THE PROCESSING AND USE OF FLINT IN THE METAL AGES. A FEW CASES FROM THE KERNAVĖ AND NAUDVARIS SITES IN LITHUANIA

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Abstract

Flints from the Late Bronze Age (Roman Period?) Naudvaris cemetery (in the Jurbarkas district) and the Iron Age Kernavė settlement (in the Širvintos district) in Lithuania were analysed functionally and from other points of view. The results are presented in the context of key issues on flint processing and use in Lithuania and Poland during the first millennium BC and the first millennium AD when metals were available.

Key words: flint tools, use wear, bipolar flaking, scaled pieces, Late Bronze Age, Iron Age, Lithuania, Poland.

Problem

There is much archaeological evidence of flint use during the metal periods, that is to say, the Bronze Age and Iron Age, in Europe. Lithuania is no exception. Flints with clear traces of processing are found quite often at structures and in cultural layers dated to the Late Bronze Age and even the Iron Age, or the first millennium BC and the first millennium AD. Some of these artefacts represent mechanical admixtures of Stone Age tools in the cultural layer of much later settlements. Others look quite different to Stone Age tools, technologically, by raw material or by size. However, Lithuanian archaeologists have not paid proper attention to such artefacts, and no detailed studies have been carried out on flint assemblages collected during excavations in the oldest hill-forts and non-fortified settlements of the first millennium BC. Today, the coherence between flints and other artefacts in many cases is not clear (Grigalavičienė 1995, p.121ff). This may explain why questions of flint processing and use were not dealt with in the most recent general study on the oldest Lithuanian prehistory (Lietuvos istorija 2005). Flint materials from sites dated to the first millennium AD always used to be assigned to much earlier times, generally to the Stone Age. Therefore, flint processing and use were never treated as subjects of Iron Age archaeology in Lithuania (Lietuvos istorija 2007).

The situation in neighbouring Poland is different. Special conferences have been held and books have been published on various questions of flint use in the Bronze Age and Iron Age (Z badań … 1997). Flint artefacts have been identified in the materials from both settlements and cemeteries (Zalewski, Melin 1991, p.37ff; Dąbrowski 1997, p.72ff; Piotrowska 2000). Worked flints were discovered in the majority of graves in some cemeteries (Zalewsk, Melin 1991, p.37). Today there is no doubt that flint was processed and flint tools were used during the Bronze Age and the Iron Age in Poland (Piotrowska 2000, p.297).

The authors of this study have tried to answer the question why flint was flaked at a time when metals were already available? Flint materials from two archaeological sites, Naudvaris cemetery and the Kernavė settlement, were studied according to raw material and size, and typological, technological and microwear aspects. These sites are situated in different parts of Lithuania (Fig. 1), and they were dated to the Late Bronze Age and the Iron Age.

Materials. The Kernavė and Naudvaris sites

Naudvaris cemetery was discovered in 2001 (Tamulynas 2001). Further archaeological excavations were headed by R. Šiaulinskas between 2001 and 2005, and in 2009. The archaeological material of the Naudvaris site has not been published yet; some short preliminary information is available only in Lithuanian (Šiaulinskas 2005a, 2005b, 2006a, 2006b). Naudvaris archaeological complex consists of two hills on a sandy dune. One of them was used for cremated burials, while another one bears some settlement features. An area of about 600 square metres was excavated in the site. Twelve graves were identified: 11 cremation and one inhumation. Burnt bones were buried in ceramic urns or without urns in pits. Flint artefacts were collected in Naudvaris cemetery, as well as on the settlement hill (Fig. 2; see Plate IV). No flints in urns or burial pits were found. One cremated grave was radiocarbon dated to the first part of the first millennium BC, i.e.

Fig. 1. Location of sites studied (A) and mentioned (B) in the text.

the Late Bronze Age, according to current Lithuanian periodisation. However, some Polish archaeologists1 believe that the cemetery could also have been used in the Roman period. The chronology of Naudvaris cemetery should be examined in detail by the leader of an excavation in the future.

Kernavė Iron Age site is situated on the right bank of the River Neris in the Pajauta valley. The site was extensively excavated in 2003 by A. Luchtanas (2005). An area of over 2,000 square metres was uncovered. The ceramics materials from the site were analysed by R. Vengalis, and the results were used in his doctoral dissertation and for a special ceramics study (2009, 2008). Ceramics typologically dated to the first to the seventh centuries AD prevailed in the cultural layer, though some artefacts from earlier and later prehistoric times were recorded too. About 1,000 flint artefacts were collected in the cultural layer (Fig. 3; see Plate IV).

Methods

The raw material was evaluated only visually, without magnification. Heavily polished or damaged natural surfaces, internal cracks and tiny carbonate inclusions were considered as features characteristic of local erratic flint, while homogenous flint without internal cracks and with a chalk cortex without traces of beating and rolling was recognised as raw material extracted from chalk blocks. Of course, some pieces of erratic flint could have been worn very slightly by natural processes, and this possibility was also considered.

Traditional Stone Age typology was inapplicable in the case of Late Bronze Age and Iron Age flints. However, it was used to describe Stone Age flints which have been reworked and (or) reused during the Iron Age. Some well-known Mesolithic and Neolithic types were recognised among the Stone Age tools interrupting the Iron Age layer due to human-caused post-depositional processes.

A technological evaluation was performed in order to find particular differences in flint processing during the Stone Age and subsequent metal periods. The characteristics of various Stone Age knapping techniques were left aside, while the difference between freehand percussion on one hand and bipolar-on-anvil technique on the other was a particular object of current research. The technological evaluation was based on and the terminology was borrowed from works published by E. Callahan (1987), K. Knutsson (1988) and J.C. Whittaker (1995). Personal experience accumulated by performing small-scale amateur and non-documented experiments in flint knapping and also some refitting attempts was also added.

The identification of and discrimination between freehand flaking and bipolar flaking products was the main task of the technical analysis. The essence of these two flaking modes lies in the different positions of the knapped objects (core), i.e. on a soft base or on a hard one (Fig. 4A; 5). Particular features and specific markers of various freehand techniques have been well discussed by plenty of authors, i.e. researchers and modern knappers (Whittaker 1995). The main point

[1] Information supplied personally by Dr J. Gackowski of the Archaeological Institute of the Nicolaus Copernicus University in Toruń.

of the bipolar-on-anvil (or splintered) technique is that the hard hammer attacking the flint piece rests on a hard anvil straight downwards (Fig. 4B; 5; Callahan 1987; Knutsson 1988). Bipolar flaking outcomes are small and thin splintered pieces and a splintered core (or bipolar) core. Usually, several small flakes, and not a single one, are reproduced when hitting a small piece of flint resting on a hard base with a hard hammer (Fig. 6). The character of the knapping is chaotic, while the number and forms of the resultant flakes are not predictable.

A microwear analysis has already been applied to Lithuanian flint materials dated as Stone Age flints several times (Girininkas 1997; Ostrauskas 2005). However, there are neither the scientists nor a specialised laboratory in Lithuania, and archaeologists have to seek help in neighbouring countries. Studying flints from Kernavė and Naudvaris in Poland was a case in point. A use wear evaluation was performed by G. Osipowicz in Toruń (Appendix 1). The sample of flints to be studied was chosen as being representative of the technical and typological variations exhibited by lithic assemblages (Table 1):

1. Bipolar cores (Naudvaris and Kernavė)
2. Splintered flakes (Naudvaris and Kernavė)
3. Bulky flint pieces with crude retouch or hard post-depositional (?) damage (Kernavė)
4. Freehand percussion flakes (Kernavė)
5. Retouched artefacts (Kernavė)
6. Stone Age blades or retouched artefacts with macroscopic traces of subsequent reworking or reusing (Kernavė)

The initial traceological analysis was conducted with the use of a Nikon SMZ-2T microscope coupled with a computer. It allows for an objective magnification value of up to 12.6 times, as well as the computer digitalisation and conversion of optical images. The microscope is fitted with a white xenon light delivered via a

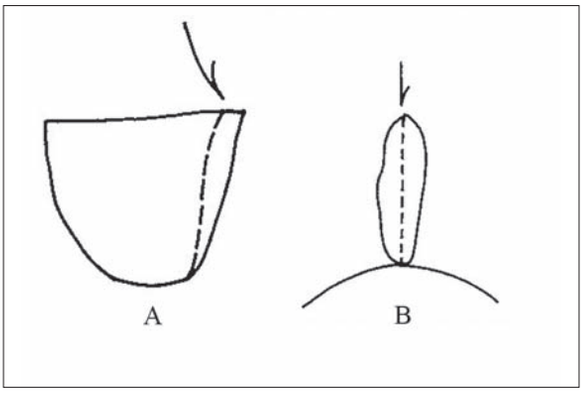

Fig. 4. A schematic representation of freehand (A) and bipolar-on-anvil (B) percussion, according to Callahan (1987).

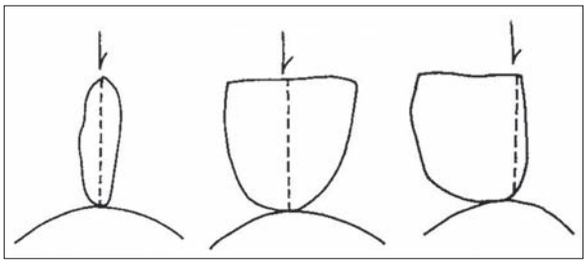

Fig. 5. A schematic representation of bipolar-on-anvil percussion on thin and thick cores, according to E. Callahan (1987).

two-point optical fibre. For the observation of glossed areas, a Zeiss-Axiotech microscope-computer set with a light source from above was used. This allows an objective magnification of up to 50 times. Most of the photographs were made with the use of this set (with the exception of photograph 10, Fig. 21, made with the Nikon microscope).

The terminology used was based on the concept system created by the Ho Ho Committee (1979, p.133ff), P.C. Vaughan (1985, glossary, p.10ff), A.L. van Gijn (1989, p.16ff), H.J. Jensen (1994, pp.20-27) and G.F. Korobkowa (1999, p.17ff). The terminology proposed by these authors was adjusted according to the needs and requirements of the study.

Prior to analysis, the material was cleaned with detergent diluted with water, and with pure C_2H_5OH. The analysis of some specimens was obstructed by post-depositional glossing and patina.

Results

No differences were observed on flints from Naudvaris cemetery hill and those from the settlement hill while studying the raw material's technical and typological features. Local erratic flint was used. It is possible to distinguish two types of raw material. The first is grey flint with chalk inserts and frost cracks. The second type is a transparent greyish or black homogenous flint (Fig. 2; see Plate IV). Both types of flint are quite common in the Lower Nemunas basin. They are kinds of erratic flint sometimes called Baltic. The cortex of such a flint is up to three centimetres in thickness, but a large part of the flint nodules lack it, i.e. the cortex was cracked by natural processes during the last glaciation. All the Naudvaris flints are products of the bipolar-on-anvil technique. This is clear by observing typical technical features, as well as by refitting one bipolar flake with a bipolar core. Very small and thin bipolar flakes, together with the event of refitting, demonstrate that flint flaking (and using?) activities were held directly in the areas of the settlement and the cemetery. A

Table 1. A list of microscopically analysed flints from the Naudvaris and Kernavė sites

No.	Site	Year	Inventories	Typological-technical description	Use wear interpretation	Fig.
1	Naudvaris	2002	-	Bipolar core	No traces	7.1
2	Naudvaris	2002	-	Bipolar flake	No traces	7.2
3	Naudvaris	2002	-	Bipolar blade-like flake	Post-depositional damage (?)	7.3
4	Naudvaris	2004	P8/C-5	Bipolar core	No traces	7.4
5	Naudvaris	2004	P9/D-2	Bipolar core	No traces	7.5
6	Naudvaris	2004	P9/C-4	Bipolar flake	No traces	7.6
7	Naudvaris	2003	-	Bipolar flake	No traces	7.7
8	Naudvaris	2003	-	Bipolar flake	No traces	7.8
9	Kernavė	2002	IV/13-6	Bipolar flake	No traces	11.1
10	Kernavė	2002	I/5-1	Freehand (?) flake	Scraper-knife for soft material	11.2
11	Kernavė	2002	I/5-6	Freehand (?) flake	No traces	11.3
12	Kernavė	2002	IIa/8-2	Bipolar flake	No traces	11.4
13	Kernavė	2002	IIa/14-4	Bipolar flake	No traces	11.5
14	Kernavė	2002	IIa/8-2	Freehand flake	Tool for processing medium-hard material (wood?)	11.6
15	Kernavė	2002	IIb/6-7	Bipolar core	No traces	11.7
16	Kernavė	2002	IIb/16-6	Bipolar flake	No traces	11.8
17	Kernavė	2002	A-8774, GEK-9153	Freehand blade with ‘fresh’ retouch (damage?)	Planing tool/saw for processing medium-hard material, fitted in an organic handle	11.9
18	Kernavė	2002	III area	Freehand blade with ‘fresh’ retouch (damage?)	No traces	11.10
19	Kernavė	2002	I area	Bulky piece with hard damage	No traces	11.11
20	Kernavė	2002	I area	Bulky piece with hard damage	No traces	11.12
21	Kernavė	2002	II area	Bulky piece with hard damage	No traces	11.13
22	Kernavė	2002	0 area	Bulky piece with hard damage	No traces	11.14
23	Kernavė	2002	A-8486, GEK-8864	Bulky piece with hard damage	No traces	11.15
24	Kernavė	2002	I area	Bipolar flake	No traces	11.16
25	Kernavė	2002	A-8455, GEK-8832	Retouched flake tool	Perforator for medium-hard material	11.17
26	Kernavė	2002	A-8480, GEK-8868	Retouched blade tool	Saw/knife for a medium-hard material	11.18
27	Kernavė	2002	II area	Retouched blade tool	Strike-a-light	11.19
28	Kernavė	2002	III area	Bipolar core	No traces	11.20
29	Kernavė	2002	II area	Bipolar core	No traces	11.21
30	Kernavė	2002	A-8279	Retouched tool on blade-like primary flake	Arrowhead	11.22

Fig. 6. A representation of bipolar-on-anvil percussion, according to Holmes (1966).

use wear analysis was applied to five splintered pieces (Figs. 2.2-3, 6-8; 7.2-3, 6-8; see Plate IV) and three splintered cores (Fig. 2.1, 4-5; 7.1, 4-5; see Plate IV) in the case of the Naudvaris flint assemblage. No plausible use wear signs were observed on flints from the site. Only a single splintered piece demonstrates slight micro-traces, possibly of post-depositional origin (Fig. 7.3).

As distinct from Naudvaris, the flint assemblage from the Kernavė site is not homogenous from raw material and technical points of view. Only about 1,000 flints were collected in an area of 2,000 square metres. The flint density correlated with the thickness of the black cultural layer. No remarkable concentrations of flint artefacts were recorded during excavations. Mesolithic and Neolithic tools (arrowheads, microlithic inserts, end-scrapers, burins, knives, blades and cores; Fig. 8) are distinguishable from the rest of the flint material, which demonstrates clear technical signs characteristic of the bipolar-on-anvil technique. Some Stone Age tools indicate hunters' camps being established a long time before the people of Brushed Pottery culture people settled in the valley. These flint tools were made

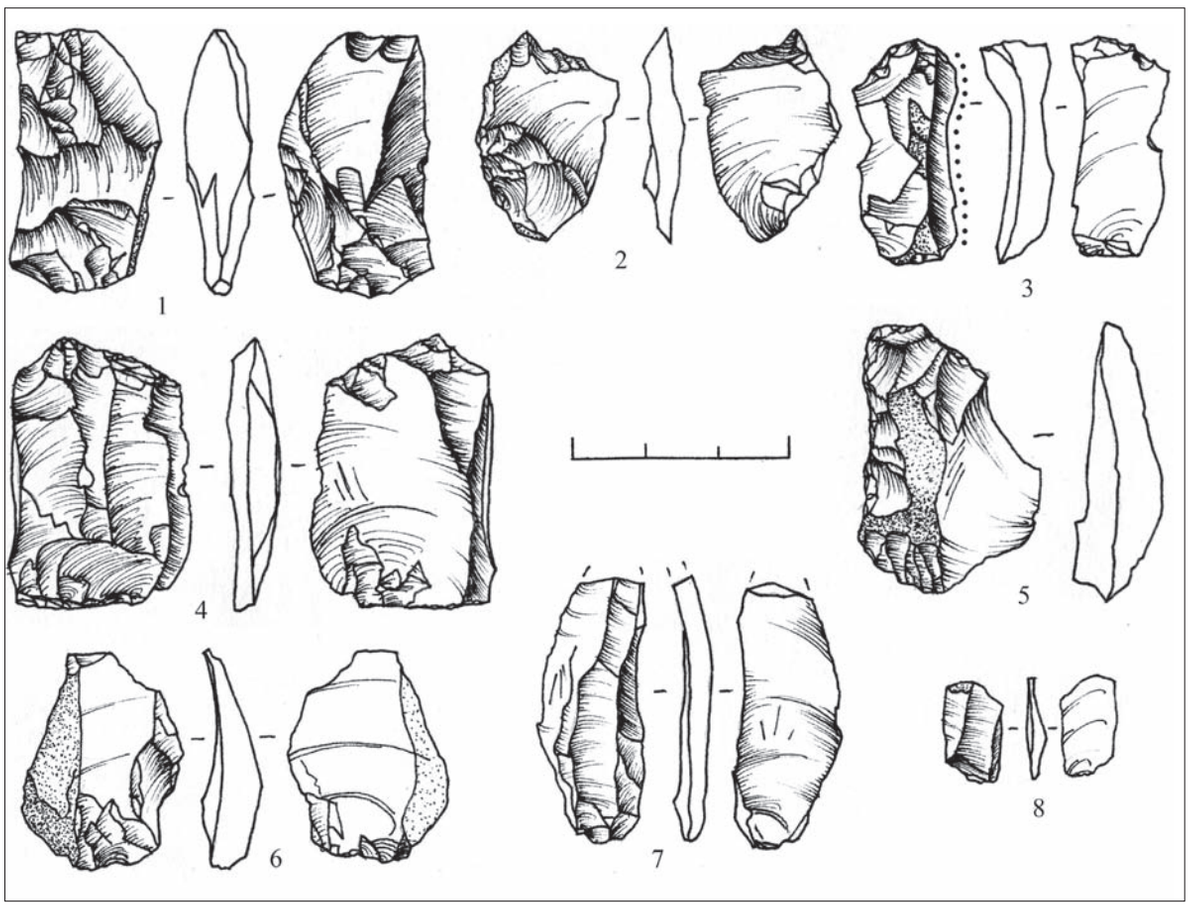

Fig. 7. Microscopically analysed artefacts from the Naudvaris site, excavations in 2002-2004 (drawing by G. Piličiauskas).

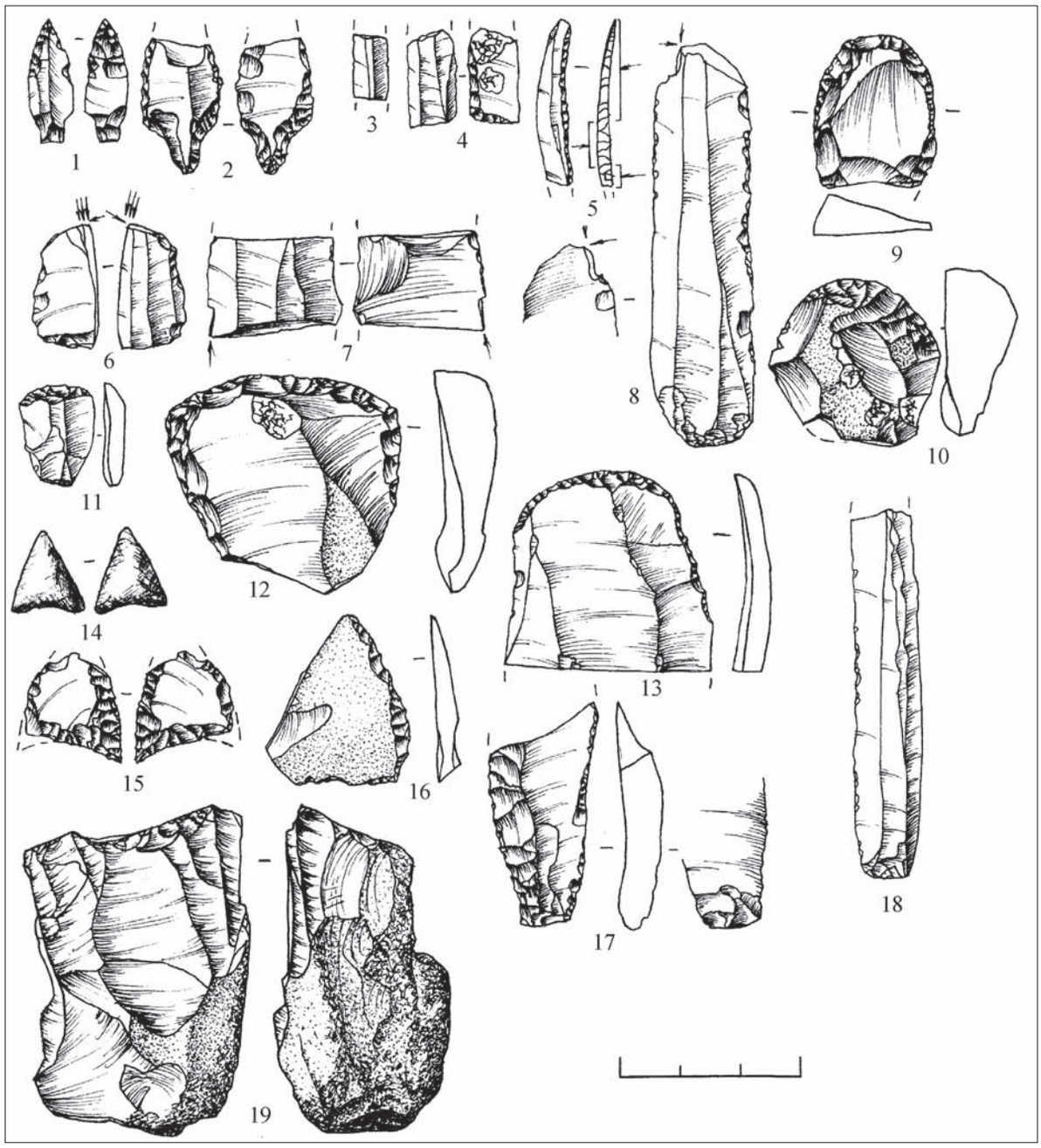

Fig. 8. Mesolithic and Neolithic tools from the Kernavė site (drawing by G. Piličiauskas).

from homogenous transparent grey or black flint. They lack the natural polishing and hard damage caused by rolling. An intact chalky cortex allows us to assume that imported flint of good quality was used in Stone Age camps at Kernavė. The nearest sources of such flint deriving from eroded chalk blocks are situated in southern Lithuania, 60 to 100 kilometres to the south-west or the south of Kernavė.

Iron Age people used for knapping local erratic small-sized flints as well as Stone Age tools collected in blown sands, i.e. Mesolithic and Neolithic 'sandy' sites. The endmost negative scars look fresher and have no patina on such artefacts (Fig. 9). They were reworked by a bipolar-on-anvil technique that is uncommon for Lithuanian Mesolithic. Erratic flint was flaked by bipolar percussion too (Fig. 10).

Use wear analysis was applied on five splintered cores (Figs. 3.7-8, 16, 20-21; 11. 7-8, 16, 20-21; see Plate IV), four splintered flakes (Figs. 3.1, 3-5; 11.1, 3-5; see Plate IV), two freehand or supposed freehand flakes (Figs. 3.2, 6; 11.2, 6), two blade fragments (Figs. 3.9, 10; 11.9, 10; see Plate IV), four retouched tools on flakes and blades (Figs. 3.17-19, 22; 11.17-19, 22), and five bulky pieces with suspected crude retouching or hard natural damage (Figs. 3.11-15; 11.11-15; see Plate IV).

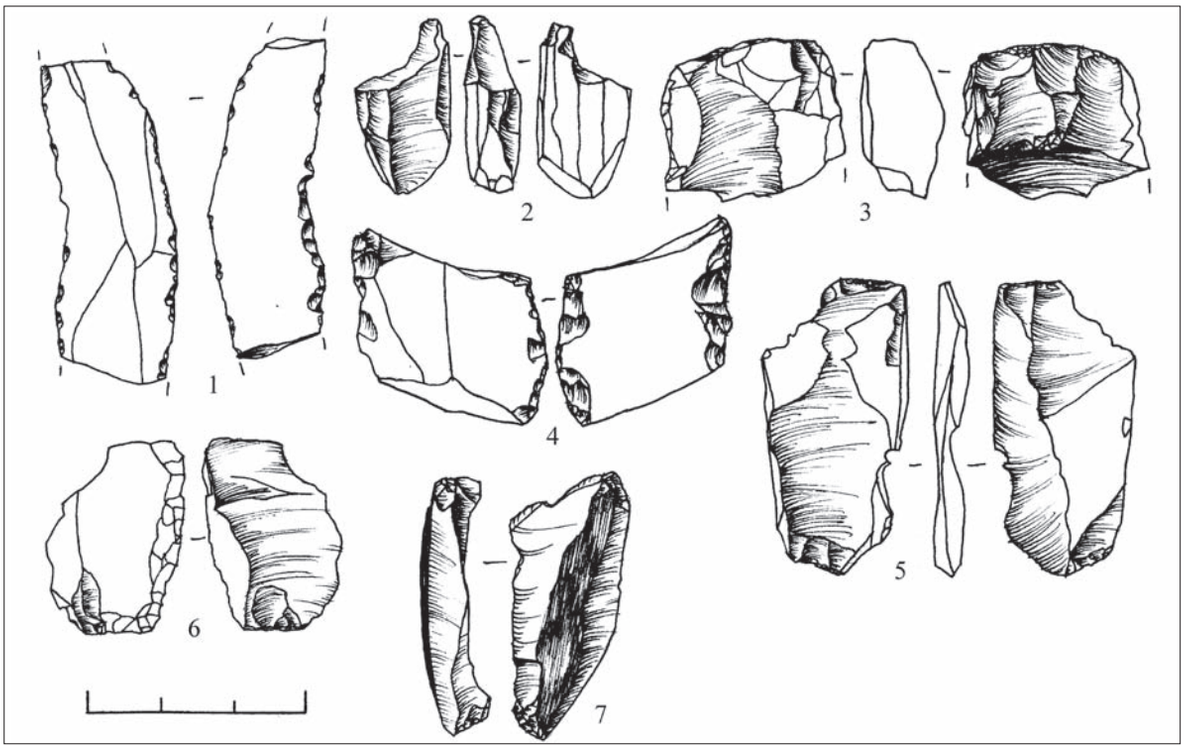

Fig. 9. Stone Age flints, reworked and reused in the metal periods, from the Kernavė site (drawing by G. Piličiauskas).

Seven flints from the Kernavė site demonstrated microwear signs of various kinds. Artefact No. 27 (Figs. 3.19; 11.19) is a possible strike-a-light made on a Stone Age blade. It has a typical severe retouch on both edges, but areas of bright, metallic glossing are absent. This could be the result of post-depositional processes, or the way in which the tool was utilised, causing its rapid deterioration. Another reused Stone Age blade (artefact No. 17) has a macroscopic edge retouch without a patina, in contrast to the other surfaces (Fig. 11.9). On a microscopic level, it demonstrates some typical marks of a planning wood tool/saw used for processing material of average hardness, possibly wood, and hafted to a handle (Figs. 14-16). The point of artefact No. 30 has a spin-off typical of an arrowhead (Figs. 3.22; 11.22; 20; 21; see Plate IV). Marks of a tar-like substance are preserved between retouch negatives on the tang. The arrowhead was made of local erratic flint, but the style of retouching on the ventral surface resembles Mesolithic points of a Pulli type (e.g. Fig. 8.1-2). Other tools were used as knives, scrapers and perforators on materials of a wide range of hardnesses, from soft to medium hard (leather, wood; Figs. 11.2, 6, 9, 17, 18; 13-19). There was no one definite use wear sign detected on the products of the bipolar-on-anvil technique. Most traceologically identified flint tools were made from good-quality imported raw material and on freehand percussion blanks. Therefore, they should be dated to the Mesolithic or the Neolithic rather than to the Bronze Age or Iron Age. Bulky flint pieces with a crude retouch of presumably human origin did not demonstrate any use wear, and therefore must be recognised as natural flints (Fig. 11.11-15). Detailed results are presented in appendix No. 1.

Discussion

Flint materials from the Kernavė settlement and Naudvaris cemetery, as well as assemblages obtained from some recent excavations on the lake dwelling site Luokesai I (Late Bronze Age) and the Iron Age settlement at Žardė (Pranckėnaitė *et al*. 2008; Masiulienė 2009), presented enough data to confirm flint use during the first millennium BC and the first millennium AD in Lithuania. The provision strategy of sedentary farmers of metal periods seems unsophisticated and very different compared to Neolithic and Early Bronze Age strategies. Small-size locally available erratic flint of different quality was used. In the case of eastern Lithuania (Kernavė, Luokesai I), moderate needs in siliceous raw materials were considerably supplemented by reworking Stone Age flints, collected in eroded or blown sandy sites. The gathering and reusing of Stone Age tools by later people has also been confirmed in Poland (Zalewski, Melin 1991, p.38; Dąbrowski 1997, p.73 and p.76). The most spectacular argument for the gathering of Neolithic flint artefacts in the Bronze Age and the Iron Age is their presence in the wooden con-

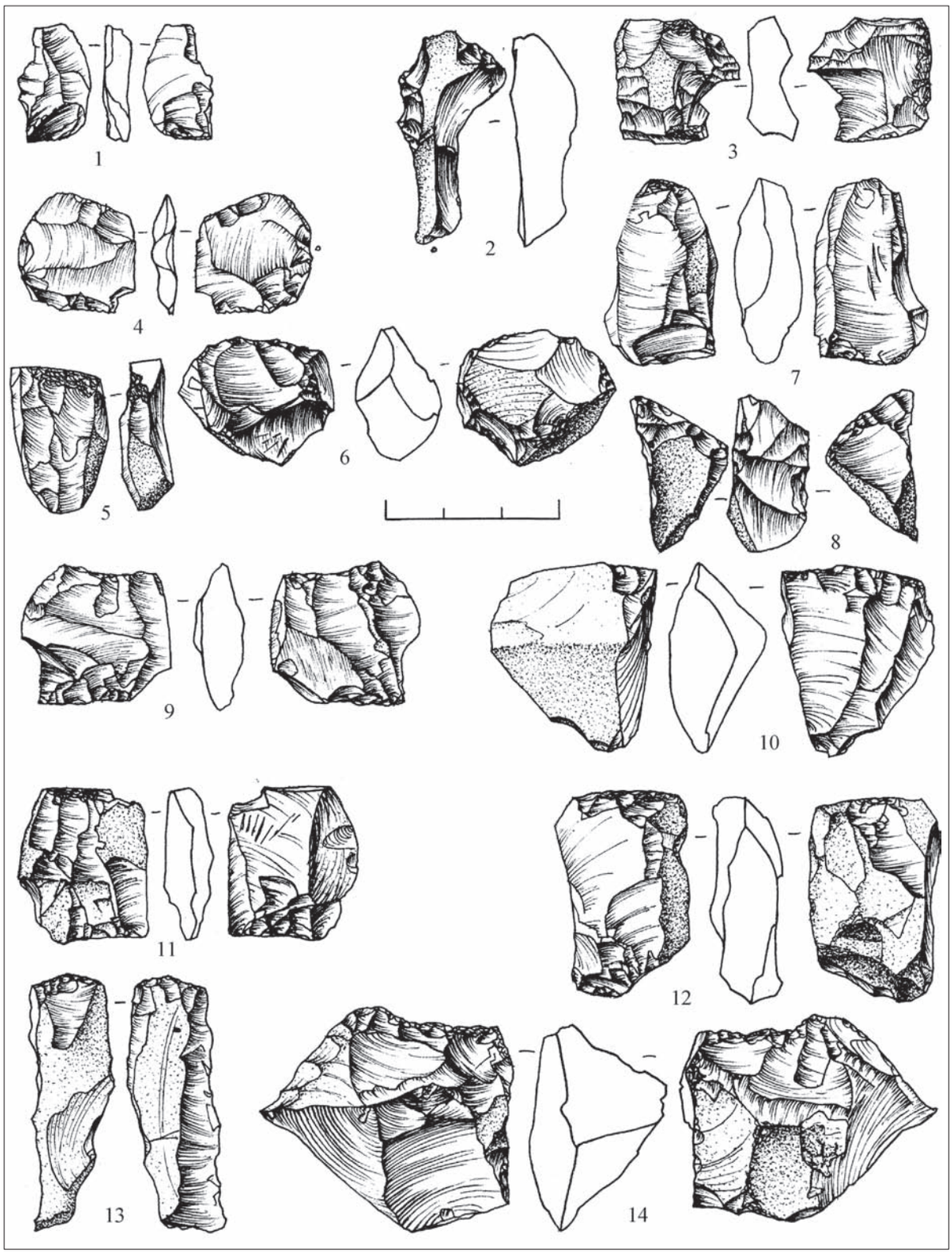

Fig. 10. Flints from the Iron Age settlement cultural layer found at the Kernavė site: 2, 6, 14 possibly natural pieces with hard damage (drawing by G. Piličiauskas).

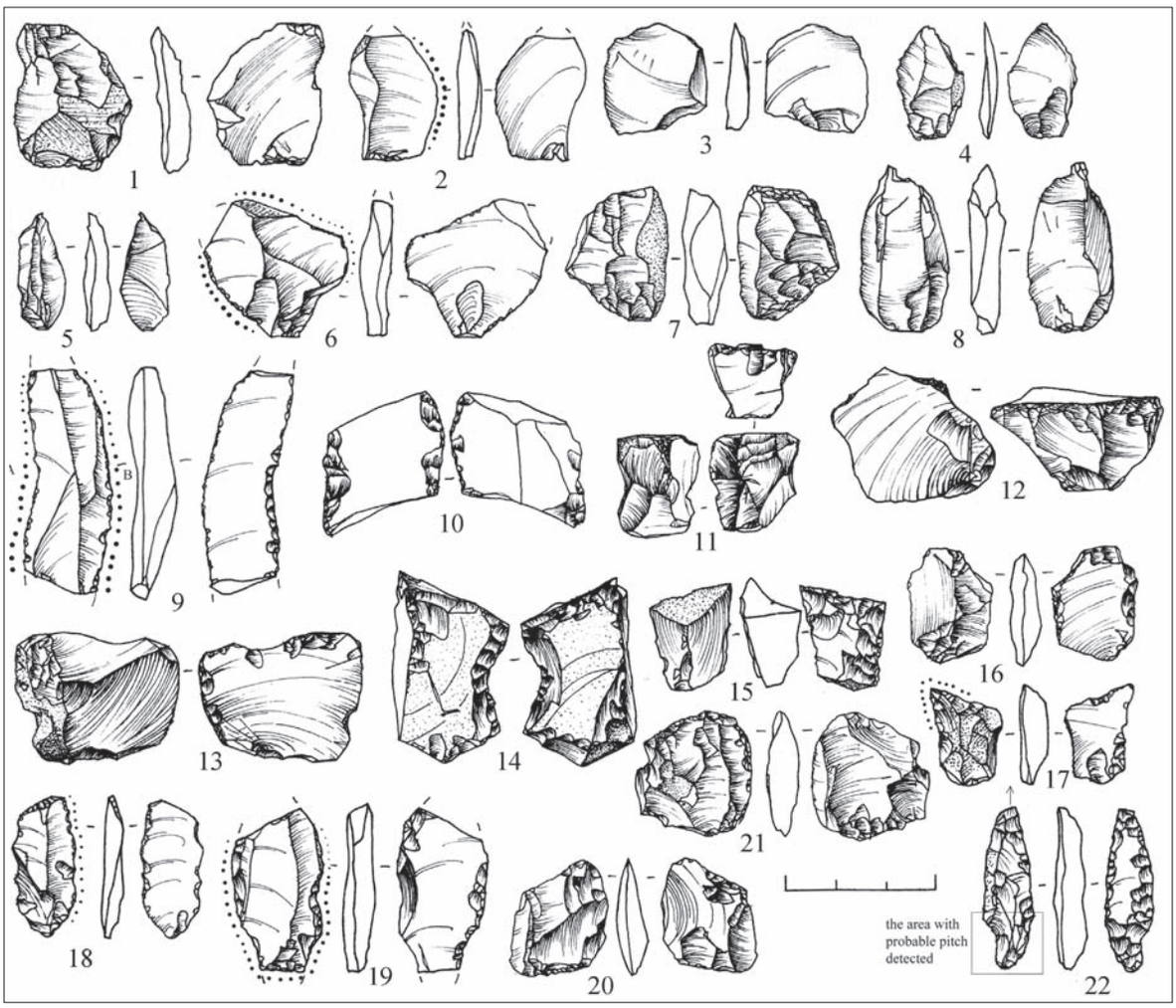

Fig. 11. Microscopically analysed artefacts from the Kernavė Iron Age settlement, with Mesolithic-Neolithic admixtures (drawing by G. Piličiauskas).

structions of the Lusitian (Łużyce) culture defensive settlement in Biskupin (Piotrowska 2000, pp.299-300, Figs. 5; 6; 7). However, old provisional strategies, such as flint mining, were not abandoned in metal periods in Poland (Lech, Lech 1997; Piotrowska 2000, p.299ff).

The custom of reusing Stone Age flint can be explained in several ways. A rational explanation would consider particular economic factors as being responsible. Both discarded Stone Age tools and knapping waste seemed to be quite attractive raw materials, due to the better quality compared to local erratic pieces. Maybe some forms of Stone Age flints were of use to metal period farmers also? (Figs. 3.9; 11.9; see Plate IV). However, Stone Age tools have been found in graves of later epochs, and they actually had a specifically magic meaning for Iron Age people. That could be a reason for collecting them also.

Typological and technical research clearly showed the bipolar-on-anvil technique to be the predominant or even exclusive way in flint processing in Late Bronze Age and later times in Lithuania. In Poland, flint working is directed mostly at flake production and the splintered technique in the first millennium BC (Zalewski, Melin 1991, p.38; Dąbrowski 1997, p.73 and p.76). Bipolar percussion was not an invention of the metal periods. It has been well known since the Palaeolithic period all over the world. The bipolar-on-anvil flaking technique represents not a cultural tradition but rather a form of adaptation behaviour. In Lithuania, it correlates with a sedentary way of life, poor-quality and small raw materials, and, as a consequence of these factors, with poor knapping skills. Bipolar cores and tools are seldom found in Stone Age sites in west and northeast Lithuania; moreover, they are extremely rare in southeast Lithuania, which is rich in good-quality flint. Bipolar cores are commonly found only in coastal sites of Neolithic Pamariai (Rzucewo) culture, where only poor-quality and small flint was available on beaches.

Despite confusion in some cases, bipolar-on-anvil products can be qualified as bipolar cores and flakes.

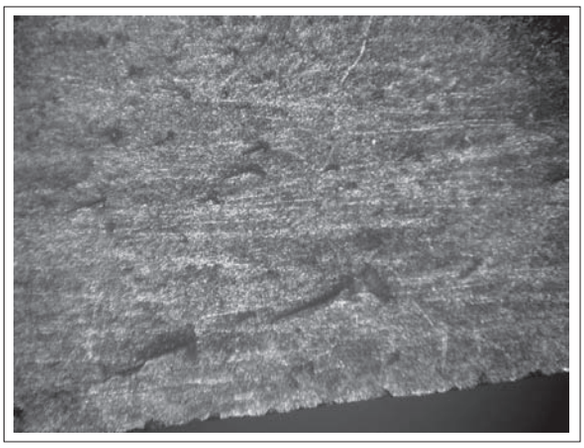

Fig. 12. Striations visible on artefact 3 (x65, ob. 5) (photograph by G. Osipowicz).

Fig. 13. Cratered polish and 'filled-in' striations visible on artefact 10 (x250, ob. 20) (photograph by G. Osipowicz).

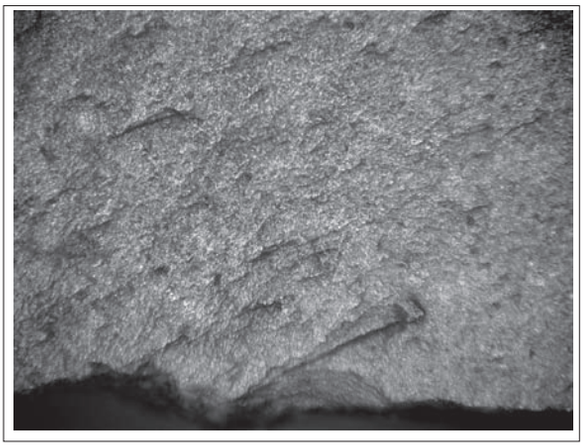

Fig. 14. Spread, generic weak polish visible on artefact 17, edge B (x65, ob. 5) (photograph by G. Osipowicz).

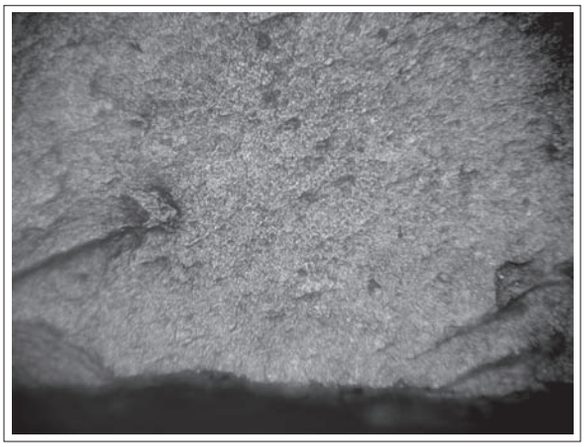

Fig. 15. Domed polish visible on artefact 17, edge A (x125, ob. 10) (photograph by G. Osipowicz).

There are almost no use wear traces on splintered flakes (Osipowicz 2010). This is no surprise, because they are usually very small and thin, and it would be very difficult to do something more complicated with them. Bipolar flakes often do not fit the requirements of so-called 'functional flakes' exhibiting a straight cutting edge of more than one centimetre and with an edge of up to 60° (Callahan 1987, p.17).

Traces of unknown origin were observable with the naked eye on some bipolar cores and reused Stone Age tools straight after finishing the excavation, i.e. during work on the excavation report. A yellow (metallic) sheen was distributed as a pattern of very thin but dense lines. Striations were visible more clearly on wet surfaces. The patterns were not of an accidental character. The striation was situated along the edge and approximately zero to five millimetres from it (in 12 cases), sometimes perpendicular to the edge covering the largest part of bipolar cores (two cases) and sometimes both along the edge and perpendicular to it (five cases). Dense lines of a yellow (metallic) sheen were observed on flints Nos. 15, 18, 19, 20, 21, 22, 24, 25, 27, 28 and 29. On the contrary, no Stone Age tools or freehand flakes demonstrated any striations. It is strange, but in 2008, when a collection for microscopic analysis was being compiled, the same artefacts lacked the aforeseen metallic striations. Nothing similar to such a kind of damage or adhesions was confirmed by subsequent microscopic analysis either. Bipolar cores both from Naudvaris and Kernavė revealed no use wear traces. Nevertheless, we cannot rule out the possibility that bipolar cores are desirable products of bipolar flaking or tools exhausted in some kind of household activity. Some use-wear studies performed outside Lithuania demonstrate splintered or bipolar cores as being tools used for bone, wood and dry hide processing (Hayden 1980; Vaughan 1985, p.91ff). The use of splintered cores as wood-working chisels during the Stone Age was also confirmed in Poland (Małecka-Kukawka 2001, p.139ff; Osipowicz 2010). However, examinations of splintered pieces dated to the Late Bronze Age and Early Iron Age did not provide such

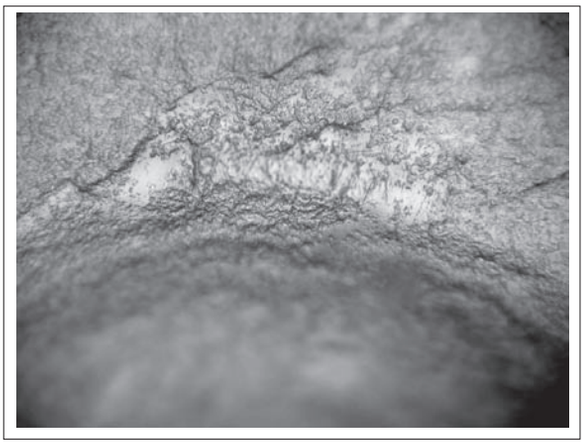

Fig. 16. Flat polish visible on artefact 17, edge B, (x250, ob. 20) (photograph by G. Osipowicz).

Fig. 17. Domed polish visible on artefact 17, edge B (x250, ob. 20) (photograph by G. Osipowicz).

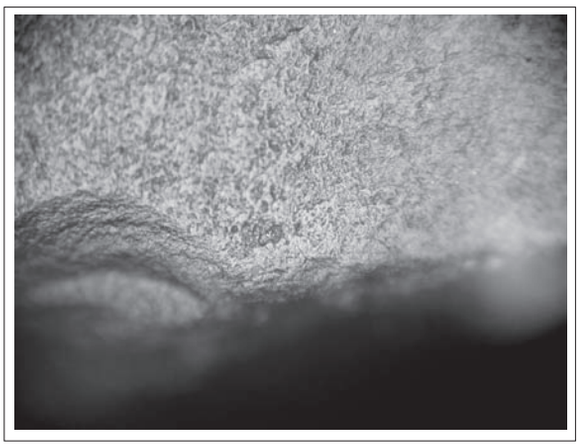

Fig. 18. Cratered/domed polish visible on rise of artefact 25 (x250, ob. 20) (photograph by G. Osipowicz).

Fig. 19. Cratered/domed polish visible on artefact 26 (x250, ob. 20) (photograph by G. Osipowicz).

results: no traces of use wear were observed (Osipowicz 2009, p.169). We can speculate that they could have been used as wood chisels, or for other quite destructive activities. Use-retouch is very invasive and multi-stage. It destroys other types of traces. So we cannot say what the cause of retouch on bipolar cores from Naudvaris and Kernavė was, work or hard hammer technique. They could be wood chisels, but clearer arguments for it should follow in the future.

Today, a third way of understanding bipolar percussion seems possible. Irrational flaking with no intention of using flint flakes could be suspected on some occasions. However, it is difficult to prove a certain knapping activity is some kind of ritual act. The absence of use-wear traces on some Kernavė and Naudvaris flints should not be an argument in this matter. Very few pieces were microscopically examined. No flints were found in graves at Naudvaris cemetery. Flints from both the cemetery and the settlement there could have been deposited during flaking or in activities fulfilling very practical needs. Unlike the case of Naudvaris, flints have been identified in cremation graves in Poland, and some ideas have been developed about a symbolic connection between flints and fire-cremation (Piotrowska 2000, p.305 and p.318). Some people think that they could have been used in rituals. Of course, flints were used in everyday life also.

Conclusions

Small scale use-wear research has not provided strong arguments to make the intentions of people using flint during the metal periods clearer to us. Of course, they used flint in making fires, but not only that. Some woodwork could have been done with the help of flint tools too. Today, we can only speculate on small-scale flint processing at a household level, and for some very specialised and trivial activity, or activities to be the case in Late Bronze Age and Iron Age Lithuania.

It is possible to add some concluding remarks:

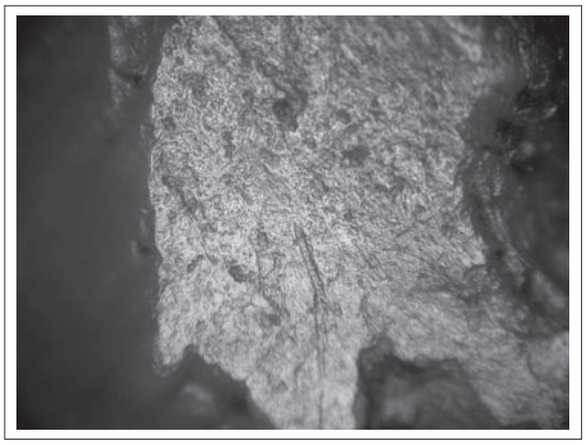

Fig. 20. Domed, linear polish visible on artefact 30 (x125, ob. 10) (photograph by G. Osipowicz).

Fig. 21. Tar-like substance identified on artefact 30 (x10) (photograph by G. Osipowicz).

1. Lithuanian archaeologists have never been interested in studying flint processing or use in the metal periods;

2. The Neolithic flint industry finally vanished during the Early Bronze Age, though flint processing continued in a very different mode by the beginning of the Roman Period at least. A shift to the use of solely locally available raw materials and to the bipolar-on-anvil technique occurred;

3. The phenomenon of reusing old flint tools collected at sandy Stone Age sites is evident in eastern Lithuania, as well as in Poland;

4. There are some indications that some flints were used as strike-a-lights. However, no bipolar pieces from the Naudvaris and Kernavė sites showed clear micro-traces of utilisation. A hypothesis stating that bipolar cores were used as wooden chisels has not been confirmed, and the main task of bipolar flaking and its outcomes should be examined in the future. New research applied on assemblages coming from stratified sites or closed structures will also be welcome.

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Translated by the authors

Appendix 1. Use wear analysis of flint artefacts from Naudvaris (Nos. 1-8) and Kernavė (Nos. 9-30) sites (analysed by Grzegorz Osipowicz, of the Archaeological Institute of Nicolaus Copernicus University in Toruń)

No. 3
Use-retouch: not identified
Use polish:
Location: B/A (ventral more polished)
Distribution: ventral side – snow-landscape polish, band along edge,
dorsal side – spread polish, streaks of polish,
Shape of polished area: irregular
Degree of intrusion: >1mm (invasive)
Topography: generic weak polish – domed
Brightness: ventral side – very bright, dorsal side – dull
Texture: not applicable (quite rough)
Striations (Fig. 12)**:**
Location: dorsal side
Type: dark striation
Directionality: parallel

Interpretation: Considering the lack of wear retouch and limited range of other types of wear and tear (around 0.5 mm), it can be assumed that probably they were formed as a result of post-depositional processes. Seeing that the registered damage is of a very regular character, it cannot be ruled out that it is a strongly deteriorated tool, with wear signs preserved only partially

No. 10
Working edge:
Contact surface: A/B
Contact angle: high
Edge rounding: slightly rounded
Use-retouch:
Distribution: close/regular
Intensity: single-stage
Form: scalar, dentated
Termination: feather

Use polish (Fig. 14)**:**
Location: both sides – B/A
Distribution: thin line along edge
Shape of polished area: irregular
Degree of intrusion: marginal
Topography: cratered
Brightness: bright, greasy
Texture: rough
Striations:
Type: filled-in striations (single – Fig. 13)
Directionality: perpendicular

Interpretation: The object was probably used for processing soft material, possibly leather. Characteristics of the working edge show that scraping was its basic activity, though it was probably also used sporadically for cutting. The intensity of visible signs of wear suggests a short period of the tool's utilisation

No. 14
Working edge:
Contact surface: A/B
Contact angle: low-high
Edge rounding: slightly rounded
Use-retouch:
Distribution: close/regular
Intensity: single-stage, two-stage
Form: scalar, dentated, lamellar
Termination: feather, step, hinge
Use polish:
Location: both sides – B/A
Distribution: thin line along edge
Shape of polished area: irregular
Degree of intrusion: marginal
Topography: generic weak polish
Brightness: -
Texture: -
Striations: not identified

Interpretation: The tool was probably used for processing a not-too-hard material, possibly wet wood (the lack of glossing makes a precise designation impossible)

No. 17: the tool has two working edges (A – right, B – left) on which traces of a slightly different character were identified
Working edge:
Contact surface: A/A
Contact angle: high, 90º
Edge rounding: edge A – slightly rounded; edge B – from slightly to very rounded
Use-retouch:
Distribution: close/irregular
Intensity: edge A – two stage, multi-stage; edge B – varied
Form: edge A – scalar, dentated; edge B – scalar-bevel, dentated-bevel, square-bevel
Termination: edge A – step, hinge; edge B – feather, step
Use polish:
Location: both sides – A/A
Distribution: isolated spots, spread (Fig. 14)
Shape of polished area: irregular
Degree of intrusion: marginal
Topography: domed (Figs. 15; 16), edge B additionally very reflective flat polish (Fig. 16) which is the result of contact with an organic handle
Brightness: dull
Texture: quite smooth
Striations: not identified

Interpretation: The object was probably used as a planing wood tool/saw for processing material of average hardness, possibly wood; it was fitted into an organic handle

No. 25
Working edge:
Contact surface: A/B
Contact angle: high
Edge rounding: sharp, slightly rounded
Use-retouch:
Distribution: close/regular
Intensity: multi-stage
Form: lamellar, dentated
Termination: hinge
Use polish:
Location: both sides, arises
Distribution: isolated spots
Shape of polished area: irregular
Degree of intrusion: marginal
Topography: cratered/domed (Fig. 18)
Brightness: bright, metallic
Texture: rough
Striations: not identified

Interpretation: The tool was probably used for making holes in a not-too-hard material, probably wood

No. 26 (truncated blade with no wear signs)
Working edge:
Contact surface: A/A
Contact angle: 90º
Edge rounding: sharp
Use-retouch:
Distribution: close/irregular
Intensity: single-stage
Form: scalar
Termination: feather
Use polish (poorly preserved, identified only in one small point):
Location: -
Distribution: isolated spots
Shape of polished area: -
Degree of intrusion: marginal
Topography: cratered/domed (Fig. 19)
Brightness: dull
Texture: quite smooth
Striations: not identified

Interpretation: Some weakly developed wear signs were observed on the tool. It was probably used as a saw/knife for a moderately hard material (soft wood, or maybe hard leather)

No. 27
Working edge:
Contact surface: A/B
Contact angle: low-high
Edge rounding: sharp
Use-retouch:
Distribution: close/regular
Intensity: multi-stage
Form: varied
Termination: hinge, step

Use polish (generic weak):
Location: -
Distribution: isolated spots
Shape of polished area: -
Degree of intrusion: -
Topography: -
Brightness: bright
Texture: -
Striations: not identified

Interpretation: The tool was definitely used for processing hard material. The type of work that was performed is uncertain. Severe retouch eliminates activities such as scraping or sawing. Its spread and character suggests that a rather short section had contact with the processed material. Similar crumble marks can be observed on flint hammer-stones and retouchers, or tools for starting a fire. But these last mentioned also show areas of bright, metallic glossing, which are not present in this case. However, this could be the result of post-depositional processes, or of the way in which the tool was utilised, causing its rapid deterioration

No. 30
Few signs of utilisation were noted on this tool. Its edge is broken off, though there is a characteristic Ω shaped break-off, in literature called a 'spin off' (Fischer, Hansen, Rasmussen 1984, p.25, Fig. 7). This type of retouch is a characteristic of arrowheads. There are also delicate linear marks of a gloss of a domed topography on the object (Fig. 20). These could be of a utilitarian character, though they could also be of a post-depositional origin. In the part near the shaft, on some of the ridges between negatives, there are bright glossy areas of a flat topography, which were probably formed as a result of contact with the organic material of the shaft. This is also confirmed by marks of a tar-like substance (Fig. 21) preserved between retouch negatives (remnants of adhesive used for the tool's binding?)
Interpretation: The tool probably functioned as an arrowhead; it is uncertain because of few traces of utilisation registered on the object

Abbreviation

ATL – Archeologiniai tyrinėjimai Lietuvoje. Vilnius.

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TITNAGO APDIRBIMAS IR NAUDOJIMAS METALŲ EPOCHOJE. KERNAVĖS IR NAUDVARIO ATVEJAI

GYTIS PILIČIAUSKAS, GRZEGORZ OSIPOWICZ

Santrauka

Titnago apdirbimas ir naudojimas vėlyvajame bronzos amžiuje, taip pat ir geležies epochoje iki šiol nesulaukė deramo archeologų dėmesio Lietuvoje ir yra nauja tyrimų kryptis, kitaip nei Lenkijoje. Šio straipsnio autoriai pabandė atsakyti, kaip ir kodėl buvo naudojamas titnagas, kai metalo gamybos ir apdirbimo technologijos buvo išplitusios. Tyrimams buvo pasirinktos Naudvario kapinyno (Jurbarko raj.) ir Kernavės geležies amžiaus gyvenviečių Pajautos slėnyje (Širvintų raj.) titnago kolekcijos (1 pav.). Titnago radiniai buvo analizuojami žaliavos ir tipologiniu-technologiniu aspektais, trisdešimties iš jų Torūnėje, Mikalojaus Koperniko universiteto Archeologijos institute buvo atlikta mikroskopinė darbo žymių analizė (2–3 pav.; IV įklija).

Naudvario kapinynas buvo atrastas 2001 m. ir R. Šiaulinsko tyrinėtas 2001–2005 metais. 2009 m. buvo atkasta 12 kapų: 11 degintinių urnose arba duobėse ir 1 griautinis. Neaptikus geležies įkapių ir datavus vieną degintinį kapą C14 būdu, kapinynas datuotas vėlyvuoju bronzos amžiumi. Kai kurie lenkų archeologai įsitikinę, kad bent dalis kapų turėtų būti skiriami romėniškajam periodui, todėl kapinyno chronologija turėtų būti kasinėjimų autoriaus patikslinta ateityje. Gausi titnago kolekcija buvo surinkta tiek kapinyne, tiek greta esančioje smėlio kopoje, spėjamos gyvenvietės teritorijoje.

Kernavės geležies amžiaus gyvenvietės Pajautos slėnyje intensyviai buvo tyrinėtos doc. dr. A. Luchtano vadovaujamos archeologų grupės 2003 metais. Ištyrus daugiau nei 2000 m² dydžio plotą buvo surinkta apie 1000 skaldytų titnagų. Pasak R. Vengalio, didžioji keramikos dalis (brūkšniuotoji ir grublėtoji) iš kultūrinio sluoksnio turėtų būti priskiriama I–VII a. po Kr., tačiau kartu pasitaikė ir daug ankstesnių, ir vėlesnių radinių.

Naudvaryje naudotas įvairios kokybės vietinis eratinis titnagas. Visi titnagai – dvipolio skaldymo technikos produktai, skaldytinį laikant ant kieto pagrindo ir smūgiuojant kietu muštuku tiesiai iš viršaus. Vienu smūgiu gaunamos kelios nuoskalos ir dvipolis skaldytinis (ankstesnis terminas – „kaltelis“); skaldymas chaotiškas. Labai smulkios nuoskalos ir 1 nuoskala, sutapusi su dvipoliu skaldytiniu, įrodo, kad titnagas skaldytas vietoje. Trys dvipoliai skaldytiniai ir penkios nuoskalos buvo tyrinėtos mikroskopiškai, tačiau neabejotinų naudojimo žymių nepastebėta (7; 12 pav.).

Kernavėje kultūriniame sluoksnyje su geležies amžiaus keramika rasta mezolitinių ir neolitinių akmens amžiaus dirbinių, pagamintų iš geros kokybės nevietinio kreidos titnago (8 pav.). Visgi didžioji dalis titnagų turėjo dvipolio skaldymo žymių (9–10 pav.). Jie buvo pagaminti iš prastos kokybės vietinio eratinio titnago, taip pat perdirbti iš senų akmens amžiaus dirbinių. Paprotys perdirbti ir (ar) naudoti akmens amžiaus dirbinius buvo užfiksuotas Lenkijos bronzos ir geležies amžių gyvenvietėse ir kapinynuose, Luokesų I polinėje gyvenvietėje. Tai galėjo būti racionalus būdas apsirūpinti titnago žaliava, tačiau simbolinę titnago reikšmę metalų epochoje liudija jų radimvietės kapuose Lenkijoje. Dvidešimt du titnago radiniai iš Kernavės buvo tyrinėti mikroskopiškai (11; 13–21 pav.). 6 iš jų buvo pripažinti įrankiais ugniai skelti, odai ir medžiui gremžti, pjauti, o vienas – strėlės antgaliu su dervos liekanomis įkotėje. Kai kurie jų buvo pagaminti iš geros kokybės titnago nuoskalų, nuskeltų minkšto mušimo būdu laikant skaldytinį rankoje ar ant kelių, ir turi

būti pripažinti esantys akmens amžiaus priemaišomis geležies amžiaus kultūriniame sluoksnyje. Nė viena dvipolio skaldymo nuoskala ir nė vienas dvipolis skaldytinis neturėjo mikroskopinių darbo žymių. Šios nuoskalos yra labai mažos bei plonos ir netiko darbui, tuo tarpu dvipoliai skaldytiniai galėjo būti naudojami trumpalaikiams medžio darbams, tačiau darbo išskalos galėjo sunaikinti silpnas nusidėvėjimo žymes, o šių išskalų dabar neįmanoma atskirti nuo dvipolio skaldymo, t. y. gamybinių išskalų. Iki šiol nepavyksta aptikti darbo žymių ant vieno tūkst. pr. Kr. ir vieno tūkst. po Kr. datuojamų dvipolio skaldymo produktų ir Lenkijoje, nors analogiškų akmens amžiaus dirbinių mikroskopiniai tyrimai įrodė juos buvus naudotus odoms, kaului, medžiui apdirbti.

Bronzos ir geležies amžių titnago radinių tyrimų metu nustatyta, kad titnagas toliau naudotas 1 tūkst. pr. Kr. ir 1 tūkst. po Kr., nors metalų epochoje gerokai pasikeitė apsirūpinimu žaliava strategija ir apdirbimo technika. Išimtinai vietinis eratinis titnagas, taip pat ir akmens amžiaus dirbiniai (9 pav.), surinkti erodavusiuose ir vėjo išpustytuose smėlynuose, buvo skaldomi. Apdirbant titnagą vyravo arba buvo vienintelė dvipolio skaldymo technika (5–6 pav.). Tai racionalus mažų gabaritų žaliavos gabalų skaldymo būdas, nereikalaujantis daug žinių ir patirties. Titnagas naudotas ugniai įskelti, turbūt ir kitoms specializuotoms ūkio veikloms, tačiau vis dar trūksta duomenų joms įvardyti tiek Lietuvoje, tiek Lenkijoje. Ritualinio skaldymo ir naudojimo įrodymais gali būti pripažįstamas akmens amžiaus dirbinių rinkimas, titnago radiniai kapuose.