

Archaeology of Conflicts

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Identification of components of the 1813 fortification line in the Lower Ohře Valley through aerial landscape survey

Martin Gajda¹

Previous employment of aerial archaeology in the study of prehistoric and historic landscape in Bohemia – mostly in its central and north-western parts – has revealed a series of features commonly referred to as military earthworks (field fortifications), which are dated to late modern times and to the origins of the industrial era (18th–mid-19th cent.). Although the employment of aerial archaeological survey in the detection, mapping and documentation of historical military relics has a relatively long tradition all over the world, in our country it did not noticeably develop until the end of the 20th century. In the first phase of development, aerial archaeology was almost completely focused on visual prospection, carried out by an archaeologist flying in a small sport airplane. The archaeologist was acquainted with basic principles of this method and was versed in morphology and other characteristic components of field fortifications, which help to properly identify them in flight. New possibilities in the aerial survey of immovable military relics were opened up in connection with dynamic development of the most modern devices, in other words the hardware and software working in digital environment, integrable into the heuristics and analysis of remote sensing data. The onset of digital photography, Global Navigation Satellite System (GNSS), drones, satellite images with ultra high resolution, airborne laser scanning (LIDAR), or the free accessibility of orthophotomaps on map servers have unprecedentedly enhanced the potential of aerial archaeology, so that it became one of the methods in a discipline aggregately referred to as remote archaeological survey (RAS). Current experience clearly refers to positive benefits of remote sensing data for detection, documentation and mapping of both the partial categories of cultural landscape and the large landscape units, which are influenced by more or less extensive human activities (on RAS in detail Gajda 2017a and 2020). From the published results clearly follows that these data nowadays (all the more in the near future) represent a wide spectrum of sources of various quality, which are stored in very voluminous files. Every single one of them contains – even though at a various extent – information, without which the research into prehistoric and historic landscape is almost unfeasible. Of great importance in this regard is their ability to capture in an image the shape/form, size and preservation state of documented relics and their spatial context. Apart from this visual perspective they also involve a cartographic aspect, which makes the most of them a basic element of topographic (2D) mapping (on the creation of maps and plans of sites identified on the basis of remote sensing data in GIS environment most recently in detail Gajda – Gajda 2019). For example, the aerial survey images (ASI) serve this purpose continuously since the

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time of the World War I, in our country then since the interwar period. 3D visualisation of cultural landscapes is made with the help of so-called stereo pairs (orthogonal images taken with some overlap enable to observe and analyse them with a stereoscope in three-dimensional form), while the direct hypsometric mapping of the Earth's surface and its relief features is primarily conducted using the airborne laser scanning.

The paper gives an example of a territory connected with a defence system built ad hoc against the threat of invasion by a hostile army, and demonstrates on this example the irreplaceable role of remote archaeological survey in detection of recently recorded military installations which left no physical traces on the ground surface. The contribution is dealing with the territory around the penultimate segment of the river Ohře before its confluence with the Elbe, more precisely in the Ohře Valley between the municipalities of Poplze and Dušníky in the Litoměřice District. The text brings information on new, recently detected (and still unpublished) field fortification facilities and on their location within the studied sector of the anti-Napoleonic defence line, and completes and partly revises the results of previous research.

Defence system and its components in the landscape at the beginning of the industrial era

The thorough study of the central-north-western sector of the Bohemian Basin, as it was captured in map sheets of the First (Josephinian), Second (Franciscan) and Third (Franciscan – Josephinian) Military Surveys of the Habsburg Empire, confirms the period reports that the field fortification elements of the Austrian Empire, which were distributed over the studied area seemingly accidentally, in fact formed a well-considered system of defence. When we take a look at many maps of these cartographic works, we can clearly see that field fortifications in regions of increased threat of military conflicts were an inherent part of the Bohemian late modern (baroque) and early industrial landscape (e.g. Nejman 2010; Neuvirtová 2010). Numerous features of this kind are still preserved in open terrain in the form of wooded and bushed islets of anthropogenic relief features (mostly as geometrically regular enclosures, whose plan consists of broken straight lines). The history of abandoned modern military fortifications, which were built in open terrain besides large bastion fortresses with a complex construction (in the studied area it was the Terezín fortress; on this fortification most recently Fuksa 2016), is a reflection of natural processes, above all the soil erosion in sloping terrain, and processes related to human exploitation of natural resources. Terrain obstacles were either removed in a single step (for example by spreading the earth from a rampart/earthwork over a field or over the bed of a defunct river meander, or by filling the ditches of these fortifications in order to level a portion of land intended for agriculture), or were levelled to the ground over a long period of time through the recurrent ploughing, pasture and climate. Numerous features from this category of archaeological heritage are thus currently buried under the ground surface and they can be successfully detected with the help of remote sensing image data.

Identification of these features in Central and Northwest Bohemia in recent years was mainly conducted with the help of repeated visual aerial archaeological survey (Smrž – Hlušík 2007, Gojda 2005, 2008 and 2013) and interpretation of publicly available orthophotomaps (esp. <https://geoportal.cuzk.cz>; www.mapy.cz; Google Earth Pro; *all internet pages referenced in this paper were accessed and their functioning was verified on 6 April 2020*) and the digital relief model of the Czech Republic (<https://ags.cuzk.cz/dmr/>). These sources represent continuously (on the global basis) or occasionally (on the regional or national basis: e.g. within a project of the University of West Bohemia, cf. Gojda – John 2013) acquired remote sensing digital image data. The crop marks helped to identify many standard as well as less usual morphological components of field fortifications, which were intended to repel

the invasion of potential enemies, more precisely the armies of the Prussian Kingdom (in the context of the War of the Austrian Succession and later War of the Bavarian Succession) and the First French Empire (at the time of the Napoleonic Wars), from Saxony to Bohemia. It is not necessary to emphasize that the potential of remote sensing data is multiplied when the process of analysis, interpretation and mapping integrates several types of these data. For example, when we explore a single particular relic preserved in the form of an anthropogenic relief feature, more precisely in the form of a concave and convex shaped terrain (transformed relics of former constructions and other forms of previous settlement activities), then the use of multiple sources has a positive effect on the overall synthesis. This effect can still be enhanced by using the above-mentioned other categories of image data, namely the old maps (for the study of military installations from the time of the Thirty Years' War esp. Matoušek 2006; Matoušek et al. 2017; for the period of the 17th–19th centuries Matoušek – Sýkora eds. 2018; generally on the mentioned integration inclusive of three case studies concerning two prehistoric relics and one modern relic, cf. Gojda 2017b).

One of the two main areas of arrival of hostile armies, particularly in the 18th and 19th centuries, was besides the East Bohemian territory (on the previous results of modern archaeological and historical-cartographic research of relics of war activities in that territory esp. Čížek – Slavík 2010, Drnovský – Hejhal 2018, Nejman 2010, 47–48) also a zone stretching from the surroundings of Mělník, which is situated at the confluence of the rivers Elbe and Vltava in Central Bohemia, in the north-western direction towards the river Ohře (the regions around Budyně and Libochovice, Louny, Žatec) and further to the Litoměřice region and to the foothills of the Ore Mountains in the vicinity of Ústí nad Labem and Teplice. From historical reports we know that the majority of military installations in this territory – exactly like the large polygonal forts – were built during the war conflicts between Austria and Prussia under Maria Theresa and at the time of the Napoleonic Wars (mainly in 1812–1813). The most recent installations come from the mid-19th century when the conflict between the above-mentioned Central European powers has again escalated and finally resulted in the outbreak of the Austro-Prussian War of 1866 (on archaeology of this battlefield most recently Holas 2019 and Rytíř – Schimerová 2018).

The defence line on the lower reaches of the Ohře River in the form of thoughtfully distributed field fortifications was built to repel the threat of invasion by one part of Napoleon's army in the late summer of 1813, less than two months before the defeat of the French emperor in the "Battle of the Nations" at Leipzig. The territory and the fortifications were mainly explored by the archaeologist Z. Smrž and by the (amateur) historian A. Hlušík, who published their research results in the form of an extensive study in the journal *Archeologické rozhledy* in 2007. They compared the information acquired from a long-term aerial survey (in 1994–2007) and from written sources – both official and narrative – and reconstructed almost the entire course of the defence line in the vicinity of Louny and Libochovice, that is, in the area between Postoloprty and Budyně nad Ohří (Smrž – Hlušík 2007, Fig. 2). The author of this paper conducted at the same time and in the subsequent period (until 2015) direct (visual) aerial survey of the Lower Ohře Plateau, and now he considers it necessary to update previous results of the above-mentioned two researchers. It is to emphasize that the new results were achieved both by visual prospection and by the analysis and interpretation of aerial survey images, orthophotomaps and digital terrain model (particular examples of using these sources cf. Gojda 2013).

The build-up of the defence line in 1813 was instigated by the emergence of the so-called Sixth Coalition against Napoleon (Russia, Prussia, United Kingdom, Sweden). Austria acceded the coalition after complicated political negotiations on 11 August. However, the repair of several existing town fortifications (in particular Louny and Budyně nad Ohří) and terrain reconnaissance (the commander-in-chief of the Bohemian corps, field marshal Schwarzenberg, together with staff engineers, conducted here repeated inspection tours already in July; Smrž – Hlušík 2007, 723) were already prepared since the early summer of that year for the sake of the planned construction of a more or less continuous line of fieldworks, which began soon thereafter. The fortification line was mainly intended to grant

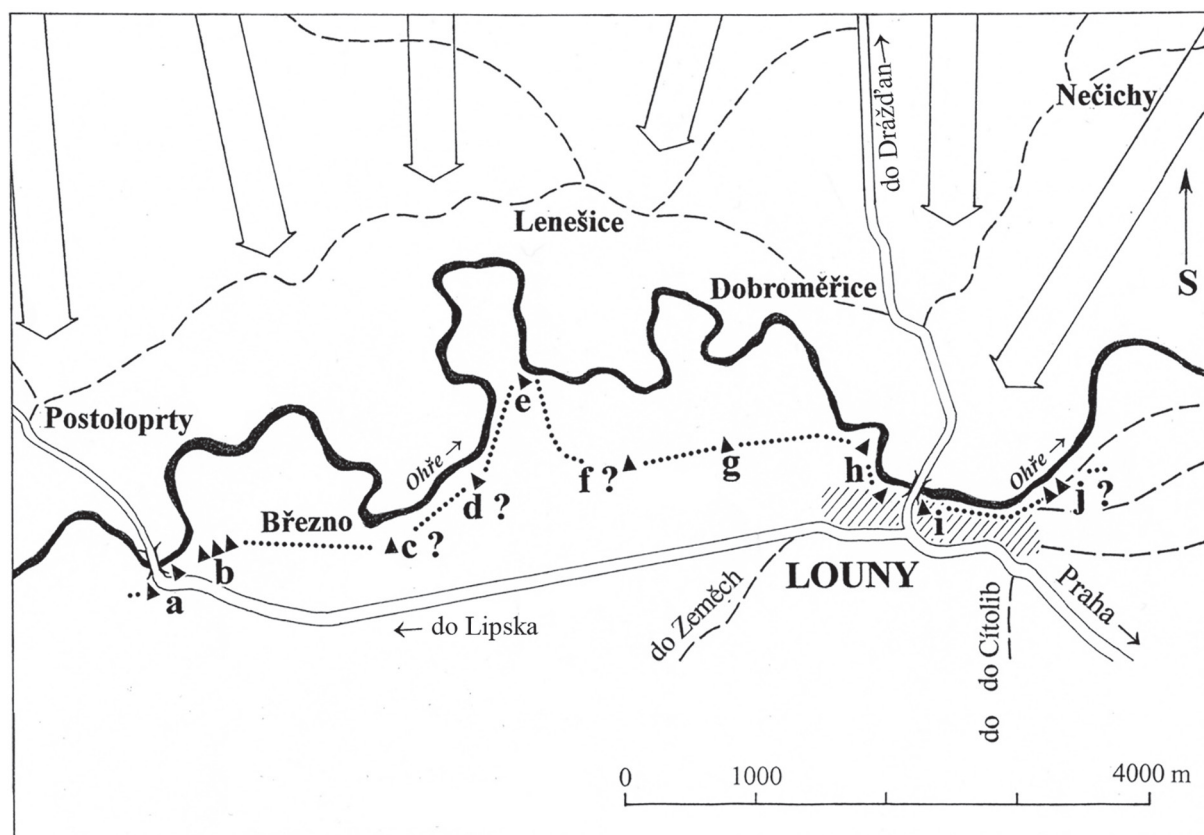


Fig. 1. Map of the first sector of the 1813 defence line in the Ohře Valley between Postoloprty and Louny based on aerial survey and study of written sources. Small letters or black triangles signify individual features of field fortification (? – uncertain), dotted line indicates the course of the defence line, the arrows in the upper part of the map indicate the potential direction of attack (after Smrž – Hlušík 2007).

protection to the so-called Bohemian (also Main) coalition corps in case that it would suffer defeat in Saxony and would subsequently retreat through the Ore Mountains into the Bohemian inland, being chased by the French army which would invade Bohemia in full power. It is to remark that the Bohemian corps formed the left wing of the coalition army, which was positioned between Louny, Mělník and Silesia (so-called Silesian corps) as far as to Berlin (so-called Northern corps). The main French military contingent was positioned in Lusatia and Silesia. The troops of the Bohemian corps, retreating in four streams, are said to have taken up their defensive positions in the territory explored by Smrž and Hlušík – on a 35 km long line along the southern (right) bank of the Ohře River between Postoloprty and Budyně nad Ohří. Three positions were situated in the neighbourhood of Louny and one in the vicinity of Budyně, where also the headquarters were positioned (Smrž – Hlušík 2007, 715–718 with numerous references to literature; summary of the situation in Bohemia at the end of the Napoleonic Wars Švankmajer 2003).

From historical sources we know that the build-up of fortifications in the Ohře Valley was paid much attention over the whole summer of 1813. We must keep in mind that at the end of August, the territory on the lower reaches of the river Ohře was occupied by an army of a quarter million of men who have been preparing for the advance to Saxony. Construction works were organised and managed by trained officers from special companies of sappers (pioneers), who became a permanent part of the technical corps of the Austrian army since the era of Napoleonic Wars. One of their primary tasks was the construction of field fortifications (a division in the size of two companies was established in 1806, thus starting the era of permanent existence of a sapper corps in the Austrian army; Sáček 2010, 60). The tempo of fortification works is indicated by the reports on numbers of workers, who were allocated

to individual building sites: for example, the chronicles of rural municipalities of Cítoliby and Dobroměřice report on three thousand people working in the sector Postoloprty – Louny; however, the burgomaster of Louny, J. R. Wladika, writes in 1844 about deployment of twelve hundred people in the same sector (Smrž – Hlušík 2007, 723; more details on the numbers of workers in the region around Budyně, which is the main area of interest for this paper, see the last chapter).

Since the tactical and strategic aspects of the arrangement of the anti-Napoleonic defence line in the Lower Ohře Valley in 1812 (esp. the distribution of individual components of the defence line in relation to terrain relief and to the distances between them) and the appearance (typology, morphology) of individual earthworks were presented in detail in the mentioned work (Smrž – Hlušík 2007, 726–734), we will give only a brief summary of this problem. The main strategic goal of the defence line, as it was already mentioned above, was to protect the Schwarzenberg's Bohemian corps chased by French troops during their expected retreat through the Ore Mountains to the inland and to help launch a subsequent counterattack, where the fortification line should have been defended by Russian forces. Schwarzenberg's corps should have made an attack on the right (western) wing of the French army, and the Prussian army of Silesia, commanded by marshal Blücher, should have attacked the Frenchmen from Litoměřice. The fortification network in the first sector of the defence line between Postoloprty and Louny was relatively dense, individual installations were mostly located at a distance of about 100 metres to the north of the main (state) road leading from Prague through Louny and Chomutov to Leipzig along the southern bank of the Ohře River (Fig. 1).

The town of Louny was thoroughly protected by multiple defensive structures due to the nearby junction of main roads (Prague – Leipzig in the W–E direction and Prague – Slaný – Dresden in the N–S direction). The fewest forts were located in the middle sector of the defence line: within the distance of about 12 kilometres (as the crow flies) between Louny and Křesín only three sites were detected. However, they were concentrated in the eastern forefield of Louny, so that in the area to the east of this concentration – according to previous detections – there was no defensive post within about ten kilometres. The highest number of earthworks were distributed within the last, eastern, sector of the defence line in wider surroundings of Budyně nad Ohří, to which we will pay attention in the following chapter of this paper.

Regarding the typological representation of field fortifications, we can say that the studied defence line in the Lower Ohře Valley included both of the basic typological variants, that is, enclosed (Fig. 2) and open (Fig. 3) fortification features.

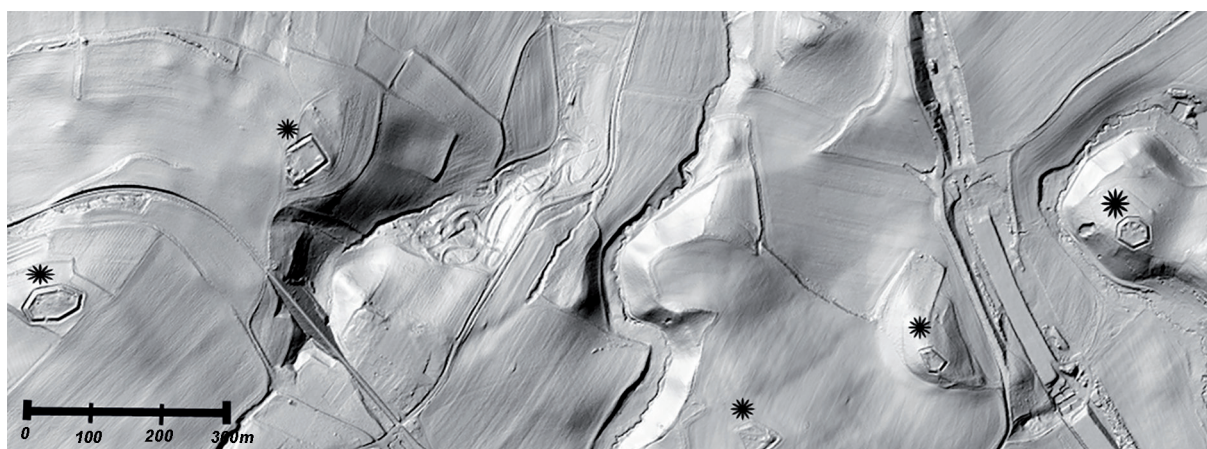


Fig. 2. Examples of typological variability of enclosed field fortifications (batteries, redoubts) preserved in the form of anthropogenic relief features from the turn of the 18th and 19th centuries (Central Bohemian Uplands, the neighbourhood of Habrovany and Žim); shaded relief model created on the basis of aerial LIDAR data (data and elaboration: project of the Department of Archaeology, University of West Bohemia in Plzeň).

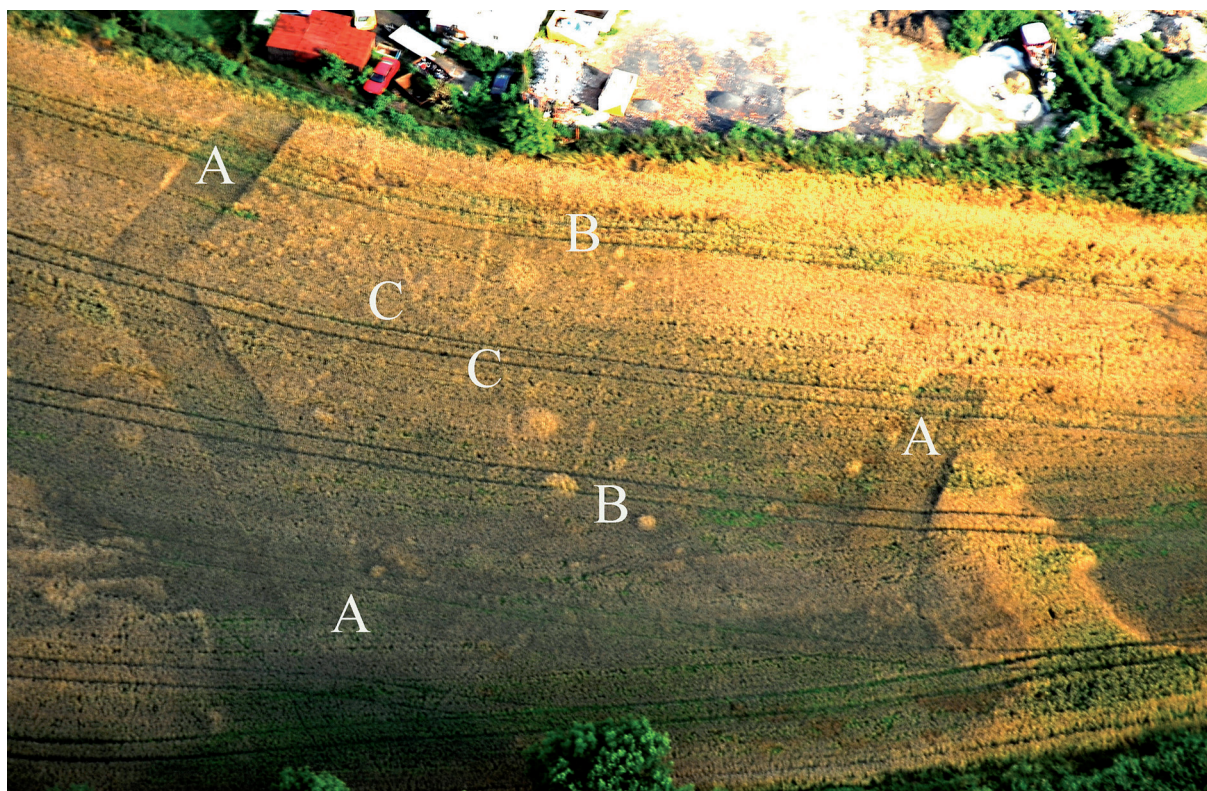


Fig. 3. Example of an open type of field fortification – lunette, one of the features of the 1813 defence line near Louny. The whole palimpsest of linear and spot features of prehistoric and historic origin buried under the ground surface is visualised through crop marks. A: lunette – element of field fortification from the final phase of the Napoleonic period; B: sunken-featured dwellings (Late Iron Age/Roman Period?) and settlement pits; C: layouts of trapezoidal enclosures, most probably foundation trenches for the walls of Late Neolithic aboveground houses (after Gojda – Gojda 2019). The author of all photographs included in this work: M. Gojda.

The first group comprises redoubts – earthworks used by both infantry and artillery troops, whose layout was either polygonal (mostly pentagonal and hexagonal) or right-angled (square, rectangular). This group also includes batteries, that is, artificially fortified artillery positions, each of them armed with a tactical unit of up to twelve guns. For example, individual batteries in the vicinity of Budyně nad Ohří, mentioned in historical sources, are reported to have had between four and twelve guns each. The group of open features of field fortification was most frequently represented by lunettes and redans (on the typology of late modern – early industrial field fortifications e.g. Kupka a kol. 2001, Meduna 1990, Grof 2010).

The results of long-term aerial survey and their importance for exploration and reconstruction of the eastern sector of the 1813 defence line on the Lower Ohře River

The field fortification line built in the summer of 1813 has been explored within a long-term aerial survey programme of the Institute of Archaeology of the Czech Academy of Sciences in Prague (1992–2015), whose partial projects integrated the data acquired from other remote sensing methods and from written and historical-cartographic sources. If we want assess the results of this research, we

should draw attention to several circumstances within the mentioned programme, which are related to the problems of modern military landscape. The existing knowledge of defunct field fortification facilities essentially represents a “by-product” of this programme because the interest in this element of historical landscape in Bohemia was never part of any particular (grant) project. However, it can be said that the gradual increase in the number of newly identified field fortification facilities and the enhancement of knowledge about these features (mainly due to repeated aerial photographing of some of these features, which are thus pictured in various types of crops in a variable contrast) gave rise to questions, which can be answered with the help of aerial survey. They regard the morphology of fieldworks, their localisation in the landscape relief, their number in areas of military significance threatened by an enemy invasion, their integration into a permanent defence system based on a combination of bastion forts and polygonal forts with a high concentration of soldiers and armament on the one hand and on a chain of field (infantry and artillery) fortifications on the other hand. When we want to study the impact of (economic) use of the landscape on transformation processes accompanying the one-time or gradual/long-term decline of these immovable relics, we should follow up the ratio of the number of completely defunct (buried) features to those, whose relics are still physically preserved in the terrain relief at various degree of destruction.

The reason for a gradual increase in interest for late modern field fortifications was the fact that their spatial distribution is associated to a great extent with the most fertile regions of the Bohemian Basin, that is, with lower reaches of major rivers (Elbe, Ohře, Jizera, Vltava), where the aerial archaeological survey has been conducted most frequently over the whole duration of the programme. These regions were chosen for at least two reasons. Firstly, their soils and geological conditions are most favourable for the emergence of the so-called crop marks (light soils on a sandy subsoil) and, secondly, these most fertile regions of the Bohemian landscape accumulate the largest amount of prehistoric and early medieval relics of settlement activities of our ancestors. However, as it is known, crop marks are able to indicate human impact on the terrain relief regardless of when it has taken place. In other words, it might have been at any time from the agrarian prehistory through to modern era. The wide alluvial valley of the still little-regulated Ohře River between Louny (at a smaller extent still more to the west, that is, between Žatec) and its confluence with the Elbe south of Litoměřice was one of the main areas of interest from the beginning to almost the very end of the programme of the Institute of Archaeology. Repeated survey campaigns were conducted here in the most productive months of the year (approximately from the mid-May to the second half of July, from the perspective of creation of crop marks).

The topic of this paper is related to the last, third, sector of the 1813 defence line on the Lower Ohře River, which is delimited in the west by the village of Poplze (on the southern bank of Ohře) and in the east by the village of Dušníky (see the map and the digital relief model in Fig. 4 with marked sites). In this transect, crop marks were so far used (except for the group of features Brníkov 1 and the feature Dušníky 1) to identify, photographically document and record (currently in the digital database Archaeological Map of the Czech Republic – AMCR) the sites that are named in the following catalogue (the toponyms in bold indicate features of field fortification, which were neither named and described in the work Smrž – Hlušík 2007 nor published elsewhere; about one-half of images were edited using the PhotoShop and Zoner Photo Studio software due to indistinct target features, which is evident, for example, in suppression of natural colours caused by artificially increased contrast). All cadastral communities in the following catalogue are located in the Ústí nad Labem Region, more precisely in the Litoměřice District.

1. **POPLZE 1** (in Fig. 4 marked as P1). Spatially extensive field fortification of the type hornwork or crownwork (dimensions: 155 x 65–90 m; ditch width: 3,5–4 m), situated on the northern slope of a distinct right-bank terrace of Ohře, rising above the river level at a length of ca. 10 km between Stradonice and Kostelec nad Ohří. In the place of the fortification (site “Salominka”), the terrace overtops the Ohře Valley by 30 metres. On the northern side of the feature, no ditch relics are preserved, so

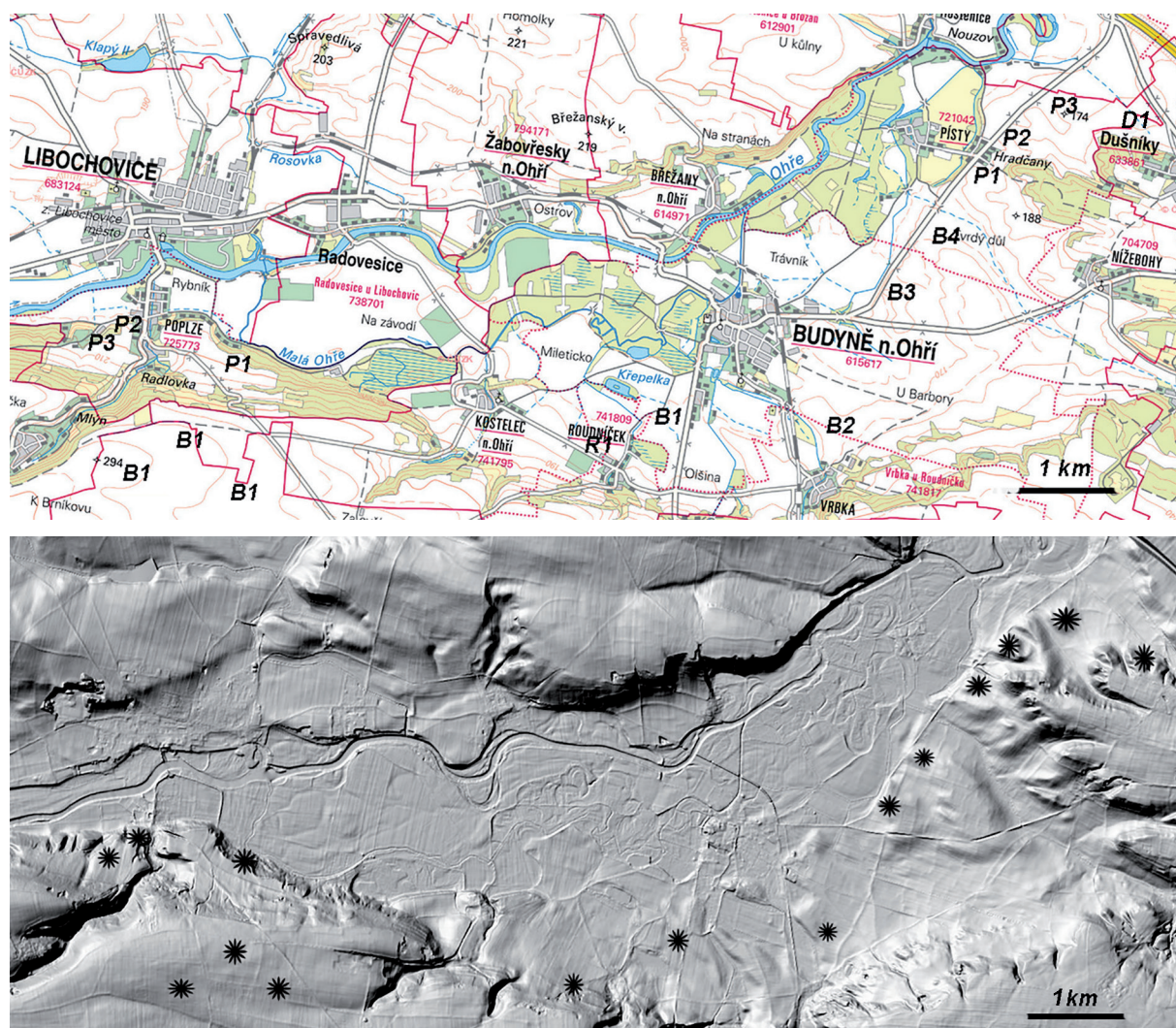


Fig. 4. Distribution of all sites mentioned in this work: a – base map; b – shaded relief model DMR 5G (State Administration of Land Surveying and Cadastre – Geoportal, <https://ags.cuzk.cz/dmr/>).

it cannot be decided whether this side was open (this is well possible with regard to the terrain configuration) or enclosed by a ditch which is not preserved due to colluvial erosion (Fig. 5). It can be supposed that this facility was intended to be armed with guns to protect the southern bridgehead of Libochovice, which is situated on the right bank of the river Ohře across from Poplze. While the plan published in 1999 (Smrž et al. 1999, obr. 1) shows a thin line of a palisade trench only on the inner side of the ditch (in the figure 5b borrowed from the work Smrž – Hlušík 2007, this line is not drawn at all), the detailed aerial image from June 2011 (Fig. 6) contains an interesting detail, namely that the palisade at the south-western corner of the ditch was diverted to outside, where it paralleled the outer edge of the ditch. From the ground plan of the feature in Fig. 5 it is evident that, unlike the situation in the 1999 plan, the middle part of its northern ditch line is interrupted not only by one but by three gaps.

This feature was the very first among the hitherto identified field fortifications in the territory of Bohemia. However, the oldest aerial images show only one part of the ditched enclosure, which was thus originally interpreted as a possible part of a local settlement of Knovíz Culture, or as a part of a multi-cultural hilltop settlement situated on the nearby site of “Viničky” (Gojda 1997); the entire layout of the feature was captured and properly interpreted later (Smrž et al. 1999, 335). The hornwork near Poplze is one of the two fieldworks of this type (the other is Budyň nad Ohří 3) which were detected within the studied sector of the 1813 defence line.

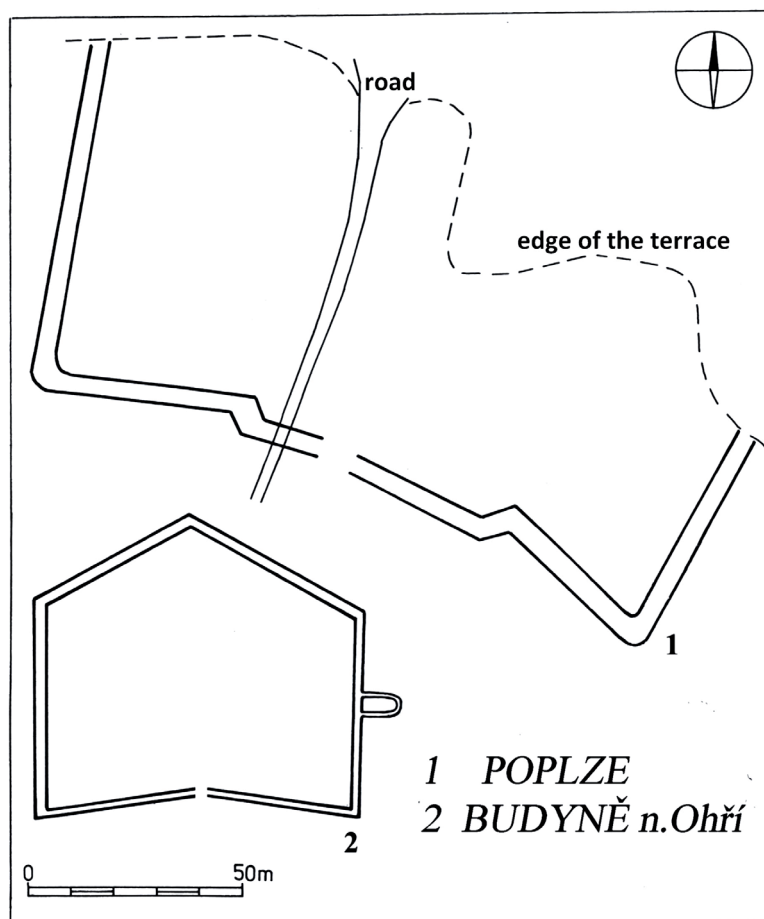


Fig. 5. Poplze 1. Field fortification of the type hornwork/crownwork. a – aerial photograph (23 June 2011); b – plan of the features Poplze 1 and Budyně nad Ohří 1 (edited after Smrž – Hlušík 2007).



Fig. 6. Poplze 1. Detailed view of the SW corner of the feature where the palisade trench, paralleling the ditch line, is redirected from its inner side to the outside. The photograph was taken two days earlier than the previous image (21 June 2011) at 19:50. The late afternoon long shadows enabled to capture this construction detail, which was not visible two days later due to worse light conditions.

2. **POPLZE 2** (in Fig. 4 marked as P2; Figs. 7 and 8a). This fortification, together with feature P3, was detected during a training course in aerial survey for archaeology students at the end of June 2012. The fortification is located on a spur ca. 770 m away from P1 and 350 m away from P3. The presence of a field fortification on this site was expected with regard to the extraordinarily favourable location (from a military viewpoint), so that its detection in the terrain was merely a matter of time. Although its layout is “contaminated” by surface runoffs and erosion grooves and is therefore more difficult to reconstruct, it can be with certainty identified as a polygonal (hexagonal or heptagonal) battery (with



Fig. 7. Aerial view of the landscape west of the village of Poplze with marked sites Poplze 1, 2, 3, situated at the edge of the Ohře River terrace. The town on the opposite bank of the river Ohře is Libochovice with well visible bridge.

a salient angle pointed towards the north, more precisely to Libochovice on the opposite bank of the river), which counts among the most frequent types of field fortification facilities in the Lower Ohře Valley (Smrž – Hlušík 2007, 730).

3. **POPLZE 3** (in Fig. 4 marked as P3; Figs. 7 and 8b). The feature located at the boundary between “Šebínská” and “Nad školkou” sites is a type of open fortification referred to as lunette. It is difficult to determine whether it was meant for artillery defence of the southern bridgehead of Ohře near Libochovice, or for protection of the surrounding area in case of an attack from the opposite side – if the enemy already crossed the river Ohře and operated in the territory south of the river. The former interpretation might be supported by the choice of an open fort, like P1, and the latter might be suggested by the fact that the feature is located out of the shooting range of the Libochovice bridge over the Ohře River and by the fact that its salient angle is pointed towards the north.



Fig. 8. a – Poplze 2, interpretation of the layout of a heptagonal or octagonal battery; the dark interpretation line is drawn parallel to the outer side of the line of former ditch; b – Poplze 3, a lunette whose front side is not directed towards the valley in the north but towards the plateau of the spur where it is situated.

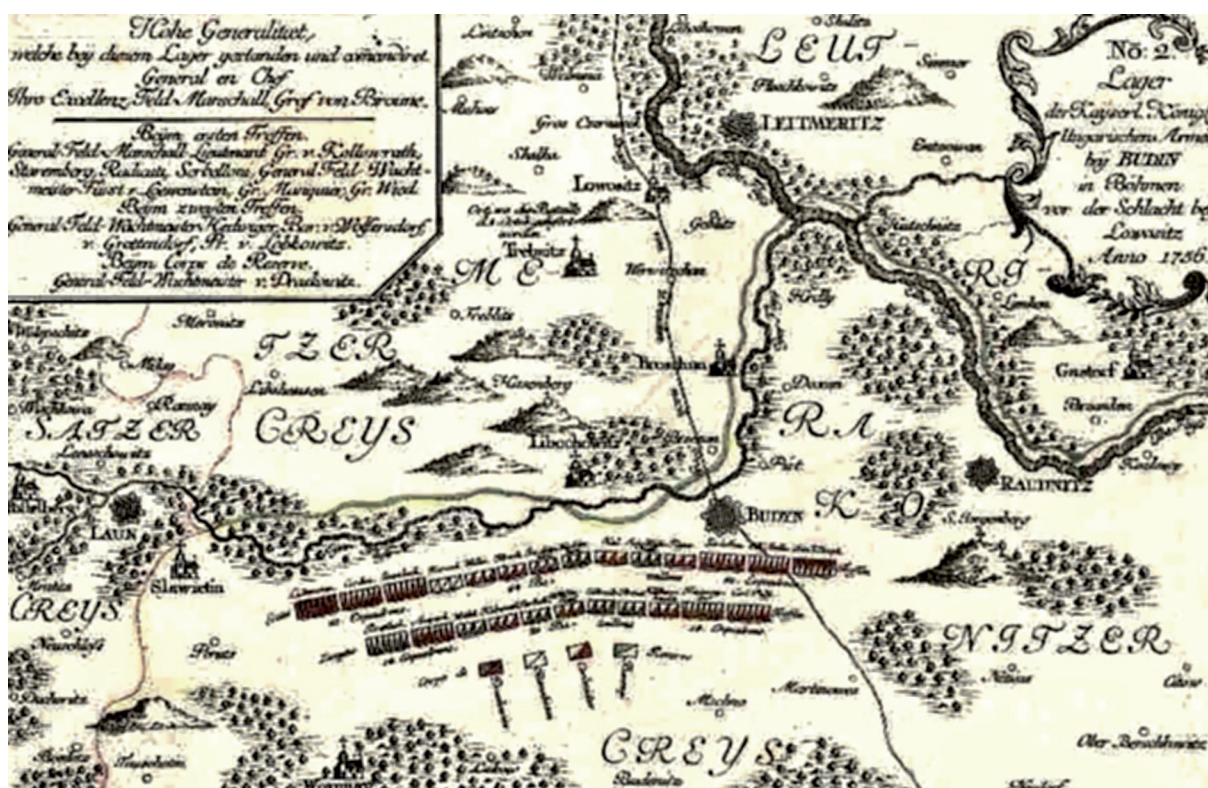
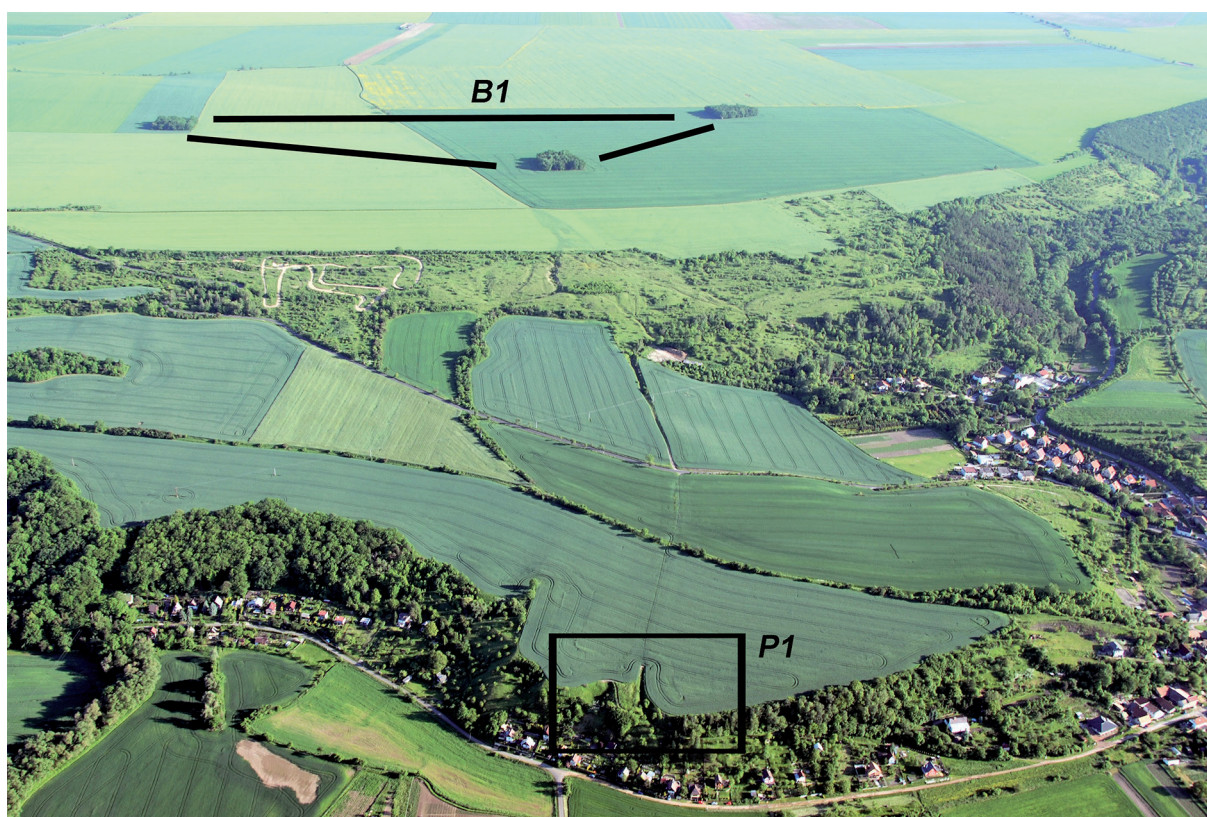


Fig. 9. a – spatial relation between the field fortification Poplze 1 (crownwork/hornwork) situated at the edge of the lower terrace of the Ohře River on the site “Salominka” and three buffer groves, most probably former (infantry?) camps (site Brníkov 1), where two of them are possible relics of a 1756 encampment of the imperial army; b – map of the Lower Ohře Valley with indicated imperial regiments positioned on the high right-bank terrace of the river Ohře during the campaign in the first year of the Seven Years’ War (1756), created for the supreme command.

4. **BRNÍKOV 1** (in Fig. 4 marked as B1). There are three quadrangular (more precisely slightly trapezoidal) wooded areas (Podbradecký, Poplzenský and Kamenný buffer groves) at the edge of an extensive plateau, which was completely deforested at least since the end of the 18th century (Fig. 9a). Because all three groves exhibit many traces of ditch lines at their perimeter (digital relief model on the website of the State Administration of Land Surveying and Cadastre <https://ags.cuzk.cz/dmr/> and the author's own terrain survey), it can be supposed that they represent relics of former military installations, probably infantry camps. While the maps of the First Military Survey contain only two of these features (the eastern and the northern one), the Second Military Survey has already recorded all three features. The two older facilities were probably built at the beginning of the Seven Years' War in 1756, as it is documented by a period map and by the depiction of an encampment of the imperial army in this area (Fig. 9b). The addition of a third camp/redoubt created a triangular system, where the north-southern axis of the central feature (closest to the edge of the Ohře River terrace) runs through the site Salominka where the feature P1 is located. This feature/buffer grove is the only one which is well visible at a distance of many kilometres from the opposite bank of the Ohře River.

5. **ROUDNÍČEK 1** (in Fig. 4 marked as R1). The fortification facility – a pentagonal or hexagonal battery/redoubt (with dimensions of about 70 x 65 m on the W–E and N–S axes drawn through the middle of the battery) – is located just behind the NW village border and its southern side adjoined the road leading from Vrbka to Kostelec nad Ohří (Fig. 10). The defunct farm road crossing the eastern and northern sides of the perimeter ditch, by all appearances, existed already before the First Military Survey. But later, the ditch was probably filled with earth from the levelled fortification feature so that the farm road overlaid the ditch. The crop marks indicating the course of the road in an aerial image thus seem to be younger than the backfilled ditch. In the catalogue of the work Smrž – Hlušík 2007, the site is referred to as Kostelec nad Ohří 19. The outline of this battery is very indistinctly visible on an orthophotomap of the server Mapy.cz – Aerial.



Fig. 10. Roudníček 1, most probably a pentagonal battery situated on the NW village border near the road to Kostelec nad Ohří.



Fig. 11. Budyně nad Ohří 1. Hexagonal battery with visible entrance in the middle of the rear (southern) side, which is bent slightly inwards.

6. BUDYNĚ NAD OHŘÍ 1 (in Fig. 4 marked as B1). The layout and dimensions (ca. 65 x 60 m on the W–E and N–S axes drawn through the middle of the battery) of this feature are similar to those of the previous redoubt near Roudnicek (the feature in Budyně is surely hexagonal); they differ from one another by the width of the perimeter ditch (in various places from 1,5 to 4 metres) and by the existence of a “lobe” (8 x 5 m), protruding from the upper half of the lateral (eastern) ditch; the function of this appendix is not entirely clear (it might have been the flanking area – the area of firing from the flank on the zone in front of the battery ditch; Smrž – Hlušík 2007, 730). The entrance to the fortification is situated in the middle of the southern ditch, which is slightly bent inwards. The function of this fortification, which was located in a place slightly overtopping the surrounding flatland (today by less than two metres, in the past probably by more), was to oversee the important road between Budyně and Slaný (Fig. 11).

7. BUDYNĚ NAD OHŘÍ 2 (in Fig. 4 marked as B2). Another redoubt, situated about 1 km (as the crow flies) southeast of the edge of the historical town centre, less than 1.4 km northeast of the fortification B1 and 2.3 km away from R1 (Fig. 12a–b). The shape is difficult to identify but it belongs to the same typological group as the two foregoing fortifications (pentagonal or hexagonal layout, but a modified hornwork is also possible).

8. BUDYNĚ NAD OHŘÍ 3 (in Figs. 4 and 15a marked as B3). Field fortification of the type hornwork (crownwork), located near the important road Budyně nad Ohří – Doksany – Terezín, about 1 km out of Budyně. It is the first one (counted from the beginning of the road at Budyně) out of six field fortifications arranged in a row along the eastern side of the road at distances of 0,5–1 km from one another. It is situated on a local hill Bruska (171 m ASL), currently overtopping the surrounding terrain by about 11 metres (Figs. 12c–d, 13a).

9. BUDYNĚ NAD OHŘÍ 4 (in Figs. 4 and 15a marked as B4). Polygonal (pentagonal or hexagonal) battery, less probably a lunette (the line of the ditch on the eastern side is unidentifiable; Fig. 13b).



Fig. 12. a–b: battery Budyně nad Ohří 2; c–d: Budyně nad Ohří 3. Fortification of the type hornwork/ crownwork. On its eastern side (farther away from the road) there is a distinct zigzag line of redans (bonnets?) – ditches paralleled by a thin line of a palisade trench on their inner side. The ditches are crossed by the lines of two defunct roads.

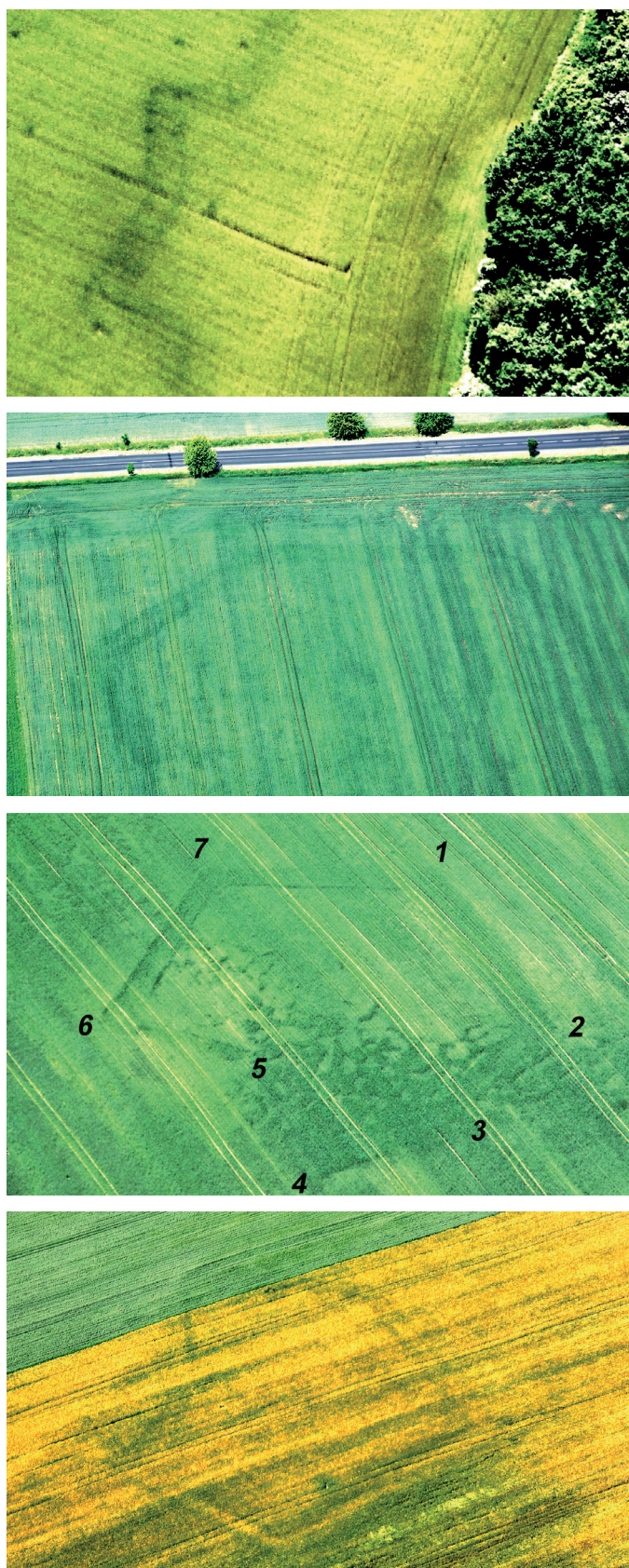


Fig. 13. a – detailed view of the middle part of the western side of the fortification feature Budyně nad Ohří 3 designed for placement of field guns; b – polygonal battery Budyně 4; c – Písty 1: polygonal battery with numbered bends of the ditched enclosure of the feature, No. 1 signifies the front side of the battery directed to the west towards the road; d – hexagonal battery Písty 3 with the rear (southern) side bent inwards; the salient angle in the front is pointed towards the north.

The layout is relatively well captured in a 2011/2012 orthophoto from the collection of aerial survey images of the State Administration of Land Surveying and Cadastre (<https://lms.cuzk.cz>).

10. **PÍSTY 1** (in Figs. 4, 15 and 16 marked as P1). One of the mostly (repeatedly) very well visualized batteries within the studied sector of the 1813 defence line (Fig. 13c). It is situated on a local hill (176 m ASL, elevation above surrounding terrain ca. 14 m), which is still marked on maps with the local toponym “Na baterii” (On the battery). The putative marking of this location with the name “Na kanonech” (On cannons) on maps of the Second Military Survey (Smrž – Hlušík 2007, 741) is incorrect; in fact it should be read “Na Račanech” (see Fig. 15b; on maps of the Third Military Survey, the place is marked as “Račana”), which is the name of a small village Hradčany east of Písty. It is a typical example of a polygonal – in this case even heptagonal – battery with a salient angle pointed towards the west, the same way as with feature B4, that is, perpendicular to the road (it is located at a distance of 80 m from the road), and with the eastern part of the perimeter ditch bent sharply inwards. Its entire layout is best captured on the server Mapy.cz – Aerial Map '06, a little worse on the Aerial (besides the battery we can see very well a defunct road from Hradčany to Nížebohy, which is captured for example on maps of the Second Military Survey, Fig. 15b; moreover, these maps may also show the battery itself, more precisely its relics, depicted as a small rectangle).

11. **PÍSTY 2** (in Figs. 4, 15 and 16 marked as P2). Probably a more extensive field fortification situated on a local hill (188 m ASL) with a central lunette (polygonal battery?). Two more ditches protrude in straight lines from the open ends of the lunette (at a distance of almost 90 m from one another) to the west and east, where the eastern ditch is directed towards the defunct road Hradčany – Dušníky (Fig. 14). The images give the impression that the fortification might have been intended to enclose a large area (ammunition dump, infantry field camp?). Figure 5 in the work Smrž – Hlušík 2007 placed this field fortification erroneously on the top of a wooded spur (in Fig. 15b it is marked with an X mark) situated more to the south (about 300 m away). However, the presence of some other defensive feature at this site cannot be excluded (Fig. 15–16).



Fig. 14. Interpretation of crop marks of the probably spatially extensive polygonal fortification Písty 2. The interpretation lines are drawn parallel to both sides of the ditch visualised by crop marks.



Fig. 15. a – general view of the landscape with marked positions of the sites Budyně nad Ohří 3 and 4, Písty 1 and 2, following the southern segment of the road between Budyně nad Ohří and Doksany, a view from NE; b – Second Military Survey: the surroundings of Hradčany (cadastral district of Písty) with marked positions of features P1 and P2. The X mark signifies the spur to which the work Smrž – Hlušík 2007 (figure 5) erroneously situated the field fortification P2.

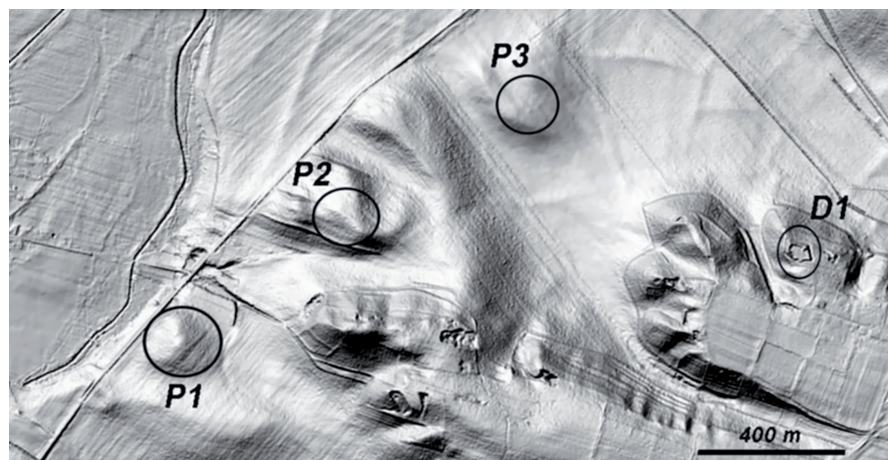


Fig. 16. The sites Písty 1, 2, 3 and Dušníky 1 in the shaded relief model DMR 5G (State Administration of Land Surveying and Cadastre, <https://ags.cuzk.cz/dmr/>).



Fig. 17. a – appearance of the polygonal battery Dušníky 1 in a detail of the shaded relief model DMR 5G (see the previous figure); b – a view of the preserved rampart of the battery Dušníky 1 from the north (March 2020).

12. **PÍSTY 3** (in Figs. 4 and 16 marked as P3). The last one among the completely destroyed (buried under the ground) features of field fortification in the region around Budyně. It was detected with the help of crop marks and is very well visible (Fig. 13d), also on the orthophotomap of Mapy.cz – Aerial Map '15. Typologically seen, it is the same type as battery P1 (hexagonal layout and the southern segment of the perimeter ditch bent relatively sharply inwards). The facility is situated on an elevation called “Bílé hlíny” (White clays) at the height of 173,5 m ASL and its dimensions are 80 m (W–E axis) x 60 m (N–S axis). It is located at a distance of about 550 m from the feature P2 and about 800 m from the redoubt D1.

13. **DUŠNÍKY 1** (in Figs. 4 and 16 marked as D1). Apart from the three redoubts on the high terrace of the river Ohře (Brníkov 1), this is the second site with a physically preserved feature of field fortification. Most probably it was the last fortification feature before a crossing of this defence line with another line leading from Litoměřice/Terezín to Prague. It is an irregular polygonal redoubt composed of an earthen rampart and ditches, which the author noticed on the 5G digital relief model of the State Administration of Land Surveying and Cadastre and subsequently photographically documented directly on site in March 2020 (Fig. 17).

Reports on field fortifications in wider surroundings of Budyně nad Ohří in historical sources. Conclusions

The works connected with construction of a network of batteries, redoubts and other military installations in the studied last sector of the 1813 defence line on the Lower Ohře River were also reflected in period reports, above all in local chronicles. These reports were collected and briefly summarised by Antonín Janda (1892, 58; cited after Smrž – Hlušík 2007, 723 sq.) in his History of the Town of Budyně nad Ohří. He wrote that a total of 13 batteries were built between Kostelec nad Ohří and Písty. In nine of them he also mentioned the numbers of guns which should have been placed in individual facilities (but this provision most probably was not made because the French troops eventually did not invade Bohemia). As regards the fortification features addressed in this paper, Janda mentioned that the Emperor Francis together with Charles, Prince of Schwarzenberg, made an inspection of fortifications on the Lower Ohře River and he wrote in this context that “... both of them set out for Poplze, where the last battery was standing...”. Other data refer to the batteries at Roudníček 1 (“eleventh battery past the village of Roudníček in the manorial field on the way to Kostelec, for 6 guns”), Budyně nad Ohří 1 (“a battery past the dam in the manorial field, for 4 guns”), probably Budyně nad Ohří 2 (“... north of the bog between Budyně and Vrbka, for 8 guns”), Budyně nad Ohří 3 (“... on the plots of land belonging to Budyně on the hill Bruska, for 12 guns”), and Písty 1 and 2 (“... one of two batteries before or past the village of Račany”).

Even though the data on numbers of workers summoned to build the defence line are sometimes different (for example, this work mentioned the reports from the sector Postoloprty – Louny), it is more than obvious that thousands of them were needed, so that the builders of fortifications in the Ohře Valley must have been also deployed from other regions. More than four thousand “rural people” from the surroundings of Mělník are reported to have been transported to the area around Budyně on 7 August (Smrž – Hlušík 2007, 723 – without reference to particular source).

Important reports on the activities related to the build-up of fortifications in the Ohře Valley in the summer of 1813 were published in the extensive work by captain Wilhelm Brinner from 1878–1881 about the history of sapper (pioneer, engineer) corps of the Austrian army. About the studied sector of the defence line he wrote that the right wing of this strongly fortified sector leaned on the village of Dušníky, the centre was located near Budyně and the left wing reached as far as the village of Poplze. The fortification, according to Brinner’s description, paralleled the elevation on the right bank of the river and was composed of enclosed redoubts and of artillery batteries positioned in between – this description roughly corresponds to our detections. Brinner also mentioned that over ten thousand locals were summoned to handle all the necessary fortification works (the data were borrowed from the publication Sáček 2010, 62).

As the foregoing lines have shown, the identification and documentation of features generally referred to as *field fortifications*, dating from the late modern times and from the beginning of the industrial era, depend to a great extent on the remote sensing methods. It is so because the wood-and-clay constructions of batteries, redoubts, redans, lunettes etc. were in most cases only temporary installations against the expected military attack and they usually were levelled to the ground soon after the end of the conflict to make the built-up area again available for economic activities, above all for agriculture. This mainly regarded those installations, which were located in the fertile agricultural lowland regions. Nevertheless, the situation in elevated areas (e.g. Central Bohemian Uplands and Ore Mountains) might have been exactly opposite and several fortifications were probably preserved for future military needs (in this connection, the site of Bříství 1 was mentioned). Most of these features in submontane regions and mainly in lowlands thus left none at all or only minimal traces on the ground surface (or in the terrain relief). Due to their relatively large dimensions they are mostly identified by non-invasive prospecting methods, above all by archaeological remote sensing. The results achieved within the study of field

fortifications in recent years have shown that the remote sensing landscape survey – which is primarily based on visualisation of buried features through crop marks – became one of the most important tools. The results presented in this work will hopefully confirm this statement.

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