

Rescue excavations at site 10 at Krzyżanówek, district of Kutno, province of Łódź (Route of A1 motorway)

Summary

Introduction (Piotr Papiernik)

The publication is the result of the study of rescue archaeological research at site 10 at Krzyżanówek, district of Kutno, which preceded the construction of the motorway A-1 in the province of Łódź (fig. 1). It was completed thanks to the co-financing by the Minister of Culture, National Heritage and Sport as part of the programme Preserving Archaeological Remains, 2021 edition.

The rescue research (fig. 2) was conducted in 2005 – 2008 supervised by Phd Jacek Moszczyński from the Museum of Archaeology and Ethnography in Łódź. The excavations were conducted in the area of 580,3 ares in total (fig. 2, 4) in the route of the motorway A -1 and in the area of the nearby flyover. The excavations resulted in unearthing 23188 vessel fragments, 904 flint objects, a bronze pin and not numerous charred bones, which are the remains of the settlements connected with the Mesolithic, the Funnel Beaker culture, the Corded Ware culture and the Trzciniec culture. There was also scarce material connected with the late Palaeolithic, forest zone cultural circle, the Lusatian culture, the Przeworsk culture, as well as the Middle Ages and the early modern period.

Among the 1338 archaeological features, the most common were various settlement pits and post holes, i.e. the remains of structures above the ground level (mostly houses from the Trzciniec culture). There were also partially recessed structures, such as half-dugouts, buildings with the preserved layer of the ground floor space, wells and bonfires. The fills of the features were described and presented in the publication based on the uniform list of the components from fig. 5.

The study of the sources was conducted by a team of researchers including : Rafał Brzejszczak, Błażej Muzolf, Przemysław Muzolf, Piotr Papiernik, Joanna Wicha and constitutes the basic part of this publication. It is supplemented by a description of the environmental conditions of the site at Krzyżanówek made by Piotr Kittel.

The publication also includes the results of the research and specialist analyses made by Rafał Brzejszczak and Joanna Wicha (non-invasive research of the site), Katarzyna Cywa (anthracological analysis), Joanna Kałużna-Czaplińska and Angelina Rosiak (organic remains found in the walls of the vessels), Marcin Krystek (analysis of the chemical composition of the pin) and Aldona Mueller-Bieniek and Krystyna Skawińska-Wieser (archaeobotanical research of the vegetation macroremains). Moreover, there were nine C-14 markings conducted by means of AMS method at the Poznań Radiocarbon Laboratory.

All the materials and the field documentation from the rescue research at Krzyżanówek was catalogued in the collection inventory of the Museum of Archaeology and Ethnography in Łódź and financed by the Konrad Jażdżewski Foundation for Archaeological Research.

Geological and geomorphological situation of the archaeological site at Krzyżanówek (Piotr Kittel)

The site at Krzyżanówek is situated north of the valley of the Ochnia river – the left-bank tributary of the Bzura river. It lies in the western part of the Kutno Plain in the vicinity of the Kutno moraine. The extensive Warsaw-Berlin urstromtal is located south of Krzyżanówek. Relief and lithology of the area of site 10 at Krzyżanówek were formed as a result of glacial morphology during the Vartanian stadial, and then underwent considerable transformation in the periglacial conditions, especially in the Upper Plenivistulian (Main Stadial of the Vistulian glaciation).

The excavated area is situated in the old-glacial morphological zone, connected with the activity of the Vartanian ice sheet. This is the period when the outline of the land relief and the surface geological structure was formed. The recessive Kutno phase of the Vartanian ice sheet is designated by the Kutno moraine, which is made up of accumulation forms of terminal moraines. The area in question is situated in their foreground. In the vicinity of the site, glaciotectonic deformations occurred, as well as the stagnation of the ice-sheet terminus, which is attested by the presence of forms of accumulation terminal moraines and recesses after the chunks of dead-ice.

During the Vistulian, the vicinity of Kaszewy and Krzyżanówek was situated ca. 20 km away from the Vistulian ice-sheet terminus in the Main Stadial, maximum phase. At that time a considerable re-modelling of the land relief took place in the periglacial conditions.

The main element of land relief in the excavated area is a system of denudation valleys, whose course resembles latitudinal layout. North-west of the site they form a valley, which joins the valley of the Ochnia river near Krzyżanów. The forms are filled with sands and deluvial silts, as well as mud deposits which are no more than 2.0m thick. At the exit section of the valley Vis-

tulian river sands were found which make up the terrace, as well as sands from the valley floor. In the close vicinity of the site, south and south-east of its area there is an extensive moraine hill, reaching 112 m AMSL and made up of sands, gravel and Vartanian ice-sheet boulders, Kutno phase. The form was regarded as the accumulation, terminal moraine. West of the site there is a terminal push moraine of the transgressive Kutno phase, reaching 115 m AMSL. It is the main topographic point in the vicinity of the site. Approximately 0.5 km north-west of the site towards the village of Kaszewy there is a small stagnant plain made up of loams and stagnant silts attributed to the Kutno phase, c.a. 20 m thick.

The site is situated within the range between 103.75 m along the axis of the denudation valley closing the area from the north to 106.5 – 107.0 m AMSL in the southern plain section of the site. Archaeological features have not been recorded in its northern lowest part, below 105 m AMSL. The boundary of the site was not discernible in the southern and south-eastern part of the site. It occupies a hill facing north-east, with the inclination between 0.4° and 1.2° and the medium inclination – 0.7°. Settlement features mainly occupy the upper part of the slope and the adjacent plain area.

The vicinity of the site is dominated by till of the Vartanian Stadial, which make up the undulated morainic plain. They are c.a. 30 m thick. The southern and south-western section of the site is made up of glacial sands and gravel. This part of the site has the largest number of archaeological features connected with the settlement of the Neolithic and the early Bronze Age. The sediment makes up moraine forms, i.e. accumulation terminal moraines. In the place of the greatest number of features connected with the Trzciniec culture underneath a 1.5 m thick gravel-sandy sediments, a level of loam-silt sediment was unearthed. On the slope descending northwards towards the denudation valley there is a cover of sands with gravel and sands changing into deluvia, which fill the denudation valley. The substrate of slope sands occasionally contained till, loams and silts.

The site at Krzyżanówek is characterized by untypical location qualities, possibly connected with agriculture (mainly extensive crop cultivation and animal breeding) and raw material exploitation of the plain zone in the close vicinity of the floor of the Warsaw-Berlin Urstromtal.

Late Palaeolithic and Mesolithic settlement (Piotr Papiernik)

The analysis of flint artefacts unearthed at site 10 at Krzyżanówek has revealed forms characteristic of the late Palaeolithic, as well as the group of sources connected with the Mesolithic, especially with the Janisławice culture (cf. P. Papiernik, Flint materials, current volume). The spatial distribution of the materials (fig. 9) permits the assumption that the area of the site was penetrated multiple times by hunter-gatherer groups at the end of the Pleistocene and in the early and middle Holocene. The majority of sources from the Mesolithic were recorded in the eastern part of the excavated area, especially in the area of land directly adjacent to its borders (fig. 9). Among a large number of the unearthed flint artefacts (cf. fig. 25) there were forms characteristic of the Mesolithic, including cores (fig. 37:3; 38:1), core preparation forms (connected with the preparation and exploitation of microlithic cores), microlithic blades, tools (fig. 37:4; 39:3) and a microlith (fig. 38:2). Moreover, the non-invasive research has revealed more artefacts connected with the Mesolithic (i.e.: core, side-scraper, trapezoidal microlith) in the eastern part of the site. Taking the above findings into account, it can be assumed that Krzyżanówek was the place of remains of Mesolithic campsites, which in total covered the area of at least a few dozen ares. Distinguishing such an inhabitation zone is rather surprising, since it is located in the area of a high plain, on a moraine hill (cf. P. Kiteł, current volume). The vicinity of the site was not characterised by elements of geographical environment typical of the Mesolithic settlement (cf. P. Kittel, current volume), e.g. in the form of a river valley, remains of a reservoir, or terrain forms made up of the sediments of aeolian origin (cf. B. Bagniewski 1987; M. Kobusiewicz 1999; T. Galiński 2011).

Neolithic settlement (Piotr Papiernik, Rafał Brzejszczak, Joanna Wicha)

During the rescue research at Krzyżanówek numerous and diverse archaeological sources have been unearthed, which can be connected with the Neolithic. They included materials of the Funnel Beaker culture, Corded Ware culture and the forest zone cultural circle.

The Funnel Beaker culture settlement

The remains of the settlement of the Funnel Beaker culture consisted of 1717 ceramic fragments in total (table 1), some flint artefacts (cf. P. Papiernik, Flint materials, current volume), 17 features recessed into the earth (fig. 116) and probably two fragments of stone axes. The sources were located mostly in the central part of the site, in the area of approx. 1.5 ha (fig.10). 17 features recessed into the earth have been unearthed at the site, which can be associated with the Funnel Beaker culture settlements, on the basis of the ceramic materials found in their vicinity (fig. 116). The majority of them was found in the eastern part of hectare III (fig. 10, 116), where the possible remains of the Funnel Beaker culture settlement were recorded. They form two clear clusters in this area, which can be linked with two smaller inhabitation units e.g. type of homesteads (A. Pelisiak, 2003). This can be attested by the spatial distribution of a rather large number of vessels unearthed in their vicinity (fig. 10).

Ceramic materials of the Funnel Beaker culture were mostly unearthened in so-called cultural layer, mainly in hectares I and III. They formed a polycentric zone of artefact occurrence, with 118 fragments in one are of land (c.f. fig. 10). Moreover, vessel sherds from this culture were found in different parts of the excavated area, either as single fragments or in smaller groups, especially in its eastern part. Only a small part of the assemblage in question (144 fragments) was found in the recessed features connected to the Funnel Beaker culture.

Determining the chronology of the sources of the Funnel Beaker culture, ~~with no C-14 dating~~, was out of necessity based on the analysis of pottery, as no C-14 dating was available. The assemblage of vessel fragments from Krzyżanówek was characterised by meagre decoration, represented by a regular, rectangular stamp placed under the mouth of the vessels, on the exterior surface only (fig. 14:1, 2, 8, 9; 15: 1, 7, 10, 12). Noteworthy is the lack of so-called zigzag motif occurring neither on its own nor in combination with the above-mentioned decorative motif. Other forms of decoration of the mouths of the vessels are by far less common in the analysed assemblage. However, moulded bands (fig. 14:7) and corrugated rims are distinguishable. Bellies were decorated only with irregular stamps and incisions placed in the upper parts of the vessels (fig. 15:6, 8). There were no decorations in the form of ladder-patterns or engraved lines. The above mentioned set of decorations is mainly characteristic of the beginnings of the Wiórek phase of the eastern group of the Funnel Beaker culture (T. Wisłański 1979). In the case of the neighbouring areas, i.e. Kuyavia we should point to phase III A after A. Koško (1981) or the beginnings of the classical phase in the Brześć Kujawski and Osłonki region, after R. Grygiel (2016). In the region of the Gostynin Lakeland it is dated to the end of phase I and the beginning of phase II of the development of the settlement of the Funnel Beaker culture, after M Rybicka (2004). Ceramic inventories from these regions which contained materials similar to those found at Krzyżanówek include e.g. : site 35 at Łojewo (M. Szmyt 1992), site 23 at Grzybowo (trench III – M. Rybicka 2001) and site 1 at Lipa (P. Papiernik, M. Rybicka 1998). The areas in the vicinity of Krzyżanówek are unfortunately very scarcely researched when it comes to the settlements from the Stone Age. In spite of that, it is worth noting the materials of the Funnel Beaker culture have their counterparts at site 1 at Dzierżówek (the Łowicz – Błonie plain – B. Muzolf, P. Muzolf, P. Papiernik, J. Wicha, D. K. Płaza, in print) and a meagre assemblage from sites 1 – 2 at Zgórze (the Kutno plain – B. Muzolf, M. Frączak, P. Muzolf, D. K. Płaza 2015).

The remains of the settlement of the Funnel Beaker culture were discovered as a result of the rescue research at Krzyżanówek in the area of over 2 ha. Relatively abundant ceramic and flint materials as well as recessed features unearthened in the central part of the site point to the existence of a settlement from the beginnings of the Wiórek phase (fig. 10). The settlement was recognised in the area of at least a few dozen ares and possibly extends to the unexcavated part of hectares II and IV. The remaining sources unearthened at the site may indicate the economic exploitation of the close vicinity of the settlement, as well as the existence of younger settlement episodes.

The above description does not exhaust the topic of the Funnel Beaker culture at the site and in its vicinity. Other important data were provided by non-invasive research (R. Brzejszczak, J. Wicha, current volume) and rescue research conducted in the route area of the motorway at the neighbouring site 1 – 7 at Kaszewy – Kolonia (c.f. fig. 5 ; R. Brzejszczak, T. Matysiak 2011). A multi-hectare settlement complex in the area of the Kutno plain was for the first time discovered during this research. It confirms the permanent inhabitation of the area by the community of the Funnel Beaker culture. Cultural patterns discovered at Krzyżanówek are clearly discernible in ceramic and flint materials and are similar to the rules that can be observed in the area of Kuyavia and the Gostynin Lakeland. The sources of cultural or migration ~~impulses~~ inspirations are to be sought in these areas. They led to the settlement of the Funnel Beaker Culture in the initial Wiórek phase in these areas, which from the south border on Kuyavia.

The Corded Ware culture settlement

The rescue research at Krzyżanówek has revealed the remains of the settlement of the Corded Ware culture, including 198 vessel fragments (table 2), two settlement pits (fig. 17, 116), a cluster of pottery (fig. 17, 116) and a part of a flint assemblage (cf. P. Papiernik, Flint materials, current volume).

The distinguished decoration and morphology of the vessels of the Corded Ware culture point to the presence of artefacts with diverse chronology. The “old Corded Ware culture” traditions are represented e.g. by various decorations in the form of engraved single lines (fig. 20:30) or combined with stamps (fig. 21: 1, 6) as well as in the form of a herringbone pattern (fig. 21:4). The earlier development phases are indicated by the results of the C-14 analysis of an organic substance found on the vessel from feature 54. The result was 3870 ± 35 (Poz - 139995), which with 68.3% probability corresponds with the period between 2454 to 2291 BC, and with 95.4% probability- to 2463 – 2208BC. The above dating (fig. 19) should be correlated with the development of so-called local groups of the Corded Ware culture according to J. Michnik (1979) or to phase III in Lesser Poland (after P. Włodarczak 2006, cf. also P. Jarosz, P. Włodarczak 2007), and in the case of Kuyavia to the cultural groups described by J. Czebreszuk (1996:2001) as the Corded Ware culture 3 and Corded Ware culture 4. The interpretation of the majority of the ceramic materials from Krzyżanówek is compliant with the dating. We observe the presence of large beakers bearing zone,

corded decorations (fig. 21:10; 22:4), different types of pots (fig. 20: 1; 9:21:2; 22:2) as well as jugs (fig. 20:8). Noteworthy is the lack of distinguished elements characteristic of the youngest groups of the Corded Ware culture e.g. pot-like beakers or developed decorations of vessel bellies in the forms of various festoons “draped triangles”, “beam-like” motifs etc. (cf. J. Machnik 1979; P. Włodarczak 2007; J. Czebreszuk 1996; 2001; A. Matuszewska 2011). The rules of pottery making are also important for chronological speculations. The materials from Krzyżanówek were made of clay with the admixture of grog, sometimes mixed with sand. They were also made of so-called clean clay, with no mineral crushed stone. This formula of clay is connected mostly with the “old Corded Ware culture” tradition. According to J. Czebreszuk (1996, 2001) the use of mineral admixture in Kuyavia is of chronological significance and is the indicator of younger groups of the Corded Ware culture.

Based on the research, it should be assumed that between several and over a dozen small campsites functioned in the area of the site at Krzyżanówek (fig. 17). Their remains are scarce artefacts, including fragments of several vessels and flint artefacts, as well as single features recessed into the earth, found in the area of 1 – 2 ares.

Unearthing movable materials, recognising settlement rules and conducting the first C-14 dating enriched the knowledge we had about the Corded Ware culture in the area of today's central Poland in its broadest meaning. So far, the materials have been known from several accidental discoveries (H. Wiklak 1976) or have been attested by meagre assemblages acquired during rescue excavations of several sites (cf. P. Papiernik 2001; L. Czerniak, J. Kabaciński 2003; J. Czebreszuk, M. Szmyt 2006; B. Muzolf, M. Frączak, P. Muzolf, D. K. Płaza 2015).

The rules of the site inhabitation recognised at Krzyżanówek are compliant with the hitherto views about the mobile or even nomadic character of the Corded Ware culture settlement (cf. J. Machnik 1979; P. Włodarczak 2006; J. Czebreszuk 1996; 2001; A. Matuszewska 2011). Discoveries of small settlements and campsites similar to Krzyżanówek are increasingly often found in different areas of Poland (cf. e.g. J. Czebreszuk 1996; 2001; J. Machnik, E. Sosnowska, W. Chyłek 1997; A. Czekał-Zastawny i in. 2003; P. Papiernik 2004; 2018).

The settlement of the forest zone cultural circle

At least 6 ceramic fragments (fig. 24) unearthed in different parts of the site (fig. 23) are attributed to the forest zone cultural circle. They point to the penetration of the site in the late Neolithic and at the beginning of the Bronze Age.

Flint Material (Piotr Papiernik)

Rescue excavations at site 10 at Krzyżanówek have yielded 904 flint artefacts (table 4). The main group (808 specimens) is made up of material excavated in the so called cultural layer, recorded in the eastern and central part of the site and in various humus layers, mainly in the bottom sediment part of the arable layer. The features, which were dated to the Neolithic, older periods of the Bronze Age or were of undetermined age contained almost 100 flint artefacts. The assemblage in question consists of artefacts excavated on the surface of the whole trench, with the greatest accumulation in the eastern and central part of the site, where a series of clusters dated to the Neolithic and older periods of the Bronze Age have been unearthed (fig. 25). Due to the specific character of the materials, which are in general typologically and morphologically undiversified, they were described according to the main, universally acknowledged classification categories, with the distinction between specimens based on core preparation and splintering technique.

The raw material structure of the assemblage is definitely dominated (90%) by forms made of the local erratic flint, so called Baltic flint, mainly represented by variant A (non-pebble stone). Imported raw materials mainly include chocolate flint – 66 artefacts (7.3% of the assemblage). These are specimens of different typological groups, dominated by blades and blade tools with the presence of core-preparation forms, flakes, splintered pieces, flakes obtained from splintered pieces and in one case a core for blades. Moreover, one fragment of a flake from the Świeciechów flint has also been unearthed. The assemblage also contains four specimens made of not well determined Cretaceous raw material of high quality. It includes one fragment of a massive, regular blade, two flakes and one flake obtained from a splintered piece with preserved negative scars of core preparation. Morphological features of the specimens imply their possible link with the Neolithic. Raw surfaces preserved on flakes in the form of a thin white cortex indicate that the artefacts in question are probably made of the Volhynian flint. A different specimen is a typological end-scraper from the Jurassic flint (fig. 40:3) which can be described as pistol flintlock or an element of hunting weapon, dated to the 17th-19th c (cf. e.g. R. de Latout 2009).

On the basis of a detailed analysis of flints from Krzyżanówek it may be concluded that they were formed in different periods and made by communities of various archaeological cultures. Most of them chronologically correspond with the settlement sequence of agricultural communities from the Neolithic and older periods of the Bronze Age. However, due to the conditions of unearthing the greatest part of the assemblage in so called cultural layer, distinguishing complete flint structures that would correspond with particular phases of the site's inhabitation is very difficult or simply impossible (cf. A. J. Tomaszewski 1997). Therefore, while attempting an interpretation, morphological qualities of the most characteristic artefacts and flint groups were

taken into account, as well as their spatial distribution. This aimed at the division into smaller assemblages corresponding with the consecutive periods of pre-historic settlement at the site.

Most probably, the oldest material corresponding with the settlement from late Pleistocene and the beginning of Holocene are blades knapped from double-platform cores, characteristic of the Mazovian cycle (fig. 40:8; 46:1). It includes a specimen which does not raise many doubts, i.e. a blade with a clear usage retouch, unearthened in are 95, hectare VIII (fig. 40:8 – cf. e.g. R. Schild 1975).

A group of materials with clear, chronologically relevant qualities consists of specimens connected with the Mesolithic. It includes microlithic cores for blades (fig. 37:3) and cores for blades and flakes (fig. 38:1) with meticulous exploitation and discernible initial core preparation, as well as the blade semi-product knapped from such cores. The tools include : a microlith of Wieliszew type on blade (fig. 37:3), a microlith of Wieliszew type on blade/flake (fig. 38:1), most probably a side-scraper (fig. 37:4), and possibly a microlithic end-scraper (fig. 88:1). The group in question also contains some part of debitage, including delicate core-preparation forms and a not very well-determined group of flakes. Judging by the characteristic specimens (cores and tools), Mesolithic artefacts were made of the Baltic and chocolate flint (cf. table 4). They were mainly unearthened in the south-eastern corner of hectare II, where they form a Mesolithic settlement zone, several ares large. On the basis of the microlith of Wieliszew type and the exploitation of the chocolate flint, there seems to be a link between the material in question and the Janisławice culture (cf. S. K. Kozłowski 1972). Moreover, several specimens with Mesolithic traits (inter alia the previously mentioned end-scraper) have been unearthened next to the eastern cross-section of the trench, in hectare III and IV, which considerably widens the range of Mesolithic settlement. Thus, it should be assumed that there were at least several settlement incidents of the hunter-gatherer communities, and their remains have the form of flint artefacts unearthened in different sections of the site. The above remark may lead to the conclusion that the area of the site was a frequently penetrated place for the groups of hunters-gatherers. Interestingly, the area in question is situated in the high plain zone, void of valley forms, i.e. not in the classic environment of a Mesolithic settlement.

The next chronological horizon, with which the unearthened artefacts can be linked is the Neolithic. We should mainly highlight specimens made from single-platform cores with mediolithic parameters (cf. B. Balcer 1983) and splintered pieces made as a result of reduction of forms following core preparation (fig. 43:3). On the basis of characteristic forms of so called core-preparation forms (fig. 35:5; 43:4), blades and tools, it should be concluded that also in this case imported raw material (chocolate, Świeciechów and possibly Volhynian flint) was used alongside the Baltic flint. The analysis of spatial distribution of the above mentioned forms, which is compliant with the greatest intensity of the settlement of the Funnel Beaker culture (cf. fig. 10; 25; 34) may indicate that most Neolithic materials are connected with that culture. The observation is additionally confirmed by the stylistic and chronological description of the Funnel Beaker culture pottery, where elements of the Wiórek phase have been found, including the similarities to site 3 at Lipa in the Gostynin Lakeland (cf. P. Papiernik, M. Rybicka 1998). It seems that flint processing of the Funnel Beaker culture at Krzyżanówek resembles that recorded at the previously mentioned site.

While discussing Neolithic forms, one should highlight specimens excavated in feature 54 (are 91 hectare IV) with the relatively numerous fragments of vessels of the Corded Ware culture (cf. J. Machnik 1966, P. Włodarczak 2006). Marking chocolate flint in the context of the consecutive settlement phase, represented by at least several campsites, makes the cultural attribution of flint materials particularly complicated, especially regarding artefacts with Neolithic qualities.

Alongside forms of the Corded Ware culture, there are also specimens of late Neolithic and early Bronze provenience. These are two arrowheads (fig. 41:4; 43:1) and a number of tools made from various kinds of semi-product (flakes, flakes obtained from splintered pieces, splintered pieces) with meticulous semi-flat or partially surface retouch, whose cultural attribution seems impossible to establish (cf. fig. 36:3; 37:5; 42:3; 45:2, 7). They may be connected with the Corded Ware culture, but also with a well-developed settlement of the Trzciniec culture.

We still need to describe the basic part of the flint assemblage from Krzyżanówek, which was formed as a result of applying hard hammer. The sources were classified as two main groups. The first one, which comprises the greatest part of the assemblage in question includes the remains of splintering exploitation of the local erratic flint. The analysis indicates that the primary forms were small lumps found in the vicinity. Concretions became splintered pieces without any additional processing. Also artefacts that were formed during the exploitation of splintered pieces (flakes obtained from splintered pieces, fragments of lumps, larger crumbles) were processed by means of the same technique. The group in question is also connected with a considerable number of crumbles and pieces of fragmented lumps as well as flakes, especially the larger ones and covered by raw surfaces with butts of striking platforms. It is worth emphasizing the presence of morphological tools and specimens with the usage retouch (cf. table 3). Apart from retouched forms there was also one specimen of a possible semi-product of an arrowhead. An interesting specimen is a retouched flake, most certainly an insert of a cutting tool with intensive polishing (fig. 39:5), which has analogies in the specimens unearthened in the early Trzciniec site at Rybiny (site 17) in Kuyavia (P. Makarowicz 2000). The second group, relatively

scarce, includes specimens formed as a result of preparation of flake exploitation of small cores with unprepared platforms, with no initial core preparation. It aimed at obtaining short and squat flakes, up to 3 cm large, whose width frequently exceeds the length of particular specimens (c.f. fig. 29). As it seems, such a semi-product could have been used for the production of arrowheads, which is attested at the site by the presence of three specimens of semi-products (fig. 37:1; 41:5). An essential quality of flint processing with hard hammer is preparing the tools directly from the lumps of raw material and flat crumbles- pseudoflakes (fig. 37:5; 40:4, 5; 41:8; 47:4). At the current stage of research it seems that most material in question should be linked with the settlement from the Bronze Age II and III discovered at the site, which P. Muzolf attributed to the Trzciniec culture. The conclusion is based on the spatial correlation of such dated remains of settlements with the greatest intensity of sources and the comparative analysis with well dated assemblages from Central Poland (e.g. Cieszanowice, site 1 – P. Papiernik 1994; Borek, site 1 – B. Maryniak 1987; Wrząca-Parcele, st. 1 – P. Papiernik 2008) and Kuyavia (Rybiny, site 14 and site 17 – P. Makarowicz 1997, 2000), which contain similar elements, particularly with reference to the stylistics of the tool group.

The youngest element of the flint assemblage from Krzyżanówek is the used flintlock, which attests the exploitation of flint in the early modern period.

Flint artefacts from Krzyżanówek confirm multiple and very diverse settlement incidents of human communities from the late Palaeolithic to the early modern period. Apart from the communities of hunters and hunters-gatherers, most of them are connected with settlements and campsites of agricultural cultures from the Neolithic (Funnel Beaker culture, forest zone cultural circle, Corded Ware culture) and the older periods of the Bronze Age. The material appeared difficult to determine, both chronologically and culturally. However, it can be observed that most of them are connected with the long-lasting settlement of the Trzciniec culture. On the basis of the material from Krzyżanówek, it can be concluded that flint processing of the culture is characterised by the use of hard hammer exclusively, which resulted in morphologically undiversified forms with a clear prevalence of specimens from the group of splintered pieces and production of small tool forms made from the flake semi-product, semi-product obtained from splintered pieces and flat crumbles. These include simple retouched forms, as well as specialized tools in the form of inserts of cutting tools and probably arrowheads.

Settlement of the Trzciniec cultural horizons from the older and middle Bronze Age (Przemysław Muzolf)

Materials linked with the groups of the Trzciniec cultural horizon are the most abundantly represented chronological level recorded at the site at Krzyżanówek. The remains of the settlement have been unearthed in the area of 350 ares, mainly in the eastern and central part of the excavated area (fig. 69, 116).

Among settlement features, 291 can be attributed to the Trzciniec cultural horizon, basing on the unearthed material. The most numerous ones include 248 settlement pits, which comprise 28 storage pits and 220 not well determined features. 30 features are interpreted as post holes, 6 as pottery clusters, 2 as wells and 5 as the remains of dwelling buildings. The latter include the following features: 409 (fig. 60, 61), 500 (fig. 50, 51:1), 660 (fig. 58, 59), 669 (fig. 58, 59), 920 (fig. 63), which were observed during excavations as extensive humus layers measuring approx. 630 – 1060 × 390 – 600 cm and between 20 and 70 cm deep. Four of them have yielded a large amount of archaeological material in the form of vessel fragments (between 60 and 407 fragments) and daub crumbles with the impressions of perches, up to 3 cm in diameter. It is important to note the presence of post holes within the structures, which must have been part of wall constructions of post in ground houses. In the case of two features (500 – fig. 50 and 669 – fig. 58) it is possible to assume the presence of alleged two utility areas, judging by the form of features and distribution of post holes. Distinguishing the remains of dwelling buildings is an important premise for the designation of homesteads which constitute the main unit of spatial organisation of the Trzciniec cultural horizon settlement.

Two unearthed features have been described as alleged wells – feature 840 (fig. 55:2) and 844 (fig. 55:4). Only one of them, however, feature 844 contained ceramic material (21 ceramic fragments) attributed to the Trzciniec cultural horizon. Feature 840 has a circular layout, measuring 224 × 208 cm and 132 cm deep. At the depth of 90 cm, the feature bore faintly discernible traces of timber which may indicate that the walls were strengthened by e.g. braided wicker or lining with log construction, with large stones at the bottom (fig. 55:2).

The second feature (feature 844) is interpreted as a well. It has an oval shape, measures between 329 × 170 cm and is 160 cm deep. In the cross-section the feature was hollow in its central part. At the depth of 50 cm it was thinned and oval-shaped, measuring 90 × 65 cm (fig. 55:4). At the depth of 90 cm, the well had a partially stone construction which supports the walls (fig. 54:4).

Analysing the composite map of the trench, it can be observed that the eastern zone of the site attracts attention. It is characterised by the density of features dated by means of ceramic material, as well as features with undetermined chronology (fig. 116). This part of the trench was also most abundant in ceramic material in so called cultural layer (fig. 69). The combination

of the above observations and the results of analyses of ceramic material, as well as the character of particular features and location of buildings of dwelling character permits designating 11 homesteads within the boundaries of the site, marked from I to XI (fig. 62). They have been distinguished on the basis of the groups of dated features. Features with undetermined chronology were also classified as part of homesteads.

Most homesteads occupy the area between 5 and 9 ares. Only two features, I and III, cover the area of over 10 ares. In five cases (I, III, IV, V and VI) it was possible to reconstruct the layout of alleged buildings of dwelling character, on the basis of the preserved post holes. As regards the size, they can be divided into two groups. The first one includes buildings between 9 and 19 sq m, i.e. small buildings, most commonly found at the settlements of the Trzciniec cultural horizon (P. Makarowicz 2010, fig. 2.56). The second group consists of medium-sized and large buildings between 40 and 54 sq m (P. Makarowicz 2010, fig. 2.56).

In the case of buildings with log construction, whose presence is highly probable in homesteads : II, V, VII and XI, their area ranges from 19.0 – 32 sq m and 50 sq m. In the case of homestead I, it can be supposed that the construction was a pen for animals, covering an area of c.a. 25 sq m.

An important observation is the designation of two features interpreted as wells within the boundaries of homestead II, as it is quite atypical in the case of the Trzciniec cultural horizon settlements. This may indicate special functions played by the homestead in the area of the whole settlement. The remains of the Trzciniec cultural horizon include 21 012 fragments of pottery which underwent analysis with regard to morphology, micromorphology, decoration and the technology of vessel making. On the basis of the analyses, two groups of materials of the Trzciniec cultural horizon have been distinguished, characterised by different stylistics and chronology. The first one consists of elements of the Iwno culture, to be more precise, its late phase IIIa (A. Koško 1979, p. 86, table 14). Such cultural attribution is indicated by the presence of vessels with bulging bellies and a mouth heavily turned outwards, whose rims are rounded and not thickened. Decorative motifs have the form of horizontal engraved and impressed grooves and fluting on the upper part of the belly and neck. According to P. Makarowicz, this phase should be synchronized with the horizon HT1. Such vessels, however, also occur in horizon HT2 dated to 1900 and 1600 BC (P. Makarowicz 1998, fig. 38). Alongside material characterised by the traits of the late Iwno culture, materials with the early Trzciniec culture characteristics were also found at the site at Krzyżanówek. This is attested by thickened rims truncated in an oblique manner, as well as smooth, horizontal single and double bands, occasionally pierced, or vertical small section bands and the horizontal engraved grooves around the vessel. Materials with such decoration should be attributed to the classical phase of the Trzciniec culture in the area of today's central Poland (A. Gardawski 1959), Lesser Poland (J. Górski 2007, p. 100) and other regions of eastern Poland (P. Makarowicz 2010, fig. 1.4). According to J. Górski (2007, p. 49) the above mentioned materials can be attributed to type A1 and dated to the 2nd half of BrA2 and the whole of BrB1 (c.a. 1650 – 1500 BC). In Kuyavia the dating is similar, and the materials are mainly connected with the horizon HT2 dated between 1850/1800 and 1650/1600 BC (P. Makarowicz 1998, p. 42). Materials characterized by identical stylistics have been distinguished at site Polesie 1 and classified as stylistic group GS1 and GS2, dated between 1720 – 1600 BC and 1720 – 1350 BC (J. Górski, P. Makarowicz, A. Wawrusiewicz 2011, p. 113, fig. 3.1.; 2011b, fig. 19). Thus, the older phase of the settlement of the Trzciniec cultural horizon at Krzyżanówek should be dated to the period between 1720 and 1500 BC, mainly on the basis of chronology of the assemblages from Polesie.

The second stylistic group consists of material decorated with vertical fluting and knobs. These are pots, amphorae, bowls and beakers gently profiled with smooth surfaces, rarely characterised by distinct shoulders. Analogous material can be found in assemblages HT5, with clear characteristics of the Tumulus culture dated to 1650 – 1300 BC and in HT6 – 7, where the vessels have traits of so called Łódź phase, dated to the period between 1500/1450 and 1300 BC (P. Makarowicz 1998, pp. 45, 52). Assemblages of similar character in the area of Lesser Poland were attributed by J. Górski to assemblages of type C (late Trzciniec), dated to BrD, 1300 – 1200 BC and type C/D (late Trzciniec, final phase) dated to 1300 do 1100 BC (J. Górski 2007, p. 91). Comparable assemblages have been unearthed at site Polesie 1, dated to 1350 – 1025 BC (J. Górski, P. Makarowicz, A. Wawrusiewicz 2011, p. 175, fig. 4.30.; 2011b, fig. 19). At Szczepidło similar materials are dated to 1297 – 1276 BC, with the probability at the level 1σ (68.2%) and 1306 – 1266 BC, and at the level 2σ – 94.5% (P. Makarowicz 2016, fig. 132, 136). It should be noted that ceramic assemblages from Krzyżanówek consisting of vessels decorated with vertical fluting and knobs, as well as pots with distinct shoulders, gentle profile and mouths with rims of type A and C are connected with the settlement phase dated to 1350 – 1025 BC.

Eight radiocarbon dates have been obtained for the site in question, made with AMS technology from the carbon deposits preserved in the interior vessel walls (table 10, fig. 100). One marking with a standard error equal 150 years has been discarded in further considerations (table 10) as irrelevant for chronological findings. The obtained dating has been made from the materials found in features (5 samples) and the cultural layer (2 samples). It should be noted that the markings refer only to phase II of the site's inhabitation. They concentrate in two zones of the site. Zone I – north-eastern – encompasses homesteads IV, V and VII and has yielded 4 dating results (fig. 101). Zone II – north-western – consists of homestead XI with 3 dates (fig. 101). All

markings come from vessel fragments with a smooth surface. One vessel fragment selected for dating is decorated with a knob, variant C1, placed on the vessel shoulder (fig. 102:B), and the second – vertical fluting, variant G2 (fig. 102:A).

A more thorough analysis of markings, (particularly the amount of charcoal, which in two samples has been regarded by T. Goslar as very low) (cf. table 10), has indicated that the following dating : Poz-139998 2770 ± 60 BP (from zone I) and Poz-139999 2850 ± 30 BP (zone II) is not very reliable. The conclusion is confirmed by the result of the calibration of dates, which determines the age to 983 – 834 BC at the level of 1σ (68.3%) and 1053 – 933BC with the probability of 2σ (95.4%). This time span is too late, taking into account the stylistics from Krzyżanówek. Disregarding the two uncertain markings, the time of functioning of the settlement is dated to 1438 – 1056 BC, at the level 1σ (68.3%), i.e. 382 years.

Thus, in the case of zone I, with 3 dates (fig. 101), the time span of settlement functioning with calibration at the level 1σ (68.3%) equals 1380 – 1127 BC, whereas at the level 2σ (95.4%) it would equal 1402 – 1056BC. The obtained dates indicate that the settlement in this zone of the site was used for 253 years or 346 years. In the case of zone II the two markings (101) indicate the time span of 1438 – 933BC with calibration at the level 1σ (68.3 %) and 1496 – 924BC with calibration at the level 2σ (95.4%), which would result in 505 years or even 572 years.

Making an attempt to characterize settlement development at site 10 at Krzyżanówek, we should take into account the range of decorative elements, characteristic of both settlement phases in the area. The first phase is characterized by decoration typical of the Kuyavian horizons HT1 and HT2 (after P. Makarowicz 1998), in the form of horizontal bands, engraved horizontal motifs, oblique and incised (fig. 102, 103). They occurred mainly in hectares I and III, with single finds in hectare II, in the total area of 0.8 ha. Unfortunately, no features have been found which would contain characteristic material, as regards this stage of settlement. Thus, it is possible that the area of the site was penetrated not intensively, but multiple times by the communities of the Trzciniec cultural horizon, between 1700 – 1500 BC. Such interpretation of the method of terrain exploitation has been confirmed in the literature on the subject (A. Gardawski 1959, P. Makarowicz 2010, p. 130).

The phase was followed by a gap in the inhabitation of the region until the arrival of communities of the late phases of the Trzciniec culture, which used vessels characterized by different stylistics.

Vessels decorated with vertical and arched fluting, as well as knobs of type C1 and C2 are characteristic elements of the assemblage. After the analysis of spatial distribution of vessel pottery, it turned out that it occupies a different area than decoration of phase I, and covers an area of 3.5 ha (fig. 102). It can be divided into two zones. The central zone is located in ha I, II and VIII, where 8 homesteads have been distinguished, with numbers between I and VIII, as well as two alleged homesteads (homestead IX and X), which can be described as the centre of the settlement (fig. 62). The second zone is designated by homestead XI, situated 100 m away from the main cluster of homesteads (fig. 62).

As regards the central zone, it should be observed that there are considerable differences in the distribution of occurrence of particular characteristic elements, connected with the stylistics of vessel decoration (fig. 102). This refers to the distribution of vessels decorated only with fluting and vessels decorated with knobs, type C1 and C2. The differences can give basis for distinguishing two stages of development : the older one (IIA – knobs) and the younger one (IIB – fluting) within settlement phase II.

It seems likely that the older stage (IIA) is connected with three homesteads (IV, V, VI) – fig. 62, located in the eastern zone of the site. They may be a part of a larger complex, situated beyond the research area. This place is the greatest concentration of ceramic materials, including the ones decorated with knobs (fig. 102, 104). The younger stage (IIB) is characterized by a larger area of occurrence of features and material decorated with fluting, which extends northwards and westwards (fig. 102, 105). It is possible that at this stage, a large settlement was set up on an oval-like plan, possibly with a square in the centre, where the remains of features are much more scarce. Unfortunately, the observations are incomplete due to the fact that not the whole area underwent excavations. At the stage IIB, homesteads with the following numbers were set up : I, II, III, VII. Homesteads IV, V and VI ceased to exist or endured (fig. 103, 106). The stage should be also linked with homestead XI. Such interpretation is confirmed by radiocarbon dating, which indicates the older age of homesteads IV and V as opposed to homestead XI (fig. 100).

Since the times of the Neolithic revolution, human diet was based not only on wild vegetation, but also on cultivated plants, such as cereals. The second source of food was meat of domesticated animals, such as cattle, pig, sheep or goat, supplemented by wild animals. Such a mixed system based on breeding and cultivating crops was also true of communities of the Trzciniec culture. This is reflected in the settlement at Krzyżanówek. This type of economy may be confirmed by the obtained results of specialist research. Unfortunately, sandy substrate of the site, which is responsible for the poor state of preservation of organic remains, hinders the possibility of conducting additional analyses. 10 samples have been taken for the analysis of vegetation macroremains and anthracological analysis. The research has confirmed the cultivation of millet and pea (c.f. A. Mueller-Bieniek, K. Skawińska-Wieser, current volume) and attested the economic use of 11 tree taxa, primarily pine, oak and spruce or larch (cf. K. Cywa, current volume). As it has previously been mentioned, site 10 at Krzyżanówek has yielded over a dozen fragments of charred bones. They occurred in features and in the cultural layer. Preliminary analysis conducted by dr Krzysztof Stefaniak

from the Zoological Institute at the University of Wrocław indicated that the bones belong to mammals, with no possibility of determining taxa. Chemical analysis of 4 ceramic vessels, which aimed to establish the type of food remains, attested that the community of Krzyżanówek consumed dairy products and vegetation food (cf. J. Kałużna-Czaplińska, A. Rosiak current volume).

To sum up, it should be observed that rescue excavations permitted the wide-area recognition of site 10 at Krzyżanówek. Noteworthy was the discovery of the settlement of the Trzciniec cultural horizon, whose area within the boundaries of the archaeological trench equalled ca. 350 ares. It is an exceptional case, as it is one of very few sites where such a large settlement from this cultural unit in Central Poland has been discovered and excavated. The conducted works permitted distinguishing main inhabitation units in the form of homesteads as well as the spatial organisation of the settlement. The obtained results contradict the earlier conclusions, present in the older literature on the subject, referring to the lack of large and permanent settlements of the Trzciniec cultural horizon in Central Poland, as opposed to the areas of Lesser Poland. The problem was already tackled in the publications of Polesie site 1 (J. Górski, P. Makarowicz, A. Wawrusiewicz 2011) and Lutomiersk-Koziówki site 3a-c (P. Muzolf, 2012). The morphological-stylistic analysis of vessel sherds permitted the designation of two inhabitation phases. The first one is characterized by the traits of the late Iwno culture and the material of the eastern-Trzciniec culture communities. The phase should be linked with the beginnings of the development of the Trzciniec cultural horizon and may be dated to 1720 – 1500 BC. The second stylistic assemblage consists of elements connected with the circle of the Tumulus cultures, i.e. vertical fluting, full knobs vertically pierced. It represents late Trzciniec phase dated to 1350 – 1025 BC. The vessel sherds were unearthed within the boundaries of homesteads I-VIII and XI.

In order to make dating of the settlement of the Trzciniec cultural horizon at site 10 at Krzyżanówek more accurate, C-14 analysis was conducted by means of AMS technology. Out of 8 radiocarbon dates (table 10), only 5 are relevant for the analysis. They point to phase II of the Trzciniec cultural horizon settlement. It can be divided into two sub-phases, marked as IIA and IIB, which correspond to two inhabitation phases at Krzyżanówek. The first one – older (IIA) consists of ceramic material characterised by knobs. The phase is linked with the homesteads located in the eastern part of the site : IV, V and VI. On the basis of C-14 dating, the functioning of the settlement in phase IIA should be dated to 1380 – 1127 BC. The younger stage, i.e. phase IIB, is characterised by decoration of ceramic vessels in the form of fluting. This phase is connected with homesteads I-III, VII, XI, and possibly some other features attributed to phase IIA. The younger settlement can be dated to 1202 – 1050BC.

Traces of settlements from the middle Bronze Age to the early modern period (Błażej Muzolf)

Traces of settlement of the Central Polish group of the Lusatian Urnfield culture

68 fragments of vessels were classified as artefacts, which belonged to the Central Polish group of the Lusatian Urnfield culture. Five forms have been identified : pots, vases, amphorae, mugs, bowls and 23 undetermined sherds (table 12). Noteworthy are: the decorations on the bowl (fig. 111:1, 4) and the form of the mug handle (fig. 111:2). The artefacts indicate connections with the southern areas: the area of Kraków and the trans-Carpathian area (more thorough discussion in B. Muzolf 2019, vol. 2, table 322:4). The artefacts in question can be connected with the late Bronze Age III and the first half of Bronze Age IV, i.e. HaA1-HaA2. They can be interpreted as the remains of a brief penetration of the site by the community of the Central Polish group of Lusatian Urnfield culture.

Traces of the Przeworsk culture settlement

20 ceramic fragments (11 sherds of the same vessel) obtained from so called cultural layer confirm that the site at Krzyżanówek was penetrated by the communities of the Przeworsk culture. On the basis of a section of the vessel bottom, which represented forms with a distinct foot (fig. 112:1) and the technological characteristics of the way the above-mentioned materials were made, it is possible to attribute them to the Roman Iron Age.

Traces of the area exploitation of the area in the Middle Ages and in the early modern period.

145 fragments of vessels attributed to the Middle Ages and the early modern period were unearthed in the excavated area. Two fragments can be connected with the period between the 12th and 14th century.

The character of the fragments of modern vessels, their spatial distribution as well as heavy fragmentation leads to the assumption that they are connected with early modern farming. This includes fertilisation of fields which belonged to the nearby village of Krzyżanówek.

