

From the Stone Age to Contemporary Times. Archaeological excavations at Redecz Krukowy in the region of Kuyavia

SUMMARY

INTRODUCTION (Piotr Papiernik)

The current publication is the result of a study of archaeological material obtained during many excavation seasons carried out at Redecz Krukowy, site 20, located in Kuyavia, on the border of Brześć Kujawski and Osiećciny (fig. 1). Intensive excavation works were conducted in the region by the Museum of Archaeology and Ethnography in Łódź. However, they had already been commenced in the inter-war period by professor Konrad Jażdżewski (R. Grygiel 2004, pp 25–66).

Archaeological excavations at the site were carried out in the years 2006–2010 by the Museum of Archaeology and Ethnography in Łódź. The works were supervised by Piotr Papiernik in co-operation with Dominik Kacper Płaza, and financed by the Konrad Jażdżewski Foundation of Archaeological Research and the Museum of Archaeology and Ethnography in Łódź.

A large number of archaeological artefacts unearthed during the excavations, were attributed to the Mesolithic, the Danubian cultural cycle, as well as the following cultural units: the Funnel Beaker, Globular Amphora, Corded Ware, Mierzanowice, Iwno, Trzciniec, Lusatian and Przeworsk cultures. There were also materials attributed to the Middle Ages and modern times. The study work was done by the following authors: Piotr Papiernik, Dominik Kacper Płaza, Rafał Brzejszczak, Błażej Muzolf, Przemysław Muzolf, Wojciech Siciński and Joanna Wicha. It constitutes the major part of the current publication. An important supplement of the work is provided by a series of analyses and specialist studies prepared by Marcin Krystek (petrographer), Krzysztof Stefaniak (archaeozoologist), Anna Zielińska (anthropologist), Aldona Mueller-Bieniek (conducted impressions of vegetation macro-remains), Radosław Bonikowski (conducted chemical analysis of pottery), Halina Młodecka (conducted chemical analysis of metals), Joanna Słomska (conducted analysis of wicker impressions), Mariusz Mielczarek (numismatics), Beata Łuczak-Kłys (conducted analysis of decoration and technique of making Funnel Beaker culture pottery).

An essential part of the study is taken up by the presentation of geomorphological research, conducted by Jacek Forsyś, as well as the soil science examination prepared by Michał Jankowski. They provide basis for determining environmental conditions of the site and preparing a stratigraphic description of the recorded natural and anthropogenic layers in the area of the main trench, also based on archaeological observations.

As it has already been mentioned, the excavations at Redecz Krukowy were begun with the intention of a comprehensive study of the settlement of the early phase of the Funnel Beaker culture. The preparation of field works relied on the appropriate selection of excavation methods and documentation of the unearthed layers and artefacts. Attention was paid to the specific character of “sandy” sites from the Stone Age,

which is mainly based on the premise that most artefacts are found outside the features (in so called cultural layer). At the same time, the excavated area is quite large and the stratigraphy of layers considerably diversified. It was essential to obtain complete movable artefacts, mainly the flint ones. The appropriate use of methods, suitable for the conditions mentioned above, involved conducting excavations by hand with equipment, such as shovels, spades, etc. and a systematic sieving of all layers, including the arable one (fig. 4). Therefore, a simple sieve was used, with net holes 4x4 mm. After sieving, further excavations of the substrate were done with shovels. Thin layers were taken off, some of which (usually between 5 and 8) were jointly documented as one mechanical layer, 10 cm thick. Mechanical layers were marked with Roman numbers from I to IX. At the same time spatial distribution plan was made with the numbering of all artefacts unearthed *in situ*. The artefacts obtained from sieving were catalogued according to mechanical layers of separate sections or features. In the case of several sections, the movable material was so abundant that it was necessary to divide the spatial distribution plan into two or three additional layers (A, B, C), within mechanical layers (e.g. IA, IB, IC, IIA etc.). Only then could they be documented at the scale 1:20. The excavations in separate sections were completed after taking off one mechanical layer underneath the occurrence of archaeological artefacts. As a rule this was a level with observable structureless sands, white, grey or light yellow in colour, characteristic of bedrock in the soil cross-section.

The research method also involved complete photographic and drawing documentation of the horizontal layout of natural and anthropogenic layers, conducted after excavating each mechanical layer. During the excavations, a detailed observation of trench cross-sections was made which allowed correlating the unearthed artefacts with the geological and soil structure of the site. In total, 630 linear meters of the trench walls underwent photographic and drawing documentation (fig. 6).

Moreover, standard photographic and drawing documentation was prepared for layouts and cross-sections of all recessed features. The main documentation unit on the site was section – 5x5 m big. The numbers were allocated as the works progressed, so the numbering is the result of setting up consecutive trenches (fig. 7, 8).

Diverse natural and anthropogenic layers have been distinguished, which form the stratigraphy of the site (c.f. plate 1). They were singled out on the basis of the analysis of drawing and photographic documentation, vertical distribution of movable artefacts and the geomorphological and soil science study. The obtained data allowed a detailed description of the depth and area of occurrence of particular layers within the main trench. Vertical stratigraphy was represented by 11 trench cross-sections, in total 340 m long (c.f. plate 2–5), which are

considered representative of the whole excavated area. The range of occurrence of particular layers was also recorded, at separate levels of the excavation of the site, i.e. after each mechanical layer.

For the purposes of the study of archaeological artefacts and stratigraphy of site 20 at Redecz Krukowy, 55 radiocarbon dates have been obtained in three laboratories: Radiochemical Laboratory of the Museum of Archaeology and Ethnography in Łódź (sample symbol: LOD; scintillation method), Poznań Radiocarbon Laboratory of the Foundation of A. Mickiewicz University in Poznań (sample symbol: Poz; acceleration method), and Beta Analytic Inc in Miami (sample symbol: Beta, acceleration method). Complete data referring to dating, location, type of sample material and its calibration according to programme OxCal v4.3.2 are presented in table 1.

Looking at a preliminary description of indicators, we must pay attention to the kind of material which underwent dating. In 20 cases it was organic substance stuck to the interior surface of the Funnel Beaker culture vessels (19 samples) and the Corded Ware culture vessels (1 sample), which were examined with the use of acceleration method (AMS). Two indicators refer to skull bones and a tooth obtained from a skeletal grave of the Przeworsk culture (c.f. table 1 and W. Siciński, current volume). The above dating is directly linked with prehistoric activity. The third group consists of 21 indicators made for charcoals, obtained from archaeological features (c.f. table 1 – sample symbol Lod). This type of material is regarded as less valuable (c.f. J. Czebreszuk, M. Szmyt 2001; S. Kadrow 1994), as the obtained results do not reflect the period when the features were used and therefore require further interpretation (c.f. A. Walańus, T. Goslar 2009; R. B. Warner 1990; N. Palincas 2017).

GEOMORPHOLOGICAL AND GEOLOGICAL FEATURES OF THE SITE AT REDECZ KRUKOWY AND ENVIRONMENTAL DETERMINANTS OF ITS LOCUS (Jacek Forysiak)

The site at Redecz Krukowy is situated between Brześć Kujawski and Radziejów, in the eastern part of the Kuyavian Lakeland (also called the Inowrocław Plain). The area in question is located in a young-glacial landscape. Although the main features of its morphology were formed as a result of glacial processes during the Vistulian Glaciation in the Poznań Phase (fig.11), the terrain relief of the Inowrocław Plain is not very diversified. Peatland (fig. 12), which surrounds the village from south-west, is the lowest lying point in the vicinity of the archaeological site at Redecz Krukowy. The contemporary surface of the peatland has been transformed as a result of drainage and partial peat extraction. Consequently, the current terrain elevations for the area differ from the original ones. The whole area is located 95m below sea level (fig. 1). The terrain in the vicinity of the archaeological site is almost completely flat. It gently rises, but only to c.a. 99m above sea level. The flat area is characterised by closed basins. The terrain relief south and east of the site in question is slightly more diversified, with hills up to 101.5m above sea level. The site is located on an elongated elevation, along east-west axis. The southern slope is shorter and marginally steeper than the northern one. Addi-

tionally, the slopes are diversified by small, weakly discernible denudational valleys.

The described area is dominated by morainic plateaus with glaciofluvial plains. The terrain of the archaeological site and its close vicinity is classified as a flat morainic plateau (M. Brzeziński 2015) and isolated fragments of a glaciofluvial plain, diversified by depressions of various origin. South-west of Redecz Krukowy, in the region of Dąbie Kujawskie, lies a patch of eolian sands. The plateau in the region of Redecz is made up of sandy layers, accumulated by wind. The locus of the archaeological site at Redecz Krukowy has been described as sand and glaciofluvial gravel (M. Brzeziński 2015a). Its substrate is made up of glacial till of the Vistulian Glaciation. Hand drilling and digs enabled the preparation of a surface lithological map (fig. 13) and geological cross-sections (fig. 14). Samples obtained from several uncovered sediments allowed the documentation of their textural features. The results of grain-size distribution in cross-sections 39, 49, 50, 64, 65 and 207 have been presented in graphs (fig. 15) and described in a text. A layer of eolian sands has been found in the cross-sections. It lies on glaciofluvial sands, except for cross-section 207 which is completely filled with eolian sands. In the vicinity of the archaeological site there is a greater diversity of geological sediments. The oldest one is glacial till (fig. 14), whose formation should be linked with the Poznań Phase of the Vistulian Glaciation. Its compact substrate has been found in the eastern part of the area in question, as well as south of the site. The upper part of glacial till layer has been recorded at the depth of 70 cm in the most western part of the site. In many places clayey sands are deposited directly on the till, in the form of a thin 20–30 cm layer (fig. 14). In terms of origin and time of formation, they are linked with the glacial till. The sediments form substrata for the glaciofluvial and eolian sands, recorded on the site.

The area in question is abundant in organo-genic sediments, such as peat, organic loams and gyttia. In small, multiple closed depressions, several-dozen centimetre layers have been bored. These were mainly organic loams (fig. 13, 14). Geological digs made in the vicinity of the archaeological site in question have revealed two small depressions, whose sediments largely consist of organic matter (fig. 17, 20). An example of a large peat-lake accumulation is a peatland, situated south-west of the site (fig. 13). It consists of lake sediments, which attest the existence of an extensive lake, covered by the peat layer.

In the vicinity of Redecz Krukowy, there is a small number of lakes. South-west of the village there is lake Czajno, covering the area of less than one hectare. Within the boundaries of the village, there are several dozen closed depressions, but only some of them function as water reservoirs. Water courses, visible in the landscape and marked on topographic maps are mainly used as temporary drainage routes and are artificially made elements that aim at draining excess water from closed depressions and a gently sloping morainic plateau. The only natural watercourse in the close vicinity begins at Miechowice, c.a. 2 km north of the archaeological site. Thus, it can be assumed the prehistoric hydrographical network of the vicinity of Redecz Krukowy was completely different from the contemporary one. The lack of watercourses facilitated penetration of the

area, as well as the communication between different parts of the plain. Only an extensive boggy land in the southern part of Redecz Krukowy hindered economic expansion in this direction and created a clear obstacle in communication.

Surface geology and lithological features of the previously described sediments indicate a considerable diversification of the explored area. As a consequence, the geological substrate was conducive for building settlement features, and provided good habitat and soil conditions. As regards natural conditions, forest habitats dominated in the Atlantic period. However, on the area of the Inowrocaw Plain they were of mosaic character (Matuszkiewicz et al 2006), dependent upon a large number of small, boggy depressions, as well as clayey and sandy patches. The site at Redecz Krukowy is situated on a thin layer of fine sand of eolian origin, but in the close vicinity on the surface (directly underneath accumulation soil level) there are glaciofluvial differently-grained sands, clayey sands and glacial till. Sands ensure easy permeability and fast drying after floods and precipitation. The lack of gravel and pebbles facilitated field works. A disadvantage of this type of material is susceptibility to blowing away. When a surface of this type is void of vegetation, the material is blown away and deposited in places where wind activity is wakened by flora or man-made features. Within the boundaries of the site, especially in its central and eastern section, Mesolithic, Neolithic or even younger cultural levels (P. Papiernik, M. Płaza, current volume) are covered by sands of eolian origin. Covering cultural horizons by a layer of fine sand with a small content of organic substance attests active eolian processes – accumulation and deflation of mineral material and soil humus. Considering the geomorphological situation of the site at Redecz Krukowy, we should rule out all other processes and accumulation environments, which could lead to overlaying the site's terrain. A shallow deposition of glacial till ensured stable moisture on the site and its vicinity, as well as the functioning of a locally shallow level of ground waters, which could have played a role in water supply.

Boggy areas, both the small ones surrounding the site, as well as the extensive peatland, were of little use in pre-historic times. Only in coastal, less damp zones can we expect attempts to set up garden economy (c.f. P. Kittel 2005). Biogenic sediments should be treated as an evidence of environmental changes (K. Tobolski 2000), where subsequent accumulated layers contain plant and animal remains. On the basis of their analysis, we can reconstruct old parameters of the environment and record traces of human activity in its vicinity.

CHARACTERISTICS OF SOIL CONDITIONS AND INTERPRETATION OF PEDOSTRATIGRAPHY AT THE ARCHAEOLOGICAL SITE IN REDECZ KRUKOWY (Michał Jankowski)

The paper presents pedological and paleopedological characteristics of the archaeological site no 20 at Redecz Krukowy as regards soil cover description. It also aims at reconstructing palaeoenvironmental prehistoric settlement conditions and the subsequent environmental transformations. Documentation of archaeological excavations prepared by Dr Piotr Papiernik in

the years 2006–2010, the literature, maps, as well as the results of field works (set of drillings and soil pits) provided basis for the current work.

Redecz Krukowy lies in the Kuyavian region, in the section called "Black Kuyavia". The name is derived from the dominance of fertile, hydromorphous soils locally named "black earths", (Mollic Gleysols/Gleyic Phaeozems). These soils mainly occupy depressions and flatlands made of weakly permeable, loamy morainic deposits. It is considered that the wide distribution of such soils could have been a key environmental factor of the ancient settlement location in this part of Poland, especially with reference to agricultural cultures. The range of black earths is accompanied by their sandy analogies – mucky soils (Gleysols (Arenic, Nechic).

Higher parts of relief are covered by automorphous soils: soils lessive (Luvisols, Retisols) developed in glacial tills and rusty soils (Brunic Arenosols) formed in sandy glaciofluvial and aeolian deposits. Gentle elevation, where the archaeological site at Redecz Krukowy is located, is covered by rusty soils with the general scheme of the horizon sequence: A–Bv (Bw)–C. In numerous profiles, however, gleyic properties appear in parent material C, which indicates that the level of ground water was higher in the past. Additionally, lamellae were observed in parent rock and at its border with Bv horizon illuvial bands, mostly in higher landscape positions, in locations, where iron and clay fraction may be washed down by percolating rain water. On the borders of the archaeological site and the surrounding depressions, below 98.4 m a.s.l. rusty soils gradually transform into hydromorphous mucky soils (Gleysols (Arenic, Nechic)), covered with humic, colluvial (deluvial) slope deposits. Such distribution of soils and slope sediments attests the effects of denudation processes.

Genetic horizons of rusty soils (A–Bv) developed in homogenous, well sorted aeolian sands. Sandy materials below (parent material C) show features of glaciofluvial sediments (worse sortation, admixture of gravels, preserved sedimentary stratification).

On the border of glaciofluvial and aeolian sands there are strongly obliterated, but still visible traces of older, fossil soil: pseudomorphoses of tree-root systems, Fe-Mn redoxymorphic concretions and gray patches of relatively deep humus horizon (Aub) remnants. Such features are typical of mucky soil that has developed in much wetter conditions than contemporary rusty soils. Relics of the fossil mucky soil probably mark the primary land surface from the time of the first constant settlement phases (Neolith) and more moist environmental conditions. However, the fact that the area of the soils was inhabited may be the evidence of their drying, probably in relation to hydrographic network changes – shrinking of the neighbouring lake system.

Subsequent phases of the environmental evolution, related to post-Neolithic settlement phases progressed in dryer conditions. This is recorded in accumulation of wind-blown cover sands and development of rusty soils typical of fresh, deciduous, oak-hornbeam forest.

The last period of the existence of the archaeological site at Redecz Krukowy is related to intense agrotechnical denuda-

tion, manifested in rusty soil erosion, colluvial (deluvial) sediment accumulation and with lessivage process degrading Bv horizons of rusty soils.

(translation by the author)

FORMATION OF THE SITE'S SURFACE IN THE LIGHT OF NATURAL PROCESSES AND THE IMPACT OF PRE-HISTORIC AND HISTORIC SETTLEMENT (Piotr Papiernik, Jacek Forysiak, Michał Jankowski)

The area of the site and its vicinity was formed during the Poznań Phase of the last Scandinavian Glacial Period, which took place c.a. 18000 – 188000 years ago (W. Wysocka, P. Molewski 2011). This was the time of the deposition of glacial till and glaciofluvial sands, covering clay at the site at Redecz Krukowy. In the next recessive phases of the Glacial Period (Pomeranian, Gardno phase), the terminus of the ice-sheet did not have a direct impact on the Kuyavian area. However, the conditions of the periglacial climate caused intensive transformation of the recently shaped landform, mainly as a result of denudation and eolian processes. In the last phase of the Glacial Period, during the younger Dryas, previously formed dunes and eolian sand fields were transformed, and possibly new ones were formed. The harsh climate of that period caused a severe reduction of vegetation cover, so the whole lowland belt was affected by eolian, denudational and slope processes (K. Kaiser et al 2009). It can be assumed that the bottom part of the eolian sediment at Redecz Krukowy could have been deposited at that time.

In the older and middle part of the Holocene, in the conditions of well-developed vegetation (W. Matuszkiewicz et al 1995; M. Ralska-Jasiewiczowa et al 2004), the activity of morphological processes was quite limited (L. Starkel 1999, J. Twardy 2008). Thick vegetation prevented eolian processes and mechanical denudation. For the area of today's Poland, it is the time of undisturbed, natural succession of taxa, with domination of forest complexes. Despite an abundant assemblage of Mesolithic artefacts, unearthed at the site at Redecz Krukowy, the interference of man into the taxa composition and thickness of the vegetation cover was so insignificant that it did not cause any visible changes in landform and deposition of mineral sediment. This was the time of soil processes, deposition of lake sediment and the growth of peat cover in marshy areas and in the vicinity of lakes.

The estimated presence of the Danubian culture communities at the site at Redecz Krukowy is c.a. 1 thousand years. It occurred in the middle Atlantic period with the climatic optimum of the Holocene. Archaeological traces indicate a possibility of cultivating semihydrogenic mucky soil and black soil at the site and in its vicinity. This must have been connected with partial deforestation, the triggering of mechanical denudation and the disturbance of natural soil processes.

However, only the settlers of the Funnel Beaker culture brought about changes in landform in the area, as a result of very intensive exploitation of the site and its vicinity. They triggered eolian deflation processes at some places of the site, which resulted in the erosion of the humus level and the sandy

layers found underneath. It also started accumulation processes, which involved the formation of sandy covers, up to several dozen centimetre thick, and a partial covering of mucky soils, together with some older archaeological artefacts. There was a significant increase in levelling of the area of the site and its close vicinity.

The period of intensive exploitation of the area in the Sub-Boreal period was followed by a partial regeneration of the vegetation cover around the site. However, late Neolithic communities and the Bronze Age groups (including the Lusatian culture) left multiple traces of economic activity at the site, visible in areas used as arable land, free of vegetation cover. This led to a further re-deposition of sandy layers, which resulted in the change of landform (flattening), also as a result of faster accumulation of biogenic sediment in small closed basins, surrounding the site.

The older part of the Sub-Atlantic period was marked by stability, resulting from a not intensive use of the area by the Iron Age cultures. However, there were observable influences of human economic activity on the elements of the natural environment, including the landform. Until the Middle Ages, the area of the site did not undergo major change, allowing the soil cover to regenerate. It was represented by rusty soils, typical of *Carpinion betuli*. Significant changes only occurred in marshy areas, where a considerable part of a former lake was covered by peat. This, however, resulted from regional climatic changes.

Visible transformation of landform resulted from agriculture and settlement during the Middle Ages, late Middle Ages, and the modern period. The changes involved the area being covered by a series of eolian sands and intensive accumulation of sediment in depressed areas.

Archaeological documentation and the abundant movable material, obtained as a result of sieving the layers, and precise levelling measurements, made it possible to evaluate the scale of landform change, with reference to quantity and spatial distribution. If this is compared with the sequence of cultural layers, we can indicate phases of intensive changes of landform, degradation of soil levels and re-deposition of mineral sediment at the site and in its vicinity. We can also point out phases of stability and regeneration of vegetation and soil cover. However, local character of these processes should be highlighted, which results from "individual" history of settlement at Redecz Krukowy, site 20.

MESOLITHIC SETTLEMENT (Dominik Kacper Płaza)

The site at Redecz Krukowy has yielded a prevalent number of Mesolithic flint artefacts, on top of the material from the Sarnowo phase of the Funnel Beaker culture. Small flint artefacts, almost exclusively made of erratic stone, have been found on the whole excavated area. Their technological and technical features indicate their Mesolithic origin. Apart from flints, some features with layouts of residential structures and their clusters, were also attributed to the Mesolithic. The analysis of dispersion of flint artefacts has resulted in distinguishing over a dozen concentrations of material. They can be treated as concentrations of flint artefacts connected to their place of

production. Additionally, a group of artefacts has been distinguished, loosely distributed on the whole excavated area. The current study includes raw material, spatial and technical-ty-pological analyses of the unearthed artefacts. At the end of the chapter on the Mesolithic all the obtained data are collated with the currently recognised Mesolithic material in Poland and the European Lowland.

During the Stone Age, different types of flint raw material have been used on the site in question. Out of seven thousand artefacts attributed to the Mesolithic, most have been made of various kinds of local erratic stone. Only 41 forms have been made of chocolate flint imported from the area of the Świętokrzyskie Mountains (Holy Cross Mountains). Quite a large number of artefacts was undetermined in terms of their raw material attribution, as a result of charring. Erratic stone dominated on the site (fig. 1), as it was locally accessible. Four raw material groups have been distinguished. The first one includes differently coloured erratic stone: from black, or dark blue to milk-blue, with transparent and smooth texture (fig. 2). The next group consists of matte raw material, occasionally rough, black or grey in colour, frequently with the remains of lime cortex (fig. 3). The third group includes transparent flints with the preserved skeletons of bryozoa or other small invertebrates (fig. 4). The last type of erratic stone, found in clusters 5 and 6 on the site, is the Pomeranian flint (fig. 5).

Thanks to sieving – a method used during field works and the analyses of documentation, it was possible to designate three states of the preservation of the site. The first one was best preserved, with fossil soils and a full soil cross-section. The second one is characterised by fragmentarily preserved soil cross-sections, whereas in the third one the soil cross-section is not preserved and the artefacts are found only in the arable layer. The first category, composed of areas which are stratigraphically and spatially distinct, consists of five concentrations, which correspond to clusters 13 and 15, and with some reservations, 2, 6 and 7. The second category includes clusters 3, 4, 9–11 and 12. The zone, whose reduced cross-section is described as sub-surface consists of clusters 1, 8 and 12.

The site in question bears traces of 13 clusters of flint artefacts, as well as the material found between the clusters. Some of them are linked with the traces of features, i.e. elements of campsites.

Hearths.

There are over a dozen features of this type on the whole area of Redecz Krukowy. On the basis of the current stage of research, only one of them was attributed to the Mesolithic (no 10 of section 30 from the vicinity of cluster 2). The hearth in question has no cairn. The charcoals have yielded date 8150 ± 50 BP (table 1), which indicates the early Atlantic period.

Post holes.

This category includes small features, whose shapes are circular or oval and cross-sections hollow or pointed. Despite a large number of holes recorded on the site, only a small number has remained as a result of further exploration and documentation.

As regards Mesolithic material, in several cases we can observe a group of holes found in the close vicinity of clus-

ters of flint artefacts. This is true of clusters: 2, 3, 5, 6, 10 and possibly 13.

Concentrations of flint artefacts connected to their production site/layouts outside the concentrations

The analysis of data from table 3 indicates that flint artefacts have occupied diversified areas. The smallest clusters covered an area of over a dozen square metres, as in cluster 9 and 11. Middle clusters, which cover an area of between 30–80 square metres, are clusters 1, 2, 10, 12 and 13. Large clusters, covering an area of over 100 square metres, include clusters 3, 4, 6 and 7. The largest cluster no 5, certainly represents several concentrations of flint artefacts connected to their production site lying on top of one another, which attests several inhabitation incidents on the site. The number of flint artefacts in the concentrations is also quite diversified. It seems, however, that the number of over 200 flint artefacts, with some reservation, indicates isolated, homogenous clusters or concentrations of flint artefacts connected to their production site. In case of most clusters we can rule out the possibility of mechanic re-location, as there were no examples of chaotically grouped re-fittings. Neither the clusters nor raw material from particular concentrations were mixed. The observation of flint artefacts' distribution confirms the findings referring to the division and description of the concentrations of flint artefacts connected to their production site. Layouts with multiple concentrations, such as cluster 5, have been observed, as well as layouts with a single concentration, like clusters 3, 11, 13 and conditionally 2. It is important to include artefacts from arable layer, e.g. cluster 1 and 9 in spatial analysis. The latter have yielded compact clusters of artefacts, in terms of technology and raw material. Moreover, cluster no 1 has been confirmed by specimens of re-fittings. They all attest single settlement incidents which should be treated as small concentrations of flint artefacts connected to their production site or small settlement units. After excavating the whole site at Redecz Krukowy, we should rule out the term "layout indicating no concentration of flint artefacts connected to their production site", which in older research resulted exclusively from a small trench area. As it can be seen from fig. 11–17, single Mesolithic flint artefacts were excavated on the whole explored area, not only in isolated clusters. However, they do not point to material re-deposition, but rather to multiple incidents of hunting groups returning to the same place.

Cluster 1 was unearthed in the southern part of the site, on the rim of the trench. Thus, estimating the initial surface of the settlement unit may be difficult, as some flint artefacts from the cluster can be found beyond the excavated area. It is also possible that the range, shape and cross-section of the concentration of flint artefacts connected to their production site has been disturbed. The excavated area in the region was deposited on the area of slightly more than two ares, and it seems it extended along the line E–W. This is most confirmed by the lines along which flint artefacts are fitted together, mainly obtained from the arable layer (fig. 20; 21; 22).

Cluster 2 is situated in the southern section of the trench (fig. 20; 21) inside and underneath the layer of the most dense-

ly concentrated artefacts per one square metre. These are pottery and flint artefacts of the Funnel Beaker culture. Compact flint artefacts were deposited in fossil soil and covered an area of c.a. 40 square metres. It seems that a large number of those were unearthed *in situ*. Network of eleven re-fittings of flint artefacts (fig. 24) covers an area interpreted as a campsite. It consists of 32 flint forms, which constitutes 5.1% of the whole assemblage in the cluster. If we exclude the smallest and undetermined objects, the percentage of re-fittings equals 9.4%.

Cluster 3 was unearthed at the north-western rim of the trench. The flints were deposited *in situ* in the layer, on the area of c.a. 100 square metres (fig. 20; 21; 25). Re-fittings of flint artefacts, which designate an area of c.a. 250–300m (fig. 25–26) are connected to the preparation and exploitation of several flint nodules. In total, nine re-fittings have been identified, including two extensive, block combinations of re-fittings consisting of several dozen flint artefacts each. Re-fittings included 75 flint forms, which constitutes 14.23 % of the whole assemblage in the cluster. If we exclude the smallest and undetermined objects, the percentage of re-fittings equals 20%.

The cluster 4 was unearthed in the middle part of the trench (fig. 20; 21). Spatial distribution of artefacts indicates that it was possible to capture the whole cluster, which is attested by the lack of artefacts in sections 301–304 (fig. 27). The artefacts were deposited on an area of c.a. 150 square metres and were re-deposited westwards. The compact part of the concentration of flint artefacts connected to their production site in section 182 covers an area of 25 square metres. Surprisingly, no re-fittings of flint artefacts can be found, which indicates that no initial cores, cores or blades were prepared on the site. This may point to a household function of the cluster.

The cluster 5, it is the most numerous cluster of artefacts with almost 3000 specimens found in the central part of the trench. In the eastern part of the area the best preserved isolated soil layer was preserved, which covered an area of c.a. 5 ares, containing diversified flint material. This indicates several incidents of recurring to the place (fig. 20; 21; 28, 29). There were also traces of over a dozen post holes which formed a layout of a residential construction (fig. 10). The area of the concentration of flint artefacts connected to their production site covers an area of c.a. 500 square metres. The artefacts, however, are not evenly distributed. The analysis of the dispersion of material (fig. 29) indicates that almost the whole area of Mesolithic artefacts' deposition was possible to be explored. The cluster contained multiple re-fittings of flint artefacts (fig. 28), which are connected to various stages of their exploitation. In general, 25 re-fittings, including several extended combinations consisting of over a dozen flint artefacts comprised 135 flint forms, which constitutes 4.6% of the whole assemblage in the cluster. If we exclude the smallest and undetermined objects, the percentage of re-fittings equals almost 8%.

The cluster 6 of material can be found in the southern and middle part of the trench, where some smaller clusters can also be observed (fig. 20; 21; 30). Flint artefacts linked with Maglemosian flint processing which has its analogies, e.g. on site 4 at Jastrzębia Góra (L. Domańska 1992) or site 3 at Turowiec (Z. Bagniewski 1987b) have been recorded on the area of c.a.

100 square metres. Six post holes have been identified in this area which may be the remains of timber planks forming the structure of a residential feature (fig. 11).

In the southern section of the middle part of the trench, a few metres away from cluster 6, artefacts have been recorded on an area of c.a. 120 square metres (fig. 20, 21; 30). The cluster 7 is located at the southern rim of the trench. The combination of several microlithic trapeziums with chocolate flint which can be found in this place, indicates that this part of the trench was penetrated by communities of the Janisławice culture in the late Mesolithic.

The Cluster 8: the area of c.a. 100 square metres in the north-western rim of the trench (fig. 20) has yielded 86 flint artefacts, mainly obtained as a result of sieving.

The Cluster 9 – 41 artefacts have been obtained from the middle, rim part of the trench (fig. 21), from a small area of less than 25 square metres. These were 10 artefacts connected with core preparation and 14 blades. The small number of artefacts, as well as the raw material and technological uniformity of the assemblage indicate the homogenous character of the small cluster. The fact that the artefacts were unearthed next to the southern rim of the trench points to a possible extension of the cluster or the presence of other clusters in the southern, unexcavated section of the site.

The Cluster 10 – artefacts unearthed in several sections, next to the rim of the trench in the eastern part of the excavated area were mainly obtained by sieving (fig. 21; 31). The area which has yielded almost 100 flint artefacts has covered c.a. 75 square metres.

The cluster 11 – 388 flint artefacts have been recorded in the eastern part of the site on a compact area of c.a. 25 square metres (fig. 21; 32). The largest number of Mesolithic, flint artefacts have been found in section 235 on an area of 8 square metres. Additionally, some small, undetermined, charred animal bones have been recorded (fig. 43).

Cluster 12 – a scattered and not very numerous concentration of flint artefacts connected to their production site was unearthed in a destroyed eastern zone of the site (21; 32). It consisted of 122 specimens. It is located at the presumable head of the Kuyavian long barrow of the Funnel Beaker culture (P. Papiernik 2012), which had an impact on the state of preservation of the concentration. Its estimated area equals c.a. 80 square metres.

Cluster 13 – compact concentration of flint artefacts connected to their production site has been recorded in the eastern section of the site, mainly in layers III–VI (fig. 6B; 21; 32). In this part of the trench single artefacts with Mesolithic features were also found in higher layers, on the secondary deposit. A good state of preservation of the concentration of flint artefacts connected to their production site is connected with the presence of the head of Kuyavian long barrow in this place, which preserved the layer of fossil soil from the Boreal period. The cluster has a regular oval shape and covers an area of c.a. 30–40 square metres.

Workshops

Thanks to a comprehensive analysis of re-fitting method, it is possible to identify, among other things, flint workshops. The

workshops of initial cores and cores have been identified in clusters 3 and 5. Cluster 11 contained blades which dominated over flakes and a series of microburins made of distal portion of the blade, which attest the production of arrow points in the workshop.

Analysis of Mesolithic flint artefacts

Cluster 1

The following forms have been recorded in the cluster: 5 cores, 40 blades, 55 flakes, 6 tools and wastes from their production, 9 microliths, 1 microburin and 58 wastes and crumbles (table 10; fig. 47). The cluster of artefacts has yielded homogenous material, both in typological and technological terms. The artefacts have features of the Duvensee or Komornica group. The cluster contained the largest percentage of re-fittings on the site – over 16% of the whole material. If we exclude the smallest and undetermined forms, the percentage of re-fittings equals nearly 25%. Taking into account their technological uniformity, it can be concluded that the artefacts from the cluster are of homogenous character. Identified cores and an assemblage of selected forms, above all microliths, such as truncated piece of the Komornica type or a shouldered point and the lack of microlithic trapeziums point to its early chronology, possibly linked with the pre-Boreal or Boreal period. Technological features of cores and semi-product correspond to component I after P. Dmochowski (2002) and technological group I or II after M. Sørensen (2006b, p. 64). They also indicate their early-Mesolithic chronology.

Cluster 2

622 flint artefacts have been unearthed, including: 3 cores, 11 technical forms, 138 blades, 116 flakes, 27 retouched tools, 25 microliths, 23 microburins and 282 wastes and chips. Apart from one artefact made of chocolate flint, all others have been made of erratic raw material (a small number artefacts were charred). The cluster was a source of interesting and diverse observations. Apart from some, not numerous forms linked with early Mesolithic flint processing, most artefacts are attributed to the younger Mesolithic. Older materials are connected with Duvensee/Maglemosian groups or with the Komornica culture. These are single, bulky blades, flakes and several microliths, such as shouldered points, truncated piece or a microlithic obtuse triangle. These forms correspond to artefacts found in other clusters, e.g. 1 or 5. Late-Mesolithic materials are connected with the Janisławice culture. This is confirmed by parameters and technology of two cores, most blades, as well as a set of points with microlithic triangles, trapeziums and microliths of the Wieliszew type. Links with the Janisławice culture are also confirmed by the discovery of the Janisławice microlithic triangle made of chocolate flint and numerous microburins.

Cluster 3

The cluster is dominated by flakes – 212 specimens over blades – 124 specimens. The smallest forms, i.e. chips and crumbles – 166 specimens are also numerous. Other categories are less numerous. 17 tools have been unearthed, including 6 retouched typological tools and 11 microliths. There were also 6 core preparation forms and wastes after tool production,

including 4 microburins and 2 spalls, as well as one two-platform core with changed orientation. The cluster consisted of homogenous material, both in spatial and technological terms. The set of microliths was not very numerous and included edge, Maglemose willow leaf-shaped arrowhead, semi-circular backed blade, retouched blades and burins. The set indicates older Mesolithic and possible links with the Maglemosian culture. Features of the core and quite wide blades can be attributed to the turn of technological group I and II, after M. Sørensen (2006a) and component I, after P. Dmochowski. The obtained re-fittings attest the existence of a workshop in this place, which was used for core preparation and exploitation of blades.

Cluster 4

Almost 800 artefacts have been obtained, including 14 cores, 10 technical forms, 174 blades, 171 flakes, 55 retouched forms, 21 microliths, 5 microburins, as well as 330 wastes and chips. Most artefacts are attributed to early Mesolithic flint processing, linked with Maglemosian assemblages. It is attested by blade truncated pieces and shouldered points. Such findings are also based on the presence of tools with a large percentage of microlithic end-scrapers which appear in the assemblages. Other categories of microliths are more widespread and have a longer chronology. However, they can also be attributed to the same cluster. Micro-technological features of this part of artefacts link with technological component I, after P. Dmochowski 2002. The presence of a trapezium and rectangular cores, which can be attributed to component III, after P. Dmochowski may confirm single episodes of penetrating this part of the site also in the younger Mesolithic by the communities of the Janisławice culture. The region where the cluster is situated can be treated as an element of a larger campsite from the early Mesolithic. This also refers to some material from cluster 5. Another explanation might be multiple visiting of the site by communities during the Mesolithic. The theory based on multiple visitations of the site in the early Mesolithic is supported by the lack of re-fittings between one cluster and the next and within the boundaries of the same cluster.

Cluster 5

It is the most abundant cluster, consisting of 2947 artefacts. The most numerous are chips and crumbles, whose number equals 1259 specimens. The second most numerous group are blades (707 specimens) and flakes (688 specimens). The other categories were less numerous, but in comparison with other clusters, their number is quite big. There were 160 tools, including 79 microliths. At least 75 core preparation forms have been identified, including flakes from core flaking surface rejuvenation, core platform rejuvenators, first crescent blades and second crescent blades. There were also 42 cores. The least numerous group in the cluster were microburins, which consisted of 16 specimens. The most abundant cluster has yielded diverse material with a younger assemblage, unearthed in upper layers of arable layer and in mechanical layers I – III. The assemblage from the older Mesolithic was found in mechanical layers IV–VII, immersed in mechanical layer VII in sections 204, 207, 208. The younger assemblage includes microlithic trapeziums and core forms with Janisławice features,

whereas the older one consists of shouldered points, blade truncated pieces as well as microlithic end-scrapers, with analogies in pre-Boreal and early Boreal Maglemosian assemblages and the assemblages of the Duvensee cluster. On the site, the assemblage is found in clusters 1–4.

Cluster 6

The cluster, situated in the middle part of the trench (fig. 21) in sections 237, 254–256 has yielded 190 flint artefacts.

The cluster contained a small number of artefacts with homogenous technological and typological features. Apart from single forms linked with the adjacent cluster 7, attributed to the late Mesolithic, all the other ones are homogenous and can be linked with Maglemosian and post-Maglemosian flint processing. There are links with pressing technology of blade production (fig. 93) in the form of cores for bladelets reaching $\frac{3}{4}$ of the core flaking surface and the regular character of the semi-product. They indicate component II (P. Dmochowski 2002) or technological group III with microlithic material (M. Sørensen 2006a). Analogous material has the form of flint artefacts from central-eastern Pomerania, site 4, Jastrzębia Góra (L. Domańska 1992), or site 3 at Turowiec on the Brda river (Z. Bagniewski 1987b).

Cluster 7

161 flint artefacts have been unearthed in sections 238–240 and 257–259 (table 26). They are situated in the southern section of the middle part of the trench (fig. 17), next to cluster 6. The features identified on flint artefacts attest exploitation with a punch and percussor, linked with component III, after P. Dmochowski 2002. Typological composition with several microlithic trapeziums and the presence of chocolate flint indicate traces of the Janisławice communities in this part of the trench in the late Mesolithic.

Cluster 8

The site has yielded 2 single-platform cores for blades, 37 blades and blade fragments, 18 flakes, chips and wastes, as well as 11 tools, including 9 microliths. Among scarce flint material found in the north-eastern part of the site blades dominate over flakes. The presence of a diversified set of microliths with triangles and a trapezium may imply their late Mesolithic chronology.

Cluster 9

The least numerous cluster consisted of 10 technical forms – flakes from core flaking surface rejuvenation, 14 blades and blade fragments, 15 forms which are the smallest and belong to the category of chips, crumbles and natural nodules, as well as 2 flakes. A large number of core preparation forms and blades made of the same raw material indicates that the function of the cluster can be connected to a short-lived flint-processing workshop, aiming at the exploitation of core for blades. Moreover, micromorphological features of the blade semi-product imply links with the late Mesolithic and the Janisławice culture.

Cluster 10

The cluster contains approximately equal amounts of crumbles and chips (31 specimens), blades (30 specimens) and flakes (22 specimens). Tools are less numerous – 9 specimens, including 6 microliths. Flake renewing core platform is exceptional. The cluster did not contain any cores or microburins. In

terms of raw material we can distinguish blade made of chocolate flint with Mesolithic flint processing features. Despite being scarce and dispersed, the artefacts obtained from the cluster have yielded interesting information. The presence of 3 microlithic trapeziums and a truncated piece may indicate their late Mesolithic chronology. The domination of blades over flakes may point to the presence of a more numerous cluster beyond the boundaries of the trench on the unexcavated area. This is yet another place which confirms the penetration of the area of the Janisławice culture communities in the late Mesolithic.

Cluster 11

The most numerous artefacts in the assemblage were chips and crumbles – 173 specimens. There were also 116 blades and blade fragments. Flakes were far less numerous (66 specimens), and so were other categories, such as tools, core preparation forms, microburins and cores (15, 10, 5 and 3 specimens respectively). As regards spatial distribution, this very compact cluster of flint artefacts has yielded very important information. The domination of blades over flakes and the presence of single-platform cores indicate function connected with the production and processing of blades, partly designed as microliths, which is attested by the unearthed microburins. The discovery of core platform rejuvenators, which in terms of raw material is connected with the core from cluster 12 is very important. The presence of 4 microlithic trapeziums indicates a late Mesolithic chronology of the cluster. Additionally, the presence of 7 microburins made of distal portion of the blade, with which it was possible to remove the most bent part of the blade allows us to link most of the artefacts from the cluster with the Janisławice culture.

Cluster 12

The most numerous were flake, blades, as well as chips and crumbles: 42, 39 and 33 specimens respectively. Apart from this, 2 categories of artefacts have been identified: tools – 7 specimens, including 2 forms of retouched tools and 5 microliths, as well as 1 core. There are no core preparation forms and microburins. This not numerous cluster of artefacts has yielded dispersed material with features characteristic of the Janisławice culture flint processing. This is attested by a single-platform blade core with a flat flaking surface with broad negative scars after long, straight blades, bent up only in the distal part. Three microliths, typical of Janisławice communities, two of which could be fitted with each other, confirm late Mesolithic chronology.

Cluster 13

Blades dominate over flakes in the assemblage. The former are the most numerous category. The next most numerous are wastes and chips – 32 specimens, followed by tools – 19 specimens, with a visible domination of microliths – 17 specimens. The latter are dominated by triangles and fragments of this type of points, in total 12 specimens. The artefacts, though not very numerous are homogenous linked with the Maglemosian group flint processing. Small single-platform cores with flaking surface around the specimen and a set of selected forms, above all microliths with dominating, massive microlithic triangles are linked with the Boreal assemblages of the Svaerdborg type. It seems that despite unearthing several cores, the lack of cor-

tex forms in blades and flakes and the lack of technical forms rules out the presence of a flint processing workshop aiming at core preparation. The lack of microburins and a larger number of tools rules out the possibility of a point workshop, as well as specialised places of tool exploitation. A large number of microliths and non-cortex blades may indicate a short-lived presence of a hunter or a group of hunters who did not set up a campsite.

Artefacts found outside the clusters

Apart from the material attributed to the above mentioned clusters, the site has also yielded loosely scattered artefacts, including single objects with technological and stylistic features linked with the Mesolithic (fig. 12–16). In total 655 Mesolithic artefacts have been obtained, 280 of which belong to category of flakes and undetermined specimens, i.e. chips and crumbles. There are 375 specimens of cores, core preparation forms, blades, tools, microliths and microburins which can be undoubtedly attributed to a Mesolithic flint assemblage. The most interesting in analytical terms are tools, mainly microliths and wastes obtained during their production. They probably attest several dozen visitations of the site during the Mesolithic.

Mesolithic material from Redecz Krukowy in the context of the analysis of other sites in the European Lowland

Archaeological excavations at Redecz Krukowy, which covered an area of c.a. 70 ares, have yielded surprising results with the applied research method. It was possible to unearth over a dozen clusters of flint material and obtain artefacts scattered between the clusters. The analysis of the artefacts and the accompanying documentation revealed that humans appeared on the site at the beginning of the Holocene. The first Mesolithic communities that were present on the site are connected with the Narew cycle, Maglemosian or Duvensee/Komornica culture (H. Więckowska 1975; S. K. Kozłowski 1989). The groups most probably came from the west or north-west during the younger part of the pre-Boreal period or at the beginning of the Boreal period. Their activity is connected with the penetration of the Kuyavian Plateau and the Kuyavian Lakeland. The indicators of early materials in Kuyavia are truncated pieces and backed blades, shouldered points and microlithic end-scrapers, which have their analogies in the early Scandinavian assemblages. Perhaps this category of artefacts should be linked with date 8620 ± 40 BC from Redecz Krukowy. This period can be linked with artefacts from clusters 1, 3 and 4 and some material from cluster 5. At that time human groups set up small campsites in the highest terrains, on the lakes or rivers. This is confirmed by the location of cluster 3 at Redecz Krukowy. Single and double-platform cores were exploited by means of direct striking. This is confirmed by micro-technological features, such as "rubbing", traces of abrasion of core processing edge, small, edge butts and the presence of such tools as: edzes, burins and microlithic end-scrapers. The produced blade semi-product was not regular and quite short. It was used for making truncated pieces, backed blades and shouldered points. The presence of hunters and gatherers at that time in the vicinity of Redecz Krukowy is confirmed by the discovery of coal dust in palynological cross-section at Osłonki, site 1 (D. Nalepka 2005, 2008), which locally reached

overgrown water reservoirs, situated several kilometres from the site (K. Wasylkowska 1990). Mesolithic communities which inhabited the site at Redecz Krukowy only used local erratic stone, like in other areas of the European Lowland.

In the late Boreal period c.a. 8200/8100 cal BP the stretch of land joining the European continent with Scandinavia and British Isles (Doggerland) (B. Weniger et al. 2008), as well as the one between Bornholm and Central Pomerania (C. Casati, L. Sørensen 2006b) were flooded. As a result human settlement decreased. Boreal period at Redecz Krukowy, site 20 is linked with artefacts from clusters 6–11 and 13. The current stage of research indicates that Mesolithic communities in Kuyavia reached their best performance during the Boreal period. It is attested by a large number of sites from that period and the appearance of sites with multiple concentrations of flint artefacts connected to their production site, such as Redecz Krukowy, site 20.

At the turn of the Atlantic and Boreal periods or at the beginning of the Atlantic period so called Janisławice communities, also called Vistulian cycle arrive at Kuyavia. They penetrated areas along river valleys and territories on the lakes. It seems that in the middle of the Atlantic period, the performance of hunters-gatherers communities was worse than in the preceding period, connected exclusively with the Maglemosian culture or the Narew cycle. Janisławice campsites recorded on the excavated areas extended over the territory of up to 400 square metres. At Redecz Krukowy, site 20, Janisławice artefacts were found at the lowest part of the site, closest to the edge of the former lake. These are clusters: 2, 7 and 12. It can be assumed that the lowering level of water in Czajno Lake, which is also confirmed by palynological analysis of other reservoirs in the vicinity (D. Nalepka 2005), made the Mesolithic communities set up more stable campsites closer to the shoreline. This is confirmed by the number of artefacts in particular Janisławice clusters at Redecz Krukowy. As regards Janisławice material, there are traces of shacks or tents built on posts. It may prove a more stable settlement in comparison with the communities of Svaerdborg group. Janisławice communities used local raw material, as well as imported chocolate one. Material from Redecz was mainly made of erratic stone, which is different from e.g. Dęby 29. It confirms excellent flint processing skills of the makers, who were flexible enough to adapt to the changing raw material.

The presented results of research of Mesolithic artefacts found in clusters at Redecz Krukowy yield a lot information connected with technology, typology and chronology of flint artefacts. On top of that they provide ample information referring to spatial layout and above all internal organisation of campsites. Clusters which have yielded particularly useful information include: 2, 4, 5 and 13. Overall results of analyses on the whole site confirm the fact that throughout the whole of the Mesolithic groups of hunters frequently visited the sandy terrain and Mesolithic clusters – concentrations of flint artefacts connected to their production site – encompass diversified areas and assume different shapes. Moreover, several clusters of artefacts were found at the rim of the trench, which can indicate the presence of other clusters of this type beyond

the excavated area. Over a dozen concentrations of flint artefacts connected to their production site and plausible several dozen other single inhabitation incidents do not fully describe the potential of the place. Discoveries at Redecz allow us to treat the site as multiple concentrations of flint artefacts connected to their production site or a campsite cluster. It is particularly interesting to observe the small size of some clusters of flint artefacts at Redecz Krukowy. The smallest ones are mainly attributed to the older Mesolithic. It can be explained in several ways, e.g. by a specific settlement strategy, based on seasonal presence of hunters' groups on the Kuyavian Plateau, lack of flint artefacts or a short-lived, rota-based exploitation of the vicinity of the site. In the younger Mesolithic campsites occupy a more extensive area. This indicates a longer presence of hunting groups on the site and more stable settlement in the Atlantic period.

Particular Mesolithic horizons are characterised by sets of forms typical or unique for Redecz Krukowy or in more general terms for Kuyavian assemblages, which can be compared to other areas. The oldest Mesolithic includes massive truncated pieces on flakes and backed blades (table...). Slightly younger pre-Boreal and early Boreal assemblages are characterised by edges, truncated pieces, shouldered points, Maglemose willow leaf-shaped arrowheads, and microlithic end-scrapers (fig. XXX: 2–7). Boreal and possibly early Atlantic assemblages are characterised by slender, geometrical-shaped microliths on bladelets, such as: microlithic triangles, microliths of the Nowy Młyn type, microliths with retouched base, slender truncated piece and backed blades (fig. XXX: 8–11). It is accompanied by a progressive microlithisation of cores and the semi-product. The youngest Janisławice assemblages are characterised by microlithic triangles, with a shorter side straight or concave, microliths of the Wieliszew type and various types of microlithic trapeziums (fig. 100:10–12).

Summary

The main outcome of the research of flint artefacts on site 20 at Redecz Krukowy is the fact that technological and typological development occurred in a similar way to other Kuyavian sites and to other neighbouring areas of the Central-European Lowland. The location of Kuyavia and Redecz Krukowy in the eastern part of the Lowland on the post-glacial territory enabled quick access to technological innovations and cultural changes (L. Sørensen et al 2013). Flint artefacts, described above, give a clear picture of social-cultural changes that took place in the early Holocene, at the same time providing a lot of information on spatial organisation, size of clusters and possibility obtaining microlithic flint artefacts from sandy sites.

SETTLEMENT OF THE DANUBIAN CULTURE CYCLE (Piotr Papiernik)

The excavations at Redecz Krukowy have yielded scarce artefacts of the Danubian culture cycle. They included movable artefacts (table 26) and recessed features of the Linear Pottery culture (c.f. table 40–42), the Stroke Ornamented Ware culture and the Brześć Kujawski group of the Lengyel culture (c.f. table

43–46). Moreover, a group of flint (c.f. P. Papiernik, J. Wicha, current volume) and stone artefacts have been distinguished. On the basis of their morphological features, they can be included to the cultural circle in question, with no attribution to a particular culture. Most of the described artefacts have been unearthed as a result of sieving all the layers on the site, including the contemporary arable layer (c.f. P. Papiernik, Introduction, current volume)

Vessel fragments as well as flint and stone artefacts have been unearthed in various parts of the trench, occasionally forming small clusters (fig. 136). On the basis of the C-14 dating (c.f. table 1, fig. 142) and the stratigraphy of layers, four features (hearth and 3 utility pits) have been attributed to the Danubian culture cycle. The discovery of the artefacts in question may be considered unusual, as the remains of the early agricultural settlement in Kuyavia are mainly recorded in the areas of fertile soil on clayey substrate (c.f. L. Czerniak 1994, R. Grygiel 2004, 2008; J. Pyzel 2010). The feature in question consisted of diverse movable artefacts and recessed features (fig. 136), which indicate not very intensive, but rather long-lasting use of the site by various groups in the 6th and 5th millennium BC (fig. 142). In an attempt to interpret the discoveries, we should refer to the results of soil science analysis (c.f. M. Jankowski, current volume), which indicates the development of mucky soil at that time. The latter is regarded as fertile and easy to cultivate. This observation corresponds with the results of a comprehensive study of the Danubian culture settlement in the Brześć Kujawski and Osłonki region (R. Grygiel 2004, 2008). It confirms archaeobotanical analysis, which attests the exploitation of vegetation complexes, growing on sandy substrate and used by the communities of the Linear Pottery culture and the Brześć Kujawski group of the Lengyel culture (c.f. R. Grygiel 2004, p. 524–544; 2008, pp. 1535–1570).

SETTLEMENT OF THE FUNNEL BEAKER CULTURE (Piotr Papiernik, Rafał Brzejszak)

The main aim of the excavations at Redecz Krukowy was the recognition of the settlement of the Sarnowo phase of the Funnel Beaker culture. Thus, it is hardly surprising that the artefacts from that culture clearly dominate among the excavated archaeological material. A numerous assemblage is connected with the culture in question. It consists of 118 281 pottery fragments of vessels and spoons, whose total weight equals 442.5 kg, flint artefacts (c.f. P. Papiernik, J. Wicha, current volume) and stone objects (c.f. R. Brzejszczak, P. Papiernik and M. Krystek, current volume). Elements of spatial organisation of the "Sarnowo" settlement, in the form of residential and utility features (fig. 143) are also connected with the Funnel Beaker culture. Most artefacts have been unearthed in various layers of the site, mainly in the cultural layer (c.f. plates 6–10; 59–64; 198–203). Only some, not numerous artefacts have been found in recessed features, including 192 vessel fragments. Clusters of the Funnel Beaker culture were designated on the basis of the following elements: the range of the so called cultural layer and the spatial distribution of pottery at separate excavation levels (c.f. plates 2–10 and plates 59–64)

analysed together with vessel fragments of the Funnel Beaker culture from the arable layer (fig. 146) and the layout of pottery and flint re-fittings (c.f. plates 65 and 195). Six main clusters have been identified, three of which are additionally divided into smaller parts (fig. 148).

The unearthened pottery artefacts are heavily fragmented due to the method of unearthing – i.e. by means of sieves. Consequently, after precise cataloguing, 28 371 vessel sherds have been distinguished (which weigh 239 kg), out of the total number of 118 281 fragments. They underwent a detailed study, with the application of uniform principles. The group contained fragments of rims (4162 items), bottoms (1319 items), handles (227 items), plates (1599 items), spoons (349 items) and decorated bellies (198 items), as well as undecorated ones (20526 items).

Detailed analyses of artefacts have been conducted with reference to three aspects: technology, morphology and decoration. Each of the above mentioned fragments underwent technological analysis, determining the type of admixture, its quantity and granulometry. Additionally, texture of surfaces and the features of the curves of particular sherds have been determined, as well as the thickness of walls – whenever it was possible.

In order to conduct a comparative analysis of clusters of the Funnel Beaker culture artefacts, detailed classifications have been prepared. Separate specifications of micro-morphological diversity have been used for rims (plate 78), bottoms (plate 80), handles (plate 80) and plate rims (plate 79). At the same time, classification of decoration has been prepared, depending on its place: under the rim (marked as “P” – fig. 166), over the rim (marked as “N” – fig. 166), on the belly (marked as “B” – fig. 169) and near the bottom (marked as “D” – fig. 168). Plates were examined differently with a separate set of decoration descriptions (fig. 168). On the basis of a partial reconstruction of 156 forms in the form of drawing (c.f. fig. 184–194) it was possible to determine basic vessel categories. They were divided on the basis of classification by A. Koško (1981), which was modified in order to suit the specific needs of the assemblage in question. The distinguished forms included: beakers, amphorae, bowls, plates, pots, with a separate type of miniature forms. As regards pots, we have assumed, after R. Grygiel (2016, p. 23) that these are beaker-like vessels, but with a moulded band. A numerous assemblage of plates underwent a separate study. The classification of these forms into shallow (type XIIA) and deep ones (type XIIB), as proposed by A. Koško (1981) are not adequate for the material from Redecz Krukowy. The artefacts which underwent a detailed analysis were basis for the assessment of the so called minimum vessel number, which was as follows: 361 items for beakers, 155 items for amphorae, 187 items for pots, 80 items for bowls, 378 items for plates and 141 items for spoons. A considerable number of pottery artefacts is definitely linked with the settlement of the Sarnowo phase. On the basis of the conducted analyses, we can observe a unique diversity in the shape and decoration of vessels. In many cases they have individual character, unknown at other sites in the early phases of the Funnel Beaker culture. However, a set of elements characteristic of the whole

assemblage from Redecz Krukowy and common for all clusters has also been distinguished. Each set contained the same categories of vessels with a similar morphological diversity and way of decorating. The most numerous are beakers, which belong to wide-mouthed forms, with a gentle, S-shaped profile and a short, flared neck. They may have a longer neck which either gently or more sharply turns into a more spherical belly (c.f. fig. 184, 185). The vessels vary in size, from miniature ones (fig. 186: 3–5) to forms with a mouth diameter of c.a. 40cm (fig. 185: 7). The beakers are frequently decorated, usually under the rim, and occasionally in the upper parts of the bellies. No beakers with handles have been discovered.

The occurrence of morphologically diversified amphorae is attested by various handles, with a characteristic division, in the form of two or even three grooves (c.f. fig. 187: 1, 3, 6, 8, 10). Better preserved fragments of the upper parts of the vessels indicate that these are forms with a small mouth diameter and a slightly flared or straight neck, usually undecorated. The forms which are particularly characteristic include an amphora, reconstructed in its upper part, probably with two handles placed in the upper part, directly under a short, flared neck (fig. 187: 10).

The material in question is abundantly represented by bowls. These are morphologically diversified forms, which is attested by fragments that are partially reconstructed. Each of the artefacts could be included to a different type of vessel form (c.f. fig. 188). It is worth noting the presence of bowls clearly linked with the younger Danubian cultures, due to the presence of knobs stretching above the vessel rim (fig. 188: 4, 9).

A distinct group of vessels is formed by pots with moulded bands (fig. 189). This element is additionally shaped with finger impressions or with a tool, sometimes in a way resembling the so called “arcade” decoration (c.f. fig. 189: 1, 4, 6, 10, 11), or decorated with different types of impressions. Pots are gently S-shaped, medium or large forms. It is worth observing an almost completely reconstructed form, 38 cm tall, with a mouth diameter equal 40 cm (plate 92: 1).

Plates are particularly characteristic. They are considered to be benchmark forms for the Sarnowo phase. On the basis of 1.6 thousand forms, including 81 partially reconstructed ones, it can be observed that these are very diversified forms in terms of size, details of morphology and decoration (c.f. fig. 163–165, 190–193). Miniature forms are of particular interest with a mouth diameter between 4.5–7 cm, usually richly decorated with no analogies at other sites of the Funnel Beaker culture (fig. 192: 1–4). Medium and large plates – sometimes up to 40cm in diameter, are numerous at the site. They are characterised by rich and diversified decoration. An exceptional artefact is a partly reconstructed transitory form – a combination of a plate and a bowl (plate 163: 1).

The assemblage at Redecz Krukowy consisted of a large number of fragments of clay spoons (fig. 194). On the basis of the shape of a handle and the size of a bowl, we can indicate their metric range. The smallest specimens are c.a. 5 cm big, (e.g. plates 130: 7; 158: 2). The largest ones are 10–12 cm long, with the depth of the bowl equal 3–4 cm and the width – c.a. 5 cm (plates 121: 3; 130: 5). Decoration in the form of pierced or

corrugated rims has also been observed in several cases (fig. 194:1, 3).

In general, 1809 decorated fragments have been distinguished, which constitute only 1.5% of the whole assemblage. The observed decoration was made with the use of four techniques: impressions, engraving, moulding and piercing. Except for plates, decoration of vessels is limited to one row of rectangular, triangular, oval or irregular impressions placed under the rim (c.f. fig. 166). We should emphasise formal diversity of elements under the rim, whose diverse shapes have no analogies in other early assemblages of the Funnel Beaker culture.

Vessels are decorated by means of corrugating the rims. It is observed in vessels of different categories (including plates) and size. The technique was either used as the only decorative element or in connection with a series of impressions, placed under the vessel rim (c.f. fig. 187:1; 188:7; 189:5; 190:8; 191:4; 192:6; 193:4). This type of decoration is linked with the younger Danubian groups, mainly the Brześć Kujawski group of the Lengyel culture (c.f. R. Grygiel 2008).

An exceptional element of the assemblages of the early phases of the Funnel Beaker culture observed at Redecz Krukowy is the decoration of vessel bellies (c.f. fig. 169). 164 fragments of decorated vessels have been distinguished. Decoration had a form of one, or more rarely two rows of oval, triangular, rectangular, or occasionally irregular impressions, placed at the point where the vessel neck turns into a belly, or on the upper part of the latter, above the greatest vessel bulge (fig. 185:7; 198). Vessels of different type and size were decorated in this way. Similar decorative motifs were recognised among artefacts of the late phase of the Brześć Kujawski group of the Lengyel culture, e.g. at the main settlement at Osłonki (c.f. R. Grygiel 2008).

While describing decoration and morphology of vessels, it is worth noting elements that were not recognised in the artefacts from Redecz Krukowy. There were no fragments of flasks with a collar or sherds of vessels decorated with a moulded band on the belly of the Baalberge type. Also, engraved and impressed motifs characteristic of phase II of the Funnel Beaker culture in Kuyavia, were missing (after A. Koško 1981), even though they are present at Podgaj 7A, Inowrocław 95, Przybranówek, site. 43, or Jezuicka Struga (c.f. L. Czerniak, A. Koško 1993; S. Rzepecki 2004).

On the basis of a detailed analysis of technological features of artefacts from Redecz Krukowy, it must be concluded that the assemblage is dominated by vessel fragments with relatively thin walls, made of clay tempered with a small amount of ceramic grog and /or ceramic mass with no admixture (so called greasy clay), fired in the reduction atmosphere (c.f. fig. 153–160). Some diversity can be observed in the types of vessels. In the case of amphorae and plates, clay with no admixture was more commonly used, whereas pots were made according to a recipe with some amount of sand.

The distinguished clusters of artefacts (pottery and flints) and the zones of occurrence of the cultural layer are connected with the unearthened remains of utility and residential features (fig. 143). The best preserved cluster no 3 (c.f. fig. 148 and 149) has a particularly interesting spatial layout. It consists of aeol-

lian sands, deposited on the settlement of the Funnel Beaker culture. A cluster of 15 post holes has been unearthened in this area, which together with the remains of daub and a rectangular pit constitute remains of a residential building (c.f. fig. 143; 172; 173; plate 51). The remains unearthened in sections 52–55 indicate that the house was supported on posts, on the plan of a trapezium measuring 6.5×3.5×2m with a small extension from the north-east. The layout of posts indicates that the building was divided into two parts: the western one consisting of an entrance and a pit – cellar, and the eastern one with a piece of daub. Eastwards, in sections 56, 57, 67, 68 a rectangular feature was unearthened, flat at the bottom. These may be the remains of a small house (3, 5×2, 5m – plate 50:2) with overground, possibly log construction (fig. 175). Additionally, there were two small, depressed pits (fig. 49:2; 52:2). The next cluster of features has been recorded in the western part of cluster 3 (c.f. fig. 143). It consists of 11 post holes and a deep recessed feature 16 (plate 50:1), at the bottom of which, two pieces of washed-away clay (fig. 176) have been found, at the depth of c.a. 1m. Also, a cylindrical pit was unearthened, whose sediment reached the level of the clay (feature 17 – plate 49:3). Interpreting the cluster of features in question, we should note their possible functional link with pottery making, for which the deposition of clay was important. Most probably some kind of roof with a light construction was built above it, in the form of a wind shelter. It should be also added that directly next to feature 17, there was a cluster of four large, charred stones (c.f. plate 49:3), and in its neighbourhood a culturally undetermined hearth and another pit (feature 19 – c.f. fig. 300, 301). The above features together with a large number of artefacts (e.g. 29 thousand of pottery sherds and 2.2 thousand of flint artefacts) can be identified as the remains of one homestead, belonging to the settlement of the Sarnowo phase.

The layouts of post holes, which can be interpreted as the remains of a house, have also been unearthened in sections 260, 261, 266 and 272 (fig. 143). Most certainly, the reconstructed house was built on the plan of a trapezium, 7×5×3m large, inside which a piece of dry clay (daub) and a cellar were unearthened. The clusters of post holes have also been recorded in the south-western part (sections 18, 34, 35 and 30, 38, 46, 58, 80), central (sections 202–204 i 217, 219) and north-eastern part of the trench (sections 279, 281, 287, 288), where clusters of weakly fired daub were also found (c.f. fig. 143). However, their layouts do not provide basis for a reliable reconstruction of further houses. Moreover, settlement of the Sarnowo phase can be linked with at least 11 pits and several hearths. The most interesting ones include 4 features, regular, rectangular in cross-section, recessed in the substrate to the level of clay (fig. 170). These are features with a special function, most probably wells.

On the basis of the obtained data, the area of the settlement of the Sarnowo phase should be estimated to 1 ha. It consisted of 6 main parts, identified as single homesteads.

The Funnel Beaker culture is also connected with some, not numerous movable artefacts (pottery and flints). They attest a further stage of using the site, after the Sarnowo phase. We can distinguish elements typical of the Wiórek phase in its

whole chronology (fig. 167). The material consists of pottery decorated with the following motifs: rows of double point impressions, motifs of regular, rectangular "posts", made with a cord, motif of a zigzag and a "ladder". It also had "knee-shaped" handles. Flint artefacts of the Wiórek phase consist of specimens made of Świeciechów and Volhynian flint (c.f. P. Papiernik, J. Wicha, current volume).

The remains of an earth embankment, interpreted as a Kuyavian long barrow (c.f. fig. 143, 300) have also been attributed to the Funnel Beaker culture. The existence of such structures is attested by a relatively regular layout of post holes, which reflects the course of the embankment, designated on the basis of the artefacts, and culminated with a clearly widened part – the front of the long barrow. Inside there was a rectangular feature – probably a single grave, equipped with a flint tool (c.f. fig. 143, 178–183). If the above assumptions are accurate, the recorded long barrow was built without stone raw material. Its estimated length is 70m. It is 18m long at the front and has maximum width of 9m. The width of the embankment is between 2 and 3m. These are measurements typical of many Kuyavian long barrows (c.f. W. Chmielewski 1952).

The Funnel Beaker culture settlement has 23 radiocarbon dating indicators. Nineteen of those were obtained from an organic substance, stuck to the walls of the Funnel Beaker culture vessels and made with AMS method (sample symbol Poz and Beta – c.f. fig. 143, 201, 202). Four dates were obtained from charcoals found in three post holes (features 42, 81 and 83) and a hearth (feature 84) by means of scintillation method (sample symbol Lod – c.f. fig. 143, 201, 202). The obtained C-14 results confirm the exploitation of the area of the site over a very long time span, estimated to at least 500 years (c.f. fig. 201–204). In the case of dating obtained from substances stuck to vessel walls it is surprising that they have a wide chronological range and at least nine of them are attributed only to the Wiórek phase (c.f. fig. 201, 202). Thus, we can observe a considerable difference between the number of younger indicators and the proportions of pottery artefacts, in which the Wiórek phase decoration was recognised in only 28 fragments, with two thousand sherds characteristic of the Sarnowo phase. The indicators were made for the pottery with no decoration, i.e. without a possibility of relative dating within the boundaries of the Funnel Beaker culture. Therefore, it is impossible to determine which of the C-14 dates can be reliably linked with the span of the Sarnowo phase settlement. It seems that these are the oldest indicators which point to the beginning of the Funnel Beaker culture settlement at the site, i.e. the 1st c. of the 4th millennium BC (fig. 201, 202, 205).

Three youngest C-14 dates were made for charcoals obtained from charred posts, which are elements of the Kuyavian long barrow (fig. 182). They indicate a relatively late period of erecting or using the feature, which is dated to the time span between 3550 and 3250 BC (c.f. fig. 201, 202). Similar C-14 dates have been obtained for the long barrow no 2 at Gaj (P. Papiernik, J. Wicha, D. K. Płaza 2017).

Summing up the early Funnel Beaker culture settlement at Redecz Krukowy it is important to consider the conclusions of the detailed analyses of the abundant pottery and flint as-

semblage. It can be observed that the general stylistics of vessels reflects the motifs known from the oldest artefacts of the Funnel Beaker culture in Kuyavia and the zone of the Polish Lowland (c.f. K. Jażdżewski 1970; T. Wiślański 1979; H. Wiklak 1980; 1983; D. Jankowska 1990; E. Niesiołowska-Śreniowska 1994; L. Nielsen 1994; L. Czerniak, A. Koško 1993;; S. Rzepecki 2004; M. Nowak 2009; L. Sorensen 2014; S. Kukawka 2015; L. Czerniak, S. Rzepecki 2015; R. Grygiel 2016). Local elements are also quite clearly visible. They indicate individual character of the assemblage from Redecz Krukowy. The major, most original motifs can be found in the vessel decoration, as well as the number and morphological diversity of plates. The findings referring to the mass import of chocolate flint artefacts are also significant (c.f. P. Papiernik, J. Wicha, current volume). The results of the analysis of the above elements indicate an exceptionally early dating of the artefacts from Redecz Krukowy. They are most similar to the material from Sarnowo, site 1A, and barrow no 8 (c.f. H. Wiklak 1980; 1983; E. Niesiołowska-Śreniowska 1994). In order to establish relative chronology and cultural attribution, it is also important to recognise the so called Baalbere decoration and the stylistic indicators of phase II of the Funnel Beaker culture (c.f. after Koško 1981; c.f. L. Czerniak, A. Koško 1993, S. Rzepecki 2004), as well as flint macrolithic artefacts (c.f. A. Zakościelna 1994, 2006, 2010, S. Kadrow 1996). The findings indicate that the settlement at Redecz Krukowy functioned before the above mentioned elements appeared in Kuyavia. In terms of relative chronology, it corresponds to the end of the 5th and the first centuries of the 4th millennium BC. These findings are confirmed by C-14 dates (c.f. fig. 201, 202), on the basis of which the beginning of the Funnel Beaker culture settlement at the site in question should be dated (with 68.2% probability) to the period not earlier than between 4029–3874 BC, and not later than 3921–3767 BC (c.f. fig. 205).

Long-lasting excavations at Redecz Krukowy have resulted in the recognition of a multi-house settlement of the Sarnowo phase of the Funnel Beaker culture. It was set up in the area of intensive and well-recognised settlement of the Brześć Kujawski group of the Lengyel culture, with the main settlement point at Osłonki (site 1), 2.5 km away from Redecz Krukowy. According to R. Grygiel (2008) the development of the group in question spans the period between 4100–4000 BC. The question remains – what were the chronological and cultural links between the communities of the Funnel Beaker culture from Redecz Krukowy and the youngest Danubian groups in Kuyavia? It should be underlined that there are considerable differences in the main elements of the cultural system, such as organisation and building development of settlements, stylistics and technology of pottery making, or flint processing. However, there are also similarities in some elements of decoration (e.g. decorating bellies, corrugating rims), vessel morphology (some types of bowls) and a set of flint tools. There are very many different interpretations of cultural and chronological relations (c.f. M. Nowak 2009, 2017; S. Kukawka 2015; R. Grygiel 2016; L. Czerniak 2018). The authors are of the opinion that the Brześć Kujawski group of the Lengyel culture had a great contribution to the development of the Funnel Beaker

culture in Kuyavia. This view is also confirmed by DNA research, where we can note considerable genetic similarity between the two populations inhabiting the area of Kuyavia (c.f. D. M. Fernandes et al 2018; W. Lorkiewicz et al 2015).

The Funnel Beaker culture artefacts from Redecz Krukowy do not reveal any significant links or similarities to the settlement of the early phases of the Funnel Beaker culture in Scandinavia, north Germany or the coastal areas of the Baltic Sea. The similarity is only limited to very general stylistic trends as regards Beaker pottery. There are very clearly observable differences in the technology of pottery making, morphology and vessel decoration, as well as flint processing. The material from Redecz Krukowy is genetically linked with the younger Danubian cultures, with no similarities to Mesolithic artefacts.

SETTLEMENT OF THE GLOBULAR AMPHORA CULTURE (Rafał Brzejszczak, Piotr Papiernik)

Artefacts of the Globular Amphora culture at Redecz Krukowy are represented by an assemblage of artefacts obtained from sediment pits and so called cultural layer. Six features contained only 127 vessel fragments, which constitute 2.1% of the total number of pottery sherds from that culture. The remaining fragments (5855 items) were found scattered loosely in the cultural layer. 4391 of those have been recorded on the spatial distribution plan. Artefacts from the Globular Amphora culture have been found in three clusters: in the western, central and eastern part of the site (fig. 208).

The first and the largest cluster of artefacts of the Globular Amphora culture at Redecz Krukowy, site 20 was found in the western part of the excavated area (c.f. fig. 1). It was divided into two smaller concentrations: A (north-eastern part) and B (south-western part), covering an approximately similar area of 2 ares each. Spatial distribution plan indicates that the greatest number of pottery fragments is found on the outskirts of the cluster with a minimal number of sherds located in its centre (c.f. fig. 208). The post holes unearthed in this area may point to the existence of a homestead with a post building in this place. It covered an area of c.a. 15–16 sq m (c.f. fig. 300, 301). The pottery material from the cluster reveals features typical of the classical phase of the Globular Amphora culture, after M. Szymt (1996). It is confirmed by a prevalence of artefacts with a large amount of crushed stone and decoration in the form of impressions of a double cord, including characteristic festoons (plate 182:7; 183:4–5). Section 161 has yielded vessel fragments with rim forms, very rare for the Globular Amphora culture. This was probably an amphora with a slightly flared neck and the rim curved inwards. This style of vessel making was widespread in the Neman culture (c.f. A. Wawrusiewicz 2012, fig. 11:6; 12:1, pp. 90–91).

The next cluster of artefacts of the community in question was found in the central part of the trench and encompassed an area of c.a. 700 sq m. It contains the smallest number of artefacts, due to the presence of several chronological horizons in this place with a similar method of vessel making (mainly from the early Bronze Age). In terms of technology and decoration, the pottery does not differ from the one found in cluster

I. It is possible to observe, however, slightly larger percentage of fragments, decorated with a cord impression around the vessel (plate 184:6). A fragment of a small vase, decorated with a knob in the upper part of the belly could be reconstructed (plate 184:5), and (partly) an upper part of a vase-shaped vessel (plate 184:8), whose type can be described as V B2, after T. Wiślański (1966). Section 197 has yielded a beaker mouth, decorated with an impression of a cord in the pattern of alternate horizontal and vertical lines (plate 184:2). This is characteristic of phase IIIa of the Globular Amphora culture (Czerniak L., Szymt M. 1990, p. 59). The technology of vessel making as well as the type and way of decorating lets us date the chronology of the cluster to the beginning of phase IIIa of the Globular Amphora culture.

The third cluster of the artefacts of the Globular Amphora culture was located in the eastern part of the site. Their largest number has been observed in sections 223–226. From the unearthed fragments it was possible to partly reconstruct an amphora with a delicately flared neck, bulging belly and a flat bottom (plate 186:1). Under the rim, the vessel was decorated with a double row of small, oval impressions, under which there were pointed festoons, impressed with a cord. Moulded decorations were also recorded in cluster 3. They had a form of small knobs under the rim (plate 187:6) and in the upper belly part (plate 185:12). There were also moulded bands under the rim (plate 185:14). Fragments of a vessel decorated with the impressions of a cord, intersected by vertical lines have also been unearthed. Such decoration is considered to be a diagnostic element of phase IIIa of the Globular Amphora culture (plate 187:7). The vessel bore traces of the rim curved inwards, which is typical of the Neman culture.

On the site in question there were also several features, which can be connected with the settlement of the Globular Amphora culture (c.f. fig. 300). The most interesting artefacts were obtained from feature 50 (plate 180:2). Its sediment contained 44 fragments of pottery of the Globular Amphora culture, out of which two vessels could be partly reconstructed: a bowl of type IV A1, after T. Wiślański (plate 188:2) and an amphora of type II A1, after T. Wiślański (plate 188: 3).

It is likely that grave remains were also unearthed (feature 54 – plate 181). The later grave (Globular Amphora culture) was dug in the embankment of a non-chamber barrow of the Funnel Beaker culture (c.f. fig. 300, 301). This was a typical method of burial for the communities of the Globular Amphora culture.

The artefacts unearthed at Redecz Krukowy indicate that the area was inhabited by the communities of the Globular Amphora culture, in its classical phase of development. A complete lack of artefacts of technological group I, rules out the presence of communities from an early phase of the culture in question on the site. The oldest artefacts of the Globular Amphora culture seem to be located within the boundaries of cluster 1. It is confirmed by a small number of moulded decoration and festoons, including the ones surrounded by holes. Decoration is based on simple, not extended motifs. Greater percentage of artefacts tempered with medium-grained sand and medium-grained crushed stone (gt. II) may indicate an older chronology than the other two clusters. Due to a wide chrono-

logical span of the technological group in question (E. Czerniak, L. Czerniak 1984, p. 36; J. Czebreszuk; M. Szmyt 1992, p. 109) the dating of the material from cluster 1 was mainly based on the stylistics of the decoration. Consequently, the cluster was dated to the end of phase IIb or the beginning of phase IIIa. Two other "amphora" clusters may be dated to the classical phase (IIIa), which is attested by more diverse decoration, including so called chequered pattern – typical of the phase in question (L. Czerniak, M. Szmyt 1990, p. 59) and a slightly larger number of fragments with moulded decoration, such as moulded bands and small knobs.

It is important to observe cultural links between the Globular Amphora culture communities at Redecz Krukowy and the Neman culture community, which is attested by mouth fragments, characteristic of the "forest" zone (plate 182: 7; 185: 6; 186: 7). The results of the analysis of flint artefacts are also interesting. They confirm the use of striped flint and provide new data on the exploitation of the local erratic stone (Baltic and Pomeranian) for the production of arrowheads (c.f. P. Papiernik, J. Wicha, current volume).

SETTLEMENT OF THE CORDED WARE CULTURE (Piotr Papiernik)

The excavations at Redecz Krukowy, site 20, have yielded material of the Corded Ware culture. It consists of a scarce assemblage consisting of 303 pottery fragments obtained from various layers of the site (c.f. comparison no 5 – CD). It also includes feature 79, recorded in section 274, in the south-eastern part of the trench (fig. 216), where a vessel and a stone quern (plate 189) were unearthed.

Fragments of vessels of the Corded Ware culture have been found in various parts of the trench. In the case of two regions, we can distinguish clusters between 100–150 sq m large (fig. 216), on the basis of their detailed location (spatial distribution plan). The first one was found in sections no 53, 57, 85–88, 90 and 92 and is composed of 74 vessel fragments (c.f. comparison no 5 – CD). The second cluster has been distinguished in the central part of the site in sections 183–185, 196–198, 203 and 237–240. It consisted of 195 vessel fragments. Moreover, various parts of the trench contained groups of artefacts, which consisted of 2–8 fragments each, with decoration typical of the Corded Ware culture.

The analysis of technology (quantity and type of admixture, surface completion, thickness of the walls) of the Corded Ware culture from Redecz Krukowy indicates typical production features of the culture in question, mainly its older phases (c.f. J. Kurzawa 2001, pp. 125–129; J. Ścibior, J. M. Ścibior 1990, p. 198, table 2). In the case of admixture-free material, relevant observations made by J. Czebreszuk (1996, p. 96–99), refer to the Corded Ware culture 1 and 2 in Kuyavia. Vessel fragments with the admixture of crushed stone indicate younger groups: Corded Ware culture 3 and 4.

The pottery of the Corded Ware culture included 63 fragments, decorated with motifs, typical of the culture in question. They consist of decorations made with the use of the impressions of cord, engraved lines and moulded bands. These

are not accurate chronological indicators, but the presence of segment type of motifs confirms the presence of younger artefacts in the area of Kuyavia, connected with the Corded Ware culture 3 and 4, after J. Czebreszuk (1996, 2001).

Fragments of a vessel, unearthed in different sections (187, 238, 237) deserve a separate description. In our opinion they come from a plant pot-shaped beaker (table 191:1). The vessel was made with an extended motif of at least four deep, engraved lines, under which an engraved zigzag pattern was made around the artefact. The vessel is thin-walled, made of clay, with no clear admixture. It is meticulously smoothed on the exterior surface. The vessel form indicates younger chronology within the range of the Corded Ware culture at the level of so called local groups. Decoration and clay recipe, however, point to older traditions. C-14 dating was made for organic substance, stuck to the interior of the vessel. It was made with AMS method by Poznań Radiocarbon Laboratory. The obtained result equals 3620 ± 35 (Poz-44440) and it spans the period between 2044–1890 BC (c.f. fig. 219: A). This dating is difficult to accept, as it is clearly younger than the span of the Corded Ware culture established for Kuyavia (c.f. J. Czebreszuk 1996, 2000) and in other areas of today's Poland (c.f. P. Włodarczak 2001, 2006; P. Jarosz, P. Włodarczak 2007; A. Matuszewska 2011).

The site also yielded feature 79 (fig. 216, table 189:1), which contained a stone quern and a vessel in the form of a beaker. The latter was decorated with the impressions of a double cord underneath a mouth and a knob, placed vertically in the place where a neck turns into a belly (plate 189: 2; fig. 218). The size of the vessel and details concerning morphological features, as well as the decoration and technology (admixture of crushed stone, brushing) let us attribute the form to the younger phases of the Corded Ware culture. In the case of Kuyavia, we should point to the groups of the Corded Ware culture 3 and 4 after J. Czebreszuk (1996, 2001), and more broadly to the development of so called local groups (c.f. J. Machnik 1979, P. Włodarczak 2006; A. Matuszewska 2011). Observations referring to a relatively regular layout and a flat bottom of the artefacts, as well as the discovery of the whole vessel and the stone tool let us interpret feature 79 as a grave of the Corded Ware culture. This conclusion is confirmed by the lack of material from this culture in the close vicinity of the feature, including the sieved arable layer.

On the basis of the analysis of artefacts it should be assumed that the site at Redecz Krukowy bears traces of multiple inhabitation incidents of different groups of the Corded Ware culture in the area. It is attested by the range of the occurrence of movable material, which form two clear clusters and several smaller concentrations. Moreover, the south-eastern part of the trench contained feature 79, which can be interpreted as a skeletal grave. On the basis of the decoration, morphology and vessel technology, the assemblage in question can be linked with various phases of the Corded Ware culture, with a considerable contribution of younger groups, from so called horizon of local groups. It is confirmed by C-14 dating for feature 79 (fig. 219:B).

The recognised clusters I and II, which can be interpreted as the remains of campsites, expand our knowledge about settlement rules of the Corded Ware culture. So far the culture has been mainly known from grave findings. The discoveries of campsites and small settlements of this culture made in recent decades (c.f. A. Bokinić 1989; J. Czebreszuk 1996; 2000; J. Machnik, E. Sosnowska, W. Cyhylek 1997; A. Czekaj-Zastawny et al 2003, pp. 294–296; P. Papiernik 2004; A. Matuszewska 2011), have proved analogous to the artefacts from Redecz Krukowy.

FLINT ARTEFACTS (Piotr Papiernik, Joanna Wicha)

The excavations at Redecz Krukowy have yielded 24825 flint artefacts. They are characterised by different chronology and cultural attribution (table 52). The whole assemblage was catalogued according to one classification list. Specimens from particular excavation units have been placed in separate catalogue tables (1890 in total), which take into consideration such criteria as: place (section, feature), depth of discovery (arable layer and mechanical layers from I to VIII) and the method of obtaining artefacts (location according to spatial distribution, sieving). In this way we obtained the whole assemblage, which later underwent chronological and cultural division. The applied method involved sieving of all layers, preparing a spatial distribution plan and numbering the artefacts. It enabled a detail study of technological, morphological and raw material diversity of the unearthed artefacts, in connection with the stratigraphy of the site. As a result, basic groups of artefacts have been distinguished, characteristic of consecutive settlement phases. It was also important to include observations based on the method of re-fitting, applied for the whole assemblage.

7667 Mesolithic artefacts selected by D.K. Płaza have already been discussed in the chapter devoted to the Mesolithic settlement. The remaining part of the assemblage includes forms made of chocolate flint, which are the focus of attention of the current study.

Artefacts made of chocolate flint

11556 artefacts made of chocolate flint constitute the most numerous group of the analysed assemblage (c.f. table 52, 54). Most of them (78.4%) have been obtained while sieving the layers, including the arable one. A detailed location has been established for 2495 specimens, which have been documented within the boundaries of mechanical layers from I to VI (c.f. plates 7–12). Only 52 flint artefacts (0.5% of the whole assemblage) have been unearthed in the features of the Funnel Beaker culture. The above findings indicate that the analysed assemblage is typical of “sandy” sites, where artefacts found outside the clusters, dominate.

Due to their large number, artefacts made of chocolate flint underwent a detailed description in terms of morphological features, based on the method applied for Neolithic assemblages in Kuyavia (c.f. P. Papiernik 2008; 2010; 2016; 2016a; 2017). Tabular and graphic comparisons have been made, which characterise statistically most numerous groups of artefacts (table 58–101, fig. 233–250). A large number of artefacts

discussed in the paper have been presented in figures, which depict drawings of core forms of most tools, as well as a selection of blades and splintered pieces, illustrating typological and stylistic diversity of the whole assemblage made of chocolate flint (plates 215–287).

While presenting the material from Redecz Krukowy, it is important to consider a great diversity of chocolate flint. The difference between each particular specimen is visible in colour, character of siliceous mass, and the features of cortex or natural surfaces. On the basis of these elements, five raw material groups have been distinguished (c.f. fig. 222–224). They refer to the whole assemblage, as the specimens of the same character do not form clusters, but they are evenly distributed on the whole excavated area. Macroscopic description of the features has been made in order to identify the deposits and origin of chocolate flint from Redecz Krukowy (c.f. J. Budziszewski et al, current volume).

During the research, 247 re-fittings of chocolate flint have been made. Three of those have been attributed to the Mesolithic and discussed by D.K. Płaza. The re-fittings include artefacts from various technological groups, unearthed on the whole area of the trench (plate 195). The dominant forms include specimens obtained during the sieving process. A clearly distinguished group includes specimens with a detailed location (from spatial distribution plan), within mechanical layers from I to V. A considerable number of re-fittings is formed by the combination of artefacts, unearthed at quite a large distance from each other, usually several dozen metres, and sometimes even 150–200 metres (plate 195). Re-fittings of artefacts found at a large distance from one another come from different technological groups, distinguished in the assemblage (c.f. plates 196, 197).

While describing the re-fittings, we should observe that they do not form extensive blocks, but mainly consist of two, three, or six elements. The re-fittings confirm that only some activities connected with chocolate flint processing were performed on the site. Apart from the preparation of tools, the re-fittings confirm flake reduction of cores and a widespread use of the technique of splintered pieces. Re-fittings of artefacts found at a large distance from one another attest multiple incidents of relocating, as well as processing and using flint artefacts in the whole area of the site. It is quite surprising that there are no re-fittings at the site which would be connected with the preparation and repairing cores for blades. They could attest local production of regular blades, whose large number has been unearthed at the site.

The connection between spatial distribution of artefacts made of chocolate flint and the settlement of the Sarnowo phase of the Funnel Beaker culture at Redecz Krukowy has already been mentioned (c.f. P. Papiernik 2012, 2016; P. Papiernik, D.K. Płaza 2015). Currently, once the study has culminated, this conclusion can be better documented by indicating a series of correlations between the occurrence of the forms in question and other artefacts of the Funnel Beaker culture. There is a striking similarity between the presence of flints and the weight of the Funnel Beaker culture pottery, including benchmark forms for the Sarnowo phase, i.e. plates. The sim-

ilarity is visible in cumulative comparisons made for the main trench in almost all sections (fig. 230, 231). There are also similarities between spatial distribution of flint forms and vessel fragments (plate 198–203) and the range of the distinguished cultural layer of the Funnel Beaker culture, observed in the layouts of the consecutive mechanical layers (c.f. plates 198–106 and plates 6–10).

The re-fittings, whose large numbers strictly correspond with the range of clusters of the Funnel Beaker culture pottery (fig. 232:1) and a big number of plates (232:2) provide further information. The above similarities can also be observed in relation to the re-fittings divided into separate typological groups (c.f. fig. 231 and plate 196). Moreover, the re-fittings of artefacts found at a large distance from one another link particular clusters, with reference to the processing and use of chocolate flint in the whole area of the settlement of the Funnel Beaker culture.

The study was based on the analysis of chocolate flint artefacts with the division into groups which correspond with separate clusters of the Funnel Beaker culture pottery. Thus, we obtained smaller and sufficiently numerous assemblages, which can be comprehensively compared and used for the description of particular inhabitation zones. The basis for distinguishing the above assemblages was spatial distribution of vessel fragments of the Funnel Beaker culture, discussed in the chapter devoted to the Sarnowo phase of the settlement.

Cluster 1 was distinguished in the south-western part of the site. It encompasses c.a. six ares of the area of the trench. Flint artefacts form an assemblage of 1121 specimens, almost half of which (527 items – 47%) come from sieving the arable layer, and only less than 15% of forms (152 items) have a detailed location on the spatial distribution plan. Statistically, cluster 1 resembles the assemblage at the whole site with a similar number of basic morphological groups (c.f. fig. 233). Retouched tools (52 items) are represented by a large number of end-scrapers (16 items ; plate 217, 218) and retouched blades (16 items ; plates 215:2; 219:7–8) and a smaller number of retouched flakes (6 items) and truncated pieces (5 items, plate 219: 2, 4, 6), as well as a group of perforators (2 items, plate 219:3, 5), microlithic trapezium (1 item) and a retouched flake from splintered pieces (1 item). Two arrowheads (plate 287:1, 2) and probably a retouched blade with two edges retouched regularly (plate 219:10) are considered to be younger elements. Specimens with usage retouch (99 forms in total, including 48 blades) (plate 215: 3, 5, 7, 8), 23 flakes (plate 220: 1, 2, 4), 15 flakes from splintered pieces and 13 splintered pieces (plate 221: 5, 8). Spatial distribution of flint artefacts clearly corresponds to the layout of vessel fragments of the Funnel Beaker culture (fig. 230), including plates (fig. 231). Tools do not form visible clusters (c.f. plates 209–214). The re-fittings link forms from different morphological groups within the cluster, from cluster 2 and 3 and found outside the clusters.

Cluster 2 is composed of artefacts unearthed in central-western part of the site (section 9–12, 15, 16, 20–23, 25–31; c.f. fig. 147). Its surface equals c.a. 5 ares, but the majority of flint artefacts were found in the centre, an area which does not exceed 1.5 ares, i.e. section 10 with the adjacent sections (c.f.

fig. 231, plates 198–203). The artefacts form an assemblage of 1653 specimens, 52% of which (867 items) come from the sieving of arable layer, and only 16% of forms (267 items) have a detailed location on the spatial distribution plan. The presence of the main morphological groups indicates certain differences from the assemblage of the whole site. There is a larger number of flakes, flakes from splintered pieces and crumbles, especially for small forms, less than 15 mm big (fig. 234). The percentage of blades and retouched blades is considerably smaller (c.f. fig. 233, plates 198–203). The above observations indicate that cluster 2 contains more wastes of all distinguished analytical groups.

Retouched tools (63 items) are strongly represented by a group of perforators (15 items, plate 228: 3–15) and retouched blades (14 items, plate 226: 6, 8; 227: 6) and retouched flakes (13 items ; plate 229:4, 7). There is a smaller number of end-scrapers (7 items, plate 226: 1–4, 6; 227: 4), truncated pieces (2 items, plate 227: 1, 3), microlithic trapeziums (2 items, plate 228: 1, 2). There are specimens with usage retouch, 69 forms in total, including 33 blades (plate 223: 1–3, 5–8, 9, 10; 224: 1, 2, 4, 6, 7; 225: 2), 17 flakes (229:6), 10 splintered pieces and 5 flakes from splintered pieces. Spatial distribution of flint artefacts forms one compact cluster and corresponds to the layout of vessel fragments of the Funnel Beaker culture (fig. 230), including plates (fig. 231). Multiple re-fittings link forms from different morphological groups within the cluster, and from all other clusters, also areas outside the clusters (c.f. plate 196–197).

Cluster 3 has been designated in the north-western part of the main trench. It covers a large area of 9.5 ares (sections 1, 2, 13, 14, 17, 18, 33–36, 39–42, 52–56, 67–69, 78, 86, 92, 94, 98, 99, 104, 107, 124, 126–130, 143, 145, 148–151, 156, 157, 162). Therefore it has been divided into three smaller clusters, corresponding to the pottery material (c.f. fig. 147). Cluster 3 consists of 2239 artefacts, including 489 from the western part (3a, sections 43, 67–69, 78, 92, 94, 98, 99, 104, 107), 362 from the eastern part (3b, sections 53, 55, 86, 143, 145, 148–151) and 1389 from the southern part (3c, sections 1, 2, 13, 14, 17, 18, 33–36, 39–42, 52, 54, 56, 124, 126–130, 156, 157, 162). 559 artefacts (25%) have been obtained from the arable layer, and the remaining ones from mechanical layers from I to V. 688 specimens (31%) have a detailed location on the spatial distribution plan. The above data indicate that cluster 3 is relatively well preserved, especially in its southern part (3c).

As regards the percentage of particular morphological groups, cluster 3 is similar to the assemblage of all artefacts of chocolate flint. A group of tools (c.f. fig. 240) should be interpreted in a similar way. It includes retouched blades (28 items, plate 238: 6; 244: 7, 249: 9, 10), end-scrapers (18 items, plates 234; 2–4; 239; 247), truncated pieces (15 items, plates 234: 5, 6; 238: 4, 7; 248: 1, 3, 4, 6–8), a considerable group of perforators (13 items, plates 235: 2; 249: 5–7), microlithic trapeziums (10 items, plates 238:3; 248: 2; 249: 1–4) and smaller retouched flakes (6 items, plate 249:8) and retouched flakes from splintered pieces (2 items). While examining morphological groups and tools at the level of the distinguished parts of the cluster in question, we can observe some significant differ-

ences. Zone 3a is characterised by the smallest percentage of tools (2.9%), a high percentage of flakes from splintered pieces (31.5%) and the lack of perforators among retouched forms. Zone 3b has some forms for core preparation (1.4%) and a high percentage of tools (7.1%), dominated by retouched blades (8 out of 26 typologically determined tools). The most abundant assemblage from the southern part (3c) is the most homogeneous, although it has a relatively large number of retouched blades (19 items), group of perforators (10 items) and microlithic trapeziums (6 items).

Cluster 3 contained multiple artefacts with usage retouch (135 specimens, c.f. table 54). Blade forms are characterised by an uneven spatial distribution with a visible cluster located in the close vicinity of the Funnel Beaker culture house (c.f. fig. 143).

The specimens from cluster 3 included a large number of re-fittings linking its parts and clusters 1, 2, 4 and 5, as well as the areas of the site situated outside the clusters (c.f. table 196–197).

Cluster 4 has been designated in the central part of the main trench. It covers an area of 6.75 ares (sections 184, 185, 196–198, 200–208, 215–221, 237–240, 256, 257). It has been divided into two smaller parts. The northern one (4a, sections 206–208, 215–221) is connected with the embankment of the Kuyavian long barrow and its closest vicinity (c.f. fig. 143). Cluster 4 consists of 1551 artefacts, including 597 specimens from the northern part (4a) and 954 from the southern one (4b). Only 192 specimens (13% – mainly in part 4a) have been obtained from the arable layer. The remaining ones were found in mechanical layers from I to VI, including 478 items (32%) with a detailed location on the spatial distribution plan. Cluster 4 consists of numerous remains of settlement from the middle Stone Age, different Neolithic cultures (Globular Amphora culture, Corded Ware culture) and the early Bronze Age.

As regards morphological forms, cluster 4 is similar to the other analysed chocolate flint assemblages (c.f. table 54, fig. 233, 234). The group of retouched tools has a standard composition (c.f. fig. 240) with a similar number of end-scrapers (14 specimens, plates 253: 2–6; 257; 258: 5), retouched blades (12 specimens, plates 252: 3, 4, 6; 259: 1–4), truncated pieces (10 specimens, plates 253: 7, 8; 258: 1–4), a large group of perforators (6 items, plates 252: 5; 253: 1; 259: 5, 6), smaller microlithic trapeziums (2 items) and retouched flakes from splintered pieces (1 item).

It is difficult to observe any considerable differences in the percentage of morphological groups and tools found in cluster 4. Only part 4b consists of a definitely larger number of retouched flakes (19% of tools) than other clusters. This can be connected with the presence of younger settlement in this place.

Not many re-fittings have been made for the artefacts in cluster 4, which would confirm its range and the inter-connected artefacts from clusters 2, 3 and 6 (c.f. plate 196–197).

Artefacts in cluster 5 have been unearthed in the north-eastern part of the trench (sections 212–214, 223–225, 230–233, 241–244, 249, 250, 260, 267–270, 273, 279–281). 1644 specimens have been recorded in the area of 6.25 ares.

502 artefacts (30% – mainly part 5b) – have been obtained from the arable layer. The remaining part was found in mechanical layers from I to VI, including only 383 (23%) with a detailed location on the spatial distribution plan.

Cluster 5 has been divided into two parts (c.f. fig. 147). The western one (5a, sections 212–214, 223–225, 230–233, 260) is connected with the close vicinity of house 2. Most probably the artefacts were partly relocated when the Kuyavian long barrow was built and then demolished. Cluster 5 is not very different from other assemblages. However, it contains the highest percentage of retouched tools (97 specimens, c.f. table 54, fig. 240). The latter are dominated by a group of perforators (37 specimens, plate 263: 3–5; 267). There is a considerably smaller number of retouched blades (15 specimens, plate 263: 8; 266: 2, 3), end-scrapers (11 specimens, plate 263: 7; 265: 1–6), truncated pieces (8 specimens, plate 263: 6), retouched flakes (6 specimens), a very small number of microlithic trapeziums (3 specimens, plate 263: 1, 2) and retouched flakes from splintered pieces (1 specimen). The analysis of the assemblages from the two parts of the cluster reveal greater differences. The western zone (5a) consists of a high percentage of blades (27%) and a small number of splintered pieces. The eastern part has 7% of retouched tools, half of which (30 specimens) constitutes the group of perforators (plate 267).

Re-fittings made for artefacts from cluster 5 well reflect its range. The re-fittings are connected with clusters 2, 3 and 6 and with other parts of the trench, mainly with the middle zone of the site (c.f. plates 196–197).

Cluster 6 has been distinguished in the eastern part of the trench (sections 276–278, 283–286, 295–297). It is the smallest and occupies the area of only 2.5 ares (c.f. fig. 147). It consists of the smallest number of artefacts (550 specimens) in comparison with all the other analysed assemblages. It should be noted that the area has not been completely recognised. The artefacts underwent secondary re-deposition as a result of building the front of the Kuyavian long barrow. However, cluster 6 resembles the overall structure on the whole site (c.f. table 54). The group of tools, consisting of only 21 specimens, is dominated by end-scrapers (10 specimens, plate 271: 1–5), which form a cluster of 8 specimens in sections 283 and 284. Artefacts from the cluster in question are linked with clusters 1, 2, 4 and 5 (c.f. plates 196–197).

The assemblage of artefacts unearthed outside the clusters consists of 2738 specimens. The statistical picture of their internal diversity does not differ from the assemblage at the whole site (table 54, fig. 233, 234). Similarities particularly refer to the group of morphological tools (c.f. table 54, fig. 240). It includes an abundant group of retouched blades (27 specimens, plates 277: 2, 3; 278: 2; 282: 1), end-scrapers (23 specimens, plates 279, 280), truncated pieces (16 specimens, plates 281: 3, 4, 7; 282: 2, 3) and perforators (16 specimens, plates 283; 284: 5, 6). There is a considerable number of microlithic trapeziums (8 specimens, plates 281: 1, 2; 284: 1–3), retouched flakes (8 specimens) and a smaller number of combined tools (3 specimens, plate 281: 5), burins (2 specimens, plate 284: 8), retouched flakes from splintered pieces (4 specimens) and

a retouched blade with two edges retouched regularly (plate 287:4).

Comparative analysis of the artefacts unearthed in particular clusters and outside them indicates great similarities between separate analytical groups. There are considerable similarities in the stylistics and morphology of particular groups of artefacts, the choice of semi-product of tools and the applied techniques of flint processing. Small differences can be observed with reference to the number of particular groups of artefacts, e.g. tools, blades, or splintered pieces. They indicate individual character of each cluster, possibly resulting from spatial diversity in performing some tasks at the site. An example of that can be provided by the domination of a group of perforators among tools in cluster 5, especially in its eastern part (5a).

An exceptionally abundant group of chocolate flint artefacts which enables a detailed analysis of the separate groups and the re-fittings provide sufficient basis to reconstruct flint processing on the site. The overall composition of the assemblage with the vestigial group of cores and core preparation forms, as well as the morphological features of the semi-product indicate that the main forms that "arrived" at the site were blades. They are dominated by regular forms with parallel side edges and homogenous thickness along the whole artefact (c.f. fig. 250). These are mainly dorsal specimens, or slightly covered by natural surfaces, which on positive sides bear traces of the previously knapped blades. Platforms and platform areas of blades indicate carefully prepared points of separating blades by rejuvenating platforms and trimming of the joint between platforms and cores. On the basis of the completely preserved or slightly damaged blades and blade forms, it should be assumed that the semi-product was between 4 and 12 cm long, between 10 – 25 mm wide, and between 3 and 8 mm thick, with some forms slightly wider or thicker (c.f. fig. 236, table 59, plates 204–207). The above features indicate that the forms in question were separated from quite large single-platform cores by means of advanced techniques of core processing. The length of blades and regularity of their side edges rule out the use of direct hammering technique. It should be assumed that the size of the platforms and their multi-negative character, as well as quite clear traces of trimming indicate the use of the former method (c.f. W. Migal 2002; 2003; W. Grużdź, J. Budziewski 2013; W. Grużdź 2017). The total number of blades with the features previously described is estimated as at least 1 thousand specimens. Detailed analysis of the remains of the core processing technique and the prepared re-fittings indicate that such blades were not produced at the site. The assemblage did not contain a sufficiently large group of core preparation forms, including repair flakes connected with the regulation of core platform, which are a necessary element of advanced core processing of blades. Such forms are ubiquitous in household assemblages, based on local processing of blade semi-product, regardless of the chronological period. It is also confirmed by the re-fittings, which lack block forms, and even fitting pieces of blade forms, i.e. specimens that confirm a mass extraction of semi-product from the same cores. Moreover, macroscopic observations of the raw material, which is con-

siderably different, indicate that the blades come from a large group of cores. Had they been processed on the site, they would have left traces of vestigial forms in the assemblage, such as splintered pieces,

A core, unearthed in section 78 (plate 232) has provided interesting information. In terms of size, details of preparation and initial exploitation, it has the character of a typical blade semi-product. The specimen reached the site in its initial form and after an unsuccessful attempt of exploitation, it was deposited in the cultural layer. Interestingly, despite its big mass (875g), the core was not repaired, which may attest the lack of knowledge and skills to obtain regular semi-product from such large cores.

The above core, the core from section 279 (plate 264:1) and possibly pre-core artefacts from feature 39 (plates 241, 242) indicate that such forms also reached the site. Their local processing is mainly attested by a numerous group of flakes. Detailed analysis of this group shows that these are small or very small specimens (fig. 238), most certainly obtained by means of simple methods, e.g. by direct striking with so called hard hammer. This technique of obtaining flakes is attested by numerous re-fittings (c.f. fig. 227, c.f. plate 196B; 220: 5; 231: 1–3; 235: 1; 240: 1; 260: 7, 8; 264: 2, 3; 27; 42: 1).

The final element of the artefacts' processing on the site was the use of the splintered pieces technique. The analysis of splintered pieces and flakes from splintered pieces indicates that forms from all morphological groups were splintered. They had to be large enough, i.e. over 2.5–3 cm. Initial forms included flakes, blades, tools and core forms. Observations of the preserved negatives on dorsal surfaces of flakes from splintered pieces should be interpreted in the same way. They indicate that 41% of those bear traces of a core processing technique, including 35 morphological tools. This is confirmed by the observed retouched surfaces.

A vast majority of morphological tools is made of blades, mainly regular imported forms. Specimens made of semi-product with worse technological features, most certainly locally produced are also visible in the assemblage, especially in the group of retouched blades (plate 259: 4; 277: 3; 278: 2). Un-retouched blades were selected according to the parameters of particular types of tools. End-scrapers were made from the widest and thickest semi-product (c.f. fig. 252). Truncated pieces were made from more delicate blades (c.f. fig. 252, table 80), whereas microlithic trapeziums from thin and narrow forms.

Flake semi-product for morphological tools constitutes c.a. 20 % of the whole assemblage. Apart from retouched flakes, it was used for making end-scrapers, and above all perforators and borers (c.f. table 54). So called blade-flake specimens were used for making end-scrapers, whose width and thickness resembled blades (c.f. fig. 241). Perforators were made from random flake semi-product, which may be considered as wastes (c.f. fig. 243).

While describing tools, we should consider specimens with usage retouch. This category includes 376 blades, 138 flakes, 76 splintered pieces and 86 flakes from splintered pieces (c.f. table 54). The group is very large, more numerous than the group of morphological tools. With no comprehensive traseo-

logical analysis it is impossible to decide how many of them were functional tools. However, the large number of these forms indicates that using different typological categories as tools without additional processing was quite widespread. This refers mainly to blades which frequently have clear traces of processed side edges. It seems that most retouched blades were used before the retouch was made. Retouch appeared when an artefact was used as a tool.

Morphological groups included 41 specimens with macroscopically visible polishing. It was most certainly made as a result of the artefacts being used as tools. There were 24 blades with usage retouch, 7 truncated pieces, 9 retouched blades, a splintered piece and 2 flakes from splintered pieces. In the case of splintered pieces, traces of polishing remained after older forms that the artefacts had been made from. In all cases processing was recorded on side edges, and their layout indicates that they were processed in a parallel or slightly diagonal way to the axis of separate forms.

The presented description of particular morphological groups indicates that artefacts made of chocolate flint form a uniform assemblage, connected with the settlement of the Sarnowo phase of the Funnel Beaker culture. However, the assemblage is not homogenous as it contains specimens which are linked with other settlement phases, distinguished on the site. The tools consist of two arrowheads from the late Neolithic or the early Bronze Age. Also, retouched blades with two edges retouched regularly and a microlithic end-scraper are stylistically different from other retouched forms. Flake forms consist of a polished flake from a tetrahedral axe, which is linked with the younger Neolithic settlement. 31 specimens were attributed to the Mesolithic by D.K. Płaza. These forms could easily be excluded from the early Beaker culture assemblage on the basis of different morphological features and spatial distribution. It seems that the assemblage of artefacts made of the raw material mentioned above, should include more forms with other than the Funnel Beaker culture attribution. However, the possibility of a precise chronological analysis of some tools, debitage forms and the group of splintered pieces is very limited. It makes a definite attribution to a settlement phase impossible. Nevertheless, the scale of potential admixtures should not influence a statistical picture of the whole assemblage, whose major part is connected with the settlement of the Sarnowo phase of the Funnel Beaker culture.

Description of flint processing of the Sarnowo phase of the Funnel Beaker culture at Redecz Krukowy

The main element of the flint assemblage at Redecz Krukowy is the material connected with the functioning of the settlement of the Sarnowo phase of the Funnel Beaker culture. As it has already been confirmed, the main raw material of the early Beaker culture settlement was chocolate flint. Morphological analysis and re-fittings indicated that the Sarnowo phase is linked with a very small number of artefacts made of local erratic stone. The above observation points to minimal interest that Funnel Beaker culture communities had in the local flint, which is attested by different stylistic and technological character of the artefacts made of chocolate and Baltic flint,

particularly visible in the group of blade forms. The settlement of the Sarnowo phase cannot be linked with other types of imported raw material. These include not numerous specimens made of striped, Świeciechów and Volhynian flint (c.f. table 52). They are mainly linked with the reduction of polished axes (plates 295: 7; 308: 4; 309; fig. 255), or the use of microlithic blade forms (plates 308: 1, fig. 262). These are forms younger than the Sarnowo phase.

Assessment of the chronology of the settlement of the Sarnowo phase at Redecz Krukowy points that it occurred in a close time span to the Brześć Kujawski group of the Lengyel culture (c.f. P. Papiernik, R. Brzejszczak, current volume), whose intensive settlement was recognised in the vicinity of the site in question. There are visible differences between the settlement of the Sarnowo phase and the flint processing of the Brześć Kujawski group of the Lengyel culture in the region of Brześć Kujawski and Osłonki. The major one is connected with replacing the local erratic raw material by imported chocolate flint. There are also clear differences in morphological features of blades, which in the case of the early Beaker culture assemblage are longer, more slender and more regular. As regards tools, the main difference is connected with the lack of truncated pieces with traces of wear, so called "harvesting glaze". However, it seems that some similarities can also be seen. The Sarnowo material, like the Brześć Kujawski group of the Lengyel culture includes the same type of morphological tools, with dominant blade forms. These are mainly retouched blades with usage retouch, end-scrapers and truncated pieces, with minimal numbers of burins and no classic retouched blades with two edges retouched regularly. A considerable difference in the number of perforators and microlithic trapeziums between Redecz Krukowy and the material of the Brześć Kujawski group of the Lengyel culture may result from the applied method of sieving all layers, thanks to which very small flint artefacts could be obtained. The compared assemblages include a considerable group of splintered pieces, with no tool function. Searching for close analogies, we can point to a group of three small flake perforators, unearthened in pit 96 at Osłonki, site 1 (c.f. R. Grygiel 2008, fig. 680: 1–3) with stylistic character very similar to forms from Redecz Krukowy (c.f. plate 283: 1–7). According to R. Grygiel (2008, p. 762) the feature represents late phase of the Brześć Kujawski group of the Lengyel culture.

The settlement of the Sarnowo phase of the Funnel Beaker culture is connected with an exceptionally numerous assemblage made of chocolate flint. This raw material is found c.a. 220km from the place where the artefacts were unearthened. Macroscopic analysis of the raw material features indicated that they come from the surface of a flint mine at Tomaszów (c.f. Budziszewski et al, current volume). Composition of the assemblage, morphological features of particular artefacts and the re-fittings point to the fact that the most important elements of the assemblage were imported blades. Core forms were less significant. In the light of the above findings, we need to consider an issue of early Beaker culture communities at Redecz Krukowy gaining access to "chocolate" artefacts.

Chocolate flint was brought to Kuyavia in the late Palaeolithic (c.f. D.K. Płaza, J. Wicha, P. Papiernik 2017) and in the

Mesolithic (M. Wąs 2005; 2008). During the settlement of the Danubian cultures, the raw material in question became important at the stage of the classical phase (note-shaped) of the Linear Pottery culture, reaching a dominant position at several sites (c.f. J. Kabaciński 2010). At the beginning of the next period, i.e. in the assemblages of the Stroke Ornamented Ware culture, chocolate flint almost disappears (c.f. Kobielić, p. 1 – P. Papiernik 2008; Węgierce, p. 12 – L. Domańska 1982, 1995). During the formation of the Brześć Kujawski group of the Lengyel culture (R. Grygiel 2008) its amount grows in the assemblages, especially in the Vistula river valley. Flint assemblages from Gustorzyn, site 1 (features from I to IV – P. Papiernik 2008), Brześć Kujawski, site 4 (pit 742 – P. Papiernik 2008) and unpublished materials from Smólsko, site 2/10 (particularly feature 1469 – c.f. P. Papiernik 2010) should be treated as diagnostic. Chocolate flint in those features ranges from 6 to 42%. A high percentage of chocolate flint has also been recorded in features attributed to the Brześć Kujawski group of the Lengyel culture at Ludwinowo, site 3 (c.f. P. Papiernik 2017). In the early assemblages, the percentage equals 41.5%, and in the classical phase – 23%. The general picture of flint processing of the Brześć Kujawski group of the Lengyel culture in the region of Brześć Kujawski and Osłonki indicates that in the classical phase and later the percentage of chocolate flint decreased. However, it was still present in the group of blades and blade tools, particularly in grave assemblages (c.f. P. Papiernik 2008). Local processing of chocolate flint is attested by assemblages with visible series of waste blades and core preparation forms, coming from the exploitation of single cores (c.f. Brześć Kujawski, site 4, pit 871 – P. Papiernik 2008; Ludwinowo, site 3, feature 4770 – P. Papiernik 2017). As it has already been mentioned, the influx of chocolate flint is attributed to contacts of the Brześć Kujawski group of the Lengyel culture with the Malice culture (P. Papiernik 2008, pp. 1451–1456), whose community most probably began mining extraction of deposits in the region of Tomaszów (R. Schild, M. Marczak, H. Królik 1985, pp. 105–106, R. Schild 1995, pp. 462–464).

The domination of chocolate flint in the oldest assemblages of the Funnel Beaker culture was already tackled in the literature on the subject (c.f. E. Niesiołowska-Śreniowska 1981, 1982, 1986, 1998, 1990, 1994; H. Młynarczyk 1982; B. Balcer 1983; A. Prinke, R. Rachmajda 1988; L. Domańska 1995). The significance of the problem was seen by E. Niesiołowska-Śreniowska, who studied the oldest Sarnowo material, and considered the use of chocolate flint by the early Beaker culture communities crucial for the explanation of the origin of the culture, not only in Kuyavia. E. Niesiołowska-Śreniowska interpreted the presence of the raw material as a sign of Mesolithic tradition of the Janisławice culture, which provided basis for the Funnel Beaker culture (c.f. E. Niesiołowska-Śreniowska 1982, 1986, 1994). Different opinions were presented by H. Młynarczyk (1982) and L. Domańska (1995) who indicated the link between the early Beaker culture flint processing with the younger Danubian cultures. Further excavations and more abundant data confirmed an exceptional character of the imported chocolate flint in the early phases of the Funnel Beaker culture, limiting the phenomenon to Kuyavia (c.f. L. Domańska

1995; P. Papiernik 2016) and the neighbouring Gostynin Lake land (P. Papiernik, M. Rybicka 2001; M. Rybicka 2004, M. Dobrzyński 2014). So far no analogous assemblages from the early Beaker culture sites have been found in other areas than the Polish Lowland. In the Chełmno Land, Greater Poland or Pomerania, chocolate flint can only be found in a very limited range (c.f. K. Adamczak, S. Kukawka, J. Małecka-Kukawka 2017; J. Kabaciński, I. Sobkowiak-Tabaka 2005; M. Wąs 2011).

The applied excavation method at Redecz Krukowy makes the statistical comparison between the presented material and other assemblages difficult, therefore in further analysis we focused on the most important observations, which reflect their description. Artefacts from Sarnowo, site 1 and 1a are the most similar in stylistic and metrical terms to the material from Redecz Krukowy. Important similarities can be observed in the structure of the assemblages (c.f. E. Niesiołowska-Śreniowska 1982, table 1; E. Niesiołowska-Śreniowska 1986, table 1) and in the tool set, parameters of the semi-product and blade tools, as well as in the group of splintered pieces (c.f. E. Niesiołowska-Śreniowska 1982, 1986). We should also note detailed analogies, such as the presence of cores for blades and pre-core forms (E. Niesiołowska-Śreniowska 1986, tablica I: 2; II), as well as the occurrence of identical tools from the group of perforators and borers, unearthed at Sarnowo, mainly in the cultural layer under the embankment of long barrow 8, and in the cluster, so called “cluster behind the trenches” (E. Niesiołowska-Śreniowska 1982, tablica IV: 1–5; VI; XI: 3–7). The tools form a clearly discernible cluster, like in the case of cluster 5b at Redecz Krukowy (c.f. fig. 147, plate 211). Moreover, in several cases we can observe very similar tools, such as a blade perforator with a short “sting” from Sarnowo, site 1A (E. Niesiołowska-Śreniowska 1986, tablica VI: 6) and a tool with a similarly formed working surface from Redecz Krukowy, section 278, mechanical layer II (plate 271:8), or some forms of end-scrapers. There are analogies in the occurrence of the traces of wear so called “harvesting glaze”, which in the case of Sarnowo and Redecz Krukowy are found along the edges of blade forms (plates 227: 6; 238: 6; 244: 7; 252: 3; 259:2). There are no truncated pieces with characteristic diagonal transformations.

The presented artefacts are similar to the assemblage of chocolate flint from Przybranówek, site 43. The similarities refer to the stylistics and parameters of multiple, slender blade forms (c.f. L. Domańska 2013, fig. 15; 16; table 8; 15–19), which are mainly ready-made imports (ibidem, pp. 32–33) and also to the occurrence of relatively massive end-scrapers on blades (ibidem, plates 10: 4 5; 11: 1: 3). It seems that a significant difference is connected with the presence of truncated pieces with diagonal polishing (ibidem, plates 12: 1, 2, 4–6, 9; 13: 1–3), accompanied by single blade forms with polishing visible along the edge of the artefact (ibidem, plate 19:5).

The remaining early Beaker culture assemblages are relatively poorly equipped. Therefore, only very general similarities can be indicated, particularly in the stylistics of blade forms, presence of core forms and in the set of tools with multiple retouched forms and forms with usage retouch, end-scrapers and truncated pieces, as well as in the description of the group of splintered pieces. However, it should be noted that the ear-

ly Beaker culture artefacts from site 2/10 at Smólsko include macroliths recognised among the semi-product and blade tools (P. Papiernik 2016, fig. 527: 4; 530–532; 533: 5), which is considerably different from the material from Redecz Krukowy. The stylistic features of these forms and elements connected with their method of making are similar to the specimens from the blade deposit at Krowia Góra, site 14, which is attributed the Lublin-Volhynian culture (c.f. A. Zakościelna, M. Florek 2003). The category of post – transformation forms also includes a vestigial core for blades from Dęby, site 10 (c.f. L. Domańska 1995, fig. 38) and several forms unearthened while excavating Kuyavian long barrows at Leśniczówka (H. Młynarczyk 1982, plate VII: 1), Sarnowo (H. Młynarczyk 1982, plate XI: 3) and the Gostynin Lake Land (c.f. M. Dobrzyński 2014, fig. 16: 1; 18: 1; 19: 4).

Metrical and technological features of blade forms from Redecz Krukowy are directly linked with the artefacts made of chocolate flint, known from the final stage of the development of the Malice culture and the Lublin-Volhynian culture, younger than the former and coming from the Sandomierz Upland and the Nałęczów Plateau. The development of processing of the raw material in question is well documented in the assemblages from Ćmielów, site 2 (J. Michalak-Ścibior, H. Taras 1995), Sandomierz-Kruków, site 20 (J. Michalak-Ścibior 1994), Sandomierz – Wzgórze Zawichojskie (A. Zakościelna 2016), Wąwolnica and Las Stocki (A. Zakościelna 1996) and Złota (grave assemblages – A. Zakościelna 2010). Literature on the subject emphasises genetic links between the Lublin-Volhynian culture and the Malice culture. Transformation period is dated to the last centuries of the 5th millennium and the beginning of the 4th millennium BC (c.f. A. Zakościelna, J. Gurba 1997, A. Zakościelna 2006; A. Zakościelna, S. Kadrow 2000; S. Kadrow 1996; M. Nowak 2009, pp. 131–136). Recently, Sandomierz – Wzgórze Zawichojskie settlement has been attributed to the late phase of the Malice culture, i.e. 4400–4200 BC, on the basis of a series of C-14 dates. Fortified settlement of the Lublin-Volhynian culture has been dated to the period between 4000–3900 BC (c.f. P. Włodarczak 2017, s. 103).

Comparative analysis of the artefacts from Redecz Krukowy and the material described above indicates that the greatest metrical similarities, which stem from the use of core processing techniques, are observed in the youngest Malice assemblages from Sandomierz (c.f. J. Michalak-Ścibior 1994; A. Zakościelna 2017) and the settlements of the the Lublin-Volhynian culture from Sandomierz – Wzgórze Zawichojskie (A. Zakościelna 2017) and Wąwolnica and Las Stocki (A. Zakościelna 1996). Particular similarities refer to the blades from Redecz Krukowy and Las Stocki, where the statistical comparison of metrical features is almost identical (c.f. table 59 and A. Zakościelna 1996, table 11). The longest blades on the sites reached 113 and 115 mm respectively and were c.a. 2 cm wide. These are assemblages with slender and quite long blades, with pre-transformation features. There was no macrolithic semi-product in the type of forms from Krowia Góra or from some grave assemblages. Two burials are particularly significant: no 101 and 122 from the site at Złota II (A. Zakościelna 2010, p. 33), which contained macrolithic artefacts from chocolate flint (A. Zakościelna 2010, table LXXV; 3, 4; table LXXVII; 1, 4). The graves were dated with C-14 method to

5060±40 BP and 5020±40 BP, which the author of the study, A. Zakościelna (2010, pp. 34–35) considers incongruous with the stylistics of the vessels found in the graves. She dates them to a later period, i.e. phase III – the youngest phase of the Lublin-Volhynian culture.

While discussing the links between the “chocolate” material from Redecz Krukowy and the assemblages of the southern cultures, we should observe one important aspect. No trend with burins was recorded at the site in question, which is a typical element of both southern groups. Also there was no trough-shaped retouch characteristic of the the Lublin-Volhynian culture (c.f. J. Michalak-Ścibior 1994; Zakościelna 1996, 2017; A. Zakościelna, Jerzy Libera 2013; B. Balcer 1983). The area of Kuyavia did not yield assemblages with a significant contribution of burins in the group of tools. Examples of using a trough-shaped retouch are attested by a small number of finds. A single macrolithic retouched blade with two edges retouched regularly has been recognised by H. Młynarczyk in the material of the embankment of barrow 4 (1982, table XI: 3), whereas a trough-shaped retouch occurs on a charred end-scraper (P. Papiernik 2016, fig. 525: 3).

To sum the above observations it should be noted that the occurrence of chocolate flint at Redecz Krukowy is connected with a mass import of ready-made blade forms to Kuyavia at the end of the 5th and at the beginning of the 4th millennium BC. It means maintaining contacts with communities which had access to deposits skills of advanced chocolate flint processing. The Malice culture and the Lublin-Volhynian culture were very significant for the development of flint processing in Lesser Poland. On the one hand, they adapted new trends from the south, which involved larger parameters of blades, and on the other developed a system of exchange of the raw material across regions (S. Kadrow 1988, 1996; A. Zakościelna 1996, 2006; A. Zakościelna, J. Libera 2013). If we accept the above assumption, it means that Kuyavian communities of the early Funnel Beaker culture took part in the system of exchange, organised by the groups of a different cultural circle. The principles and details of that system is still difficult to recognise. We can only indicate differences, possibly chronological, in the influx of forms, connected with so called metrical transformation. In the case of Redecz Krukowy and Sarnowo, site 1A (settlement) and the assemblage from the cultural layer unearthened underneath barrow 8, such forms made of chocolate flint have not been recorded. Blades and tools with macrolithic features have been observed in Smólsko, site 2/10 and younger assemblages from Dęby, site 10, Leśniczówka, site 1 and the Gostynin Lake Land.

The second interpretation of the influx of chocolate flint is the assumption that during the functioning of the settlement at Redecz Krukowy, early Beaker culture settlement was present in the areas adjacent to the deposits of the raw material, which would have maintained contacts with Kuyavia. However, due to the lack of early assemblages with similar stylistic features in the areas of Lesser Poland (c.f. M. Nowak 2009; P. Włodarczak 2006; J. Kruk, S. Milisauskas 2018) this assumption is difficult to accept. Moreover, at the recognised sites of the Funnel Beaker culture with a relatively early chronology, e.g. in the region

of Nida Basin, chocolate flint only occurs in small quantities, and the unearthened stylistic forms differ from the assemblage at Redecz Krukowy (c.f. M. Nowak 2006; 2009).

To sum up the problem of materials from the Sarnowo phase, it should be observed that the flint assemblage is a combination of two distinct cultural traditions. The first one is connected with the import of ready-made artefacts made of chocolate flint, which are the produce of communities exploiting chocolate flint and taking part in inter-regional exchange of products at the highest level of technological advancement at that time (c.f. W. Migal 2002, 2003, A. Zakościelna 1996). The current state of recognition of settlement of Neolithic communities using chocolate flint and the C-14 dating from Redecz Krukowy indicate that the groups of the Lublin-Volhynian culture from the region of Sandomierz Upland and Nałęczów Plateau were probably the first ones to produce fully macrolithic forms in the area of today's Poland (A. Zakościelna 1996).

The second element visible in the material from Redecz Krukowy is the tradition of lowland Neolithic flint processing, which should be linked with the Brześć Kujawski group of the Lengyel culture in Kuyavia at that time. We should point out a conservative approach in preparing and fitting morphological tools (c.f. table 53), with no reference to so called trend with burins or a trough-shaped retouch, and a widespread use of the splintered piece technique.

The dependence of local production on imported forms at the very early stage of the development of the Funnel Beaker culture should be perceived as breaking with a local tradition of flint processing, which was based on self-sufficient use of the raw material and the ability to satisfy their own needs on the basis of the production of regular semi-product from single-platform cores for blades (P. Papiernik 2008, J. Kabaciński 2010). It should also be observed that progressive enlargement of the parameters of blades prevented their production from erratic Baltic flint. It obviously resulted from the size of lumps of the raw material, which ruled out obtaining regular semi-product over 80–90mm. The consequence of import and using longer blades was the limiting or abandoning the use of re-fitted tools, widespread in the early and middle Neolithic and replacing them with one-edge tools, typical of younger phases of the Funnel Beaker culture (c.f. B. Balcer 1973, 1983, 2002; W. Migal 2002; P. Papiernik 2016).

Flint artefacts connected with other settlement phases

Settlement of the Danubian cycle is linked with a relatively small group of flint artefacts, mainly made of Baltic flint. They include a core for blades (plate 288:1), as well as blades and tools (plates 288: 2–5, 289: 10; 290: 1, 3, 4; 291: 2; 292: 1–4) with stylistic and morphometrical features typical of the early and middle Neolithic in Kuyavia (c.f. R. Grygiel 2004; P. Papiernik 2008; J. Kabaciński 2010). The above artefacts have been unearthened as single finds in various parts of the main trench (fig. 253), usually in the places of pottery material or in the neighbourhood of recessed features of the Linear Pottery culture, the Stroke Ornamented Ware culture, or the Brześć Kujawski group of the Lengyel culture (c.f. fig. 136., plate 40, 43). Undoubtedly, the characteristic forms in the discussed as-

semblage can be accompanied by other, so far unrecognised "Danubian" specimens, which may also be found among the specimens made of chocolate flint. However, the total number of artefacts should not have a considerable influence on the statistical picture of the whole assemblage.

On the basis of C-14 dating and relatively scarce ceramic material, it should be assumed that the site was also used during the younger phases of the Funnel Beaker culture. The period can be linked with scarce flint artefacts, mainly recognised as macrolithic forms and specimens with preserved polished surfaces made of imported raw material: Świeciechów flint (plate 308, fig. 262, 263), chocolate flint (plate 287:3) and Volhynian flint. Their number and distribution in the area of the trench (fig. 255) indicates incidental use of diversified flint tools in the area of almost the whole site.

Flint artefacts, which are generally linked with the settlement of late-Neolithic communities and the Bronze Age are the third main group of artefacts (after the Mesolithic and Sarnowo ones) which form an assemblage unearthened on the site in question. They are mainly connected with the flake and splintered piece exploitation of the local erratic raw material. However, the overlap of consecutive settlement phases and the lack of unambiguous criteria of cultural attribution of particular forms and groups of artefacts results in the situation, when only over a dozen artefacts can undergo more precise chronological description, out of an assemblage of several thousand specimens. These are mainly arrowheads, points with a surface retouch and specimens struck from polished tools. The only exception is provided by materials from cluster 3 of the Globular Amphorae culture (c.f. R. Brzejszczak, P. Papiernik, current volume), which have been distinguished on the basis of re-fittings, which overlapped with the range of pottery from that culture (fig. 256). On the basis of the re-fittings, we can determine the exploitation of the Baltic and Pomeranian flint by means of a flake and splintered-piece technique (c.f. 257, 258, plate 297–306, 307: 3–5). It aimed at obtaining small, flat flakes and crumble-flakes (fig. 257), which underwent transformation into simple retouched tools, end-scrapers and arrowheads. The Globular Amphorae culture is connected with the use and reduction of polished tools, made of striped flint. It is attested by the re-fitting of block specimens, unearthened in cluster 2 of that culture (fig. 260–261, plate 309:3).

Summary

As a result of multi-faceted analysis, the exceptionally large assemblage of flint artefacts from Redecz Krukowy turned out to have been formed over several thousand years. The technique of re-fittings appeared particularly useful while analysing such a complex assemblage. It enabled us to distinguish compact assemblages and find out about the production and use of flint forms between the Mesolithic and the Bronze Age. It was also very significant in dealing with problems of technological diversity, spatial distribution of Mesolithic campsites and the settlements of the Funnel Beaker culture and the Globular Amphorae culture (more broadly P. Papiernik, D.K. Płaza 2015).

The re-fittings would not have been made if not for the excavation work, involving sieving of all layers of the site. Only then was it possible to complete all necessary data to conduct a multi-faceted analysis and to obtain reliable results as regards cultural and chronological diversity of flint artefacts, unearthed at Redecz Krukowy, site 20.

STONE ARTEFACTS (Rafał Brzejszczak, Piotr Papiernik)

The whole assemblage of stone artefacts was obtained during the excavations at Redecz Krukowy. It underwent specialist petrographic analysis, performed by Dr Marcin Krystek, an employee of Jan Ziomek Geological Museum at the Faculty of Earth Sciences at Łódź University (current volume).

Stone artefacts consist of a group of specimens which may be linked with the Neolithic. They include six stone axes. The specimens were unearthed in the arable layer, in sections 31 (plate 314: 1) and 260 (plate 314:2). These are small, slightly asymmetrical and partly damaged tools. The first one was made of local erratic stone – gabbroid whereas the second was imported and made of actinolite – tremolite slate. Tools of this type are typical of the early and middle Neolithic, mainly connected with the communities of the Danubian cultural cycle. The other axes were made of quartzite (section 90, layer IV), dioritoid (section 145, layer III; section 228 arable layer) and amphibolites (27 arable layer; section 228 layer I). Unfortunately, the state of preservation of some specimens prevented a precise analysis. In the case of well-preserved axes, it can be concluded that they represent a popular type of tools, commonly used in the middle and late Neolithic and mainly linked with the Funnel Beaker culture, in its younger phases. The next group of Neolithic forms consists of five stone drill cores, unearthed in the excavation layers, in sections 10, 80, 154, 221 and 257 (plate 314: 6–9). They confirm that stone axes were made at the site at Redecz Krukowy, most probably from local erratic stone – amphibolites. Two specimens of stone axes (plate 311: 4; 312: 2), should also be attributed to the Neolithic. They are both fragmentarily preserved. Tools of this type can be linked with the younger phases of the Funnel Beaker culture, but similar forms have also been recorded at the sites of the Corded Ware culture.

Thanks to the method of sieving of the whole sediment, it was possible to unearth the artefacts which would otherwise be impossible to obtain. An example of this kind can be a small bead made of sandstone, unearthed within mechanical layer II, in section 151 (plate 312:6). It has a tubular shape, measures 15x7mm and has an asymmetrically placed hole. This decoration may be a replica of amber beads.

A stone pendant (plate 314:5) found in mechanical layer IV, in section 232, is a unique discovery. The artefact is made of gaize, has a trapezoidal shape and is 4.5cm long. In its upper part there is a small hole, 4mm in diameter. According to petrographic analysis the artefact is a fossil. It does not rule out a possibility that after some processing, it was used as a pendant by the communities of the Funnel Beaker culture or other Neolithic groups.

A large number of stone artefacts unearthed at the site include: grinders, hammers, polishers and querns. They mainly come from pebbles and bear clear traces of wear. The tools commonly occur at many sites and have a different chronology. That is why precise chronology is difficult to determine. However, analysing spatial distribution of stone artefacts at the site, we can observe that their most numerous clusters overlap with separate concentrations of the Funnel Beaker culture material (c.f. fig. 147 and 264). Therefore, it can be assumed that the major part of the obtained stone assemblage can be linked with this cultural unit.

Section 219 has yielded two large stones, which performed the function of a quern (plate 313:1–2). Both specimens were 20cm long, with one surface bearing traces of wear. They were recorded in feature 54, which is most probably a grave of the Globular Amphora culture. This culture should also be linked with a large, depressed form of a quern from feature 38 (plate 312:3). The stone unearthed in section 274, feature 79 was most probably used in the same way. The feature is a grave of the Corded Ware culture (plate 314:3).

Stone artefacts also contained tools of the Krummeser type, which are discussed separately by B. Muzolf (current volume).

SETTLEMENT FROM THE BRONZE AGE (Przemysław Muzolf, Błażej Muzolf)

Methods applied for the classification of pottery artefacts.

The analysis of pottery artefacts has been carried out on the basis of the classification applied by the authors for the research of settlements and cemeteries from the Bronze Age (P. Muzolf 2011, 2012, 2013; B. Muzolf 2002, 2012, 2017).

In order to determine technological groups (Gt) of vessels, a simplified questionnaire of features has been adopted, according to which each vessel is described by means of the following code markings: exterior and interior surface: 1 – brown, 2 – grey-black, 3 – multi-colour/spotted (brown-grey). Description sample: B11 – both surfaces brown, etc.

F – type of texture of the outer and inner surface of the vessel: F1: smooth surface – at times shining, F2 – coarse surface, F3 – coarsened surface with variants of the range of coarsening. 27 combinations can be obtained by combining features B and F. As a result we have combinations BF, which describe the method of making of particular vessels and their fragments (table 102).

D – description of admixture of ceramic mass used for the production of vessels, macroscopically made, in order to determine its type and granulation of the main factor, i.e. crushed stone admixture: 1 – thick>2mm; 2 – medium 1–2mm; 3 – fine<1mm; 4 – sand. Other admixtures include: grog (s), organic (o), bones (k) and mica (m).

On the basis of the type of admixture, with reference to the position of each factor, depending on its quantity, we obtain, so called recipe of ceramic mass, e.g. D123, etc. Recipes of ceramic mass (D) in connection with categories BF enables a schematic description of possible technological groups (Gt), according to which vessel or vessel fragments were made (Gt=BF/D).

This results in a code description, such as Gt 111/123, which describes a vessel with an exterior surface smoothed, both surfaces in brown colour, made of ceramic mass tempered with crushed stone of various granulation.

P – in order to determine the type of vessel wall modelling (and at the same time the course of firing), three types have been distinguished: 1 – one-colour, 2 – two-colour and 3 – three colour (multi-colour).

Settlement from the early Bronze Age

Early Bronze Age settlement on the site at Redecz Krukowy is connected with material which should be linked with the epi-Corded Ware Carpathian cultural circle. It is represented by an assemblage of 2031 vessel fragments obtained only from the cultural layer.

As regards mouth rims, the identified types included simple forms, corresponding to types D and A, after S. Kadrow (1991, p. 43). There was also a mouth form, thickened on the inside which occurred in bowl fragments of sub-group M1. The whole assemblage included 6 fragments tape handles from mugs, amphora and a pot.

Decoration was performed with two techniques: imprints (cord, stamps) and a moulded elements (knobs, moulded band). Three benchmark motifs have been distinguished:

Group I – imprints of a double cord, usually in “carpet-like” patterns. This type of decoration was mainly put on the necks of large, thick-walled vessels, e.g. amphorae and pots.

Group II – knobs in the main two forms: round – IIa, in two variants – straight – IIa1, with an indentation in the middle – IIa2 (and oval – IIb also in two variants – horizontal – IIb1 and vertical – IIb2).

Outside the Mierzanowice culture, knobs were also recorded on site at Dobra, whose cultural attribution cannot be definitely determined (J. Czebreszuk 1995, p.16 fig. 1:1). Decorating with knobs is quite common on the area of the Lower Oder basin on selected vessel forms of the Corded Ware culture (A. Matuszewska 2011). On the area of Lesser Poland – Sandomierz Valley, this type of decoration was found on plant pot-shaped beakers, where they could have played a role of handles (P. Włodarczyk 2006, p. 16).

Group III – moulded bands with finger imprints, which appeared on pots and were situated in two positions: under the mouth and in the place where the neck turns into the belly. Decoration of this type occurs on sites dated to the early and classical phase of the Mierzanowice culture, but also on sites connected with its late phase. A single case of a pot with this type of decoration comes from the grave of the Corded Ware culture at Łękawa from phase IIIb (P. Włodarczyk 2006, fig. 47, plate LXXIII:6).

The assemblage in question consists of several vessel forms with prevalent forms of pots: C (C1 and C2), A2, B5 and H or G, after S. Kadrow and J. Machnik (1997, fig. 72). Pots of type C are equipped with knobs of type IIb. They are recorded in early classical assemblages of the Mierzanowice culture and in its late phase. In the latter case, however, they have no knobs of type IIb. Instead they have a decoration made with fingernails. Analogies of those can be found in the environment of the

Corded Ware culture in Lesser Poland on the site at Łękawa, where the material is dated to phase IIIb (P. Włodarczyk 2006, fig. 47, plate LXXIII:6). Pots of type A2 are decorated with knobs of IIb variant arranged vertically, supplemented by a row of stamps. This type of forms also includes vessel decorated with a moulded band. Pot type B5 is equipped with a handle, whose closest analogy is the form from Kowal from the classical phase of the Mierzanowice culture (S. Kadrow, J. Machnik 1997, fig. 29:4). Pot type H or G is represented by a specimen decorated with a moulded band on the vessel belly. Pots of this type mainly occur in late Mierzanowice assemblages of the Szarbia group and are either undecorated or have single knobs on the upper belly parts (S. Kadrow, J. Machnik 1997, p. 44).

Bowls are represented by types F and C1, after typology by S. Kadrow and J. Machnik (1997, fig. 72).

With reference to analogies of decoration with cord imprints, it can be concluded that there are two theories concerning its origin on Kuyavian material (J. Czebreszuk 1995). According to this author, the first one indicates links between Lesser Poland and is called “southern”. The second one is connected with the western and south-western region groups of the Corded Ware culture, e.g. the Wkra group, etc (ibidem). The presence of knobs mainly occurs in the early and classical phase of the Mierzanowice culture. Only oval knobs in the horizontal layout occur in the environment of the Corded Ware culture, but they are accompanied by other decorative elements. Moulded bands with fingernail imprints, recorded on the site, can be found on vessel necks and they are mainly recorded in the late and classical phase of the Mierzanowice culture. Taking into account the obtained data, it is possible to put forward cultural interpretation of the unearthened material. It should be concluded that vessel decoration at Redecz Krukowy, such as the motif of a cord in double and triple layout, or “carpet” pattern, together with knobs, pot forms (A2, C2, B5), bowl of C1 type and moulded bands with fingernail imprints are indicators of the early and classical phase of the Mierzanowice culture. The first four elements co-occur on the area of c.a. 40 ares and thus most certainly attest one inhabitation incident on the territory (fig. 266). Only moulded bands with fingernail imprints are located east of those, but they co-occur with vessels from group H or G, which are indicators of the late Mierzanowice culture or settlement from the same phase. Therefore, it can be concluded that we deal with material from the early, classical and most probably also late phase of the Mierzanowice culture with analogies in Lesser Poland. However, due to the lack of cord-decorated mugs and jugs or decoration in the form of a loop, we should narrow down the span of settlement at Redecz Krukowy to the younger section of the early phase and classical phase with the elements of the late phase of the Mierzanowice culture. Consequently, the material should be attributed to 2050–1800 BC (S. Kadrow, J. Machnik 1997, fig. 70).

Settlement of the Linin group of the Neman culture.

This settlement level consisted of 23 vessel fragments, including 9 decorated ones, mainly from thin-walled forms. The vessels were made according to the recipe of group M, distinguished by B. Józwiak, and corresponding to classical Neman

assemblages (B. Jóźwiak, 2003, pp. 104 and 190). The distinguished vessel mouths most certainly come from S-shaped pots and they are decorated with a furrow motif. Analogous material is included to classical Neman culture of group AD by B. Jóźwiak, who dates it to a broad chronological period between 3650 to 1800 BC. He also points out that they co-occur with other Linin horizons – HL1–4 (ibidem, p. 195). Vessel fragments from that horizon are basically concentrated in one part of the site, and are undoubtedly the remains of a small, short-lived campsite on that territory (fig. 268).

Settlement of the Iwno culture.

Settlement of the Iwno culture is connected with 197 vessel fragments (fig. 269). The distinguished assemblage is marked by only two decorative motifs: the first one is a single moulded band and the other one multiple, engraved lines visible on S-shaped vessel fragments. Due to its fragmentation and lack of more precise chronological indicators, the unearthed material should be linked with the general Iwno-Trzciniec horizon, i.e. time span of assemblages of KI IIIa, after A. Koško (1979) and HT1 and HT2, after P. Makarowicz, with dating between 1950–1700 BC (1997, fig. 19).

Material from that horizon occurred in two clusters (fig. 269). The bigger one encompassed an area of 100 square metres and consisted of 155 vessel fragments. They mainly came from one vessel in the form of an S-shaped pot with a moulded band. The second cluster covered an area of 25 square metres and included 21 vessel fragments. The obtained material should be linked with a short-lived campsite of small groups of people.

Settlement of the Trzciniec culture

Trzciniec culture settlement is represented by 323 vessel fragments and one feature no 35 (Fig. 270). Only five fragments were decorated: two fragments with a moulded band around the vessel, two with the motif of horizontal grooves and one with wide, vertical fluting pattern. Two vessel forms have been reconstructed in the form of a pot G111 and bowls M32. The discussed material was found in two clusters which do not overlap with the material from the Iwno culture, which according to P. Makarowicz includes horizons: HT4, HT5 and HT6 and is dated to the period between 1650–1300 BC (P. Makarowicz 1997, fig. 19).

Settlement from the circle of the Tumulus culture

This settlement level is represented by 94 vessel fragments. The fragments are only parts of pots decorated with plain moulded bands (fig. 9:2, 3) and decorated with finger imprints (fig. 9:5, 6). There are also vessel fragments with daubed exterior surfaces and trowelled with a bunch of hay (?), which is comparable to a pseudo-textile decoration. Such decorations on vessels can be found in the material of the west-Polish group of the Tumulus culture, e.g. at Brodnia (E. Kłosińska 1997, plate XVII: 8), Szczepidło 17 (P. Makarowicz 2017), and in the stronghold of Bruszczewo (E. Kłosińska 1997, plate XVII: 8), Szczepidło 17 (P. Makarowicz 2017), where they are linked with the late phase of the Unetice culture and clear influences of the Veterov culture, but with no Tumulus elements (P. Silska

2012, p. 238). The distinguished material is found on the area of c.a. 600 square metres and attest a short-lived inhabitation incident of the Tumulus culture community on the area between 17th and 16th c. BC.

Settlement of the Lusatian culture urn fields.

1562 vessel fragments, two features and several metal artefacts have been included in the settlement level of the Lusatian culture urn fields. Ceramic artefacts underwent technological – stylistic analysis (table 102). Spatial distribution plan was also made in the area of the excavation trench (fig. 272). The obtained artefacts, mainly heavily fragmented, made a more complete reconstruction of vessels impossible. However, it was possible to distinguish several basic morphological groups of vessels. Pots include forms with an S-shaped profile, mainly with completely coarsened surfaces and a smoothed band above the bottom. Vases are represented by bi-conical forms of subgroup W2 and a bulging belly of subgroups: W3 and W4, with so called ruff-shaped mouth. Decoration is very scarce. There are only single fragments with bow-shaped motifs and horizontally fluted ones. Fragments of mugs/jugs (K/D) and ladles (C) are not numerous. They include vessels of subgroup K1 K3 and C1. Bowls (M) are represented by semicircular forms of subgroup M1 subgroups M2 in two variants, profiled, decorated artefacts from subgroup M3 and undecorated ones.

Phase I

The phase I was established and dated on the basis of several characteristic forms of pottery and bronze artefacts. The oldest form is considered to be a profiled bowl, decorated with vertical fluting. Analogies from Kuyavia have been obtained from sites, such as: Zgławiażczka site 3 and Sławsko Wielkie site 12. They are dated to BrD – HaA1. Analogous specimens have also been recorded at Szczepidło 17 at the settlement of the Tumulus culture, dated to 1330–1230 BC and many other settlements of the Trzciniec culture, e.g. at Lutomiersk-Koziówki, site 3a-c. The presence of the previously mentioned bowl seems to indicate either the beginnings of the Lusatian culture settlement of the urn fields, or the end of the Tumulus or Trzciniec settlement on the site in question. The second form of diagnostic character includes fragments of a bowl with blackened surfaces and faceted rim section. An equivalent of this form is found on the site at Kraków-Mogila, where it is linked with inspirations from the middle Danubian group of urn fields and the Belegis II culture dated to HaA1. Handles – triangular in cross-section, coming from mugs/jugs have their analogies in, inter alia, the Makó-Kosihy-Čaka culture, dated to BrD/HaA1 – to HaA1 and to the early phase of the middle Danubian urn fields. They occurred at the cemetery at Kietrz, alongside grave vessels dated to period IV of the Bronze Age. They are considered to have been influenced by trends from Moravia. Another element – fragment of a vase from subgroup W3 has a form of a knob/handle, from the top surrounded by bow-shaped fluting. An analogous vase, unearthed at the settlement in Lesser Poland, at Warzyce, site 17, also contains such elements. It is linked with vessels of the Carpathian Basin Kyjatice culture, dated to BrD to HaA, including the latter. The phase in question is linked with a cluster of pot fragments with coarsened surfaces and charred bone remains, supposedly human. This may imply that we deal

with a single cremation grave. All the above artefacts clearly indicate that the phase in question should be dated to the late Bronze Age III and Bronze Age IV (HaA1/HaA2-HaB1). This dating is not disproved by metal artefacts which are discussed below. It is important to observe the size of elements which indicate the southern (trans-Carpathian) source of influence on the character of the artefacts in question.

Phase II – Bronze Age V (HaB2-B3).

The phase is established on the basis of the remains of a hearth, unearthed on the site. The C – 14 dating for the feature is 840–775 BC with 68.2% (Lod-1718, 2630±50). These are most probably remains of a penetration (economic?) settlement episode in the area. There are no other identifiable artefacts, especially pottery.

Spatial planning of the Lusatian settlement of the urn fields.

The analysis of spatial planning of the Lusatian settlement causes problems, which stem from the lack of recessed features (except for the previously mentioned hearth and a potential grave). Thus, the analysis can only be based on spatial distribution of pottery and bronze artefacts. Distribution of Lusatian material allows the designation of two zones of their occurrence: I – the most abundant, II – considerably more scarce. Zone I is linked with smaller clusters (A–G), which may correspond to household clusters of families functioning as part of bigger groups in the area. They did not inhabit permanent features, such as homesteads with post buildings or half dugouts. Instead, they would have used light structures, such as shacks. Thus, we think that the site at Redecz Krukowy was a short-lived (seasonal?) campsite, rather than a permanent settlement.

Metal artefacts

The cultural layer at Redecz Krukowy has yielded eight, functionally diversified, metal artefacts. In eight cases they were made of bronze and in one case of copper (c.f. H. Młodocka, current volume).

Decorations – pins.

Needle-shaped pin – fig. 273. Needle-shaped pins on the area of Poland have been divided into two main types: type I – with a straight shaft and type II with a sabre-shaped shaft in a number of variants, depending on the position of the hole (fig. 274). Pins of this type were usually linked with the classical phase of the Tumulus culture from period II of the Bronze Age, and with the early phase of the Lusatian urn field culture, i.e. period III of the Bronze Age (BrD–HaA1). The problem of dating, cultural attribution and the function of this type of pins is more complex, which is attested by a wider analysis of published sources. They are based on other finds from assemblages of the Lusatian culture from younger stages of its development, which correspond with the forms of older specimens. It is also confirmed by artefacts called needles, which come from, inter alia, Lusatian settlements (fig. 274:18), strongholds (fig. 274:19) and graves. Their occurrence on the area of today's Poland encompasses Lower Silesia, southern part of Greater Poland and single finds in Kuyavia and Pomerania (fig. 3). Most of the oldest pins occurred in grave assemblages in the Tumulus culture and in the mixed Tumulus-Trzciniec culture assemblages (Masanów, Borek). The youngest specimens were

found in the groups of the Lusatian urn field culture, dated to BrD–HaA1 until HaC including D.

Finds of needle-shaped pins have been recorded in Slovakia, with the cluster on the middle Danube river and its left-bank tributaries from Croatia and Peloponnese). West of the territory of today's Poland, they are found more rarely. An iron pin from Seelow was unearthed in the Górzyca culture and a bone pin in the Białowice culture. Analogous pins can also be found in Upper Bavaria at Roseinsel. The latest finds come from Jutland from the Roman period. They were also unearthed in Poland, e.g. in biritual graves of the cemetery at Karczyn/Witowy 21/22, district of Inowrocław and at Opoki.

Definite function of this type of artefacts is difficult to determine. Some researches are convinced that they served the purpose of pinning garment, whereas some others claim that these were used as sewing needles. At least some metal (but also bone) needle-shaped pins were used for pinning garment. It is also important to observe the bone equivalents of metal, needle-shaped pins, with a much older chronology. They are linked with the Samborzec group of the Mierzanowice culture, where they are described as needles with two blades. The finds enabled the reconstruction of their use, which was also applied to an artefact from Redecz Krukowy. To sum up, it should be concluded that needle-shaped pins could have been used and definitely were used for pinning garment, especially long artefacts (variant I/B2 and IB/3), and sabre-shaped ones (type II). They may also have played a role of sewing needles, e.g. specimen I/A and possibly I/B1a.

Pin with a bi-conical head. It represents a type with a straight, undecorated shaft with a bi-conical head, flat at the top. The upper part of the pin head is decorated with horizontal midribs, and in the lower part with lines around the artefact. It belongs to the Pleszów type of pins, which are connected with the early-Lusatian assemblages from HaA1, resembling specimens from the Deszczno type. The Pleszów type consists of at least three variants. The specimen from Redecz Krukowy belongs to type A. As a new classification has been suggested, the artefacts were placed on the map, together with the finds of pins of the Deszczno type. Analogies of the pins from Redecz Krukowy (Pleszów type) can also be found outside Poland, e.g. in Slovakia, where we come across specimens similar to variant B2 and B1. They are also found in Moravia at the cemetery of Domamyslice, district of Prostějov, in a large number of variants. A pin similar to variant B1 has been obtained from the Romand hoard in Hungary, and another one similar to variant C from Velemszeenvid. In lower Saxony, a new comparison of pins resembling the Pleszów type has been made, with a prevalent number of pins with decorated shafts. In Italy, the pins in question concentrate around Garda Lake, and are described as Mezzocorona, dated to the younger Bronze Age and the Peschier phase. On all areas in question, the pins of the Pleszów type come from the assemblages of the late Tumulus groups and the initial phase of the urn field phase, i.e. BrD – HaA1/HaA2-B1.

Tools

Awl – (fig. 279), dating of this type of finds generally refers to younger periods of the Bronze Age. Two variants can

be distinguished: variant A – awls made of a rod, round in the cross-section, with both endings needle-shaped, an example of which is a specimen from Redecz Krukowy and variant B, in which half of the awl is round in the cross-section, with a needle-shaped ending, and the other half clearly flattened, quadrangular in the cross-section.

Sickle – fig. 280, two blade fragments have been unearthed, included to the type of straight, knife-like sickles, dated generally to BrD

Knife – fig. 281, fragment of a middle part of the knife blade with characteristic type of decoration in the form of hammering. Due to the size of the preserved fragment, we can only apply a very general dating to the Bronze Age.

Axe – fig. 282, the unearthed specimen's form corresponds with so called flat axes, mainly of the Kalinowice Dolne type, variant A, dated to BrA2-BrB (fig. 20). Metallographic analysis indicated that it was made of non-arsenic copper. The nearest cluster of flat, copper axes can be found in Bohemia and Moravia, where artefacts made of non-arsenic and arsenic copper occur in the Eneolithic and in the older Bronze Age. They concentrate on the Bohemian-Moravian border and in the vicinity of Hodonin and Brno.

Weaponry

Arrowhead – fig. 283, belongs to type IIa with barbs and a long socket, with quite a sharp midrib on the blade, dated to at least BrA2-BrB (fig. 20).

Javelin head – fig. 284, it is a head fragment, with a characteristic element in the form of double-sided midrib. Determining the type is impossible, but it should be linked with the horizon of the Lusatian settlement, from BrA2-BrB.

PRZEWORSK CULTURE (Wojciech Siciński)

Excavations on site 20 at Redecz Krukowy have revealed not numerous traces of penetration of the area by the Przeworsk culture community. Only three archaeological features have been unearthed. Two of them are of utility character, whereas the third one is a sepulchral feature. The first one is a hearth dated by means of radiocarbon dating to the turn of the younger pre-Roman and the beginning of the early Roman period. The second one is a pit with pottery material of undetermined utility character.

Feature no 5 of sepulchral character is absolutely exceptional as regards settlement research. It is a collective, skeletal burial in a grave pit, whose shape resembles a rectangle. It contains bone remains of three individuals. Grave equipment was not found. Two radiocarbon dates have been obtained from the bone remains. The results were very similar and pointed to the younger pre-Roman period and the beginning of the early Roman period. They confirm the dating of the utility feature, i.e. the hearth.

Excavations have not yielded many artefacts which could be linked with the Przeworsk culture settlement. The material is fragmented and recorded over a large area of the site. Pottery is represented by only 145 fragments, some of which comes from one reconstructed vessel.

It is worth noting a discovery of three glass beads, which has definitely resulted from a very thorough research method.

On the basis of the material of the Przeworsk culture, we can distinguish two inhabitation episodes on the site. The first one can be dated to the younger pre-Roman period, or possibly the period between the old and the new era. It is represented by two archaeological features, the most important being a multi-burial, skeletal grave, which as yet, has no analogies with the material from the Kuyavian, archaeological sites dated to that period, which have been published so far.

The second settlement episode took place in the Roman period. Not numerous pottery material comes from that time, including a partly reconstructed vessel and an exceptional find of three glass beads. The material is dated to the younger Roman period (second half of the 2nd c – half of the 3rd c. AD).

ARTEFACTS FROM THE MIDDLE AGES AND THE MODERN PERIOD (Dominik Kacper Płaza, Piotr Papiernik)

An exceptional and consistently conducted research method made it possible to identify a large number of settlement incidents, the youngest of which refer to the Middle Ages and the modern period. A special place is occupied by the unearthed remains of a trackway from the modern times, dated to the 17th century by means of coins. The end of the track's functioning coincides with the changes that took place in Kuyavia as a result of the 2nd and 3rd Northern War (c.f. S. Roszak, current volume). As a result of the "deluge" and other political events, a large number of towns and villages were destroyed, and some of them even completely abandoned (c.f. M. Borucki 1882, Z. Guldon 1964, 1984; H. Szczechowicz 2013; B. Degórska 2015). Precise dating of the trackway's remains, obtained for archaeological research at Redecz Krukowy, turned out to be essential. It allowed determining the chronology of the deposition of eolian sands, which covered the remains of prehistoric settlement.

CONCLUSION (PIOTR PAPIERNIK)

Professor Konrad Jażdżewski in his academic script "Ochrona zabytków archeologicznych. Zarys historyczny" ("Protection of archaeological artefacts. Historical outline"), published in 1966, wrote as follows: "...every time archaeological excavations are carried out... they are inextricably linked with irreversible damage of a large, possibly even major part of scientific material, i.e. the environment (close vicinity of the site, cultural layer) as well as artefacts and features. Therefore archaeology ... resorts to an array of means, including the latest physical and chemical methods provided by natural sciences, in order to compensate for the great loss of the foundation where an artefact had been deposited before being excavated".

The authors found it of utmost importance to prepare a monograph of archaeological excavations at Redecz Krukowy. We are of the opinion that publishing the results of the excavations is a necessary element in drawing conclusions about the works begun at the moment of "the first dig in the ground".

We sincerely hope that we have at least partially fulfilled the expectations that Professor Konrad Jażdżewski laid before us, as regards "decent" archaeological excavations.