

Battlefield Archaeology of the First World War in Northeastern Slovakia

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On the Slovak side of the Carpathian mountains, the archaeology of the First World War had long been completely outside the scope of research interest. At the same time, conflicts in this region had played a very important role in the initial phase of the war. Here, the Austro-Hungarian army blocked the invasion of the Russian army into Hungary with all its might. This lack of attention changed in the last decade with surveys conducted by our team from Masaryk University. In this short overview we describe and evaluate our main research conclusions so far based on surveys conducted at sites bearing the names of the hills of Staviská, Kobyla, Cingov and Wertyszów. Each of the sites is a place where various military events took place, so we have applied different, mostly non-destructive, methods to their study. Our results are mostly an introduction to the state of research and a review of a decade of expeditions to this unique field of conflict, where the armies learned how to fight in mountainous areas.

KEY-WORDS: First World War, spring 1915, Eastern Slovakia, Carpathian battlefield, Easter battle in the Carpathians, geophysics, metal detecting, non-invasive survey, trenches^a

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INTRODUCTION

The frontline of the Carpathian battlefield (1914–1915) ran along mountain ridges, where severe conditions challenged every single soldier as well as whole armies. The specific setting of the battlefield is reflected in the state of preservation of the relics of war and the specific demands of field research in this environment. On one hand, previous extensive research on archival sources has created a relatively precise big picture (e.g., Čaplovič *et al.*, 2016). On the other hand, we have quite detailed but subjective sources of oral history or story telling (e.g., Englund 2012). In between, there is a gap that has the potential to be filled with insights from archaeology and anthropology, as has been done in the research of battlefield on the Polish side of Carpathians, where the team of Jagiellonian University led by Marcin Czarnowicz is closest to our environment. They are focused on survey of trenches and localisation of lost cemeteries or soldiers buried in the place of their death (Kołodziejczyk *et al.*, 2016; Czarnowicz and Ochał-Czarnowicz 2019). The most modern conflict archaeology approach in area is made by Anna Izabella Zalewska and Dawid Kobiółka in lowlands of eastern Poland (Zalewska and Czarnecki 2019; Zalewska ed. 2021; Kobiółka 2022), by Uroš Košir and Matia Črešnar in the mountain environment of Slovenia (Mlekuž *et al.*, 2016; Košir 2019), and in Romania by Roxana-Talida Roman (Roman 2020), who extends the scope of researched topics by not studying just a place of battle or basic survey, but the full aspect of components tied to topic of conflict from archeological point of view. In the Carpathian region this approach is however in the beginnings.

In archaeological surveys of First World War remains, it is important to look at the conflict's specific position in the contemporary history of the area, especially at sites yet to be surveyed. During our archaeological surveys we mostly take a non-destructive or slightly intrusive approach. Standard methods of archaeological research have to be adapted when surveying sites of relatively modern events. It has been demonstrated that remote sensing, especially light detection and ranging (LiDAR), is an effective tool for mapping of World War I relics in montane regions (Mlekuž *et al.*, 2016). However, field surveys are still needed to obtain more detailed information and shed new light on extensive defensive structures.

This article presents four case studies from the Carpathians in present-day eastern Slovakia, spanning from the Kobyla hill in the east to the Staviská hill in the west. The main aim however is not to present all knowledge and research efforts, but to provide a preview into Slovakia's mostly underestimated area of archeological interest and to illustrate the varied nature of this battlefield and the results of different methodological approaches. Most of the sites are overgrown by dense forests or woodlands,



Fig. 1. Location of investigated sites. Graphics created by the authors.

and there are still no published LiDAR data for most of north-eastern Slovakia. This limitation currently precludes us from carrying out more extensive research in this landscape, so we mainly focus on places with a known history and different fates.

REGIONAL SETTING

The area of interest is part of the Eastern Carpathians, where Carpathian flysch rocks build a hilly landscape covered mostly (about 60%) by beech or beech-fir woodland, which is reflected in the name of the range Bukovské vrchy (Bukovec Mountains – meaning “beech mountains”). Mountain ridges in the area are mostly oriented approximately in a north-west to north-east direction and are separated by valleys with sparse settlements of small or medium size (Veda 1979: 298) and pastures or small fields. The area is divided into several administrative districts, of which Bardejov and Medzilaborce include the sites under investigation (Fig. 1).

The Staviská site (Bardejov district), which has received the most archaeological attention, is located north of the town of Bardejov (Slovakia) on the Slovak-Polish border, between the settlements of Stebník, Vyšný Tvarožec (Slovakia) and Blechnarka (Poland). It is a mountain ridge oriented in the south-east to north-west direction and reaching 806 metres above sea level. Old maps from the 18th century call



Fig. 2. Trenchline with two square shelters at Staviská hill, highlighted by snow symptoms. Photo: Authors.

it Porsutschina Berg (Badger Mountain). During the First World War it was called Plazini, and today the name of the hill is Staviská. The site Kobyla hill (638 m a.s.l.) above the village of Výrava is located on the ridge between the Laborec river valley and Výrava brook, which is situated in a narrow valley connecting the towns of Medzilaborce and Snina. The two remaining sites are situated in the Laborec Valley. The Cingov site is a grassland above the village of Sukov, south of Medzilaborce. The site of Wertyszów (742 m a.s.l.) is located near the Polish-Slovak border. It lies at a distance of 4 km from the nearest Slovak municipality of Habura in the Medzilaborce district (at the time of the First World War called Laborcťó). The top of the hill is covered by forest, but the foot of the hill is a pasture without woody vegetation. Today, it is almost the same environment as a hundred years ago (see Fig. 8).

METHODOLOGY

The main methodological procedures are taken from other archaeological subdisciplines and adapted to use in the environment of the Carpathians. Our methodological

approach is based on field surveys of deserted mediaeval settlements or mediaeval siege positions in the Bohemian-Moravian Highlands (e.g., Dejmal *et al.*, 2016; Mazáčková *et al.*, 2016: 59–92;; Těsnohlídek *et al.*, 2017). The survey itself was divided into several phases. Each surveyed place was chosen according to the historical events that happened there and its distinctions compared to the other places.

Archival resources

One of the first steps is archival research. Thanks to our colleagues from the research groups “KVH Beskydy” (Slovakia) and “Signum Belli 1914” (Czechia), who have in-depth knowledge of the historical frontline movements, we are able to trace the military units that built and used the trenches under investigation. Very useful sources for information about the activities of the Austro-Hungarian army, Czech units and Tyrolean regiments are the War Archive (*Kriegsarchiv*) in Vienna, the Military History Institute (*Vojenský Historický Ústav*) in Prague and the Tyrolean Land Archive (*Landesarchiv*) in Innsbruck, respectively. Due to the language barrier preventing us from reading Hungarian written sources, we cooperated with the “Nagy Háború” association in Hungary. Because of the complicated geopolitical and social situation in the study area during the last hundred years, like changing of borders, the rise and fall of states, removal and replacement of the population, which is the topic for a separate article, other sources of information are now not available for study, or lost.

The most frequently used documents are personal and regimental diaries, reports and military plans drawn directly by officers at all levels of military structure, from platoons and regiments to divisions and armies. Other useful resources are period manuals describing how to build trench lines, barriers, etc. Every country printed its own manuals, which were updated every few years. It is enlightening to compare manuals from the pre-War period, which depict the then-idealized state, with those from the War period and that following it, which were modified based on newly learned skills and practical experience (*Voyennaya tipografiya* 1910; *Druck und Kommissionsverlag der k. k. Hof- und Staatsdruckerei* 1915). This allows us to deeply study the development of military techniques and to relate it to the actual situation on the battlefield.

Field survey

We conducted our field surveys in two different manners depending on their particular aims. One small-scale survey was intended to document a specific historic event at the Wertyszów site, and another aimed to identify a specific part of the battlefield at Cingov. Both these sites also served to test a specific method of geophysical surveying. The other two surveys, carried out at the Kobyla and Staviská hill sites, were large-scale surveys intended to identify larger parts of the trench line.

Regardless of the scale of the survey, fieldwalking and metal detecting were conducted. During the small-scale surveys, fieldwalking was done only in close proximity of the site, aiming to identify only war relics connected to the particular historic event.

In the large-scale surveys, fieldwalking was carried out in three stages. During the first, it was necessary to get to know the site, the environment, the vegetation cover and the quantity and state of preservation of field fortifications. In the next stage, either a short section of a trench or a specific structure was chosen for a more comprehensive survey. The research group was split into two teams: the first one followed the main trench line, and the second one surveyed structures at the rear of the trench line to identify a suitable spot for more detailed research. We thus explored the intensity of artillery bombardment and infantry fights, as well as construction details of the trenches and sunken structures. In the last stage we mapped each site's wider surroundings to identify as much of the fortified area as possible. With the use of GPS, we recorded several kilometres of trench lines along with some other structures. In some areas we also used a metal detector.

Because of a dense canopy cover at most of the sites, a GPS receiver was used only to record the position of the trench lines. The recording of smaller structures such as foxholes was inaccurate, with a deviation reaching 20 metres in some cases. Because of this, the GPS receiver was used only to record the start and the end of an axis, which was used for a drawn documentation of these structures.

For the drawn documentation of trench lines and other larger structures, a scale of 1:100 was used, as it was suitable for documenting a large extent of them. Excavated structures and sections were drawn at the standard scale of 1:20. Both types of plans were used to record the positions of artefacts.

In some cases we used an auger to characterise depth and stratigraphy of sunken feature infills. This approach is useful especially in sites with developed soils (e.g., Kobyla hill). Patches of snow provide some more help because in trench depressions snow stays longer (Fig. 2). During our research we also tried to use geophysical methods at places where the trenchline is not preserved, mostly in open fields. Geomagnetism was tested at two sites, Wertyszów and Cingov, with a Magneto DLM magnetometer device from Sensys, with five gravimetric sensors. The survey was conducted by geophysicists from the Herman Ottó Museum in Miskolc, led by Daniel Kiss (2018). However, its results are questionable (see Zubalík *et al.*, 2019; Kapavík *et al.*, in print).

The remote landscape of the eastern Carpathians is an ideal environment for metal detecting. Despite all large metal artefacts being long gone because of three decades of illegal plundering, there is still great potential for archaeological exploration by this

method. It can be used for quick non-destructive large-scale reconnaissance of metal concentrations in places such as battlefields, camping grounds, firing lines, etc. (see the discussion of Wertyszów below) or for classic “invasive” metal detecting, such as at Staviská hill. By contrast some places in the Carpathians are littered with so many metal artefacts that manageable detecting is nearly impossible to process (for example at Kobyla hill, where heavy fighting took place).

In terms of coordinating the data collection process, it turned out that best performance was achieved with a total station, or by old-school marking on the paper plans printed at 1:20 or 1:100 scale. GPS plotting often has inconsistent accuracy caused by forest density and satellite signal unavailability. Systematic metal detecting could be used as a way to protect endangered historical sites. Artefact looting took place mainly around the turn of the century and has harmed every single one of the sites which we have studied. It seems that illegal activities in the Carpathian battlefield have slowed down, partly because Slovakia adopted a new archaeological act in 2009, but mainly because it is much harder to find “valuable” war artefacts now (Michalík 2009: 524, 535; Zubalík *et al.*, 2017: 520).

Remote sensing and GIS processing

Part of the research included the evaluation of available LiDAR data that are freely accessible through the Polish service *Geoportal Infrastruktury Informacji Przestrzennej*. Such data were only available for sites close to the Slovak-Polish border. Data from Slovakia had not yet been published for the surveyed area (as of October 2022). A digital elevation model of the sites was processed in ArcGIS Pro with the help of its relief visualization toolbox, specifically the “Multidirectional hillshade” and “Local relief” functions (Zakšek *et al.*, 2011). These functions helped us with the reconnaissance of sections that were poorly visible during the field surveys. Visibility analysis for the site Staviská was performed by a “visibility” function with two different settings. The first was visibility from the ground level (e.g., by a soldier in a trench) and from the height of 1.5 m (e.g., by a standing soldier outside of a trench). The second was visibility from the ground level (e.g., by a soldier in a trench) and from the height of 0.5 m (e.g., by a crawling soldier).

We processed the results of our field surveys in ArcGIS. The data were negatively affected by several factors such as inaccurate maps, GPS device accuracy and problematic RTK corrections. Therefore, we had to conduct a geodetic survey within a relative network and spatially adjust the GIS layers during post processing. LiDAR data served to visually review the postprocessing corrections. During our field campaigns, we use a simple, lightweight commercial quadcopter (Mavic), mainly to create pictures of whole sites and their emplacement in a broader context (e.g., Fig. 10).

Considering that all the preserved parts of the First World War fortifications we researched are located on wooded land, there is no point in trying to map/picture them from the air. Nevertheless, a quadcopter can also be used for the aerial documentation of excavated structures.

RESULTS

Staviská

The site had been occupied by the Austro-Hungarian army since the end of March 1915. On the morning of 3rd April, a Russian attack at nearby Stebnik caused the annihilation of the 28th infantry regiment. One remnant of it, about 50 men strong, retreated to the ridge of Staviská. During the day, the empty space in the frontline was quickly reinforced by the 4th regiment of the Tirolean Jägers (TKJR4), who kept the positions until 24th of April, when it was replaced by the 97th Infantry regiment (IR97). This regiment held the line for the next few days until 5th of May, when the whole place was left by the army, due to the success of Gorlice-Tarnów offensive¹ (Vojtas 2018: 25).

An archaeological survey has been conducted in several expeditions since 2013. During this period we have mapped and analysed a large part of the frontline and the structures behind the line; one of which was excavated (Fig. 3). The main aim of the survey was concentrated in the area between the top of the Staviská hill and the place where the frontline bent at the end of the ridge to the saddle to the south. The whole area is built of sandstone flysch, which rises almost to the surface. Fortification systems were thus built primarily of rock. Without the need of excavation it is still possible to trace and document the stone walls of the trenchline, standardized hideouts/shelters, firing ports, and probably also machine gun nests, which, however, is yet to be confirmed (Fig. 3; Vojtas 2018: 67). Behind the trenchline was a plateau with structures, situated mostly behind the ridge, hidden from the enemy eyes and connected with the frontline by connection trenches. Metal detector surveys of these places prove that they were used mostly for camping (Vojtas 2018: 53).

One of the largest rearline structures was excavated in 2020. In the middle of the north side, a stone oven with metal plates was built. In the ash filling of the oven there was a bone from a sheep or goat. Other finds consisted of eight metal meat cans, utensils and a fragment of window glass. Walls built of boards were joined by nails and insulated using cardboard, and the roof was supported with posts (Fig. 4, top). Another important fact connected to this structure in this place is the location of the

¹ Feldakten der Tiroler Kaiserjäger, Tiroler Landesarchiv, TKJR 4, Gruppe II, Karton 32, Akten IV.

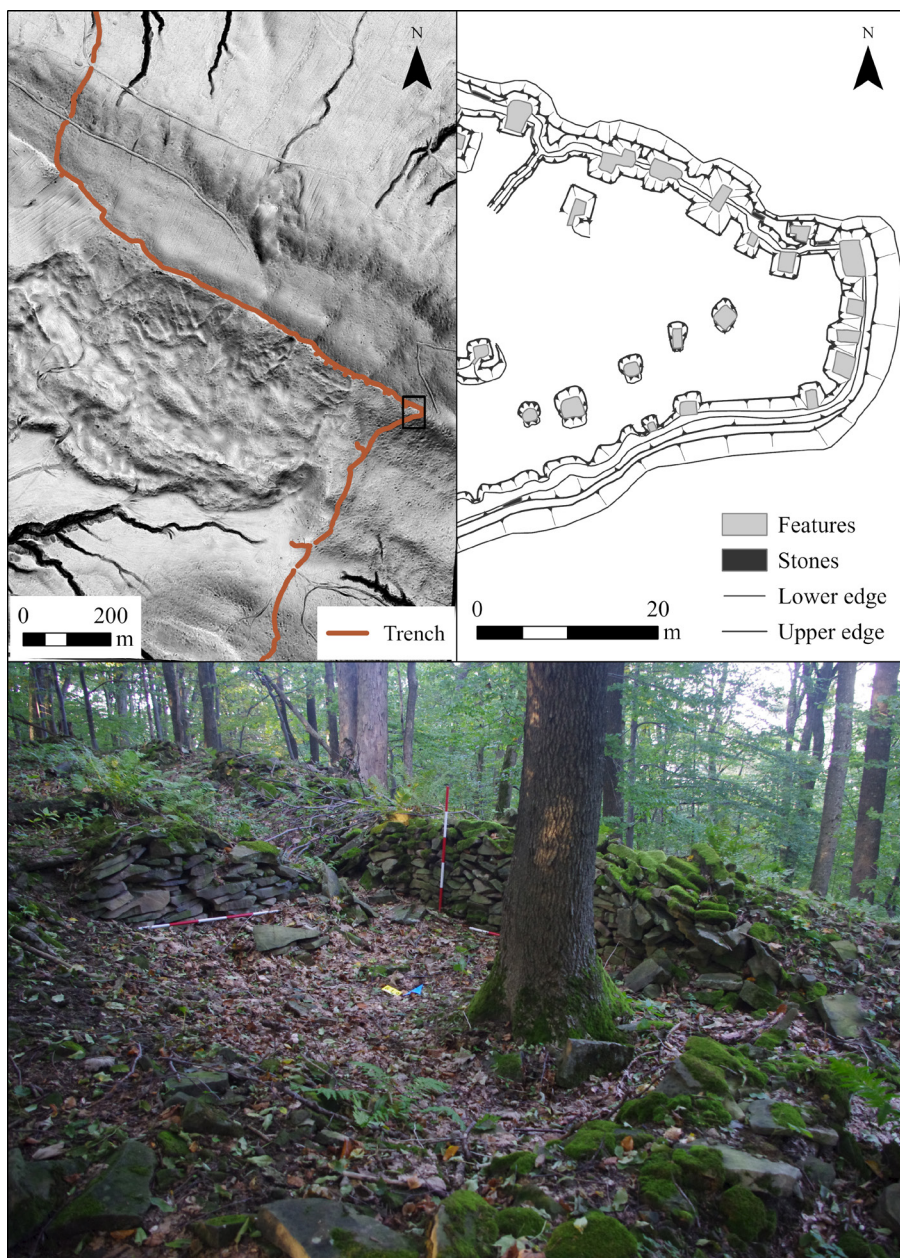


Fig. 3. Top left: preserved trenchline at Staviská; top right: documented trenchline at Staviská ridge. Bottom: preservation state of trenchline at Staviská. Graphics created by the authors.

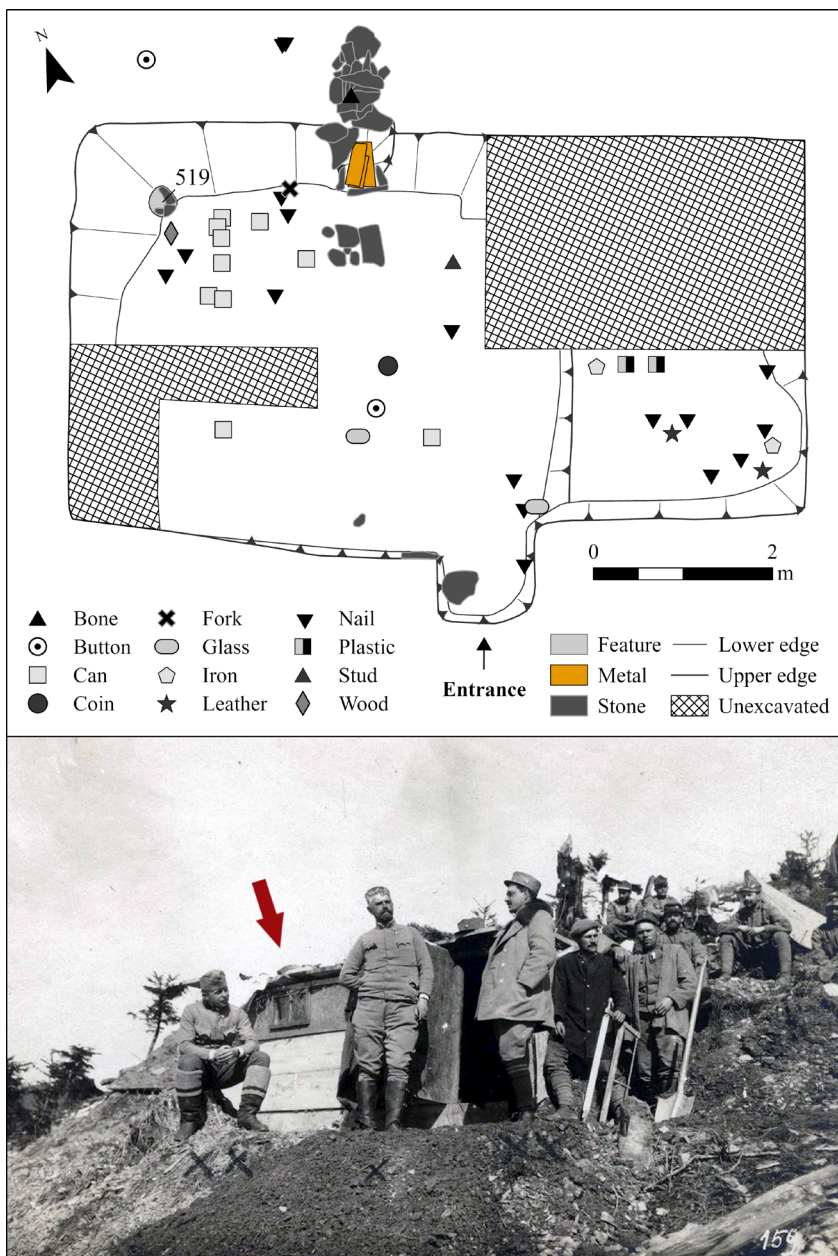


Fig. 4. Top: rearline structure at Staviská. Bottom: HQ of 28th Infantry Regiment (Opravil 1917, modified). Graphics created by the authors.

“Gruppenkommando Plazini” headquarters. According to period plans², it is located somewhere in this area, without closer specification. Photographs of other comparable officer huts allow us to think about this possibility (Fig. 4, bottom).

The whole fortified ridge was never attacked by the Russians, who occupied the opposite hill, Lieštiny. In historical sources, we have only found one mention of the ridge, stating that “On 7th April, hptm. Szmarzenka at Plazini was hit by shrapnel to his butt and went to seek first aid; the new commander is hptm. Kern”³. At the entrance of the excavated structure, we have actually found one shrapnel ball. Other than that, of all the ammunition found at Plazini, which was the most common find here, only two rifle and two pistol cartridges were shot. The rest of the empty cartridges were emptied to obtain gunpowder, possibly to use as a firestarter.

Besides ammo, most of the artefacts found are construction and fortification remains (nails, barbed wire), parts of equipment and personal belongings (buttons, coins, *Zeltbahn* loops, a FJI cockade/head badge, a table fork and a folding table knife, and a pocket watch attachment). Together with reports from the archive, where new supplies of cardboard and boards were often mentioned⁴, this led to the idea of well built trenches with wooden roofs. These constructions are also captured in historical photographs (Fig. 5). The absence of a bigger amount of materials at present could be connected with later organized disassembly of these structures by the army or by the local population for further use. We quite often encounter information from locals to the effect, “our grandpa built a barn of these boards”.

Kobyła hill

One of the fiercest fights in the territory of today’s Slovakia took place in the hills above the village of Výrava during the winter of 1914/1915. The hills on its northeastern side were occupied by the Russian army (800 m a.s.l.), while the Austro-Hungarian army built its defences on the hills opposite: Kobyła hill (638 m a.s.l.) and Dielec hill, directly above Výrava. It was here that the Russians launched one of their main assaults in March 1915, in a battle which became known as the “Easter battle in the Carpathians”. Their first target was Dielec hill. After they conquered it, the assault continued towards Kobyła hill for several days. In the end, the Russian army seized the Austrian trenches. However, several days later, the combined forces of the Austro-Hungarian army and German *Beskidenkorps* launched a successful counterattack

2 Neue Feldakten, Divisionkaommandos, Österreichisches Staatsarchiv, Kriegsarchiv Wien, Karton 1614, 1615 (28. ITD; April 1915).

3 Feldakten der Tiroler Kaiserjäger, Tiroler Landesarchiv, TKJR 4, Gruppe II, Karton 32, Akten IV; 7th April

4 Feldakten der Tiroler Kaiserjäger, Tiroler Landesarchiv, TKJR 4, Gruppe II, Karton 32, Akten IV; 8th, 15th, 17th and 21st April)



Fig. 5. Constructions behind lines (Opravil 1917, modified). Graphics created by the authors.

and took back the original positions⁵ (Kapavík 2016). These hills are forested nowadays, which creates favourable conditions for preserving the remains of fortifications, which are endangered only by forest machinery and artefact looting.

⁵ Combat report on the activities of the 2nd Infantry Division 23 March – 4 April 1915, Österreichisches Staatsarchiv, Kriegsarchiv Wien, Neue Feldakten b: Gefechtsberichte und Umstürzberichte, Karton 1802 (Alt).

The survey on Kobyla hill brought some difficulties not encountered at the other sites. The main drawback is the absence of LiDAR data for this area (January 2023). Therefore, the only way to track the trench lines is to study historical documents first and then to conduct field research. However, the interpretation is also complicated here because the whole ridge, including the Kobyla hill and the Dielec hill, changed ownership several times during two different assaults. Therefore, several trench lines belonged to different armies, and some fortifications could have been used by both armies at different stages of battle (Zubalík *et al.*, 2017: 539–540).

The most important historical documents for studying the course of the front are staff maps of the Austro-Hungarian 2nd Infantry Division, which defended its positions here. These maps were created on 25th March, 26th March, 27th March, 29th March, 31st March and 3rd April 1915.⁶ Most of them depict the 2nd Infantry Division holding the trenches on the hills Javirská and Kobyla; the Russian army was already situated on Dielec hill (Fig. 6, top).

There are several trenches and other field fortifications directly on the tops of Kobyla hill, Javirská hill, and Dielec hill, which continue to the ridge in the southeast direction. Some sections of the trenches are well preserved to this day, reaching the depth of 1 to 1.5 metres. However, there are also sections that have almost disappeared. The whole complex, documented by GPS, has an overall length of more than 5 km. Directly on Kobyla hill, there are at least two trench lines – one is oriented to the north-east, facing the Russians, the other one is on the opposite side of the hill. The latter is shallower, indicating that it was prepared in a shorter time, so it perhaps belonged to the Russian army (Fig. 6, bottom). This situation should be similar to the opposite situation described by Simon Verdegem at Messines Ridge, where a fight occurred in June 1917 and where the German trench system was taken over by the Allied forces (Verdegem 2021: 49). In both situations neither of the sides fully used the trenches of opponents, but built their own due to different expectations, tactical situations and customs.

For the more detailed survey, we selected one part of the Austro-Hungarian trench on Kobyla hill. The trench line has three bends here, each making an angle of almost 90 degrees. Here, a greater number of structures than average were situated directly on the trench line. Six of them were connected in a standard manner to the rear wall of the trench; however, three more were connected to the front wall of the trench. As far as we know, these are only structures connected to the front wall of the trench in the whole fortified area. Approximately 100 metres eastwards, the base of the trench line goes up to the surface. From this point, the field fortification continues as a rampart for several dozens of metres before it changes into a trench again (Zubalík *et*

6 Ibidem.

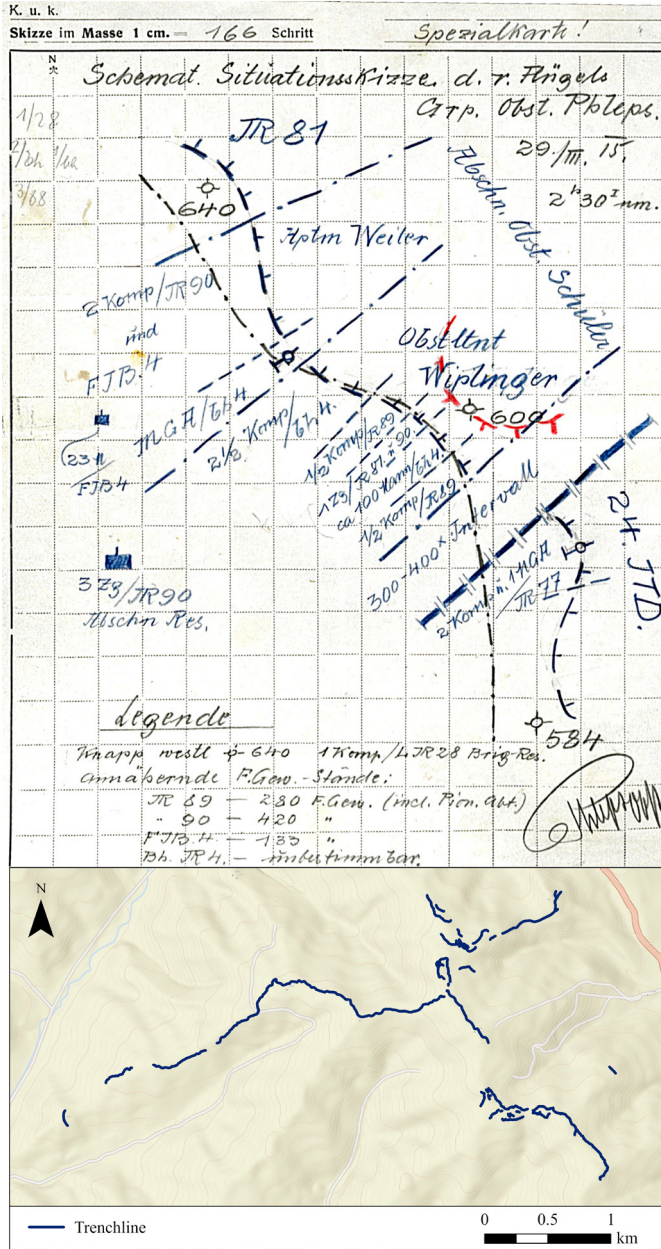


Fig. 6. Top: staff map of 2nd division at Javoriská and Kobyla hill. Bottom: GPS of trenchline at Kobyla hill. Graphics created by the authors.

al., 2017: 544–548). Historical accounts state that ramparts were built if there were many roots in the soil.⁷

Approximately 50 metres behind the bends of the trench line, there is a group of five connected structures. Their dimensions are 2.3–3.4 m by 1.2–1.8 m; the fifth one is a little larger and has two entrances. The function of these structures is unclear. Perhaps they served as rearline shelters for soldiers or as ammunition depots, as might be indicated by a hoard of 8×50 R Mannlicher cartridges, found in a wall (Fig. 7; Zubalík *et al.*, 2017: 549–550).

Wertyszów

The first fights in the area between Austro-Hungarian and Russian soldiers took place in November 1914. At that time, the 3rd Army (of Austria-Hungary) was forced to retreat here from Galicia by attacks of The Russian 8th Army. It was decided to make a defence line in the territory around Medzilaborce, including Wertyszów (the name of the hilltop from the Polish side). However, the defence was not successful and since December quite a large area was controlled by the Russians. For the next few months, numerous skirmishes occurred in the area of the hill, but in terms of positions, nothing changed. The turning point came after the Gorlice offensive (2nd May 1915), which brought a great retreat of Russian forces.

At the time, the Austro-Hungarian forces were ordered to attack and pursue the retreating Russian troops. On 6th May, they reached the village of Habura, which was the night before burned by the enemy. A Russian rearforce (Siberian riflemen from the III Russian army), created a defence line around Wertyszów hill (742 m) and Revejka (752 m). The Austro-Hungarian headquarters decided to attack early in the morning on 7th May. Responsible for chasing out the last Russians from sovereign Hungarian land were the 17th and a mix of the 1st, 2nd, 3rd and 4th Royal Honvéd Regiments. After a full day of fighting, the Russians were put to flight (Kriegsarchiv Wien 1932; Rozsáfi 2017).

The Russian defence line is well preserved at the edge of the Polish–Slovak border forest (Fig. 8). We have recognized three types of structures. Most recognizable is a line of rectangular foxholes with their smaller side facing down the hill. According to Russian sources (Syтин 1914: 6–9), these are firing pits for single riflemen. In some sections of the frontline, groups of firing pits start to connect together. Thus we can study the process of trench-making. The distances between foxholes document the

⁷ Combined Fund of the Headquarters of Infantry Regiments, Military Central Archive Prague- Military Historical Archive Prague, Combined Fund of the Headquarters of Infantry Regiments K. und K. Infantry Regiment No. 8I, k. 7, Gefechtsberichte - Situationenen, Description of the regiment's battles from the beginning of the war to 30.3.1915.

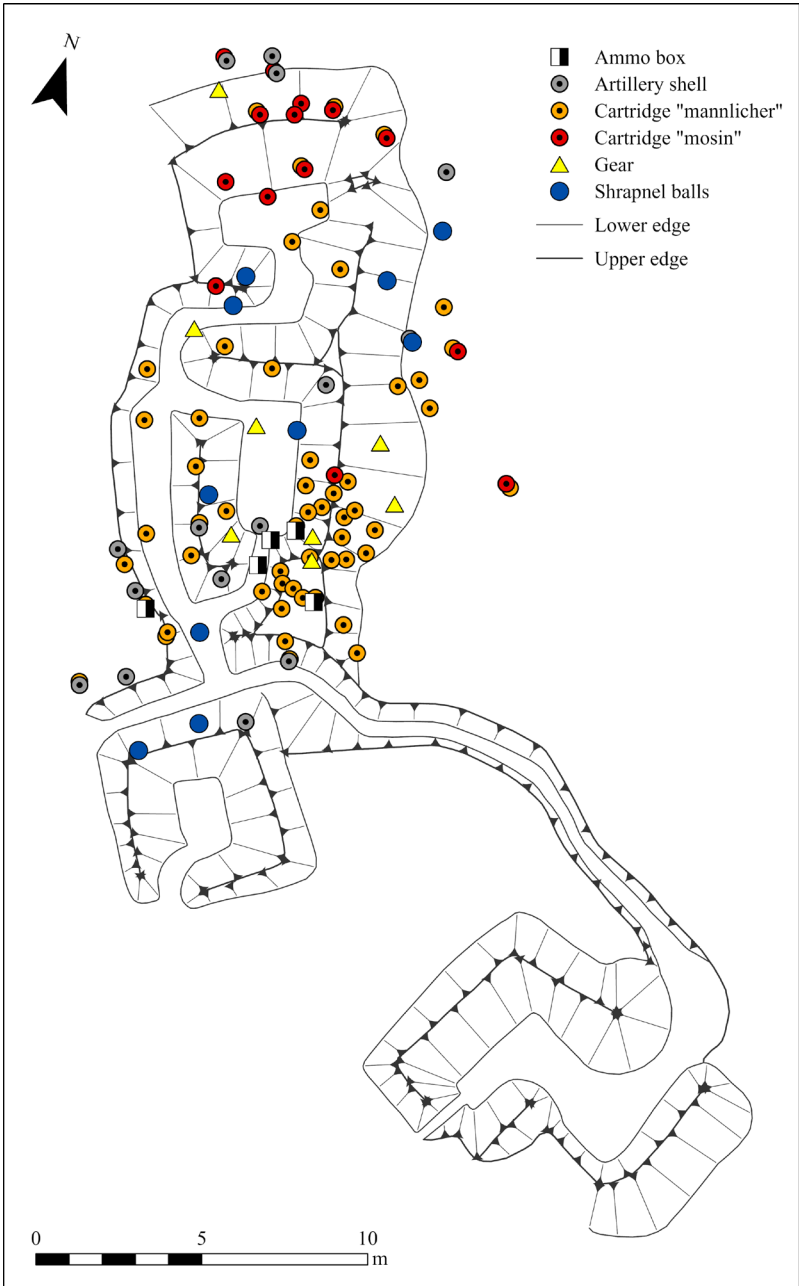


Fig. 7. Investigated structure at Kobyla hill (Zubalík et al., 2017: 549–550; modified).

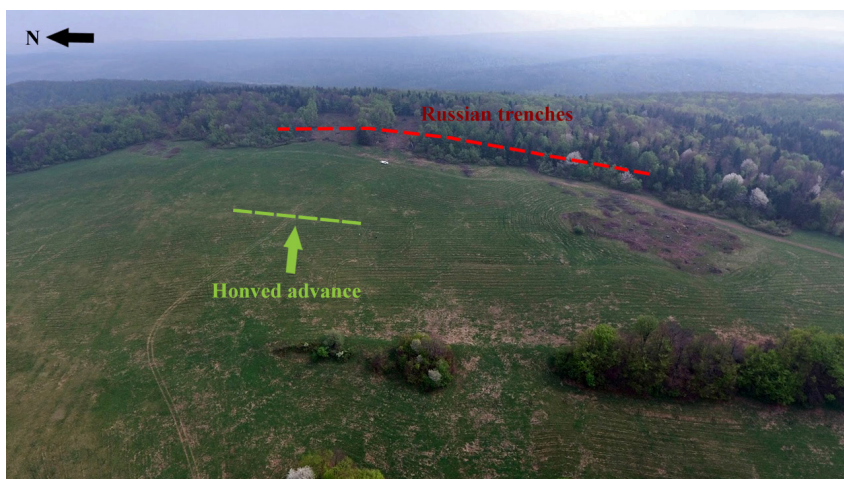


Fig. 8. Aerial view of Wertyszów – Habura. Photo: Authors.

inconsistent density of Russian soldiers. The second type are irregular dugouts with visible entrances. Because of the presence of artefacts inside, we can assume that they possibly belonged to Austro-Hungarian positions from 1914. The most recent ones that can be distinguished are possibly connected with the end of the Second World War. Large dugouts for Soviet artillery are superimposed on imperial Russian firing pits. Especially in mountainous areas, where the choice of positions is strongly influenced by the configuration of the terrain, it may happen that similar terrain positions are used in various conflicts.

In 2017, we decided to find the approximate place of the Honvéd attack. To achieve that, we followed the right angle from the Russian defence line down the hill into the pasture and by random use of a metal detector we found a large linear concentration of ammunition cases. These results allowed us to set two polygons (total area 50×50 m) for a detailed metal detector survey. The position of every single artefact was determined by a total station and then spatially evaluated in GIS. The total number of 173 artefacts can be divided into three categories. The most common finds are connected with the attack of Austro-Hungarian soldiers. These consist of 120 finds of spent 8×50 R cartridges for Mannlicher rifles, two bullets, ammo clips and a cleaning rod. The second category are shell fragments from Russian artillery support. The last one are recent artefacts, including a Czechoslovak coin from the communist era. Spatial analysis allowed us to recognize the exact firing line of Austro-Hungarian troops, which is nowadays invisible in the terrain (Zubalík *et al.*, 2019: 83). However, the exact place of the breaching point remains to be located (Fig. 9).

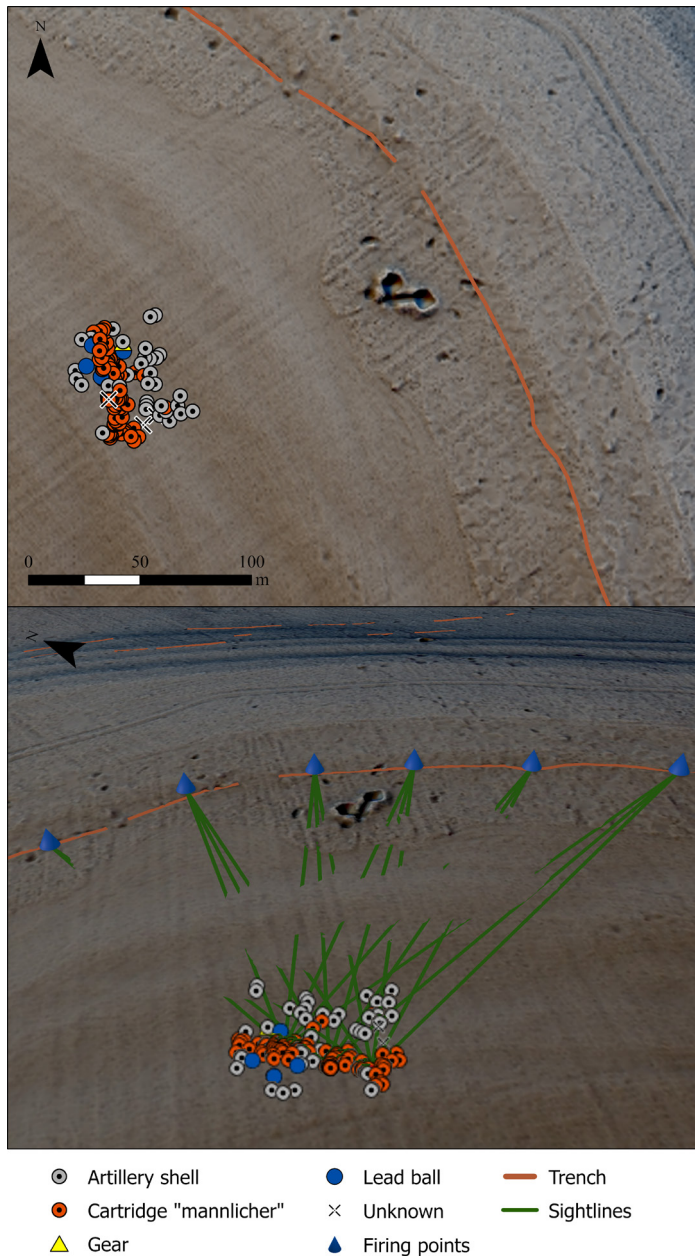


Fig. 9. Top: located Austro-Hungarian fire line and Russian trenches at Wertyszów – Habura hill. Bottom: results of visibility analysis. Graphics created by the authors.

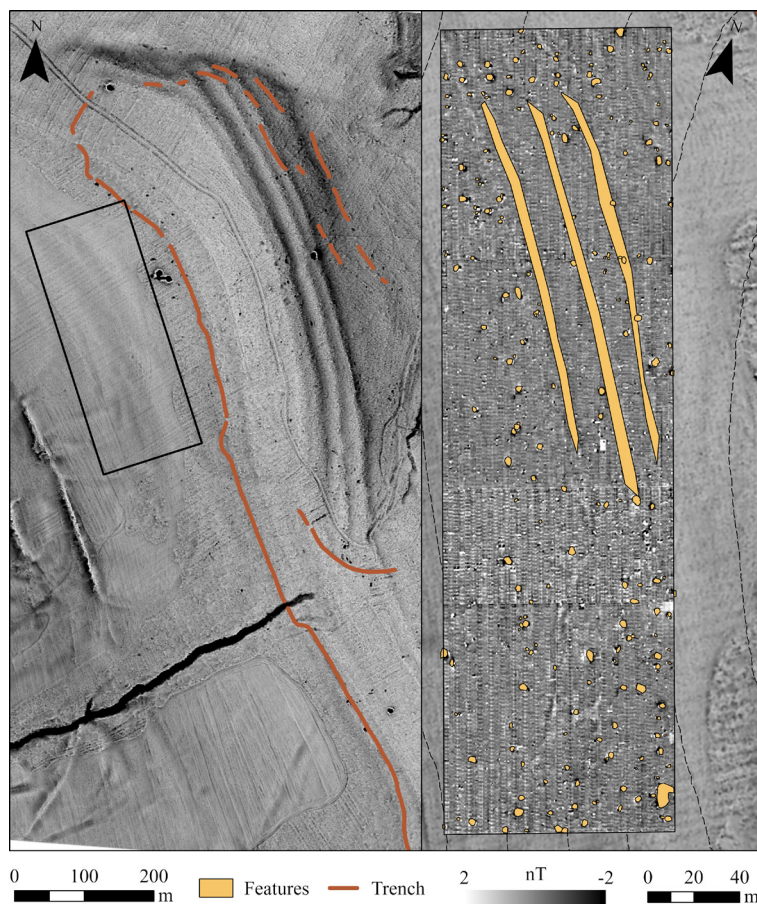


Fig. 10. Left: preserved trenchline at Wertyszów – Habura hill.
Right: results of geophysical survey. Graphics created by the authors.

The last part of our survey for the time being was a geophysical survey. It was carried out in summer 2018 by colleagues from the Ottó Herman Museum in Miskolc. They covered an area of 100×350 m. The results confirmed that there are no trenches in the area in front of the Russian line, but there are visible magnetic and ferromagnetic objects all over the place, which can be identified as possible artillery shell fragments. Interesting are three visible ditches of unknown function. They are not filled with magnetic and ferromagnetic objects. There is a possibility that they are results of older agricultural activities (Fig. 10; Kiss 2018).

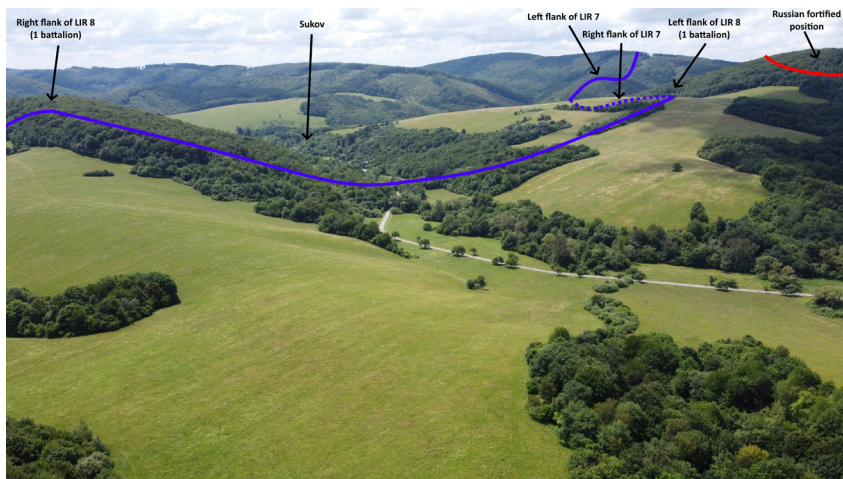


Fig. 11. Position above Cingov – Sukov after the end of the Austrian counteroffensive – 18 February – 20 March 1915. Photo: Authors.

Cingov

The Cingov site is situated in one of the most important areas of the conflict between the Russian and Austro-Hungarian armies due to its strategic location (the railway line leading through the Lupkow Pass through the Carpathian ridge). The front line settled near the village of Sukov for a month (from February to March), when a surprise attack by Russian troops took place here. Due to this attack, a large part of the Austro-Hungarian 8th Landwehr Infantry regiment, defending the positions above the village, was captured. The vast majority of the north-east Slovak trench lines are situated in forested areas, so they are well preserved. Above the village of Sukov, on Cingov hill (411 m a.s.l.), however, the section of the trench line passes through a grazed meadow (Fig. 11). Aerial photography did not reveal any crop marks and soil marks that would indicate the presence of belowground remains. Even a surface survey of the site did not reveal any remains of trenches, whose positions can be estimated only from an officer's report sketch dated to 10 March 1915⁸ (Kapavík *et al.*, in print).

The main purpose of the survey was to find the trench line and thus to confirm or refute its presence in this tactically unfavourable position. Another issue was the documentation of combat operations in the area. A geophysical survey with a magnetometer

⁸ Neue Feldakten, Divisionkommandos, Österreichisches Staatsarchiv, Kriegsarchiv Wien, Karton 1195 (21. Schützendivision 1 March – 30 April 1915).

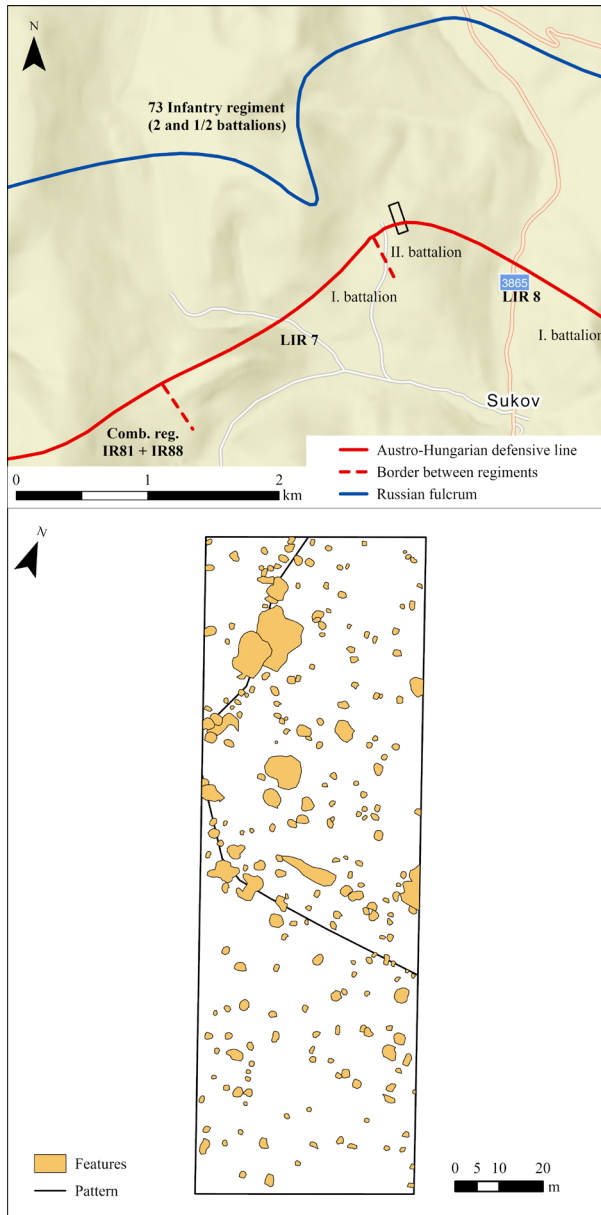


Fig. 12. Top: view of the area around Cingov – Sukov. Bottom: visualisation of magnetometric measurement results at the site Cingov – Sukov. The line marked the expected course of the trench according to the concentration of magnetic objects in the ground (Kiss 2018: 8). Graphics created by the authors.

was conducted in the summer of 2018 in an area of 150×50 m (Fig. 12). This survey was the first application of geophysical methods aimed at the First World War battlefield archaeology in the Carpathians. The survey did not reveal the presence of the trench itself, as the body of the trench line did not appear in the data of the resulting magnetogram. However, its results are affected by the presence of magnetic and ferromagnetic objects, such as metal artefacts or magnetic substrates. In our case, where we assume a larger amount of metal artefacts on the site, this information was used to our advantage. In a certain section, bipolar signals are clearly concentrated in a line passing through the entire measured field from the north to the west and from the west to the east. This indicates the existence of a firing line in these places and the accumulation of metal artefacts in the trench. In addition, the area contained small burnt surfaces, which, however, did not correspond to any pattern and were distributed randomly. It could be the result of an explosion of artillery ammunition.

DISCUSSION

One of the basic questions during field surveys is the reason for building trenches in their current positions. First of all, we need to know the military manuals from this period. For the Russians it is manual from 1910 (*Voyennaya tipografiya* 1910). The most relevant for the Austro-Hungarian army at the Carpathian front are manuals from 1906 and 1911 (K. u. k. Kriegsschule 1906; Steffen 1911). A reprint from 1915 corresponds to a doctrine change and the advent of positional warfare, due to experiences of the first year of war on the Carpathian battlefield (*Druck und Kommissionsverlag der k. k. Hof- und Staatsdruckerei* 1915; *Druckerei des k. u. k. Kriegsministeriums* 1915). Nevertheless, even these did not represent the specifics of mountain warfare. This opens the opportunity for comparison.

The character of the entire field fortification at Staviská hill suggests a certain level of improvisation during its construction. The terrain is almost never ideal for a trench system to be built exactly according to the manuals, but the Carpathian battlefield and static positional warfare was something to be dealt with. Two classes of structures identified at Staviská trenchline can be interpreted as shelters, in manuals defined as *Untertritte*, which should be underground in the frontal side of the trench (*Druck und Kommissionsverlag der K. K. Hof und Staatsdruckerei* 1915: 33–34), and the third class represents bigger shelters known as *Unterkunft* (*Druckerei des K. u. K. Kriegsministeriums* 1915: 12, 16). In contemporary reports, there are machine guns pictured there, which should be located in a special type of structure. There is not a single structure like that, but some of them can be considered. The emplacement for the machine gun

should protrude into the front wall of the firing line and there are some structures, which are situated on the trench line in this manner, but we found no physical evidence of the presence of heavy weapons (Vojtas 2018: 67).

In military manuals, it is recommended not to build trenches at the top or on the slope, but at the foot of the hill (*Druck und Kommissionsverlag der K. K. Hof und Staatsdruckerei* 1915: 15). However, this recommendation was not being followed by either army at any of our surveyed sites.

To understand why the trenchline was built on such spots, contrary to the contemporary military manuals, where different procedures are proposed (*Voyennaya tipografiya* 1910: 36; *Druck und Kommissionsverlag der k. k. Hof- und Staatsdruckerei* 1915: 15), we must use the data from the LiDAR. At Staviská hill, we were able to map the course of the line, compare it with old military plans and use GIS analysis tools. This analysis made it clear that the positions were built to keep a good overview of the opposite hill and stream in the pass; on the other hand, it was impossible to observe the space directly in front of the trenchline which was still hard to cover without leaning out of the trench (Fig 4, right). Other answers are provided by the profile of the hill, which offered limited space for building a trenchline with rear structures.

At Wertyszów and Kobyla hill, the terrain is comparable. Defending soldiers simply used the advantage of a relatively flat hilltop, with a long climb. At a distance of about 150 metres from trenches, located close to the ridge, there is a rise in the terrain that allows advancing troops to be quite effectively covered from defenders, but the rest is open field, which makes the area in the defenders' firing range easy to control. According to the maps of the Third military Survey from the second half of the 19th century (1869–1885), these areas of both of the hills were deforested and used as pastures. This was the background to the successful Russian defence and high losses of attacking Honvéd soldiers. On 7th May 1915, more than 100 men were killed and hundreds were wounded, when Honvéd troops were pinned down on the meadow, exposed to enemy infantry and artillery fire for a whole day (Zubalík *et al.*, 2019: 115–116).

Unfortunately, there are no available LiDAR data for the sites of Cingov and Kobyla hill, so we utilized other methods to map trench lines and other features. The Cingov site is mostly situated on an arable field with no visible morphological features. One of the main reasons was probably the situation when the main fighting took place over the possession of the hills and whoever was at a lower spot was at a disadvantage. The enemy could fire from higher ground directly into the trenches. We have learnt there that using magnetometry to search for military trenches is difficult, but in this given area, where we know the trenchline was present, it was possible

to locate a line of ferromagnetic anomalies, which we put down to metal objects left in the trench. The line marked this way traces the trench line. In addition, burnt surface signals can indicate locations of the impact of artillery ammunition and thus can help us to evaluate the extent of combat operations. (Kiss 2018: 2–4; Kapavík *et al.*, in print). The reason for building trenches at positions on Cingov hill makes less sense and they are the result of a disadvantageous tactical situation.

There is a difference between the Austro-Hungarian and the Russian trenches in the way they were built. The Russian trenches were supposed to be dug in a zig-zag manner (*Voyennaya tipografiya* 1910: 32), but quite often they were just straight lines. These trenches have not yet been specifically surveyed, as we focused on the Austro-Hungarian remains, but for the sake of a comprehensive understanding, we will give them more attention in the near future. Austrian trenches were constructed with a traverse system, in which the line is interrupted every few metres by a rectangular bypass (*Druck und Kommissionsverlag der K. K. Hof und Staatsdruckerei* 1915: 17). There had to be shelters in trenches, but in the conditions of Carpathian winter, it was very difficult to build such underground shelters. At Staviská, we have a special situation, where trenches and shelters could not be dug, so shelters were built at the level of trenchline (see Fig. 3).

Another possibility was to build shelters close to the trenchline. In the case of Staviská, this was on the far side of the hill, where geological platforms served as bases for encampments (findings of *Zeltbahn* loops). Constructions of another kind were built of wood, earth and with insulation of cardboard, as the one described above. It is quite clear that it served the purpose of a shelter, where food was prepared in an oven, and according to period photographs, it possibly also served as a headquarters. The manuals propose to build such constructions and camps deeper in the rear of the combat zone, but here it is placed on the other side of the hill in a place where it was protected from shelling by its steep slopes.

The other rear structure was investigated at Kobyla hill. Here, no heating was found, but the area was under heavy gunfire from infantry and artillery weapons. The presence of a bigger amount of ammo, equipment and personal items suggest that this area was not just a shelter, but maybe a depot (Fig. 7).

The whole area of Kobyla hill is unfortunately well known for illegal metal detecting. Still, it was littered with artillery ammunition, namely frag grenade fragments and lead shrapnel projectiles that contaminated the soil in a way that metal detecting was very time-consuming and nearly meaningless (Zubalík *et al.*, 2017: 550–555). This is the clear evidence of how intense was the clash that we are trying to unravel.

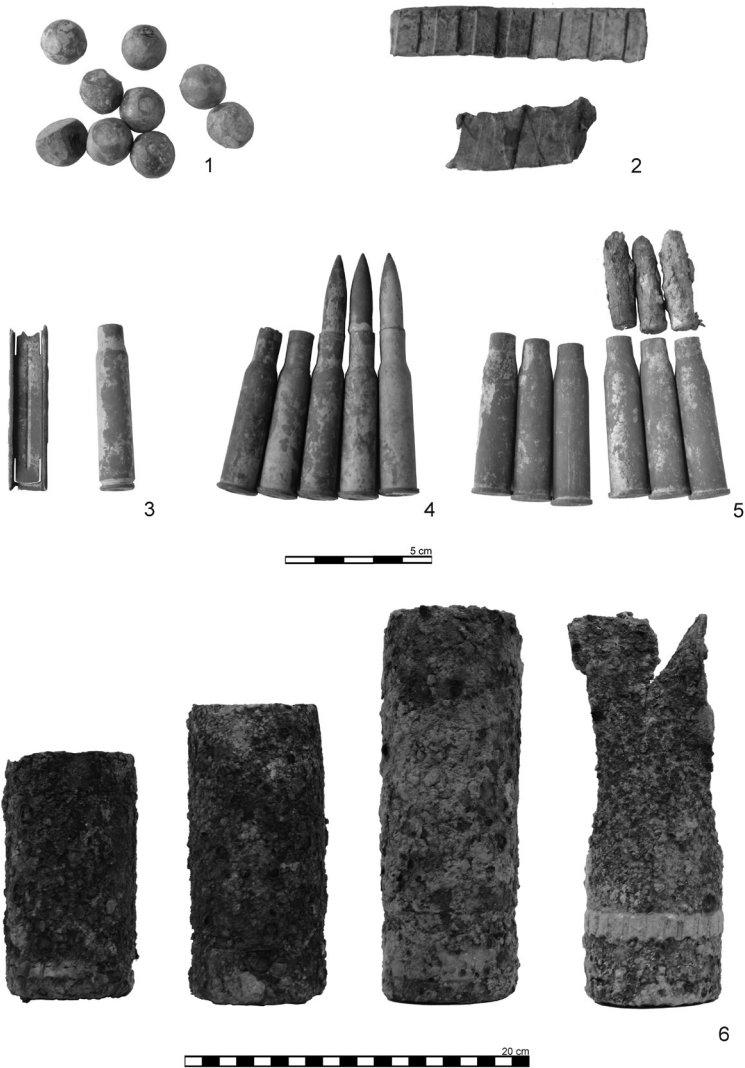


Fig. 13. Examples of handgun and artillery ammunition from Kobyla hill: 1. shrapnell lead projectiles; 2. copper driving bands; 3. 7,92x57 mauser clip and spent cartridge made in 1914 – evidence of German troops at Kobyla hill; 4. 7,62x54R mosin projectiles and cartridges; 5. 8x50R Mannlicher projectiles and cartridges; 6. Russian 76 mm shrapnel grenades.
 Photo: J. Těsnohlídek and J. Petřík; Zubalík *et al.*, 2017: 551.

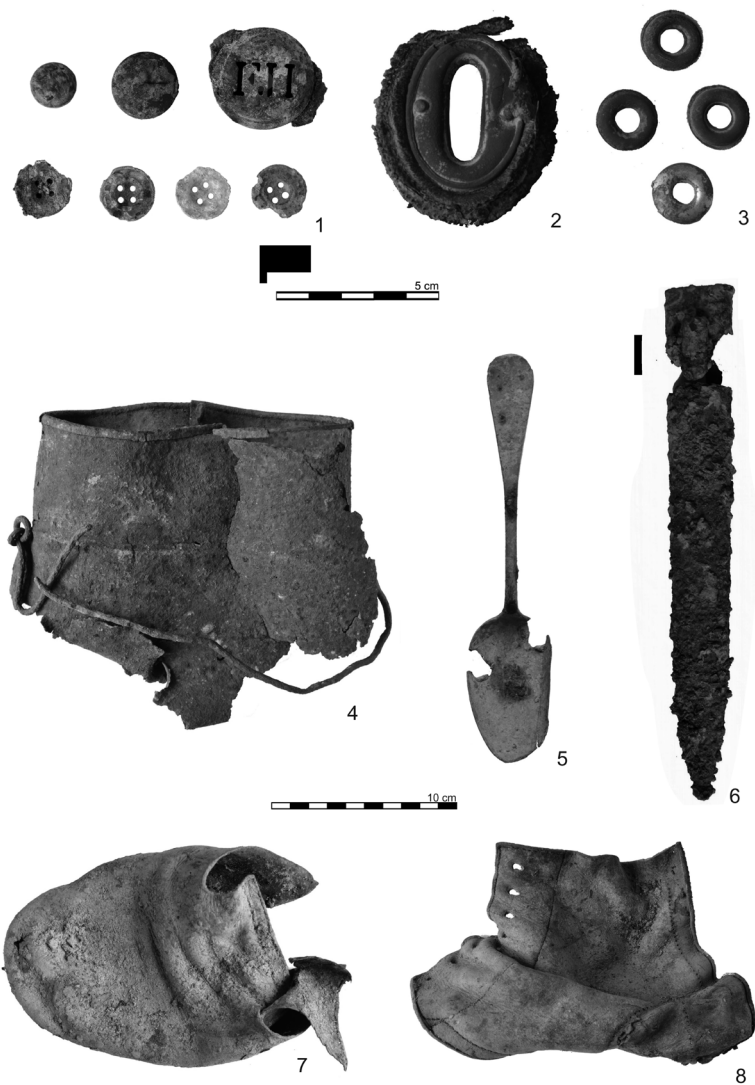


Fig. 14. Examples of Austro-Hungarian equipment from Kobyla hill: 1. FJ-I headbadge/cocarde and various uniform buttons; 2. and 3. *Zeltbahn* loops; 4. M1888 Austro-Hungarian mess kit body; 5. kitchen spoon with impact holes; 6. Mannlicher bayonet scabbard; 7. and 8. remains of service ankle boots. Photo: J. Těsnohlídek; Zubalík *et al.*, 2017: 554.

CONCLUSION

Every one of the sites discussed here has its unique situation and history during the same time period of the Carpathian war of spring 1915. In this paper, we have briefly described each of them and examined their common features and differences. The main benefit of studying the site Staviská is because it represents a place where there was enough time to build a solid trench line into the rocky ground. This gives us an opportunity to study this place as a unique set of relatively organized positions in the chaos of war. The trenches and the rear structures are well preserved, deserted in a short time with a lot of artefacts found in situ. At Kobyla hill and Javirská hill, intense fights took place, and our metal detecting survey yielded a lot of Austro-Hungarian and Russian rifle ammunition, an M1888 Austro-Hungarian mess kit, several parts of infantry ankle boots, a Mannlicher bayonet scabbard, an alpacca spoon with an impact holes, some Austro-Hungarian buttons, an FJ-I headbadge/cocarde and *Zeltbahn* loops (Figs 13 and 14). The trenches were of short-term use, built by all three armies of the conflict, and their affiliation and mutual relations deserve to be subjected to further research. The strongpoint structure was also investigated by a metal detector and the results indicate that it was heavily shelled. Wertyszów is at this moment the perfect place to describe a single-event battlefield utilizing archaeological and geo-information data (even with disruptive superpositions from World War II). We were able to delimit the positions of attacking and defending soldiers, their activities and directions of advance. They were strongly affected by the local terrain. The survey at Cingov was done to locate the line of the Austro-Hungarian army. The overall results are significant not only because of the successful localization of the trench line, but also from a methodological point of view. It turned out that it is not necessary to search directly for the belowground structure (i.e., the body of the trench), but that it is possible to evaluate secondary symptoms of its presence, such as metal artefacts inside the trench.

This article is an initial report on surveys of a set of remarkable war-time relics, and progress in archaeological science will bring about a more complete picture of the Carpathian battlefield.

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