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Neolithic Flint Axes Made from Cretaceous flint of the Bug and Neman Interfluve in the Collection of the Museum of Podlasie in Bialystok

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The aim of the article is to present and characterize the collection of flint axes made of Cretaceous flint from the interfluve of the Bug River and Neman that morphologically resemble the forms from the Neolithic cultures of the Polish Lowland (the Funnel Beaker Culture, Globular Amphorae Culture and Corded Ware Cultures). This group of objects consists of 10 items found in the Podlasie region. The presented axes are a small part of a large collection (50 flint axes) exhibited in the Museum of Podlasie in Bialystok. A new term for local Cretaceous flint has been introduced for the purpose of this study. Until now, this type of flint was known as Northeastern Flint, and although research to define this term has been done, it has never been fully finalized. Because of that, the author of this study has coined a new and more suitable term: Cretaceous flint from the interfluve of the Bug River and Neman. This includes a group of Cretaceous flints from the Podlasie area and contains all the local variations of it: Mielnik flint, Rybniki flint, flint from the Cretaceous beds and marls and Krasne Siolo flint

KEY-WORDS: flint axe, Podlasie region, northeastern flint, Cretaceous flint, stray finds, Neolithic, Funnel Beaker Culture, Globular Amphorae Culture, Corded Ware Culture

INTRODUCTION

The state of knowledge on flint axes across the whole area of the Odra and Vistula basin is rather variable. This material is well described in the areas of Lesser Poland, the Lublelskie and Greater Poland regions, (e.g., Włodarczak 2006; Libera 2016; Pyżewicz *et al.*, 2016). In comparison to the above-mentioned areas, the territory of today's Podlasie Province is poorly investigated in this field of research. Although this area has been studied by archaeologists since the end of the 19th century, there has never been a larger number of axes described from Podlasie Province. Discoveries made in recent years indicate that in the Neolithic and Bronze Age the local communities of this region

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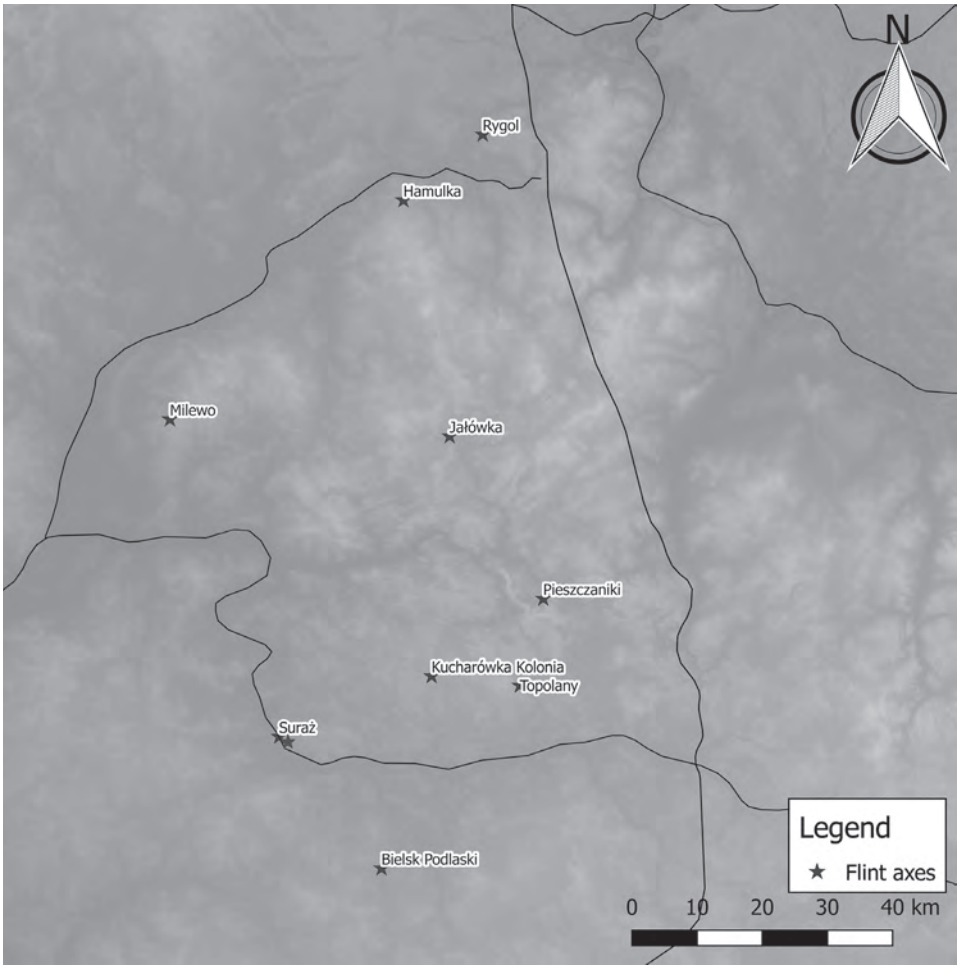

Fig. 1. Localisation of neolithic flint axes from Museum of Podlasie in Bialystok.
Computer graphics: H. Lepionka.

had a number of broad cultural contacts (Wawrusiewicz *et al.*, 2015). In order to fully understand this region, we should turn to other categories of archaeological evidence.

The purpose of this work was a stylistic and taxonomic characterization of the collection of tetrahedral flint axes made from the local Cretaceous flint. The study was limited to objects related to the Neolithic cultures of the Funnel Beaker, Globular Amphora and Corded Ware Cultures (Fig. 1). The article is part of a wider discussion of the collection of flint axes from the Museum of Podlasie in Bialystok.

METHODS

The descriptive methodology is based on formal criteria drawn from works on flint axes by Polish, Lithuanian and Belarusian archaeologists (Wiślański 1966; Nosek 1967; Kulczycka-Leciejewiczowa 1996; Obuchowski 2003; Włodarczak 2006; Piličiauskas 2007; Bobrowski and Sobkowiak-Tabaka 2008; Libera 2009; Miecznikowski 2014; Libera 2016). The scheme of description and naming of individual parts of the axes was taken from the guidelines of the *Biblioteka Muzealnictwa i Ochrony Zabytków* with the changes introduced by Zbigniew Miecznikowski (Kulczycka-Leciejewiczowa 1996; Miecznikowski 2014). It was also decided to introduce standardized shapes of cross-sections and shapes of individual parts of the axe (Fig. 2).

The collection of flint axes from Museum of Podlasie in Bialystok contains 50 artefacts. The condition of these finds is various. Most of them are unbroken but some of them are damaged and some have been preserved as fragments of edges or butts (Table 1). The nature of the collection, which is mostly stray finds, does not allow us to use the context in the allocation of individual tools to an archaeological culture. It should be considered that individual finds of flint axes do not necessarily mean the presence of representatives of given cultures in Podlasie. The appearance of axes in this area may be the result of the functioning of long-distance routes or 'chain' exchange between neighbouring communities. Cultural attributions can only be done on the basis of the form and style, comparing them with tools with a more secure chronology. Analogies from the other sites with context, both near and from more distant areas, e.g., Lesser Poland, were used to categorise the axes from the Podlasie region investigated in the paper. Although if local raw materials were used to make axes of non-local style, it adds to discussions about the *modus operandi* of borderlands in the past. It seems that this methodology is justified until the characteristics of axes of local production will be better identified.

The analysis was carried out in morphologically similar groups of products. Metric features, weight, as well as the shape of individual parts of the axe were considered: the shape of the faces, the side view and cross-section, the character of the faces and side surfaces and the shape and position relative to the tool axis, blade and butt. It was only as a result of the observed correlations that particular objects registered in Podlasie were assigned to archaeological cultures.

RAW MATERIAL

The axes presented in this article were made of local Cretaceous flint described in the archaeological literature as 'northeastern flint'. The first researcher who discussed the issue of Cretaceous flint from this area was Krzysztof Cyrek (1979, 1983). The author

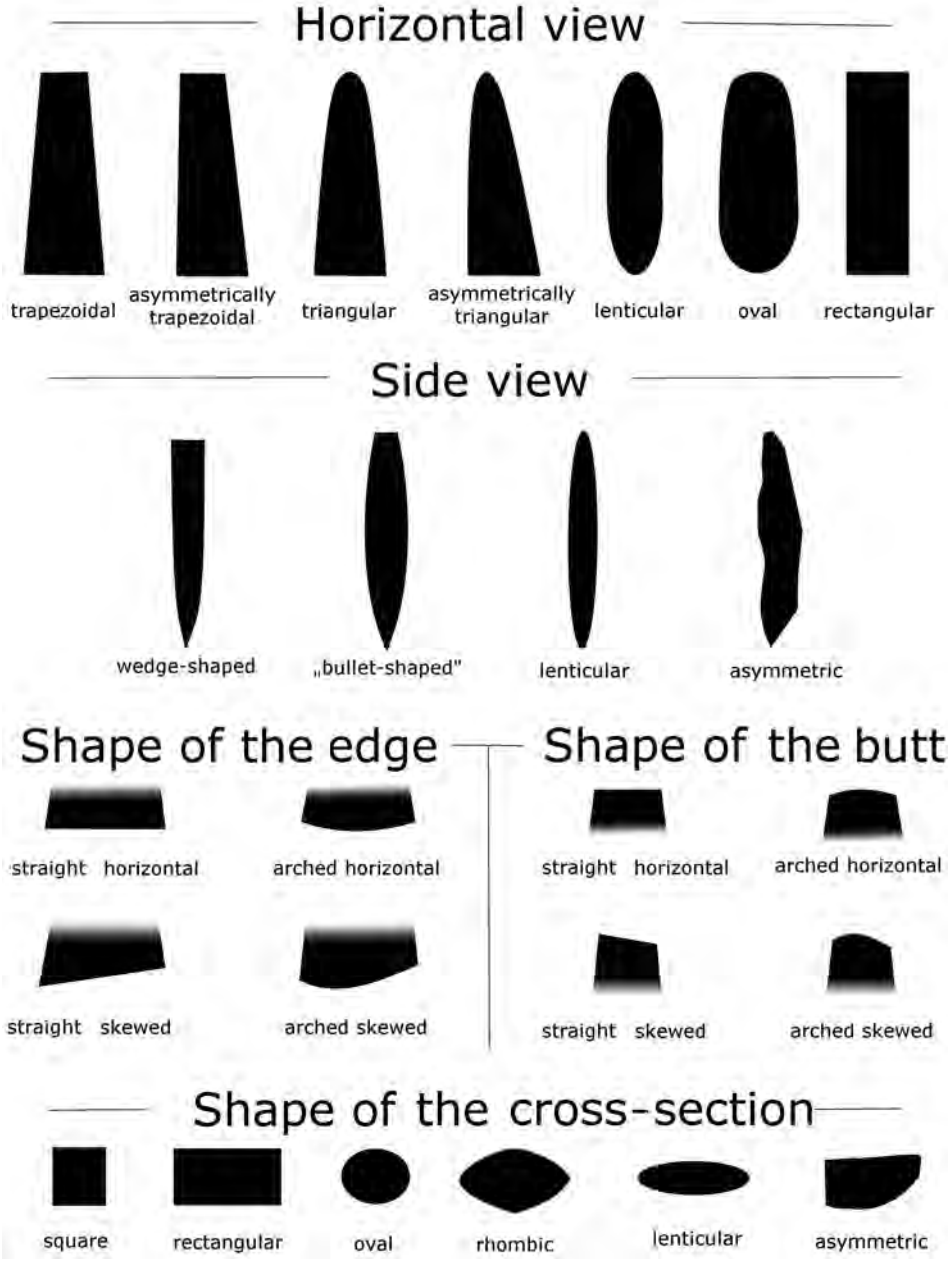

Fig. 2. Standardized shapes of individual parts of axe used in article and Table 1.
Computer graphics: H. Lepionka.

Table 1. Collection of flint axes from the Museum of Podlasie in Bialystok, described in accordance with the standardized shapes proposed in Fig. 2.

No.	localization	district	type	condition	horizontal view	side view	shape of edge	shape of the butt	shape of the cross-section
1	Białystok	loco	bifacial	unbroken	trapezoidal	lenticular	arched skewed	arched horizontal	lenticular
2	Białystok	loco	tetrahedral	repaired	trapezoidal	wedge-shaped	straight horizontal	straight skewed	rectangular
3	Bielsk Podlaski	Bielsk Podlaski	bifacial	unbroken	trapezoidal	lenticular	arched horizontal	arched skewed	lenticular
4	Bielsk Podlaski	Bielsk Podlaski	tetrahedral	unbroken	asymmetrically trapezoidal	'bullet-shaped'	arched horizontal	arched horizontal	rectangular
5	Bielsk Podlaski, site 34	Bielsk Podlaski	tetrahedral	damaged and repaired edge	trapezoidal	wedge-shaped	-	straight horizontal	rectangular
6	Brzozowo	Sokółka	tetrahedral	fragment of the body	trapezoidal (?)	wedge-shaped (?)	-	-	rectangular
7	Daniłowo Małe, site 6	Białystok	tetrahedral	partly damaged edge	trapezoidal	'bullet-shaped'	arched horizontal (?)	arched horizontal	rectangular
8	Daniłowo Małe, site 7	Białystok	tetrahedral	fragment of the edge	-	-	arched horizontal (?)	-	-
9	Dziarnowizna	Białystok	bifacial	slightly damaged edge and butt	triangular	'bullet-shaped'	straight horizontal	arched horizontal (?)	oval
10	Eliaszuki	Hajnówka	bifacial	unbroken	asymmetrically triangular	lenticular	arched skewed	arched skewed	rhombic
11	Ełk	Ełk	tetrahedral	unbroken	trapezoidal	'bullet-shaped'	arched horizontal	straight horizontal	rectangular
12	Góra Strękowa	Białystok	bifacial	slightly damaged butt	triangular	wedge-shaped	straight horizontal	straight horizontal	oval
13	Hamulka	Sokółka	tetrahedral	unbroken	asymmetrically trapezoidal	wedge-shaped	arched horizontal	arched horizontal	rectangular
14	Jałówka	Sokółka	tetrahedral	unbroken	trapezoidal	'bullet-shaped'	arched horizontal	arched horizontal	rectangular
15	Jeroniki	Białystok	bifacial	repaired edge	asymmetrically triangular	'bullet-shaped'	arched horizontal	arched skewed	oval

16	Kraśniany	Sokółka	tetrahedral	fragment of the butt	trapezoidal (?)	wedge-shaped	-	straight horizontal	rectangular
17	Krzemionki Opatowskie	Ostrowiec Świętokrzyski	tetrahedral	unbroken	trapezoidal	wedge-shaped	arched horizontal	arched horizontal	rectangular
18	Kucharówka Kolonia	Białystok	tetrahedral	unbroken	trapezoidal	wedge-shaped	arched horizontal	straight horizontal	rectangular
19	No data	No data	tetrahedral	unbroken	trapezoidal	'bullet-shaped'	arched horizontal	straight horizontal	rectangular
20	Milewo	Mońki	tetrahedral	unbroken	trapezoidal	wedge-shaped	arched horizontal	arched horizontal	rectangular
21	Morusy	Mońki	bifacial	unbroken	oval	lenticular	straight horizontal	arched horizontal	lenticular
22	Narew	Hajnówka	tetrahedral	small fragment of the body	-	-	-	-	-
23	Pieszczaniki	Białystok	tetrahedral	unbroken	rectangular	'bullet-shaped'	arched horizontal	straight skewed	rectangular
24	Pieszczaniki	Białystok	tetrahedral	unbroken	asymmetrically trapezoidal	wedge-shaped	arched horizontal	arched horizontal	rectangular
25	Pieszczaniki	Białystok	tetrahedral	unbroken	rectangular	'bullet-shaped'	arched horizontal	straight horizontal	rectangular
26	Poświętne	Białystok	bifacial	damaged body	asymmetrically triangular	'bullet-shaped'	arched skewed	arched horizontal	lenticular
27	Rygol	Augustów	bifacial	unbroken	trapezoidal	'bullet-shaped'	straight horizontal	arched horizontal	lenticular
28	Rygol	Augustów	tetrahedral	repaired butt and damaged edge	trapezoidal	wedge-shaped	arched horizontal	straight horizontal	rectangular
29	Słomianka	Mońki	trihedral	unbroken	asymmetrically triangular	wedge-shaped	arched horizontal	straight horizontal	asymmetric
30	Sokółka	Sokółka	bifacial	damaged edge	oval	asymmetric	-	arched horizontal	oval
31	Sośnia	Grajewo	bifacial	unbroken	asymmetrically trapezoidal	asymmetric	arched horizontal	straight skewed	lenticular
32	Supraśl	Białystok	tetrahedral	fragment of the butt	trapezoidal (?)	-	-	arched horizontal	rectangular
33	Suraż	Białystok	tetrahedral	unbroken	trapezoidal	wedge-shaped	arched horizontal	straight horizontal	rectangular

34	Suraż	Białystok	tetrahedral	damaged edge	trapezoidal	'bullet-shaped'	-	arched horizontal	rectangular
35	Suraż	Białystok	tetrahedral	unbroken	trapezoidal	'bullet-shaped'	arched horizontal	arched horizontal	rectangular
36	Szpakowo	Mońki	bifacial	unbroken	oval	'bullet-shaped'	straight horizontal	arched skewed	oval
37	Topczykały	Bielsk Podlaski	bifacial	unbroken	asymmetrically triangular	'bullet-shaped'	straight horizontal	arched horizontal	lenticular
38	Topolany	Białystok	tetrahedral	slightly damaged edge	trapezoidal	'bullet-shaped'	arched horizontal	straight horizontal	rectangular
39	Tykocin	Białystok	oval	unbroken	oval	wedge-shaped	arched horizontal	straight skewed	oval
40	Wojszki	Białystok	bifacial, half-product	unbroken	oval	asymmetric	arched skewed	arched skewed	asymmetric
41	Złotoria site 53	Białystok	bifacial	slightly damaged edge	asymmetrically triangular	asymmetric	straight skewed	straight skewed	asymmetric
42	Złotoria site 56	Białystok	bifacial, half-product	unbroken	asymmetrically triangular	asymmetric	straight horizontal (?)	arched skewed (?)	asymmetric
43	Złotoria site 56	Białystok	bifacial, half-product	broken edge	trapezoidal	asymmetric	-	arched skewed	rhombic
44	Złotoria site 56	Białystok	oval	unbroken	rectangular	'bullet-shaped'	straight skewed	arched horizontal	oval
45	Złotoria site 56	Białystok	bifacial	fragment of the edge	-	-	arched skewed	-	lenticular
46	Złotoria site 56	Białystok	bifacial	fragment of the edge	-	-	arched horizontal	-	lenticular
47	Złotoria site 56	Białystok	bifacial	broken edge	trapezoidal	'bullet-shaped' (?)	-	straight horizontal	lenticular
48	Złotoria site 56	Białystok	oval	fragment of the butt	oval	asymmetric	-	arched horizontal	asymmetric
49	Ploski	Bielsk Podlaski	bifacial, half-product	unbroken	triangular	wedge-shaped	straight horizontal	arched horizontal	lenticular
50	No data	Białystok	tetrahedral	unbroken	rectangular	wedge-shaped	arched horizontal	straight horizontal	rectangular

states that this raw material is probably the same age as the Baltic flint but the deposits that were its source had not been localized, it is very similar in colour to the Baltic flint, but occurs in larger, non-cracked concretions with preserved cortex. The first division of the northeastern raw material into more precise varieties was introduced by Karol Szymczak (1992, 1995). He proposed a division into two types (mine and erratic) based on the state of preservation of the concretions. The first group is characterized by perfectly preserved flint mass and a thick, often undamaged, cretaceous cortex that has not undergone leaching processes and still retains its white colour. The second one bears traces of long-distance transport and is often preserved as cracked chunks. Another classification proposed by Szymczak is a division based on a few chemical and petrographic studies. The author introduces two varieties that are not recognizable macroscopically and have a different content of zinc (Zn) and nickel (Ni; Szymczak 1992, 1995). Two groups of raw material with different levels of these elements are visible, but unfortunately, due to the small number of samples, these data should be considered only as an interesting indication of the need for future chemical consideration.

In the Polish school of specifying flint raw material, the names of particular flint species were traditionally given according to the observation of a characteristic macroscopic feature (e.g., 'chocolate' or striped flint), or the name of the locality or region in which it appeared (Świeciechow, Volhynian, Jurassic-Cracow flint). According to the present author, the term 'northeastern flint' and its characterisation proposed by Cyrek is too imprecise to properly describe this raw material. This paper uses the term 'Cretaceous flint of the Bug and Neman interfluves', which at the same time defines the origin and spatial delimitation of the raw material in question. It is noteworthy that due to the state of petrographic and chemical research, the term refers to a group of flints, within which individual types can be recognized macroscopically.

According to current geological thought, the Cretaceous flint of the Bug and Neman interfluve was formed in the Turon period in the upper Cretaceous period (Fig. 3). Flints of this type occur in situ in tertiary sediments (e.g., Mielnik on the Bug), and more often in marlstone limes, marls, and rocks that have been transported by an ice sheet, probably, but not only, from around Grodno (Wójcik 2005: 25–26; Zalewski 2011: 297). The distinction between the geological origins is often blurred due to the numerous glaciations that occurred in this zone and moved material. Often the accumulation of concretions is the only trace of Cretaceous beds formerly deposited here (Wójcik 2005: 26).

The Cretaceous flints of the Bug and Neman interfluve group have several characteristic attributes (Fig. 4). Flint nodules occur in various shapes. For instance, flint nodules from the Roś river area are oval and regular in shape whereas samples from Mielnik are irregular and full of chalk intrusions. Cortexes are mostly only a few millimetres thick with a thick chalk layer on them. The silica mass has lots of

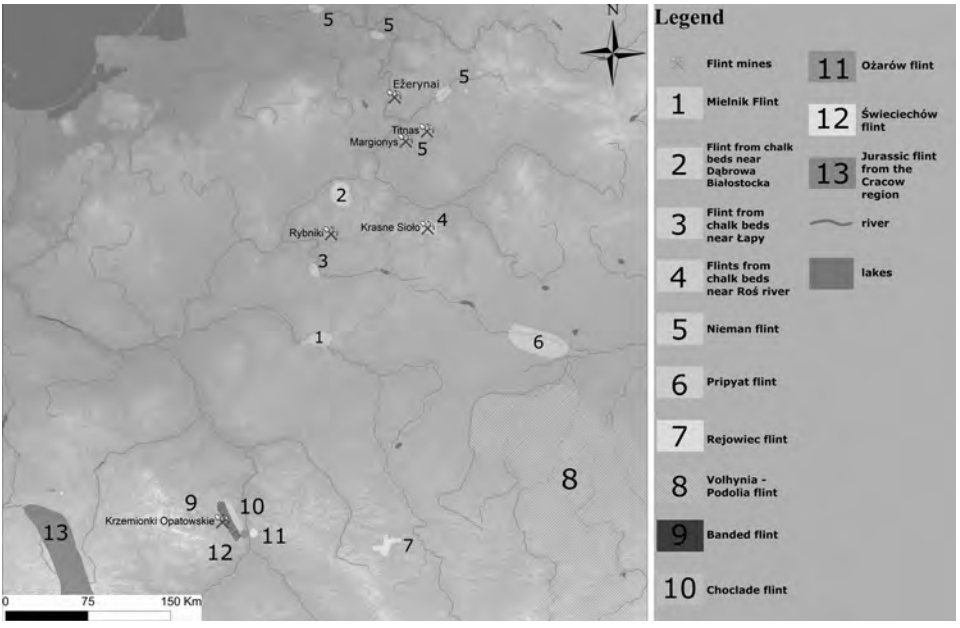

Fig. 3. Raw flint material background for Podlasie region. Based on: Balcer 1987; Szymczak 1992; Piličiauskas 2007; Lepionka 2015; Gruždź 2016. Computer graphics: H. Lepionka.

white or grey dots and 'vein-like' lines. There can also be seen an evident zoning. Just under the cortex, there is a dark zone about a centimetre thick which is distinct from the inner greyer flint mass. Sometimes chalky intrusions are situated in the body of the nodule.

Due to its 'Cretaceous' genesis, it is sometimes not simple to macroscopically separate this raw material from other Cretaceous flints such as flints from Rügen, Volhynia, and Ruthenian flint. Only a sample large enough, like a flint axe or core, can provide a good set of characteristic attributes to make proper macroscopic analyses. On the basis of data from the literature and personal examination by the author, four types of source areas of these flints can be distinugished. These are: a – flint from the Roś river area, b – so-called Rybniki flint, c – Mielnik flint, d – Cretaceous beds in the vicinity of Łapy, Dąbrowa Białostocka (Poland), Margionys, Titnas and Eżerynai (Lithuania).

Today we have evidence for exploitation of this raw material in the Palaeolithic, Neolithic and Bronze Age. Each mentioned flint outcrop was used in a different epoch. In the Palaeolithic there was in common use a raw material from Cretaceous beds in the vicinity of Łapy, Dąbrowa Białostocka (Poland); Margionys, Titnas (Lithuania) and maybe Mielnik flint (Szmit 1929; Gieysztor-Szymczak 1980; Baltrūnas *et*

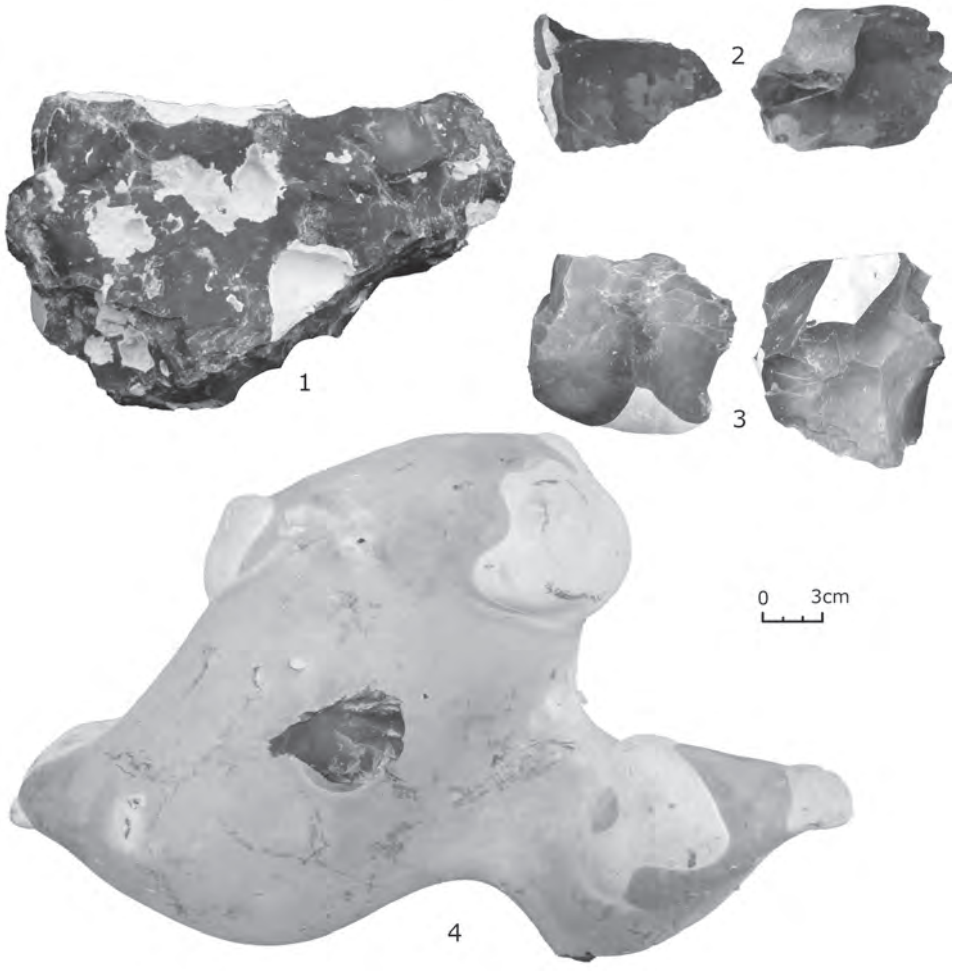

Fig. 4. Examples of Cretaceous flint of the Bug and Neman interfluve: 1–Mielnik, Siemiatycze district; 2–Cretaceous beds near Łapy, Białystok district; 3–Krasne Siolo, Grodno district. Photo: H. Lepionka.

al., 2006). The raw material was used in producing double striking platform cores for knapping blades. During the Mesolithic, it seems that an erratic variant of local Cretaceous flint was used in about the same percentage as the Erratic Baltic Flint (Szymczak 1992).

This situation changed during the Neolithic period when the first mines began to function. Hitherto, evidence for exploitation has come from mines located at Krasne Siolo and Margionys (Gurina 1976; Czarniausky 1995; Kalicki and Kalicki 2012). In the archaeological literature until recently, the beginning of mining was associated with the Neman Culture but in more recent studies it is thought to be more probable that the first miners were of the Globular Amphora Culture. The mines continued in use in the times of the Corded Ware Culture (Czarniausky 1995: 269). In the beginning, the production at Krasne Siolo was oriented towards making tetrahedral axes, later bifacial axes and sickles (Czarniausky 1995; Barska 2002; Kalicki and Kalicki 2012). In Margionys, production was similar to Krasne Siolo but without any activity in the Globular Amphora Culture period (Baltrūnas *et al.*, 2006).

In the Bronze Age, mining of Cretaceous flints of the Bug and Neman interfluve group evolved further from the situation in the Neolithic period. Flint production changed focus from tetrahedral axes to bifacial axes, daggers and sickles. In this period, some new mines were begun, like the Rybniki complex, but old known outcrops also continued to be mined: Krasne Siolo, Margionys, Titnas (Gurina 1976; Czarniausky 1995; Borkowski and Zalewski 2005; Baltrūnas *et al.*, 2006; Zalewski 2011; Kalicki and Kalicki 2012; Zalewski *et al.*, 2016).

It has been shown that the Cretaceous flint of the Bug and Neman interfluve group was an object of raw material exploitation and tools produced in the past. Current knowledge allows us to discern two phases of flint processing. The first phase is associated with Final Palaeolithic societies and was focused on blade production from double platforms cores. The second phase began in the Neolithic and was sustained in the Bronze Age. It was oriented, in the beginning, toward the production of tetrahedral axes, then in the Bronze Age changed to bifacial tools like axes, daggers and sickles.

MATERIAL

The analysis of items in the collections includes ten tetrahedral undamaged axes made from the group of Cretaceous flints of the Bug and Neman interfluve. The objects are presented in alphabetical order.

1. Axe from Bielsk Podlaski site 34, Bielsk Podlaski district (Fig. 5)
A tetrahedral axe with a trapezoidal faces. Wedge-shaped from the side view. The cross-section was, before damage, rectangular. The faces are ground to a flat surface. The side surfaces are similar to the faces. The edge has traces of flaking and the intensity of the ripples on the flake negatives suggests that a splintered-pieces technique was used. This could have been an attempt to repair the tool or reutilize it in the past, maybe in the Bronze Age. The back of the axe is horizontally straight.

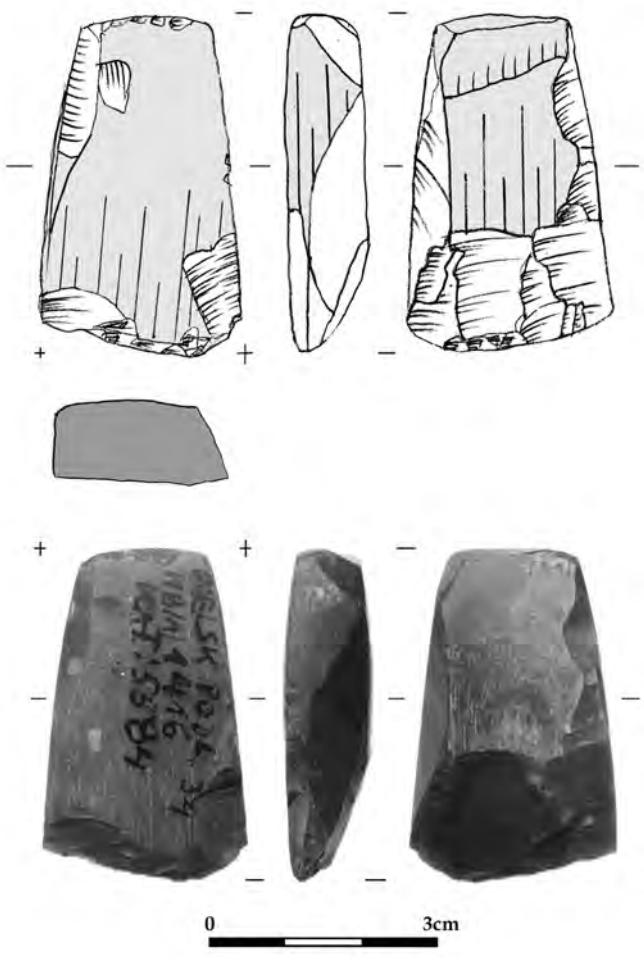

Fig. 5. Axe from Bielsk Podlaski site 34, Bielsk Podlaski district. Computer graphics: H. Lepionka.

2. Axe from Hamulka, Sokółka district (Fig. 6)
The axe from Hamulka has asymmetrically trapezoidal faces. The side view is wedge-shaped and the cross-section is rectangular. The faces are nicely ground with significant separation of the edge polished area. The side surfaces are flat and one of them is damaged maybe by the hafting. The edge is horizontally arched, as is the butt.

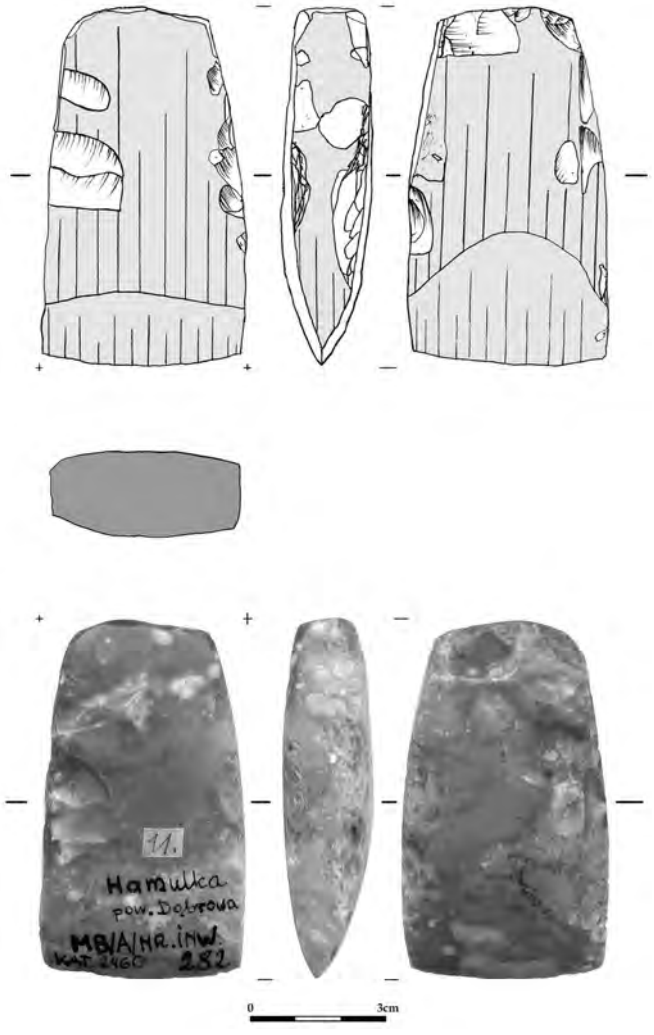

Fig. 6. Axe from Hamulka, Sokółka district. Computer graphics: H. Lepionka.

3. Axe from Jałówka, Sokółka district (Fig. 7)
This axe has trapezoidal faces. The side view is 'bullet-shaped' and the greatest thickness of the object is towards the blade. In the middle, the cross-section is rectangular with convex long sides. The faces are carefully ground with a few flat flake scars left. This object has three grinding zones, of which the last, near the blade, is polished. The side surfaces are thoroughly polished with a few flaking scars. The blade and butt have a horizontally arched shape.

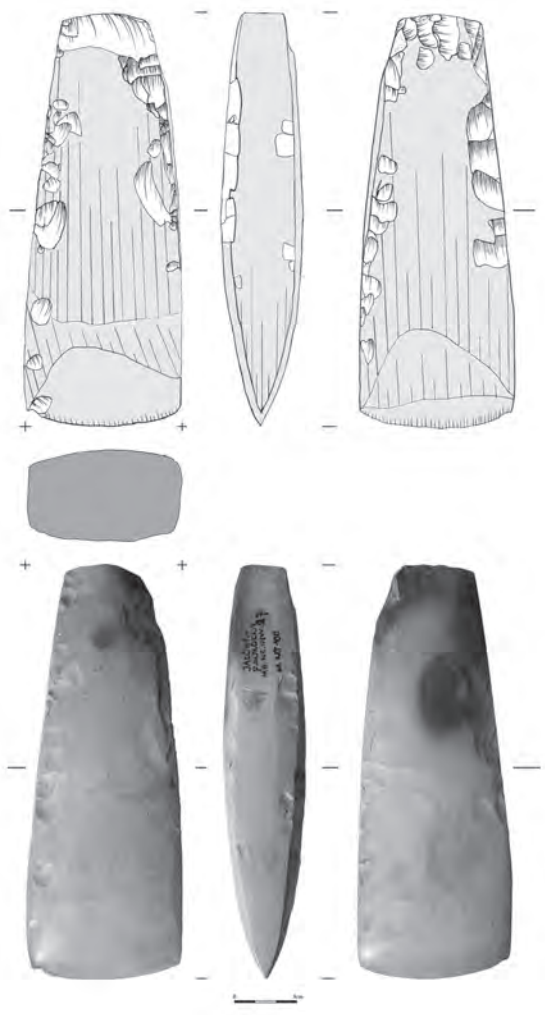

Fig. 7. Axe from Jałówka, Sokółka district. Computer graphics: H. Lepionka.

4. Axe from Kucharówka Kolonia, Białystok district (Fig. 8)
The axe found in Kucharówka Kolonia has trapezoidal faces. The side view of the tool is wedge-shaped. The cross-section has a quite rectangular shape. One of the faces was ground in central part when on edge there are left deep flaking scars, the second is ground just on the edges when the central part of face surface is natural. One of the faces has two polishing areas. The side surfaces are ground with some flake scars left. The edge is skewed arched and butt is horizontally straight.

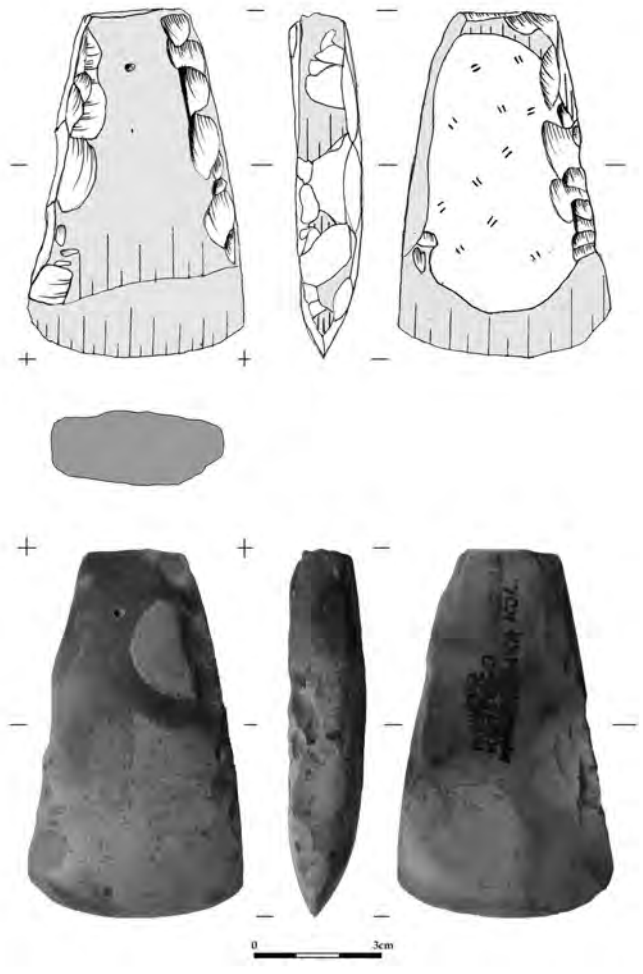

Fig. 8. Axe from Kucharówka Kolonia, Białystok district. Computer graphics: H. Lepionka.

5. Axe from Milewo, Mońki district (Fig. 9)
The axe's faces are trapezoidal and the side view is wedge-shaped. The cross-section is rectangular and the faces were probably ground by a 'machine-tool'. In justification of that hypothesis is the presence of deep and long grinding lines, similar to the ones resulting archaeological experiments (Vemming *et al.*, 1983; Madsen 1984). In the whole axe can be see a chalk intrusion typical of the Cretaceous flints of the Bug and Neman interfluve group especially of the Mielnik flint type. The side surfaces are quite round and ground with few flaking scars left. The edge and butt of the axe are arched horizontally.

Fig. 9. Axe from Milewo, Mońki district. Computer graphics: H. Lepionka.

6. Axe from Pieszczaniki, Białystok district (Fig. 10)
The axe has rectangular faces and a 'bullet-shaped' side view. The cross-section of the object is rectangular. The axe's faces are oblique with fine polishing. On one side there are two polished areas. The side surfaces are ground with left deep flaking scars left. The edge has an arched skewed shape however the butt is horizontally straight.

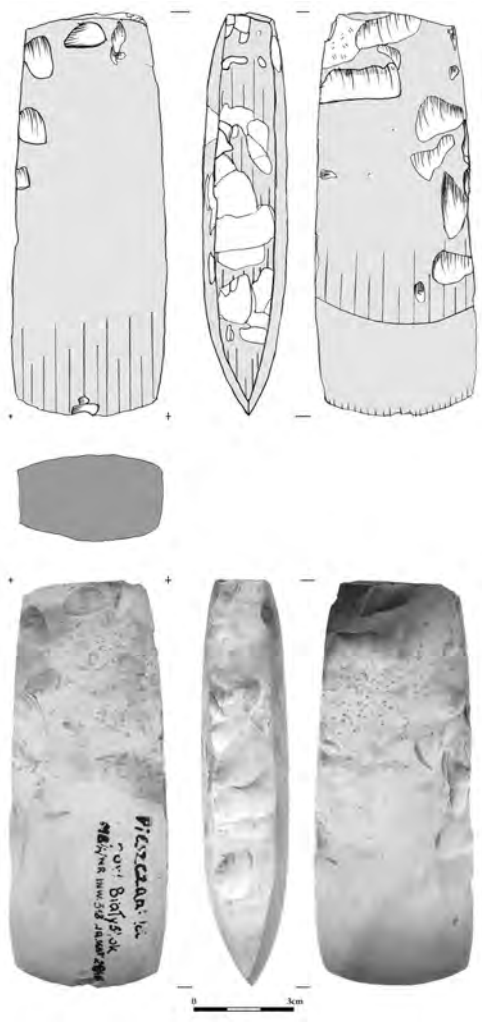

Fig. 10. Axe from Pieszczaniki, Białystok district. Computer graphics: H. Lepionka.

7. Axe from Rygol, Augustów district (Fig. 11)
The Rygol axe is made from a broken larger axe. It has trapezoidal faces and the side view is wedge-shaped. The cross-section of the tool is rectangular. The faces are ground with visible deep lines of grinding but not all flaking scars have been ground away. On both faces, there are two areas of grinding, the side faces are ground only slightly. The edge is horizontally straight. The butt is formed on the broken part and has an asymmetrical shape.

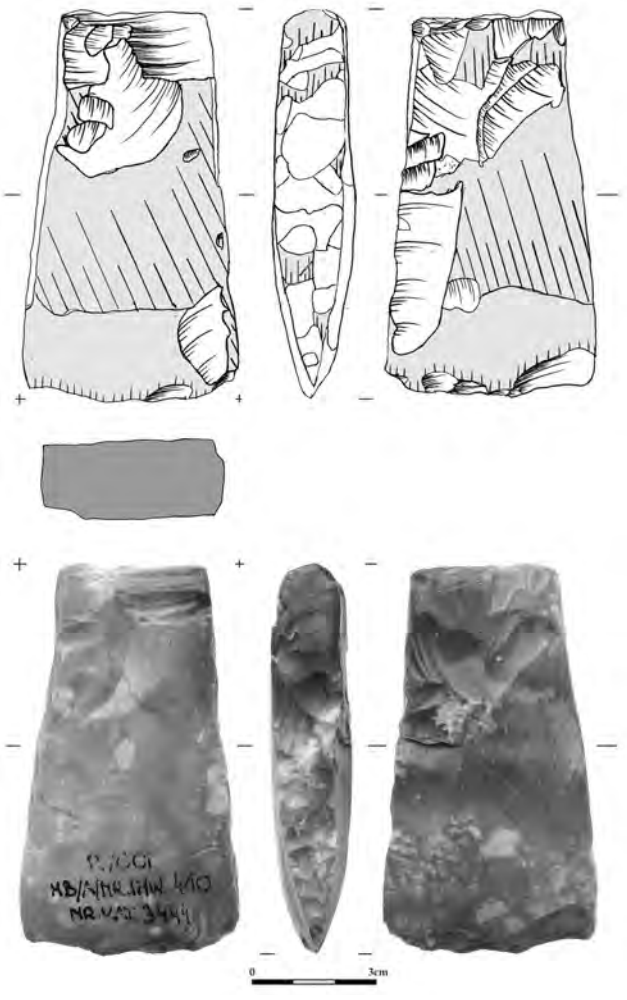

Fig. 11. Axe from Rygol, Augustów district. Computer graphics: H. Lepionka.

8. Axe from Suraż, Białystok district (Fig. 12)
The first axe from Suraż has trapezoidal faces. In side view it is 'bullet-shaped'. The cross-section is rectangular. The faces and side surfaces are finely ground. The edge is damaged by reutilization as a core or an attempt to repair the tool by flaking. The butt is arched horizontally.

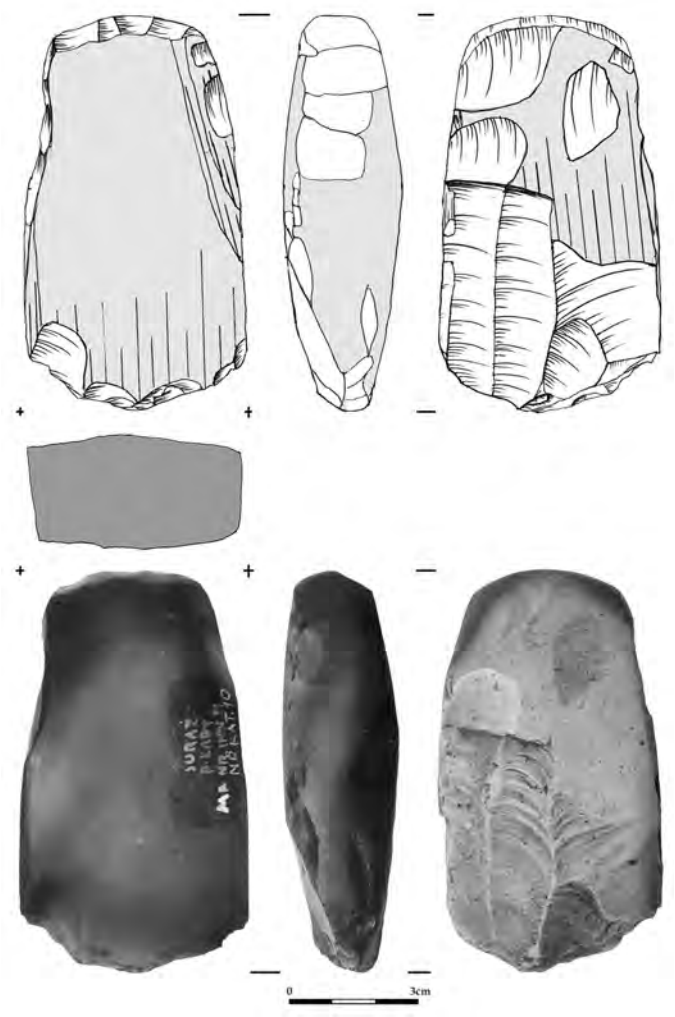

Fig. 12. Axe from Suraż, Białystok district. Computer graphics: H. Lepionka.

9. Axe from Suraż, Białystok district (Fig. 13)
This miniature axe has trapezoidal faces. In side view it is wedge-shaped and the cross-section is rectangular. The faces of the tool are finely ground and side surfaces are treated this same way. On the faces, there is a classic three area separation. The edge is horizontally straight but the butt is horizontally arched. In view of the morphology of this tool, it can be an edge of the chisel.

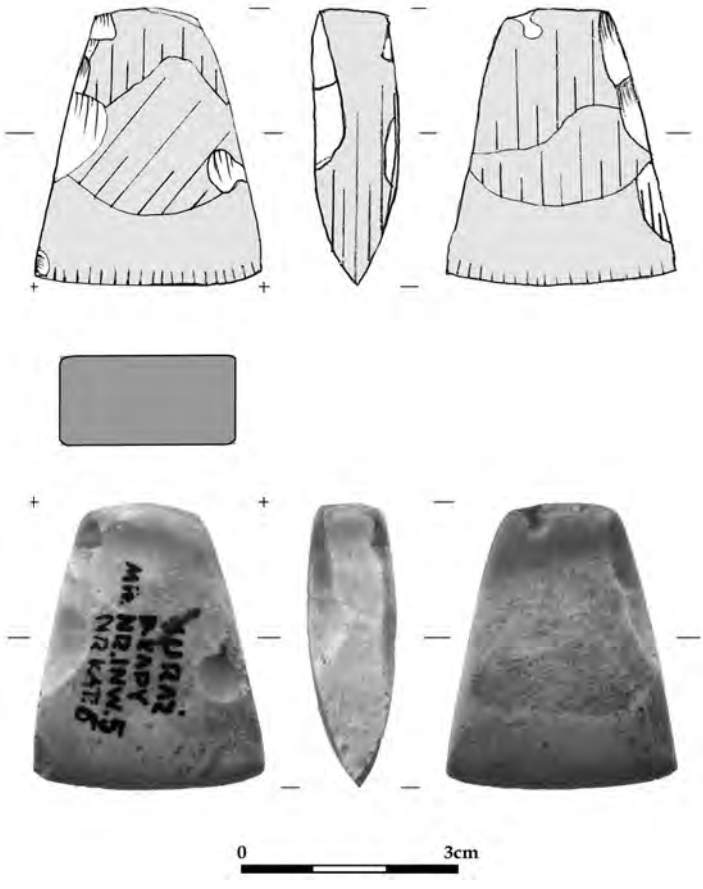

Fig. 13. Axe from Suraż, Białystok district. Computer graphics: H. Lepionka.

10. Axe from Topolany, Białystok district (Fig. 14)

The last axe chosen for this analysis has trapezoidal faces. In side view, it is bullet-shaped. The cross-section is rectangular. The faces are ground with several flake negatives left. Three areas of grinding can be seen and one of them has traces of 'machine grinding' similar to the axe from Milewo. The side surfaces are finely ground. The edge is horizontally arched. The butt is straight horizontal.

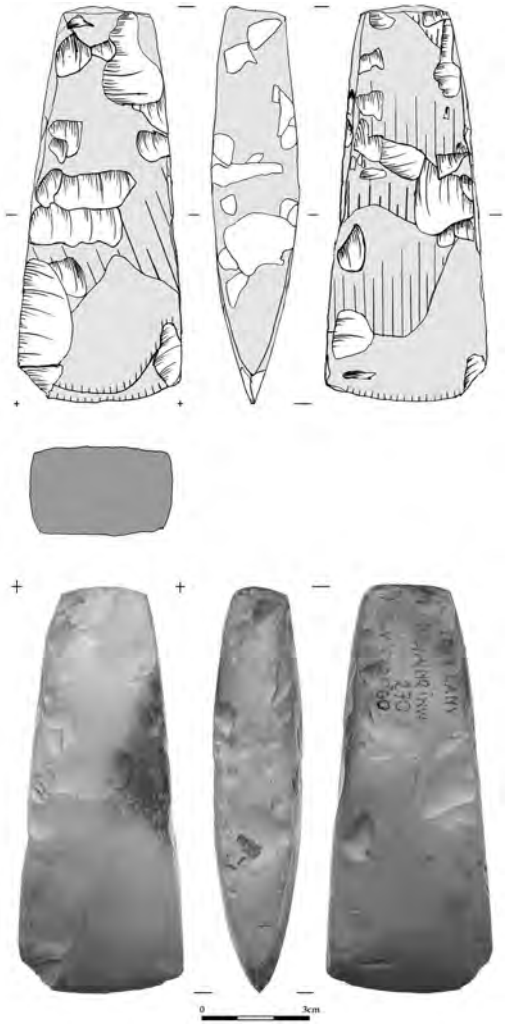

Fig. 14. Axe from Topolany, Białystok district. Computer graphics: H. Lepionka.

CULTURAL ATTRIBUTION

There are three groups of axes in the presented collection. The first one could morphologically connected to the Funnel Beaker Culture. This refers to the axe from Jałówka and the morphology of this tool clearly refers to the type B introduced by Bogdan Blacer (Balcer 1974, 2002). This type is characterized as axes with varying degrees of widening above the blades, and then narrowing towards the butt. It also includes specimens with parallel sides above the blade and then tapering towards the butt. They usually have slightly convex walls, slightly curved edges and poorly distinguished butts (Balcer 2002: 90).

The second group includes six axes with traits commonly associated with the Globular Amphorae Culture. These are the artefacts from: Bielsk Podlaski site 34, Milewo, Pieszczaniki, Rygol, Suraż and Topolany. They have a trapezoidal or rectangular shape, more often they are slender rather than stocky. In the side view, they are wedge-shaped or 'bullet-shaped'. The cross-sections are rectangular. On the frontal surfaces, often flattened out, two or three grinding zones are visible, the last of which is usually polished at the blade. Almost the entire surface of these forms is polished. The side surfaces of the objects are usually thoroughly ground with a few flaking scars left. The blades and butts shapes are straight or arched horizontally. Only in this morphological group are visible traces of the use of hard machine grinding on axes from Milewo, Rygol and Topolany. This type is characterized by long grinding lines and an extreme flattening of the ground zone (Vemming *et al.*, 1983; Madsen 1984).

The above-described group of axes matches the style of axes commonly associated with the Globular Amphorae Culture (Wiślański 1966; Nosek 1967; Kempisty 1971; Budziszewski and Grużdź 2013). These are tetrahedral specimens with a carefully made trapezoidal shape, completely or almost entirely smoothed. Their cross-sections are rectangular and very regular, and they expand to varying degrees from the butts to the blades (Wislański 1966: 39; Nosek 1967: 323–324; Balcer 1986: 209). The discussed artefacts most often appear as an element of burials.

The axe from Hamulka requires separate discussion, it has both Globular Amphorae Culture and Corded Ware Culture attributes. The issue of the occurrence of Globular Amphorae Culture axes in Corded Ware Culture inventories was addressed by Jerzy Libera, who separated those axes as a separate group (type E) in his typology of Corded Ware Culture axes (Libera 2009, 2016).

The third group includes axes of typical Corded Ware Culture morphology from Kucharówka Kolonia. In the typology of Piotr Włodarczak, based on inventories from Lesser Poland, axes from this group can be classified as types IC, dated to the third phase of development of the Corded Ware Culture (Włodarczak 2006: 28, 120). Phase III, which is a period of deep regionalization of the Corded Ware Culture, is dated in Lesser Poland to 2600/2500 – 2200 BC (Włodarczak 2006: 126).

In the typology of Jerzy Libera for the axes of the Corded Ware Culture made of Świeciechowski flint, the axe from the Kucharówka Kolonia corresponds to type A, which can be dated just like the axes from Lesser Poland (Włodarczak 2006; Libera 2016: 486).

CONCLUSIONS

Podlasie was a region abounding in Cretaceous flint, outcrops of which occur in the interfluve of the Bug and the Neman river. This raw material, described in this work as the Cretaceous flint of the Bug and Neman interfluve, is one of the least recognized flint raw materials from the territory of Poland. Based on the characteristics of macroscopic features, it has been possible to distinguish several of its variations, though many things remain unclear. Further research should be focused on petrochemical analysis. On the other hand, we do not know all the occurrences of this raw material. That problem would be a suitable topic for a future research programme.

The Museum's collection includes objects that, in their 'style', refer to the Neolithic cultures of the Polish Lowlands. Current knowledge indicates that there were two regions with tetrahedral axe production: the mines in Krasne Siolo and Margionys. Some objects in the collections can be connected to the Krasne Siolo mining complex. This refers to the characteristic zonation of the flint mass visible on the axes from Jałówka, Pieszczanniki, Suraż and Topolany. That trait is characteristic of the flint from the area of the Roś river (Gurina 1976; Czarniausky 1995; Barska 2002; Kalicki and Kalicki 2012). The rest of the axes could have been made in other hitherto unknown production sites. Future research should look for any traces of these workshops especially blanks and flakes with bifacial negatives.

In the whole picture outlined above, there is a lack of information about local, long-lasting subneolithic communities. This collection lacks axes with an oval section and a pick form of technology, equated with the products of the Pripet-Neman Culture or Neman Culture (Czarniausky 1979; Dziedzic 2011).

Finally, a few more research postulates should be put forward. The first one would be the need to create a register of flint axes from different regional institutions to confirm or modify the image drawn on the basis of the group of axes from the Museum of Podlasie in Bialystok. It should also consider whether it is necessary to include in the program the development of other macrolithic flint objects like - daggers, bifacial tools and blades of sickles. The second postulate is that it is necessary to formulate a program for the recognition of the local Cretaceous flint resources. This task should consider the broad sampling of raw materials and the analysis using Geographic Information Systems (GIS). In order to obtain the best results, it is also necessary to perform specialist petrographic, geological and chemical testing.

REFERENCES

Balcer, B. 1975. *Krzemień świeciechowski w kulturze pucharów lejkowatych: eksploatacja, obróbka i rozprzestrzenienie*. Wrocław-Warszawa-Kraków-Gdańsk.

Balcer, B. 1986. *Wytwórczość narzędzi krzemiennych w neolicie ziem Polski*. Wrocław.

Balcer, B. 2002. *Ćmielów, Krzemionki, Świeciechów: związki osady neolitycznej z kopalniami krzemienia*. Warszawa.

Baltrūnas, V., Karmaza, B., Kulbickas, D. and Ostrauskas, T. 2006. Distribution of raw material for prehistoric flint artefacts in South Lithuania. *Geografija* 42 (2): 41–47.

Barska, K. 2002. Nowe dane dotyczące powiązań kopalni krzemienia w Krasnym Siole z kulturą amfor kulistych. In M. Karczewska and M. Karczewski (eds), *Badania archeologiczne w Polsce Północno-Wschodniej i na zachodniej Białorusi w latach 2000 – 2001,* 101–111. Białystok.

Bobrowski, P. and Sobkowiak-Tabaka, I. 2008. Makrolityczne narzędzia z krzemienia czekoladowego na Niżu Polski. In W. Borkowski, J. Libera, B. Sałacińska, and S. Sałaciński (eds), *Krzemień czekoladowy w pradziejach*, 203–214. Warszawa-Lublin.

Budziszewski, J. and Grużdź, W. 2013. O technikach i metodach krzemieniarskich. In M. Przybyła, A. Szczepanek and P. Włodarczak (eds), *Koszyce, stanowisko 3: przemoc i rytuał u schyłku neolitu*, 161–178. Kraków.

Cyrek, K. 1983. Surowce krzemienne w mezolicie dorzeczy Wisły i górnej Warty. In J. K. Kozłowski and S. K. Kozłowski (eds), *Człowiek i środowisko w pradziejach,* 106–113. Warszawa.

Czarniausky, M. 1995. BY 1 Krasnaselsky, Grodna province. BY 2 Karpautsy, Grodna province. *Archeologia Polona* 33: 262–269.

Dziedzic, A. 2011. Siekierki krzemienne z kolekcji Wandalina Szukiewicza z miejscowości Kaszety w zbiorach Muzeum Archeologicznego w Krakowie. In U. Stankiewicz and A. Wawrusiewicz (eds), *Na rubieży kultur. Badania nad okresem neolitu i wczesną epoką brązu*, 321–332. Białystok.

Gieysztor-Szymczak, E. 1980. Płonka-Kozły, gm. Łapy, woj. białostockie stanowisko 1. *Informator archeologiczny* 14: 18–19.

Gurina, N. 1976. *Driewnije kriemniedobywajuszczije szachty na tierritorii SSSR*. Leningrad.

Grużdź, W. 2016. *Sierpy z krzemienia ożarowskiego na tle wytwórczości narzędzi bifacjalnych z obszaru Małopolski i Wołynia na przełomie III i II tysiąclecia BC.* Unpublished PhD thesis, Cardinal Stefan Wyszyński University in Warsaw.

Kalicki, T. and Kalicki, P. 2012. Mikroregion prahistorycznego górnictwa w Krasnym Siole (Zachodnia Białoruś) a zmiany wybranych komponentów środowiska geograficznego. *Prace i Studia Geograficzne* 50: 41–55.

Kempisty, E. 1971. Kultura amfor kulistych na Mazowszu i Podlasiu. *Materiały Starożytne i Wczesnośredniowieczne* 1: 7–34.

Kulczycka-Leciejewiczowa, A. 1996. *Opis zabytków kamiennych: propozycja standaryzacji*. Warszawa.

Lepionka, H. 2015. *Krzemienne rdzenie neolityczne ze stanowiska Brańsk 22, obiektu 31. Przyczynek do badań nad surowcem krzemiennym Polski Północno-Wschodniej.* Unpublished BA thesis, Adam Mickiewicz University in Poznań.

Libera, J. 2009. Czy siekiery krzemienne mogą być wyznacznikiem kultury amfor kulistych? In H. Taras and A. Zakościelna (eds), *Hereditas praeteriti. Additamenta archaeologica et historica dedicata Ioanni Gurba Octogesimo Anno Nascendi,* 169–179. Lublin.

Libera, J. 2016. Siekiery kultury ceramiki sznurowej z Wyżyny Lubelskiej – próba identyfikacji. In P. Włodarczak, P. Jarosz and J. Libera (eds), *Schyłek neolitu na Wyżynie Lubelskiej*, 479–492. Kraków.

Madsen, B. 1984. Flint axe manufacture in the Neolithic: experiments with grinding and polishing of thin-butted flint axes. *Journal of Danish Archaeology* 3: 47–62.

Miecznikowski, Z. 2014. *Neolityczne siekiery i topory ze zbiorów Muzeum Mazowieckiego w Płocku (T. 1).* Płock.

Nosek, P. 1967. *Kultura amfor kulistych w Polsce*. Wrocław.

Obuchowski, W. 2003. *Zabytki krzemienne i kamienne od paleolitu do wczesnej epoki żelaza z terenów Białorusi w zbiorach Państwowego Muzeum Archeologicznego w Warszawie*. Warszawa.

Piličiauskas, G. 2007. *Titnago industrija Pietryčių Pabaltijyje 2900-1700 m. pr. Kr. gludintų titnaginių kirvių tyrimų duomenimip.* Unpublished PhD thesis, University of Klaipeda in Vilnius.

Pyżewicz, K., Grużdź, W. and Dmochowski, P. 2016. Lokalna wytwórczość form czworościennych w Wielkopolsce. Wstęp do problematyki. In W. Borkowski, B. Sałacińska and S. Sałaciński (eds), *Krzemień narzutowy w pradziejach*, 309–362. Warszawa.

Szmit, Z. 1929. Badania osadnictwa epoki kamiennej na Podlasiu. *Wiadomości Archeologiczne* 10: 27–36.

Szymczak, K. 1992. *Północno-wschodnia prowincja surowcowa kultury Świderskiej*. Łódź.

Szymczak, K. 1995. *Epoka kamienia Polski północno-wschodniej na tle środkowoeuropejskim*. Warsaw.

Vemming Hansen, P. and Madsen, B. 1983. Flint axe manufacture in the Neolithic: an experimental investigation of a flint axe manufacture site at Hastrup Vænget, East Zealand. *Journal of Danish Archaeology* 2: 43–59.

Wawrusiewicz, A., Januszek, K. and Manasterski, D. 2015. *Obiekty obrzędowe Pucharów Dzwonowatych z Supraśla. Złożenie darów, przejecie terenu czy integracja kulturowa.* Białystok.

Wiślański, T. 1966. *Kultura amfor kulistych w Polsce północno-zachodniej.* Wrocław.

Włodarczak, P. 2006. *Kultura ceramiki sznurowej na Wyżynie Małopolskiej*. Kraków.

Wójcik, Z. 2005. Rybniki - „Krzemianka" - wprowadzenie geologiczne. In W. Borkowski and M. Zalewski (eds), *Rybniki - „Krzemianka". Z badań nad krzemieniarstwem w Polsce Północno-Wschodniej*. Warszawa.

Zalewski, M. 2007. *Archeologia. Najdawniejsze dzieje Puszczy Knyszyńskiej*. Warszawa – Białystok.

Zalewski, M. 2011. O potrzebie i możliwościach badań nad wydobyciem krzemienia w pradziejach na Podlasiu. In U. Stankiewicz and A. Wawrusiewicz (eds), *Na rubieży kultur. Badania na okresem neolitu i wczesną epoką brązu,* 297–303. Białystok.

Zalewski, M., Sałaciński, S. and Sałacińska, B. 2016. Eksploatacja krzemienia narzutowego w międzyrzeczu Bugu i Narwi. In W. Borkowski, B. Sałacińska and S. Sałaciński (eds), *Krzemień narzutowy w pradziejach*, 79–104. Warszawa.