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Rekonstrukcja lateńskiego hełmu z Bagienic Wielkich. Rys. JULIA HARBARUK
Reconstruction of the La Tène helmet from Bagienice Wielkie. Drawing JULIA HARBARUK

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GRAŻYNA ORLIŃSKA, KAMIL NOWAK

A LATE BRONZE AGE HOARD FROM NOWA GÓRNA, BŁONIE COMMUNE, WARSAW WEST COUNTY

SKARB Z MŁODSZEJ EPOKI BRĄZU Z NOWEJ GÓRNEJ, GM. BŁONIE,
 POW. WARSZAWSKI ZACHODNI

Abstract: *The article presents a hoard of 53 bronze items, dated to HaB_p, consisting of 49 socketed axes and four hoop ornaments, weighing over 13 kg. The assemblage is unique both because of its location in Mazovia, to date devoid of spectacular finds from the Late Bronze Age, and because of its contents, most of which are various types of axes of Middle Danubian origin. The local axes of the Kowalewko type, which were deposited as part of the hoard, differ from the specimens of this type found in western Poland in that they are additionally decorated with nested angular ribs. An analysis of the traces of production, shaping and use of the axes made it possible to distinguish untreated and used specimens from both environments, as well as the less numerous specimens bearing only the traces of shaping, which were exclusively of Transcarpathian origin. The objects were deposited in a protective package in a place that was only periodically flooded, which made it possible to retrieve them at a later date.*

Keywords: *item deposition, Bronze Age, hoop ornaments, socketed axes, traces of production, traces of shaping, use-wear, casting techniques, casting moulds*

Słowa kluczowe: *depozycja przedmiotów, epoka brązu, ozdoby obręczowe, siekierki z tulejką, ślady produkcji, ślady formowania, ślady używania, techniki odlewnicze, formy odlewnicze*

INTRODUCTION

The hoard of bronze objects from Nowa Górna, consisting of 49 socketed axes, mostly with a loop, and four hoop ornaments, was discovered by chance in 2015. In a report sent to the Voivodeship Historic Preservation Office in Warsaw (Polish: Wojewódzki Urząd Ochrony Zabytków, hereinafter WUOZ) in Warsaw at the beginning of July that year, the finder mentioned 24 artefacts (22 axes and two hoops) that he had found while digging for worms on the bank of the Utrata River “near the vil-

lages of Cholewy and Stary Łuszczewek” in the Warsaw West County (Fig. 1).

During a field inspection organized by WUOZ a few days later, the finder indicated the location of the hoard according to the GPS coordinates reported. The spot was located on the left bank of the Utrata River near a bridge (Fig. 2), on the north-eastern edge of the land under the administration of the village of Nowa Górna, about 150 m south of the buildings of Nowy Łuszczewek, bordered to the east by Stary Łuszczewek, mentioned in the report to the conservation services. In the WUOZ report 275

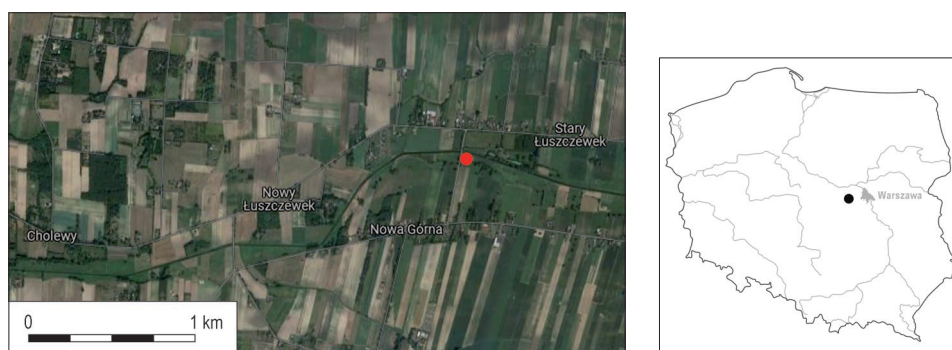


Fig. 1. Place of discovery of the hoard from Nowa Górna, Warsaw West County in the area encompassing the villages mentioned by the finder in the report to the Provincial Office for the Protection of Monuments. Graphics: G. Orlińska (based on: www.google.com/maps).

Ryc. 1. Lokalizacja miejsca odkrycia skarbu w Nowej Górze, pow. warszawski zachodni na obszarze obejmującym wsie wymienione przez znalazcę w zgłoszeniu do Wojewódzkiego Urzędu Ochrony Zabytków. Grafika: G. Orlińska (wg: www.google.com/maps).

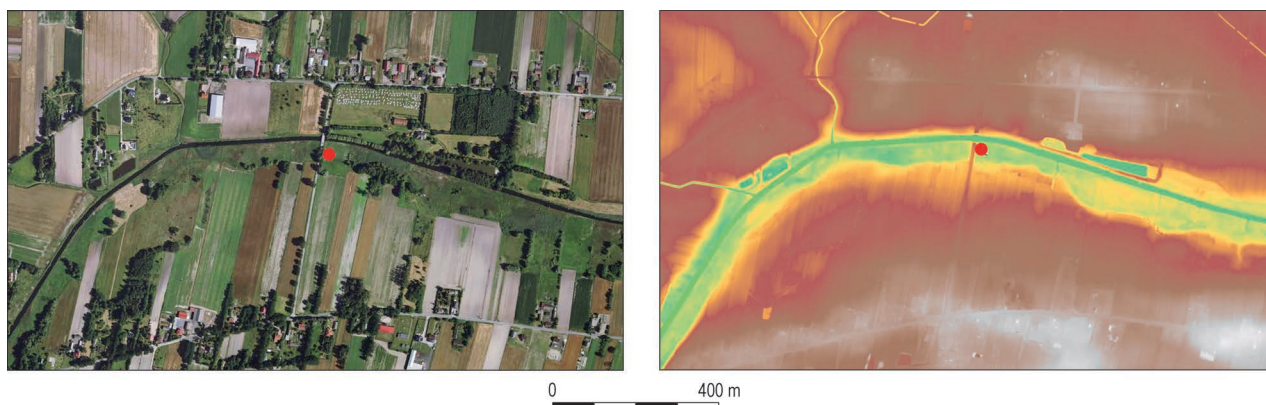


Fig. 2. Nowa Górna, Warsaw West County. Place of discovery of the hoard. Graphics: G. Orlińska (based on: www.geoportal.gov.pl).

Ryc. 2. Nowa Górna, pow. warszawski zachodni. Lokalizacja miejsca odkrycia skarbu. Grafika: G. Orlińska (wg: www.geoportal.gov.pl).

on the field visit, it was noted that the remains of the pit from which the artefacts had been recovered were still visible, and that there were four other fresh cuts nearby. The finder then handed over 26 objects (24 axes and two hoops), which is two more than he had mentioned in his earlier report. According to the decision of the Conservation Officer for the Mazovian Voivodeship of 2015, the objects were transferred to the State Archaeological Museum in Warsaw (Polish: Państwowe Muzeum Archeologiczne, hereinafter PMA), under site registration number III/10618.

A joint expedition by WUOZ and PMA staff to survey the site with metal detectors took place in the autumn of 2015, a few months after the field survey described above.¹ The aforementioned cuts were no longer visible,

and many hours of searching did not reveal any other objects that could have been part of the hoard, nor any material that would prove the existence of an archaeological site in the area.

In the autumn of 2016, 25 socketed axes and two hoop ornaments were secured during a police search in connection with an investigation into the illegal activities of a group of treasure hunters near Łódź. In the course of the investigation it became clear that these objects formed the second part of the hoard from Nowa Górna, which had not yet been revealed by the finder. For the duration of the investigation, the artefacts remained at the disposal of the Łódź Public Prosecutor's Office. In 2018, the District Court in Brzeziny, Brzeziny County, decided to transfer them to the Zgierz City Museum, where they were entered into the inventory as objects from Cholewy, one of the localities mentioned by the finder both in the report to WUOZ in 2015 and during the court trial. The finder did not mention Nowa Górna, as he was most likely not

¹ We would like to thank all the persons involved in the survey and, in particular, Mr Łukasz Karczmarek who participated both in the field and office works.



Fig. 3. Nowa Górna. Objects from the hoard, axes of Middle Danubian origin on the left, local products on the right. Bronze.
Photo: Ł. Karczmarek.

Ryc. 3. Nowa Górna. Przedmioty ze skarbu, z lewej strony siekierki pochodzenia środkowodunajskiego, z prawej wyroby lokalne. Brąz.
Fot.: Ł. Karczmarek.

aware of the administrative boundaries of this village or its neighbouring communes.

In the spring of 2019, the part of the hoard stored in the Zgierz Museum was made available for the purposes of this comprehensive study of the find, for which we would like to thank the director, Robert Starzyński, and the supervisors of the Archaeological Department, Piotr Świątkiewicz PhD and Krzysztof Wiliński.

The artefacts from both parts of the hoard from Nowa Górna, stored in the PMA and Zgierz Museum, were subjected to metal science tests at the Historical Layers Research Centre at the Faculty of Foundry Engineering of the University of Science and Technology in Cracow (Polish: Akademia Górniczo-Hutnicza, hereinafter AGH). The results of eight chemical composition analyses² have been published to date; they are included in our article, although they do not constitute a sample representative of the entire collection.

CONTEXT OF DISCOVERY

Nowa Górna is located in the eastern part of the Łowicz-Błonie Plain,³ which is part of the Central Masovia Low-

land. It is a flat, highly denuded plain south of the Kutno Plain and the western part of the Warsaw Basin, bordering the Koło Basin and the Łask Heights to the west and the Warsaw Plain to the east. It is rich in good brown earth and black earth soils, and, in the vicinity of Błonie and Sochaczew, also in varve loams.⁴ The Utrata River, by which the hoard was found, is one of the main tributaries of the Bzura River, which flows from the Southern Masovia Hills. Drained along almost its entire length before World War I, it responds dynamically to heavy rainfall and thaw.⁵

According to the finder's account and GPS, the hoard was discovered about 33 m from the present bed of the Utrata, at an altitude of about 83 m above sea level, roughly in the middle of a bottom floodplain covered with lush grasses (Fig. 2). Further south, the area rises slightly, reaching an elevation of just over 84 m a.s.l. after about 50 m.

According to the first information provided to the conservation services by the finder, the hoard was thought to be at a depth of 10 cm from the ground surface. However, in a report written a few days later, during the field inspection of the place of discovery, it was noted that the objects formed a compact cluster, approximately 40 cm

² A. GARBACZ-KLEMPKA *ET ALII* 2018, 182, table 1.

³ English names of physico-geographical mesoregions of Poland given after J. SOLON *ET ALII* 2018.

⁴ J. KONDRACKI 2013, 190.

⁵ S.L. DĄBKOWSKI, A. CIEPIEŁOWSKI, M. GUTRY-KORYCKA 2004, 304, 305.

in diameter and 30 cm thick, at a depth of 40 to 70 cm from the ground surface. Analysis of the soil samples taken from inside the sockets of several axes and from under the grass near the site of discovery⁶ confirms the latter version. The soil from the axes contained mineral material and sparse organic remains (tissues and pollen), very fragmented and degraded by weathering and microbial activity, which are typical of deposits subjected to long-term wet-dry cycles, which certainly occurred in the periodically flooded Utrata River valley. The soil sample from under the grass differs from that described above and is characterised by a low content of pollen from many plants, preserved to various degrees, and a large presence of fungal hyphae. Therefore, the hoard must have been located deeper, 40–70 cm from the ground surface, as noted in the field survey report.

Well-preserved pine pollen, identified in one of the soil samples taken from the axes, which most likely entered the socket accidentally through a large hole in the face, places the time of discovery of the hoard in May–June,⁷ i.e., just before the objects were reported to WUOZ.

The data presented above makes it highly probable that the Utrata River valley in Nowa Górna is the actual place of discovery of the assemblage. This is the second hoard of socketed axes to be found in western Masovia, the other being that from Gole, Grodzisk Mazowiecki County, just a dozen or so kilometres away.⁸

CATALOGUE

The items from the hoard are presented in accordance with the numbers assigned to them for the purposes of this study. The axes discussed were divided into specimens of Middle Danubian origin (nos. 1–39) and those manufactured locally (nos. 40–49), in a system consist-

ent with classification published by Jerzy Kuśnierz.⁹ Axe 39 is the only one whose type was determined based on the more recent findings of Wojciech Blajer.¹⁰ Within the specific types, the specimens from the same casting mould are described first, followed by individual specimens. The decorated axes were arranged according to the type of decoration motifs, starting with the simplest pattern. The catalogue ends with the descriptions of hoop ornaments (nos. 50–53).

The Catalogue descriptions contain information about the formal features of the objects (described collectively for the artefacts cast in the same mould), casting defects, finishing treatment, state of preservation, dimensions and weight. The inventory numbers identifying the items and the numbers of the X-ray images¹¹ used to determine the parameters of the sockets are provided. The references to the figures presenting the artefacts can be found at the beginning of their descriptions.

The following terms are consistently used in the descriptions of the axes:

blade – the working, lower part of the axe, solid or overlapping the socket, defined by thinning and/or flattening one or both faces or giving it a wedge-shaped longitudinal cross-section;

blade height – the ratio of the height of the blade to the total length of the axe (0.28–0.52); a low blade is described by a value of <0.35, a medium blade by a value from ≥0.35 to <0.45, and a high blade by a value of ≥0.45;

cutting edge width – the ratio of the width of the cutting edge to the smallest width of the axe, with values ranging from 1.11 to 1.9, determining the degree of the profiling of the body; this quotient for a very narrow edge is <1.25; for a narrow edge, it is between ≥1.25 and <1.35; for a medium-wide edge, it is between ≥1.35 and <1.5; for a wide edge, it is between ≥1.5 and <1.6; for a very wide edge, it is ≥1.6;

face – the wider side of the axe;

socket depth – the ratio of the socket depth to the length of the axe, ranging from 0.5 to 0.78; for a shallow socket,

⁶ For the analyses, we offer our thanks to Ass. Prof. Krzysztof Bińka (Department of Climate Geology, University of Warsaw).

⁷ The blooming of pine trees generally lasts from mid-May to mid-June and, under favourable conditions, can begin as early as early May and extend into the third decade of June (after: www.medme.pl/artykuly/kiedy-pyli-sosna,72644; accessed on 22.08.2020).

⁸ G. ORLIŃSKA 2020, footnotes 58 and 81.

⁹ J. KUŚNIERZ 1998, 14–22, 28.

¹⁰ W. BLAJER 2018, 306–307, 309.

¹¹ The images were made by Eng. Władysław Weker in the X-Ray Laboratory of PMA, where they are also kept.

Table 1. Nowa Górna. Compilation of metric (in cm) and weight (in g) parameters of the axes (1–39 – Middle Danubian axes; 40–49 – local axes). a – axe; b – casting mould; c – axe length; d – blade height (in brackets: d/c ratio); e – min. width of the axe; f – width of the cutting edge (in brackets: f/e ratio); g – socket depth (in brackets: g/c ratio); h – dim. of the socket mouth; i – diam. of the holes in the sides; j – weight; * – preserved dimensions.

Tabela 1. Nowa Górna. Zestawienie parametrów metrycznych (cm) i wagowych (g) siekier (1–39 – siekiery typów środkowodunajskich; 40–49 – siekiery typów lokalnych). a – siekiera; b – forma odlewnicza; c – dług. siekierki; d – wys. ciosu (w nawiasach: wskaźnik d/c); e – najm. szer. siekierki; f – szer. krawędzi tnącej (w nawiasach: wskaźnik f/e); g – głęb. tulejki (w nawiasach: wskaźnik g/c); h – wym. otworu tulejki; i – średn. otworków w bokach siekierki; j – waga; * – wymiary zachowane.

a	b	c	d	e	f	g	h	i	j
1	1	9.5	3.3 (0.35)	2	3.8 (1.9)	5.4 (0.57)	2.7×2.3	–	96.7
2 (NG 6)	2	11.9	3.9 (0.33)	2.4	4.3 (1.79)	6.7 (0.56)	2.8×2.2	–	206.1
3 (NG 8)		12.2	3.9 (0.32)	2.5	4.5 (1.8)	6.7 (0.55)	2.7×2.2	–	214.2
4		11.8	3.9 (0.33)	2.3	4.2* (1.83)	6.8 (0.58)	2.9×2.2*	–	202.7
5	3	11.5	5–5.3 (0.43–0.46)	2.3	4.1 (1.78)	6.5 (0.56)	2.4×2–2.1	0.25; 0.35	131.5
6	4	11.3	5.4 (0.48)	2.6	4.1 (1.58)	6.2 (0.55)	2.5–2.6×1.9–2	0.2×0.25; 0.35	128.4
7 (NG 17)	5	14	5.8 (0.41)	3.3	4.3 (1.3)	10.6 (0.76)	3.6–3.7×2.9	–	352.9
8 (NG 20)		14.3	5.8 (0.41)	3.3	4.3 (1.3)	11 (0.77)	3.5–3.6×2.8	–	333.2
9 (NG 18)	6	13.3	5 (0.38)	3.3	4.3 (1.3)	8.3 (0.62)	3.4×2.8–2.9	–	326.2
10 (NG 19)		13.3	5 (0.38)	3.3	4.4 (1.33)	8.3 (0.62)	3.3×2.8–3.1	–	315.1
11		13.3	5 (0.38)	3.2	4.2* (1.31)	8.8 (0.66)	3.3–3.4×2.8–2.9	–	310.9
12 (NG 21)	7	13.6	6 (0.44)	3.5	5 (1.43)	7.3 (0.54)	3.5×2.5–2.6	–	371.8
13 (NG 14)		13.7	6 (0.44)	3.4	4.9 (1.44)	7.3 (0.53)	3.4×2.5	–	364.4
14		13.5	6 (0.44)	3.4	4.9 (1.44)	7.4 (0.56)	3.4×2.5–2.7	–	387.7
15 (NG 24)	8	14.2	5.9 (0.42)	3.3	5.2 (1.56)	7.2 (0.51)	3.4×2.6–2.7	–	363.9
16		13.9	5.9 (0.42)	3.2	5.1 (1.59)	7 (0.5)	3.4×2.4–2.7*	–	361.8
17 (NG 25)	9	13	5.3; 6 (0.41; 0.46)	3.2	4.5 (1.41)	9 (0.69)	2.7–2.9×2.2–2.3	–	294.2
18 (NG 23)	10	12.6	4.1 (0.33)	3.6	4.7 (1.3)	8.4 (0.67)	3.6×2.7	0.15; 0.25×0.3	249.4
19 (NG 11)		12.7	3.9 (0.31)	3.6	4.7 (1.3)	8.4 (0.66)	3.4–3.6×2.7	0.3×0.2; 0.4	257.1
20 (NG 22)	11	12.6	3.5 (0.28)	3.6	4* (1.11)	8.5 (0.67)	3.6×2.6	0.15; 0.3	240.7
21 (NG 13)		12.5	3.3; 3.9 (0.26; 0.31)	3.6	4.2 (1.17)	8.6 (0.69)	3.5×2.7	0.2; 0.3	242.7
22		12.6	3.5; 4 (0.28; 0.32)	3.7	4.3 (1.16)	8.8 (0.69)	3.5–3.7×2.6–2.7	0.25; 0.4	250
23		12.7	3.5; 4 (0.28; 0.31)	3.6	4.1* (1.14)	8.9 (0.69)	3.7×2.7–2.8	0.25; 0.35	242.3
24	12	12.5	–	3.5	4.2 (1.2)	8.4 (0.67)	3.6–3.7×2.8	0.3	245.1
25	13	12.7	4.7 (0.37)	3.2	4.9* (1.53)	8 (0.63)	3.4×2.3	0.3; 0.3×0.35	171.3
26	14	13.2	4.2; 4.4 (0.32; 0.33)	3.3	4.7* (1.42)	8.8 (0.67)	3.5–3.6×2.5–2.7	0.3; 0.4	201.4
27	15	12.9	3.8; 4.2 (0.29; 0.33)	3.4	4.4 (1.29)	8.2 (0.64)	3.6×2.6–2.7	0.2; 0.35	268.4
28 (NG 7)	16	13.1	3.8; 4.2 (0.29; 0.32)	3.4	4.8 (1.41)	8.8 (0.67)	3.6×2.7	0.1; 0.3	193
29	17	13.1	4.5; 4.8 (0.34; 0.37)	3.2	4.6 (1.43)	7.8 (0.6)	3.2×2.3	–	216.3
30		13	4; 4.2 (0.31; 0.32)	3.2	4.6 (1.43)	7.7 (0.59)	3.1–3.3×2.3	–	235.6
31	18	12.8	4; 4.4 (0.31; 0.34)	3.2	4.5 (1.4)	7.9 (0.62)	3.1×2.3	–	206.3
32 (NG 9)		13	4 (0.3)	3.3	4.7 (1.42)	8.8 (0.68)	3.3×2.2	–	177.1
33	19	12.8	4 (0.31)	3.2	4.5 (1.4)	8.7 (0.68)	3×2.3	–	194
34		12.9	4.1; 4.4 (0.32; 0.34)	3.2	4.6 (1.43)	8.6 (0.67)	3.1×2.3	–	194.7
35	20	12.6	5.2 (0.41)	2.7	4.2 (1.56)	6.4 (0.51)	2.6–2.7×2.1	–	146.9
36	21	12.2	5 (0.41)	2.8	4.5 (1.61)	6.7 (0.55)	2.8–2.9×2.1–2.2	–	135.8
37 (NG 27)	22	11.2	5.3; 5.4 (0.47; 0.48)	2.3	4* (1.74)	6 (0.54)	2.7×2.3	–	139.1
38 (NG 4)	23	10.2	5.3 (0.52)	3.6	4.6 (1.28)	7.7 (0.76)	3.4×2.9	0.1	215.9
39 (NG 16)	24	10.8*	4.5* (>0.42)	3.2	4.1 (1.28)	6.4 (0.59)	3.2–3.3×3	–	208.8
40	25	13.2	6 (0.45)	2.8	3.7 (1.32)	9 (0.69)	3.2×3.2	–	351
41		13	6 (0.46)	2.8	3.7 (1.32)	9 (0.69)	3.5×3.2	–	324.3
42		13.2	6 (0.45)	2.8	3.7 (1.32)	9.4 (0.71)	3.3×3	–	315.5
43 (NG 10)		13.3	6 (0.45)	2.8	3.7 (1.32)	9.6 (0.72)	3.2×3	–	306.8
44 (NG 5)		13.5	6 (0.44)	2.8	3.7 (1.32)	9.6 (0.71)	3.2×2.7–2.8	–	315
45 (NG 26)	26	12.7	4.2; 4.6 (0.33; 0.36)	2.7	4.1 (1.52)	10 (0.79)	3.1×2.7	–	306.5
46 (NG 15)	27	13.1	6.3 (0.48)	2.6	4.1 (1.56)	9.8 (0.77)	3.5×3–3.2	–	283
47 (NG 12)	28	12.5	6.3 (0.5)	2.7	4.2 (1.56)	9.7 (0.78)	2.8×2.6–2.8	–	262.2
48	29	13.6	6.7; 7 (0.49; 0.51)	3	4 (1.33)	9.8 (0.72)	3.1×3–3.1	–	394.5
49	30	10.7*	3* (>0.28)	2.9	3.9 (1.34)	7.2 (0.67)	3.1×2.9	–	315.3

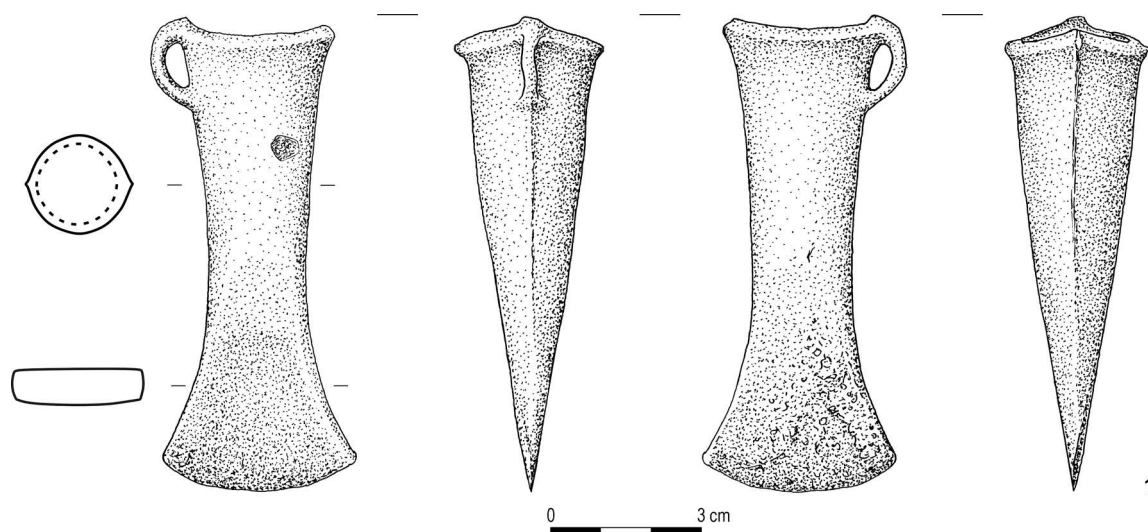


Fig. 4. Nowa Górná. Axe 1 with a symmetrically concave socket edge, variant A. Bronze. Drawing: B. Karch.
Ryc. 4. Nowa Górná. Siekierka 1 z symetrycznie wklęsłym wylotem tulejki, wariantu A. Brąz. Rys.: B. Karch.

this value is <0.6 ; for a medium-deep socket, it is between ≥ 0.6 and <0.7 ; and for a deep socket, it is ≥ 0.7 .

The metric and weight parameters of the axes are listed in Table 1¹².

1. Axe with a symmetrically concave socket edge, variant Kuśnierz A, cast in mould 1 (Figs. 4, 5:1, 6:1, 7:1). Constricted slightly below the mid-length. The cross-section of the upper part of the socket is almost circular, the lower part is oval, the cross-section of the blade is quadrangular, and the longitudinal section is almost wedge-shaped.¹³ Elongated, cylindrical loop, slightly protruding above the edge of the socket, topped with a thickening in the form of a flat, pointed rib of uneven width. Traces of protrusions left by a (removed) pouring channel above the loop. Blade of medium height, solid, with one flat face, slightly rounded sides and sharp edges at the bottom. Very wide and rounded cutting edge. Casting seams (casting flashes) invisible on the loop and sides of the blade, and in the form of low ribs expanding downwards on the sides of the socket. The surface is slightly coarse and uneven, one face of the blade is rough in places and, further up, caved on the side without the loop, a shrinkage cavity in the face of the socket on the other side. Shallow, conical socket, slightly rounded at the bottom, oval, almost circular at the top. Slightly chipped cut-

ting edge. Patina removed, golden-grey surface. Length 9.5 cm, min. width 2 cm, blade height 3.3 cm, cutting edge width 3.8 cm, dimensions of the socket mouth 2.7×2.3 cm, socket depth 5.4 cm, weight 96.7 g. X-ray 2580. Inv. no. MMZ/A-2018/26.

2–6. Axes with a straight, profiled socket edge, variant Kuśnierz A

Axes 2–4, cast in mould 2 (Figs. 5:2–4, 6:2–4, 7:2–4, 8). Constricted below the mid-length. Hexagonal cross-section, asymmetrical longitudinal section—one face of the socket is more strongly arched. Metal-filled loop with a rhomboidal cross-section, set on the edge of the socket, topped with a thickening in the form of a flattened, pointed rib, narrowed on the side of the same face in each axe. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. At the level of the loop, there are two horizontal, pointed ribs (the lower one is slightly wavy), the ends of which diverge on the sides. The lateral edges of the socket are poorly defined. Low, solid blades, with almost flat faces, with one sharp lateral edge and the others uneven (especially in specimens 2 and 4). Very wide, straight cutting edges, with a casting seam. The flashes on the sides are narrow and uneven. The faces of the axes (metal streaks on each one) are shifted relative to each other (to a significant degree in the case of specimen 3). Conical, shallow, oval sockets, rounded at the bottom.

Axe 2. Incomplete circumferential ribs on the less convex face of the socket and a misrun in the side without the loop. A shrinkage cavity on the other side, at the base of the blade. Coarse and mostly uneven surface. Brown-

¹² The abbreviation 'NG' indicates the numbers of axes from the PMA collection used during the analyses at the AGH Faculty of Foundry Engineering and (in bold) in the publication of A. GARBACZ-KLEMPKA ET ALII (2018, Table 1).

¹³ Longitudinal sections of the axes as per terminology of J. KUŚNIEZ (1998, 4, fig. 4).



Fig. 5. Nowa Górna. Axes with a symmetrically concave socket edge, variant A (1) and with a straight, profiled socket edge, variant A (2–4, 5, 6). Bronze. Photo: B. Solarewicz.

Ryc. 5. Nowa Górna. Siekierki z symetrycznie wklęsłym wylotem tulejki, wariantu A (1) i prostym, profilowanym wylotem tulejki, wariantu A (2–4, 5, 6). Brąz. Fot.: B. Solarewicz.

green patina. Length 11.9 cm, blade height 3.9 cm, min. width 2.4 cm, cutting edge width 4.3 cm, dimensions of the socket mouth 2.8×2.2 cm, socket depth 6.7 cm, weight 206.1 g. X-ray 2586. Inv. no. PMA/10535/15 (NG 6).

Axe 3. The rib on the edge of the socket is slightly wavy. Incomplete significant part of the side without the loop, circumferential ribs on both faces and misruns in one face. A shrinkage cavity at the base of the blade, below the more convex face of the socket (as in specimen 2).

Coarse and partially uneven surface. Inside the socket, under the edge, there is a small gas pore. Brown-green patina. Length 12.2 cm, blade height 3.9 cm, min. width 2.5 cm, cutting edge width 4.5 cm, dimensions of the socket mouth 2.7×2.2 cm, socket depth 6.7 cm, weight 214.2 g. X-ray 2587, 2608. Inv. no. PMA/10535/16 (NG 8).

Axe 4. Incomplete circumferential ribs on the less convex face of the socket (a misrun, as in specimen 2). Uneven surface on the other side below the socket, coarse



Fig. 6. Nowa Górná. Details of the socket side and edge treatment of the axes with a symmetrically concave socket edge, variant A (1) and with a straight, profiled socket edge, variant A (2–6). Bronze. Photo: B. Solarewicz.

Ryc. 6. Nowa Górná. Detale opracowania boków i krawędzi tulejek siekier z symetrycznie wklęsłym wylotem tulejki, wariantu A (1) i prostym, profilowanym wylotem tulejki, wariantu A (2–6). Brąz. Fot.: B. Solarewicz.

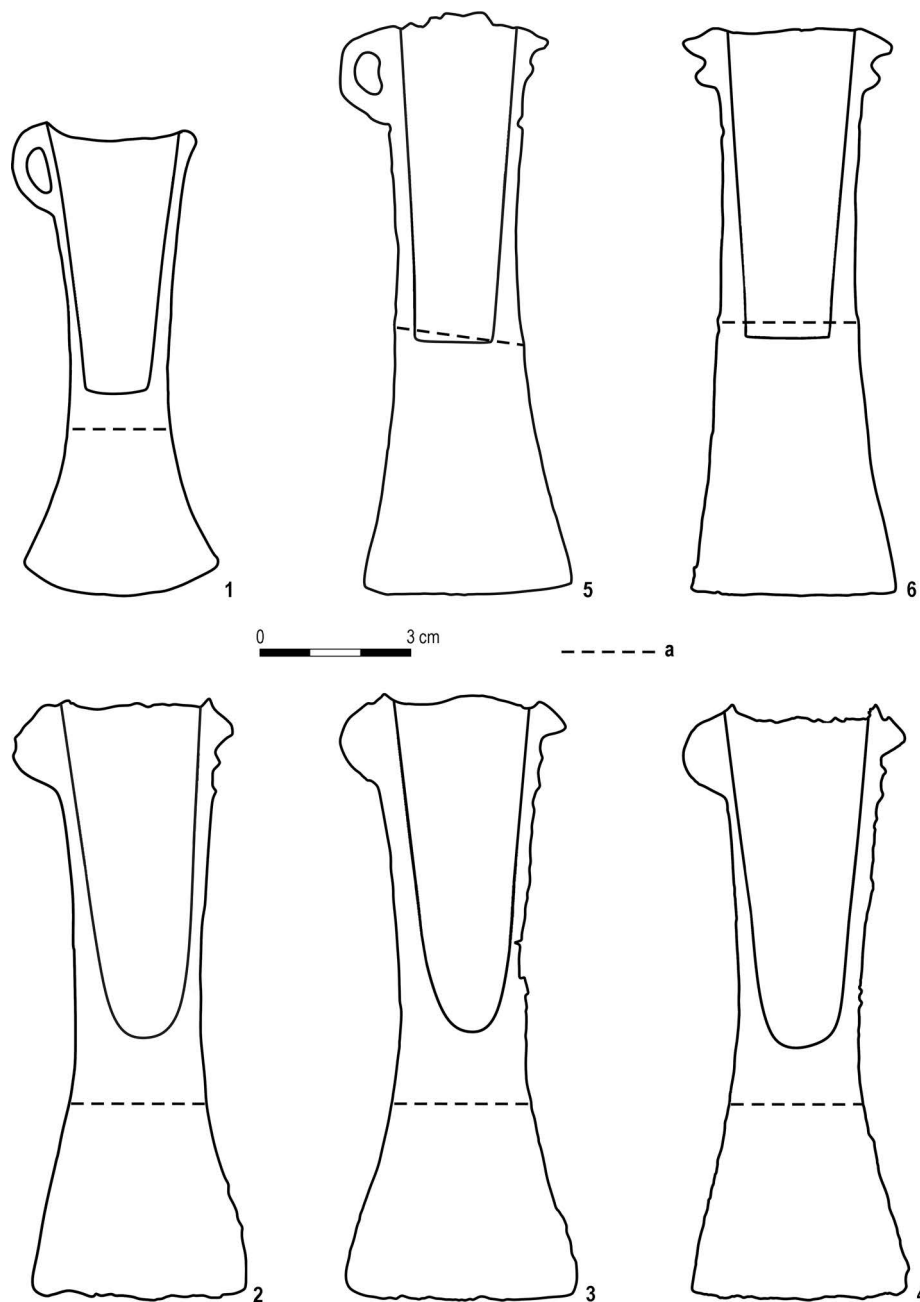


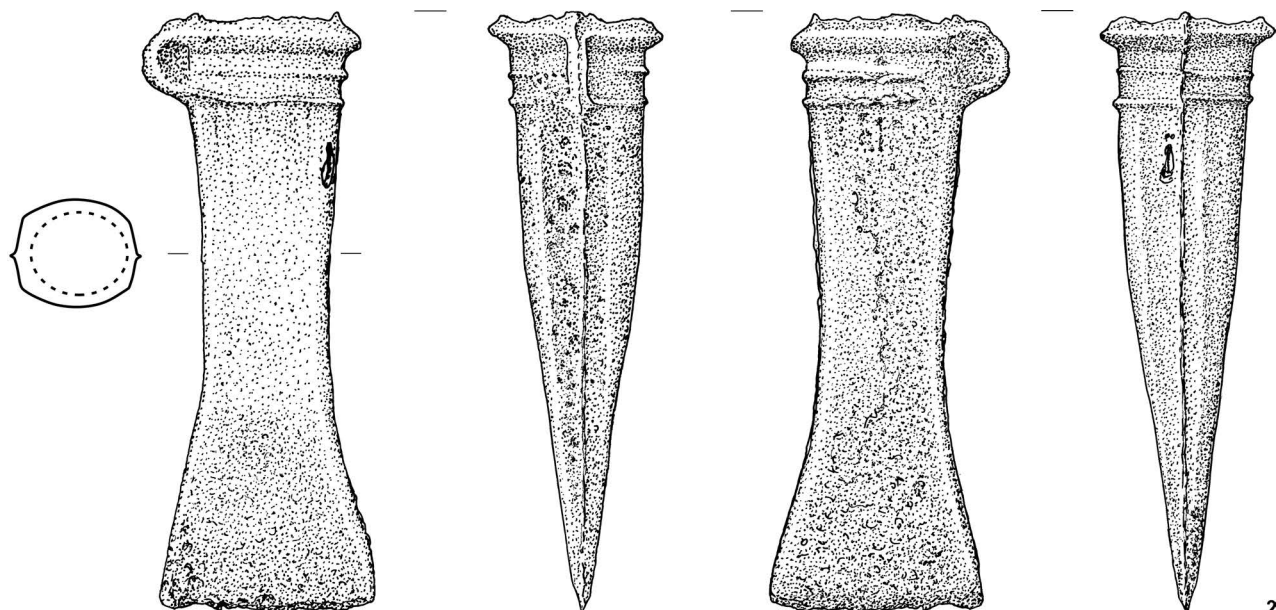
Fig. 7. Nowa Górna. Sections of the axes with a symmetrically concave socket edge, variant A (1) and with a straight, profiled socket edge, variant A (2–6). a—blade base. Key applies to Figs. 13, 22, 29, 40 & 46. Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 7. Nowa Górna. Przekroje siekier z symetrycznie wklęsłym wylotem tulejki, wariantu A (1) i prostym, profilowanym wylotem tulejki, wariantu A (2–6). a—nasada ciosu. Legenda dotyczy Ryc. 13, 22, 29, 40 i 46. Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

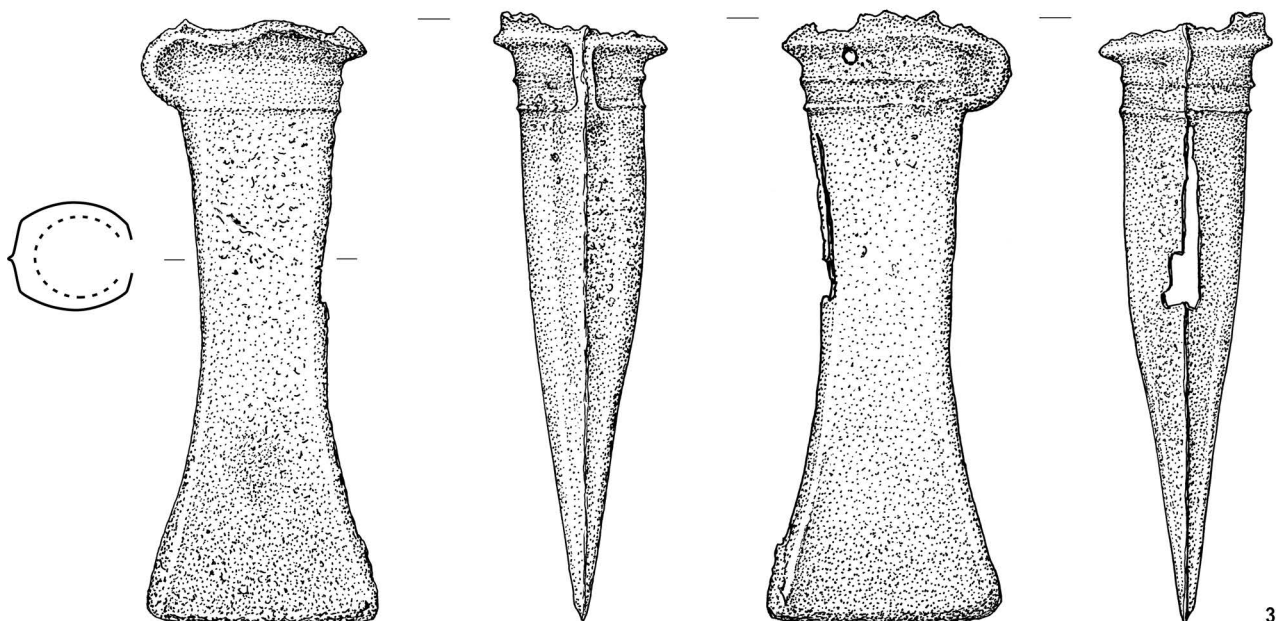
everywhere else. Inside the socket, under the edge, there are several small gas pores. Patina removed, golden-grey surface. Length 11.8 cm, blade height 3.9 cm, min. width 2.3 cm, preserved cutting edge width 4.2 cm, preserved dimensions of the socket mouth 2.9×2.2 cm, socket depth 6.8 cm, weight 202.7 g. X-ray 2581. Inv. no. MMZ/A-2018/21.

Axe 5, cast in mould 3 (Figs. 5:5, 6:5, 7:5, 9:5). Con-

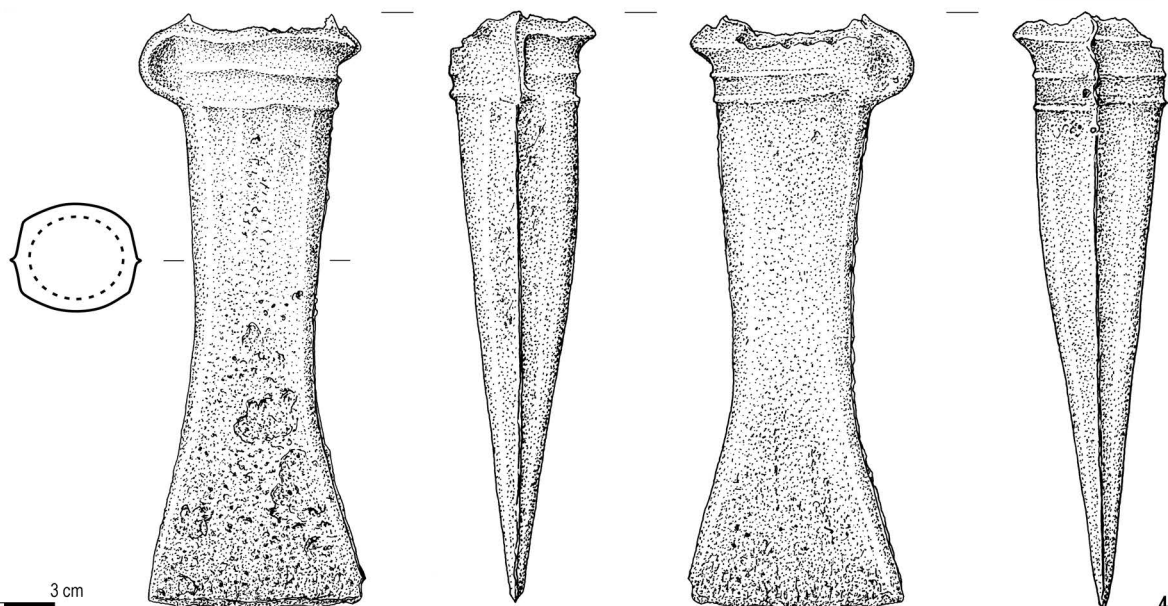
stricted at the mid-length. The cross-section of the socket is lenticular, of the blade quadrangular. The loop is rhomboidal in cross-section, placed on the edge of the socket, topped with a thickening in the form of a flat rib of unequal width. Below, a circumferential rib, pointed on one face, rounded on the other and partially incomplete (a misrun). At the edge of the socket, in the middle of the faces, there are traces of protrusions left by two 283



2



3



4

pouring channels. Holes on the opposite sides, an irregular one under the loop, the other one round and larger. Solid blade of medium height (slightly higher on the side with the loop and overlapping the socket), thinned on both sides, slightly expanded at the base, with sides flat above the cutting edge and slightly rounded above. At the level of the flat sides, the lateral edges of the blade are

sharp. The cutting edge is very wide, straight and sharp. There is a shrinkage cavity on both faces at the base of the blade, and a misrun near the loop. Flattened casting seams on the edge of the socket, narrow and even under this edge and on the loop, invisible below. Smooth surface on the upper part of the socket and above the cutting edge, mostly rough everywhere else. Conical, shallow, oval

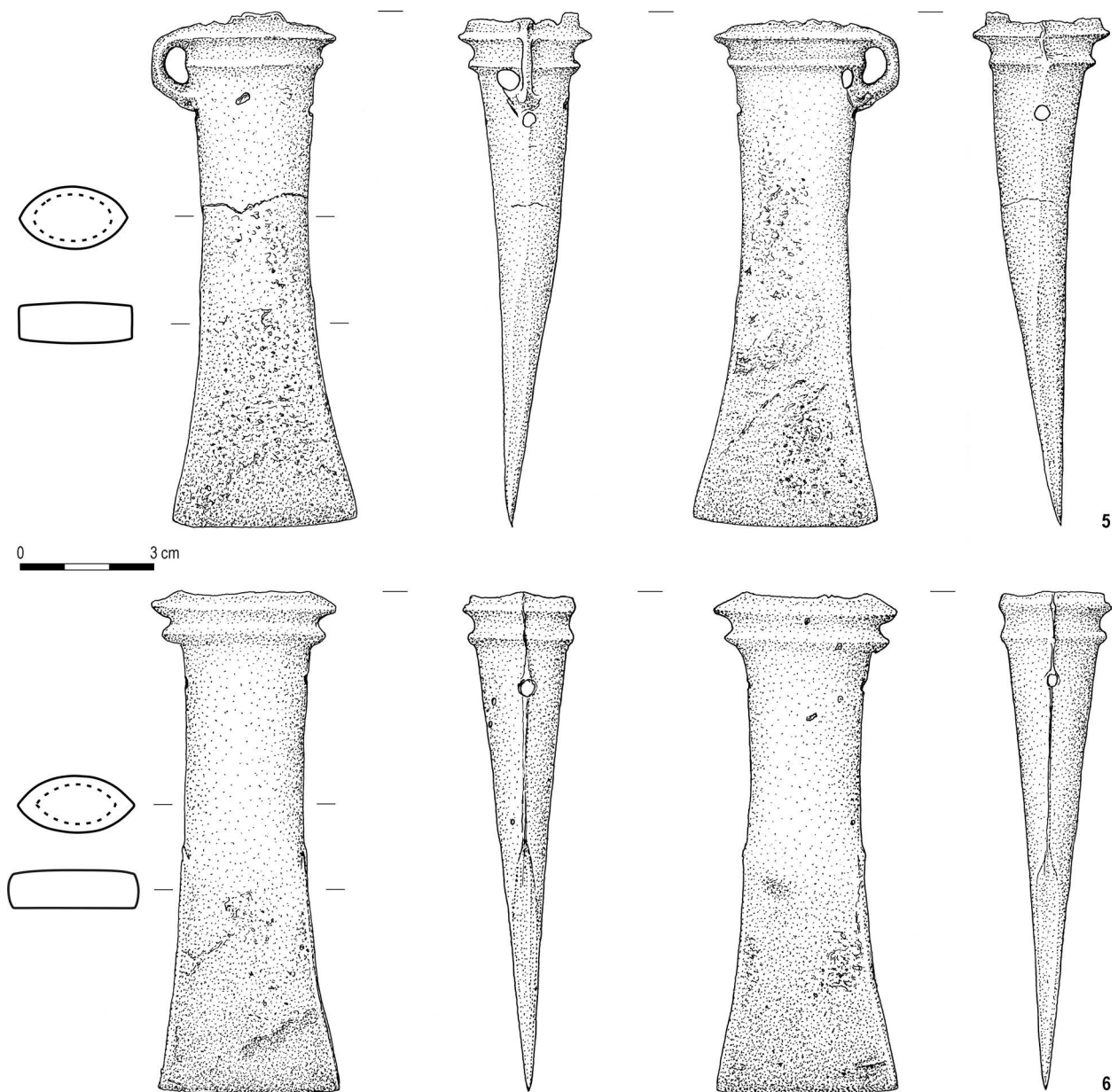


Fig. 9. Nowa Górna. Axes 5 and 6 with a straight, profiled socket edge, variant A. Bronze. Drawing: B. Karch.

Ryc. 9. Nowa Górna. Siekierki 5 i 6 prostym profilowanym wylotem tulejki, wariantu A. Brąz. Rys.: B. Karch.

Fig. 8. Nowa Górna. Axes 2–4 with a straight, profiled socket edge, variant A, cast in the same mould. Bronze. Drawing: B. Karch.

Ryc. 8. Nowa Górna. Siekierki 2–4 z prostym, profilowanym wylotem tulejki, wariantu A, odlane w tej samej formie. Brąz. Rys.: B. Karch.

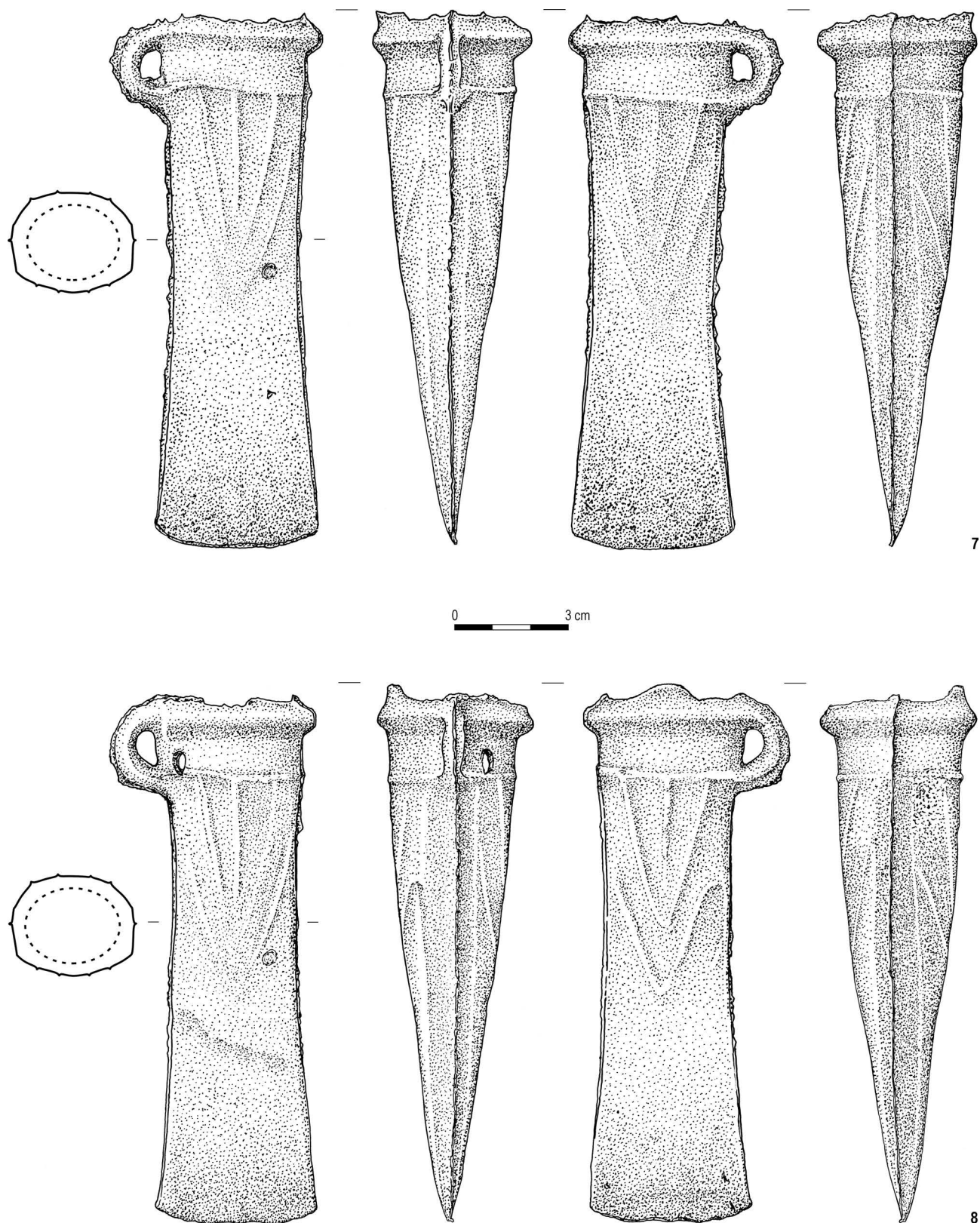


Fig. 10. Nowa Górna. Axes 7 and 8 with a straight socket edge, variant B, cast in the same mould. Bronze. Drawing: B. Karch.
Ryc. 10. Nowa Górna. Siekierki 7 i 8 z prostym wylotem tulejki, wariantu B, odlane w tej samej formie. Brąz. Rys.: B. Karch.

socket, straight at the bottom. Several small gas pores inside the socket, under the edge and below. Curved body with a transverse crack. Patina removed, golden-grey surface, the rough parts are dark grey. Length 11.5 cm, blade height 5–5.3 cm, min. width 2.3 cm, cutting edge width 4.1 cm, dimensions of the socket mouth 2.4×2–2.1 cm, socket depth 6.5 cm, diam. of the holes in the sides 0.25 and 0.35 cm, weight 131.5 g. X-ray 2582. Inventory no. MMZ/A-2018/22.

Axe 6, cast in mould 4 (Figs. 5:6, 6:6, 7:6, 9:6). No loop. Constricted at the mid-length. The cross-section of the socket is lenticular, of the blade quadrangular, and the longitudinal section is asymmetrical—one face is slightly more arched. On the edge of the socket, there is a thickening in the form of a pointed rib of uneven width; in the middle of the faces, there are traces of protrusions left by two pouring channels; under the edge of the socket, there is a circumferential rib. Holes on the opposite sides, one oval, the other round and larger. High, solid blade (slightly overlapping the socket), thinned on both sides, with an expanded base, one flat face, rounded sides and sharp lateral edges. Wide, straight and sharp cutting edge. Three misruns in the more convex face, shallow sink between the socket and the blade. The edge of the socket is flat along part of the circumference. Pointed casting seams on the sides under the socket edge, and in the form of narrow, low and even ribs (one slightly flattened) below; on the sides of the blade, seams not visible. The surface is rough in places, slightly coarse and uneven on the socket, with traces of metal streaks, smoother on the blade. Conical, shallow, lenticular socket with an oval mouth, straight at the bottom. Inside the socket, there are numerous gas pores. Patina removed, golden-grey surface. Length 11.3 cm, blade height 5.4 cm, min. width 2.6 cm, cutting edge width 4.1 cm, dimensions of the socket mouth 2.5–2.6×1.9–2 cm, socket depth 6.2 cm, diam. of the holes in the sides 0.2×0.25 and 0.35 cm, weight 128.4 g. X-ray 2582. Inventory no. MMZ/A-2018/27.

7–17. Axes with a straight socket edge, variant Kuśnierz B

Axes 7 and 8, cast in mould 5 (Figs. 10, 11:7.8, 12:7.8, 13:7.8). Constricted at the mid-length. The cross-section under the edge of the socket is oval, below pentagonal, the longitudinal section is asymmetrical—one face is more strongly arched. Fairly massive loop, placed at the edge of the socket, surrounded by a biconical thickening, narrowed on the side of the same face in both axes. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The decoration, extending to the base of the blade, consists of a massive circumferential rib (slightly wavy, with ends diverging on the sides) at the level of the lower base of

the loop, and of narrower ribs—vertical ones extending from the circumferential rib and two V-shaped ones with slightly convex arms; the arms of the upper angular rib touch the circumferential rib, and the arms of the lower one touch the lateral edges. Blades of medium height, overlapping the socket, with blunt lateral edges. Narrow cutting edges, slightly rounded, with a casting seam. The seams on the sides are narrow and uneven. The faces are slightly shifted relative to each other. Conical, deep, oval sockets, rounded at the bottom. Inside the sockets, halfway up, there are gas pores—one in specimen 7, and several smaller ones in specimen 8.

Axe 7. Incomplete top of the lower V-shaped rib on both faces; on the less convex face, a bowl-shaped thickening next to the lower rib. Coarse surface, slightly rough in some places on the blade. Brown-green patina. Length 14 cm, blade height 5.8 cm, min. width 3.3 cm, cutting edge width 4.3 cm, dimensions of the socket mouth 3.6–3.7×2.9 cm, socket depth 10.6 cm, weight 352.9 g. X-ray 2591. Inventory no. PMA/10535/9 (NG 17).

Axe 8. Incomplete top of the lower V-shaped rib on the less convex face; next to it, there is a bowl-shaped thickening (smaller than in axe 7); on the part of the blade overlapping the socket, there is an oblique shrinkage cavity and a misrun under the edge of the socket. On the other side, the arm of the lower V-shaped rib is washed around an oval recess. The remains of the larger pouring channel in the form of a knob. Slightly coarse surface, small metal streaks on the blade. Brown and, in places, green patina. Length 14.3 cm, blade height 5.8 cm, min. width 3.3 cm, cutting edge width 4.3 cm, dimensions of the socket mouth 3.5–3.6×2.8 cm, socket depth 11 cm, weight 333.2 g. X-ray 2591. Inventory no. PMA/10535/10 (NG 20).

Axes 9–11, cast in mould 6 (Figs. 11:9–11, 12:9–11, 13:9–11, 14). Constricted at the mid-length. The cross-section of the upper part of the socket is oval, below hexagonal, the longitudinal section is asymmetrical—one face of the socket is more strongly arched. Fairly massive loops of the same size, but with holes of different sizes, placed on the edge of the socket, surrounded by a low, biconical thickening, narrowed in all specimens on the side of the same face. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The lateral edges of the socket are quite poorly defined. The decoration, extending to the base of the blade, is composed of pointed ribs: massive circumferential ones at the level of the lower base of the loop (with ends diverging on the sides) and, below, three narrower V-shaped ribs with slightly concave arms, from the tops of which extend short, vertical ribs; the arms of the upper and middle ribs touch the circumferential rib, and the arms of the lower rib converge in

an arch on the upper part of the sides, above the arch formed by the lateral edges (both arches are poorly defined). Blades of medium height (in specimen 11, slightly overlapping the socket), with slightly flattened faces and

quite sharp and even lateral edges. The cutting edges are narrow, straight in axes 9 and 10 and slightly wavy in specimen 11, with a casting seam in the case of the last two specimens. The flashes on the sides are narrow



Fig. 11. Nowa Górna. Axes 7–16 with a straight socket edge, variant B. Bronze. Photo: B. Solarewicz.

and uneven. The faces are shifted relative to each other. Conical sockets of medium depth, oval, rounded at the bottom. Inside the sockets, under the edge, there are almost identical gas pores.



Fig. 11 (cont.).
Ryc. 11. (cd.).

Axe 9. A misrun in the more convex face of the socket, a circular recess in the circumferential rib on the other side. A shrinkage cavity on both faces at the base of the blade. Coarse surface, slightly rough on the blade. Brown-green patina. Length 13.3 cm, blade height 5 cm, min. width 3.3 cm, cutting edge width 4.3 cm, dimensions of the socket mouth 3.4×2.8–2.9 cm, socket depth 8.3 cm, weight 326.2 g. X-ray 2590. Inventory no. PMA/10535/5 (NG 18).

Axe 10. A misrun in the less convex face of the socket (in the place of the recess in the rib in specimen 9) and, above it, a biconical thickening on the socket's edge. Shrinkage cavities at the base of the blade, like in axe 9. Coarse surface, rough in places. Brown-green and, here and there, brown patina. Length 13.3 cm, blade height 5 cm, min. width 3.3 cm, cutting edge width 4.4 cm, dimensions of the socket mouth 3.3×2.8–3.1 cm, socket depth 8.3 cm, weight 315.1 g. X-ray 2590. Inventory no. PMA/10535/6 (NG 19).

Axe 11. A misrun in the less convex face of the socket. A pit-shaped shrinkage cavity on the other side, at the base of the blade, closer to one side. Coarse, mostly uneven surface. Patina removed, golden-grey surface. Length 13.3 cm, blade height 5 cm, min. width 3.2 cm, preserved cutting edge width 4.2 cm, dimensions of the socket mouth 3.3–3.4×2.8–2.9 cm, socket depth 8.8 cm, weight 310.9 g. X-ray 2580. Inventory no. MMZ/A-2018/12.

Axes 12–14, cast in mould 7 (Figs. 11:12–14, 12:12–14, 13:12–14, 15). Constricted at the mid-length. Hexagonal cross-section, asymmetrical longitudinal section—one face of the socket is more convex. Loop of roughly rhomboidal cross-section, set on the edge of the socket, topped with a thickening in the form of a prominent, pointed rib, narrowed on the side of the same face in each axe. On the edges of the sockets of specimens 13 and 14, in the middle of the faces, there are traces of protrusions left by two pouring channels; in specimen 12, only the remains of the larger pouring channel are visible¹⁴. The lateral edges of the upper part of the socket are usually poorly defined. The decoration, extending to the base of the blade, is composed of pointed ribs: two horizontal ones (the upper one at the level of the lower base of the loop, the second about a centimetre lower) and two slender V-shaped ribs with slightly convex arms, extending from the lower horizontal rib. The less convex face of the socket has almost exclusively horizontal ribs, while the other one has V-shaped ribs. Solid blades of medium height, with uneven lateral edges and a cutting edge of medium width, with a casting seam in axe 12. The faces of specimens 12 and 14 are slightly flattened at the top,

¹⁴ Cf. A. GARBACZ-KLEMPKA *ET ALII* 2018, fig. 4, with three pouring channels marked.



Fig. 12. Nowa Górn a. Details of the socket side and edge treatment of axes 7–16 with a straight socket edge, variant B. Bronze.
Photo: B. Solarewicz.

Ryc. 12. Nowa Górn a. Detale opracowania boków i krawędzi tulejek siekierek 7–16 z prostym wylotem tulejki, wariantu B. Brąz.
Fot.: B. Solarewicz.

and the cutting edges are slightly wavy; in specimen 13, one face of the blade is flattened, and the cutting edge is straight. The seams on the sides are narrow and uneven. Conical, shallow, oval sockets, rounded at the bottom—heavily in axes 12 and 13, and slightly in axe 14.

Axe 12. Misruns on the side with the loop and on both faces of the socket. Most of the surface is coarse and uneven, with metal streaks on the blade caused by unevenness of the negative of the casting mould. Inside the socket, in the upper part, especially under the edge, there are shallow gas pores. Brown-green patina. Length 13.6 cm, blade height 6 cm, min. width 3.5 cm, cutting edge width 5 cm, dimensions of the socket mouth 3.5×2.5–2.6 cm, socket depth 7.3 cm, weight 371.8 g. X-ray 2585. Inventory no. PMA/10535/7 (NG 21).

Axe 13. Misruns in the loop and in more convex face of the socket. Uneven and, in places, coarse surface. Inside the socket, under the edge, there are shallow gas pores; lower, in the side without the loop, there are several very small but deep cavities. Patina brown on one face of the axe, brown-green on the other. Length 13.7 cm, blade height 6 cm, min. width 3.4 cm, cutting edge width 4.9 cm, dimensions of the socket mouth 3.4×2.5 cm, socket depth 7.3 cm, weight 364.4 g. X-ray 2585. Inventory no. PMA/10535/8 (NG 14).

Axe 14. Shrinkage cavities on both faces at the base of the blade. Coarse and uneven surface, with metal streaks on the blade. The remains of the smaller pouring channel in the form of a knob. The faces are shifted relative to each other. Inside the socket, in the upper part, there are quite numerous, mostly small gas pores. Patina removed, golden-grey surface. Length 13.5 cm, blade height 6 cm, min. width 3.4 cm, cutting edge width 4.9 cm, dimensions of the socket mouth 3.4×2.5–2.7 cm, socket depth 7.4 cm, weight 387.7 g. X-ray 2539. Inventory no. MMZ/A-2018/3.

Axes 15 and 16, cast in mould 8 (Figs. 11:15.16, 12:15.16, 13:15.16, 16). Hexagonal cross-section, asymmetrical longitudinal section—one face is more convex. Loops with a rhomboidal cross-section, similar in size but with holes of assorted sizes, set on the edge of the socket, topped with a thickening in the form of a flat, pointed rib, incomplete in specimen 15 and slightly narrowed on the side of one face in specimen 16. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The lateral edges of the socket are usually poorly defined. The decoration, extending almost to the base of the blade (cast on the more convex face), consists of pointed ribs: two horizontal ones at the level of the loop and, below, three V-shaped ones with straight arms; the arms of the upper and middle ribs touch the lower circumferential rib; the arm of the lower rib on the side of the loop extends

to the lateral edge, the other is overrun and reaches the casting seam. Solid blades of medium height, with a wide, slightly arched cutting edge, in the case of axe 16—with a casting seam. The edges of the blade of specimen 15 are quite sharp, those of specimen 16 are uneven. The flashes on the sides are narrow and quite even. The faces are shifted relative to each other. Conical, shallow, oval sockets, rounded at the bottom.

Axe 15. Incomplete rib on the edge of the socket and a misrun in the more convex face. Slightly oblique loop, the upper base is missing (so-called cold shut). Shrinkage cavities on both faces at the base of the blade. Mostly slightly coarse surface, with metal streaks on the blade. A gas pore inside the socket, under the edge. Brown-green patina. Length 14.2 cm, blade height 5.9 cm, min. width 3.3 cm, cutting edge width 5.2 cm, dimensions of the socket mouth 3.4×2.6–2.7 cm, socket depth 7.2 cm, weight 363.9 g. X-ray 2587. Inventory no. PMA/10535/11 (NG 24).

Axe 16. Cast on the less convex face, there is a small fragment of the lower V-shaped rib; on the other side, there are incomplete horizontal ribs and the tops of the angled ribs. Surface mostly coarse, with metal streaks above the cutting edge, slightly rough higher up. The remains of the smaller pouring channel in the form of a knob. Patina removed, golden-grey surface. Length 13.9 cm, blade height 5.9 cm, min. width 3.2 cm, cutting edge width 5.1 cm, dimensions of the socket mouth 3.4×2.4–2.7 cm, socket depth 7 cm, weight 361.8 g. X-ray 2579. Inventory no. MMZ/A-2018/7.

Axe 17, cast in mould 9 (Figs. 13:17, 17, 18). Constricted slightly above the mid-length. The cross-section of the socket and the lower part of the blade is hexagonal, the rest of the blade is octagonal, and the longitudinal section is asymmetrical. Metal-filled loop, placed on the edge of the socket, topped with an incomplete thickening in the form of a pointed rib of unequal width. On the edge of the socket, opposite the loop, there is a probable trace of a pouring channel.¹⁵ The lateral edges of the socket are poorly defined, unmarked at the top. At the level of the loop, there is a narrow horizontal rib; below it, there are two more massive V-shaped ribs with straight arms, from the tops of which extend short vertical ribs; on one face, the arms of the ribs reach the lateral edges; on the other, the ribs are narrower, and a vertical rib, curved at right angles at the bottom, runs through the ends of the arms preserved on one side. Wedge-shaped blade, with blunt lateral edges, one face of medium height and the other (flat and more strongly undercut) high. Cutting edge of medium width, rounded. On both faces, there are shrink-

¹⁵ A. GARBACZ-KLEMPKA *ET ALII* 2018, fig. 5, where the channel was marked on the opposite side.

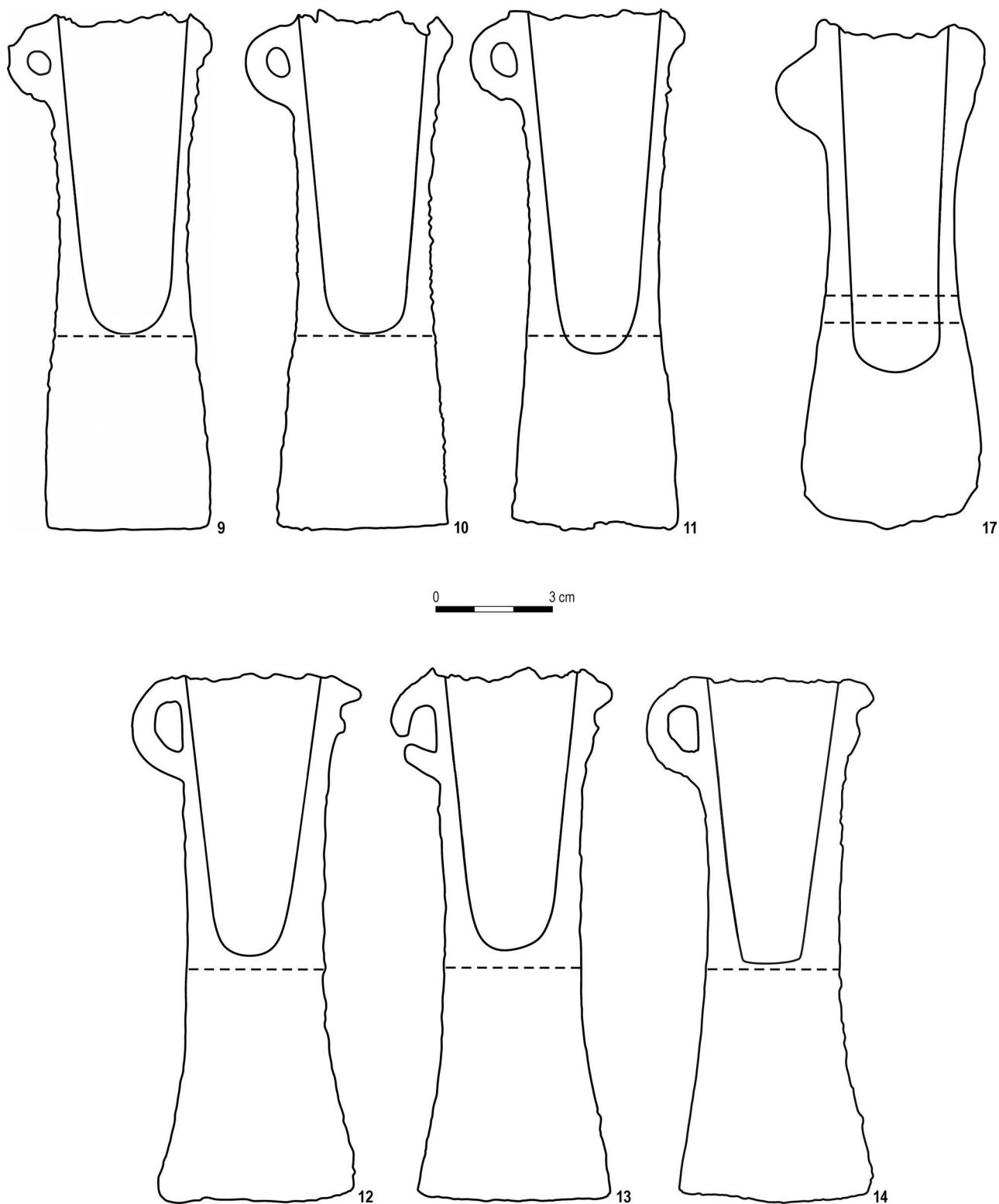


Fig. 13. Nowa Górna. Sections of the axes with a straight socket edge, variant B. For the key, see Fig. 7.

Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 13. Nowa Górna. Przekroje siekier z prostym wylotem tulejki, wariantu B. Legenda por. Ryc. 7.

Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

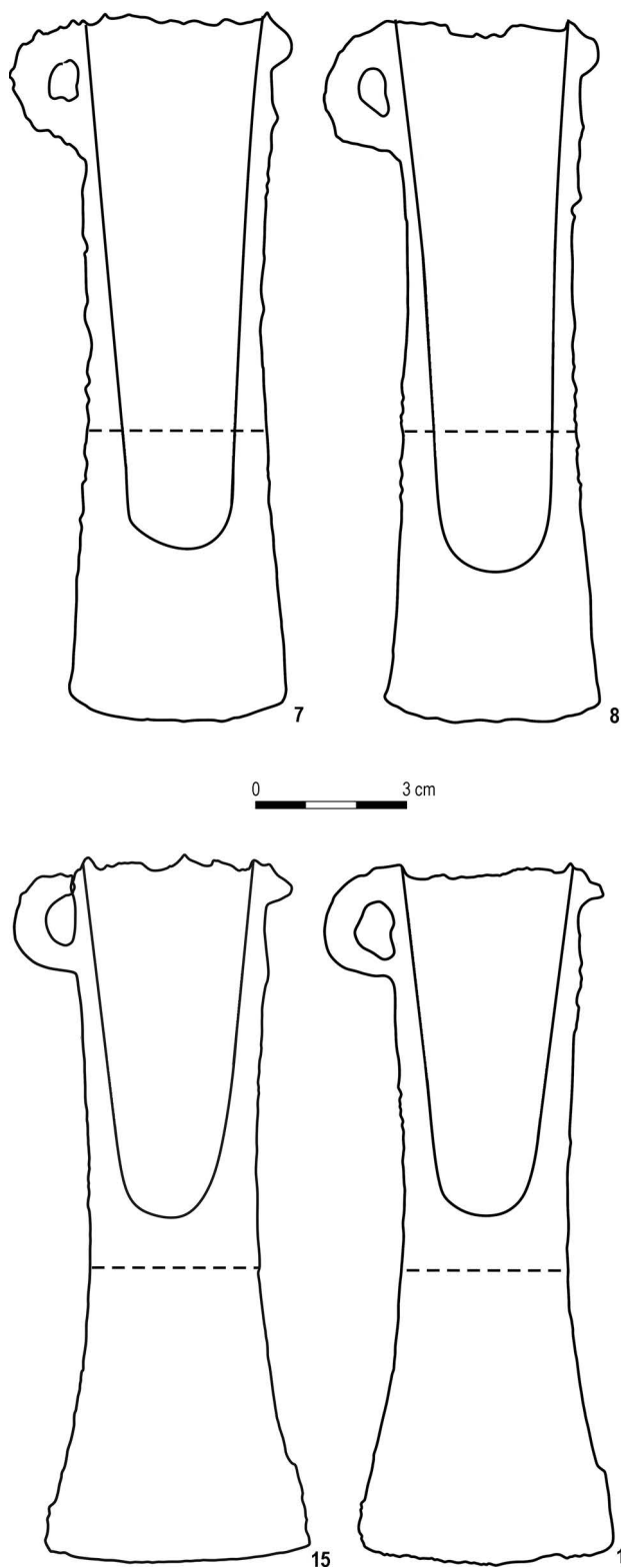


Fig. 13. (cont.).

Ryc. 13. (cd.).

age cavities at the base of the solid part of the blade. In the place of the casting seams on the sides of the socket, there are wide and uneven thickenings; above the cutting edge, the flashes are narrow and high, and invisible higher up on the flattened sides of the socket. Coarse and uneven surface. The faces are significantly shifted relative to each other. The socket is almost cylindrical, of medium depth, oval, rounded at the bottom. Inside the socket, in the upper part, there are mostly shallow gas pores; under the presumed pouring channel, the hole is large and deep. Chipped cutting edge, significantly damaged socket. Brown-green patina. Length 13 cm, blade height 5.3 and 6 cm, min. width 3.2 cm, cutting edge width 4.5 cm, dimensions of the socket mouth 2.7–2.9×2.2–2.3 cm, socket depth 9 cm, weight 294.2 g. X-ray 2586. Inventory no. PMA/10535/12 (NG 25)

18–36. Axes with a straight socket edge, variant Kuśnierz C¹⁶

Axes 18–24. Decorated on the upper part of the socket with two nested V-shaped ribs with tops pointing downwards and, below, with a Y-shaped rib with a short leg.

Axes 18 and 19, cast in mould 10 (Figs. 19, 20:18.19, 21, 22:18.19). Constricted at the mid-length. The cross-section of the socket is oval, of the blade quadrangular, and the longitudinal section is almost wedge-shaped. The loop has a rhomboidal cross-section and is set below the edge of the socket surrounded by a prominent, rounded thickening, narrowed on the side of the same face in both axes. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. On the sides of the socket, there are two poorly marked, narrow, vertical planes, separated from the faces by vertical ribs of various lengths, later transitioning into the lateral edges of the blade. The arms of the V-shaped ribs are straight on one face, slightly concave on the other. Holes on the opposite sides, the smaller one under the loop. The blades are low, solid, with one (not the same) face slightly thinned and flattened (with a step at the base) and a very narrow, straight, sharp cutting edge. The sides of the axes above the cutting edge are flattened, and higher up, the side without the loop is rounded almost up to the hole. The other side is flat in the right half; in specimen 19, this flattening reaches almost to the hole; in axe 18, it ends halfway along the side and has an uneven width. The lateral edges of the blade are sharp above the cutting edge and, above it, only along the flat section on the side with the loop. Faint traces of hammering on the thinned face of the blade. The casting seam on the loop is narrow and low;

¹⁶ For a compilation of terminology used to describe specimens decorated with a Y-shaped rib, cf. J.G. TARBAY (2014, fig. 10).

above and below the loop, it is flattened to the base of the blade and invisible on the side of the blade. On the upper part of the second side, the seam is in the form of a low, sometimes flattened rib, almost imperceptible

lower down. Conical sockets, of medium depth, oval, slightly rounded at the bottom.

Axe 18. The leg of the Y-shaped rib is incomplete on one face, with two holes on the other side. On this face,

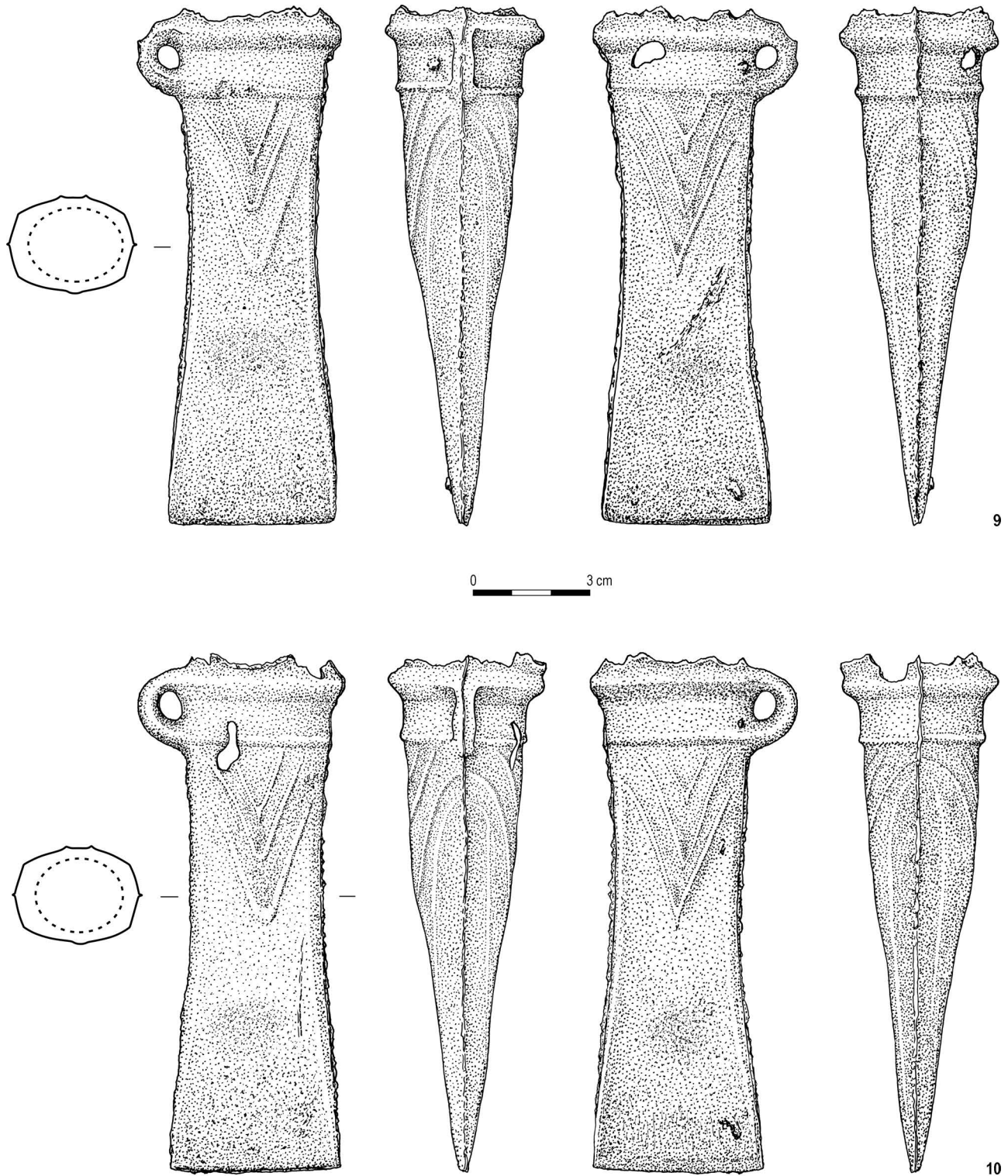


Fig. 14. Nowa Górna. Axes 9–11 with a straight socket edge, variant B, cast in the same mould. Bronze. Drawing: B. Karch.

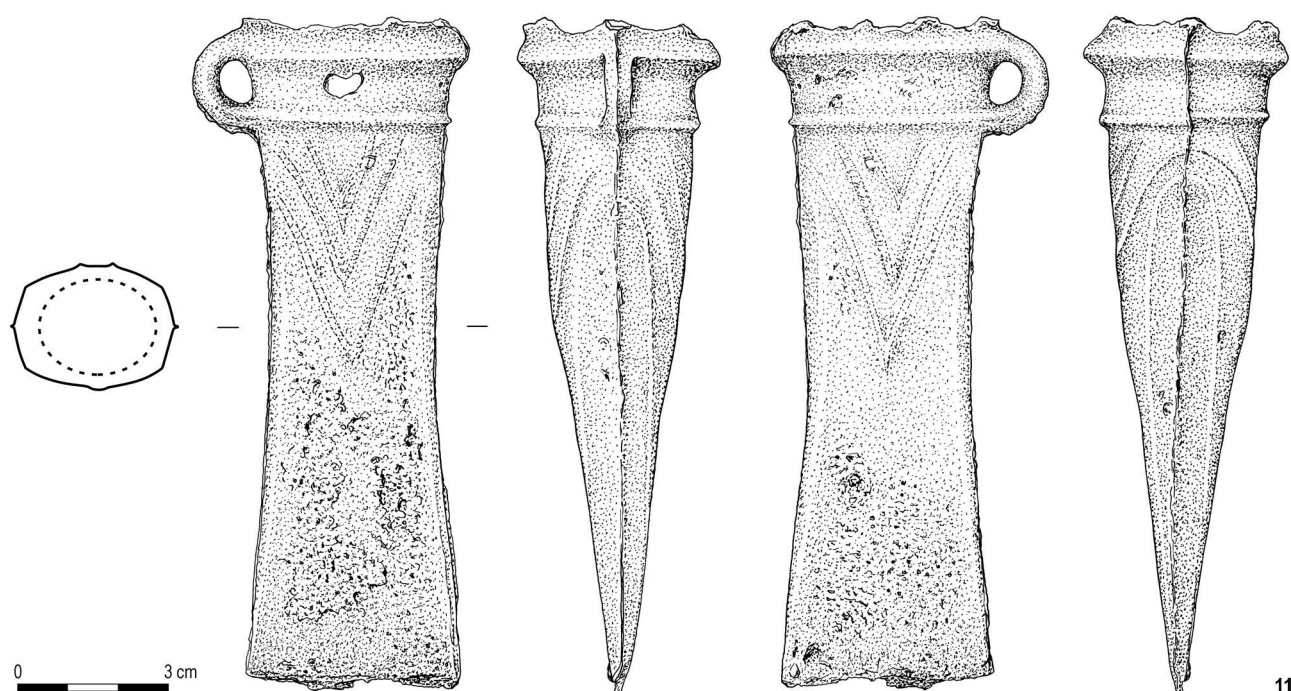


Fig. 14. (cont.).

Ryc. 14. (cd.).

at the base of the blade, there is a shrinkage cavity; on the extension of the Y-shaped rib, there is a long, rough streak of metal and several smaller ones nearby. The hole under the loop is round, the other one oval. Most of the surface of one face is slightly coarse; the other face is rough, with a part of the blade slightly smoother. Inside the socket, there are numerous small gas pores. Slightly chipped cutting edge. Green-brown patina, darkest in the rough spots. Length 12.6 cm, blade height 4.1 cm, min. width 3.6 cm, cutting edge width 4.7 cm, dimensions of the socket mouth 3.6×2.7 cm, socket depth 8.4 cm, diam. of the holes in the sides 0.15 and 0.25×0.3 cm, weight 249.4 g. X-ray 2588. Inventory no. PMA/10535/1 (NG 23).

Axe 19. Incomplete lower base of the loop, a misrun in each face and vertical ribs on the sides of the socket. On one face, the V-shaped ribs are almost invisible, and there is a shallow shrinkage cavity at the base of the blade. On the opposite side, a cavity is deeper, and the arms of the ribs are incomplete. The hole under the loop is oval, the other one is almost round. One face of the axe is almost entirely smooth, the other is slightly rough and smooth only above the cutting edge. Inside the socket, in the upper part, there are numerous and generally small gas pores, with several larger holes at the level of the misruns in the faces. Brown-green patina, darkest in the rough spots. Length 12.7 cm, blade height 3.9 cm,

min. width 3.6 cm, cutting edge width 4.7 cm, dimensions of the socket mouth 3.4–3.6×2.7 cm, socket depth 8.4 cm, diam. of the holes in the sides 0.3×0.2 and 0.4 cm, weight 257.1 g. X-ray 2588. Inventory no. PMA/10535/2 (NG 11).

Axes 20–23, cast in mould 11 (Figs. 20:20–23, 22:20–23, 23, 24:20–23). Constricted at the mid-length. The cross-section of the socket is oval, of the blade of specimen 20 quadrangular, in the other specimens, the cross-section is quadrangular above the cutting edge and roughly pentagonal higher up; the longitudinal section is slightly asymmetrical. Loop of rhomboidal cross-section, set below the edge of the socket surrounded by a prominent, rounded thickening of uneven width (in specimens 20 and 21, narrowed on the side of the same face, and in specimens 22 and 23—on the opposite side). On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. On the sides of the socket, there are two poorly marked narrow vertical planes, separated from the faces by vertical ribs later transitioning into the lateral edges of the blade. The ribs forming the on the faces are massive, sparsely spaced, with usually straight arms. Holes on the opposite sides, a smaller one under the loop. Low, solid blades, slightly thinned on both sides (with a step at the base of specimen 20), with faint traces of hammering, with one (the same) face flattened. The same blade face in axes 21 295

and 22 and the opposite one in specimen 23 is slightly higher than the other; in specimens 22 and 23, it slightly overlaps the socket (mismatches). The cutting edges are very narrow, straight and sharp. The edges of the blades

are sharp in the lower part, at the level of the flat sides, and only in the case of axe 20 one edge on the side without the loop is sharp along its entire length. This side is rounded almost up to the hole, and the other side is flat

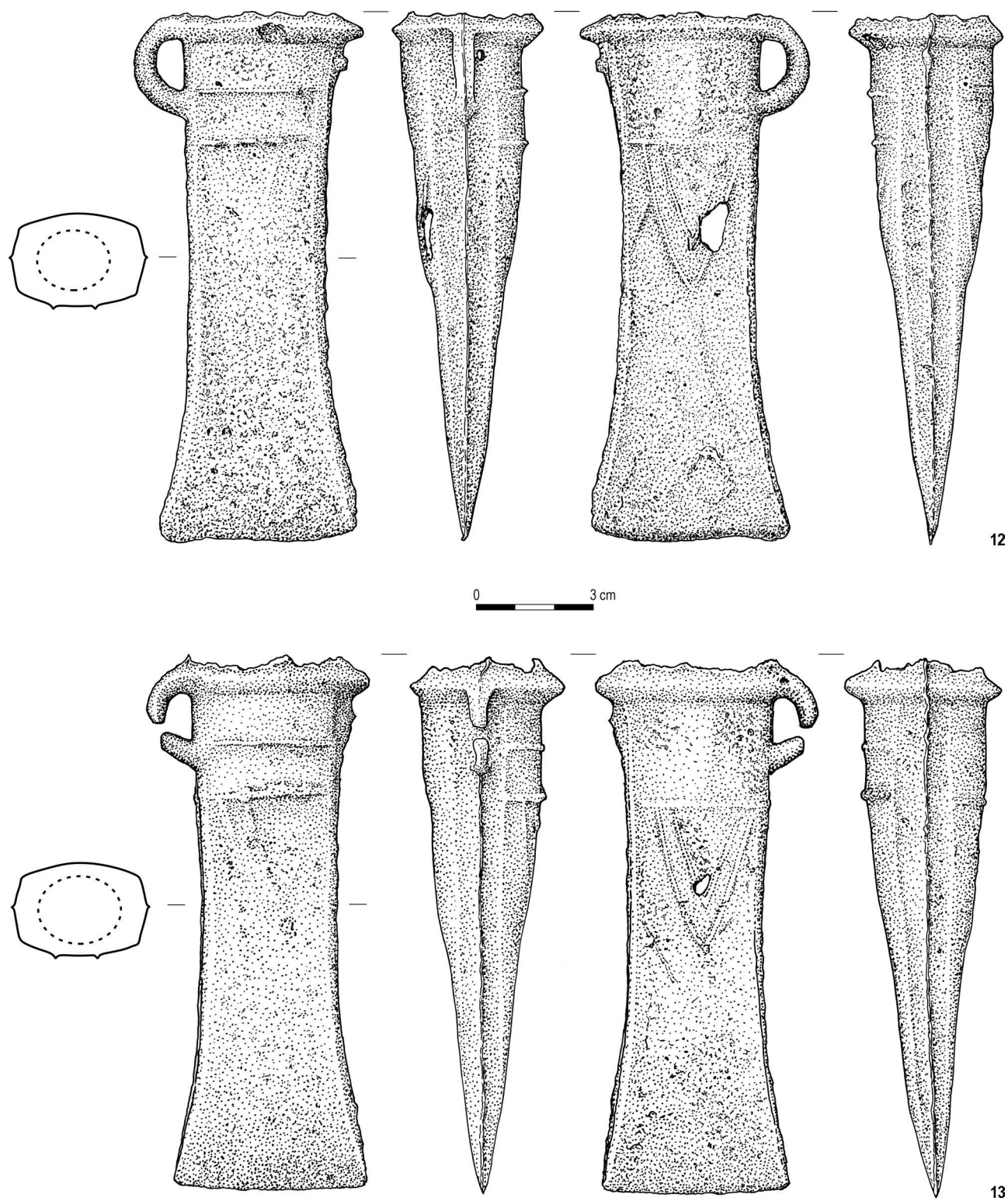


Fig. 15. Nowa Górna. Axes 12–14 with a straight socket edge, variant B, cast in the same mould. Bronze. Drawing: B. Karch.

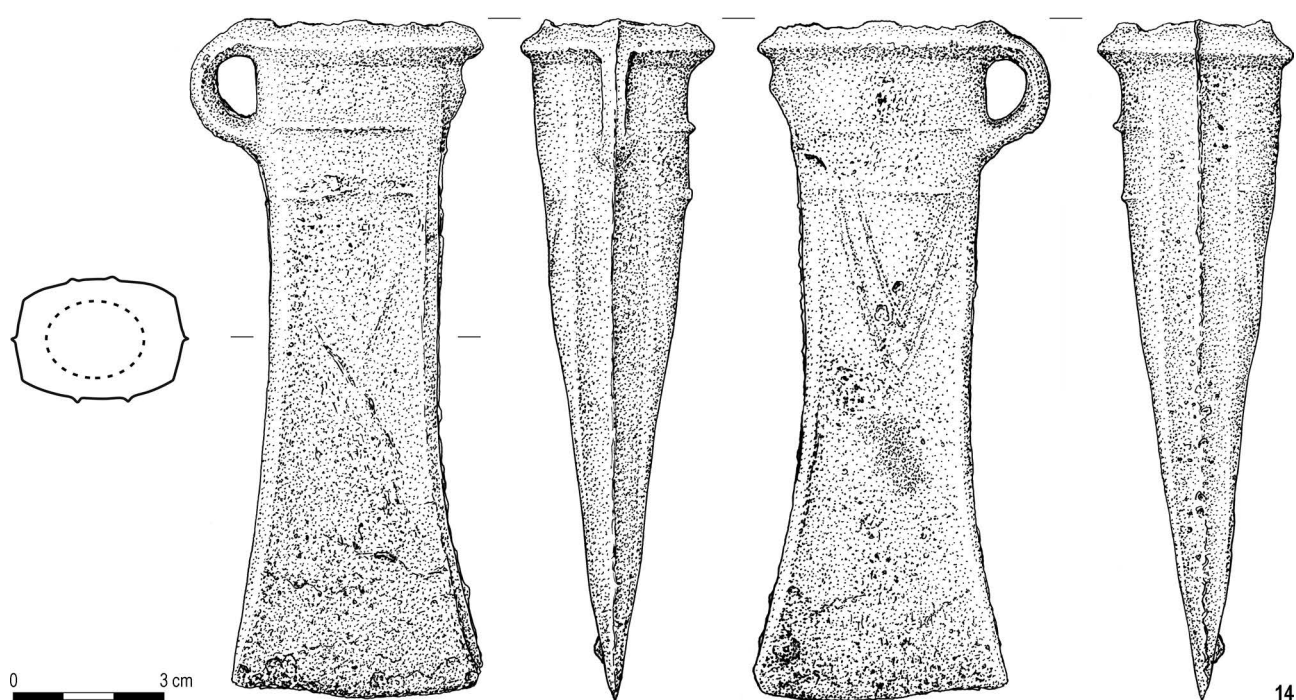


Fig. 15. (cont.).

Ryc. 15. (cd.).

in the right half (as in specimens 18 and 19). In all four axes, the casting seam is flattened above the loop and around the hole and up to approx. 1 cm lower, and quite narrow and low on the loop and just below it; further down, there is a noticeable trace of a narrow seam (even in axe 20, uneven in specimen 21 and flattened in axes 22 and 23). In the upper part of the other side of specimen 20, there is a casting seam in the form of a low rib; lower down and in some places on the thickening at the edge of the socket, it is invisible. In the remaining axes, there is a low, partially flattened rib in place of the seam along the entire length of the side without the loop. The faces of axes 21–23 are shifted relative to each other. Conical sockets of medium depth, oval, straight at the bottom.

Axe 20. Three misruns on both faces, shrinkage cavities at the base of the blade, and metal streaks below the Y-shaped ribs (the leg of one was incomplete). Round hole under the loop, the other one oval. Surface slightly coarse, rough in places, smooth on the blade above the cutting edge. Inside the socket, except for the lower part, there are numerous gas pores of various sizes, the largest one halfway up the side with the loop. Broken-off corner of the blade. Brown-green patina, black in the rough spots. Length 12.6 cm, blade height 3.5 cm, min. width 3.6 cm, preserved cutting edge width 4 cm, dimensions of the socket mouth 3.6×2.6 cm, socket depth 8.5 cm, diam. of the holes in the sides 0.15 and 0.3 cm, weight 240.7 g. X-ray 2589. Inventory no. PMA/10535/4 (NG 22).

Axe 21. Incomplete leg of the Y-shaped rib (as in specimen 20) and four misruns on one socket face, two in the other side. Deep shrinkage cavities on both faces at the base of the blade, and metal streaks under the Y-shaped ribs. An oval hole under the loop, the other one round. Slightly coarse surface, rough in places, and smooth in a narrow strip above the cutting edge. Inside the socket, there are numerous gas pores of various sizes (at least in the lower part), the largest one near the gap left by the pouring channel. Brown-green patina, black in the rough spots. Length 12.5 cm, blade height 3.3 and 3.9 cm, min. width 3.6 cm, cutting edge width 4.2 cm, dimensions of the socket mouth 3.5×2.7 cm, socket depth 8.6 cm, diam. of the holes in the sides 0.2 cm and 0.3 cm, weight 242.7 g. X-ray 2589. Inventory no. PMA/10535/3 (NG 13).

Axe 22. Incomplete leg of the Y-shaped rib (as in axes 20 and 21) and two misruns on one socket face, a shallow shrinkage cavity at the base of the blade. A pit-shaped cavity on the other face, closer to one side. Irregular hole under the loop, the other one round. Mostly slightly coarse surface, rough in places in the lower part of one face, blade smooth above the cutting edge. Inside the socket, in the upper part there are a few gas pores, one large hole under the edge, next to the pouring channel (as in specimen 21), the other one slightly deeper. Cutting edge chipped. Patina removed, golden-grey surface, black in the rough spots. Length 12.6 cm, blade height 3.5 cm and 4 cm, min. width 3.7 cm, cutting edge width

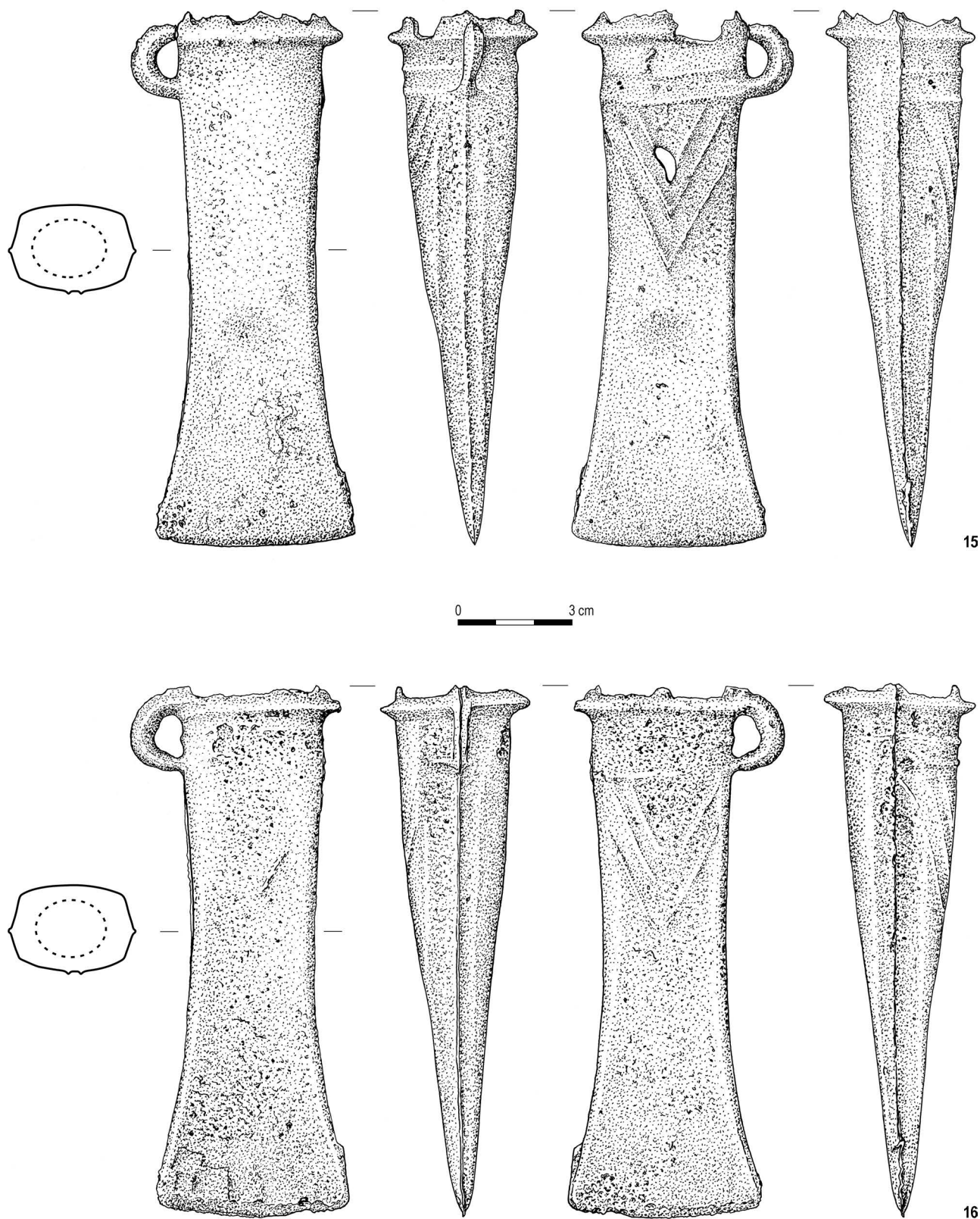


Fig. 16. Nowa Górna. Axes 15 and 16 with a straight socket edge, variant B, cast in the same mould. Bronze. Drawing: B. Karch.
Ryc. 16. Nowa Górna. Siekierki 15 i 16 z prostym wylotem tulejki, wariantu B, odlane w tej samej formie. Brąz. Rys.: B. Karch.

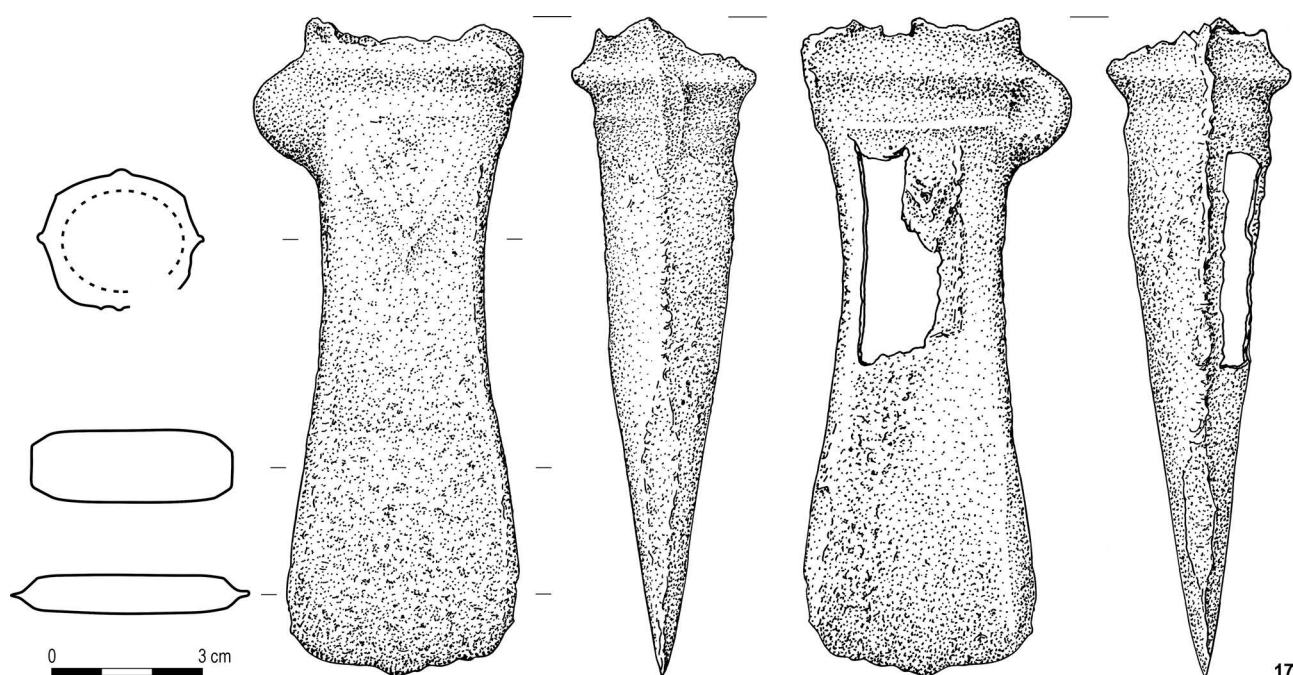


Fig. 17. Nowa Górna. Axe 17 with a straight socket edge, variant B. Bronze. Drawing: B. Karch.

Ryc. 17. Nowa Górna. Siekierka 17 z prostym wylotem tulejki, wariantu B. Brąz. Rys.: B. Karch.



Fig. 18. Nowa Górna. Casting and treatment details of axe 17 with a straight socket edge, variant B. Bronze. Photo: B. Solarewicz.

Ryc. 18. Nowa Górna. Detale odlewu i opracowania siekierki 17 z prostym wylotem tulejki, wariantu B. Brąz. Fot.: B. Solarewicz.

4.3 cm, dimensions of the socket mouth 3.5–3.7×2.6–2.7 cm, socket depth 8.8 cm, diam. of the holes in the sides 0.25 cm and 0.4 cm, weight 250 g. X-ray 2580. Inventory no. MMZ/A-2018/9.

Axe 23. Incomplete decoration and a misrun on one socket face. Round holes in the sides. Mostly coarse surface, part of one face rough, blade fairly smooth above the cutting edge. A few gas pores inside the socket, in its upper part (one of them next to the pouring channel as in specimens 21 and 22), a few larger ones in the side with the loop. Chipped cutting edge, broken-off corner of the blade. Patina removed, golden-grey surface. Length 12.7 cm, blade height 3.5 cm and 4 cm, min. width 3.6 cm, preserved cutting edge width 4.1 cm, dimensions of the socket mouth 3.7×2.7–2.8 cm, diam. of the holes in the sides 0.25 cm and 0.35 cm, socket depth 8.9 cm, weight 242.3 g. X-Ray 2568; Inventory no. MMZ/A:2018/15.

Axe 24, cast in mould 12 (Figs. 20:24, 22:24, 24:24, 25). Constricted at the mid-length. The cross-section of the socket is oval, of the blade hexagonal, roughly pentagonal just above the cutting edge; the longitudinal section is wedge-shaped. Loop of rhomboidal cross-section, 299

set below the edge of the socket surrounded by a prominent rounded thickening of uneven width. On the edge of the socket, in the middle of the faces, traces of protrusions left by two pouring channels. On the sides of the socket, two narrow planes, separated from the faces by vertical ribs later transitioning into the lateral edges of

the blade. The ribs forming the decoration on the faces are tightly spaced, with straight arms, partly incomplete. Round holes on the opposite sides, the smaller one under the loop. Undefined blade with a very narrow, straight, sharp cutting edge. The side with the loop is flat just above the cutting edge, the other side less flattened at

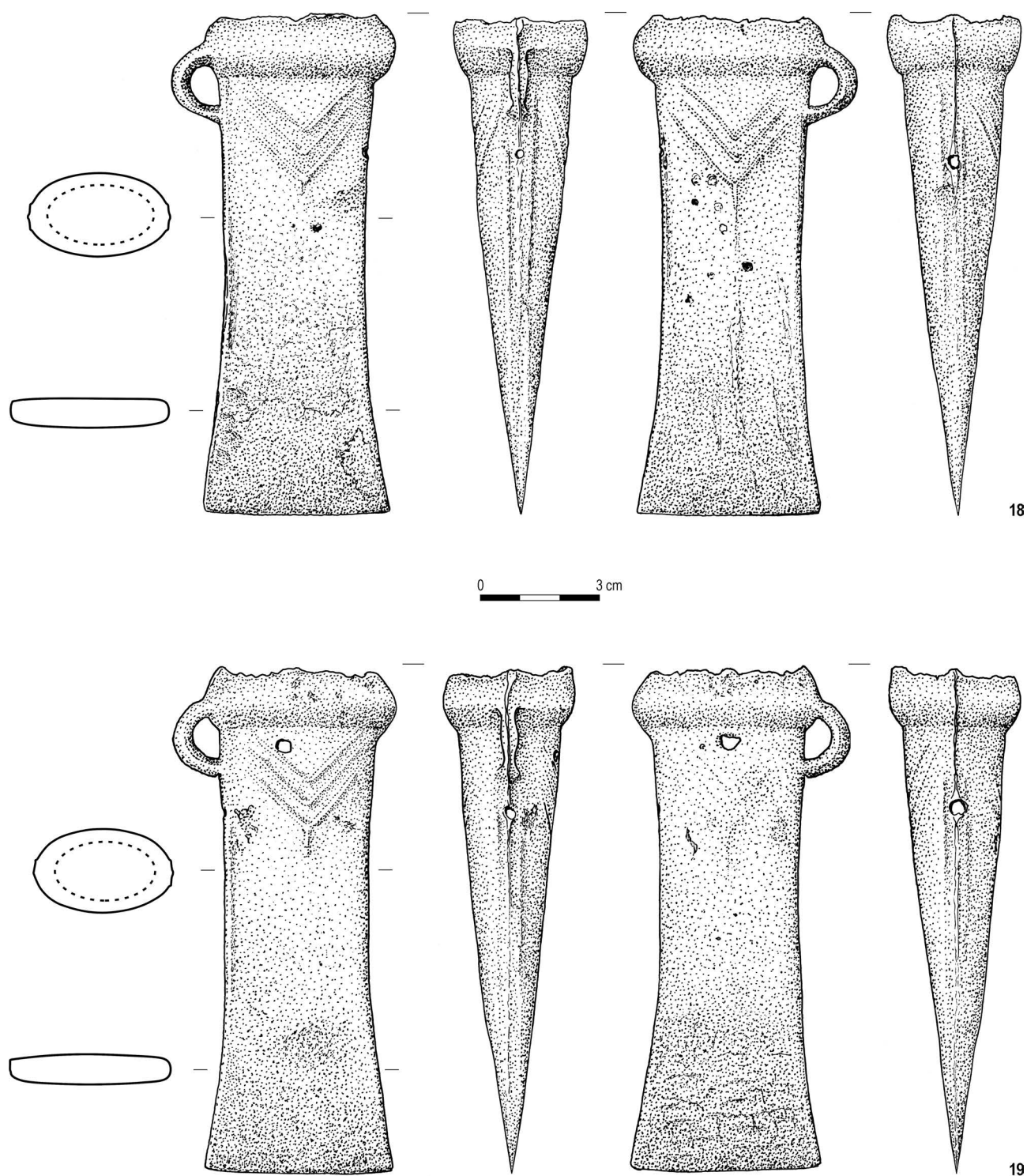


Fig. 19. Nowa Górna. Axes 18 and 19 with a straight socket edge, variant C, cast in the same mould. Bronze. Drawing: B. Karch.

a slightly longer length. Edges of the blade sharp in the lower part, at the level of the flat sides. Shrinkage cavities on both faces at the base of the blade—a deep, pit-shaped one on the face with three misruns, a shallow one on the other side. A misrun in the side without the loop. The casting seams on the upper part of the sides are narrow and low, and flat below the holes. Rough and largely coarse surface, with a smooth strip above the cutting edge. Conical socket of medium depth, oval,

slightly rounded at the bottom. Quite numerous, mostly small gas pores inside the socket, especially in its upper part. Patina removed, golden-grey surface (darkest in the rough spots). Length 12.5 cm, min. width 3.5 cm, cutting edge width 4.2 cm, dimensions of the socket mouth 3.6-3.7×2.8 cm, socket depth 8.4 cm, diam. of the holes in the sides 0.3 cm, weight 245.1 g. X-Ray 2584. Inventory no. MMZ/A-2018/25.



Fig. 20. Nowa Górna. Axes 18–24 with a straight socket edge, variant C. Bronze. Photo: B. Solarewicz.

Ryc. 20. Nowa Górna. Siekierki 18–24 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.



Fig. 21. Nowa Górn a. Details of the socket side and edge treatment of axes 18 and 19 with a straight socket edge, variant C. Bronze.

Photo: B. Solarewicz.

Ryc. 21. Nowa Górn a. Detale opracowania boków i krawędzi tulejek siekier 18 i 19 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.

Axes 25 and 26. Decorated on the socket with two horizontal ribs (on the same face in both specimens, the ribs run at a slightly angle), a Y-shaped rib whose arms touch the lower horizontal rib, and with vertical ribs on either side, gently flared at the top.

Axe 25, cast in mould 13 (Figs. 26:25, 27:25, 28:25, 29:25). Constricted at the mid-length. The cross-section of upper part of socket is irregular and hexagonal below; the longitudinal section is somewhat asymmetrical. Large, elongated loop of rhomboidal cross-section, set below the edge of the socket surrounded by a biconical thickening, slightly narrowed in places. On the edge of the socket, in the middle of the faces, traces of protrusions left by two pouring channels. Holes on the opposite sides, round one under the loop, the other one larger and oval in shape. The lateral edges of the socket are poorly defined, incomplete on the side without the loop above the hole. The decoration, extending almost to the base of the blade, is composed of sparsely spaced massive ribs. Blade of medium height, solid, heavily thinned on both sides,

with flat faces with traces of hammering and a sharp one edge on the side without the loop. Wide, straight cutting edge, with a casting seam. On the sides, the flashes are narrow, mostly low and fairly even; the seam on the side with the loop was broken off just above the cutting edge. The surface of the socket is slightly coarse, uneven on the side without the loop, partially rough on one face of the blade. The faces are slightly shifted relative to each other. Conical socket of medium depth, lenticular, straight at the bottom. Patina removed, golden-grey surface, black in the rough spots. Length 12.7 cm, blade height 4.7 cm, min. width 3.2 cm, preserved cutting edge width 4.9 cm, dimensions of the socket mouth 3.4×2.3 cm, socket depth 8 cm, diam. of the holes in the sides 0.3 cm and 0.3×0.35 cm, weight 171.3 g. X-Ray 2567. Inventory no. MMZ/A-2018/11.

Axe 26, cast in mould 14 (Figs. 26:26, 27:26, 28:26, 29:26). Constricted at the mid-length. The cross-section is hexagonal, the longitudinal section is slightly asymmetrical. Small, elongated loop of rhomboidal cross-

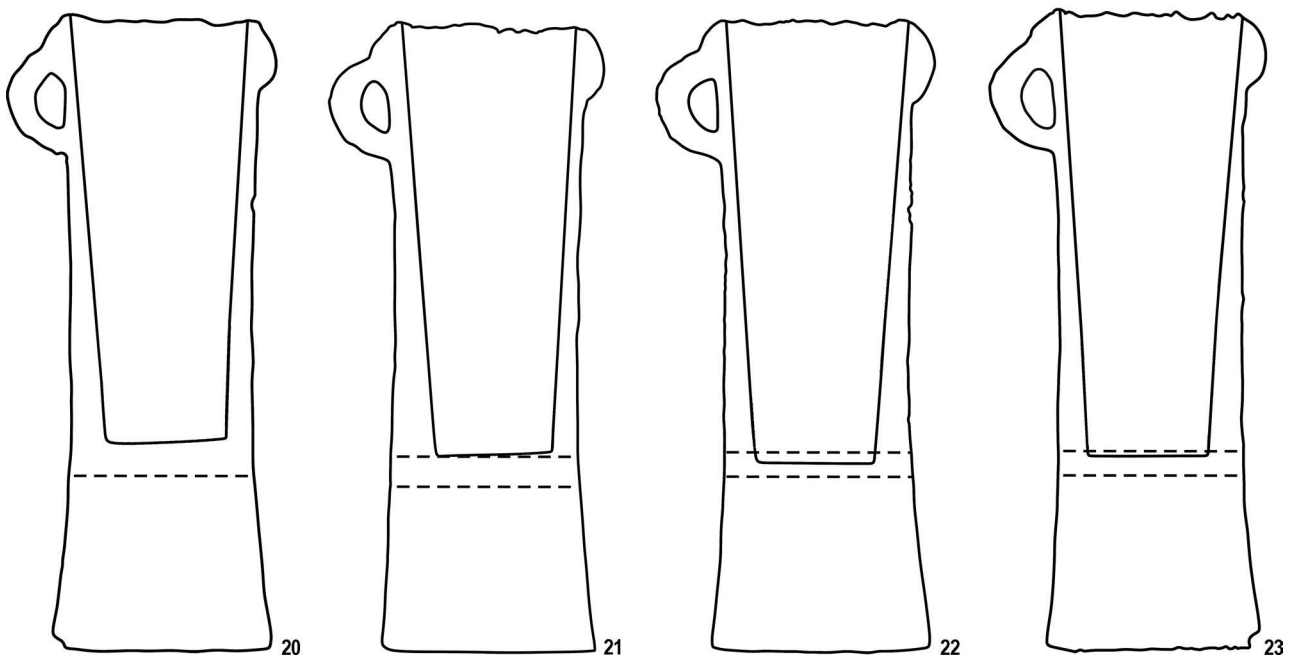
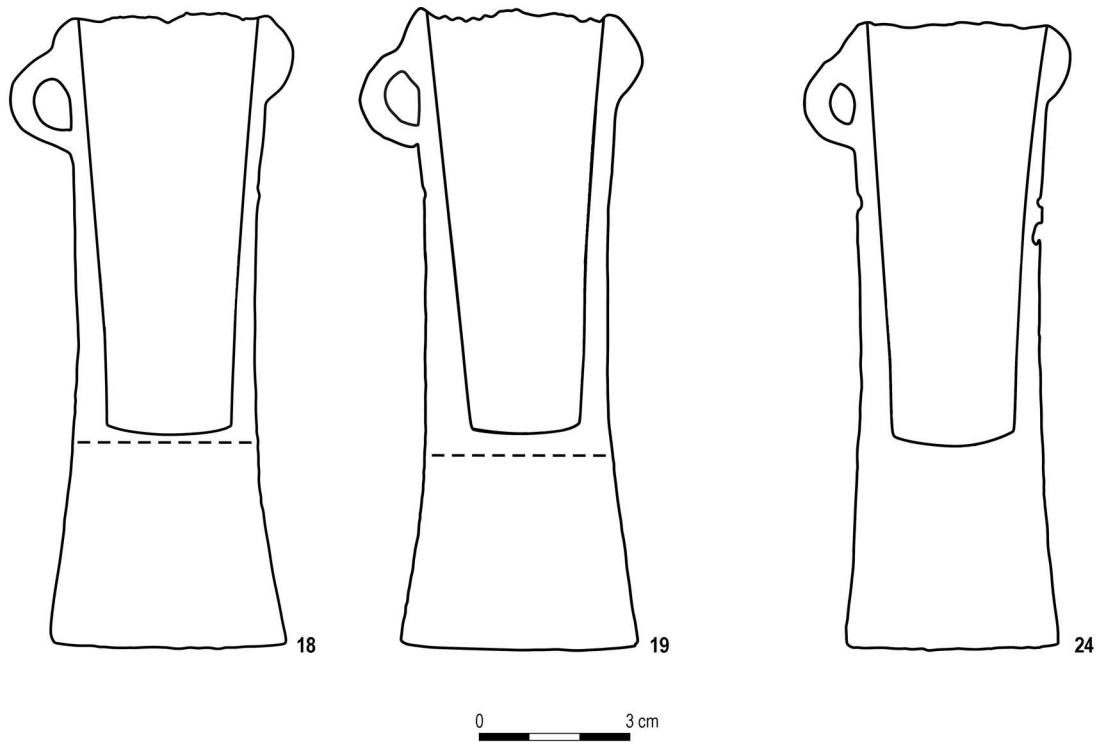


Fig. 22. Nowa Górna. Sections of axes 18–24 with a straight socket edge, variant C. For the key, see Fig. 7.

Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 22. Nowa Górna. Przekroje siekier 18–24 z prostym wylotem tulejki, wariantu C. Legenda por. Ryc. 7.

Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

section, set below the edge of the socket surrounded by a rounded thickening. On the edge of the socket, in the middle of the faces, traces of protrusions left by two pouring channels. The faces of the socket are separated from the sides by vertical ribs (incomplete). Oval holes

on the opposite sides, the smaller one under the loop. Tightly spaced Y-shaped and vertical ribs. Low, solid blade, thinned on both sides, with traces of hammering, with one flat face and sharp one edge on the side without the loop. Cutting edge of medium width, straight. Flat 303

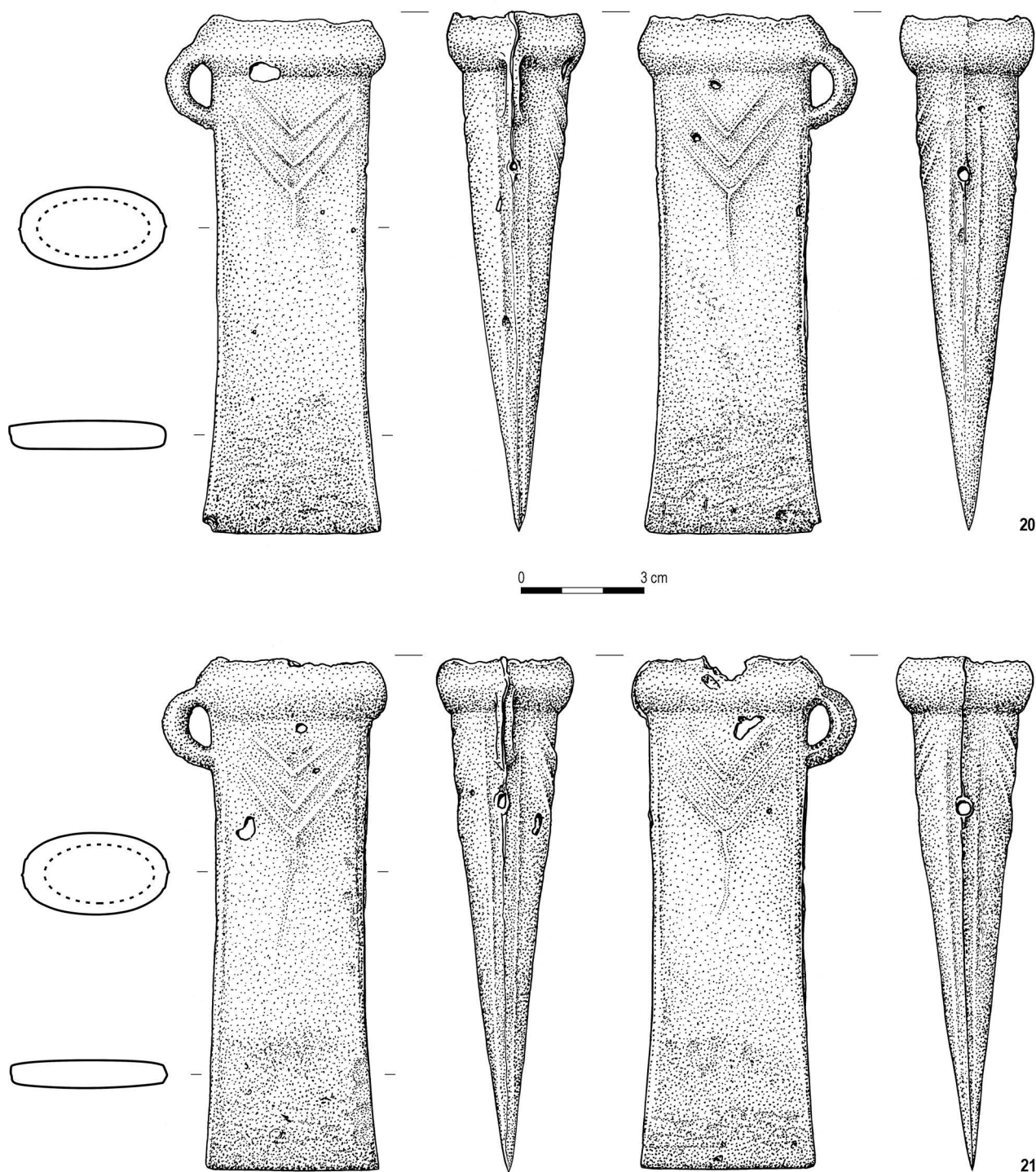
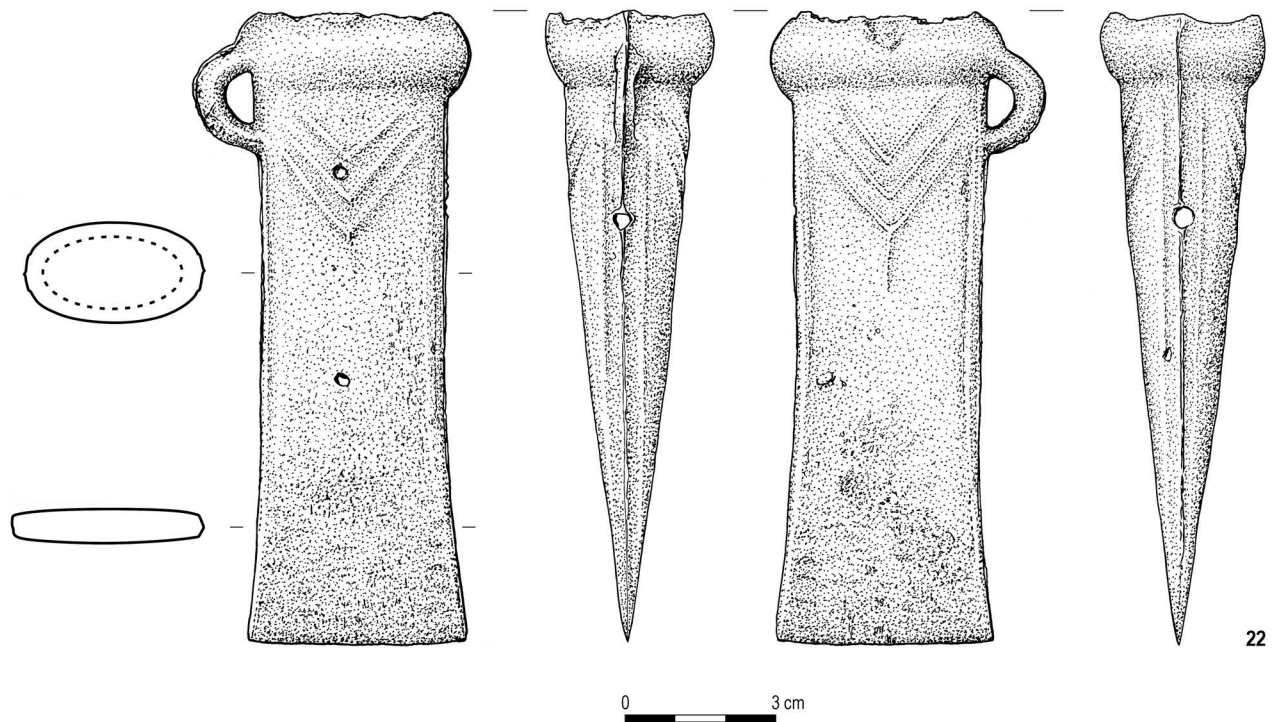


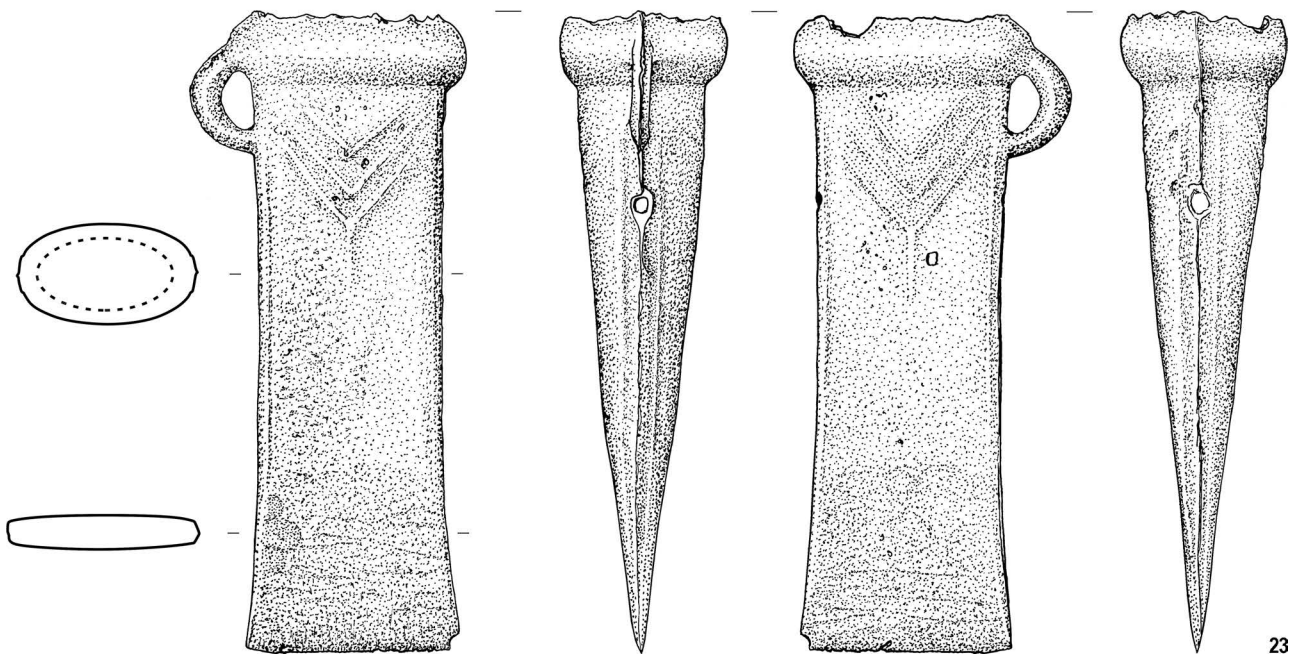
Fig. 23. Nowa Górna. Axes 20–23 with a straight socket edge, variant C, cast in the same mould. Bronze. Drawing: B. Karch.
Ryc. 23. Nowa Górna. Siekierki 20–23 z prostym wylotem tulejki, wariantu C, odlane w tej samej formie. Brąz. Rys.: B. Karch.

304 casting seam on the upper part of the loop and, above it, on the thickening on the edge of the socket; below and on the other side, the flashes are narrow, low and even. Slightly coarse surface on the socket, uneven in places, slightly rough on one face of the blade. Conical socket of medium depth, lenticular, straight at the bottom. In-

side the socket, especially under the edge, there are a few small gas pores. There is a chip in the cutting edge, one corner of the blade was broken off, the other is slightly deformed. Patina removed, golden-grey surface, black in the rough spots. Length 13.2 cm, blade height 4.2 cm and 4.4 cm, min. width 3.3 cm, preserved cutting edge width



22



23

Fig. 23. (cont.).

Ryc. 24 (cd.).

4.7 cm, dimensions of the socket mouth 3.5–3.6×2.5–2.7 cm, socket depth 8.8 cm, diam. of the holes in the sides 0.3 cm and 0.4 cm, weight 201.4 g. X-Ray 2569. Inventory no. MMZ/A-2018/17.

Axes 27 and 28. Decorated on the socket with massive, sparsely spaced ribs: two horizontal ones, a V-shaped

one between the arms of a Y-shaped rib, on either side of which there are vertical ribs flared at the top.

Axe 27, cast in mould 15 (Figs. 27:27, 28:27, 29:27, 30:27, 31:27). Constricted at the mid-length. The cross-section is hexagonal, and the longitudinal section is asymmetrical—one face is more convex. Loop of lenticular



Fig. 24. Nowa Górn a. Details of the socket side and edge treatment of axes 20–24 with a straight socket edge, variant C. Bronze. Photo: B. Solarewicz.

Ryc. 24. Nowa Górn a. Detale opracowania boków i krawędzi tulejek siekier 20–24 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.

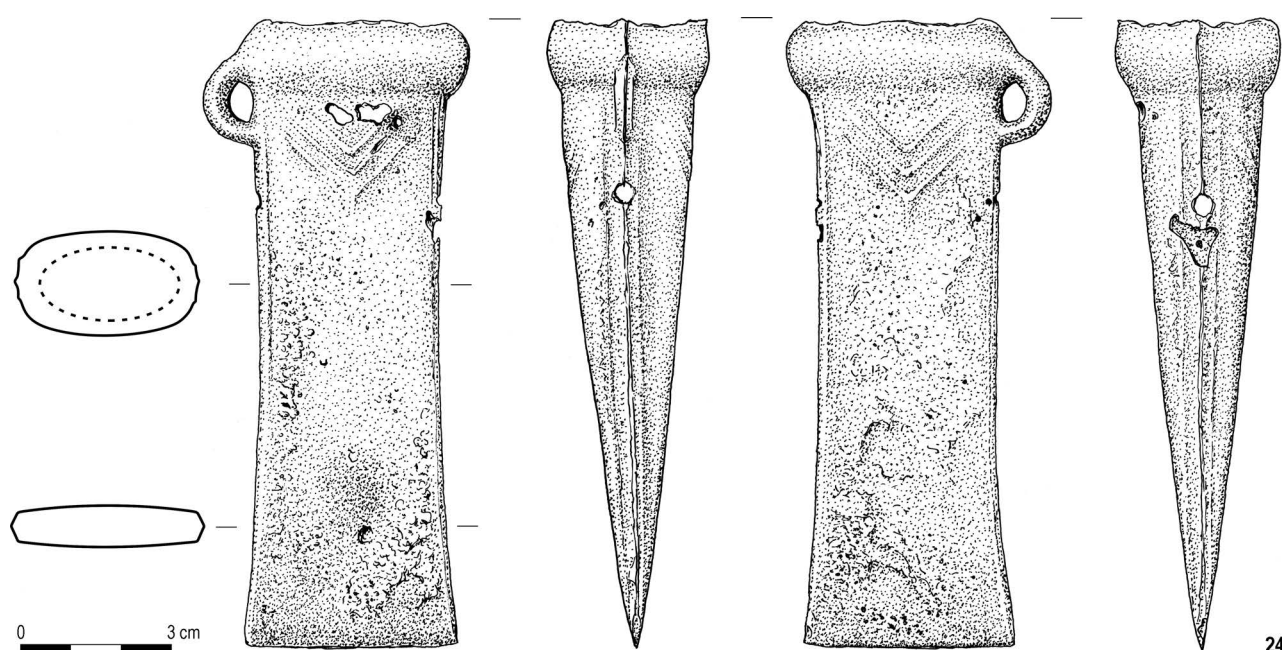


Fig. 25. Nowa Górn a. Axe 24 with a straight socket edge, variant C. Bronze. Drawing: B. Karch.

Ryc. 25. Nowa Górn a. Siekierka 24 z prostym wylotem tulejki, wariantu C. Brąz. Rys.: B. Karch.

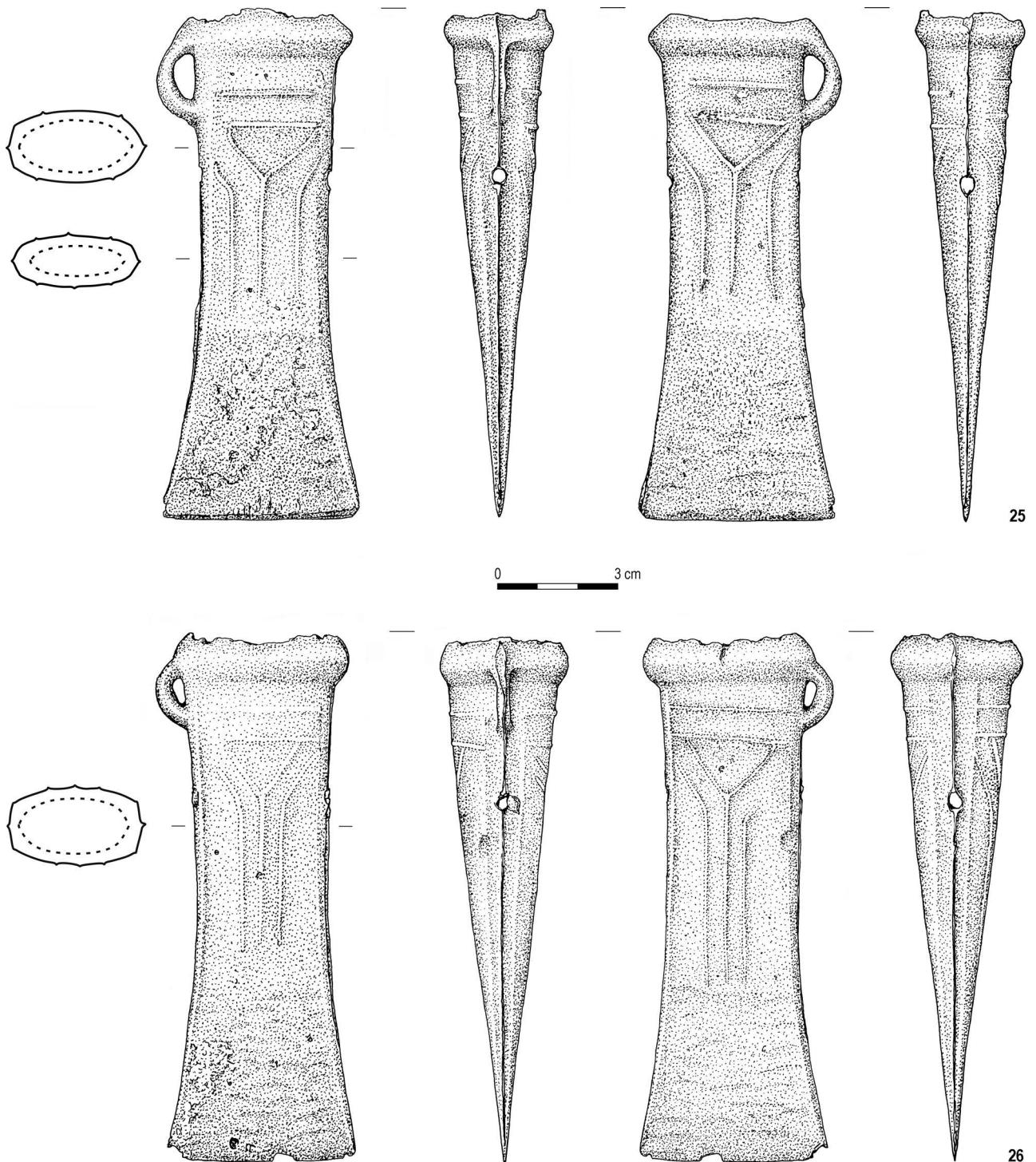


Fig. 26. Nowa Górna. Axes 25 and 26 with a straight socket edge, variant C. Bronze. Drawing: B. Karch.

Ryc. 26. Nowa Górna. Siekierki 25 i 26 z prostym wylotem tulejki, wariantu C. Brąz. Rys.: B. Karch.

cross-section, set below the edge of the socket surrounded by an incomplete rounded thickening of uneven width. On the edge of the socket, in the middle of the faces, traces of protrusions left by two pouring channels. The faces of the socket are separated from the sides by verti-

cal ribs. Round holes on the opposite sides, the smaller one under the loop. The decoration (more poorly cast on the less convex face) covers the upper part of the socket. The arms of the V- and Y-shaped ribs touch the lower horizontal rib. Low, solid blade with traces of hammering, 307

slightly thinned on both sides, with sharp lateral edges, separated from the socket by horizontal notches. Narrow, straight, sharp cutting edge. The casting seams on the sides are narrow, low and even, the ones on the thickening on the edge of the socket are higher. Slightly coarse surface on the socket, slightly rough at the side with the loop, and smooth on the blade. Conical socket of medium depth, oval, straight at the bottom. Inside the socket, under the edge, there is a large gas pore, with a number of smaller pits below it. A chip in one face of the blade. Patina removed, golden-grey surface. Length 12.9 cm, blade height 3.8 cm and 4.2 cm, min. width 3.4 cm, cutting edge width 4.4 cm, dimensions of the socket mouth 3.6×2.6–2.7 cm, socket depth 8.2 cm, diam. of the holes in the sides 0.2 cm and 0.35 cm, weight 268.4 g. X-Ray 2566. Inventory no. MMZ/A-2018/5.

Axe 28, cast in mould 16 (Figs 27:28, 28:28, 29:28, 30:28). Constricted at the mid-length. The cross-section is roughly hexagonal, and the longitudinal section is slightly asymmetrical. Large loop of rhomboidal cross-section, set below the edge of the socket surrounded by an incomplete biconical thickening of uneven width. On the edge of the socket, in the middle of the faces, traces of protrusions left by two pouring channels, one in the form of a knob¹⁷. The lateral edges of the socket are very poorly defined. Round holes on the opposite sides, the smaller one under the loop. Both arms of the V-shaped ribs and one arm of the Y-shaped rib touch the lower horizontal rib. Low, solid blade, heavily thinned on both sides, with flat faces and a sharp edge on the side with the loop. Cutting edge of medium width, straight. A misrun on one face under the edge of the socket. The casting seams on the sides are mostly narrow and low. Mostly coarse surface, uneven in places, slightly rough above the cutting edge. Conical socket of medium depth, oval, slightly rounded at the bottom. A few gas pores inside the socket, under the edge and slightly deeper. The cutting edge is chipped, a corner of the blow was broken off. Brownish-green patina. Length 13.1 cm, blade height 3.8 cm and 4.2 cm, min. width 3.4 cm, preserved cutting edge width 4.8 cm, dimensions of the socket mouth 3.6×2.7 cm, socket depth 8.8 cm, diam. of the holes in the sides 0.1 cm and 0.3 cm, weight 193 g. X-Ray 2592. Inventory no. PMA/10535/13 (NG 7).

Axes 29–34. Decorated on the sockets with narrow ribs not reaching the base of the blade: three horizontal ribs, a V-shaped rib between the arms of a Y-shaped rib and with vertical ribs on both sides, sharply bent outwards at the top. The Y-shaped and vertical ribs are tightly spaced.

Axes 29 and 30, cast in mould 17 (Figs. 28:29.30, 29:29.30, 31:29.30, 32, 33:29.30). Constricted at the mid-



Fig. 27. Nowa Górná. Axes 25–28 with a straight socket edge, variant C. Bronze. Photo: B. Solarewicz.

Ryc. 27. Nowa Górná. Siekierki 25–28 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.

length. The cross-section of the socket is oval, of the blade hexagonal. Small, oblong loop of near lenticular cross-section, set near the edge of the socket surrounded by a biconical, here and there rounded, thickening, slightly narrowed opposite the loop. On the edge of the socket, in the middle of the faces, traces of protrusions left by two



Fig. 28. Nowa Górna. Details of the socket side and edge treatment of axes 25–36 with a straight socket edge, variant C. Bronze.
Photo: B. Solarewicz.

Ryc. 28. Nowa Górna. Detale opracowania boków i krawędzi tulejek siekierok 25–36 z prostym wylotem tulejki, wariantu C. Brąz.
Fot.: B. Solarewicz.

pouring channels. On the sides of the socket, there are two narrow planes, separated from the faces by vertical ribs (incomplete at the top), later transitioning into the lateral edges of the blade. The V-shaped rib touches the lower horizontal rib; the arms of the Y-shaped rib and

the two vertical ribs join the ribs running along the sides. Solid blades, heavily thinned on both sides, with traces of hammering; specimen 30 has a low blade, with one flat face with sharp lateral edges; the blade of specimen 29 is of medium height and is separated from the socket by

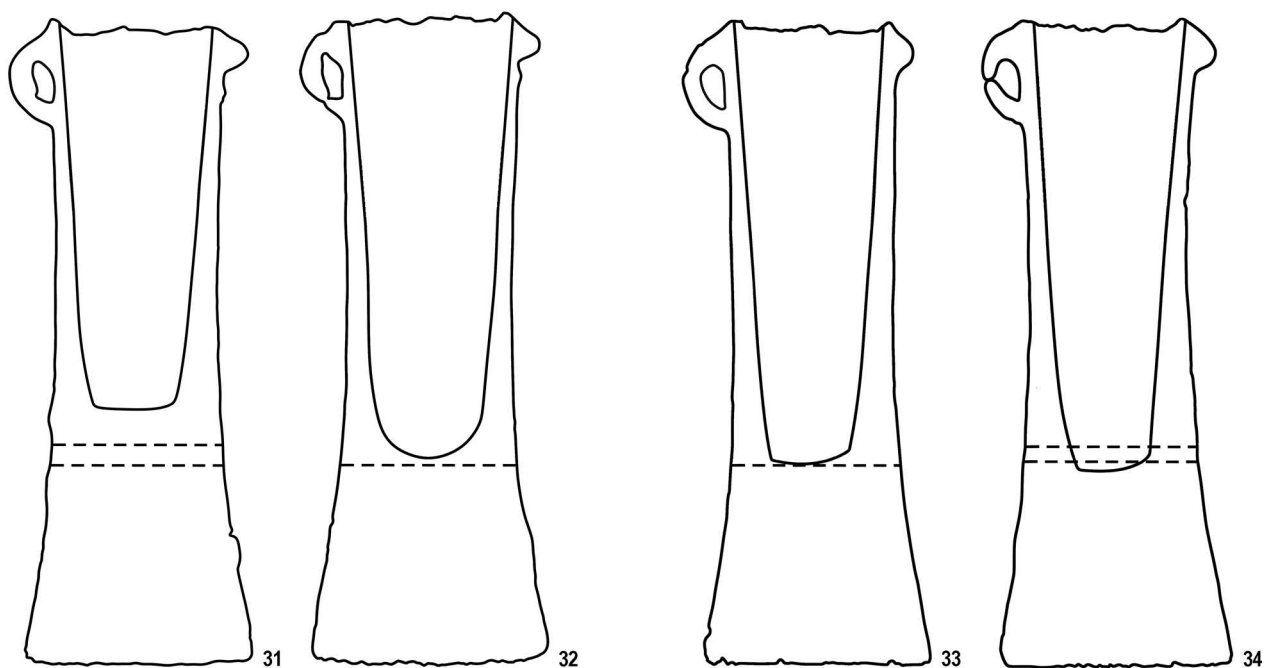
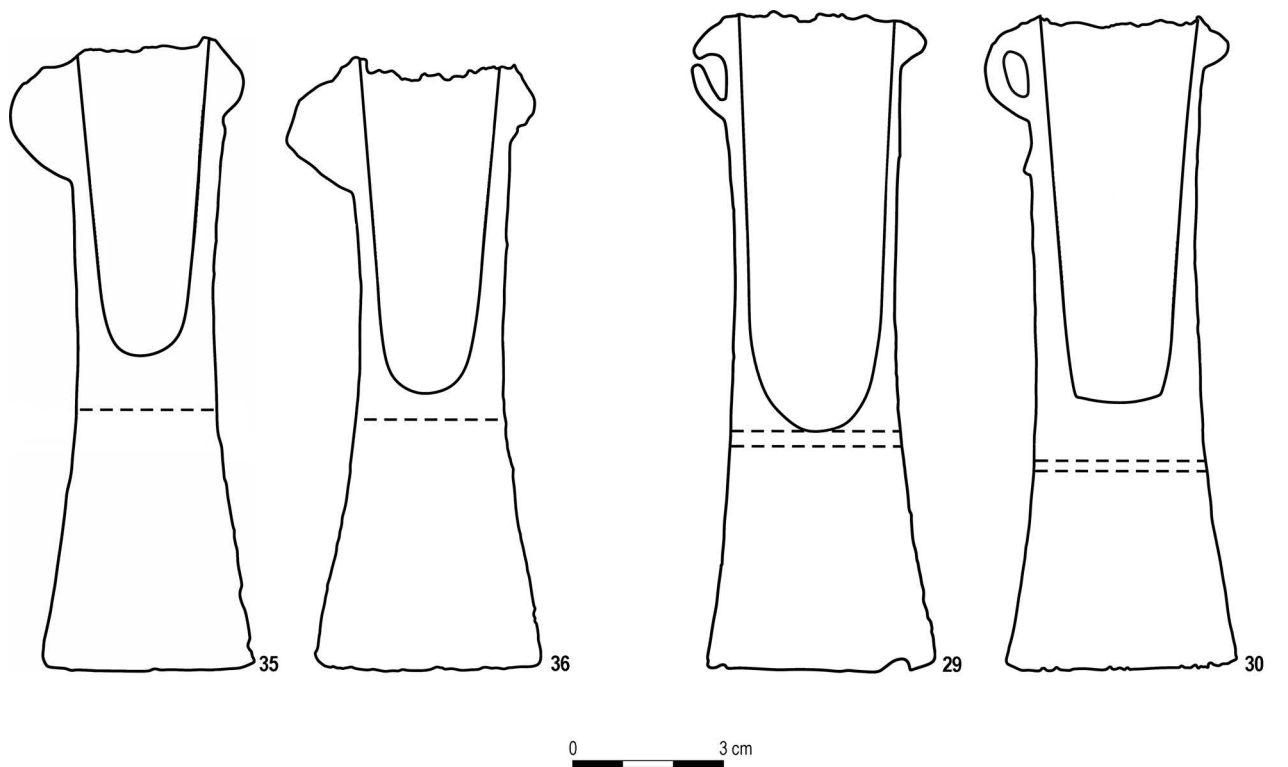


Fig. 29. Nowa Górna. Sections of axes 25–36 with a straight socket edge, variant C. For the key, see Fig. 7.
Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 29. Nowa Górna. Przekroje siekier 25–36 z prostym wylotem tulejki, wariantu C. Legenda por. Ryc. 7.
Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

shallow notches, it has one rather sharp one edge on the side without the loop. Cutting edges of medium width, straight, with a remnant of a casting seam in specimen 30. On the sides, the flashes are mostly narrow, low and even. Coarse surface, rough in places. The faces are slight-

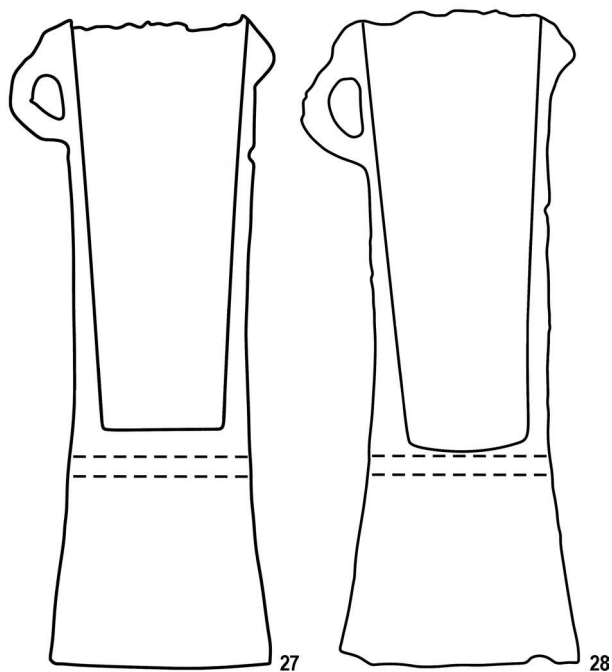
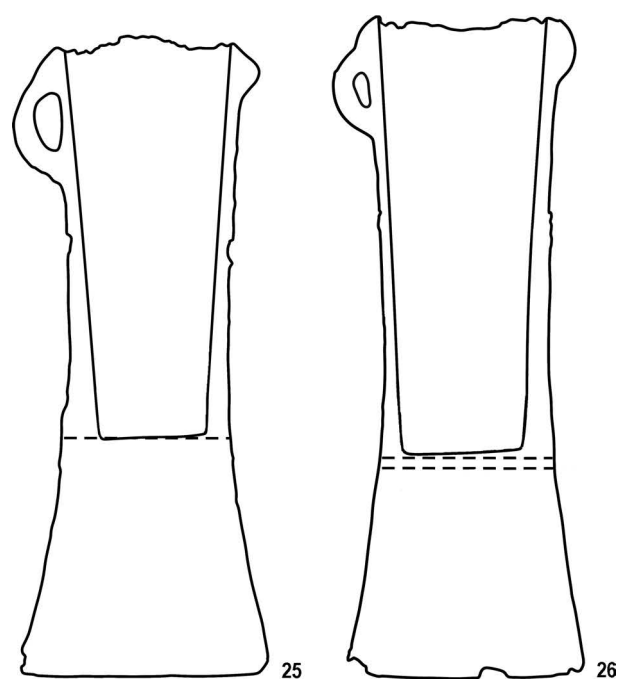


Fig. 29. (cont.).
Ryc. 29 (cd.).

ly shifted relative to each other. Oval sockets—the one in axe 29 is almost cylindrical, of medium depth, rounded at the bottom; in specimen 30, the socket is conical, shallow, slightly rounded at the bottom.

Axe 29. Incomplete loop, horizontal ribs cast a bit more poorly than the others. Patina removed, golden-grey surface, dark in the rough spots. Length 13.1 cm, blade height 4.5 cm and 4.8 cm, min. width 3.2 cm, cutting edge width 4.6 cm, dimensions of the socket mouth 3.2×2.3 cm, socket depth 7.8 cm, weight 216.3 g. X-Ray 2568. Inventory no. MMZ/A-2018/13.

Axe 30. Poorly cast horizontal ribs. Patina removed, golden-grey surface, dark in the rough spots. Length 13 cm, blade height 4 cm and 4.2 cm, min. width 3.2 cm, cutting edge width 4.6 cm, dimensions of the socket mouth 3.1–3.3×2.3 cm, socket depth 7.7 cm, weight 235.6 g. X-Ray 2570. Inventory no. MMZ/A-2018/18.

Axes 31 and 32, cast in mould 18 (Figs. 28:31.32, 29:31.32, 31:32, 33:31.32, 34). Constricted at the mid-length. The cross-section is hexagonal, and the longitudinal section is slightly asymmetrical. Small, elongated loop of roughly lenticular cross-section (incomplete at the bottom), set on the edge of the socket surrounded by a biconical, in places rounded, thickening, narrowed on the side of one face in specimen 32. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The lateral edges of the upper part of the socket are undefined; in the lower part, the edges are clear and, here and there, sharp. The arms of the V- and Y-shaped as well as the vertical ribs touch the lateral edges. Low, solid blades, heavily thinned on both sides, with traces of hammering, flattened on one face in axe 31 and on both faces in specimen 32. Cutting edges of medium width, straight, with casting seams. The flashes on the sides are usually narrow, low and even. The faces are slightly shifted relative to each other. Conical sockets of medium depth, oval, rounded at the bottom—slightly in the case of axe 31 and more heavily in the case of axe 32.

Axe 31. Incomplete horizontal ribs on both faces (especially near the side without the loop), and large shrinkage cavities at the base of the blade. Slightly coarse surface, metal streaks on the blade. Patina removed, golden surface, in places grey. Length 12.8 cm, blade height 4 cm and 4.4 cm, min. width 3.2 cm, cutting edge width 4.5 cm, dimensions of the socket mouth 3.1×2.3 cm, socket depth 7.9 cm, weight 206.3 g. X-ray 2571. Inventory no. MMZ/A-2018/24.

Axe 32. Incomplete horizontal ribs on both faces (near both sides), holes in one face and in the side without the loop. Coarse surface, on the blade rough in places, with metal streaks on the socket. Brown-green patina, black in the rough spots. Length 13 cm, blade height 4 cm, min.

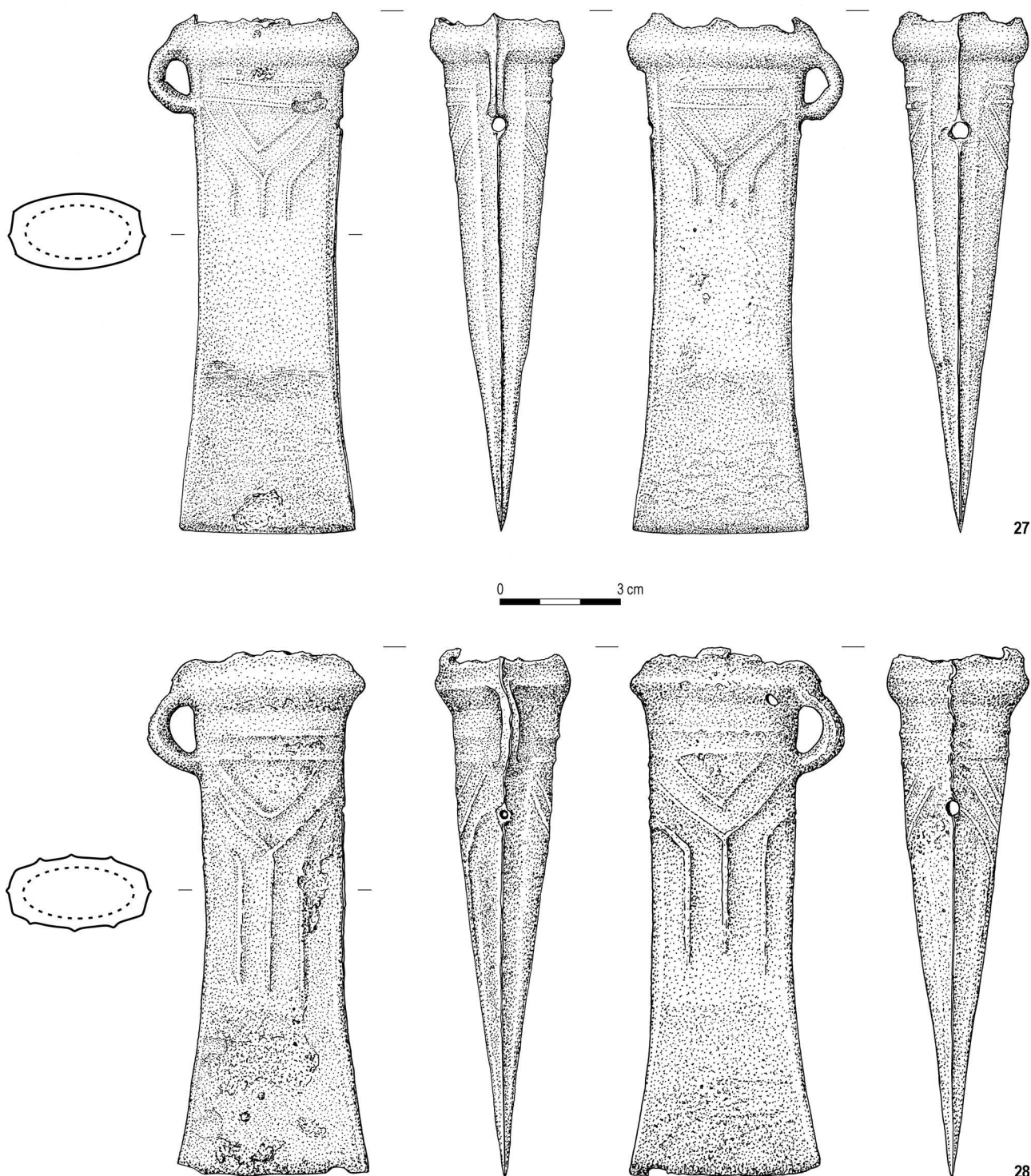


Fig. 30. Nowa Górn a. Axes 27 and 28 with a straight socket edge, variant C. Bronze. Drawing: B. Karch.
Ryc. 30. Nowa Górn a. Siekierki 27 i 28 z prostym wylotem tulejki, wariantu C. Brąz. Rys.: B. Karch.

width 3.3 cm, cutting edge width 4.7 cm, dimensions of the socket mouth 3.3×2.2 cm, socket depth 8.8 cm, weight 177.1 g. X-ray 2592. Inventory no. PMA/10535/14 (NG 9).

Axes 33 and 34, cast in mould 19 (Figs. 28:33.34, 29:33.34, 31:34, 33:33.34, 35). Constricted at the mid-length.

312 The cross-section is hexagonal, and the longitudinal

section is slightly asymmetrical. Small, elongated loop of roughly lenticular cross-section (incomplete in the middle), set on the edge of the socket surrounded by a bi-conical, in places rounded, thickening, narrowed in the same place in both axes. On the edge of the socket, in the middle of the faces, there are traces of protrusions left



Fig. 31. Nowa Górna. Traces of plastic shaping on the blades of axes 27, 29, 30, 32, and 34 with a straight socket edge variant C. Bronze. Photo: B. Solarewicz.

Ryc. 31. Nowa Górna. Ślady obróbki plastycznej na ciosach siekier 27, 29, 30, 32 i 34 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.

by two pouring channels. On the socket, there are two alternating lateral edges in the form of ribs, all edges in the upper part are undefined. The arms of the V- and Y-shaped as well as the vertical ribs touch the lateral edges. Low, solid blades (in specimen 34, slightly overlapping the socket), heavily thinned on both sides, with traces of hammering, with one (the same) flat face. Cutting edges of medium width, straight, with traces of a casting seam in axe 34. The flashes on the sides are usually narrow, low and even. The faces of specimen 34 are slightly shifted relative to each other. Conical sockets of medium depth, oval, slightly rounded at the bottom.

Axe 33. The arms of the V- and Y-shaped ribs wash over the side without the loop. On one face, at the base of the blade, there are two shrinkage cavities one above the other, one shrinkage cavity on the other face. Coarse and, in places, uneven surface, slightly rough on the faces of the blade. Patina removed, golden-grey surface, dark in the rough spots. Length 12.8 cm, blade height 4 cm, min. width 3.2 cm, cutting edge width 4.5 cm, dimensions of the socket mouth 3×2.3 cm, socket depth 8.7 cm, weight 194 g. X-ray 2569. Inventory no. MMZ/A-2018/16.

Axe 34. The decoration is poorly cast. Mostly coarse surface, slightly rough on one face of the blade. Patina removed, one face is golden-grey, the other greyish gold. Length 12.9 cm, blade height 4.1 cm and 4.4 cm, min. width 3.2 cm, cutting edge width 4.6 cm, dimensions of the socket mouth 3.1×2.3 cm, socket depth 8.6 cm, weight 194.7 g. X-ray 2566. Inventory no. MMZ/A-2018/6.

Axes 35 and 36. Decorated on the socket with horizontal ribs (almost completely uncast), a V-shaped rib between the arms of a Y-shaped rib and vertical ribs placed on both sides, with the tops sharply bent outwards.

Axe 35, cast in mould 20 (Figs. 28:35, 29:35, 33:35, 36:35). Constricted at the mid-length. The cross-section of the socket is roughly oval (two vertical planes are faintly marked on the sides), and the longitudinal section is slightly asymmetrical. Large, metal-filled loop, set below the edge of the socket surrounded by a prominent, rounded thickening of uneven width. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. A small fragment of the lower horizontal rib cast on one face. The arms of several ribs wash over the side with the loop. Blade of medium height, solid, heavily thinned on both sides, with flat faces, one with a trace of hammering. Wide, straight cutting edge. The casting seams on the sides of the socket are low and even, and higher on the sides of the blade. Mostly coarse surface, rough in the remaining spots and uneven in places; one face of the blade is smoother. The faces are shifted relative to each other. Conical, shallow, oval socket, rounded at the bottom. A few shallow gas pores inside the socket, in its upper part. Patina removed, golden-grey surface, black in the rough spots. Length 12.6 cm, blade height 5.2 cm, min. width 2.7 cm, cutting edge width 4.2 cm, dimensions of the socket mouth 2.6–2.7×2.1 cm, socket depth 6.4 cm, weight 146.9 g. X-ray 2570. Inventory no. MMZ/A-2018/19.

Axe 36, cast in mould 21 (Figs. 28:36, 29:36, 33:36, 36:36). Constricted at the mid-length. The cross-section of the socket is roughly oval (two vertical planes are faintly marked on the sides). Large, metal-filled loop, set on the edge of the socket surrounded by a rounded thickening. There are traces of protrusions left by two pouring channels on the edge of the socket. The vertical planes on the sides are separated from the faces by 313

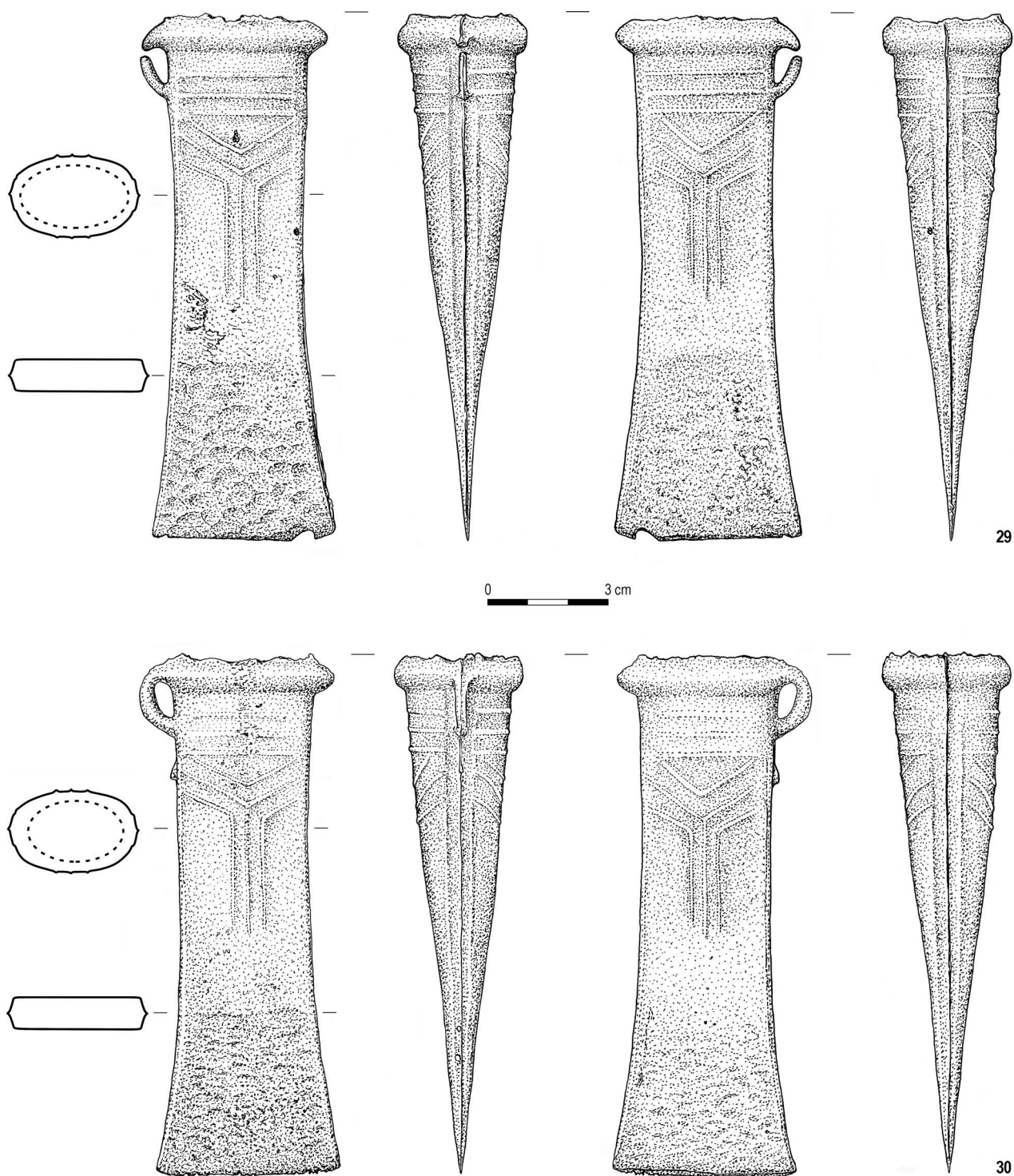


Fig. 32. Nowa Górn a. Axes 29 and 30 with a straight socket edge, variant C, cast in the same mould. Bronze. Drawing: B. Karch.
Ryc. 32. Nowa Górn a. Siekierki 29 i 30 z prostym wylotem tulejki, wariantu C, odlane w tej samej formie. Brąz. Rys.: B. Karch.

314 ribs, uneven and partially incomplete. The ribs forming the decoration on the faces are very narrow, less visible on the face with two holes. Fragments of two horizontal ribs are visible on the other face. The arms of several ribs wash over the side with the loop. Blade of medium

height, solid, heavily thinned on both sides, with flat faces and blunt lateral edges. Wide and straight cutting edge. Casting seams narrow, typically low. Coarse surface, largely rough; one side of the blade is smoother. The faces are slightly shifted relative to each other. Conical,



Fig. 33. Nowa Górna. Axes 29–36 with a straight socket edge, variant C. Bronze. Photo: B. Solarewicz.
Ryc. 33. Nowa Górna. Siekierki 29–36 z prostym wylotem tulejki, wariantu C. Brąz. Fot.: B. Solarewicz.

shallow, oval socket, rounded at the bottom. Inside the socket, below the edges, there are several shallow gas pores. Cutting edge chipped. Patina removed, golden-grey surface, black in the rough spots. Length 12.2 cm, blade height 5 cm, min. width 2.8 cm, cutting edge width 4.5 cm, dimensions of the socket mouth 2.8–2.9×2.1–2.2 cm, socket depth 6.7 cm, weight 135.8 g. X-ray 2567. Inventory no. MMZ/A-2018/10.

37. **Axe with a defined blade, variant Kuśnierz D** (Figs. 37, 38:37, 39:37, 40:37), cast in mould 22. Constricted at the mid-length. The cross-section under the edge of the socket is oval and, below, hexagonal; the longitudinal section is asymmetrical— one face of the socket is more convex. Loop of irregular cross-section, set below the edge of the socket surrounded by a prominent, rounded thickening, narrowed on the side of one face. On the edge 315

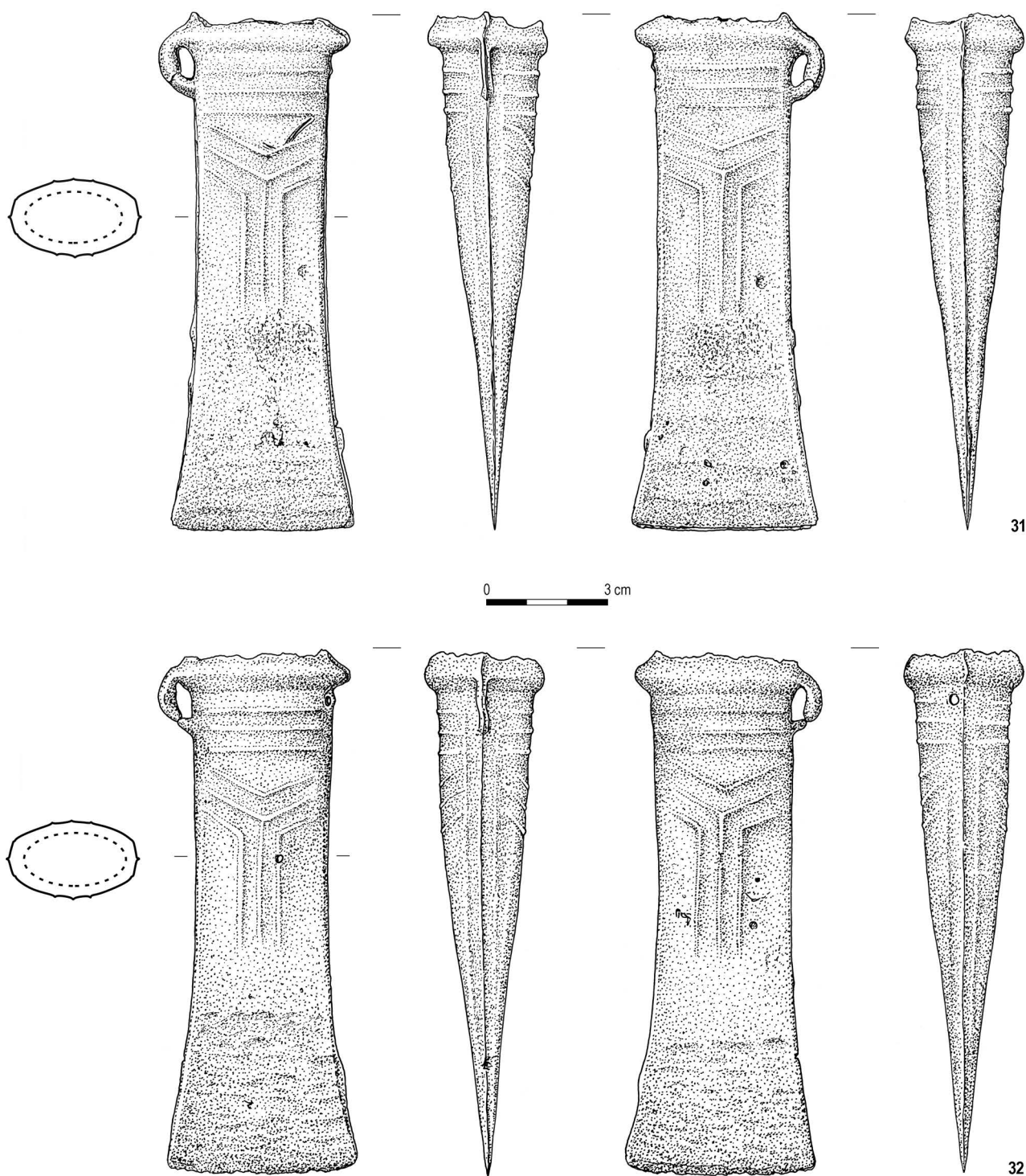


Fig. 34. Nowa Górn a. Axes 31 and 32 with a straight socket edge, variant C, cast in the same mould. Bronze. Drawing: B. Karch.
Ryc. 34. Nowa Górn a. Siekierki 31 i 32 z prostym wylotem tulejki, wariantu C, odlane w tej samej formie. Brąz. Rys.: B. Karch.

of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The decoration consists of two circumferential ribs (with ends diverging on the sides), one V-shaped rib extending from the lower circumferential rib, and two U-shaped ribs, the outer of which runs along the edges converging in an arch

on the upper part of the sides. The more convex socket face at the place of the V-shaped rib and below, between the U-shaped ribs, incomplete. High, solid blade, with both faces flat (on one side there are a few faint traces of hammering) and sharp lateral edges. The cutting edge is very wide and rounded. The casting seams are narrow,

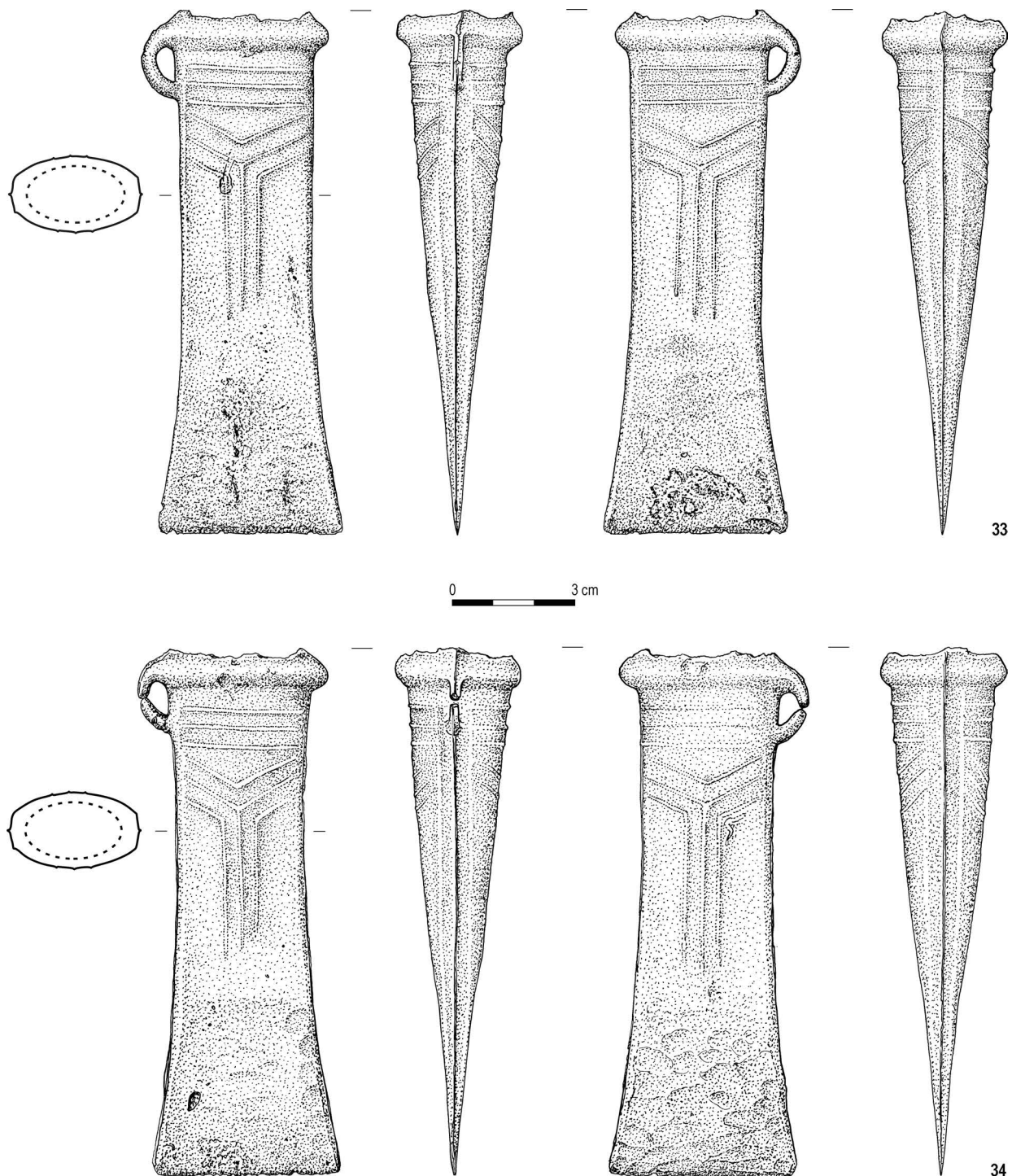


Fig. 35. Nowa Górna. Axes 33 and 34 with a straight socket edge, variant C, cast in the same mould. Bronze. Drawing: B. Karch.

Ryc. 35. Nowa Górna. Siekierki 33 i 34 z prostym wylotem tulejki, wariantu C, odlane w tej samej formie. Brąz. Rys.: B. Karch.

low and even (the seam on the side without the loop is flattened in places). Fairly smooth surface, one face of the blade is partially rough. The faces are shifted relative to each other. Conical, shallow, oval socket, straight at the bottom. Chipped cutting edge, a gap in the corner of the blade and a crack on the other side. Brown-green

patina. Length 11.2 cm, blade height 5.3 cm and 5.4 cm, min. width 2.3 cm, preserved cutting edge width 4 cm, dimensions of the socket mouth 2.7×2.3 cm, socket depth 6 cm, weight 139.1 g. X-ray 2587, 2606. Inventory no. PMA/10535/17 (NG 27).

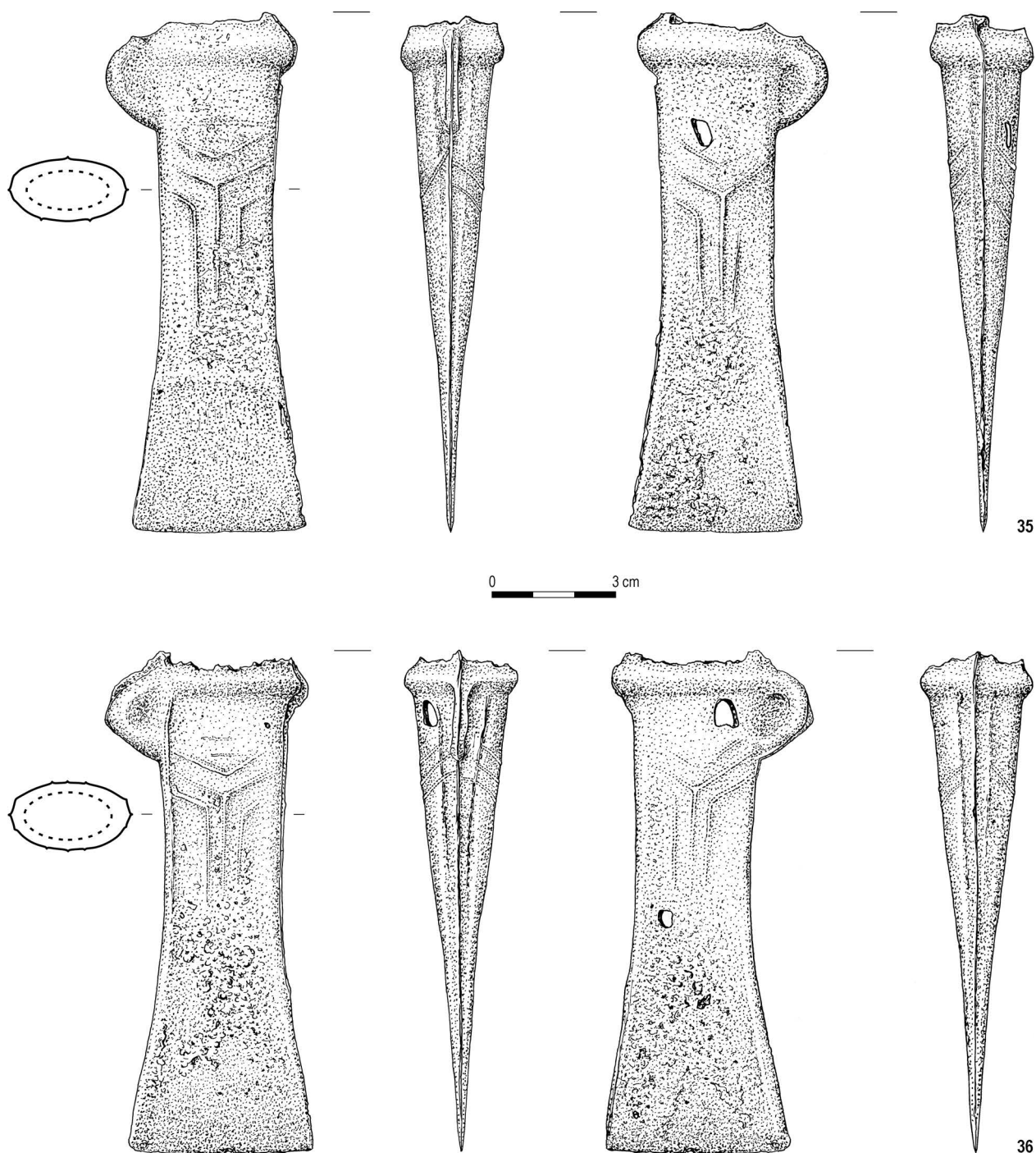


Fig. 36. Nowa Górna. Axes 35 and 36 with a straight socket edge, variant C. Bronze. Drawing: B. Karch.

Ryc. 36. Nowa Górna. Siekierki 35 i 36 z prostym wylotem tulejki, wariantu C. Brąz. Rys.: B. Karch.

38. Axe richly decorated on its wider sides, variant Kuśnierz A (Figs. 38:38, 39:38, 40:38, 41:38), cast in mould 23. Constricted at the mid-length. The cross-section under the socket edge is oval, hexagonal below, quadrangular above the cutting edge; the longitudinal section is slightly asymmetrical. Elongated, cylindrical loop, set below the edge of the socket surrounded by a slightly curved, rounded thickening, strongly narrowed on the

side of one face (no trace of the pouring channel here), a broken-off protrusion left by a pouring channel on the opposite side. There are faintly visible groups of curved ribs on the socket (on one face, they have three ribs, on the other—two each), the outer ones of which, running along the lateral edges, converge in an arch in the upper part of the sides. Small, circular holes on the opposite sides. High blade, overlapping the socket, wedge-shaped,

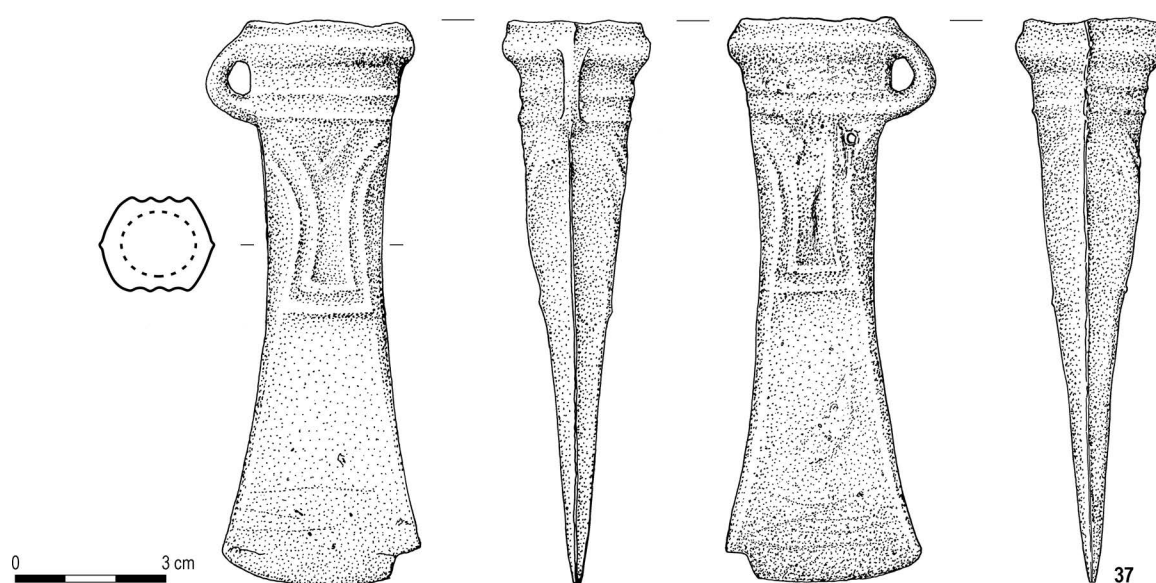


Fig. 37. Nowa Górna. Axe 37 with a defined blade, variant D. Bronze. Drawing: B. Karch.

Ryc. 37. Nowa Górna. Siekierka 37 z wyodrębnionym ciosem, wariantu D. Brąz. Rys.: B. Karch.



Fig. 38. Nowa Górna. Axes: with a defined blade, variant D (37), richly decorated on its wider sides, variant A (38), and of the *Jablonka* type (39). Bronze.

Photo: B. Solarewicz.

Ryc. 38. Nowa Górna. Siekierki z wyodrębnionym ciosem, wariantu D (37), bogato zdobiona na szerszych ściankach, wariantu A (38) i typu *Jablonka* (39). Brąz.

Fot.: B. Solarewicz.

slightly expanded at the bottom, with one face flattened and slightly undercut, with flat sides and sharp lateral edges above a narrow, rounded, sharp cutting edge. Above the loop, there is a flat casting seam, removed from the loop, with wide, uneven thickenings in the place of the seams below and on the other side; flashes above the cutting edge invisible. Coarse and uneven surface (with corrosion cavities); only a small part of one face and the adjacent part of the side are smooth. Almost cylindrical socket, deep, oval, slightly rounded at the bottom. Chipped cutting edge, deformed loop. Brown and, in

places, green patina. Length 10.2 cm, blade height 5.3 cm, min. width 3.6 cm, cutting edge width 4.6 cm, dimensions of the socket mouth 3.4×2.9 cm, socket depth 7.7 cm, diam. of the holes in the sides 0.1 cm, weight 215.9 g. X-ray 2585, 2606. Inventory no. PMA/10535/18 (NG 4).

39. Axe of the *Jablonka* type¹⁸ (Figs. 38:39, 39:39, 40:39, 41:39), cast in mould 24. Constricted below the mid-

¹⁸ This name of the axe type has not been used in the literature on the subject. Undecorated specimens with lenticular or polygonal cross-



Fig. 39. Nowa Górn a. Details of the side and edge treatment of the axes: with a defined blade, variant D (37), richly decorated on its wider sides, variant A (38), and of the *Jablonka* type (39). Bronze. Photo: B. Solarewicz.

Ryc. 39. Nowa Górn a. Detale opracowania boków i krawędzi tulejek siekier: z wyodrębnionym ciosem wariantu D (37), bogato zdobionej na szerszych ściankach, wariantu A (38) i typu *Jablonka* (39). Brąz. Fot.: B. Solarewicz.

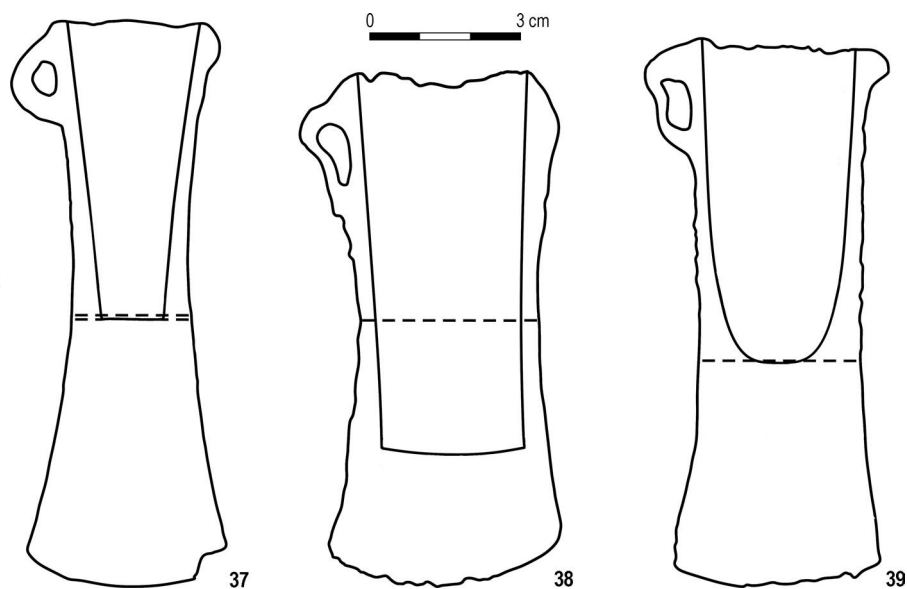


Fig. 40. Nowa Górn a. Sections of the axes: with a defined blade, variant D (37), richly decorated on its wider sides, variant A (38), and of the *Jablonka* type (39). For the key, see Fig. 7. Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 40. Nowa Górn a. Przekroje siekier: z wyodrębnionym ciosem, wariantu D (37), bogato zdobionej na szerszych ściankach, wariantu A (38) i typu *Jablonka* (39). Legenda por. Ryc. 7. Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

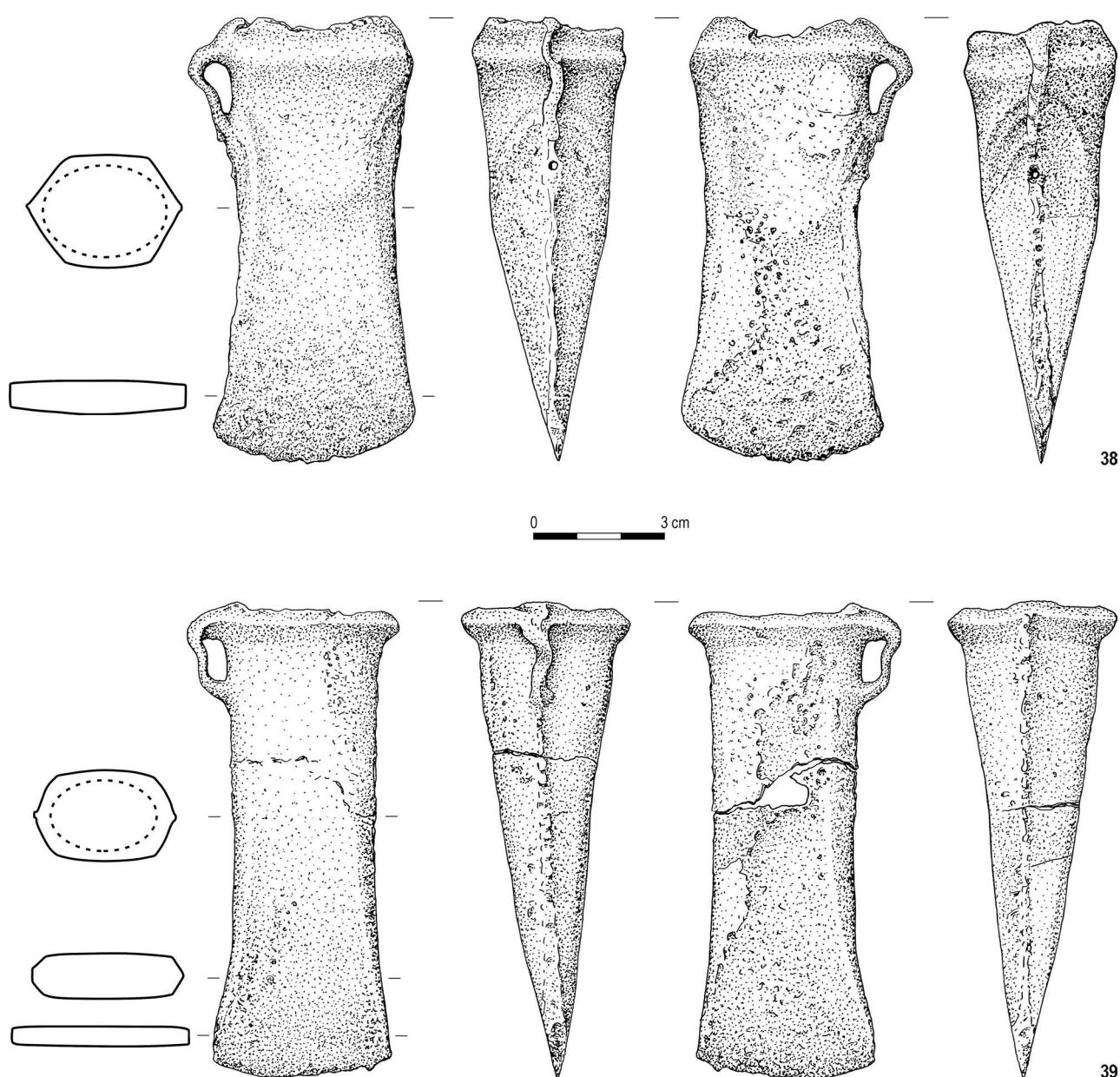
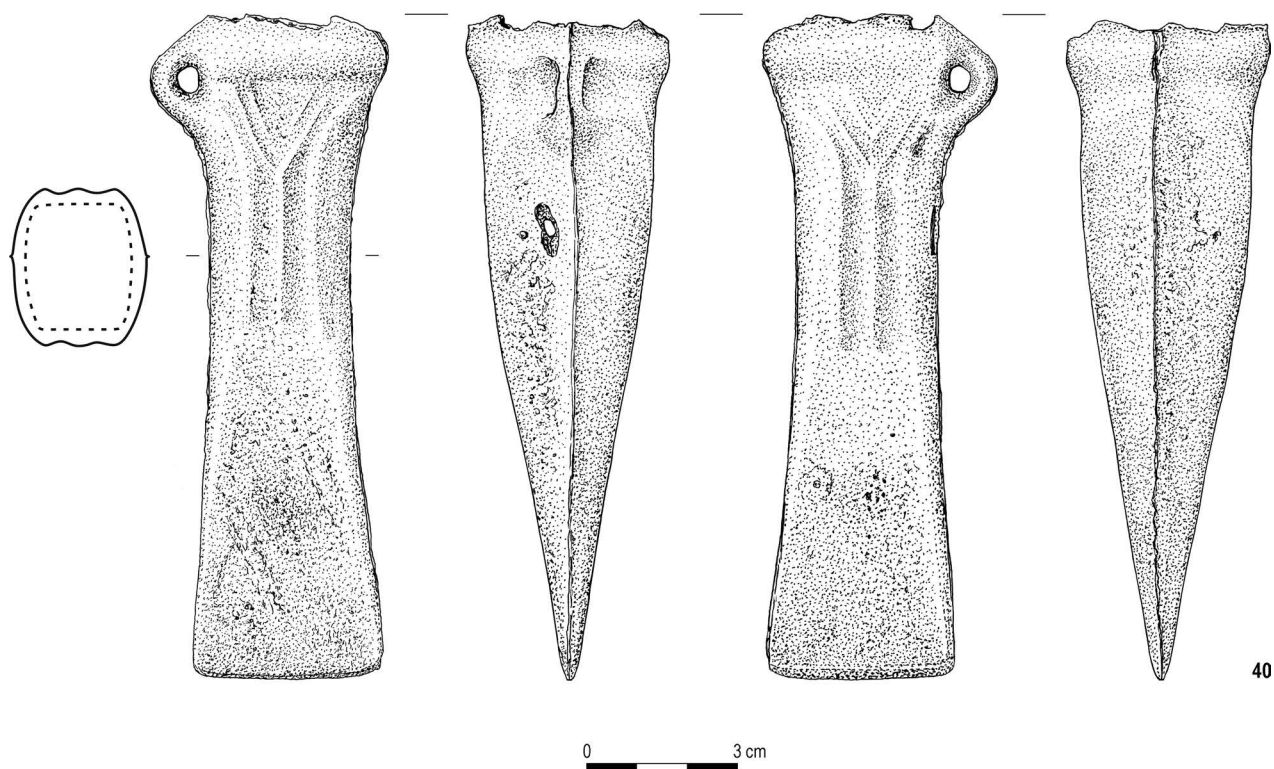


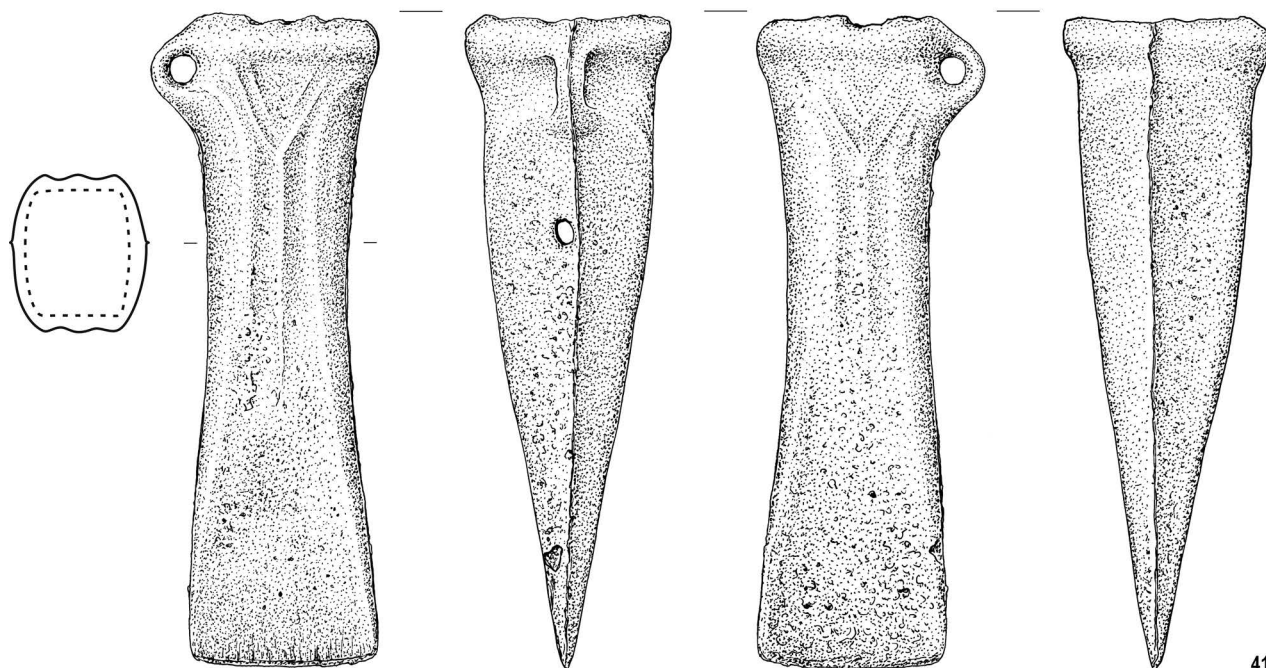
Fig. 41. Nowa Górna. Axes: richly decorated on its wider sides, variant A (38), and of the *Jablonka* type (39). Bronze. Drawing: B. Karch.
Ryc. 41. Nowa Górna. Siekierki: bogato zdobiona na szerszych ściankach, wariantu A (38) i typu *Jablonka* (39). Brąz. Ryc.: B. Karch.

length. The cross-section of the socket is hexagonal, of the upper part of the blade heptagonal and quadrangular in the lower part; the longitudinal section is roughly wedge-shaped and slightly asymmetrical. Oblong, cylindrical loop, set on the edge of the socket topped with a thickening in the form of a prominent, pointed rib, strongly narrowed on the side of one face. On the edge of the socket, in the middle of one face, there is a trace of

a protrusion left by a pouring channel. The lateral edges of the socket are poorly defined. Poorly defined blade of medium height, solid, with both faces flattened, one more strongly undercut. The edges of the latter face are sharp along their entire length, the opposite edges are sharp only above the cutting edge, at the level of the flat sides. Cutting edge narrow, rounded, sharp. The casting seams on the loop and above the cutting edge are invisible, and on the sides they appear as uneven thickenings. Coarse surface, uneven on one face (with corrosion cavities), except for a small, smooth fragment and the adjacent part of the side. Almost cylindrical socket, shallow, oval, with an almost circular mouth, rounded



40



41

Fig. 42. Nowa Górn a. Axes 40–42 of the *Kowalewko* type, variant B, cast in the same mould as specimens 43 and 44. Bronze.
Drawing: B. Karch.

Ryc. 42. Nowa Górn a. Siekierki 40–42 typu *Kowalewko*, wariantu B, odlane w tej samej formie co okazy 43 i 44. Brąz.
Rys.: B. Karch.

at the bottom. Heavily chipped cutting edge, deformed loop, cracked socket, with a defect in the face. Brown-green patina. Preserved length 10.8 cm and blade height approx. 4.5 cm, min. width 3.2 cm, cutting edge width

4.1 cm, diam. of the socket mouth 3.2–3.3×3 cm, socket depth 6.4 cm, weight 208.8 g. X-ray 2586. Inventory no. PMA/10535/19 (NG 16).

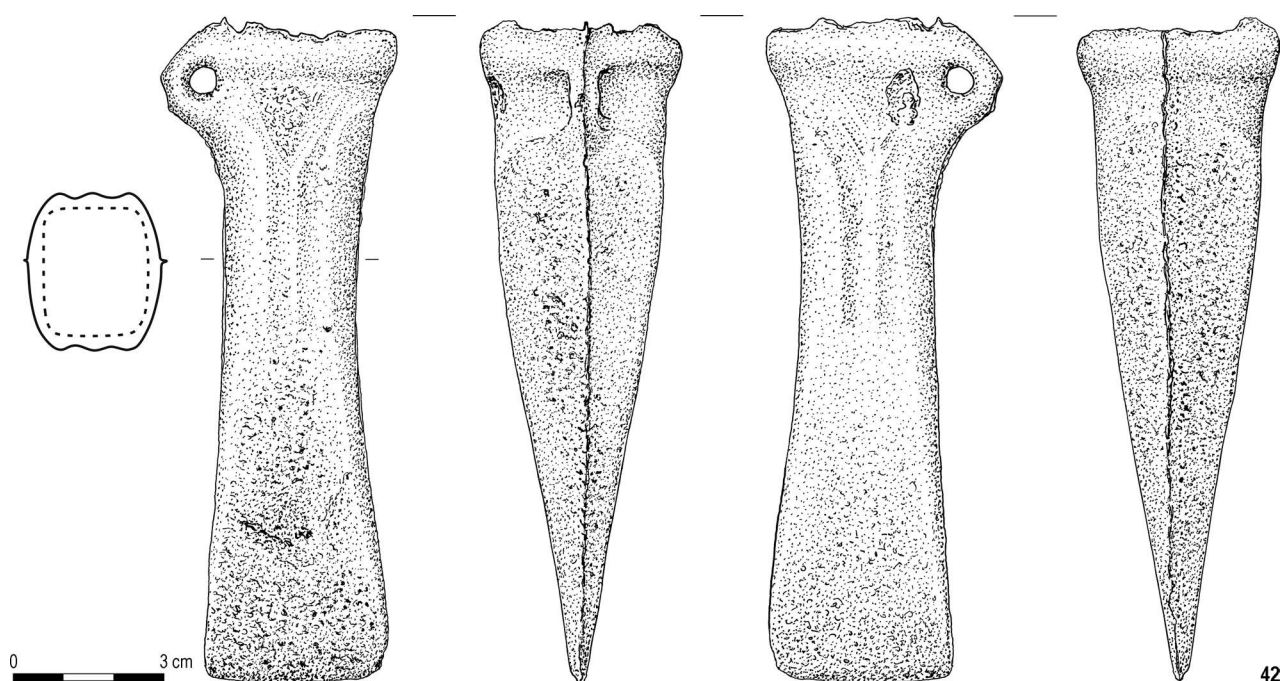


Fig. 42. (cont.).

Ryc. 42 (cd.).

40–49. Axes of the *Kowalewko* type, variant Kuśnierz B

Specimens with a quadrangular cross-section, decorated with a mid-rib on the socket faces and with bent, thickened lateral edges.¹⁹ Shallow, longitudinal recesses between the ribs and the edges. Under the edge of the socket, small, nested V-shaped ribs with tops pointing downwards.

Axes 40–44, cast in mould 25 (Figs. 42, 43, 44:40–44, 45:40–44, 46:40–44). Constricted at the mid-length. Asymmetric longitudinal section—one face is more heavily convex. Massive, slightly pointed and crooked loops of the same size but differing in the size of the hourglass-shaped holes, set on the edge of the socket surrounded by a rounded thickening of uneven width. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. Two V-shaped ribs, with arms touching the thickening on the edge of the socket; on the less convex face, they are set on the rounded mid-rib, and on the other side the pointed mid-rib extends to the top of the upper angular rib. More massive than the mid-ribs, the rounded, thickened lateral edges converge in an arch on the upper part of the sides (the arch near the loop is asymmetrical and quite clearly marked; on the other side, it is almost invisible). The blades are of medium height in specimens 40–43 and slightly shorter in specimen 44; they are wedge-shaped, overlapping the

socket, with a slightly flattened face on the less convex side. Narrow, straight cutting edges, with a casting seam. Narrow flashes on the sides, the lowest in specimen 40. The faces are shifted relative to each other. Conical sockets—of medium depth in specimens 40 and 41, deep in the others—quadrangular, with oval and, in the case of axe 40, circular mouths, rounded at the bottom.

Axe 40. A misrun in the upper part of the side with the loop, a pit-shaped shrinkage cavity at the base of the solid part of the blade on the less convex face. Slightly coarse surface, rough in places. Inside the socket, under the edge, there are several large gas pores, and deeper, at the level of the loop, there is a large, irregular cavity. Patina removed, golden-grey surface. Length 13.2 cm, blade height approx. 6 cm, min. width 2.8 cm, cutting edge width 3.7 cm, dimensions of the socket mouth 3.2×3.2 cm, socket depth 9 cm, weight 351 g. X-ray 2581, 2609. Inventory no. MMZ/A-2018/14.

Axe 41. Incomplete V-shaped ribs on both faces, with a hole in the upper part of the side with the loop. A shallow, pit-shaped shrinkage cavity at the base of the solid part of the blade, on the less convex face, a narrow metal streak below the central rib. Coarse surface, rough on the blade. Inside the socket, under the edge, there is a small gas pore, and a flat some additional metal at the level of the loop, caused by penetration of metal inside the core. Patina removed, golden-grey surface. Length 13 cm, height of the flattened face of the blade approx. 6 cm, min. width 2.8 cm, cutting edge width 3.7 cm,

¹⁹ Cf. G. ORLIŃSKA 2020, 205.

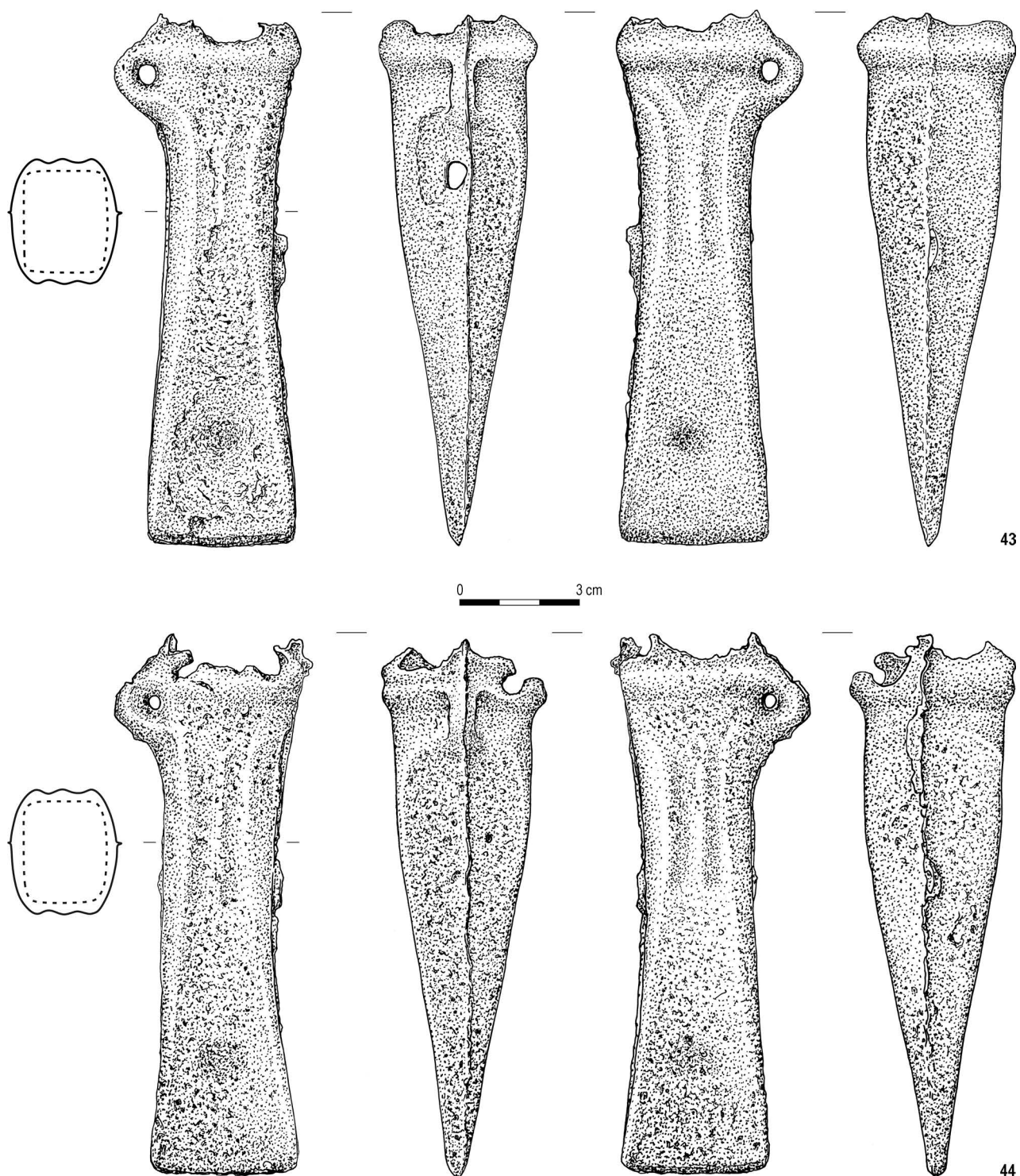


Fig. 43. Nowa Górn a. Axes 43 and 44 of the *Kowalewko* type, variant B, cast in the same mould as specimens 40–42. Bronze. Drawing: B. Karch.

Ryc. 43. Nowa Górn a. Siekierki 43 i 44 typu *Kowalewko*, wariantu B, odlane w tej samej formie co okazy 40–42. Brąz. Rys.: B. Karch.

dimensions of the socket mouth 3.5×3.2 cm, socket depth 9 cm, weight 324.3 g. X-ray 2579, 2609. Inventory no. MMZ/A-2018/8.

324 **Axe 42.** Incomplete V-shaped ribs on both faces. A narrow, pit-shaped shrinkage cavity at the base of the solid

part of the blade, on the less convex face. Mostly very coarse surface. Inside the socket, under the edge, there are several shallow gas pores. Patina removed, greyish-golden surface. Length 13.2 cm, blade height approx. 6 cm, min. width 2.8 cm, cutting edge width 3.7 cm, dimensions of

the socket mouth 3.3×3 cm, socket depth 9.4 cm, weight 315.5 g. X-ray 2582. Inventory no. MMZ/A-2018/23.

Axe 43. V-shaped ribs cast only on the more convex face. A misrun in the upper part of the side with the loop. Deep, pit-shaped shrinkage cavities on both faces at the base of the solid part of the blade. There is a massive casting flash halfway along the side, caused by metal penetration inside the mould. One face is slightly coarse, with metal streaks on the blade, the remaining surface is uneven. Inside the socket, under the edge, there are large gas pores. Brown patina on one face, brown-green on the other. Length 13.3 cm, blade height approx. 6 cm, min. width 2.8 cm, cutting edge width 3.7 cm, dimensions of the socket mouth 3.2×3 cm, socket depth 9.6 cm, weight 306.8 g. X-ray 2593, 2608. Inventory no. PMA/10535/20 (NG 10).

Axe 44. Only a fragment of the lower V-shaped rib was cast on the less convex face. Largely incomplete thickening on the edge of the socket, and a small hole in the side with the loop. Pit-shaped shrinkage cavities on both faces at the base of the solid part of the blade. On the side without the loop, there is a massive casting flash at the mid-length (as in specimen 43) and above, caused by metal penetration inside the mould. Coarse and uneven surface. Inside the socket, under the edge, there are gas pores. Brown and, in places, green patina. Length 13.5 cm, blade height approx. 6 cm, min. width 2.8 cm, cutting edge width 3.7 cm, dimensions of the socket mouth 3.2×2.7–2.8 cm, socket depth 9.6 cm, weight 315 g. X-ray 2593, 2607. Inventory no. PMA/10535/21 (NG 5).

Axe 45, cast in mould 26 (Figs. 44:45, 45:45, 46:45, 47:45). Constricted at the mid-length, with a wedge-shaped longitudinal section. Massive, pointed loop with an almost conical hole, set on the edge of the socket surrounded by a prominent, biconical and, in places, rounded thickening of similar width. On the edge of the socket, in the middle of the faces, there are traces of two pouring channels. The thickened lateral edges converge in the upper part of the sides into poorly defined arches (the arch near the loop is slightly more visible). The discontinuous decoration extends to the base of the blade. The longer upper section of the decoration is composed of a rounded mid-rib, thickened lateral edges and two small V-shaped ribs set on the central rib (cast only on one face). The lower fragment of the decoration consists of three flat thickenings on the extension of the mid-rib and thickened edges on one face, and of five narrow ribs (three on the extension of the mid-rib and thickened lateral edges and two to the side) on the other. Pit-shaped shrinkage cavities on both faces at the base of the blade, a misrun below the loop and a massive casting flash caused by metal penetration inside the mould. Low blade, overlapping the socket, with one flattened face, sharp lateral edges and flat sides above a wide, slightly rounded,

sharp cutting edge. On the loop and just below it, there is a casting seam in the form of a flat rib; in the upper part of the other side, in the place of the seam, there is an uneven thickening. The flashes are barely visible in the lower part of the sides, and imperceptible above the cutting edge. Coarse surface, uneven on the sides and on one face (with corrosion cavities). Conical, deep, quadrangular socket with a nearly circular mouth, rounded at the bottom. Inside the socket, under the edge, there are two small gas pores. Chipped cutting edge. Brown-green patina. Length 12.7 cm, blade height 4.2 cm and 4.6 cm, min. width 2.7 cm, cutting edge width 4.1 cm, dimensions of the socket mouth 3.1×2.7 cm, socket depth 10 cm, weight 306.5 g. X-ray 2594, 2607. Inventory no. PMA/10535/23 (NG 26).

Axe 46, cast in mould 27 (Figs. 44:46, 45:46, 46:46, 47:46). Constricted at the mid-length, with an asymmetric longitudinal section—one face is slightly more convex. Massive loop with a very small, hourglass-shaped hole, set on the edge of the socket surrounded by a prominent thickening (largely incomplete) of uneven width, biconical and rounded in places. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. Two V-shaped ribs, cast only on the more convex face, are set on a poorly defined, rounded mid-rib; on the other side, the midrib is more prominent. The thickened lateral edges, which are more massive than the mid-ribs, converge on the upper part of the sides into poorly defined arches (the arch near the loop is slightly more visible). High, wedge-shaped blade, overlapping the socket, with a flat face on the less convex side, and sharp lateral edges and flat sides above a wide, rounded, sharp cutting edge. Noticeable sinks on both faces at the base of the solid part of the blade. Misruns in the sides and the less convex face. The casting seam on the loop is narrow, slightly flattened; below, it is in the form of a thickening of variable width and invisible above the cutting edge. On the other side, the seam remains only under the thickening on the edge of the socket. Mostly coarse and uneven surface (with corrosion pits); the upper part of the side without the loop and the adjacent parts of the faces are slightly smoother. The faces are shifted relative to each other. Funnel-shaped, deep, quadrangular socket with a nearly circular mouth, rounded at the bottom. Inside, in the upper part of the socket, there are numerous, generally small gas pores, the largest one under the edge on the side of the loop. Chipped cutting edge; a corner of the blade was broken off. Brown-green patina. Length 13.1 cm, blade height 6.3 cm, min. width 2.6 cm, cutting edge width 4.1 cm, dimensions of the socket mouth 3.5×3–3.2 cm, socket depth 9.8 cm, weight 283 g. X-ray 2595. Inventory no. PMA/10535/24 (NG 15).



Fig. 44. Nowa Górna. Axes of the Kowalewko type, variant B. Bronze. Photo: B. Solarewicz.

Ryc. 44. Nowa Górna. Siekierki Kowalewko, wariantu B. Brąz. Fot.: B. Solarewicz.

326 **Axe 47, cast in mould 28** (Figs. 44:47, 45:47, 46:47, 48:47). Constricted at the mid-length, with an asymmetric longitudinal section—one face is more convex. Massive loop with a conical hole, set on the edge of the socket surrounded by a prominent, cylindrical thickening

of uneven width (incomplete near the loop). On the edge of the socket, in the middle of one face, there is a probable trace of a protrusion left by a pouring channel. The thickened lateral edges converge in the upper part of the sides into poorly defined arches (the arch near the loop is



Fig. 44. (cont.).
Ryc. 44. (cd.).

slightly more visible). On the more convex face, there are incomplete V-shaped ribs, a rounded mid-rib and thickened edges; at the base of the solid part of the blade, there is a shallow, extensive shrinkage cavity; on the other side, there is a trace of the V-shaped ribs, thickened pointed edges, an incomplete mid-rib. High, wedge-shaped blade,

overlapping the socket, with a flat face on the less convex side, sharp lateral edges and flat sides above a wide, rounded, sharp cutting edge. On the loop and in the upper part of the socket on the same side, the casting seam is quite narrow and even; on the part of the blade overlapping the socket, it is wider and flattened in places. At the mid-length on the other side, there is a casting seam in the form of a rib, higher up and on the solid part of the blade, on both faces, there is a series of recesses in the place of the seams; flashes above the cutting edge are invisible. Mostly coarse and uneven surface (with corrosion pits). Almost cylindrical, deep, quadrangular socket, rounded at the bottom. Several small gas pores inside the socket, under the edge. The faces are shifted relative to each other. Chipped cutting edge, a defect in one side of the blade. Brown-green patina. Length 12.5 cm, blade height approx. 6.3 cm, min. width 2.7 cm, cutting edge width 4.2 cm, dimensions of the socket mouth 2.8×2.6–2.8 cm, socket depth 9.7 cm, weight 262.2 g. X-ray 2594. Inventory no. PMA/10535/22 (NG 12).

Axe 48, cast in mould 29 (Figs. 44:48, 45:48, 46:48, 48:48). Constricted above the mid-length, with an asymmetric longitudinal section—one face is more convex. Massive loop, set on the edge of the socket surrounded by a biconical thickening of uneven width, incomplete and most narrowed opposite the loop. On the edge of the socket, in the middle of the faces, there are traces of protrusions left by two pouring channels. The mid-ribs are narrow and pointed, and the more massive, thickened lateral edges converge in the upper part of the sides into poorly defined arches (the arch near the loop is slightly more clearly outlined). Below the edge of the socket, there are three V-shaped ribs set on the mid-rib. High, wedge-shaped blade, overlapping the socket, with a flat and more strongly undercut face on the more convex side. Along the part of the blade that overlaps the socket, the lateral edges are rounded; along the solid part, they are sharper. Cutting edge narrow, slightly curved, with a casting seam. The flashes on the sides are narrow and uneven. Mostly smooth surface, rough in a few places. Conical socket of medium depth, quadrangular with an almost circular mouth, rounded at the bottom. Inside the socket, especially under the edge, there are small gas pores. Patina removed, golden-grey surface. Length 13.6 cm, blade height 6.7 and 7 cm; min. width 3 cm, cutting edge width 4 cm, dimensions of the socket mouth 3.1×3–3.1 cm, socket depth 9.8 cm, weight 394.5 g. X-ray 2539. Inventory no. MMZ/A-2018/4.

Axe 49, cast in mould 30 (Figs. 44:49, 45:49, 46:49, 48:49). Constricted at the mid-length, wedge-shaped longitudinal section. Small, strap-like loop with a heavily expanded lower base, set on edge of the socket topped with a cylindrical thickening, with a marked bend in



Fig. 45. Nowa Górn a. Details of the socket side and edge treatment of the axes of the *Kowalewko* type, variant B. Bronze.
Photo: B. Solarewicz.

Ryc. 45. Nowa Górn a. Detale opracowania boków i krawędzi tulejek siekierek typu *Kowalewko*, wariantu B. Brąz.
Fot.: B. Solarewicz.

some places. On the edge of the socket, in the middle of one face, there is a probable trace of a protrusion left by a pouring channel. The thickened lateral edges converge in an arch in the upper part of the sides (the arch

near the loop is clearly outlined). The arms of the three V-shaped ribs and the mid-rib running through their tops (incomplete on one face) extend to the thickening on the edge of the socket. Paddle-shaped blade, solid,

low (originally probably higher), of asymmetric longitudinal section, with flat sides and sharp lateral edges. Cutting edge of medium width, rounded, sharp. The casting seams are invisible on the loop and the sides of the blade; on the sides of the socket, they are in the form of flat thickenings; under the edge of the socket opposite the loop, they are in the form of a narrow rib. Coarse surface, here and there uneven and rough. Conical socket of medium depth, quadrangular, straight at the bottom. Chipped cutting edge. Patina removed, greyish-golden surface. Preserved length 10.7 cm and blade height 3 cm, min. width 2.9 cm, preserved cutting edge width 3.9 cm, dimensions of the socket mouth 3.1×2.9 cm, socket depth 7.2 cm, weight 315.3 g. X-ray 2581. Inventory no. MMZ/A-2018/20.

50–53. Hoop ornaments (Figs. 49, 50) open, made of a tetrahedral rod twisted around its axis to the left, with undecorated, thinned terminals varying in thickness.

Hoop 50. Twisted 6 times, the middle twists are much longer than the others. The more massive terminal has a circular cross-section and is cut in a straight line; the second one, with a plano-convex cross-section, is slightly convex at the end. On the outer and inner sides of the rod, there are two sharp edges between the twists, the remaining edges are flattened—on the outer side, the second one on the side of the larger terminal and the first two at the thinner end; on the underside, three edges at the massive terminal and only the second one on the opposite side. Coarse surface, heavily so on the top of both terminals, on one plane of the rod and part of the adjacent plane. Patina removed, golden-grey surface. Hoop diam. 11.7×10 cm (inner 9.8×8.3 cm), distance between the terminals 4.1 cm, rod length 30.5 cm, max. rod thickness 1 cm, weight 134.7 g. Inventory no. MMZ/A-2018/2.

Hoop 51. Twisted 8 times. The terminals are circular in cross-section, the narrower one is slightly convex at the end, the other one was broken off. On the outer side of the rod, the second edge between the twists on the side of the narrower terminal and the first two on the opposite side are flattened, the remaining ones are sharp. On the underside, only the two middle edges are not flattened. Mostly slightly coarse surface, more so on the terminals, on one plane of the rod and part of the adjacent plane. Longitudinal cracks on the underside of the narrower terminal. Green patina, in places the golden colour of the metal shines through. Hoop diam. 11.7×10.5 cm (inner 9.9×9 cm), distance between the terminals 4.3 cm, rod length 30.5 cm, max. rod thickness 1 cm, weight 135.1 g. Inventory no. PMA/10535/25 (NG 1).

Hoop 52. Twisted 9 times. The more massive terminal, cut in a straight line, has a circular cross-section; the second one, with a plano-convex cross-section, is slightly

convex at the end. On the outer side, the edge between the twists in the centre of the hoop is slightly flattened and the rest are quite sharp; on the underside, all edges of the twists are flattened. Coarse surface, heavily so at the terminals and, in places, on two adjacent surfaces of the rod. On the outer side of the narrower terminal, there is a narrow, irregular crack. Patina removed, golden-grey surface. Hoop diam. 11.3×10.5 cm (inner 9.6×9.2 cm), distance between the terminals 3.8 cm, rod length 31 cm, 29.5 cm, max. rod thickness 0.9 cm, weight 103.5 g. Inventory no. MMZ/A-2018/1.

Hoop 53. Twisted 9 times, the middle twists are longer than the others. The broken-off terminals (one slightly more massive) have a plano-convex cross-section. The edges between the twists are very sharp on the outer side (at the narrower terminal, the first one is wavy and the second one is discontinuous), flattened on the underside, most strongly in the central part. Coarse surface, smooth in places on the smaller fragment. On the underside of the narrower terminal, there are several longitudinal, irregular cracks. Not broken in modern times (?). Green patina, in places the original golden colour of the metal shines through. Hoop diam. approx. 13.6×9.8 cm (inner approx. 12.1×9 cm), distance between the terminals approx. 8.5 cm, rod length 29.5 cm, max. rod thickness 0.9 cm, weight 57.2 g and 44.9 g (total 102.1 g). Inventory no. PMA/10535/26 (NG 2, NG 3).

REMARKS ON THE CASTING TECHNIQUE AND PREPARATION OF MOULDS

Socketed axes were cast in two-piece moulds, using a core. The moulds could be used repeatedly, and the shape and size of the core and the depth of its embedment influenced both the amount of metal used for casting and the quality of the hafting.²⁰ The moulds were made of clay, bronze or stone. In ceramic moulds, the cavities reproducing the shape of the axe could be imprinted in soft clay using, for

²⁰ Socketed axes were usually hafted on knee-shaped wooden handles. However, other solutions are also known. The socketed axe from Sheperton, Surrey County (southern England), dated to ca. 800–600 BCE, was hafted on a two-piece wooden handle. The horizontal boat-shaped part with a drilled hole was made of hard oaken wood of high durability, the vertical handle was ash, which ensured the flexibility of the construction (<http://chertseymuseum-interactive.org.gridhosted.co.uk/objects/socketed-axe-head/>; accessed on 23.05.2022). The axe from the HaA₁-dated hoard from the Upper Tisza River basin, from Makarova/Макарьова (Zakarpatska obl., UA), was hafted in a comparable manner. In this case, the horizontal element was a decorated bronze hammer-axe (T.E.F. VACHTA 2008, 31, fig. 19; J.P. KOBAL' 2015, 288, 294–295, figs. 3, 4:1).

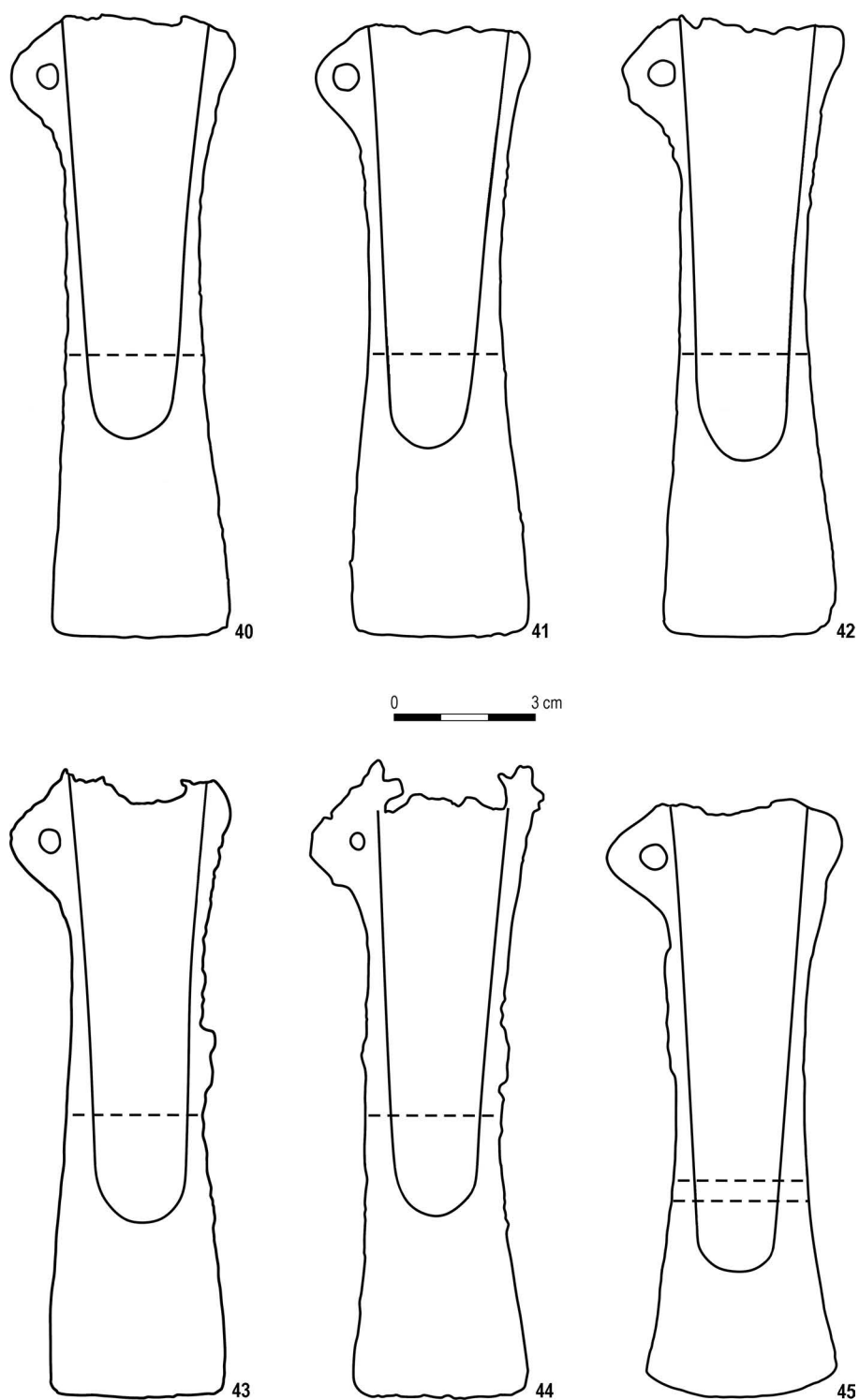


Fig. 46. Nowa Górn a. Sections of the axes of the *Kowalewko* type, variant B. For the key, see Fig. 7.

Drawing: G. Orlińska (acc. to the X-Ray images by W. Weker).

Ryc. 46. Nowa Górn a. Przekroje siekierok typu *Kowalewko*, wariantu B. Legenda por. Ryc. 7.

Rys.: G. Orlińska (wg zdjęć Rtg W. Wekera).

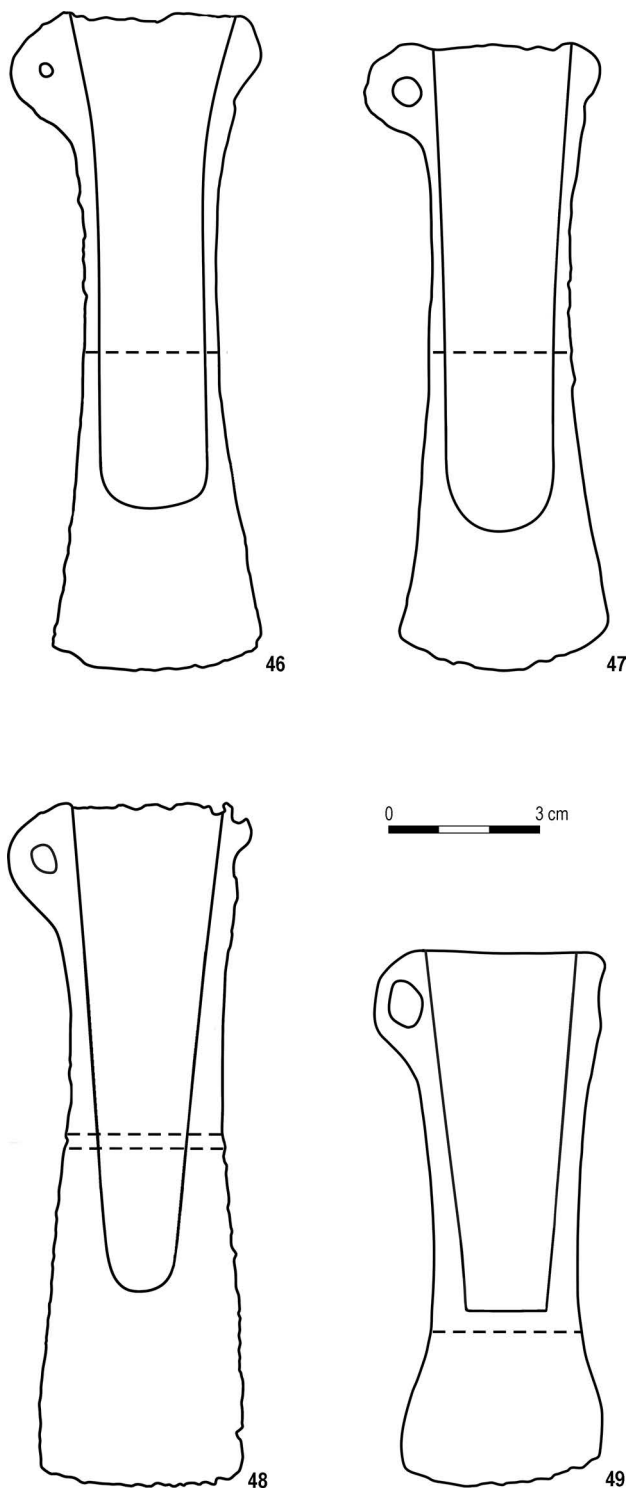


Fig. 46. (cont.).
Ryc. 46. (cd.).

example, metal²¹ or wooden²² models.²³ For other types of objects (e.g., sickles), it has also been suggested that their negatives may have been modelled by hand.²⁴ Metal casting moulds were cast using the lost wax process.²⁵ In stone moulds, the cavities were chiselled out and smoothed.²⁶ The halves of the mould were joined together for the duration of the casting, and were first heated to remove any moisture that might cause the poured metal to gasify. The long use of a stone mould could cause its wear, damage to the negative or loss of integrity. In effect, the resulting castings could have been of inferior quality, and their surface preparation could have required more effort.²⁷ In order to prevent the creation of such castings, which were disadvantageous and uneconomical in terms of the extra effort spent on surface preparation, damaged casting moulds could be successively repaired or remade.²⁸

The quality of a casting was influenced by the accuracy of the reproduction of the object in the cavity, the removal of any impurities from the mould walls that might imprint themselves on the surface of the casting, the tight and even fit of the two mould parts, as well as the parameters of the metal itself and the casting process. Leaky moulds resulted in massive casting seams (flashes) and uneven fit of the mould parts resulted in misalignment of the object faces (mismatches). A non-uniform depth hollowed halves of the mould resulted in an asymmetrical longitudinal section of the object. Insufficient drying of the moulds and cores resulted in cavities in the surface of the casting caused by air bubbles that could not escape through the impermeable walls of the mould. Too much moisture inside the mould was usually caused by an inadequately heated stone core or an inadequately dried clay core. The formation of bubbles was also influenced by the temperature of the molten metal being too low. Low permeability of the permanent moulds (metal and stone ones) combined with insufficient filling of the moulds with liquid metal could have led to the formation of voids in the form of holes of varying sizes.²⁹ Misruns could also be caused by an insufficient diameter of the runners, which were designed not only to ensure the flow of liquid metal into the mould cavity, but also to eliminate defects associated with its shrinkage during solidification. Uneven solidification of the metal in the mould results in shrinkage cavities of different sizes and depths on the blade faces

²¹ O. DIETRICH 2011, 80–81; K. NOWAK 2019b.

²² H.W. HODGES 1954, 64, fig. 3; S. Ó FAOLÁIN 2004, 43, fig. 3:22.

²³ A. GARBACZ-KLEMPKA, D. ŚCIBIOR, Z. KWAK 2016, 111.

²⁴ CH. JAHN 2013, 51, fig. 2:10.

²⁵ B.R. ARMBRUSTER 2000, 42; D. JANTZEN 2008, 172.

²⁶ B. WANZEK 1989, 35; L. LESHTAKOV 2019, 216.

²⁷ A. GARBACZ-KLEMPKA *ET ALII* 2018, 180.

²⁸ L. LESHTAKOV 2019, 223.

²⁹ A. GARBACZ-KLEMPKA *ET ALII* 2018, 181, 184.

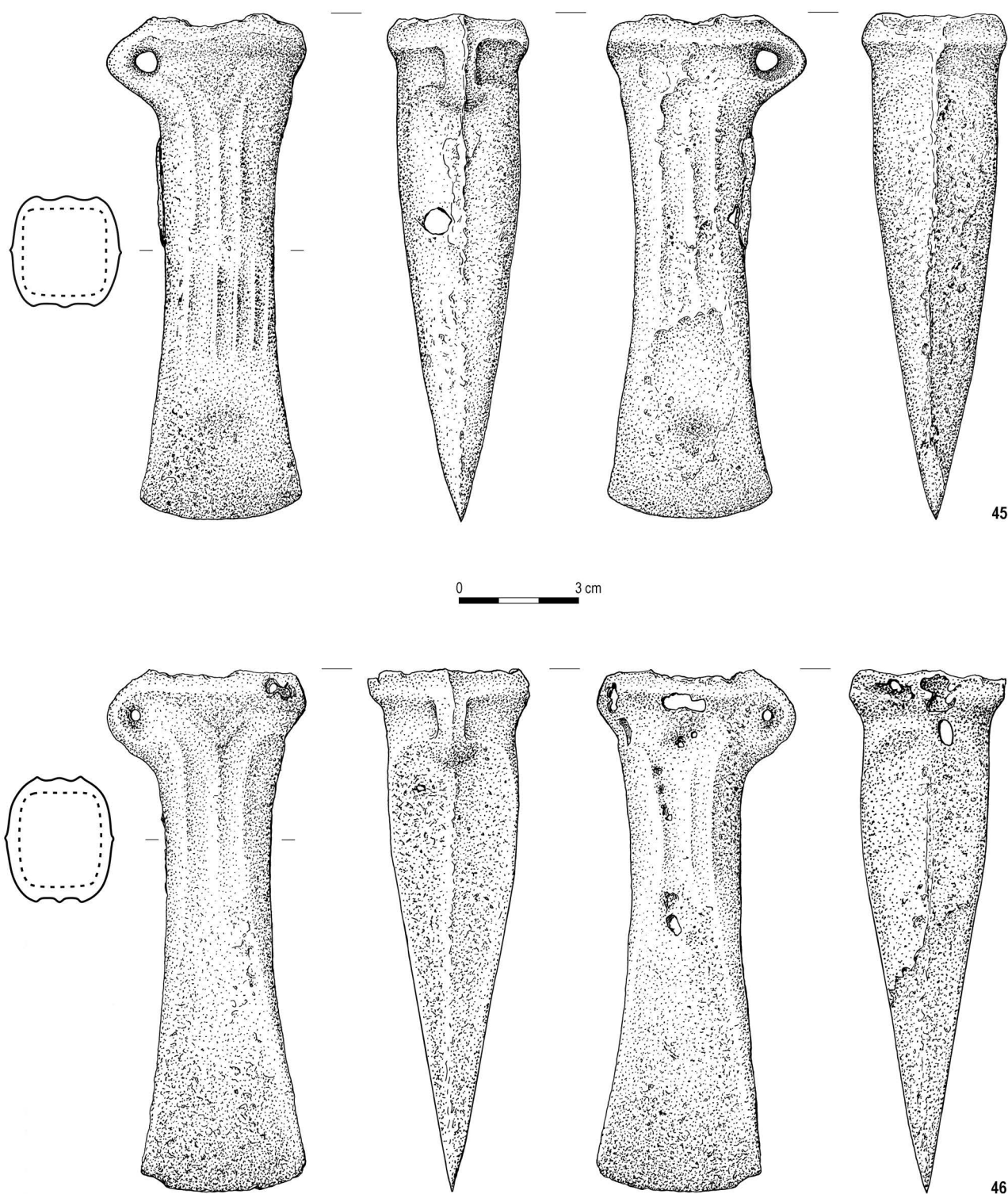


Fig. 47. Nowa Górn a. Axes 45 and 46 of the *Kowalewko* type, variant B. Bronze. Drawing: B. Karch.

Ryc. 47. Nowa Górn a. Siekierki 45 i 46 typu *Kowalewko*, wariantu B. Brąz. Rys.: B. Karch.

at the point of contact between the socket and the solid blade. The quality of the casting was also influenced by the correct cast ability and temperature of the casting alloy, which for tin bronzes with about 10% Sn should be 1080–1120°C; for lower tin contents, it should be about

1180°C.³⁰ The addition of tin had a favourable effect on the mechanical properties of the castings, which became

³⁰ A. GARBACZ-KLEMPKA ET ALII 2018, 184.

harder and more ductile,³¹ and a golden or silver colour, resembling that of precious metals.³²

The treatment of the axes removed from the moulds consisted of removing the gating system (pouring basin and channels), grinding of the casting seams and preparing of the blade for use by increasing its strength through hammering and sharpening the cutting edge.³³ The surface was polished to minimise irregularities and roughness.

Thirty-nine axes of Middle Danubian origin were cast in 24 moulds.³⁴ Six moulds yielded two specimens each with a straight socket edge, variant B (nos. 7 and 8, 15 and 16) and C (nos. 18 and 19, 29 and 30, 31 and 32, 33 and 34), three moulds were used to make three specimens each with a straight, profiled socket edge, variant A (nos. 2–4), and with a straight socket edge, variant B (nos. 9–11, 12–14), one mould yielded four axes with a straight edge, variant C (nos. 20–23). Single specimens (35.9%) of the above mentioned types (nos. 5, 6, 17, 24–28, 35, 36) as well as the axes: with a defined blade, variant D (no. 37), richly decorated on its wider sides, variant A (no. 38), and of the *Jablonka* type (no. 39) came from 14 moulds.

Fourteen axes: two with a straight, profiled socket edge, variant A (nos. 5, 6), 11 with a straight socket edge, variant C (nos. 18–28), and one richly decorated on its wider sides, variant A (no. 38), were cast using cores with a horizontal hole and stabilised in the mould with a pin.³⁵ The pin was most likely inserted on the side without the loop, where the hole is larger than on the opposite side (except for specimen 38, with very small holes of similar size). The holes in the sides of the axes, with diameters ranging from 0.1 cm to 0.4 cm, are mostly circular or oval. The pin-fixed cores were mostly oval in cross-section, except for the one used in the production of axe 38 (inserted deep into the mould, almost cylindrical, with a slightly rounded top), were conical, straight at the end (nos. 5, 20–23, 26, 27), or at most slightly rounded (nos. 18, 19, 24, 28), and were usually set at a medium depth, shallow only in specimen 5. Three cores of lenticular cross section with a straight top were set shallowly (no. 6) and at a medium depth (nos. 25, 26).

The solid cores, as well as those with a hole, were usually conical, most of them oval, with a strongly (nos. 2–4,

7–13, 15, 16, 32, 35, 36) or slightly rounded top (nos. 1, 30, 31, 33, 34); in exceptional cases, the end was straight (no. 37). The cores were set shallowly (nos. 1, 2–4, 12–16, 30, 35–37), rarely at a medium depth (nos. 9–11, 31–34), and occasionally deeply (nos. 7, 8). Two of the three almost cylindrical, oval-shaped cores with a strongly rounded top were set at a medium depth (nos. 17, 29), while the third one was set shallowly (no. 39). The cores used in the casting of axes 1 and 39 had an almost circular cross-section at the level of the socket edge.

Both methods of fixing the core were ineffective and did not stabilise it during the filling of the mould with metal, hence the narrowing of the ribs/thickenings at the edge of the socket, sometimes quite considerable (nos. 1, 5, 14, 15, 38, 39). In general, the cores were inclined to the same side during the casting operations carried out in the same moulds. The exception was the production of axes 20–23, when, during the casting of the first two specimens, the core tilted in the opposite direction to that of the other two. The core with a slightly rounded top used in the casting of axe 31 remained almost vertical, while the core with a strongly rounded end inserted deeper into the same mould, used in the production of specimen 32, tilted.

Axe 1, the smallest and lightest in the hoard, having a symmetrically concave socket edge, variant A, weighing less than 100 g, was cast almost flawlessly, in a well-dried mould with symmetrical hollow sections; it was the only mould into which metal was introduced through a single pouring channel located at the upper base of the loop.

Five axes with a straight, profiled socket edge, variant A, were cast in three moulds. They differ in their formal features, quality of workmanship and finish, and casting technique. The protrusions left by the pouring channels on the edge of the sockets, in the middle of the faces, were of uneven size, as in most the other axes. Such a significant discrepancy in the dimensions of the channels may be related to their different functions in the mould—the wider one being used for feed metal and the narrower one for gas discharge.³⁶

Axes 2–4, weighing just over 200 g, were cast in a mould with cavities of unequal depth, presumably using three different cores, set shallowly without the aid of a pin. The best dried mould was used to specimen 2. The mould halves were joined tightly but unevenly, especially in the case of axe 3. The incomplete side of this specimen and the hole on the same side in specimen 2 may have been caused by the small distance between the core and the mould wall, which prevented the cavity from being evenly filled with alloy. Despite the incomplete side, axe 3 slightly

³¹ Cf. A. GARBACZ-KLEMPKA, D. ŚCIBIOR, Z. KWAK 2016, 110.

³² J.-L. FANG, J.G. McDONNELL 2011, 56, fig. 1.

³³ Cf., e.g., Z. HENSEL 1996, 152; A. GARBACZ-KLEMPKA, D. ŚCIBIOR, Z. KWAK 2016, 109; K. NOWAK 2018, 98–99, 120; A. GARBACZ-KLEMPKA ET ALII 2018, 184.

³⁴ Most of the moulds for casting socketed axes from Romania is made of stone, while much less durable moulds made of clay are recorded nine times less often (O. DIETRICH 2011, fig. 4).

³⁵ Cf. E.F. MAYER 1977, 191, pl. 85:1212; C. KACSÓ 2013, 227, fig. 3. Such a method of casting socketed axes was used in Transylvania already in BD (cf. O. DIETRICH 2010, 131, fig. 4:2).

³⁶ K. NOWAK, K. SIELICKA, B. MIAZGA 2022, 105–106.



Fig. 48. Nowa Górn a. Axes 47, 48 and 49 of the *Kowalewko* type, variant B. Bronze. Drawing: B. Karch.

Ryc. 48. Nowa Górn a. Siekierki 47, 48 i 49 typu *Kowalewko*, wariantu B. Brąz. Rys.: B. Karch.

outweighs the other two, probably due to the use of a shallower, slightly smaller core³⁷. The shrinkage cavities at the

base of the blade on the same face of axes 2 and 3 indicate that the metal solidified in the mould in a similar way.

³⁷ The weight of the axes also depended on the atomic weight of the alloy used. The few published results of analyses of the chemical composition of different types of axes, among which there are no

specimens from the same casting mould (see A. GARBACZ-KLEMPKA ET ALII 2018, table 1), make it impossible to formulate any conclusions on this subject.

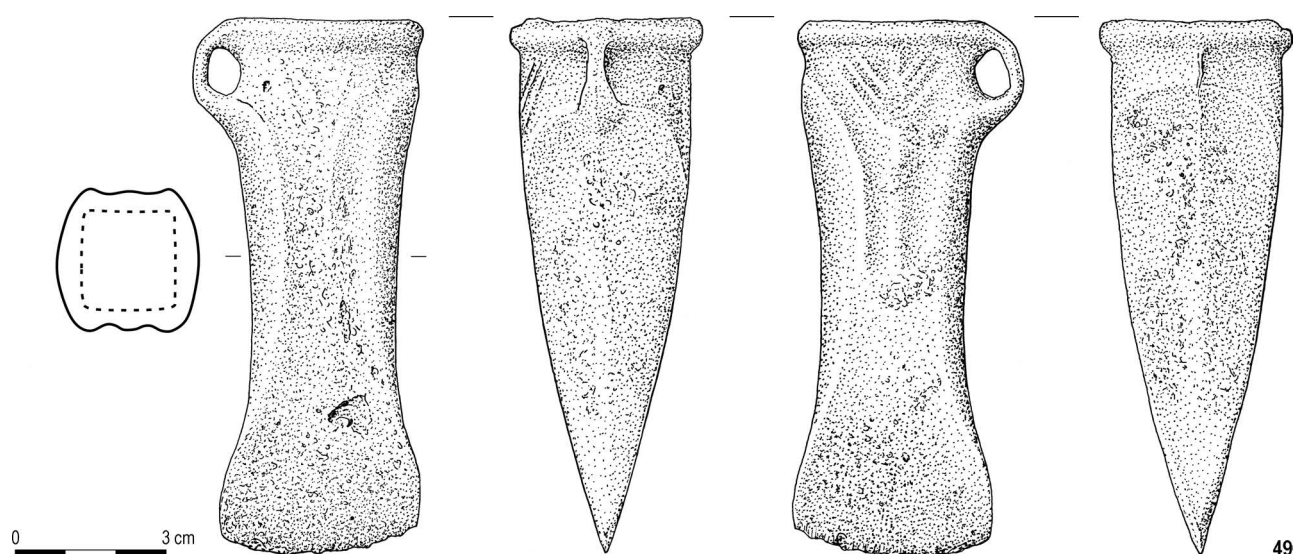


Fig. 48. (cont.).

Ryc. 48. (cd.).

Cores stabilised with a horizontal pin were used to cast axes 5 and 6, with similar weights of around 130 g, both with shrinkage cavities at the base of the blade. In the symmetrical parts of the mould cavity, where axe 5 was obtained, the shape of the circumferential rib was unevenly reproduced. The less well dried mould used to make specimen 6 had a slightly deeper one half of the cavity.

The four moulds with cores attached without pins, used to cast ten axes with a straight socket edge, variant B, were leak-proof, with asymmetrical hollow halves, resulting in a greater convexity of either an entire face (nos. 7, 8, 15 and 16) or just the socket (nos. 9–14). The mould halves were evenly joined during the casting of axes 12 and 13. These specimens and specimen 14, obtained in the same mould, lack the shrinkage cavities at the base of the blade, indicating even solidification of the metal. Shrinkage cavities formed on axes 9–11 cast in one mould and on one of the two specimens (nos. 8, 15) from the other moulds.

The cavity of the mould used to cast axes 7 and 8, apart from one deeper part, had unevenly shaped sides, except for a deeper part, hence the unusual pentagonal cross-section of both specimens. Minor gasification of the alloys due to the moisture in the mould or the core occurred at the same location within the sockets. The considerable depth of the sockets means that the axes in question weigh less (in the case of the heavier specimen 7, just over 350 g) than specimens 15 and 16 despite their comparable length. The reduction of nearly 20 g in the weight of axe 8 compared to specimen 7 may have been caused by a deeper setting of a slightly larger core.

Slightly lighter than those discussed above, axes 9–11 (the heaviest specimen 9 weighs no more than 330 g) were probably cast with the same core set at a medium depth; both the core and the mould were well dried. The metal filled the cavity unevenly, hence the misruns in each axe. The similar defects of specimens 9 and 10 indicate similar casting processes. The least amount of metal was used to cast axe 11, which had the deepest socket, reaching below the base of the blade. In addition to the shallower socket, the weight of the most massive specimen 9 is also increased by the compact alloy, without shrinkage porosity, as shown in the X-ray image.

Axes 12–16, like specimens 2–4 with a straight, profiled socket edge, variant A, were cast using shallowly set conical cores. The small depth of the sockets was not conducive to metal economy and, combined with the size of the specimens in question, made them the most massive of the axes of Middle Danubian origin, with a weight in excess of 360 g. Cast in different moulds, specimens 12 and 15 were made from bronzes with similarly low tin content (4.190% and 4.812% Sn respectively).³⁸ The alloy used in the production of axe 12 contains an elevated proportion of lead (2.675% Pb), which could be either the result of an intentional addition of this component to the alloy³⁹ or a recycled admixture introduced with the scrap used as raw material. The prevailing opinion in the literature is that an intentional addition of lead to bronze is indicated by a lead concentration of more than 5%, while

³⁸ A. GARBACZ-KLEMPKA *ET ALII* 2018, table 1 (NG 21 and NG 24).

³⁹ Cf. A. GARBACZ-KLEMPKA *ET ALII* 2018, 182.

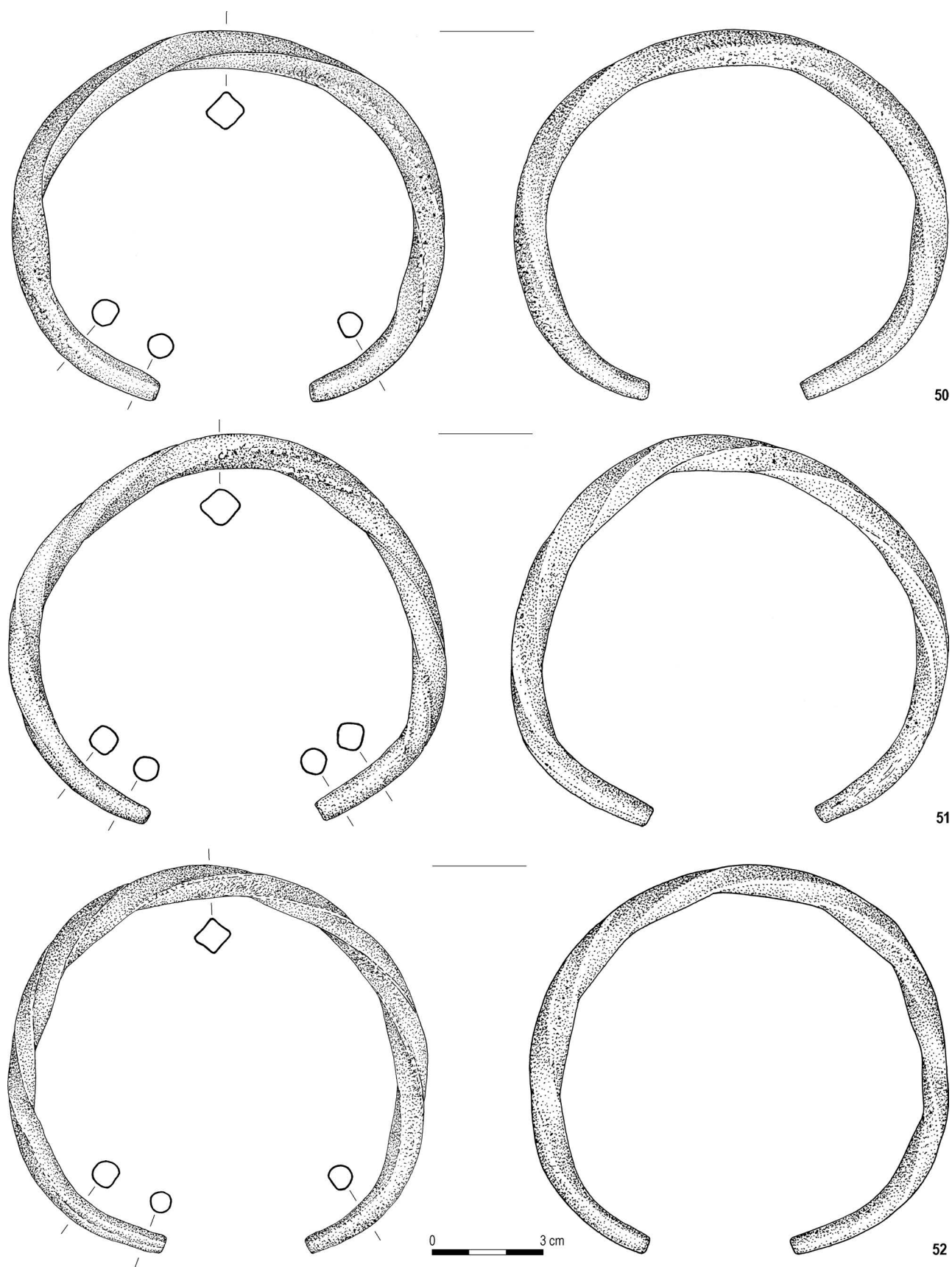


Fig. 49. Nowa Górna. Hoop ornaments. Bronze. Drawing: B. Karch.

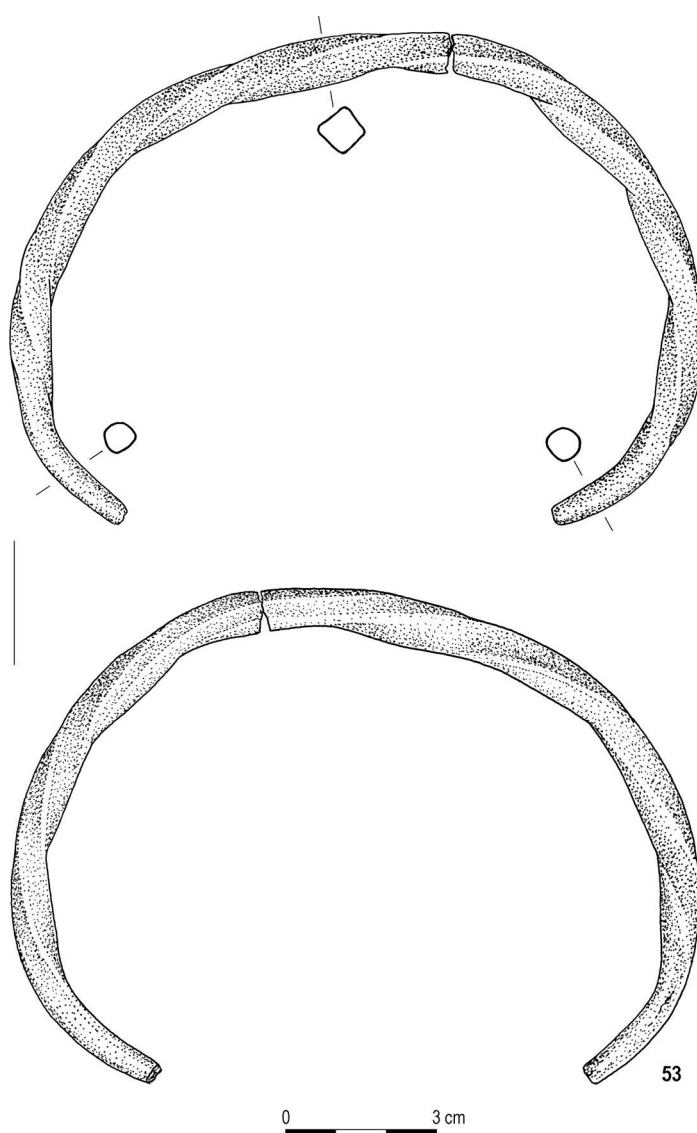


Fig. 49. (cont.).
Ryc. 49. (cd.).

a proportion of less than 1% Pb almost certainly rules out such a possibility.⁴⁰

The lack of decoration on one (the same) face of the five specimens in question seems to indicate that the two moulds used to cast them either had one part of the cavity defectively prepared or that the casting processes were inadequate. Moreover, it cannot be excluded that halves of two different moulds were used, or that one of the parts was worn out to a greater extent (faster wear?) as a result of progressive abrasion of the negative in the casting mould cavity. We can also indicate the 'production sequence' and the order in which the individual objects were cast. In one of the moulds, axe 12 would have

been made first, followed by specimen 14, and finally specimen 13. Axe 12, judging by the partial casting of the decoration, was not the first object obtained in this mould. In the case of the two specimens from the next mould, it can be assumed that axe 16 was made before specimen 15, whose decoration on one face was not cast at all. As the decoration on the second face of axe 16 is not as well reproduced as in specimen 15 (incomplete in the lower part), it is difficult to determine conclusively whether the different quality of the rib casting was a result of damage to the negatives in the mould or a casting defect (misrun).

The surface of axes 12–14, like that of specimens 2–4, is uneven and rough, with metal streaks. Specimens 12 and 13 were cast using two different cores with a strongly rounded tops. The core, slightly rounded at the top, used in the production of specimen 14 was slightly smaller than the other two, which resulted into an increase in alloy consumption to nearly 390 g. At the same time, the greater space between the core and the mould wall allowed the cavity to be filled evenly with metal. During each casting process, there was gasification of the alloy under the edge inside the socket.

Axes 15 and 16, with a similar weight of just over 360 g, were probably cast using the same core. An X-ray image showed numerous shrinkage porosities in the bronze of specimen 16.

Axe 17 with a straight socket edge, variant B, which differs in a number of features from the specimens of this type discussed above, was cast unsuccessfully in a mould that had not fully dried; its two parts were unevenly joined and leaked, especially in the upper part on the side without the loop, below the presumed pouring channel. The hollow halves of the mould were not identical, hence the different heights of the blade faces overlapping the socket and the non-uniform decoration on the faces. The bronze used to cast this axe has a tin content of only 1.209%.⁴¹

The axes with a straight socket edge, variant C, which were the most numerous among the specimens of Middle Danubian origin, were cast using different technologies. Eleven specimens (nos. 18–28) were cast in seven moulds with cores stabilised by a horizontal pin, and eight axes (nos. 29–35) were cast in five moulds with cores fixed without a pin. According to published analyses of the chemical composition the axes nos. 21, 28 and 32 were made of alloys with a high tin content (11.25–15.62% Sn).⁴² The bronze of axe 28 is distinguished by a higher

⁴⁰ Cf. Z. HENSEL 1996, 148–149; E. PERNICKA 2014, 256.

⁴¹ A. GARBACZ-KLEMPKA ET ALII 2018, table 1 (NG 25).

⁴² A. GARBACZ-KLEMPKA ET ALII 2018, table 1 (NG 7, NG 9 and NG 13). 337

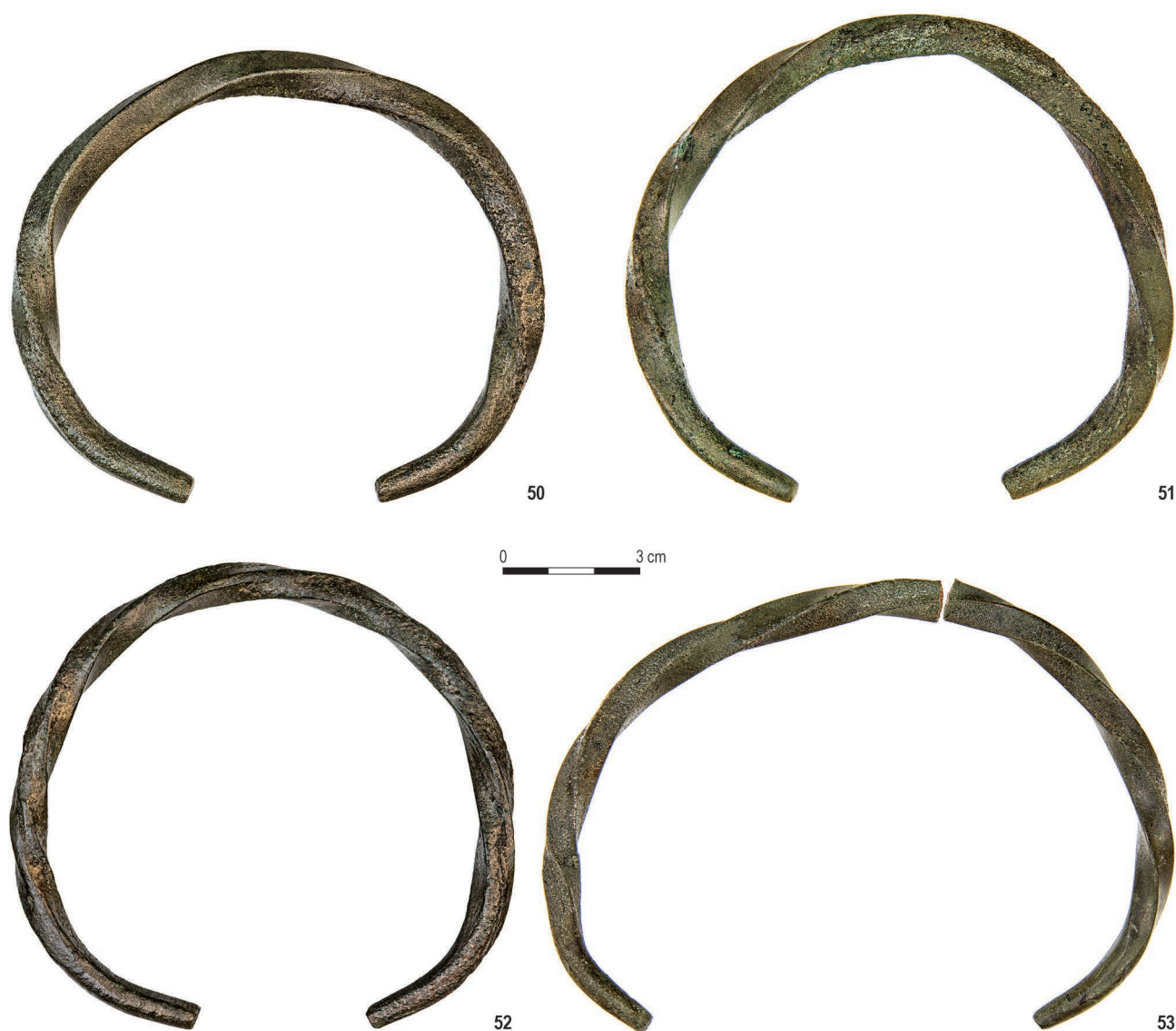


Fig. 50. Nowa Górna. Hoop ornaments. Bronze. Photo: B. Solarewicz.
Ryc. 50. Nowa Górna. Ozdoby obręczowe. Brąz. Fot.: B. Solarewicz.

contents of nickel, up to 1.348%, and a slightly higher content of arsenic and antimony (0.335% As and 0.085% Sb)—volatile elements that are lost during the smelting of copper from the ore—than in the other metals.⁴³

Axes 18–24, with almost identical formal characteristics and similar weights of approximately 240–257 g (Table 1), were most likely made in the same workshop. In all casting processes, there was gasification of the metal (the fewest shrinkage cavities formed in the sockets of axes 19, 22 and 23), and there are misruns in the faces and incomplete decoration. Specimens 18, 19 and 24 were cast in two moulds, using different cores with a slightly round-

ed tip, and axes 20–23 were cast in another mould, most likely using the same straight-ended core. The specimens in question (with the exception of axe 23) had shrinkage cavities formed at the base of the blade, usually on both faces. In the case of axes 20–23, there was no logical correlation between socket parameters and the weight of the casting; specimen 22, with the deepest socket and few gas pores, was the heaviest.

The four moulds in which axes 25–28 were cast had slightly asymmetrical hollow halves, and the cavity of the mould intended for specimen 25 also had uneven sides, which resulting in an irregular cross-section of the casting. The halves of this mould were not evenly joined at the time of casting, but, unlike the others, the mould was well

dried, as was the core. The absence of sinking at the base of the blade is evidence of uniform solidification of the metal.

Cast in three moulds, axes 29–34, with similar dimensions, almost identical proportions and decoration, appear to have been made in a single workshop. The absence of gas pores inside the sockets and the recesses at the base of the blade in most cases (except for specimens 31 and 33) indicate a similar casting process. The hollow halves of the moulds used to cast axes 31–34 were somewhat asymmetrical. In only one of these moulds, specimen 33, were the parts evenly joined. Specimens 33 and 34, with an almost identical weight of 194 g, were most likely cast using the same core, which was fixed in the mould at a similar depth. A more massive core was used in the casting of axe 29 in a different mould, which reduced its weight by almost 20 g compared to specimen 30. Axe 32 was made with a larger and more massive core than specimens 31 and weighs 30 g less, which is the largest difference in weight between specimens of Middle Danubian origin cast in the same mould.

Presumably from the same workshop came axes 35 and 36, also unsuccessfully cast in not fully dried moulds with parts unevenly joined at the time of casting. The mould in which specimen 35 was cast had slightly asymmetrical cavity halves.

Asymmetrical cavity halves were also present in a well-dried mould designed for axe 37 with a defined blade, variant D, cast using a core fixed without the aid of a pin. The metal did not fill the deeper part of the cavity evenly, resulting in a casting defect on the socket face.

Axe 38 of variant A, richly decorated on the wider sides, made with a deeply set massive core stabilised by a very thin pin, was cast unsuccessfully in a dried mould with an uncertain number of channels, leaking especially on the side without the loop, and with asymmetrical hollow halves with unevenly reproduced decoration.

The mould intended for axe 39 of the *Jablonka* type was also dried and leaky, with an unknown number of pouring channels (the greatest amount of metal spilled in the lower part on the side with the loop). The core, as in the case of specimen 38, was also almost cylindrical, but set flat and without the use of a pin. Both of these axes were cast to a comparable quality.

The ten local *Kowalewko*-type axes were cast in six different moulds⁴⁴—one mould yielded five specimens (nos. 40–44), and the remaining five moulds produced a single specimen each (nos. 45–49).⁴⁵ Most likely, all these

moulds were equipped with two pouring channels located in the centre of the faces at the edge of the socket. The cores fixed without a pin usually had a strongly rounded top, and only the core used in the production of specimen 49 was straight at the end. The conical cores were the most common and were inserted to a medium depth (nos. 40, 41 and 49) and more often deep (nos. 42–45 and 48). The funnel-shaped core (no. 46) and the almost cylindrical core (no. 47) were also inserted deeply. The cores used to cast specimens 47 and 49 were square along their entire length, and the straight-ended core used to cast this last specimen was the best stabilised. The remaining cores were quadrangular in the section introduced into the mould and, starting from the edge of the socket, almost circular (nos. 40, 45, 46 and 48) or oval (nos. 41–44). Presumably, the same core used in the production of specimens 40–44 was positioned differently each time.

The most thoroughly dried moulds were those with symmetrical cavity parts, intended for casting specimens 45 and 49. The remaining moulds had one part more hollowed out (sometimes quite significantly), which usually reproduced the non-flat face of the blade reproduced; only in the case of specimen 48 was the arrangement of the faces reversed. Most of the moulds were not completely sealed. In the case of the mould used to cast axe 45, metal leakage occurred in the upper part on the side with the loop, and the moulds used for specimens 46 and 47 leaked on the lower part. In the case of the mould used to make five axes, metal leaked to the side without the loop but only during the production of specimens 43 and 44. The result of the inaccurate reproduction of the decoration in the cavity parts of each mould is the uneven (rounded or pointed) shape of the central ribs and the thickened lateral edges. Dirt, damage, or incorrectly reproduced narrow V-shaped grooves resulted in the motif of nested angular ribs being cast incorrectly or not at all. The discontinuous decoration on axe 45, which extends to the base of the low blade, differs from the decoration of other pieces. It was obtained by modifying the mould cavity by adding lower (different) sections of the decoration.

The *Kowalewko*-type specimens of similar length (example 49 is shorter due to a fracture/wear of the blade) differ quite significantly in weight. The largest axe 48, with a relatively shallow and narrow socket, weighs almost 395 g, and the lightest specimen 47 weighs just over 260 g. Of the five specimens cast in the same mould, the heaviest axe 40 with the shallowest socket weighs over 44 g more than the lightest specimen 43. The difference in casting quality of axes 40–44 may be due to the deteriorating condition of the mould or its inadequate preparation. This mould was dried most carefully before casting

⁴⁴ In Poland, most of the two-piece casting moulds were made of stone (cf. K. NOWAK 2018, fig. 1). On the other hand, out of 22 moulds for casting socketed axes, ten are made of bronze, seven of stone and five of clay (cf. K. NOWAK, B. MIAZGA 2018, 317–318, 324–325, fig. 2).

⁴⁵ To cast axes 45 and 46, bronzes with low tin content were used (2.413% and 1.559% Sn respectively). Cf. A. GARBACZ-KLEMPKA ET

specimens 41 and 42, whereas during the production of the others—the visually most successful axe 40 and the defective specimens 43 and 44—quite numerous shrinkage cavities, caused by air bubbles, were formed in the upper part of the socket. The many sizes and shapes of the protrusions left by the pouring channels, the uneven shrinkage cavities at the base of the solid part of the blade, misruns, the unevenly distributed rough spots and the poor stabilisation of the core, all point to different casting processes.

It appears that there was a recurring fault in the casting of the Kowalewko type axes, resulting in defective solidification of the metal at the junction of the socket and the solid part of the blade. Shrinkage cavities were noted on one or both faces of eight out of ten specimens—pit-like cavities on axes 40–45 and shallow cavities on specimens 46 and 47. In the case of the axes of Middle Danubian origin, shrinkage cavities are much less common, being present in 20 out of 39 specimens (nos. 1–3, 5, 6, 8–11, 14, 15, 17–22, 24, 31, 33) and in three cases only in the form of deep shrinkage cavities (nos. 11, 22, 24).

The rods from which the **hoop ornaments** were formed were most likely cast in one-piece open moulds or two-piece moulds with one flat part⁴⁶. The length of the rods used to make the ornaments ranges from 29.5 to 31 cm. They may have been cast longer and only later divided into appropriate sections, or they may have been extended from shorter sections using plastic working.

From the analysis carried out, it can be concluded that the moulds used to cast the Kowalewko type axes were not as well prepared as the 'Middle Danubian' moulds (see Table 2). Of the six moulds, four were leaky, five had uneven cavity parts, and the halves of three of the latter were unevenly joined at the time of casting. The cores fixed without pins, unlike those of the specimens of Middle Danubian origin, were quadrangular in cross-section, at least in the section inserted into the mould, and mostly at a considerable depth, which on the one hand saved raw material and on the other allowed the axe handle to be embedded deeper. Of the 24 'Transcarpathian' moulds, only three were leaky, 14 had unevenly joined parts, 16 had asymmetrical cavity halves and, in the case of two of the latter ones, also sides. The cores, mostly conical and oval in cross-section, were only occasionally deeply embedded. They were stabilised in the moulds with a horizontal pin (an axe production technique unknown in the area of modern Poland) and were usually set at a medium depth, and the cores without a hole for the pin were set shallowly rather than at a medium depth.

OBJECT DEPOSITION MODEL BASED ON THE PRESENCE OF PRODUCTION AND USE WEAR

Wear analyses carried out for metal artefacts are an excellent tool for categorising objects in terms of surface treatment (including their division into used and unused⁴⁷). The traceological method has been the subject of several methodological studies;⁴⁸ recently, its limitations have also been pointed out in Polish literature.⁴⁹ Certainly, the study of traces preserved on the surface of metal objects provides information not only about their use but also, and perhaps above all, about the methods of their production and the quality of their workmanship. By analysing the imperfections and remnants of the casting process found on the surfaces of artefacts, we can attempt to reconstruct the production process of the objects under study. Traces left by the final shaping of the obtained castings, i.e., plastic forming and grinding, are also a valuable source of information. Use-wear preserved on the surface of the artefacts (e.g., scratches, dents) indicate their role in the daily activities of prehistoric communities. All the information obtained allows us to trace the biography of the objects from the moment of production to the act of deposition.⁵⁰

The artefacts from the Nowa Górna hoard were subjected to microscopic observations in order to identify traces related to their manufacture and use (Table 2). A portable Dino-Lite digital microscope and a Nikon SMZ745T stereoscopic microscope were used for this purpose.⁵¹ The objects were examined after conservation, which was different for the artefacts stored in the State Archaeological Museum and those in the Zgierz City Museum, and the differences in the colour and surface structure of the objects are well illustrated in Figure 3. The patina has been removed from the artefacts in the Zgierz museum, so that their surface has a 'metallic', golden colour. According to the photographic documentation taken before conservation, the surface of most of the objects was covered with a thick layer of dirt and patina. Some of the axes also showed spots of loose, weathered corrosion.

Traces analysis of artefacts whose surface has been 'modified' to some extent by conservation (i.e., after removal of dirt, corrosion products, etc.) is problematic, because it is often difficult to clearly identify certain

⁴⁷ Cf. e.g. J.G. TARBAY 2022.

⁴⁸ C. GUTIÉRREZ SÁEZ, I.M. LERMA 2015; A. DOLFINI, R.J. CRELLIN 2016; V. GENTILE, A. VAN GIJN 2019.

⁴⁹ M. KASPROWICZ 2022.

⁵⁰ D. FONTIJN 2002, 27–33, table 3:2; D. SYCH 2014.

⁵¹ For providing access to the microscope, we would like to thank the Staff of Institute of Archaeology of Nicolaus Copernicus University in Toruń, Ass. Prof. Grzegorz Osipowicz and Justyna Orłowska PhD.

⁴⁶ Cf. K. NOWAK 2018, 98, with earlier literature; E. TOMCZAK, A. SZCZEPANEK, P. JAROSZ 2021, figs. 28, 89.

types of wear, mainly small scratches, as the remains of prehistoric activity. This is the case with the hoard from Nowa Górna, especially the axes from the Zgierz collection, where the patina layer has been removed from the surface. For this reason, the small and very regular superficial scratches, whose origin was considered to be modern were excluded from the analysis and overall interpretation.

AXES

The set of 49 axes discovered at Nowa Górna was divided into three main categories according to the presence or absence of traces on the surface: 1 – untreated axes, i.e., those without traces of shaping or use and with preserved traces of production; 2 – axes prepared for use, with preserved traces of production and of surface shaping (hammering and grinding); 3 – axes with traces of use, including scratches near the cutting edge, nicks on the sharpened cutting edges, and severe abrasion of the sides in the lower part (Fig. 51).

1. Untreated axes

A large collection, consisting of 19 items, was considered to have been deposited in a raw state (Fig. 51). These axes, with surfaces without traces of interference and processing, apart from the removal of casting jets, are characterised by thick and blunt cutting edges. The identified traces of production include untreated, sharp-edged casting seams on the sides of specimens 2, 4, 9, 10, 13–15, 41, 42 (Fig. 52:8), 44 and 48 and on the cutting edge of specimens 3, 7, 8, 11 (Fig. 52:1), 12, 16, 40 and 43. Most axes possess casting defects, such as misruns (e.g., nos. 3, 9, 12, 15) or incomplete loops (nos. 13, 15), traces of metal penetrations into the walls of the casting mould, usually in the lower part of the blade (e.g., nos. 9, 10, 43), or metal-filled loops (nos. 2–4). An asymmetry in the side view (difference in the size of the object halves) is

visible in the case of all axes; an asymmetry, sometimes significant, related to the shifting of the mould halves or poor fit during casting, was identified for 16 pieces (e.g., nos. 3, 7, 43). Few axes bear traces of solidification and shrinkage of the metal (Fig. 52:7). It should be noted that the defects described above, generally small misruns and traces of slight metal penetrations, are not serious enough to exclude these items from preparation and subsequent use. The only defect requiring significant effort and time to fix would be the removal of excess metal from the filled-in loops. The category of deposited untreated axes includes both the specimens described as local—six axes of the *Kowalewko* type, variant B (nos. 40–44 and 48), as well as those presumably imported—three specimens with a straight socket edge, variant A (nos. 2–4), and 10 with a straight socket edge, variant B (nos. 7–16). Of the axes of the latter type, only the very poorly preserved specimen 17 (discussed below) shows traces indicating preliminary surface treatment.

2. Axes prepared for use

Twelve axes bear traces of shaping and preparation for use (Fig. 51). They also show traces of production, such as filled-in (nos. 17, 35) or incomplete loops (Fig. 52:3), other misruns (Fig. 52:4; so-called cold shut), unevenness in the decoration and reflecting the structure of the negative of the casting mould (Fig. 52:5,6), or metal penetrations in the place of casting seams (Fig. 53:4). The latter extend right to the cutting edge and have not been ground or abraded by use. In most cases, the cutting edges are blunt, with remnants of casting seams (nos. 30–32) or with traces of plastic processing that also included the seam (Fig. 53:6). Traces that have been associated with the shaping of the tools for use are grinding and blade hammering. Grinding, often associated with traces of hammering, was identified on six axes—nos. 25, 31 and 33–36 (Fig. 53:8). These are mainly regular,

Table 2. Nowa Górna. Traces of production, shaping and use on the objects from the hoard (1–39 – Middle Danubian axes; 40–49 – local axes). No. – object number; a – casting mould; b – grinding (lines parallel or oblique to the cutting edge); c – sharpening (oblique scratches only at the cutting edge); d – hammering; e – shrinkage; f – metal penetration; g – misrun or cold shut; h – untreated casting seam; i – casting seam, smoothed or grinded down/hammered out (G/H) near the cutting edge; j – damage to/unevenness of the mould; k – asymmetry of the parts; l – mould shift; n – scratches related to use; n – notches in the cutting edge; o – damaged object (broken, bent, cracked); p – protrusions left by pouring channels (their number). Cases where they differed in size were marked with *; q – hole for affixing the core; r – raw state; s – miscast (unsuitable for use); t – finished product (unused, with traces of shaping, i.e., hammering – H, grinding – G); u – finished product (used).

Tabela 2. Nowa Górna. Ślady produkcji, formowania i używania na przedmiotach ze skarbu (1–39 – siekiery typów środkowodunajskich; 40–49 – siekiery typów lokalnych). Nr – numer przedmiotu; a – forma odlewnicza; b – szlifowanie (linie równoległe lub ukośne do krawędzi ostrza); c – ostrzenie (rysy ukośne tylko przy krawędzi ostrza); d – kucie; e – skurcz; f – nadlew; g – niedolew; h – szew odlewniczy bez ingerencji; i – szew odlewniczy zagładzony, albo zeszlifowany/kuty (G/H) przy krawędzi ostrza; j – uszkodzenie/nierówność formy; k – asymetria części; l – przesunięcie części; m – rysy związane z użytkowaniem; n – szczyrby w ostrzu; o – przedmiot uszkodzony (złamany, zagięty, pęknięty); p – nadlewy kanałów wlewowych (ich liczba). Symbolem * zaznaczono przypadki, gdzie nadlewy różniły się wielkością; q – otwór do mocowania rdzenia; r – stan surowy; s – źle odlany (wykluczający użycie); t – gotowy produkt (nieużywany, ze śladami formowania, tj. kucia – H, szlifowania – G); u – gotowy produkt (używany).

No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
1	1	-	-	-	-	-	-	-	1 (G)	-	-	-	-	1	-	1	-	-	-	-	1
2	2	-	-	-	-	1	1	1	-	-	1	1	-	-	-	2*	-	1	-	-	-
3		-	-	-	1	1	1	1	-	-	1	1	-	-	-	2*	-	1	-	-	-
4		-	-	-	-	1	1	1	-	-	1	1	-	-	-	2	-	1	-	-	-
5	3	1	-	-	-	-	1	-	1	-	-	-	-	1	1	2*	1	-	-	-	1
6	4	-	1	-	-	-	1	-	1 (H)	1	1	-	1	1	-	2*	1	-	-	-	1
7	5	-	-	-	-	1	1	1	-	-	1	1	-	-	-	2*	-	1	-	-	-
8		-	-	-	-	1	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
9		-	-	-	-	1	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
10	6	-	-	-	-	1	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
11		-	-	-	-	-	1	1	-	-	1	1	-	-	-	2*	-	1	-	-	-
12		-	-	-	-	1	1	1	-	1	1	-	-	-	-	1	-	1	-	-	-
13	7	-	-	-	-	-	1	1	-	1	1	-	-	-	-	2*	-	1	-	-	-
14		-	-	-	-	-	-	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
15		-	-	-	-	-	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
16	8	-	-	-	-	1	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
17		-	-	-	-	1	1	1	-	1	1	1	-	-	-	2*	-	1	-	-	-
18		1	-	1	-	-	1	-	1 (H?)	-	1	1	-	-	1	1?	-	-	-	1?	-
19	10	1	1	1	-	-	1	-	1	1	-	-	-	1	-	2	1	-	-	-	1
20		1	-	1	-	-	1	-	1	-	1	-	-	1	-	2	1	-	-	-	1
21		1	1	1	-	-	1	-	1	-	1	1	-	1	-	2	1	-	-	-	1
22	11	1	1	1	-	-	1	-	1	1	1	1	-	1	-	2	1	-	-	-	1
23		-	1	1	1	-	1	-	1	-	1	1	-	1	-	2	1	-	-	-	1
24		-	1	-	-	-	1	-	1	-	-	-	-	1	-	2	1	-	-	-	1
25	13	1	0	1	0	0	1	1	0	1	1	1	0	0	0	2*	1	0	0	$\frac{1}{(H+G)}$	0
26	14	0	0	1	0	0	1	0	1	0	1	0	0	1	0	2	1	0	0	0	1
27	15	0	1	1	0	0	1	0	1	0	1	0	1	1	0	2	1	0	0	0	1
28	16	0	0	1	0	0	1	0	1	1	1	0	0	0	1	2	1	0	0	1h	0
29	17	1	0	1	0	0	1	1	0	0	0	1	0	0	0	2*	0	0	0	1h	0
30		0	0	1	0	0	0	1	0	0	0	1	0	0	0	2	0	0	0	1h	0

No.	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
31	18	1	0	1	0	0	1	1	0	1	1	1	0	0	0	2*	0	0	0	1 (H+G)	0
32		0	0	1	0	0	1	1	0	1	1	1	0	0	0	2*	0	0	0	1 (H)	0
33	19	1	0	1	0	0	1	1	0	1	1	0	0	0	0	2*	0	0	0	1 (H+G)	0
34		0	0	1	0	0	1	1	0	1	1	1	0	0	0	2	0	0	0	1 (H+G)	0
35	20	1	0	0	0	1	1	1	0	1	1	1	0	0	0	2	0	0	0	1 (G)	0
36	21	1	0	1	0	1	1	1	0	0	0	1			0	2	0	0	0	1 (G)	0
37	22	0	0	1	1	0	1	0	1	0	0	1	0	0	1	2*	0	0	0	1 (H)	0
38	23	0	0	0	0	0	0	0	1 (H)	0	1	0	0	0	0	≥1	1	0	0	0	1
39	24	0	0	1	0	0	0	0	1 (H/G)	0	0	0	0	0	1	≥1	0	0	0	0	1
40	25	0	0	0	1	0	1	1	0	0	1	1	0	0	0	2	0	1	0	0	0
41		0	0	0	0	0	1	1	0	0	1	1	0	0	0	2	0	1	0	0	0
42		0	0	0	0	0	0	1	0	0	1	1	0	0	0	2	0	1	0	0	0
43		0	0	0	1	1	1	1	0	1	1	1	0	0	0	2	0	1	0	0	0
44	26	0	0	0	1	1	1	1	0	1	1	1	0	0	0	2	0	1	0	0	0
45		0	0	1	0	1	1	0	1	1	0	0	0	0	0	2	0	0	0	0	1
46		0	0	1	0	1	1	0	1	0	1	1	0	0	0	2*	0	0	0	0	1
47		0	0	1	0	1	1	0	1	1?	1	1	0	0	0	1?	0	0	0	0	1
48	29	0	0	0	1	0	1	1	0	0	1	0	0	0	0	2*	0	1	0	0	0
49	30	1	0	1	0	0	0	0	1	0	1	0	1	1	0	1?	0	0	0	0	1
50	metal rod forged from a bar, quadrangular in the cross-section, twisted; traces of cracks due to twisting; flattening on the edges / pręt wykuty ze sztabki, przekrój czworokątny, tordowany; ślady spękań związane ze skręcaniem; wypłaszczenia na krawędziach																				
51	metal rod forged from a bar, quadrangular in the cross-section, twisted; twisting defects (related to the preparation of the rod); minor cracks on the outside due to rod bending; one end rounded, the other uneven; no traces of use/traces not visible / pręt wykuty ze sztabki, przekrój czworokątny, tordowany; błąd skręcania (jest związany z przygotowaniem pręta); drobne spękania na zewnętrznej stronie związane z zginaniem; jeden koniec zaokrąglony, drugi nierówny; brak śladów używania/ślady nieuchwytnie																				
52	metal rod forged from a metal bar, quadrangular in the cross-section, twisted; no traces of use/traces not visible / pręt wykuty ze sztabki, przekrój czworokątny, tordowany; brak śladów używania/ślady nieuchwytnie																				
53	metal rod forged from a bar, with the twisting bent on one side (it is not regular, more tightly twisted, perhaps it is related to holding during twisting); unevenness and hollows forged; no traces of use/traces not visible; preserved in two fragments / pręt wykuty ze sztabki, z jednej strony zagięte tordowanie (nie jest regularne, mocniej zakręcone, być może związane ze ścisaniem podczas tordowania); nierówności i wgłębienia zaklepane w sztabie; brak śladów używania/ślady nieuchwytnie; zachowany w dwóch fragmentach																				

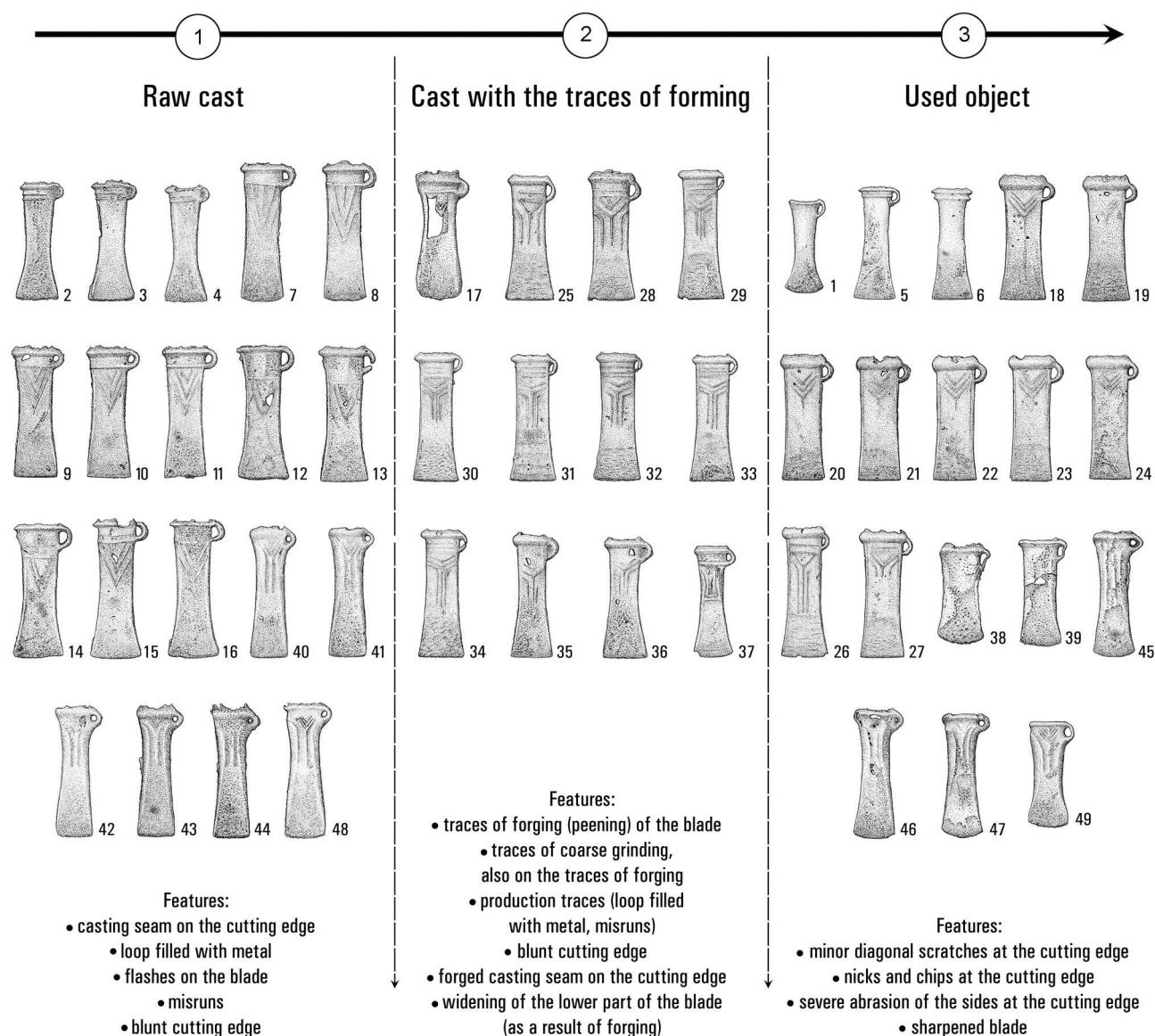


Fig. 51. Nowa Górná. Three axe deposition models based on the preserved traces of production, shaping and use. Graphics: K. Nowak.
Ryc. 51. Nowa Górná. Trzy modele depozycji siekier na podstawie zachowanych na nich śladów produkcji, formowania i używania:
1. Odlew w stanie surowym (cechy: szew odlewniczy na krawędzi tnącej; uszko zalane metalem; nadlewy na ciosie; niedolewy; tępą krawędź tnącą); 2. Odlew ze śladami formowania (cechy: ślady punktowego kucia ciosu; ślady szlifowania, także na śladach kucia; ślady produkcji [uszko zalane metalem, niedolewy]; tępą krawędź tnącą; kuty szew na krawędzi tnącej; poszerzenie dolnej partii ciosu [wskutek kucia]); 3. Przedmiot używany (cechy: drobne ukośne rysy przy krawędzi tnącej; szczyrby i ubytki w krawędzi tnącej; silne wytarcie boków przy krawędzi tnącej; krawędź tnącą zaostzona). Grafika: K. Nowak.

deep scratches, running parallel to the cutting edge, e.g., on specimens 25 and 36 (Fig. 53:4.8). The blades of most axes in this category were plastically worked using the hammering technique, starting about one centimetre below the lower edge of the decoration (nos. 25, 28–34, 37). The hammering did not leave traces of a homogeneous nature, indicating that it was carried out using tools with different working surfaces. Densely

spaced traces of treatment are small (Fig. 53:6) or have larger, diversified deformation surfaces, as for example on specimens 29 (Fig. 53:5) and 34. On axes 31 and 33, there are traces of hammering, preserved as dents and characteristic ‘corrugations’ located at the edges of the blade, which have been removed by oblique grinding. The marks on specimen 32 are longitudinal and form ‘hammering bands’ parallel to the cutting edge (Fig. 53:7). Similarly hammered blades are pre-

sent in the axes with a straight socket edge, variant B (e.g. from Jászkarajenő⁵² and hoard B from Budakeszi,⁵³ both Kom. Pest, and variant C from hoard III from Debrecen-Fancsika, Kom. Hajdú-Bihar⁵⁴), discovered in the area of distribution of this type of specimens. In the case of the Budakeszi specimen, the hammering was present not only on the blade but also on the socket around the ribs forming the decoration and on the edge of the socket.

The collection of axes, prepared for use to varying degrees, consists exclusively of the specimens of Middle Danubian origin. In addition to the predominant axes with a straight socket edge, variant C (10 specimens – nos. 25, 28–36), it also includes specimen 17 of variant B of the latter type and specimen 37 with a defined blade, variant D. Due to the state of preservation of axe 17, it is difficult to determine clearly whether it shows traces of surface shaping or whether it is an untreated casting. Only the flattening of the casting seams on the sides of the axe indicates that it was pre-treated. However, they are only flattened in the central part, and not at the cutting edge, as is the case with the treated specimens. These traces can only indicate the preliminary preparation of the tool (neither the traces of metal penetration above the edge of the socket nor the excess metal from the filled-in loop were removed) and exclude the possibility that it was used.

3. Axes with use-wear

Eighteen axes were assumed to have been in use (Fig. 51). Damage that shows the practical use of the tool is sometimes accompanied by remnants of grinding or sharpening (Fig. 53:1). Wear from use consists mainly of nicks in the cutting edge and small diagonal scratches, such as those on the cutting edge of specimen 6 (Fig. 53:2), as well as deep scratches perpendicular to the cutting edge, such as those on specimen 27, which are cut and abraded by diagonal scratches located in the lower part of the blade (Fig. 53:3). Diagonal scratches should be seen as traces of sharpening of the cutting edge, which removed the previous wear and tear. The nicks noted on the cutting edges of 11 axes are small indentations (e.g., nos. 5, 22) or large chips of metal (nos. 20, 23, 26, 46). Used axes have sharp cutting edges with flattened/abraded casting seams on the sides (e.g., nos. 1, 5, 6, 18, 38).

The use-wear on most of the axes in this assemblage is not clear and suggests that the axes were not used very intensively. The exceptions are specimens 38, 39 and 49, which have a stockier build than the others and have more flattened/abraded casting seams. Specimens 38 and 39

also have deformed loops, which may be related to the hafting of the handle. The paddle-shaped, widened blade of axe 49 was most likely obtained as the result of sharpening, which shortened the length, and several rounds of plastic shaping.

HOOP ORNAMENTS

When analysing traces of production and use on metal artefacts, ornaments should be treated as a separate category of objects on which some of the traces identified on tools or weapons are absent. Production traces are rarely visible on ornaments, and those related to use are usually difficult to interpret unambiguously.

The main production traces on the surfaces of the four hoops from Nowa Górna include the twisting of a previously prepared metal rod. The rod was given a quadrangular cross-section by plastic processing (consisting of several alternating sessions of forging and annealing). It was then probably placed in special holders⁵⁵ and twisted around its own axis. In the final stage, the twisted rod was bent into a hoop. These operations caused cracks in the metal structure, which were present in the specimens tested. The twisting is manifested by longitudinal cracks (which make the forging sequences legible; Fig. 54:1), and the bending by transverse cracks. The ornaments also have flat spots on the originally sharp edge of the rod (Fig. 54:2), which may be related to their use or to the production process. It is not possible to clearly identify the ornaments in question as unused or used items.

DEPOSITION MODEL – PRODUCTION AND PROVENANCE OF THE OBJECTS

It is assumed that tools provide a sound basis for observing traces associated with use due to the clearly defined working part, where use-wear is expected to be present.⁵⁶ In the case of most of the Nowa Górna axes, there is no clear wear that can be associated with their use in the pre-historic times. Because of the preserved manufacturing traces, the assemblage can be used to study the casting techniques used. The recorded traces made it possible to distinguish three categories of axes: 19 untreated pieces, 12 pieces with traces of shaping, and 18 used pieces (Fig. 51). There is a kind of balance in the deposition of used and untreated objects is evident.

What is puzzling is the considerable number of axes of 'foreign' provenance deposited in a crude state. This issue was recently raised in a publication on the hoard from Paszowice, Jawor County, tentatively dated to the end of Bronze Age IV and the beginning of Bronze

⁵² A. MOZSOLICS 1985, pl. 250:8.

⁵³ J.G. TARBAY 2022, pl. 77:B.C.

⁵⁴ A. MOZSOLICS 1985, pl. 265:4.

⁵⁵ Cf., e.g., A. PIETZSCH 1964; P. STACHOWIAK 2013, 542–543.

⁵⁶ Cf., e.g., T.L. KIENLIN, B.S. OTTAWAY 1998; B. ROBERTS, B.S. OTTAWAY 2003.

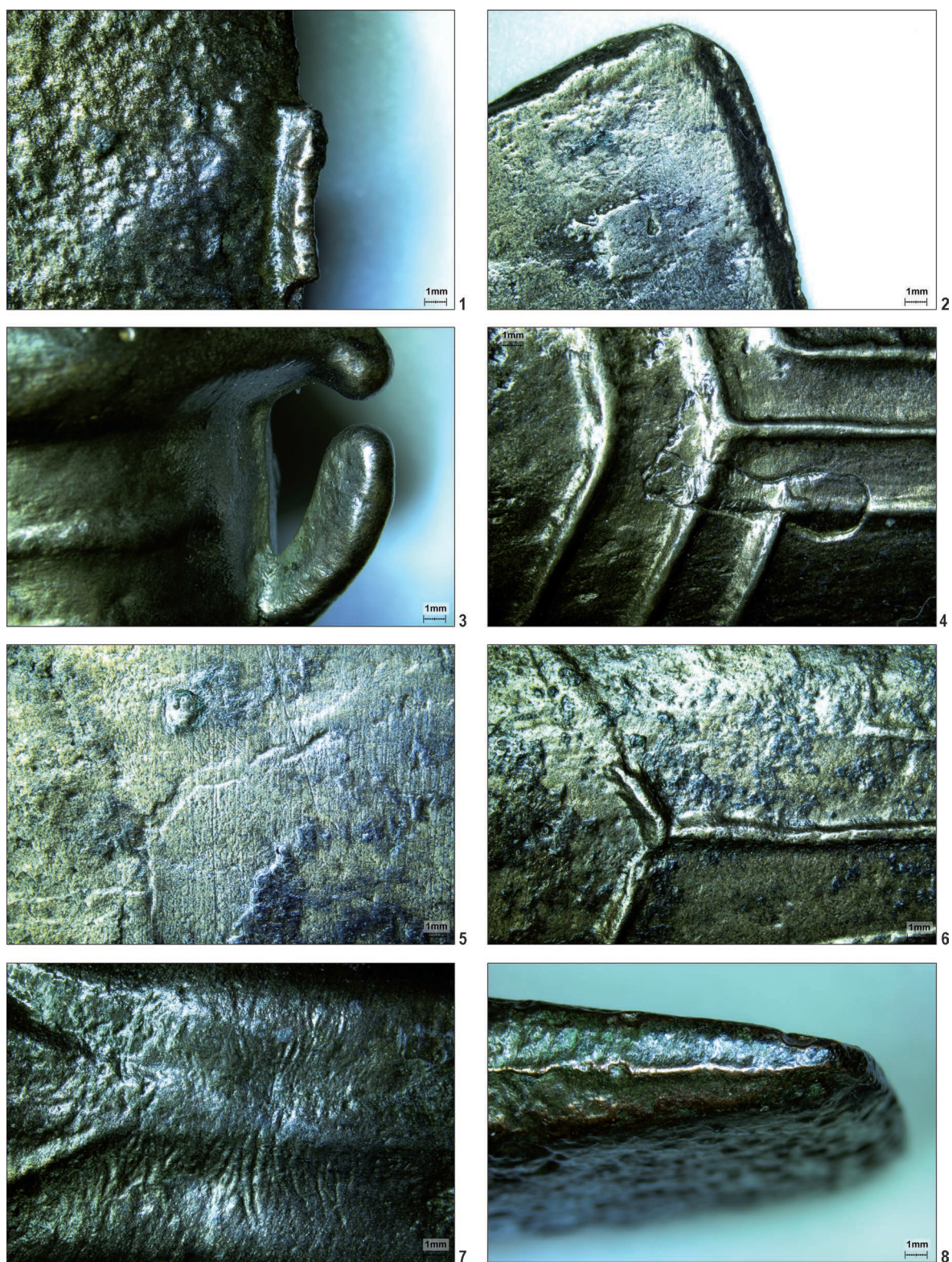


Fig. 52. Nowa Górná. Traces of production on the axes of Middle Danubian provenance (1–6) and the local *Kowalewko* type (7, 8). 1 – flashes on the lower part of the blade (axe 11), 2 – casting seam on the cutting edge (25), 3 – incomplete loop (29), 4 – misrun/cold shot (33), 5 – uneven surfaces reflecting the structure of the mould's negative (35), 6 – uneven decoration (35), 7 – traces of metal solidification/shrinkage (40), 8 – sharp-edged casting seam extending to the cutting blade (42). Photo & graphics: K. Nowak.

Ryc. 52. Nowa Górná. Ślady produkcji na siekierkach pochodzenia środkowodunajskiego (1–6) i lokalnego typu *Kowalewko* (7, 8). 1 – nadlew w dolnej partii ciosu (siekierka 11), 2 – szew odlewniczy na krawędzi tnącej (25), 3 – niedolane uszko (29), 4 – niedolew (33), 5 – nierówności odwzorowujące strukturę negatywu formy odlewniczej (35), 6 – nierówności ornamentu (35), 7 – ślady zastygania metalu/skurcz (40), 8 – ostrokrawędzisty szew odlewniczy dochodzący do krawędzi tnącej (42). Fot. i grafika: K. Nowak.

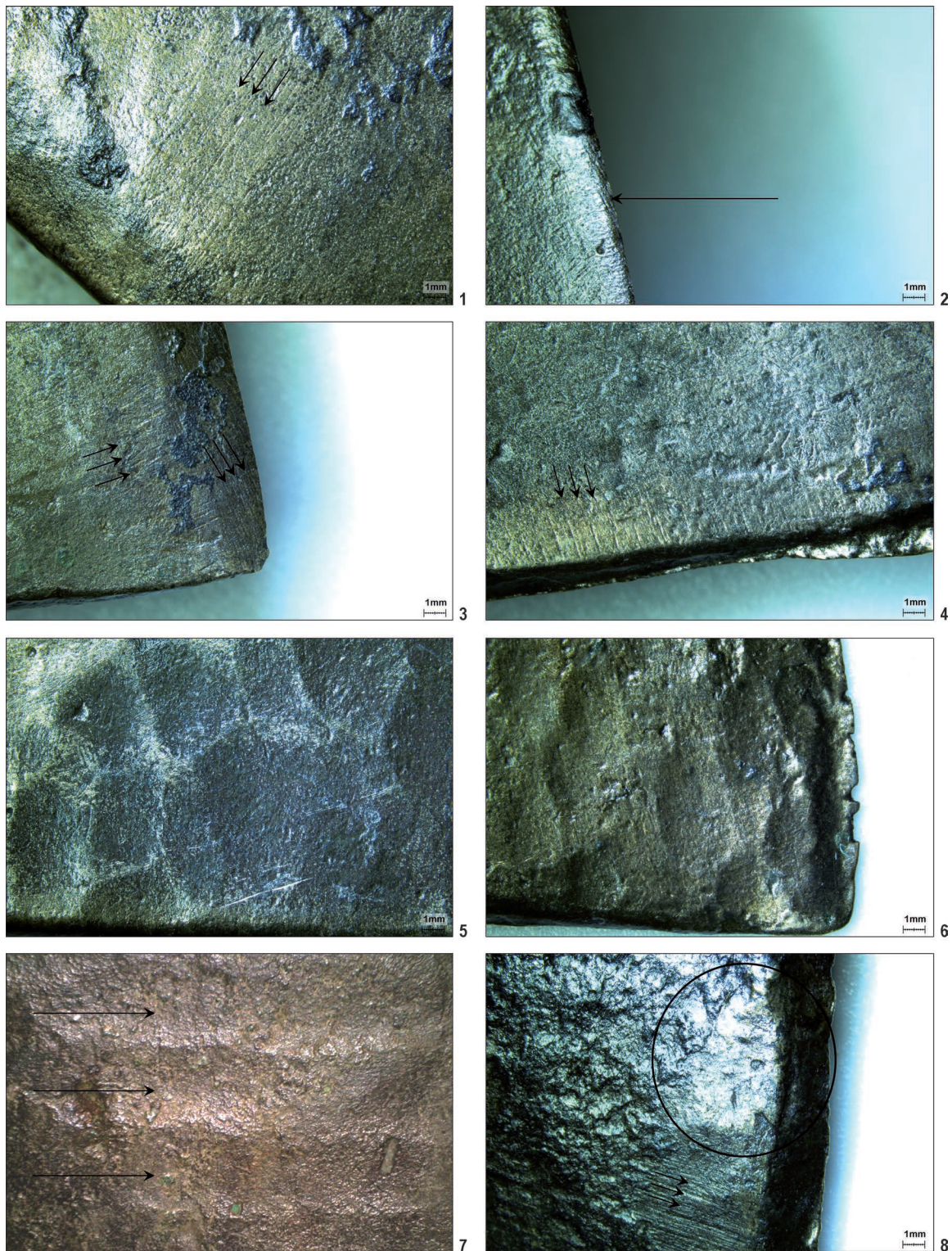


Fig. 53. Nowa Górna. Traces of shaping and use on the axes of Middle Danubian provenance. 1 – traces of transverse grinding (axe 5), 2 – short oblique scratches, potential use-wear (6), 3 – oblique traces of sharpening the lower part of the blade, crossing and erasing perpendicular use-wear (27), 4 – transverse traces of grinding at the side edge of the blade (25), 5–7 – plastic shaping by hammering (29, 30, 32, respectively), 8 – a single hammering mark and traces of transverse grinding (36). Photo & graphics: K. Nowak.

Ryc. 53. Nowa Górna. Ślady formowania i używania na siekierkach pochodzenia środkowodunajskiego. 1 – ślady poprzecznego szlifowania (siekierka 5), 2 – krótkie, ukośne rysy, prawdopodobne ślady używania (6), 3 – ukośne ślady ostrzenia dolnej partii ciosu, przecinające i usuwające prostopadłe ślady używania (27), 4 – poprzeczne ślady szlifowania przy krawędzi bocznej ciosu (25), 5–7 – formowanie plastyczne poprzez kucie (odpowiednio 29, 30, 32), 8 – pojedynczy ślad po kuciu oraz ślady poprzecznego szlifowania (36). Fot. i grafika: K. Nowak.

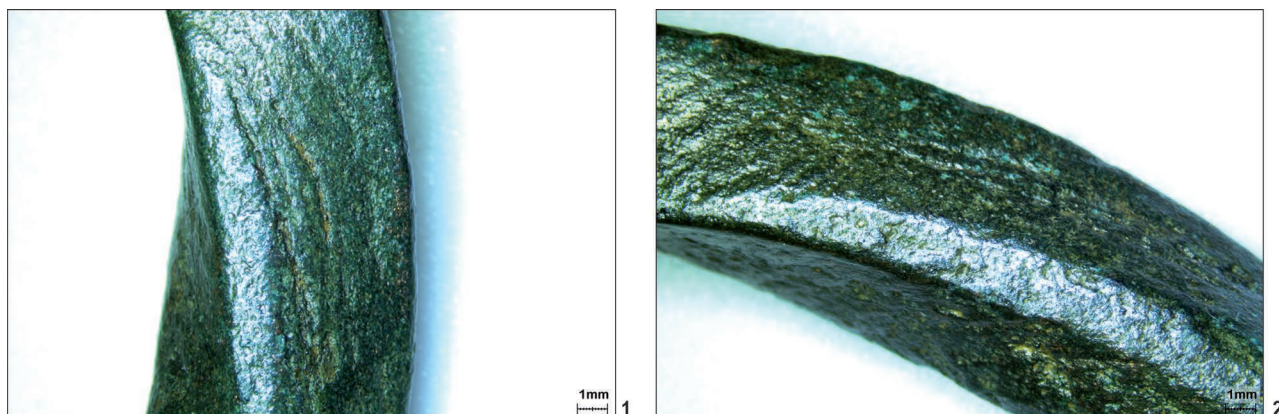


Fig. 54. Nowa Górna. Traces of production on hoop decoration 51. 1 – stratification of metal that occurred while twisting the rod around its axis, 2 – one of the clear flattenings on the edges of the rod. Photo & graphics: K. Nowak.

Ryc. 54. Nowa Górna. Ślady produkcji na ozdobie obręczowej 51. 1 – rozwarstwienie metalu powstałe podczas skręcania pręta wokół własnej osi, 2 – jedno z wyraźnych wypłaszczeń na krawędziach pręta. Fot. i grafika: K. Nowak.

Age V,⁵⁷ and, in the light of more recent findings, to HaB₁, i.e., the second half of Bronze Age IV.⁵⁸ The assemblage in question included objects of foreign origin, such as tanged sickles with back thickened with a rib, as well as ‘Middle Danubian’ axes with a symmetrical concave socket edge, variants A and B, an axe with a straight socket edge, variant B, an axe richly decorated on the wider sides, and a fragment of an axe with a distinct blade, decorated with pseudowings. Some of the aforementioned sickles and axes are in a raw state, with the pouring channels not removed.

In the hoard from Nowy Kramsk, Zielona Góra County, the deposition of which was dated to HaB₂/HaB₃,⁵⁹ several unused axes of Middle Danubian origin with traces of manufacture can be found, together with examples of local types. On axes of foreign provenance, NK 13 and NK 14, traces of use or preparation for use were observed. The surfaces of the other axes were unworked or bore only traces, some of which can be associated with shaping.⁶⁰ The unused axe NK 11 shows clear traces of metal penetration into the wall of the casting mould in the blade part, reproducing the structure of the negative of the mould in which it was cast, and specimen NK 15 shows numerous unremoved remnants of the casting process.

It has been suggested that artefacts of foreign origin—in the case of the hoards discussed above, the axes—were imports. The possibility of local production based on a foreign design has also sometimes been considered.⁶¹

In the case of the first possibility, objects were transported to remote areas in a raw state, with the remnants of production, such as metal penetrations or casting seams on the cutting edges. It can, therefore, be concluded that the manufacturer was not involved in the finishing work of the castings.

None of the axes of Middle Danubian origin from Nowa Górna have pouring channels preserved, which were most likely removed shortly after metal was poured into the casting mould, and the solidification was complete. Casting jets, especially in serial production, may have been an important addition to the raw material supply. Therefore, it was not economically viable for the producer to leave them on the castings that would serve as an exchange product. The situation is different in the case of casting seams or traces of metal penetrations. Removing such elements is labour- and time-consuming. These imperfections, also in the case of items prepared for exchange, were not removed, because they did not present any value as raw material.

The non-local production of at least some of the Nowa Górna axes may be evidenced by the method, discussed in the previous section, of affixing the casting core used to form the socket with a horizontal pin, which is unknown in Poland. Such a method was used in local workshops only for the production of spearheads.⁶² Interestingly, axes of the same type—with a straight, profiled socket edge, variant A, and with a straight socket edge, variant C, from the analysed hoard were cast in two different ways: with the core stabilised by a pin (nos. 5, 6, 18–28) and without it (nos. 2–4, 29–36). Could this indicate that the axes came from different workshops and

⁵⁷ K. NOWAK, K. SIELICKA, B. MIAZGA 2022, 100–104, figs. 3:a–e, 6:b.f–i.

⁵⁸ K. NOWAK ET ALII 2023, 5–6.

⁵⁹ J. ORLIKA-JASNOCH 2019, 22–23, 30.

⁶⁰ K. NOWAK 2019a, 183.

⁶¹ K. NOWAK, K. SIELICKA, B. MIAZGA 2022, 108.

⁶² Cf. K. NOWAK 2016, 79, fig. 2.

arrived in central Poland in at least two transports from different production areas? The most abundant examples in the Nowa Górna hoard with a straight socket edge, variants B and C, are mainly found in the areas south of the Carpathians (Fig. 55). Unfortunately, the moulds for casting axes of this type are so sporadic there that it is impossible to determine local differences in production.

The production of local specimens from melted down imported ones should also be considered. This hypothesis seems to be supported by the presence in the hoard of axes of foreign origin, which most likely underwent deliberate fragmentation. These are specimens 5 and 39, which belong to the used category, as well as specimens 17 and 37, whose surfaces show traces of shaping. The subject of the presence of object fragments in hoards has been widely discussed in the literature.⁶³ Several possible explanations for this phenomenon have been put forward. Fragments are seen as raw material; they may also have been part of a pre-monetary system or involved in ritual activities. In the case of the Nowa Górna hoard, axes 5 and 39 were broken in half. Traces preserved on specimen 17 may indicate a similar treatment of the object (a blow to the middle part). Another pattern of fragmentation is presented by axe 37, where successive fragments of the blade were broken off by systematic blows to the edge. It is possible that the recycled metal was reused in local production, using the knowledge and skills of local metalworkers.

The Nowa Górna hoard contained objects from three stages of production and use. In the case of the axes of Middle Danubian origin, it can be assumed that at least some of them were brought in untreated. It is also possible that all the 'foreign' axes found in the hoard were originally in this condition and were then subjected to surface treatment (grinding and hammering) on site. The used axes are numerous, and several of them show signs of deliberate fragmentation. The local specimens of the *Kowalewko* type were made from imported metal, the source of which may have been damaged or worn out 'foreign' axes.

The contents of the hoard are an interesting example of the deposition of objects reflecting the whole metallurgical cycle: untreated castings (at the moment of their importation), shaped objects (surface treatment by local metalworkers), used and damaged objects/objects to be remelted, and newly cast pieces using recycled imported objects. This whole cycle was symbolically represented in the act of deposition.

ARCHAEOLOGICAL ANALYSIS

The hoard from Nowa Górna, weighing just over 13 kg (13.04 kg to be precise), contains bronze objects of two categories—49 socketed axes and four hoop ornaments.

The assemblage is dominated by **axes of Middle Danubian origin** (39, i.e., 73.6%), most of which have no counterparts in Poland; for some of them it is also difficult to find close analogies in the Transcarpathian material. This situation is not helped by usually laconic descriptions of axes in Hungarian and Romanian publications, by photographs of poor quality that usually show only one side of the object, and by schematic drawings that show the approximate shape but not always the decorative details.⁶⁴ There is no information on the cross-sections of the axes,⁶⁵ the way the blade was defined, details of the finish and the shape and depth of the socket. Detailed information is important both for the purpose of dating the hoard and for distinguishing imported axes from their possible local imitations.⁶⁶

Axe 1 with a symmetrically concave socket edge, variant A, differs significantly from HaA₁-dated specimens of this type from the Polish lands.⁶⁷ In shape, it resembles a larger, slender specimen (c. 11 cm long), with a less flared and rounded cutting edge, decorated with a circumferential rib below the slightly concave edge of the socket of lenticular cross-section, from the HaA₁-dated hoard I from Szolnok, Kom. Jász-Nagykun-Szolnok.⁶⁸ Decorated with ribs, a slightly smaller but stocky specimen with a very wide and rounded cutting edge comes from the assemblage from Balmazújváros, Kom. Hajdú-Bihar, dated to phases HaA₂–HaB₁.⁶⁹ The closest analogy to the analysed specimen is an axe from the HaB₁-dated assemblage from Nagyrábá, Kom. Hajdú-Bihar—undecorated, with similar proportions and size (preserved length approx. 7.7 cm) and a slightly concave socket edge, with flat blade sides; on the other hand, it

⁶⁴ Cf. e.g., M. PETRESCU-DÎMBOVIȚA 1977; 1978; T. KEMENCZEI 1984; A. MOZSOLICS 1985; 2000.

⁶⁵ AMÁLIA MOZSOLICS (1985, 32–33, 36) briefly describes cross-sections of early axes with a concave socket edge. The oldest specimens from the BD-dated Ópályi horizon (B IVb) were hexagonal, while younger ones, from the BD/HaA₁-dated Aranyos horizon (B Va), were already also lenticular. For the very numerous axes of various types, specimens with a straight socket edge in particular, of variants A–C from the Kurd (B Vb) and Gyermely (B Vc) horizons, dated respectively to HaA₁ and HaA₂, there are no similar findings. In the later part of the article, the chronology of finds is given in accordance with the system created by Paul Reinecke.

⁶⁶ Cf. K. MOSKWA 1976, 45, with earlier literature.

⁶⁷ J. KUŚNIERZ 1998, 11–12, pl. 1:7–11.

⁶⁸ A. MOZSOLICS 1985, 36, 198, pl. 221:4.

⁶⁹ T. KEMENCZEI 1984, 83, 96, 169, pl. CXCb:1. A. MOZSOLICS (2000, fig. 3) HaB₁ correlates with phase B VIa and Hajdúböszörmény hoard horizon.

⁶³ Cf., e.g., B. REZI 2011; J. BRÜCK 2016; D. BRANDHERM 2018; M.G. KNIGHT 2019; 2021.

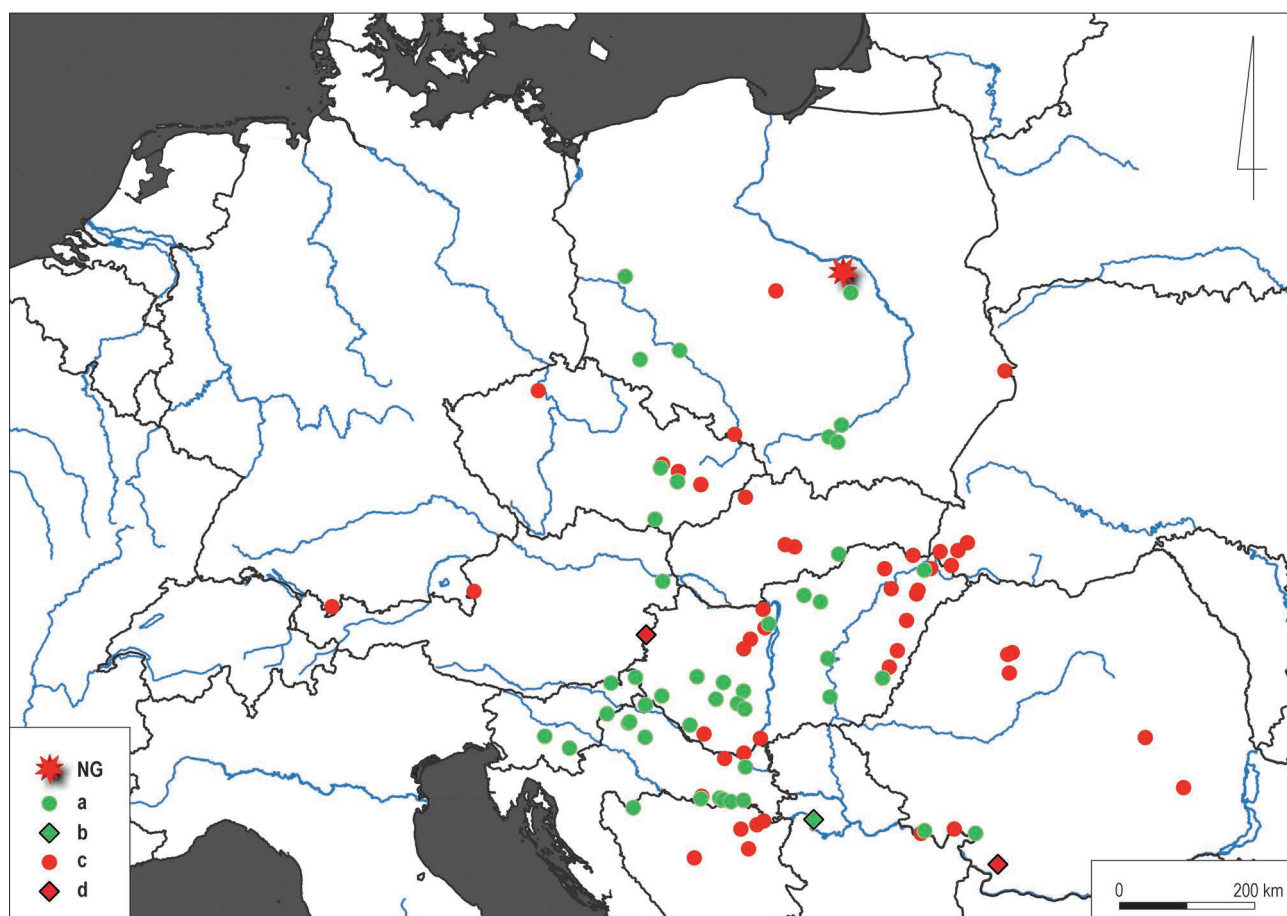


Fig. 55. Location of the Nowa Górna hoard (NG) and distribution of axes with a straight socket edge, variants B (a) and C (b), and casting moulds used to make them (c and d, respectively). After: B. WANZEK 1989, T. SOROCEANU 1995b, J. KUŚNIERZ 1998, O. DIETRICH 2012, W. BLAJER 2013, B. KONIECZNY 2014, J.G. TARBAY 2014, 2019 and 2022, J. ORLIĆKA-JASNOCH 2019, G.V. SZABÓ 2019 and G. ORLIŃSKA 2020. Graphics: K. Nowak.

Ryc. 55. Lokalizacja skarbu z Nowej Górnjej (NG) i rozmieszczenie siekier z prostą krawędzią tulejki, wariantów B (a) i C (b) oraz form odlewniczych służących do ich produkcji (odpowiednio c i d). Wg: B. WANZEK 1989, T. SOROCEANU 1995b, J. KUŚNIERZ 1998, O. DIETRICH 2012, W. BLAJER 2013, B. KONIECZNY 2014, J.G. TARBAY 2014, 2019, 2022, J. ORLIĆKA-JASNOCH 2019, G.V. SZABÓ 2019 i G. ORLIŃSKA 2020. Grafika: K. Nowak.

has a more massive and rounded loop,⁷⁰ rather than an elongated, cylindrical one.

The specimens with a straight, profiled socket edge, variant A, from Nowa Górna, differ in their formal characteristics (Table 1, nos. 4–6), casting and working techniques. The unworked massive axes 2–4 have a low blade and a very wide cutting edge and were cast in a mould with a core stabilised without a pin; they do not resemble any of the five stray finds of this type from Poland and differ from them in size, proportions and cross-sections. These axes—three from north-eastern Poland and one each from Western Pomerania and Lower Silesia—are dated to HaB₁ on the basis of the chronology of hoards containing stocky specimens of variant B of the same

type.⁷¹ In the Middle Danubian zone, axes similar to those discovered at Nowa Górna have an earlier chronology. One is part of the BD-dated hoard from Balassagyamat, Kom. Nógrád,⁷² the others come from the HaA₁-dated assemblages of Szentcs-Terehalom, Kom. Csongrád,⁷³ and from Kék⁷⁴ and hoard II from Napkor (specimen without a loop),⁷⁵ both in Kom. Szabolcs-Szatmár-Bereg. The axes from the last two finds as well as specimens 2–4 are only decorated with circumferential ribs, while the others have more elaborate decorations.

⁷¹ J. KUŚNIERZ 1998, 13–14, pl. 2:16–23; W. BLAJER 2013, 31.

⁷² T. KEMENCZEI 1984, 25–26, 96, 114, pl. XLIIIb:2.

⁷³ A. MOZSOLICS 1985, 193, 194, pl. 224:16.

⁷⁴ A. MOZSOLICS 1985, 131, 132, pl. 191:22; T. KEMENCZEI 1986, 74–76, 96, 174, pl. CLXXX:1.

⁷⁵ T. KEMENCZEI 1986, 25–26, 96, 114, pl. XLIIIb:2.

Probably similar to axes 5 and 6 (the only one from Nowa Górna without a loop) is the largest Polish specimen (just over 13 cm long) with a straight, profiled socket edge, variant A, found in Dolina, Iława County.⁷⁶ Like the examples analysed, it has a thinned, high blade and was cast using a core affixed with a horizontal pin. Good analogies to the discussed artefacts are two specimens without a loop, manufactured using the same technology, also with a thickening at the edge of the socket in the form of a pointed rib and a circumferential rib lower down and a high blade with a quadrangular cross-section, from the hoard III from Debrecen-Fancsika, dated to either HaA₂⁷⁷ or HaA₂–HaB₁.⁷⁸ This chronological inconsistency, which will be mentioned several more times in this chapter, is part of the ongoing debate in the literature about the validity of distinguishing the Gyermely horizon synchronous with HaA₂.⁷⁹ It has been suggested that the finds previously associated with this phase should be dated either to HaA₂–HaB₁ or to HaB₁ only.⁸⁰ Two other axes (one without a loop like the Nowa Górna specimen) with almost identical dimensions, cross-sections, blades and shallow sockets as specimens 5 and 6, also cast in moulds with a core stabilised by a pin, but with a prominent rounded, rather than formed into a pointed rib, thickening at the edge of the socket and without a circumferential rib underneath, come from the HaB₁ hoard from Dridu, jud. Ialomița (in Muntenia).⁸¹

The majority of axes with a straight socket edge, variant B, similarly to those analysed earlier, find no analogies in Poland. The specimens of this type recorded so far (four in Lesser Poland,⁸² two each in Greater Poland⁸³ and Lower Silesia,⁸⁴ and one in western Mazovia⁸⁵) of varying dimensions, cross-sections and decoration do not have a thinned blade like specimens 7–16. The Lesser Poland hoards containing axes of the discussed type (from Podłęże, Wieliczka County, and a doubtful one from Pławowice, Proszowice County), the Mazovian hoard from Gole and the Lower Silesian hoard from Paszowice,⁸⁶ as well as the stray find from Wrocław-

Osobowice⁸⁷ are dated to HaB₁. The axe from urn grave 17 from the Lusatian Culture cemetery at Targowisko, Wieliczka County, site 10-11,⁸⁸ probably dates to the same chronological range. The Nowy Kramsk specimen with a straight socket edge, variant B, occurs in the hoard together with specimens of the local *Czarków* and *Przedmieście* types, which are mainly characteristic of Bronze Age V.⁸⁹

A decoration consisting of a circumferential rib, from which a vertical rib and two V-shaped ribs extend — seen on axes 7 and 8, the largest among the Nowa Górna specimens of the Middle Danubian origin, very poorly profiled, with a socket of considerable depth and an overlapping blade—has a long chronology in the Transcarpathian areas. Such motifs can be seen on an axe without a loop from the hoard II from Bükkaranyos, Kom. Borsod-Abaúj-Zemplén, dated to BD/HaA₁, on numerous specimens with and without a loop from finds dated to HaA₁ from Transdanubia, north-eastern Hungary, Transylvania, Moravia and Lower Austria,⁹⁰ and from younger assemblages from the upper Tisza River basin, from Vajdácska, Kom. Borsod-Abaúj-Zemplén (HaA₂),⁹¹ and Tiszaeszlár, Kom. Szabolc-Szatmár-Bereg (HaA₂–HaB₁).⁹² The above mentioned Transcarpathian specimens differ from axes 7 and 8 not only in form but also in the arrangement of the decoration, where the V-shaped ribs are much narrower, and both (not only the smaller one) are connected to the horizontal rib by arms. An axe from the Jászkarajenő hoard (HaA₂),⁹³ has the same arrangement of V-shaped ribs as the Nowa Górna specimens, but it is decorated with two circumferential ribs instead of one, has a much wider and more rounded cutting edge, and hammered blade surfaces.

Axes 9–11, untreated just like specimens 7 and 8, with a narrow cutting edge, a biconical thickening at the edge of the socket and a massive loop, have a lower blade, a shallower socket (Table 1) and a different cross-section. An identical decoration, consisting of a circumferential rib and three V-shaped ribs, from the tops of which short vertical ribs extend and the arms of the lower rib do not meet the horizontal one, is found on a specimen with a straight socket edge, variant B, from nearby Gole.⁹⁴ The axe in question has similar dimensions, proportions and

⁷⁶ J. KUŚNIERZ 1998, pl. 2:17.

⁷⁷ A. MOZSOLICS 1985, 36, pl. 264:7.8.

⁷⁸ T. KEMENCZEI 1984, 83, 94, 171, pl. CXCIb:4.5 (as *Debrecen, Dombostanya*).

⁷⁹ Cf. footnote 65.

⁸⁰ J.G. TARBAY 2015, 329–332.

⁸¹ V. ENĂCHIUC 1995, 295, fig. 1:3.7.

⁸² W. BLAJER 2013, 145, 148, pls. 47:2, 48:3, 57:2; B. KONIECZNY 2014, figs. 27:11, 31.

⁸³ J. KUŚNIERZ 1998, 15, pl. 3:36; J. ORLIŃSKA-JASNOCH 2019, 23, 61–62, fig. 8:15, pl. 8:15.

⁸⁴ J. KUŚNIERZ 1998, 15, pl. 3:35; K. NOWAK, K. SIELICKA, B. MIAZGA 2022, 90, figs. 3:c, 6:i.

⁸⁵ G. ORLIŃSKA 2020, figs. 2:a, 3:a.

⁸⁶ K. NOWAK *ET ALII* 2023, 5–6.

⁸⁷ W. BLAJER 2013, 31–32; G. ORLIŃSKA 2020, 208.

⁸⁸ B. KONIECZNY 2014, 138–139, table 13.

⁸⁹ J. ORLIŃSKA-JASNOCH 2019, 29–30.

⁹⁰ E.F. MAYER 1977, 192, 196, pl. 76:1052; M. PETRESCU-DÎMBOVIȚA 1978, 132, pl. 163:65; A. MOZSOLICS 1985, 33, pl. 42:6, 180:6, 199:2; M. SALAŠ 2005a, 42, 348; 2005b, pl. 178:3.

⁹¹ A. MOZSOLICS 1985, 210–211, pl. 206:15.

⁹² T. KEMENCZEI 1984, 78, 96, 187, pl. CCXXb:14.

⁹³ A. MOZSOLICS 1985, 130, pl. 250:8.

⁹⁴ G. ORLIŃSKA 2020, figs. 2:a, 3:a.

cross-section⁹⁵, but a deeper, almost cylindrical socket and a non-thinned blade with flat sides over a sharp cutting edge. Among the axes found in the Middle Danubian zone, ribs in such an arrangement as those from Nowa Górna and Gole are found on a specimen from the Transylvanian hoard II from Zlatna, jud. Alba (HaA₂).⁹⁶ In the case of the specimens from HaA₁, the arms of the mostly narrow and high V-shaped ribs touch the circumferential rib.⁹⁷

Axes 12–16, produced in two moulds, are similar to the previously discussed specimens 2–4 in terms of massiveness, hexagonal cross-section, thickening in the form of a pointed rib at the edge of the socket, the presence of a loop of rhomboidal cross-section, poorly defined lateral edges and the lack of finish treatment. The cores used were also conical, with a rounded top, and set flat without the use of a pin. The solid blades of the specimens analysed are admittedly slightly higher than those of axes 2–4, and the cutting edge is narrower (Table 1), but it is likewise straight or at most slightly curved.

An decoration consisting of two horizontal ribs and two V-shaped ribs extending from the lower horizontal rib, as seen on axes 12–14, is mainly found on specimens from Hungarian and Moravian hoards dated to HaA₁.⁹⁸ The main difference between these axes and the ones discussed here is a wider and rounded cutting edge and a prominent rounded thickening at the edge of the socket.⁹⁹ Only an axe from Rétközberencs, Kom. Szabolcs-Szatmár-Bereg¹⁰⁰ is known to have a blade thinned on both sides like those from Nowa Górna. Specimens with a decoration like the present one are also known as stray finds from Slovakia¹⁰¹ and Austria.¹⁰² An axe from Marchegg, Bez. Gänserndorf, is almost identical in length to specimens 12–14, has the blade thinned on both sides and an decoration cast on one face only; on the other hand, it has a hexagonal cross-section like the previously discussed specimens 9–11.

⁹⁵ Previously, the cross-section of this axe was described as roughly circular (G. ORLIŃSKA 2020, 190), as the polished-off side edges are almost unmarked. On the sides, below the arch formed by the two converging lower V-shaped ribs, there are two poorly legible vertical planes.

⁹⁶ M. PETRESCU-DÎMBOVIȚA 1978, 139, pl. 222A:2.

⁹⁷ M. PETRESCU-DÎMBOVIȚA 1978, 127, 132, pls. 143:97, 163:66; A. MOZSOLICS 1985, 149, 211, pls. 90:8, 206:14.22.

⁹⁸ A. MOZSOLICS 1985, 123, 137, 182, 183, 195, 199, pls. 31:8.11, 97:1.2, 111:3, 116:4, 144:5, 169:6, 193:1; M. SALAŠ 2005a, 309, 370; 2005b, pls. 92:5, 201:9.

⁹⁹ The aforementioned axe from the Paszowice hoard has a similar 'archaic' form: it is decorated with not one but three horizontal ribs and, extending from the lower horizontal rib, two nested V-shaped ribs (K. NOWAK, K. SIELICKA, B. MIAZGA 2022, figs. 3:c, 6:i).

¹⁰⁰ T. KOVÁCS 1981, 163, fig. 1:2.

¹⁰¹ M. NOVOTNÁ 1970, 84, pl. 35:618.

¹⁰² E.F. MAYER 1977, 196, pl. 80:1112.

Two specimens from the Polish lands are decorated with a pair of circumferential ribs and three V-shaped ribs, like axes 15 and 16, but they have a biconical thickening at the edge of the socket instead of a pointed rib. The specimen from Podłęże,¹⁰³ with a hexagonal socket and a poorly defined, low blade with flat sides, has very high V-shaped ribs arranged as on the axes from Nowa Górna—the arms of two smaller ones touching the circumferential rib, and the arms of the third one extending to the lateral edges. The larger, hexagonal specimen from an unknown location in Greater Poland¹⁰⁴ has all the V-shaped ribs connected with the horizontal one. A similar arrangement of ribs is seen on the axes from Somogybabod, Kom. Somogy, and from Velem-Szentvid, Kom. Vas, dated to HaA₁ and HaA₂ respectively,¹⁰⁵ with a rounded thickening at the edge of the socket instead of a pointed rib, and of different proportions to those of specimens 15 and 16. Decorated in a similar manner as the discussed artefacts, an axe with a thinned blade from the HaB₁-dated assemblage from Groșii Țibleșului, jud. Maramureș,¹⁰⁶ with a biconical thickening on the edge of the socket like the specimens from Podłęże, Greater Poland and specimens 7–11 from Nowa Górna, is just as poorly profiled as the latter.

The ten axes presented here with a straight socket edge, variant B, differ in a number of features from specimens of this type from HaA₁. The biconical thickening on the edge of the socket, as in specimens 7–11, is considered by Maria Novotná to be characteristic of younger forms.¹⁰⁷ The decoration considered typical of HaA₁, in which the arms of all the V-shaped ribs touch the horizontal rib¹⁰⁸ was present only on axes 12–14. According to Amália Mozsolics, straight or, at most, slightly curved cutting edges, as in the specimens analysed, are, very rare in HaA₁ on axes decorated with V-shaped ribs (*Tüllenbeile mit Keilrippen*) and usually only one horizontal or circumferential rib; younger specimens had two or more such thickenings.¹⁰⁹ Axes 12–16, which share features with specimens 2–4 with parallels in BD and HaA₁, may be older than specimens 7–11, which have different proportions and socket parameters.

There are no known analogies for axe 17 with a straight socket edge, variant B, which differs from other examples of this type in the form and arrangement of the decoration and, unlike them, bears traces of shaping. The

¹⁰³ W. BLAJER 2013, 31–32, 34, pl. 57:2.

¹⁰⁴ J. KUŚNIERZ 1998, pl. 3:36.

¹⁰⁵ A. MOZSOLICS 1985, 33, 210, 211, pls. 122:2, 228:5.

¹⁰⁶ C. KACSÓ 1994, 6, fig. 1:3.

¹⁰⁷ M. NOVOTNÁ 1970, 84.

¹⁰⁸ T. SOROCEANU, É. LAKÓ 1995, 188.

¹⁰⁹ A. MOZSOLICS 1985, 86; 2000, e.g., pls. 38:2, 55:4, 61:2.11, 84:10.12, 9:4.

placement of V-shaped ribs below the horizontal ones, as in the example discussed and in a specimen from the Targowisko cemetery,¹¹⁰ is considered characteristic of HaB.¹¹¹ A specimen as unusual as axe 17—small, likewise unsuccessfully cast in a mould with a single pouring channel, decorated with a V-shaped rib that not connected to the horizontal one—comes from the Late Bronze hoard from Nowy Kramsk mentioned above.¹¹² Unlike the Nowa Górna specimen,¹¹³ the axe in question was not cast from bronze with an extremely low tin content (1.209% Sn) but from lead bronze with a very high lead content, based on copper of the *Fahlerz* class (tetrahedrite).¹¹⁴

There are no Polish analogies for the almost identical axes 18–24 with a straight socket edge, variant C, cast in three different moulds using cores stabilised with a pin. A specimen with similar proportions and an decoration placed on the upper part of the socket—two V-shaped ribs nested between the arms of a Y-shaped rib—comes from the already mentioned hoard III from Debrecen-Fancsika, dated to HaA₂¹¹⁵ or HaA₂–HaB₁.¹¹⁶ Both this assemblage and the similarly dated hoard I from Napkor consist mainly of axes that are as poorly profiled as those discussed here but are decorated with more complex patterns.¹¹⁷

Axes 25–36, in addition to a Y-shaped rib, are decorated with horizontal ribs, vertical side ribs, slightly widened or angled in the upper part, and, in most cases, also with a V-shaped rib. These decorations, depending on the degree of the angle between the arms of the Y-shaped rib, the number of horizontal ribs and the presence or absence of a V-shaped rib, are classified by Nicolaus Boroffka and Florin Rediche as separate groups of decorations, divided into a number of patterns. It is assumed that in the Middle Danubian zone axes decorated in this way first appeared in large numbers in HaA₂ and were used until HaB₂, when they were already rare.¹¹⁸

The decorations of specimens 25–28, cast using cores fixed with a horizontal pin, consist of two horizontal ribs, a Y-shaped rib with a sharp angle between the arms, bordered on either side by vertical ribs widening at the top.

The decoration of axes 25 and 26, without a V-shaped rib, corresponds to N. Boroffka and F. Ridiche pattern 2.b.6.a.4-0/2. Few specimens decorated in this manner can be found in a wide area, from Transylvania to Transdanubia, and in the Sava River basin¹¹⁹.

Specimens with a V-shaped rib (Boroffka and Ridiche pattern 2.b.6.a.4-1/2), such as axes 27 and 28, are more numerous than those discussed above and come mainly from the middle and upper Tisza basin and Transylvania, several from Wallachia¹²⁰ and one from central Poland, from the hoard from Starzyn, Poddębice County, dated to HaB₁.¹²¹ This last axe, close in proportions to specimen 28 and with a similar cross-section, has no holes in the sides from the pin securing the core, the thickening on the edge of the socket is rounded and not biconical, and there are no traces of hammering on the blade, which is thinned on both sides. Its decoration, as on specimen 28, extends to the base of the blade, and the arms of the V-shaped rib touch the horizontal rib. Axe 27 resembles specimens 18–24 in its proportions, its slightly thinned, low blade, and the decoration placed on the upper part of the socket, (see Table 1). Similar examples, both in terms of formal characteristics and decoration, can be found in the hoard III from Debrecen-Fancsika¹²² and in the Dridu assemblage.¹²³

The very similar axes 29–34, made in three moulds (see Table 1), were, in contrast to the previously discussed specimens with a straight socket edge, variant C, were cast using cores fixed without a pin and were decorated with N. Boroffka and F. Ridiche pattern 2.b.6. a.3-1/3, composed of three horizontal ribs, a Y-shaped rib with an obtuse angle between the arms, a V-shaped rib (in specimens 29 and 30, its arms touch the lower horizontal rib; in the others, they are placed lower) and vertical ribs on the sides.¹²⁴ In the Middle Danubian zone, axes decorated with the discussed decoration are much more numerous than those decorated with patterns with two horizontal ribs and are concentrated in the upper and middle Tisza basin and in the lower Sava basin; some are known from Transylvania, Transdanubia and from beyond the Carpathians.¹²⁵ In Poland, an axe decorated with motifs similar to those discussed above but with an acute rather than obtuse angle between the arms of the Y-shaped rib, i.e., Boroffka and Ridiche pattern 2.b.6.a.4-1/3, comes from the Bronze Age IV find from

¹¹⁰ B. KONIECZNY 2014, figs. 27:11, 31.

¹¹¹ Cf. T. SOROCEANU, É. LAKÓ 1995, 188.

¹¹² J. ORLIĆKA-JASNOCH 2019, 61, 62, fig. 8:15, pl. 8:15.

¹¹³ Cf. footnote 41.

¹¹⁴ Ł. KOWALSKI, A. GARBACZ-KLEMPKA 2019, 146, tables 1, 3, 9.

¹¹⁵ A. MOZSOLICS 1985, 36, pl. 266:3.

¹¹⁶ T. KEMENCZEI 1984, 83, 94, 171, pl. CXCIb:4.5 (as *Debrecen, Dombos tanya*).

¹¹⁷ A. MOZSOLICS 1985, 36, pls. 257:6–8, 265:4.

¹¹⁸ Cf. N. BOROFFKA, F. RIDICHE 2005, 150–152, 154, figs. 8, 9:2. JÁNOS GÁBOR TARBAY (2014, 189) dates specimens with three horizontal ribs and a Y-shaped rib whose arms form an obtuse angle (such as axes 29–34 from Nowa Górna) to HaA₂–HaB₁.

¹¹⁹ N. BOROFFKA, F. RIDICHE 2005, 150, list 8C2, fig. 8:D3, map 5:A.

¹²⁰ Cf. N. BOROFFKA, F. RIDICHE 2005, 151, list 8D2, fig. 8:D8, map 5:B.

¹²¹ W. BLAJER 2013, 32–33, pl. 97:2.

¹²² T. KEMENCZEI 1984, 81, 96, pl. CXCIb:9 (as *Debrecen, Dombos tanya*); A. MOZSOLICS 1985, pls. 111, 112, 265:4.

¹²³ V. ENĂCHIUC 1995, 275, 295, fig. 1:8, pl. XIII:10.

¹²⁴ N. BOROFFKA, F. RIDICHE 2005, 150, list 8B3, fig. 8:C9.

¹²⁵ N. BOROFFKA, F. RIDICHE 2005, 151–152, map 4:C.

the vicinity of Hrubieszów, Hrubieszów County.¹²⁶ Axes decorated in this manner are found throughout the Carpathian Basin and the surrounding areas.¹²⁷

So far, no specimens similar to axes 35 and 36 have been found in Poland. The two artefacts were cast using cores fixed without pins, like specimens 29–34, but they differ from them in proportions, socket parameters and weight (Table 1). The number of horizontal ribs is unknown, but the remaining elements of the pattern are the same as in the six specimens discussed above. A specimen very similar in shape to those discussed, also unsuccessfully cast, but with a circular, rather than oval, socket mouth and a defined (and not just thinned) blade, comes from the Dridu hoard.¹²⁸

Axe 37 with a defined blade, variant D, is the fourth specimen of this type to be discovered in Poland—two are components of the hoards from Lower Silesia, the location of the third specimen is unknown.¹²⁹ Another artefact similar in proportions (high, solid blade and very wide edge) and decoration (two U-shaped and two circumferential ribs) is a slightly larger axe from the HaB₁-dated hoard from Miejsce, Namysłów County,¹³⁰ which has two cast knobs below the circumferential ribs instead of a V-shaped rib. An angular rib was present on the axes with a defined blade, but with arched rather than U-shaped ribs (i.e., specimens of variant Kuśnierz C) from the Moravian hoard from Služin, okr. Prostějov (HaB₁), and the Lower Austrian assemblage from Haslau-Regelsbrunn, Bez. Bruck a.d. Leitha, dated to HaB₂.¹³¹ In the Middle Danubian zone, axes with U-shaped ribs (*Tüllenbeile mit Rahmenmuster*) first appeared in HaA₂.¹³²

Axe 38 richly decorated on its wider sides, variant A, differs from the previously known examples of this type found in Poland and the Middle Danubian zone in the casting technique (use a core fixed with a horizontal pin), the presence of a high and weakly pronounced thickening on the edge of the socket, the absence of a circumferential rib underneath it and a high, wedge-shaped blade as in axes of local types.¹³³ Transylvanian specimens, similar in proportions to the one discussed, decorated with pairs of curved ribs and one or two circumferential ribs below the socket, and with an elongated but more massive loop, come from the assemblages found in Cluj-Napoca, jud. Cluj (HaA₂), and Spălnaca, jud. Alba,

hoard I (HaB₁).¹³⁴ More similar to axe 38 is a specimen from a younger hoard, also with a weak thickening at the edge of the socket and the loop set in the middle of its length. The specimens from Chłopowo, Choszczno County, and Deszczno, Gorzów County, have decoration similar to that discussed above, with groups of ribs placed close to the edge and without a circumferential rib below the thickening on the socket edge, but they are smaller, slimmer and have a wider cutting edge.¹³⁵ In Poland, axes of this type are dated to HaB₁–HaB₂, and the above-mentioned hoards from western Greater Poland are dated to Bronze Age V.¹³⁶

Examples of the *Jablonka* type, represented by axe 39, recorded in the Polish lands, mainly in Lower Silesia and less frequently in Lesser Poland, are dated by W. Blajer to HaA₂–HaB₁, or even later, and he does not exclude that the inspiration for the production of such axes may have come from the Middle Danubian zone, where similar specimens have been found.¹³⁷ A specimen from the Moravian assemblage from Krumšín, okr. Prostějov (HaB₁)¹³⁸ is similar in proportions to the axe from Nowa Górna. More slender examples although hexagonal in cross-section like the one discussed, come from the similarly dated finds from Pławowice (an axe with flat sides but with a massive and rounded, rather than elongated, loop) and from the Czech hoard I from Liščin–Maškovice, okr. Litoměřice (an axe with an elongated loop and a rounded, rather than formed into a pointed rib, thickening at the socket edge).¹³⁹

Axes of the Kowalewko type are the oldest local specimens with a socket and loop, manufactured in HaB₁.¹⁴⁰ Ten examples of variant B of this type from Nowa Górna increase the number of specimens published so far to 43, including four with curved sides from Gole, Pobyłkowo, Pułtusk County, Rogowo, Toruń County, and Wilamowice, Płońsk County.¹⁴¹ The faces of 25 axes of the *Kowalewko* type, variant B (approx. 58.1%), have a central rib, thickened lateral edges and shallow, longitudinal recesses

¹²⁶ Cf. W. BLAJER 2013, 32–33, 40.

¹²⁷ Cf. N. BOROFFKA, F. RIDICHE 2005, 151, list 8D3, fig. 8:D9, map 5:C.

¹²⁸ V. ENĂCHIUC 1995, 275, 295, fig. 1:11, pl. XIII:7.

¹²⁹ Cf. J. KUŚNIERZ 1998, 19, pl. 4:57–59.

¹³⁰ J. KUŚNIERZ 1998, 21, pl. 4:58; W. BLAJER 2013, 33.

¹³¹ E.F. MAYER 1977, 194, 197, pl. 79:1087; M. SALAŠ 2005b, pl. 421:5.

¹³² A. MOZSOLICS 1985, 37, e.g., pl. 243:1, 244:11.14, 249:2, 268:2.

¹³³ Cf. J. KUŚNIERZ 1998, 4, fig. 4:3.

¹³⁴ M. PETRESCU-DÎMBOVIȚA 1978, 141, 145, pl. 228B:4, 244:13.

¹³⁵ J. KUŚNIERZ 1998, 22, pl. 4:61.62.

¹³⁶ J. KUŚNIERZ 1998, 23–24.

¹³⁷ W. BLAJER 2018, 305–307, 309, fig. 11, with further literature.

¹³⁸ M. SALAŠ 2005a, 40, 435–436; 2005b, pl. 378B:2.

¹³⁹ O. KYTLICOVÁ 2007, 278–279, pl. 111:56; W. BLAJER 2013, 145, pl. 48:1; 2015, 307.

¹⁴⁰ Cf. J. KUŚNIERZ 1998, 30; W. BLAJER 2013, 34.

¹⁴¹ J. KUŚNIERZ 1998, 28–29, 84–85, pl. 7:103–112, 8, 9:128–132, 33:683, 685.688 (as type *Littausdorf*); W. BLAJER 2013, 145, 152–153, 158, pl. 57:3, 76:4 (as type *Littausdorf*), 97:1; G. ORLIŃSKA 2020, 205, figs. 2:b, 3:b, 8, 9, 15, 16. The axe from Hrebenne, Tomaszów County, unclassified by the authors of the study (cf. H. TARAS, H. DZIEWICZKIEWICZ 2018, 187–188, fig. 2), slightly smaller than the specimens of the *Kowalewko* type, with a very poorly defined central rib and side edges and differently faceted sides, was omitted.

between these thickenings,¹⁴² while the remaining specimens have either a few vertical ribs¹⁴³ or only defined lateral edges.¹⁴⁴ Of the 14 specimens from the middle Vistula basin with a central rib and bold edges, only the one discovered at Pobyłkowo is not decorated with a motif of inserted angles (Fig. 56); at Nowa Górna, Rogów and Wilamowice this pattern is rendered with ribs, and at Gole with grooves. In the last three specimens, and in the equally impressive specimen 48 from Nowa Górna, the central rib and the thickened edges are more prominent, and the longitudinal grooves between them are deeper than in the other axes. On axe 45, the central rib and thickened edges were extended to the base of a low, undefined blade. A slightly similar decorative effect could have been achieved by the vertical faceting of the faces of two specimens of the *Kowalewko* type—variant A from the hoard from Miejsce and variant B from Wrocław-Osobowice, site 5.¹⁴⁵

The axes from Nowa Górna, measuring 12.5–13.3 cm (specimen 49 is slightly shorter due to the wear/fracture of the blade), are of the same length as the other axes of the *Kowalewko* type, variant B, with a central rib and thickened lateral edges,¹⁴⁶ usually also narrowed in the middle. The two slimmest axes, specimen 48 and the one from Pobyłkowo with faceted sides,¹⁴⁷ are narrowed in the upper part. A rounded thickening at the socket edge, as on axes 40–44 and 47 (the irregular thickening on axes 45 and 46 is rounded on part of the circumference), is more common than the biconical thickening on axe 48, four faceted axes from the middle Vistula basin and the specimens from Podłęże, Chrustowo, Piła County, and Podgórniki, Złotoryja County.¹⁴⁸

The axes from Chrustowo, Wrocław-Osobowice site 5, Nasławice, Podgórniki, Podłęże¹⁴⁹, and the faceted Mazovian specimens from Gole and Wilamowice¹⁵⁰ were found to have high and medium-high blades, mostly wedge-shaped in longitudinal section, such as nos. 40–44 and 46–48. It seems that only Nowa Górna has so far yielded

untreated axes of the *Kowalewko* type (nos. 40–44 and 48) with narrow and thick cutting edges.

Axe 49, with a paddle-shaped, re-sharpened blade, a cylindrical thickening on the socket edge and strap-like loop has no analogies among other *Kowalewko*-type specimens. Blades of similar shape were found in four stray finds of axes of two local types, dated to the same period (Fig. 56). Two larger specimens with arched faceted sides—from Drohiczyń, Siemiatycze County, and Masłomęcz, Hrubieszów County¹⁵¹—differing in proportions, the shape of the faces and of the thickening of the socket edge, and the placement of the loop, with a length of 11 cm, correspond to the *Wielichowo* type axes in the classification of J. Kuśnierz. The blade of the slender specimen from Podlachia is very low and the quotient describing it, 0.2, does not fall within the values calculated for Nowa Górna. An axe of Middle Danubian origin with a straight socket edge, variant B, from the hoard at Pławowice has an equally low paddle-shaped blade.¹⁵² Paddle-shaped blades were also formed on two specimens with several vertical ribs on the faces¹⁵³—one of the *Wielichowo* type from an unknown town in Greater Poland, the other of the *Czarków* type, variant A, from the Bolechowicka Cave in the Kraków-Częstochowa Upland.¹⁵⁴

The deep and medium-deep sockets of axes 40–46 and 48 from Nowa Górna are quadrangular and usually circular or oval at the rim. According to the published drawings, socket mouths of this shape can be found in the specimens from Chrustowo, Nasławice, Podłęże, the larger one from Podgórniki and three from Wrocław-Osobowice site 5.¹⁵⁵ Deeper, the cross-sections of the sockets of the specimens from Nasławice and Podgórniki are oval, while the cross-sections of the axes from Podłęże are roughly quadrangular. The sockets of the axes from Gole and Wilamowice are quadrangular along their entire length, as in specimens 47 and 49. The socket of the smaller specimen from Podgórniki, which is quadrangular at the edge, is almost oval deep inside.¹⁵⁶ It is, therefore, possible that the use of cores of quadrangular cross-section—at least in the section inserted into the casting mould—is typical of the middle Vistula basin.

The sockets of most *Kowalewko*-type axes from Nowa Górna are deep, those from Gole and southern and western Poland are of medium depth; shallow sockets are

¹⁴² J. KUŚNIEZ 1998, pl. 7:103.111, 8:116.126.127, 9:128.132; W. BLAJER 2013, pl. 45:3, 53:1.2, 57:3; G. ORLIŃSKA 2020, footnote 45, figs. 2:b, 3:b, 8, 9, 16. Two axes from *Kowalewko*, Oborniki County, with heavily flattened side edges and a central rib, were omitted (J. KUŚNIEZ 1998, pl. 8:114.115; W. BLAJER 2013, pl. 27:1.2).

¹⁴³ Cf. J. KUŚNIEZ 1998, 26; G. ORLIŃSKA 2020, 210, footnote 43.

¹⁴⁴ J. KUŚNIEZ 1998, pl. 7:109; W. BLAJER 2013, pl. 52:2.4, 53:3.

¹⁴⁵ J. KUŚNIEZ 1998, 27, 29, pl. 5:83, 9:129; W. BLAJER 2013, 141, pl. 40:4.

¹⁴⁶ See footnote 142.

¹⁴⁷ G. ORLIŃSKA 2020, 199, fig. 15.

¹⁴⁸ Cf. J. KUŚNIEZ 1998, 28, pl. 7:103; W. BLAJER 2013, 146, 148, pl. 53:2, 57:3; G. ORLIŃSKA 2020, figs. 2:b, 3:b, 8, 9, 15, 16.

¹⁴⁹ J. KUŚNIEZ 1998, pl. 7:103, 8:126.127, 9:128; W. BLAJER 2013, pl. 45:3, 53:1.2, 57:3.

¹⁵⁰ G. ORLIŃSKA 2020, figs. 3:b, 5:b,c, 9.

¹⁵¹ G. ORLIŃSKA 2020, 209–210, figs. 11, 12, with earlier literature.

¹⁵² W. BLAJER 2013, pl. 48:3.

¹⁵³ Cf. footnote 151.

¹⁵⁴ J. KOSTRZEWSKI 1964, 27, pl. 5:4 (as *Bolechowice*); J. KUŚNIEZ 1998, 32, 33, 41–42, pl. 10:155 (as *Großpolen*), 10:159 (as *Bolechowice*).

¹⁵⁵ J. KUŚNIEZ 1998, 28, 29, pl. 7:103, 9:126.127, 10:128; W. BLAJER 2013, pl. 45:3, 53:2, 57:3.

¹⁵⁶ W. BLAJER 2013, pl. 53:1.

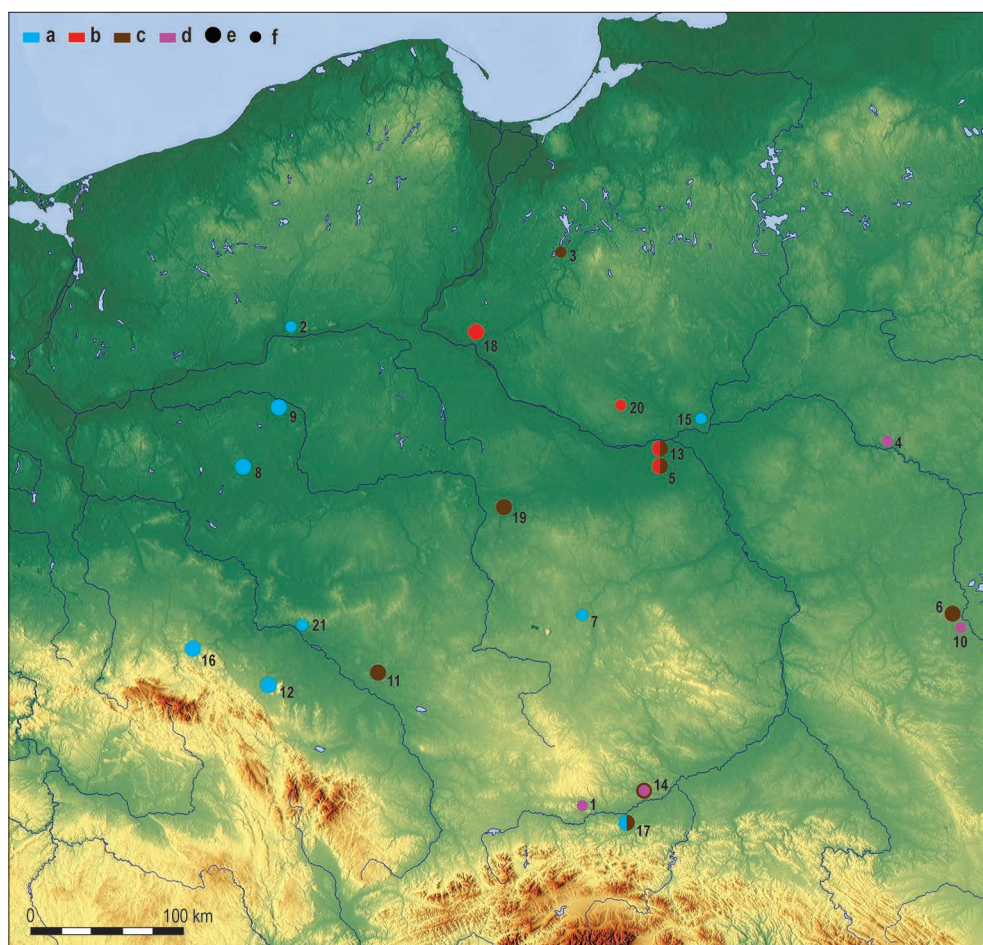


Fig. 56. Distribution in Poland of axes of the *Kowalewko* type, variant B, with a mid-rib and thickened side edges, and of specimens of Middle Danubian origin and local forms analogous to the specimens found in Nowa Górna. Axes of the *Kowalewko* type without V-shaped ribs (a) and decorated with V-shaped ribs (b), axes of Middle Danubian origin (c), axes with a paddle-shaped blade of local types and Middle Danubian origin (d), hoards (e), stray finds (f). After: J. KUŚNIERZ 1998, W. BLAJER 2013 & G. ORLIŃSKA 2020.

Graphics: G. Orlińska.

1 – Bolechowicka Cave, Kraków County; 2 – Chrustowo, Piła County; 3 – Dolina, Iława County; 4 – Drohiczyń, Siemiatycze County; 5 – Gole, Grodzisk Mazowiecki County; 6 – Hrubieszów (vicinity), Hrubieszów County; 7 – Huta Przerębska, Radomsko County; 8 – Kotowo, Grodzisk Wielkopolski County; 9 – Kowalewko, Oborniki County; 10 – Masłomęcz, Hrubieszów County; 11 – Miejsce, Namysłów County; 12 – Nasławice, Wrocław County; 13 – Nowa Górna, Warsaw West County; 14 – Pławowice, Proszowice County; 15 – Pobylkowo, Pułtusk County; 16 – Podgórnik, Złotoryja County; 17 – Podłęże, Wieliczka County; 18 – Rogowo, Toruń County; 19 – Starzyny, Poddębice County; 20 – Wilamowice, Płońsk County; 21 – Wrocław-Osobowice.

Ryc. 56. Rozmieszczenie na ziemiach polskich siekierok typu *Kowalewko*, wariantu B, z żeberkiem środkowym i pogrubionymi krawędziami bocznymi oraz egzemplarzy pochodzenia środkowodunajskiego i lokalnych stanowiących analogie do okazów znalezionych w Nowej Górze. Siekierki typu *Kowalewko* bez V-kształtnych żeberok (a) i zdobione V-kształtnymi żeberkami (b), siekierki pochodzenia środkowodunajskiego (c), siekierki z łopatkowatym ostrzem typów lokalnych i pochodzenia środkowodunajskiego (d), skarby (e), znaleziska luźne (f).

Wg: J. KUŚNIERZ 1998, W. BLAJER 2013 i G. ORLIŃSKA 2020. Grafika: G. Orlińska.

1 – Bolechowicka Jaskinia, pow. krakowski; 2 – Chrustowo, pow. pilski; 3 – Dolina, pow. iławski; 4 – Drohiczyń, pow. siemiatycki; 5 – Gole, pow. grodziski (mazowiecki); 6 – Hrubieszów (okolica), pow. hrubieszowski; 7 – Huta Przerębska, pow. radomszczański; 8 – Kotowo, pow. grodziski (wielkopolski); 9 – Kowalewko, pow. obornicki; 10 – Masłomęcz, pow. hrubieszowski; 11 – Miejsce, pow. namysłowski; 12 – Nasławice, pow. wrocławski; 13 – Nowa Górna, pow. warszawski zachodni; 14 – Pławowice, pow. proszowski; 15 – Pobylkowo, pow. pułtusk; 16 – Podgórnik, pow. złotoryjski; 17 – Podłęże, pow. wielicki; 18 – Rogowo, pow. toruński; 19 – Starzyny, pow. poddębicki; 20 – Wilamowice, pow. płoński; 21 – Wrocław-Osobowice.

found only in the Wilamowice specimens and the larger one from Podgórnik. The cross-sections of the few axes from Lesser Poland and Lower Silesia, drawn from the side, do not reveal the shape of the lower part of the

socket.¹⁵⁷ Most of the Mazovian specimens have conical sockets, rounded at the bottom (nos. 40–45 and 48, Gole

¹⁵⁷ Cf. W. BLAJER 2013, pl. 45:3, 53:1.2, 57:3.

and Wilamowice¹⁵⁸), and only the socket of axe 49, with a paddle-shaped blade, is straight at the bottom.

The available analyses of the chemical composition of the *Kowalewko*-type axes from Nowa Górna,¹⁵⁹ Gole and Wilamowice¹⁶⁰ do not provide a basis for drawing conclusions about preferences in the choice of alloys. Axes 45 and 46 from the Nowa Górna hoard are cast from bronzes with a very low tin content, the specimen from Wilamowice was made from an alloy with a medium content of this element, and the spectacular axe from Gole is made of high-tin bronze, the composition of which is very similar to the classic one.

Open **hoop ornaments** with an inner diameter of usually more than 9 cm, made of 0.9–1 cm thick rods twisted around their own axis, correspond to the anklets of the Lusatian Culture distinguished by Albert W. von Brunn.¹⁶¹ They are all twisted to the left, six, eight or nine times. Hoops 50 and 51, with fewer twists, are larger than the other two.

Such ornaments, manufactured from HaA₁, became particularly popular in the middle and late phases of the Urnfield Culture (HaA₂–HaB₂).¹⁶² Weakly twisted specimens (which undoubtedly include those discovered in Nowa Górna), often with stamped terminals, are thought to precede thinner, more densely twisted specimens without thickened ends.¹⁶³

Quite weakly twisted hoops (two out of 10) with unthickened, straight-cut terminals and dimensions corresponding to those from Nowa Górna are part of the HaA-dated assemblage from Hoyerswerda–Klein Neida, Ldkr. Bautzen. Similar specimens (three out of 17) were found in the hoard from Železné, okr. Brno-venkov, dated to HaA₂.¹⁶⁴ For comparison, in the hoard from HaB₁ from Poznań–Wielka Starołęka, the weakest, fourteen-fold twist is present in only one pair of anklet (out of 31 pieces).¹⁶⁵

DISCUSSION

The hoard from Nowa Górna cannot be dated earlier than HaB₁, i.e., the second half of Bronze Age IV, due to

the presence of *Kowalewko* type axes. Such specimens remained in circulation for much longer, as is shown by an axe of variant B of this type in the assemblage from Opalenie, Tczew County, dated to Bronze Age VI.¹⁶⁶ The assemblage of bronzes from Nowa Górna does not justify extending the dating of the hoard deep into Bronze Age V, beyond the assumed century-long duration of HaB₁.¹⁶⁷ Axes 2–4 with a straight, profiled socket edge, variant A, with parallels in the Middle Danubian zone that are mainly dated to HaA₁, as well as specimens 12–16 with a straight socket edge, variant B, with similar formal characteristics, can be considered to be the oldest in the hoard. The remaining 31 axes of Transcarpathian provenance are dated in their indigenous area to HaA₂–HaB₁. The youngest of these appear to be four specimens with traces of use—axe 1 with a slightly concave socket edge, variant A; specimen 17 with a straight socket edge, variant B; and specimens 38 and 39—richly decorated on its wider sides, variant A, and of the *Jablonka* type—as well as specimen 37 with a defined blade, variant D, bearing only traces of shaping.

The axes of Middle Danubian origin from Nowa Górna, most of which have no analogies in Poland, can be considered imports. Fourteen specimens from the hoard, including axe 6 without a loop, were made using cores stabilised in moulds with a horizontal pin, a technology of axe manufacture not used in the Polish lands. Socket axes without loops are typical of the Middle Danubian zone. The series of almost identical copies 18–24 and 29–34 probably came from the same specialised workshops. Specimens 35 and 36 were probably also made by one person, as were, possibly, specimens 38 and 39, which were cast in comparable quality. The perfectly finished specimens 1, 5, 6 and 37 must be regarded as the creations of experienced metalworkers.

The oldest socketed axes of Middle Danubian origin in Poland—HaA₁-dated specimens with a concave socket edge, variant A—are concentrated in the upper Vistula basin,¹⁶⁸ where they probably arrived from the south via river valleys crossing the Carpathians.¹⁶⁹ Most of the younger specimens, which are considered to be more or less distant analogies to the specimens from Nowa Górna—with a straight, profiled socket edge, variant A (Dolina), with a straight socket edge, variants B (Gole, Podłęże) and C (Hrubieszów area) and the *Jablonka* type (Pławowice)—were recorded in the Vistula River basin (Fig. 56). The spread of Middle Danubian products northwards was facilitated by the expanding settlement

¹⁵⁸ G. ORLIŃSKA 2020, fig. 5:b.c.

¹⁵⁹ Cf. footnote 45.

¹⁶⁰ Cf. G. ORLIŃSKA 2020, table 1.

¹⁶¹ W.A. VON BRUNN 1968a, 100–101.

¹⁶² M. SALAŠ 2005a, 96–97.

¹⁶³ W. BLAJER 1999, 77–78; 2013, 64, 90.

¹⁶⁴ W.A. VON BRUNN 1968a, 325 (as *Klein Neida*, Kr. *Hoyerswerda*); 1968b, pl. 91:2.3 (as *Kleinneida*; loosely twisted is the lower ankle-ring from pl. 91:2, and the third one from the bottom in pl. 91:3 was twisted 12 or 13 times); M. SALAŠ 2005a, 96, 410; 2005b, pl. 320:21–23 (one ankle-ring twisted 8 times, other two twisted 12 times).

¹⁶⁵ W. BLAJER 2013, 63, 149, pl. 63:1.5.

¹⁶⁶ Cf. G. ORLIŃSKA 2020, 211, footnote 39.

¹⁶⁷ W. BLAJER 2013, 97.

¹⁶⁸ Cf. J. KUŚNIERZ 1998, pl. 42:A.

¹⁶⁹ Cf. A. GARDAWSKI 1979, 284; J. KUŚNIERZ 1998, 11, pl. 42:A.

of the Gava Culture.¹⁷⁰ Contacts between the Transcarpathian zone (especially the Tisza metallurgical centre) and the areas north of the Carpathians were particularly intensive in HaB₁,¹⁷¹ when the road through Moravia and the Moravian Gate played an essential role.¹⁷² At that time, axes with a defined blade (e.g., from Miejsce, similar to specimen 37) and richly decorated on the wider sides first appeared in the Oder River basin;¹⁷³ such items were found to be among the youngest in the hoard from Nowa Górna.

The assemblage in question is the sixth HaB₁-dated hoard from Poland, containing the oldest socketed axes of the local type and specimens of Middle Danubian provenance; the considerable number and variety of the latter specimens also make it quite exceptional. The hoard from Miejsce, which is more than three times lighter (about 3.9 kg) than the one analysed here, consists of two categories of objects—11 axes (a specimen of the *Kowalewko* type, variant A, nine pieces of Transcarpathian provenance and one of unknown origin) and seven bracelets.¹⁷⁴ Among the axes of Middle Danubian origin, there were six of the *Jabłonka* type, two with a defined blade and one unclassified.¹⁷⁵ The hoard from Gole, found in a former riverbed, contains one specimen with a straight socket edge, variant B, and one axe of the *Kowalewko* type axe with a central rib and thickened lateral edges.¹⁷⁶ From the assemblage from Starzyny, discovered at the edge of a wet valley, comes an axe with a straight socket edge, variant C, and a *Kowalewko*-type specimen with several vertical ribs.¹⁷⁷ The hoard from Podłęże, weighing only about 2 kg, included two axes (one with a straight socket edge, variant B, and one of the *Kowalewko* type with a central rib and thickened edges), weapons, ornaments and clothing accessories.¹⁷⁸ The assemblage from Podgórnik, apart from an axe with a defined blade (different from those found in Nowa Górna

and Miejsce) and six specimens of the *Kowalewko* type, variant B (only two with a central rib and thickened lateral edges), included weapons, ornaments, bronze bowls and presumably raw material which accounted for almost half of the total weight of the find, which amounted to about 13.5 kg.¹⁷⁹ So far, the only hoards from the Polish lands containing only specimens of Middle Danubian origin are the assemblage from Paszowice, with the four above-mentioned specimens and a fragment of a fifth,¹⁸⁰ and the dubious hoard from Pławowice, consisting of four axes with a straight socket edge, variants A and B, one of the *Jabłonka* type, and a fragment of a sixth unspecified axe.¹⁸¹

The assemblage from Nowa Górna, weighing 13 kg, is very similar to the contemporaneous Lower Silesian hoard of 13.5 kg, with a much more varied composition, from the aforementioned Podgórnik¹⁸² and Racibórz-Sudół, Racibórz County.¹⁸³ The latter included “hoops” (*obręcze*), “axes” (*topory* [*Streitäxte*]) (an axe with a straight socket edge, variant C, with a T-shaped rib, and a specimen of western provenance with upper wings have been preserved) “and blades” (*ostrza* [*Spieße*]), of which a chisel has been preserved.

Axes of the *Kowalewko* type, variant B, with a central rib and thickened lateral edges form three clusters (Fig. 56), apart from the isolated specimens recorded in Lesser Poland (Podłęże) and in central Poland (stray find from Huta Przerębska, Radomsko County¹⁸⁴). In northern Greater Poland, three specimens have been recorded: a single one from Chrustowo¹⁸⁵ and two from hoards without specimens of Middle Danubian origin—from Kotowo¹⁸⁶ and the water-related one from Kowalewko.¹⁸⁷ In Lower Silesia, three *Kowalewko* type axes with a central rib and thickened lateral edges were found during the dredging of the Oder River,¹⁸⁸ two in the hoard from Podgórnik discussed above and one in Nasławice, together with palstaves of western provenance, which were most commonly used in HaA.¹⁸⁹ As a result, they remained in

¹⁷⁰ Cf. H. TARAS 2009, 241, with earlier literature.

¹⁷¹ T. KEMENCZEI 1984, 85.

¹⁷² Cf. O. KYTLICOVÁ 2007, 134, 235.

¹⁷³ J. KUŚNIERZ 1998, pl. 42:B.

¹⁷⁴ W. BLAJER 2013, 141, pl. 40–42; 2015, 306.

¹⁷⁵ J. KUŚNIERZ 1998, 91, pl. 38:762; W. BLAJER 2013, 37, pl. 40:3. The axe, with a thickened straight socket edge and a circumferential rib below it, finds analogies in the assemblages dated to z HaA₁ from Transdanubia (A. MOZSOLICS 1985, 89, pl. 87:10) and Transylvania (M. PETRESCU-DÎMBOVIȚA 1978, 132, pl. 162:41), in the HaA-dated hoard from Czechia (O. KYTLICOVÁ 2007, 133, 255, pl. 180A:6), and a stray find from Austria (E.F. MAYER 1977, 187–188, pl. 73:1006). Similar axes were also found in Poland—one dated to HaB₁ in Zarudzie, Zamość County (H. TARAS 2009, 235–236, 240–241 fig. 3) and one of undetermined chronology in Zaborowo, Wolsztyn County (J. KUŚNIERZ 1998, 91, pl. 38:763).

¹⁷⁶ G. ORLIŃSKA 2020, 190, 192, 194–195, figs. 1–3.

¹⁷⁷ W. BLAJER 2013, 158, pl. 97:1.2.

¹⁷⁸ W. BLAJER 2013, 145–147, pl. 50–55.

¹⁷⁹ J. KUŚNIERZ 1998, 18, 28, 29, pl. 3:45, 7:109.110 (as *Jelenia Góra-Garbary*), 8:121–123; W. BLAJER 2013, 146–147, pl. 50–55.

¹⁸⁰ Cf. footnote 58.

¹⁸¹ W. BLAJER 2013, 145, pls. 47, 48; 2015, 307.

¹⁸² W. BLAJER 2013, 148, pl. 56–59

¹⁸³ J. KUŚNIERZ 1998, 15, 16, pl. 3:38 (as *Sudół*); W. BLAJER 2013, 29, 151–152, pl. 75.

¹⁸⁴ J. KUŚNIERZ 1998, pl. 9:132.

¹⁸⁵ J. KUŚNIERZ 1998, 18, pl. 7:103.

¹⁸⁶ J. KUŚNIERZ 1998, 28, 42, pls. 7:111, 15:268; W. BLAJER 2013, 138, pl. 25:2.3.

¹⁸⁷ J. KUŚNIERZ 1998, 28, pls. 7:112, 8:113–116; W. BLAJER 2013, 138, pls. 26, 27:1.2; 2015, 306; M. MACIEJEWSKI 2017, 106, figs. 1, 2, with earlier literature.

¹⁸⁸ J. KUŚNIERZ 1998, 29, pls. 8:126.127, 9:128.

¹⁸⁹ W. BLAJER 2013, 28, pl. 45:1.2.

circulation for a long time, as did one of the axes of Middle Danubian origin from Miejsce¹⁹⁰ and specimens 2–4 and 12–16 of Transcarpathian provenance and hoop ornaments from Nowa Górna.

In Mazovia, 13 axes of the *Kowalewko* type, variant B, with a central rib and thickened lateral edges have been found, which is more than all the others put together. With the exception of the Nowa Górna specimen, they have faceted sides, and, with the exception of the axe from Pobyłkowo, two or three nested angles set on the central rib below the socket edge. An axe very similar to the one from Wilamowice, found in the hoard from Rogowo on the southern edge of the Chełmno Land, corresponds to the Mazovian specimens.¹⁹¹

The occurrence in the middle Vistula basin of axes of the *Kowalewko* type with a central rib, thickened edges and an additional decoration, which have not yet been recorded in the western part of Poland, makes it likely that they came from workshops operating outside the so-called Oder Metallurgical Centre.¹⁹² The existence of such workshops is also supported by the presence of local untreated axes in the Nowa Górna hoard and the absence of finds with several ribs or with only marked side edges in the area under discussion. The axes of the *Kowalewko* type from Mazovia seem to combine elements of local (shape), Nordic (central rib and thickened lateral edges, curved faceted sides, decoration of grooves and depressions on the Gole specimen) and Middle Danubian (massive thickening on the socket edge, nested V-shaped ribs) manufacture.¹⁹³ The middle rib and the lower V-shaped rib on top of it form a Y-shaped rib,¹⁹⁴ the central motif of the Transcarpathian specimens with a straight socket edge, variant C. Local manufacturers had a selection of casting moulds (used several times and modified, e.g., to extend the decoration), cores and a stock of raw material at their disposal. It is possible that in the case of Nowa Górna, the source of raw material may have been imported axes. Thirteen most massive untreated specimens (Fig. 51), with a total weight of just over 4.1 kg, accounted for as much as 1/3 of the entire hoard, and as many as eight of these were the oldest axes in the hoard (nos. 2–4, 12–16). The presence of younger specimens in the assemblage, with traces of shaping and use, suggests that the specimens of Transcarpathian provenance may have come from several shipments. One of these would include the axes with a straight socket edge, variant C,

predominant in the deposit (weighing 4.1 kg, i.e., the same as the unworked specimens), with an simple (German: *plumpe*) shape, unmodified by metalworkers.¹⁹⁵

Discovered on the floodplain of the Utrata River, the hoard from Nowa Górna, like its contemporaries from Gole, Kowalewko and Starzyno, can be linked to the aquatic environment.¹⁹⁶ The axes and hoop ornaments, which form a compact bundle of 40 cm in diameter and 30 cm thick, may have originally been placed in a box or wrapped tightly in cloth or leather to protect them from the river current.¹⁹⁷ Their deposition in a wet environment is confirmed by the dark, mostly brownish-green patina¹⁹⁸ that was not removed during the conservation of the artefacts in the PMA collection. However, the deposition of the hoard in a site that was only temporarily flooded with water, as indicated by the soil analyses, offered the possibility of later recovery.

The axes from the former riverbed at Gole—local and of Transcarpathian provenance—have been carefully treated and without discernible signs of use.¹⁹⁹ In the Kowalewko hoard, deposited near a river, one of the five axes was probably used,²⁰⁰ as were 18 of the 49 specimens from Nowa Górna (Fig. 51). Almost the same number of axes (19 specimens) were unworked, and 12 (of Middle Danubian origin only) were unused but with traces of shaping. The content of the analysed hoard, consisting of objects of local and foreign origin, cast in various qualities and sometimes damaged, used or not, does not differ in character from other water finds from Poland.²⁰¹

Axes, which could serve as weapons,²⁰² tools, signs of prestige and sacrificial objects,²⁰³ were deposited in aquatic environments in Poland throughout the Bronze Age and Early Iron Age. They were found almost four times less frequently than swords, and they are also less frequently than daggers and spearheads. They are more likely to be found singly than in hoards, and usually in standing water.²⁰⁴ Most of the few finds from the Mazovi-

¹⁹⁵ O. KYTLICOVÁ 2007, 134–135, with further literature.

¹⁹⁶ Axes of several local types of Middle Danubian provenance were recovered from the Oder—nine specimens dated to HaA₂–HaB₁ (J. JEREMICZ 2007, 227, no. 193, with earlier literature) and Vistula Rivers at its confluence with the Nida—four specimens dated to HaB₁ (J. JEREMICZ 2007, 227, no. 217, as a presumed water find from *Korczyn, Busko County*, with earlier literature; cf. G. ORLIŃSKA 2020, 209, footnote 82).

¹⁹⁷ Cf. J. JEREMICZ 2007, 214.

¹⁹⁸ Cf. J. JEREMICZ 2009, 268, with further literature.

¹⁹⁹ G. ORLIŃSKA 2020, 190, figs. 2, 3.

²⁰⁰ M. MACIEJEWSKI 2017, 110, fig. 2:7.

²⁰¹ J. JEREMICZ 2007, 217–218.

²⁰² As weapons are seen axes with a defined blade, subjected to various improvements, found in richly furnished male graves (cf. O. KYTLICOVÁ 2007, 134–135, with further literature).

²⁰³ J. BAŁEŁ 1998, 8.

²⁰⁴ J. JEREMICZ 2007, 214.

¹⁹⁰ Cf. footnote 175.

¹⁹¹ J. KUŚNIEZ 1998, 73, 85, 28:594, 33:685; W. BŁAJER 2103, 152–153, pl. 76:4.6.

¹⁹² Cf. M. KACZMAREK 2012, 334, 338, 341–342, fig. 148:B; G. ORLIŃSKA 2020, 209.

¹⁹³ Cf. G. ORLIŃSKA 2020, 209, 210–211.

¹⁹⁴ Cf. J. DĄBROWSKI 1997, 48.

an region, same as in the rest of Poland, were submerged in standing water in HaA. A few axes of the *Kłodzisko* type were found in Złaków Kościelny, Łowicz County,²⁰⁵ and Maciejowice, Garwolin County,²⁰⁶ the other two, damaged, of undetermined type, found in Pieczyska, Sochaczew County, were so valuable to their owner that he put them in a wooden box, the parts of which were held together with bracelets.²⁰⁷ From standing water come the swords of the *Liptov* type from Warszawa-Białoleka²⁰⁸ and Sierakówek, Gostynin County,²⁰⁹ and a stone axe from Ząbki, Wołomin County.²¹⁰ The importance of blunt and bladed weapons in Mazovia in the Middle Bronze Age seems to be confirmed by the contents of the HaA₁-dated hoard from Czubin, Pruszków County, consisting of 17–19 objects found in groups on a hill washed by a river; in addition to nine axes (five of the *Czubin* type, three palstaves as well as one palstave of Norse origin with an upper socket), it contained at least five knobbed shaft-hole axes of the *Nortycken* type.²¹¹ In addition to the treasures from Gole and Nowa Górna deposited at the end of the IV EB, a dagger of older date from Drądzewo, Maków Mazowiecki County,²¹² and a deer antler hammer from Warsaw-Bielany, which has analogues in early Iron Age sites²¹³, are also associated with flowing waters. In the area adjacent to Mazovia, between the Bug and Wieprz Rivers, axes were sunk throughout the Bronze Age.²¹⁴

²⁰⁵ J. JEREMICZ 2007, 227, no. 201, with earlier literature. Sunk were not only parts of weaponry but also ornaments—in Kluczewo, Płońsk County (J. KOSTRZEWSKI 1964, 40, fig. 35), Cieszewko, Płock County, and Góra, Legionowo County, as well as ornaments and tools in Pruszków, Pruszków County (W. BLAJER 2001, 329, 333, 337, with earlier literature).

²⁰⁶ J. DĄBROWSKI, M. MOGIELNICKA-URBAN 2014, 114, fig. 148:1.

²⁰⁷ J. JEREMICZ 2007, 214, 225, no. 120, with earlier literature.

²⁰⁸ J. ANTONIEWICZ 1949, 33–35.

²⁰⁹ J. JEREMICZ 2007, 225, no. 148, with earlier literature.

²¹⁰ J. JEREMICZ 2007, 227, no. 199, with earlier literature.

²¹¹ A. DRZEWICZ 2003b, 63–65, fig. 1.

²¹² J. JEREMICZ 2007, 223, item 33, with earlier literature.

²¹³ Cf. A. DRZEWICZ 2003a, 163–164, fig. 1.

²¹⁴ Ten isolated axes may come from standing waters (the deposition environment of six of them was reconstructed on the basis of the colour of the patina): two flint ones from Brus Sary, Włodawa County (J. JEREMICZ 2009, 269, fig. 2:7.8, with earlier literature), a copper one possibly from Busówno (or Pniówno), Chełm County (A. BRONICKI 2009, 225–226, fig. 2; J. JEREMICZ 2009, 269, fig. 2:1, with earlier literature), flanged specimens from Zanowin, Chełm County (A. BRONICKI 2009, 227–228, fig. 3) and Brus Sary, Włodawa County, the vicinity of Kock, Lubartów County, and the vicinity of Topornica, Zamość County (J. JEREMICZ 2009, 269–270, fig. 2:1–4, with earlier literature). A specimen of the *Kowalewko* type, variant A, was presumably found in the Krasnystaw County (E.M. KŁOSIŃSKA 2006, 311, fig. 4), and the aforementioned pieces with faceted sides come from Masłomęcz (J. JEREMICZ 2009, 269–270, fig. 2:5, with earlier literature) and Hrebenne (H. TARAS, H. DZIEWICZKIEWICZ 2018, 187).

In the immediate vicinity of Nowa Górna no remains of a Bronze Age settlement of the Lusatian Culture have been found. During fieldwalking surveys in a 3-km radius around the findspot of the hoard (AZP areas 57-61 and 57-62) revealed only a few traces of settlement in the form of potsherds, tentatively attributed to the Lusatian Culture (Bieniewo-Parcele, Górna Wieś/Nowa Wieś, Rochaliki/Wawrzyszew, all in the Warsaw West County). Only the existence of a Bronze Age settlement of the Lusatian Culture at Rochaliki, where two pits with abundant daub, potsherds and burnt stones were uncovered, was confirmed by rescue test excavations.²¹⁵ Three cremation urns (an urn decorated with motifs typical of the Roman Period, discovered around 1875 and two others, undescribed, discovered between 1910 and 1912) found in the area of the Rochale Wielkie estate (present-day village of Rochale, Warsaw West County) came from the same cemetery. A comparison of the archival location sketch of the finds with the contemporary map of Rochale shows that all the discoveries were made at a distance of about 100 m to the west of the manor.²¹⁶

CONCLUSION

The hoard from Nowa Górna is unparalleled in the Polish lands, not only for the number and variety of axes of Middle Danubian origin, but also in terms of the large series of the oldest local socketed specimens of the *Kowalewko* type, variant B, with a central rib and thickened lateral edges. They differ from specimens of this type found in western Poland by the presence of an additional ornamental motif in the form of nested angles, also found on other axes from the middle Vistula basin.

The assemblage in question was discovered in an area where important travel and transport routes intersected. One of them ran from the south in a wide strip along the Vistula River, the other led from north-western Europe along the Lower and Middle Oder River, then along the course of the Warta River, through the Gniezno Lake District to Kujawy, then southwards along the Vistula and Bug Rivers.²¹⁷ The influence of various cultural centres, which reached the Middle Vistula basin at the end of Bronze Age IV, both in the form of designs and finished objects, contributed to the development of local bronzemaking, the characteristic product of which

²¹⁵ B. BUCZEK-PEACHTOWA 1965, 102–103, 104, figs. 2–4. Site Rochaliki VIII/56 in the area AZP 57-62 (WUOZ Archive).

²¹⁶ Folder *Rochale (Wielkie)* (Laboratory of Scientific Documentation, PMA). Rochale Wielkie, sites I/54 and I/55 in the area AZP 57-62 (WUOZ Archive).

²¹⁷ J. AFFELSKI 2011, 165, with further literature.

are axes combining features of local, Nordic and Middle Danubian specimens.

The hoard from Nowa Górna was discovered on the floodplain of the Utrata River and, like its contemporaries from Gole, Kowalewko and Starzyny, can be linked to the aquatic environment. The Mazovian hoards come from an area where, as in the interfluvium of the Bug and Wieprz Rivers, the practice of sinking axes has a long tradition.

The hoard consists of objects in three stages of production and use, symbolically reflecting the entire metallurgical cycle in the act of deposition. The placement of the package of bronzes, protected from disturbance by the current of the river, in a place that is only temporarily flooded, suggests that the 'sinking' may not have been merely a sacrificial act. It is possible that the need to retrieve the deposit, either to recover finished products or raw material for local bronze production, was taken into account.

Answers to this and other questions concerning both the spiritual and material spheres of the Lusatian Cul-

ture population in the Late Bronze Age in Mazovia can only be provided by further finds.

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SKARB Z MŁODSZEJ EPOKI BRĄZU Z NOWEJ GÓRNEJ, GM. BŁONIE, POW. WARSZAWSKI ZACHODNI

STRESZCZENIE

Skarb wyrobów brązowych z Nowej Górnjej, pow. warszawski zachodni, złożony z 49 siekier z tulejką oraz czterech ozdób obręczowych, o łącznej wadze nieco ponad 13 kg, został znaleziony przypadkowo w 2015 roku nad rzeką Utratą, jednym z ważniejszych dopływów Bzury, we wschodniej części Równiny Łowicko-Błońskiej (Ryc. 1–3).

Przebadanie miejsca znaleziska przy użyciu detektorów do wykrywania metali nie doprowadziło do odkrycia dalszych przedmiotów mogących pochodzić ze skarbu, ani materiałów dowodzących, że miejsce to jest częścią większego stanowiska archeologicznego. Zgodnie z relacją odkrywcy skarb znajdował się w odległości ok. 33 m od obecnego

koryta rzeki Utraty. Przedmioty tworzyły zwarte skupisko o średnicy ok. 40 cm i miąższości 30 cm, zalegające na głębokości od 40 cm od powierzchni gruntu. Taki kontekst odkrycia potwierdziły analizy geoboznawcze próbek ziemi pobranej z miejsca znaleziska oraz z tulejek siekieriek. Zidentyfikowany w nich materiał organiczny okazał się typowy dla nawarstwień czasowo zalewanych wodą. W przypadku Utraty, dynamicznie reagującej na nawałne opady i roztopy, do podnoszenia się poziomu wód dochodziło wielokrotnie. Na zaleganie zabytków w środowisku mokrym wskazuje również ciemna, brunatno-zielona patyna, nieusunięta podczas konserwacji z części zabytków.

Przedmioty ze skarbu opisane są w katalogu w kolejności zgodnej z numerami nadanymi im na potrzeby tego opracowania. Siekierki omawiane są w podziale na okazy pochodzenia środkowodunajskiego (nr. 1–39; Ryc. 4–41) i wykonane w środowisku miejscowym egzemplarze typu *Kowalewko*, wariantu B (nr. 40–49; Ryc. 42–48), w układzie zgodnym z klasyfikacją Jerzego Kuśnierza z 1988 roku; typ siekierki nr 39 określono opierając się na ustaleniach Wojciecha Blajera z 2018 roku. Katalog zamykają opisy czterech ozdób obręczowych, określanych jako nagolenniki kultury łużyckiej (nr. 50–53; Ryc. 49, 50).

Wymiary, proporcje i wagę siekieriek zestawiono w Tabeli 1.

Siekierki pochodzenia środkowodunajskiego reprezentują sześć typów: z symetrycznie wklęsłą krawędzią tulejki, wariant A (nr 1), z prostą, profilowaną krawędzią tulejki, wariant A (nr. 2–6), z prostą krawędzią tulejki, warianty B (nr. 7–17) i C (nr. 18–36), z wyodrębnionym ciosem, wariant D (nr 37), bogato zdobiona na szerszych ściankach, wariant A (nr 38), oraz typu *Jablonka* (nr 39).

Trzydzieści dziewięć siekieriek pochodzenia środkowodunajskiego wykonano w 24 formach odlewniczych. Z sześciu form pochodzą po dwa egzemplarze z prostą krawędzią tulejki, wariantów B (nr. 7 i 8, 15 i 16) i C (nr. 18 i 19, 29 i 30, 31 i 32, 33 i 34), z trzech po trzy okazy z prostą, profilowaną krawędzią tulejki, wariantu A (nr. 2–4), oraz z prostą krawędzią tulejki, wariantu B (nr. 9–11, 12–14), z jednej cztery siekierki z prostą krawędzią tulejki, wariantu C (nr. 20–23), oraz z 14 form okazy pojedyncze (35,9%) wymienionych wyżej typów (nr. 5, 6, 17, 24–28, 35, 36), a także z wyodrębnionym ciosem, wariantu D (nr 37), bogato zdobiony na szerszych ściankach, wariantu A (nr 38), i typu *Jablonka* (nr 39).

Czternaście siekieriek proveniencji zakarpackiej (nr. 5, 6, 18–28, 38) odlano z zastosowaniem rdzeni zaopatrzonych w poziomy otwór i stabilizowanych w formie sztyftem. Sztyft wprowadzano najprawdopodobniej od strony boku bez uszka siekierki, w którym otworek jest większy niż po przeciwnej stronie (wyjątkiem jest okaz nr 38 z bardzo małymi otworkami o podobnej wielkości). Mocowane sztyftem rdzenie, w większości stożkowate i owalne w przekroju poprzecznym, były na końcu proste (nr. 5, 20–23, 26, 27) lub co najwyżej lekko zaokrąglone (nr. 18, 19, 24, 28) i osadzone zwykle na średniej głębokości, a płytko tylko w okazy nr 5. Trzy rdzenie soczewkowate w przekroju poprzecznym z prostym wierzchołkiem zamocowano płytko (nr 6) i średnio głęboko (nr. 25, 26), a owalny, jedyny niemal cylindryczny rdzeń o słabo zaokrąglonym wierzchołku był osadzony głęboko (nr 38).

Rdzenie pełne, podobnie jak te z otworem, były przeważnie stożkowate, większość owalna, z końcem zaokrąglonym silnie (nr. 2–4, 7–13, 15, 16, 32, 35, 36), lekko (nr. 1, 30, 31, 33, 34) i wyjątkowo prostym (nr 37), osadzone płytko (nr. 1, 2–4, 12–16, 30, 35–37), rzadziej na średniej głębokości (nr. 9–11, 31–34) i sporadycznie głęboko (nr. 7, 8). Dwa z trzech prawie cylindrycznych, owalnych w przekroju rdzeni z silnie zaokrąglonym wierzchołkiem zamocowano na średniej głębokości (nr. 17, 29), trzeci – płytko (nr 39).

Tych samych rdzeni użyto jedynie podczas odlewania egzemplarzy 9–11, 15 i 16, 20–23 oraz 33 i 34. Obie metody stabilizowania rdzenia nie były skuteczne podczas wypełniania formy metalem, stąd w większości siekieriek szerokość zgrubienia na krawędzi tulejki nie jest jednokrotna.

Podobnie niestabilne były mocowane bez sztyftu rdzenie w formach do odlewu siekieriek typu *Kowalewko*, z silnie zaokrąglonym wierzchołkiem, z wyjątkiem prostego na końcu użytego przy produkcji okazy 49. Przeważały rdzenie stożkowate, które osadzano na średniej głębokości (nr. 40, 41, 49) i częściej głęboko (nr. 42–45, 48). Głęboko zamocowano także rdzeń lejkowaty (nr 46) i prawie cylindryczny (nr 47). Rdzenie były przeważnie czworokątne w przekroju na odcinku wprowadzanym do formy i koliste albo owalne wyżej, rzadziej czworokątne na całej długości (nr. 47, 49). Pochodzące z jednej formy okazy 40–44 odlano najprawdopodobniej z użyciem tego samego rdzenia.

Większość form odlewniczych wykorzystanych do odlania siekieriek środkowodunajskich i lokalnych była zaopatrzona w dwa kanały wlewowe umieszczone naprzeciwko siebie pośrodku ścianek. Kanały były przeważnie niejednakowej wielkości – szerszy służył do doprowadzenia metalu, a węższy do odprowadzenia gazów. Niewątpliwie jeden kanał wlewowy ułożony powyżej uszka miała forma przeznaczona dla siekierki nr 1. W przypadku egzemplarzy nr 17, 38 i 39 liczba kanałów wlewowych jest niepewna (Tab. 2).

Makroskopowy ogląd siekieriek pod kątem pozostałości po procesach odlewniczych wykazał, że formy miejscowe były gorzej przygotowane od „środkowodunajskich”. Z sześciu form użytych do odlania siekieriek typu *Kowalewko* nieszczelne były cztery (uzyskano w nich okazy nr 43–47), pięć miało niejednakowej głębokości części wnęki (por. Tab. 2), a połowy trzech nierówno połączono na czas odlewu. Z 24 form „zakarpackich” nieszczelne były tylko trzy (wyprodukowano w nich egzemplarze nr 17, 38 i 39), 14 miało nierówno połączone części, 16 niesymetryczne połowy wnęki, a dwie z tych ostatnich (przeznaczone dla okazów nr 7 i 8 oraz 25) także boki.

Wydaje się, że podczas odlewania siekieriek typu *Kowalewko* powielany był błąd skutkujący wadliwym krzepnięciem metalu na styku tulejki i litej części ciosu. Na jednej lub obu ściankach ośmiu z dziesięciu egzemplarzy odnotowano zapadnięcia – dołkowate w siekierkach nr 40–45 i płytkie w okazach nr 46 i 47. Zapadnięcia w siekierkach pochodzenia środkowodunajskiego rejestrowano znacznie rzadziej, bo na 20 z 39 okazów (nr. 1–3, 5, 6, 8–11, 14, 15, 17–22, 24, 31, 33) i zaledwie trzykrotnie miały one kształt dołków (nr. 11, 22, 24).

Analiza śladów produkcji i używania na zabytkach z Nowej Górnjej (Ryc. 52–54) wykazała obecność siekieriek w trzech stadiach produkcyjnych i użytkowych (Ryc. 51); w wypadku ozdób obręczowych ustalenie takich szczegółów było niemożliwe. Z 19 siekieriek w stanie surowym 13 jest pochodzenia środkowodunajskiego (okazy z prostą, profilowaną krawędzią tulejki, wariantu A, i z prostą krawędzią tulejki, wariantu B). Ślady formowania nosi 12 okazów proveniencji zakarpackiej, przede wszystkim z prostą krawędzią tulejki, wariantu C. Egzemplarze tego typu dominują również w zbiorze siekieriek używanych, obejmującym także cztery okazy typu *Kowalewko*. Obecność w skarbie kilku siekieriek kawałkowanych (nr. 5, 17, 37, 39) pozwala postawić hipotezę, że egzemplarze typu *Kowalewko* z Nowej Górnjej mogły być wykonane z metalu importowanego, którego źródło stanowiły okazy „zamiejscowe”. Inwentarz skarbu byłby zatem ciekawym przykładem depozycji przedmiotów związanych z całym cyklem metalurgicznym.

Skarb z Nowej Górnjej z uwagi na obecność siekieriek typu *Kowalewko* nie może być datowany wcześniej niż na HaB₁, czyli 2. połowę IV EB, a jego inwentarz nie daje podstaw do rozciągania datowania w głąb V EB. Za najstarsze w zespole można uznać siekierki nr 2–4 z prostą, profilowaną krawędzią tulejki, wariantu A, o paralelach w strefie środkowodunajskiej przede wszystkim w HaA₁ oraz okazy nr 12–16 z prostą krawędzią tulejki, wariantu B, o zbliżonych do wymienionych cechach formalnych. Pozostałe 31 siekieriek proveniencji zakarpackiej jest datowanych na obszarze macierzystym w granicach HaA₂–HaB₁. Za najmłodsze z nich, odnoszone do HaB₂, uznano używane egzemplarze nr 1, 17, 38 i 39 oraz jedynie formowany okaz nr 37.

Analiza archeologiczna potwierdza formułowane wcześniej wnioski o zamiejscowym pochodzeniu siekieriek zakarpackich, w przeważającej części bez analogii na ziemiach polskich. 14 egzemplarzy (w tym okaz nr 6 bez uszka) wykonano przy użyciu rdzeni stabilizowanych w formach poziomym sztyftem, w technologii niestosowanej na ziemiach polskich w produkcji siekieriek. Serie niemal identycznych siekieriek nr 18–24 i 29–34 są najpewniej produktem tych samych wyspecjalizowanych warsztatów. Spod jednej ręki wyszły też najprawdopodobniej egzemplarze nr 35 i 36 oraz przypuszczalnie siekierki nr 38 i 39 odlane z porównywalną jakością. Perfekcyjnie wykończone okazy nr 1, 5, 6 i 37 należy uznać za produkty doświadczonych metalurgów.

Nieliczne siekierki z ziem polskich mogące stanowić mniej lub bardziej ściśle analogie do okazów z Nowej Górnjej – z prostą, profilowaną krawędzią tulejki, wariantu A (Dolina, pow. iławski), z prostą krawędzią tulejki, wariantów B (Gole, pow. grodziski i Podłęże, pow. wielicki) i C (okolice Hrubieszowa, pow. loco) oraz typu *Jablonka* (Pławowice, pow. proszowski) zarejestrowano w dorzeczu Wisły (Ryc. 56). Rozprzestrzenianiu się takich okazów w kierunku północnym sprzyjało rozszerzające się osadnictwo kultury Gava. Szczególnie intensywne kontakty strefy zakarpackiej (zwłaszcza nadcisańskiego ośrodka metalurgicznego) z terenami na północ od Karpat przypadły na HaB₁, kiedy główną rolę odgrywała droga wiodąca przez Morawy i Bramę Morawską. W ich wyniku w dorzeczu Odry pojawiły się siekierki z wyodrębnionym ciosem (m.in. podobna do okazu nr 37, odkryta w Miejscu, pow. namysłowski) i bogato zdobione na szerszych ściankach, czyli typów w skarbie z Nowej Górnjej uznanych przez nas za jedne z najmłodszych.

Omawiany zespół jest szóstym skarbem z HaB₁ na ziemiach polskich zawierającym najstarsze lokalne siekierki z tulejką i okazy pochodzenia środkowodunajskiego – poza wymienianymi już znaleziskami z Gól, Miejsca i Podłęża oraz zespołami odkrytymi w Podgórniku, pow. złotoryjski i Starzynach, pow. poddębicki – ale wyjątkowym z uwagi na znaczną liczbę i różnorodność okazów zakarpackich. Wagą 13 kg skarb z Nowej Górnjej niewiele ustępuje współczesnym mu 13,5-kilogramowym zespołom dolnośląskim, ale o znacznie bardziej urozmaiconym inwentarzu, z wymienionego wyżej Podgórniku oraz z Raciborza-Sudołu, pow. raciborski. Niestety, z tego ostatniego skarbu zachowały się tylko dwie siekierki: środkowodunajski okaz z prostą krawędzią tulejki, wariantu C, z żeberkiem w kształcie litery T, i egzemplarz proveniencji zachodniej z górnymi skrzydełkami, oraz dużo i ozdoba obręczowa.

Siekierki typu *Kowalewko*, wariantu B, podobnie jak w Nowej Górnjej z żeberkiem środkowym i pogrubionymi krawędziami bocznymi, poza pojedynczymi egzemplarzami zarejestrowanymi w Małopolsce (Podłęże) i Polsce środkowej (Huta Przerębska, pow. radomszczański) tworzą trzy skupiska (Ryc. 56). W północnej Wielkopolsce odnotowano trzy okazy: pojedynczy z Chrustowa, pow. pilski i dwa ze skarbów niezawierających okazów pochodzenia środkowodunajskiego – z Kotowa, pow. grodziski i związanego ze środowiskiem wodnym zespołu z Kowalewka, pow. obornicki. Z Dolnego Śląska znanych jest sześć takich siekieriek typu *Kowalewko*: trzy z Odry we Wrocławiu-Osobowicach, dwie z cytowanego wcześniej skarbu z Podgórniku i jedna z Nasławic, pow. wrocławski. Na Mazowszu odkryto 13 siekieriek omawianego typu (łącznie z okazami o facetowanych bokach z Gól, Pobyłkowa, pow. pułtusi i Wilamowic, pow. płoński). Z wyjątkiem siekierki z Pobyłkowa mają one umieszczone pod krawędzią tulejki dwa lub trzy wsunięte w siebie kąty (w Golach wyjątkowo wyobrażone żłobkami, a nie żeberkami, jak na pozostałych okazach) osadzone na żeberku środkowym. Do okazów mazowieckich przystaje siekierka

z facetowanymi bokami, bardzo podobna do wilamowickiej, ze skarbu z Rogowa, pow. toruński.

Występowanie w dorzeczu środkowej Wisły siekieriek typu *Kowalewko* z żeberkiem środkowym, pogrubionymi krawędziami i dodatkowym ornamentem, jakich nie odnotowano dotychczas w zachodniej części ziem polskich, czyni prawdopodobnym ich pochodzenie z warsztatów działających poza tzw. nadodrzańskim ośrodkiem metalurgicznym. Za funkcjonowaniem tutaj miejscowych pracowni brązowniczych przemawia dodatkowo obecność w Nowej Górnjej lokalnych siekieriek w stanie surowym i brak – jak dotychczas – na omawianym obszarze okazów typu *Kowalewko*, wariantu B, z kilkoma pionowymi żeberkami lub tylko zaznaczonymi krawędziami bocznymi. Siekierki z warsztatów nadwiślańskich wydają się łączyć elementy wytwórczości miejscowej (forma), nordyjskiej (zeberko środkowe i pogrubione krawędzie boczne, łukowato facetowane boki, a w wypadku okazu z Gól także ornament żłobkowo-dołkowy) i środkowodunajskiej (masywne zgrubienie na krawędzi tulejki, wsunięte w siebie V-kształtne żeberka). Zeberko środkowe i osadzone na nim wierzchołkiem dolne żeberko V-kształtne składają się w żeberko w kształcie litery Y, centralny motyw zdobniczy zakarpackich okazów z prostą krawędzią tulejki, wariantu C. Lokalni wytwórcy dysponowali wyborem form odlewniczych (używanych kilkakrotnie i modyfikowanych, np. dla przedłużenia ornamentu okazu nr 45), rdzeni i zasobem surowca, którego źródłem w przypadku Nowej Górnjej mogły być siekierki importowane. Trzynastcie najmaszywniejszych okazów w stanie surowym (Ryc. 51), o łącznej wadze nieco ponad 4,1 kg, stanowi 1/3 całego zasobu, a osiem z nich (nr. 2–4, 12–16) to siekierki najstarsze w skarbie. Obecność w skarbie także siekieriek młodszych, ze śladami formowania i użytkowania, pozwala sądzić, że okazy proveniencji zakarpackiej mogły pochodzić z kilku transportów. Niewykluczone, że jeden z nich obejmował dominujące w depozycie siekierki z prostą krawędzią tulejki, wariantu C, o wadze bliskiej 4,1 kg, czyli takiej jak okazów nieopracowanych.

Rozwojowi wytwórczości brązowniczej na obszarze dorzecza środkowej Wisły, której charakterystycznym produktem są siekierki łączące cechy trzech stref kulturowych, sprzyjały krzyżujące się tutaj ważne „drogi” komunikacyjne, którymi rozchodziły się wzorce i gotowe wyroby. Jedna z „drog” biegła z południa szerokim pasem wzdłuż Wisły, druga prowadziła z północno-zachodniej Europy wzdłuż dolnej i środkowej Odry, dalej zgodnie z biegiem Warty, przez Pojezierze Gnieźnieńskie na Kujawy, następnie wzdłuż Wisły i Bugu w kierunku południowym.

Odkryty na terasie zalewowej rzeki Utraty skarb z Nowej Górnjej, podobnie jak współczesne mu zespoły z Gól, Kowalewka i Starzyn, można łączyć ze środowiskiem wodnym. Skarby mazowieckie pochodzą z obszaru, na którym podobnie jak w międzyrzeczu Bugu i Wieprza zwyczaj zatapiania siekieriek miał długą tradycję. Omawiany zespół wyróżnia się znaczną liczebnością, z dominacją siekieriek pochodzenia środkowodunajskiego, jak można sądzić importowanych. Na skarb składają się przedmioty w trzech stadiach produkcyjnych i użytkowych, oddające symbolicznie w akcie depozycji cały cykl metalurgiczny. Umieszczenie zabezpieczonego przed naruszeniem przez nurt rzeki pakietu z brązami w miejscu tylko czasowo zalewanym wodą pozwala domniemywać, że „zatopienie” mogło nie być jedynie aktem ofiarnym. Niewykluczone, że liczono się z potrzebą wydobycia depozytu, czy to dla odzyskania gotowych wyrobów, czy surowca dla miejscowej produkcji brązowniczej. Odpowiedzi na to i inne pytania dotyczące tak sfery duchowej, jak i materialnej ludności kultury łużyckiej w młodszej epoce brązu na obszarze Mazowsza mogą przynieść tylko kolejne znaleziska.

WYKAZ SKRÓTÓW TYTUŁÓW CZASOPISM I WYDAWNICTW WIELOTOMOWYCH

ABBREVIATIONS OF PERIODICALS' AND SERIAL PUBLICATIONS' TITLES

AAC	– „Acta Archaeologica Carpathica”, Kraków
AAHung.	– „Acta Archaeologica Academiae Scientiarum Hungaricae”, Budapest
AFB	– „Arbeits- und Forschungsberichte zur sächsischen Bodendenkmalpflege”, Berlin (Stuttgart)
Amtl. Ber.	– „Amtlicher Bericht über die Verwaltung der naturgeschichtlichen, vorgeschichtlichen und volkskundlichen Sammlungen des Westpreußischen Provinzial-Museums für das Jahr...”, (później: „Amtlicher Bericht über die Verwaltung der naturhistorischen, archaeologischen und ethnologischen Sammlungen des Westpreußischen Provinzial-Museums für das Jahr...” oraz „Amtlicher Bericht über die Verwaltung der naturgeschichtlichen, vorgeschichtlichen und volkskundlichen Sammlungen des Westpreußischen Provinzial-Museums für das Jahr...”), Danzig
APolski	– „Archeologia Polski”, Warszawa
APS	– „Archeologia Polski Środkowowschodniej”, Lublin (wcześniej: Lublin-Chełm-Zamość)
AR	– „Archeologické rozhledy”, Praha
B.A.R. Int. Series	– British Archaeological Reports, International Series, Oxford [BAR Publishing]
BerRGK	– „Bericht der Römisch-Germanischen Kommission”, Frankfurt a.M.-Berlin
BJahr.	– „Bonner Jahrbücher”, Köln/Bonn
BMJ	– „Bodendenkmalpflege in Mecklenburg-Vorpommern”, Lübstorf (wcześniej: „Bodendenkmalpflege in Mecklenburg. Jahrbuch ...”, Schwerin/Rostock/Berlin)
CRFB	– Corpus der römischen Funde im europäischen Barbaricum
FAP	– „Fontes Archaeologici Posnanienses” (wcześniej: „Fontes Praehistorici”), Poznań
Inf.Arch.	– „Informator Archeologiczny. Badania rok ...”, Warszawa
InvArch.	– „Inventaria Archaeologica, Pologne”, Warszawa-Łódź
JmV	– „Jahresschrift für mitteldeutsche Vorgeschichte”, Halle/Saale
JRGZM	– „Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz”, Mainz
KHKM	– „Kwartalnik Historii Kultury Materialnej”, Warszawa
KSIA	– Краткие сообщения Института археологии Академии наук СССР, Москва
MIA	– Материалы и исследования по археологии СССР, Москва
MatArch.	– „Materiały Archeologiczne”, Kraków
MS	– „Materiały Starożytne”, Warszawa
MSiW	– „Materiały Starożytne i Wczesnośredniowieczne”, Warszawa
MSROA	– „Materiały i Sprawozdania Rzeszowskiego Ośrodka Archeologicznego”, Rzeszów-Krosno-Sandomierz-Tarnów (-Przemyśl/Tarnobrzeg)
MZP	– „Materiały Zachodniopomorskie”, Szczecin
PA	– „Památky archeologické” (wcześniej: „Památky archeologické a místopisné”), Praha
PArch.	– „Przegląd Archeologiczny”, Poznań
PMMAE	– „Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna”, Łódź
PomAnt	– „Pomorania Antiqua”, Gdańsk
Prahistoria ziem polskich	– <i>Prahistoria ziem polskich</i> , tom I: <i>Paleolit i mezolit</i> (red. W. Chmielewski, W. Hensel), Wrocław-Warszawa-Kraków-Gdańsk 1975; tom II: <i>Neolit</i> (red. W. Hensel, T. Wiślański), Wrocław-Warszawa-Kraków-Gdańsk 1979; tom III: <i>Wczesna epoka brązu</i> (red. A. Gardawski, J. Kowalczyk), Wrocław-Warszawa-Kraków-Gdańsk 1978; tom IV: <i>Od środkowej epoki brązu do środkowego okresu lateńskiego</i> (red. J. Dąbrowski, Z. Rajewski), Wrocław-Warszawa-Kraków-Gdańsk 1979; tom V: <i>Późny okres lateński i okres rzymski</i> (red. J. Wielowiejski), Wrocław-Warszawa-Kraków-Gdańsk 1981 [Ossolineum]
Prussia	– „Sitzungsberichte der Altertumsgesellschaft Prussia” (później: „Prussia. Zeitschrift für Heimatkunde”), Königsberg.
PZ	– „Praehistorische Zeitschrift”, Berlin-New York
RArch.	– „Recherches Archéologiques”, Kraków
RB	– „Rocznik Białostocki”, Białystok
RGA	– Reallexikon der Germanischen Altertumskunde: 1. edycja: J. Hoops (wyd.), tomy 1–4 (K.J. Trübner, Straßburg 1911–1919), 2. edycja: H. Jankuhn, H. Beck i in. (wyd.), tomy 1–35 (Walter de Gruyter/De Gruyter, Berlin-New York 1973–2007).
RO	– „Rocznik Olsztyński”, Olsztyn
RosArh.	– „Российская археология”, Москва
SJahr.	– „Saalburg Jahrbuch”, Berlin-New York
SLA	– „Slovenská archeológia”, Bratislava
SovArh.	– „Советская археология”, Москва
SprArch.	– „Sprawozdania Archeologiczne”, Kraków

SprPMA	– „Sprawozdania P.M.A.”, Warszawa
WA	– „Wiadomości Archeologiczne”, „Wiadomości Archeologiczne. Spostrzeżenia lat ostatnich w dziedzinie starożytności krajowych. Czasy przedhistoryczne” (I–IV – 1873–1882); „Wiadomości Archeologiczne. Organ Państwowego Głównego Konserwatorium Zabytków Przedhistorycznych” (V–IX – 1920–1925); „Wiadomości Archeologiczne. Organ Państwowego Muzeum Archeologicznego” (X–XXII – 1929–1955); „Wiadomości Archeologiczne” (XXIII–XXXI – 1956–1966), „Wiadomości Archeologiczne. Organ Muzealnictwa i Konserwatorstwa Archeologicznego” (XXXII–LV – 1966–2001); „Wiadomości Archeologiczne” (od LVI – 2002), Warszawa
ZfE	– „Zeitschrift für Ethnologie”, Berlin
ZNUJ	– „Zeszyty Naukowe Uniwersytetu Jagiellońskiego”, Kraków
ZOW	– „Z otchłani wieków”, Warszawa

WYKAZ SKRÓTÓW NAZW WYDAWNICTW

ABBREVIATIONS OF PUBLISHING HOUSES NAMES

Zobacz / See:

<http://www.wiadomosci-archeologiczne.pl/Wykaz-skrutow-nazw-wydawnictw,5442.html>

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