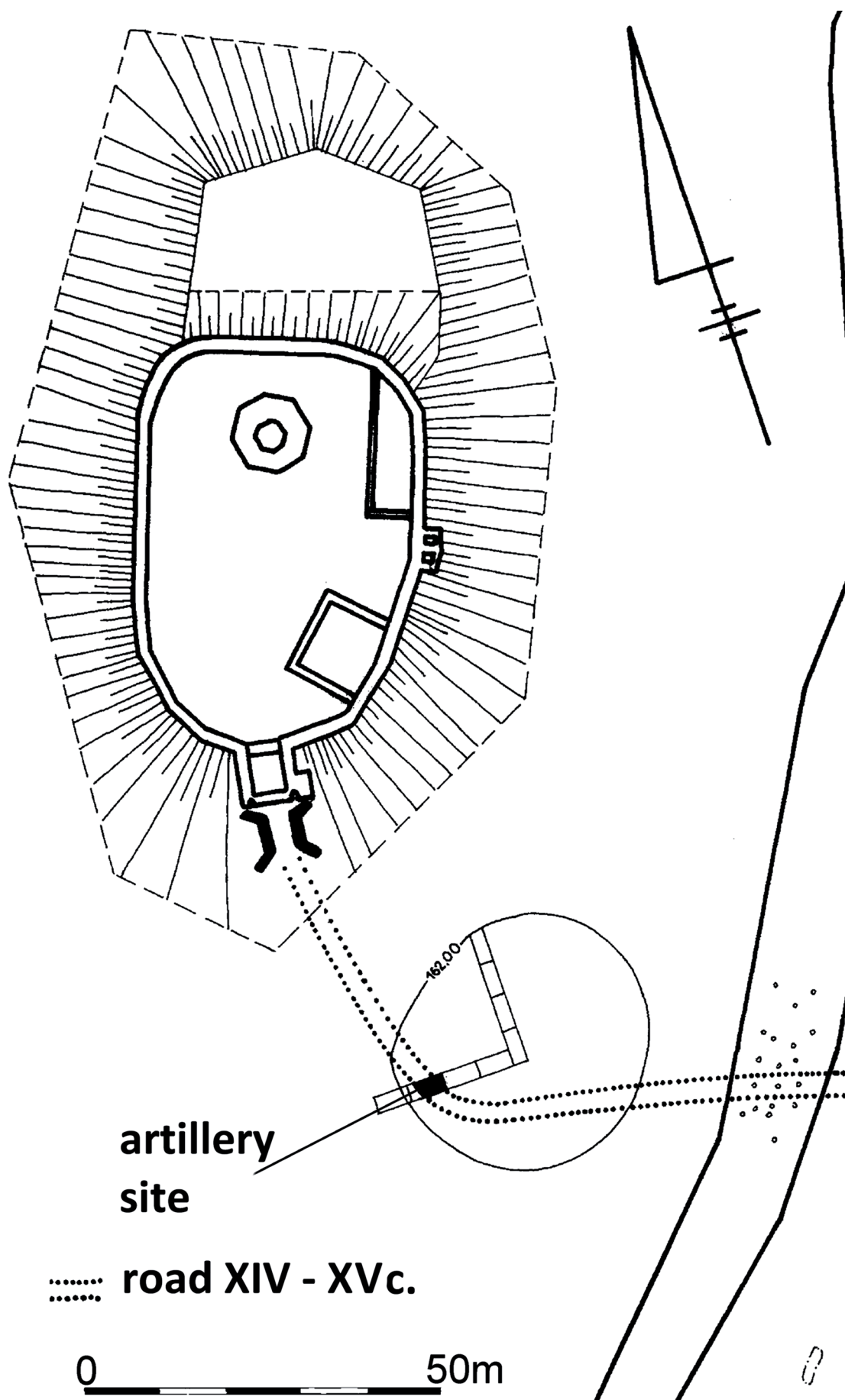


Fig. 6. Bolesławiec on the Prosna river. The castle layout and artillery site. Strzyż 2014, fig. 24.

Unfortunately, the state of preservation of the building did not allow for the reconstruction of the way it was fortified. The earth embankment was located 46 meters from the castle walls and 72–90 meters from the castle buildings. It was a very convenient distance for the artillery of that time, as the best effectiveness was achieved by direct fire at close range (Strzyż 2012, 101; 2014, 189–190). The position for the cannon, however, required an appropriate cover against the fire from the castle, as the position of the defenders was above it by 15 m. Probably the cannon was shielded with an earth and wood structure, and a movable cover was installed above the bombard – raised during the shot and lowered for cleaning and loading the cannon. The chronicler Jan Długosz wrote that the Polish army encircled the castle in Bolesławiec with small „mottes”, which served as shelters for artillery (Joannis Dlugossi, liber X, 215). These „small strongholds” could have been earthworks – artillery posts, which also indicates that the castle was bombed from many sides. On the basis of archaeological research, it was found that the residential building, erected by Vladislaus II of Opole before the war with Jagiellon, was so badly damaged during the siege that the new starost of the castle – Marcin of Borowno, had to order its demolition after 1396. Its destruction by fire was also indicated by the fact that one of the two largest stone balls was discovered in the pavement, at the corner of the demolished building and the perimeter wall (Poklewski 1979, 21–22; Strzyż 2014, 189–190).

The layout of the siege site in Bugaj in relation to the castle in Barwałd is very similar to numerous siege sites in the Czech Republic and Slovakia, such as Čabard, Krupina county or Perštejn, Chomutov county (Miño 2010; Koscelník – Jukl 2016, 277–278, fig. 5–8; Wojenka 2019, 266, 267, fig. 9: A–B). Relics of a specific, polygonal object, once interpreted as the position of the commander, and now rather as a siege engine, is also known from Lichnice castle, besieged in the years 1428–1429 (e.g. Sedláček 1900, 39; Frolík 2002, 399, Fig. 1–2; Teplý 2007, 467, Fig. 1–3). An interesting observation is also made about the likely exchange of fire between the defenders from Barwałd and the besiegers on the Bugaj river. The fire exchange was proven, for example, by research at Sióń castle near Kutná Hora. A total of 56 bolt heads and 29 firearm projectiles have been discovered in the relics of the documented siege site. Among the projectiles of firearms, as many as 22 were fired by the defenders of the castle – they were found in the embankment and in the forefield of the siege site. In this case, the duel was conducted at a distance of 93 to 123 m (Koscelník, Kypta, Savková 2012, 578–579, 582, 589–590, 593, Fig. 2–5, 7–8, 10–11).

The site that provided a lot of important information about the use of firearms in the Kingdom of Poland is certainly Puck, including both the castle and the buildings of the Town Hall. The castle in Puck was built in the first years of the 15th century, on the western slope of the hill. The building, which was later called the tower, had the rectangular shape measuring 10,5 x 22,5 m, with a small annex (3,5 x 7,5 m) on the eastern side (Kruppé – Milewska 2014, 30–57, fig. 15) (Fig. 7: 1–2).

The only major military action in its medieval history took place during the Thirteen Years' War (1454–1466), in 1464. Armed troops from Gdańsk surrounded the city and the castle from the land with bastions and earth fortifications, and from the bay with armed ships. The Teutonic garrison defended itself from April 23 to September 24, 1464 (Kruppé – Milewska 2014, 18). Numerous finds of medieval weapons and equipment are the remnants of these activities. They also include items related to the use of firearms – handguns and artillery. Ammunition is the most numerous. A total of 73 projectiles were found, most of them at the castle and – smaller amount – in the city. Their chronology is of the greatest importance, which is supported both by the stratigraphic situation (layers dated by e.g. ceramics, coins) and information known from written sources (for more information see, Kruppé – Milewska 2014, 80–103).

The cannon ammunition is represented by 22 stone balls (Fig. 7: 3–7) and one projectile made of lead (Fig. 7: 8). The caliber of the stone balls oscillates between 5,5 and 13,5 cm, while the lead projectile has a diameter of 6,7 cm. The weight of the stone specimens ranges from 0,3 to 3,5 kg, while the lead projectile weighs 1,5 kg. All the above-mentioned finds come from the west side of the castle, from the moat next to the castle wall and from the nearby western gate (Fig. 7: 1–2). It is also not

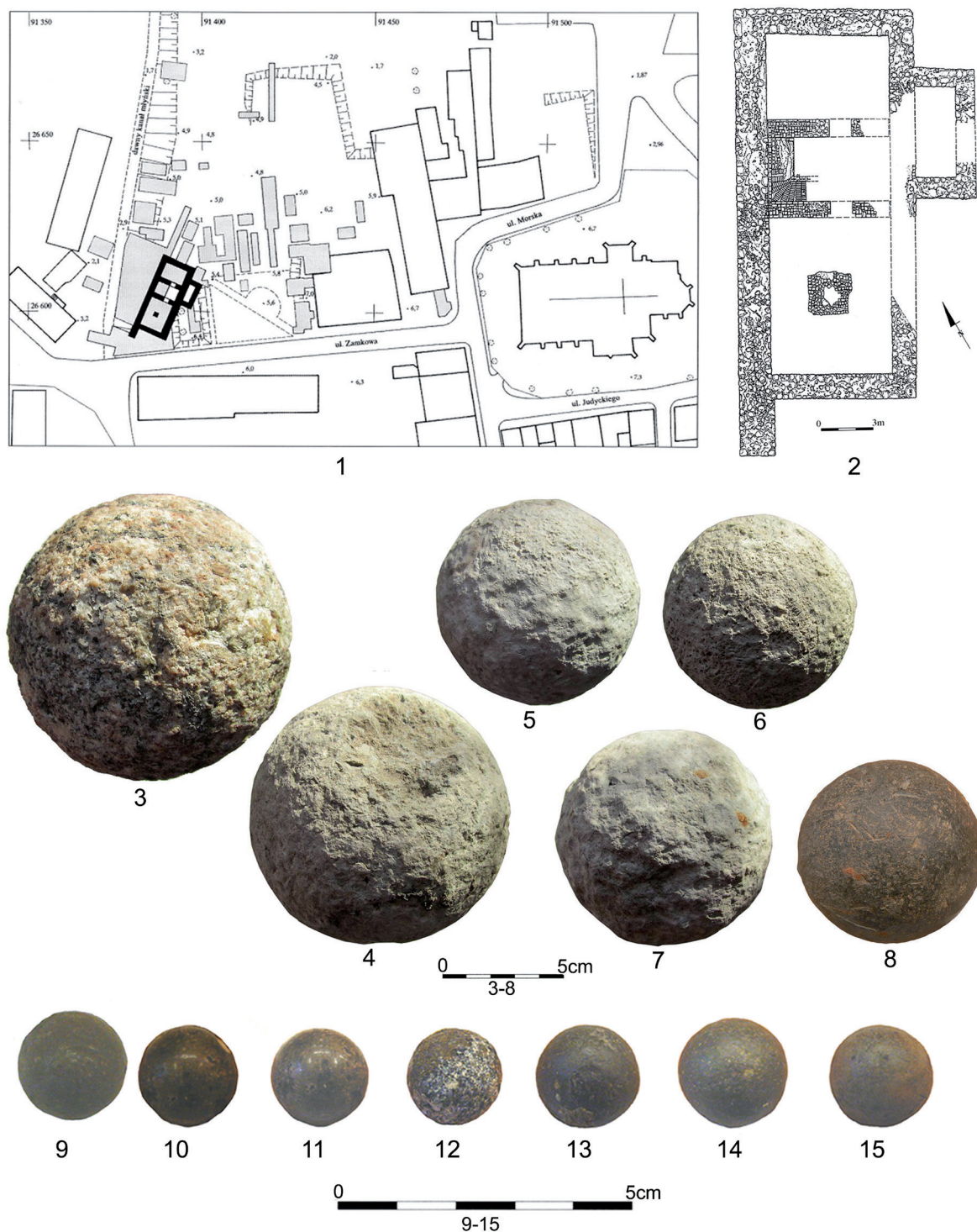


Fig. 7. Puck. 1 – The castle localization on a town map, Kruppé – Milewska 2014, ryc. 9; 2 – Projection of the castle foundations 14/15th century, Kruppé – Milewska 2014, fig. 15; 3–7 – stone balls, 8 – lead ball, 9–15 – hand-held firearm bullets, 3–15 Photo P. Strzyż.

without significance that in the area of the castle gate, specimens with larger diameters (9,0–13,5 cm) were found, while smaller balls (5,5–8,5 cm) were found near the northern and central parts of the brick house. Granite and limestone balls are the largest ones (13,5 and 11,5 cm), which leads to the conclusion that the stone-firing cannons, so called Steinbüchsen, were the main artillery of the Gdańsk troops. Smaller stone balls (5,5–9,0 cm) and a lead ball are likely to be associated with light artillery.

In the period in question, these were usually trestle-guns and fowlers. For such weapons, not only lead projectiles were used, but also stone ones.

In the latter case, it was usually a local stone, which occurred frequently in the form of erratic boulders. The Puck collection, however, is unique in this respect, because only one ball was made of local granite (granitoid), the remaining specimens were carved from Gotland limestone. The raw materials used here- Palaeozoic limestones – form extensive outcrops extending from southwest to northeast along the Baltic Sea basin. They are exposed on the surface mainly in Gotland and Öland, and in the form of erratic rocks they occur on the almost entire territory of Poland. Limestone was rarely used in Poland for making the cannon balls. In this respect, granitoids and sandstones were mostly preferred, because limestone was a low-density material, prone to cracking. The unusual rock material dominating the Puck ball collection can be explained in two ways. Either the balls were made in Puck or its neighborhood and a large erratic boulder of Gotland limestone was used as the raw material, or the balls come from a workshop in Gotland where they used local rocks. The first hypothesis seems less probable, because the petrographic diversity in the set of balls is much greater than possible in a single, even quite large, erratic boulder. It would also be difficult to explain why limestone was chosen when there were plenty of crystalline rocks available in the area. Relatively precise carving of the Puck balls speaks against haste in their production. Therefore, the possibility that the Puck stone ball collection is an import from Gotland seems much more likely. The whole Gotland is built of different types of limestone, and their exploitation has been carried out since the 12th century. Qualified stonemasons processed it. Small petrographic differences within the limestone spheres are possible even in a quarry of a small scale (Czubla – Strzyż 2013). The fact that the balls were purchased in Gotland proves the existence of trade and military ties between the southern Baltic coast and the islands of the Baltic Sea.

Among the Puck artillery ammunition set there are no large-caliber balls (over 20 cm) that would be able to break the castle walls. The assortment of projectiles (in the range of 5,5–13,5 cm) allows us to conclude that the main goal of the siege troops was rather exhaustion and elimination of the crew. The cannons of a smaller caliber did not have large destructive power, but they were adapted to firing at higher intensity. It was of great importance for possible breaking of the Teutonic garrison's will to fight. Archaeological research also allowed stating that during the siege in 1464, the castle in Puck was not heavily damaged, and only minor renovation works were carried out after its incorporation into the Kingdom of Poland (Kruppé – Milewska 2014, 57).

Apart from artillery ammunition from the castle in Puck, 48 bullets for hand-held firearms were obtained (Fig. 7: 9–15). In their case, the prevalence of glass specimens is extremely interesting – 35 of them were excavated from the cultural layers dated to the mid-15th century. The diameter of the smallest one is 1,3 cm, and the largest one – 1,8 cm, and the weight is 3–4 grams. Besides the glass bullets, these are also stone bullets (5 specimens with a diameter of 1,6–2,7 cm and a weight of 3–34 g), lead bullets (6 specimens with a diameter of 1,1–1,8 cm and a weight of 9–19 g) and iron bullets (2 specimens with a diameter of 1,3–1,6 cm and weight 9 g). Many of these bullets, especially the glass ones, bear clear signs of damage that resulted from hitting the castle masonry fortifications. It is also worth emphasizing that almost all bullets for hand-held firearms were found close to not only artillery projectiles, but also close to crossbow elements and bolt heads (Fig. 8: 2–11), which supports the hypothesis about their military use. The issue of the combat use of glass ammunition for hand-held firearms has been heavily discussed in the Polish scientific literature until recently. It was pointed out that the raw material from which they were made was too brittle to pierce, for example, plate body armors (for more see Strzyż 2011, 54; 2014, 122). However, tests carried out a few years ago showed that the glass ammunition is hard enough to penetrate a wooden shield or a body protection made of iron sheets (Chlebowicz 2013, 77–78, 80, fig. 33, 36). Thus, the finds from Puck, apart from the discoveries from the battlefield of Grunwald and the castle in Venice near Žnin (Strzyż 2011, 53, cat. No. 21, 97, 99, 100–101, table XLII: 3), confirm the possibility of using ammunition of this type in the Middle Ages.

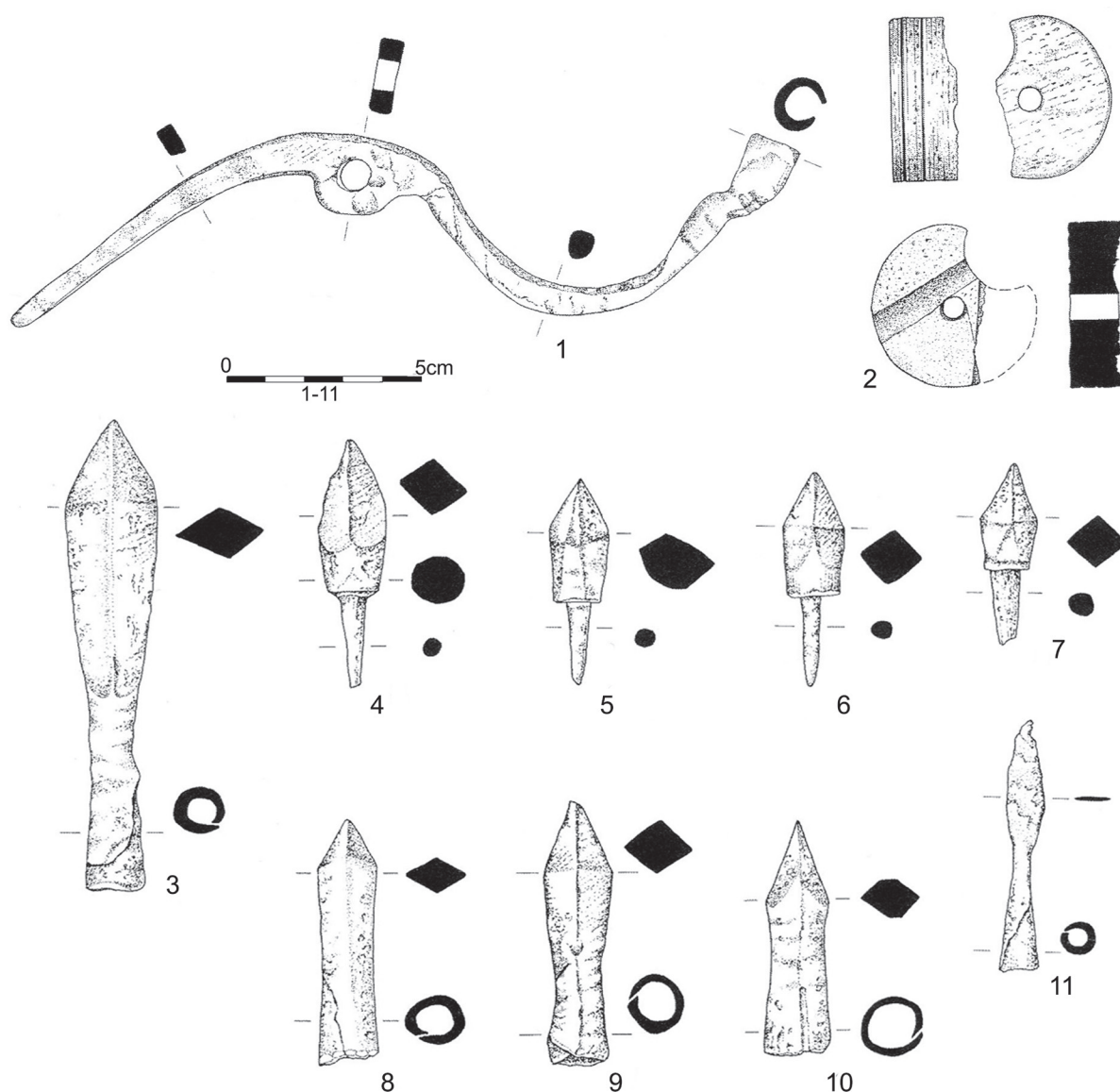


Fig. 8. Puck. 1 – serpentine, 2 – crossbow nut, 3–11 – bolt heads, Kruppé – Milewska 2014, tabl. 27, 29.

The trigger mechanism of a firearm in the form of the so-called serpentine (Fig. 8: 1) is another, extremely important find from the castle in Puck. It is an S-shaped iron bar with a hole in the middle part that allows it to be swiveled to the bed. The upper end has the form of an open sleeve into which a fuse was inserted (Kruppé – Milewska 2014, 100, tab. 29:11). This artifact is very important for a more precise definition of the beginnings of the use of the oldest forms of matchlocks in Poland, and more broadly – in Central Europe. Moving the ignition hole in the barrels of hand-held firearms to the right side was a determinant of these changes. So far, these changes have been observed on such artifacts as the hackbut from the Gajary-Posádka site near Bratislava or fragments of a torn barrel from Mstěnice in Moravia (Polla 1962, 116; Strzyż 2014, 56, cat. No. 82, tab. LXXII: 5–8). Both artifacts are precisely dated: Gajary before 1467, artifacts from Mstěnice before 1468. The find of the serpentine from Puck castle, as well as the ammunition discussed above, can be dated before 1464. This is another discovery proving the course of changes. Finds of firearms equipped with this oldest type of trigger device are quite rare, and a good example of it is a hackbut from the Kupa River in Croatia, which can be dated to the beginning of the 16th century (McLachlan 2010, 54; Strzyż 2014, 66, table LIX: 5–6).

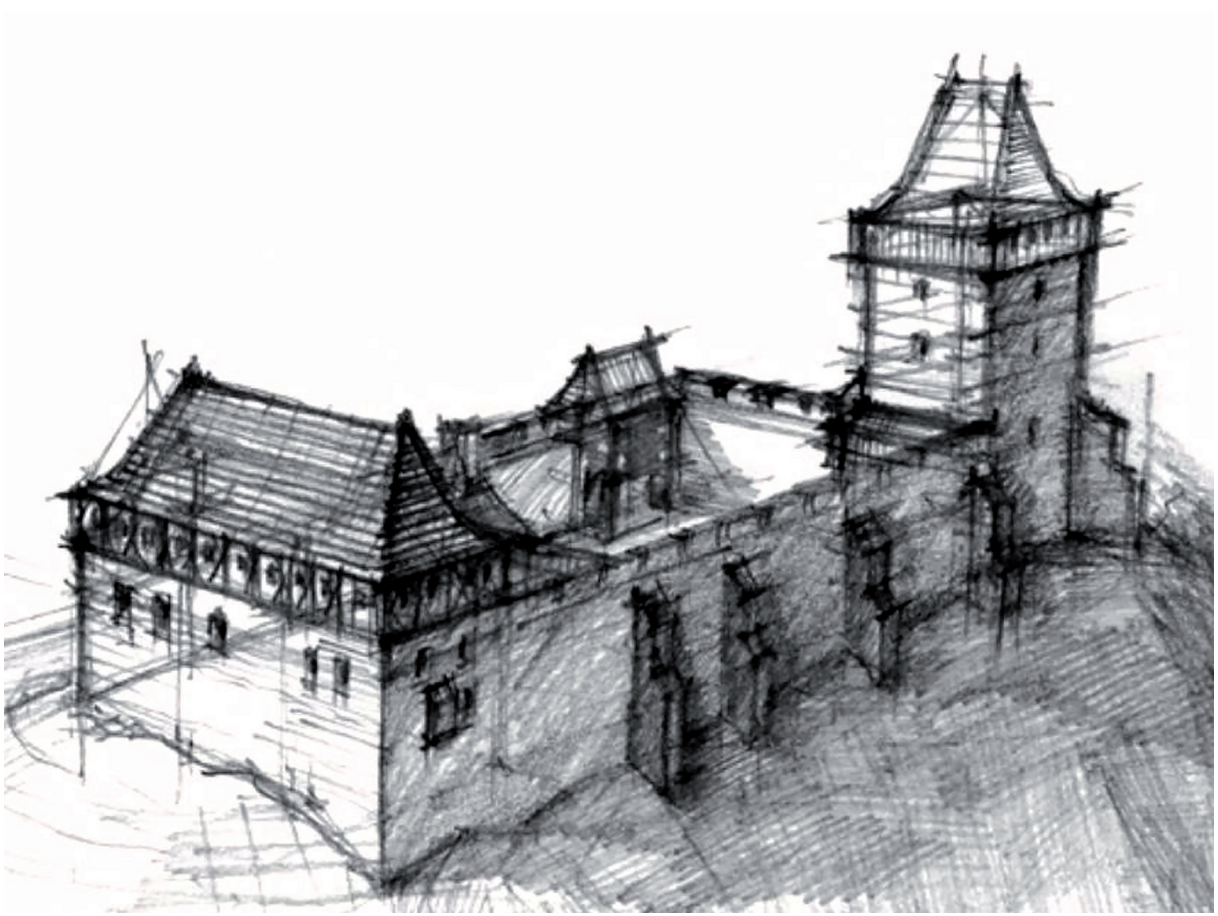


Fig. 9. Muszyna. Reconstruction of the castle, fig. J. Serafin, Ginter – Majorek 2019a, 69.

Interesting materials on the use of firearms were also provided by the activities at the castle in Muszyna, which was destroyed during the Polish-Hungarian war for the throne of Bohemia in 1471–1474. At the beginning of January 1474, the southern border of the Kingdom of Poland was crossed by two Hungarian troops with a total of about 6,000 armed men. One unit held the road from Bardejów via Zborow and on January 13 they captured the town and the castle in Żmigród, and in the following days Dukla and Jasło. Krosno was also besieged, but the attackers were forced back of the walls, i.e. by the fire of hand-held firearms. At the same time, a smaller unit attacked Muszyna from Bardejów (Plewczyński 2005, 71–72). There was a stone castle of Cracovian bishops in Muszyna. It was a rectangular structure, with dimensions approximately 59 x 29 m, with a quadrangular tower on the eastern side (Fig. 9).

During the first day of hostilities, the castle tower was demolished, and on the second day the garrison surrendered. Archaeological works carried out in the castle have provided numerous military items, which are largely related to the above-mentioned events. They were found in layers of rubble in the foreground of the castle tower and inside the buildings. First of all, five fragments of burst hackbuts or puszczel guns should be mentioned (Fig. 10: 1–5). The largest of them is an iron destructed polygonal barrel with a caliber of about 3,0 cm. The second fragment is a remnant of a barrel cast from a copper alloy, the caliber of which was about 2,1 cm. Other remains of the barrels are in such poor condition that their caliber can only be roughly determined at 1,5 cm and 2,1 cm. A detached hook from the hackbut was also found (Strzyż 2014, 243, table LXXI: 5; Ginter – Majorek 2019a, 79–80). Apart from the remains of hand-held firearms, the siege finds also included artillery projectiles carved out of sandstone with a diameter of about 13 cm (Fig. 11: 8–10) and an iron ball with a diameter of 4,8 cm (Fig. 11: 7). Hand-held firearms ammunition is represented by iron bullets (2,1 cm in diameter), lead bullets (1,0 and 1,7 cm in diameter) and one marble bullet (2,2 cm in diameter) (Fig. 11: 1–6).

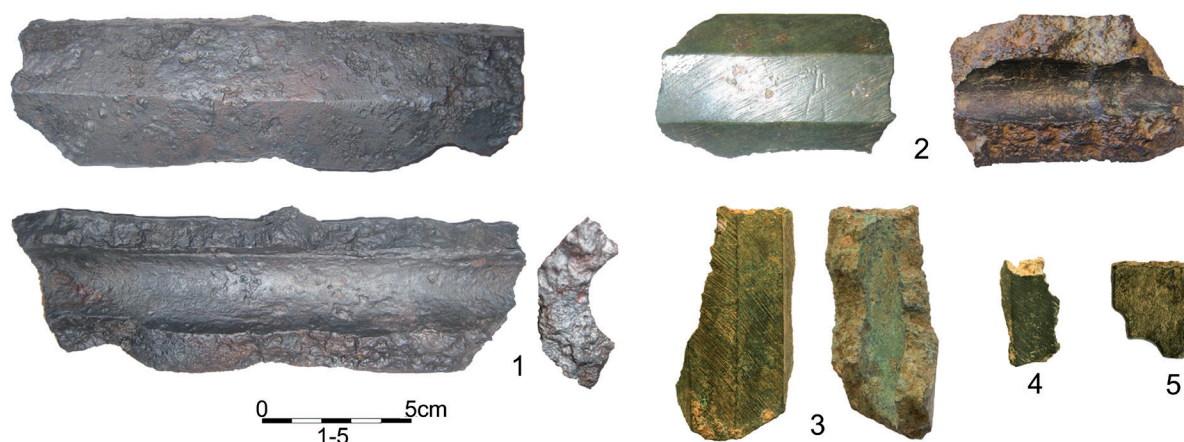


Fig. 10. Muszyna. 1–5 – damaged barrels of the hand-held firearms. 1–2 Photo P. Strzyż, 3–5 Photo A. Ginter.



Fig. 11. Muszyna. 1–7 – hand-held firearm bullets, 8–10 – sandstone artillery balls. 1–2, 8 Photo A. Ginter, 3–7, 9–10 Photo P. Strzyż.

Stone and iron artillery balls come from the foreground of the tower, while the ammunition for hand-held firearms was found both inside and outside the castle (Chudzińska 2011, 205, 207, fig. 3; Strzyż 2011: 28, 101, table VII: 2–6). In the case of Muszyna – similarly to Puck, during the siege the guns with a caliber of about 13 cm were used, which, nonetheless, turned out to be sufficient to force the castle crew to surrender. However, with regard to hand-held firearms, both the documented projectiles and barrel fragments confirm the use of medium and heavy types of hackbuts with a caliber of 2,1–3,0 cm.

In 2018, the remains of a late-medieval gord were examined in the vicinity of the castle in Muszyna. It is situated to the north of the castle, approximately 150 m away. The conducted archaeological work allowed to state that this site was also destroyed by the Hungarian invasion in 1474. During the excavations, besides 11 bolt heads, the remains of ammunition for hand-held firearms were also

discovered. It was a collection of 39 lead bullets of a spherical shape and also very rare in Poland bullets of a cylindrical shape. Their caliber ranged from 0,8 to 2,65 cm. A very interesting discovery was made when the archeologists found there a semi-finished product or raw material for the production of ammunition in the form of a lead rod several centimeters long (Ginter – Majorek 2019b, 111–117). Semi-finished products of this kind are known from Lichnice castle in Bohemia, and were associated with the siege operations in 1428/1429. It was a U-shaped lead rod with a diameter of 13–15 mm (Frolík 2002, 402, Fig. 5: 16, 17; Strzyż 2014, 117). The discovery of ammunition from the gord in Muszyna is very important, because until recently, the cylindrical projectiles for firearms have been unknown in the territory of Poland. However, recently several discoveries have been made confirming their use in late medieval Poland. In addition to the previously mentioned artifacts from Bugaj and Muszyna, two such artifacts were also recorded in the archaeological materials of Kolno castle, conquered and burnt down in 1443. They are made of lead and their caliber is approximately 2.5 cm (Marek 2014, 137, fig. 6: 1–4; 2017, 79, fig. 12: a). The cylindrical ammunition, intended for both hand-held firearms and light artillery, is very common in the territory of the Czech Republic (e.g. Vránova – Vrána 2008, 457, 459; Strzyż 2014, 115–120 – further reading there). In the area of present-day Poland, it occurs mainly in areas once politically connected with the Kingdom of Bohemia (Kolno in Silesia), or in its close vicinity (Bugaj, Muszyna). Therefore, one can risk a statement that their use may result from the reception of a certain form of military equipment in border areas.

The above-mentioned, necessarily selected examples, provide new information that allows for better recognition of medieval techniques of siege and defense of fortified structures in the Kingdom of Poland. On the one hand, the analysis of archaeological materials makes it possible to identify the range of firearms of the besieging and defending units. On the other hand, this is a sort of information that is not usually mentioned in written sources, so they can be supplemented with data on, for example, raw materials used in the production of projectiles, type of ammunition used, etc. Accurate location of the finds in the field may also help to identify places which were under heavy fire during a siege, such as gates or defense towers. Finally, the discoveries such as the one of the Puck serpentine also allow us to follow the changes in the development of firearms, which quite quickly evolved from very primitive forms at the end of the 14th century to fully functional weapons in the second half of the 15th century.

References

- Jana Długosza, *Roczniki, czyli kroniki sławnego Królestwa Polskiego, księga 12 (1462–1480)*, J. Mrukówna trans., Warszawa 2006.
- Joannis de Czarnkow *Chronicon Polonorum*, *Monumenta Poloniae Historica* 2, J. Szlachetkowski edd. Lwów 1872.
- Joannis Długossi, *Annales seu cronicae incliti Regni Poloniae, liber X (1370–1405)*, D. Turkowska edd. Warszawa 1985.
- Joannis Długossi, *Annales seu cronicae incliti Regni Poloniae, liber XII (1462–1480)*, D. Turkowska edd. Kraków 2005.
- Chlebowicz, P. 2013: *Ręczna broń palna w średniowieczu (badania eksperymentalne)*. Chojnice-Toruń.
- Chudzińska, B. 2011: Pozostałości średniowiecznej ręcznej broni palnej z zamku w Muszynie. *Acta Militaria Mediaevalia* 8, 203–215.
- Czubla, P. – Strzyż, P. 2013: Rock materials in the manufacture of cannonballs in Poland – selected examples. *Fasciculi Archaeologiae Historicae* 26, 99–109.
- Frolík, J. 2002: Nálezy z obléhání hradu Lichnice v letech 1428–1429. *Castellologica Bohemica* 8, Praha, 399–408.

- Ginter, A. – Majorek, M. 2019a: Zamek i gród. Stan badań archeologicznych. In: J. Ginter – A. Ginter (eds.), Muszyna-Plaveč. Odkrywamy zapomnianą historię i kulturę polsko-słowackiego pogranicza. Muszyna, 69–83.
- 2019b: (Nie)zwykli świadkowie życia na grodzie. In: J. Ginter – A. Ginter (eds.), Muszyna-Plaveč. Odkrywamy zapomnianą historię i kulturę polsko-słowackiego pogranicza. Muszyna, 110–122.
- Haftka, M. 2010: Pod murami Malborka. Lato 1410. Gdańsk.
- Imiołczyk, E. – Kawka, W. 2017: Rekonstrukcje przeszłości. Ślężacy pod Grunwaldem. Katalog wystawy. Bytom.
- Kajzer, L. – Kołodziejski, S. – Salm, J. 2001: Leksykon zamków w Polsce. Warszawa.
- Klučina, P. 2004: Zbroj a zbraně. Evropa 6.–17. století. Praha–Litomyšl.
- Koscelník, P. – Jukl, J. 2016: Obléhání hradu Perštejn roku 1451. *Castellologica Bohemica* 13, 267–280.
- Koscelník, P. – Kypta, J. – Savková, J. 2012: Dobývání hradu Siónu roku 1437. *Povrchový průzkum palebných postavení obláhatelů. Archeologické rozhledy* 65/3, 574–598.
- Kruppé, J. – Milewska, M. 2014: Dzieje zamku w Pucku. Warszawa.
- Leńczyk, G. 1983: Katalog grodów i zamczysk z terenu Małopolski. Kraków.
- Maik, J. 1997: Military accesories from Bolesławiec on the Proсна. *Fasciculi Archaeologiae Historicae* 10, 19–39.
- McLachlan, S. 2010: Medieval Handgonnes. The first black powder infantry weapons. Oxford.
- Marek, L. 2014: Castle at War – Archaeological record of fighting during the siege of the Castle Kolno in Silesia. In: *Schlachfeld und Massengrab – Spektren interdisziplinärer Auswertung von Orten der Gewalt. Conference papers. In: Forschungen zur Archäologie im Land Brandenburg* 15, 131–144.
- 2017: Marcher Castle on Fire. Aftermath of a 15th Century Siege. *Fasciculi Archaeologiae Historicae* 30, 73–81.
- Miňo, M. 2010: Príspevok k životu v stredovekom vojenskom tábore. *Archaeologia Historica*, 35/1–2, 81–93.
- Novobilský, M. 2008: Obléhání hradu Lopaty. Rekonstrukce obléhání hradu z roku 1432–1433. Plzeň.
- Plewczyński, M. 2005: Wojny Jagiellonów z wschodnimi i południowymi sąsiadami Królestwa Polskiego w XV wieku. Siedlce.
- Poklewski, T. 1979: Dzieje Bolesławca nad Prosną. Kalisz.
- (ed.) 1982: Zamki środkowopolskie, cz. II. Bolesławiec nad Prosną. Wrocław.
- Polla, B. 1962: Pamiatky hmotnej kultúry 15. storočia z Posádky pri Gajaroach. *Sborník Slovenského Národného Múzea* 46, *História* 2, 107–140.
- Sedláček, A. 1900: Hradý, zámky a tvrže království českého XII, Čáslavsko. Praha.
- Starski, M. 2015: Rynek miasta lokacyjnego w Pucku w świetle badań archeologicznych. Warszawa.
- Strzyż, P. 2011: Średniowieczna broń palna w Polsce. Studium archeologiczne. Łódź.
- Strzyż, P. 2012: Artyleria w działaniach zbrojnych pod Wieluniem i Bolesławcem nad Prosną w latach 1391–1396. *Rocznik Wieluński* 12, 89–107.
- Strzyż, P. 2014: Broń palna w Europie Środkowej w XIV–XV wieku. Łódź.
- Szymczak, J. 2004: Początki broni palnej w Polsce (1383–1533). Łódź.
- Teplý, J. 2007: Obležení hradu Lichnice 1428–1429. Dnešní stav po obláhacím okruhu. In: M. Drda, – Z. Vybíral (eds.), Jan Žižka z Trocnova a husitské vojenství v evropských dějinách. VI. Mezinárodní husitolologické symposium, Tábor 12.14. října 2004, Husitský Tábor – Suplementum 3, Tábor, 463–489.
- Vránova, V. – Vrána, J. 2008: Olověné projektily z hradu Tepence. *Castellologica Bohemica* 11, 457–460.
- Wojenka, M. 2019: Czy grodzisko w Bugaju na górze Żar to pamiątka po oblężeniu zamku Barwałd w 1477 roku? In: P. Lasek – P. Sypczuk (eds.), *Residentiae tempore belli et pacis. Materiały do badań i ochrony założeń rezydencjonalnych i obronnych*. Warszawa, 252–280.

Piotr Strzyż
Instytut Archeologii, Uniwersytet Łódzki
ul. G. Narutowicza 65
90-131 Łódź
piotr.strzyz@uni.lodz.pl