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HIDDEN LITHIC TREASURES. RESEARCH PERSPECTIVES ON MUSEUM COLLECTIONS OF NEOLITHIC STONE TOOLS

ABSTRACT

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Museum collections contain numerous finds that are considered low-quality data and do not attract the proper attention of researchers. The most common reason is the uncertain context of the finds or lack of other precise identification. The main aim of this paper is to increase the scientific value of so-called stray finds. The collection of the Neolithic stone tools from two museums was subjected to multifaceted analysis combined with detailed archival research. The results allowed us to address two important aspects. At the level of objects, the use of microscopic observations proved the complexity and prolonged use-life of the Neolithic tools. At the cultural level, the re-evaluation of stray finds introduces changes in the range of Neolithic settlements in SW Poland.

Keywords: Stray finds, Neolithic, macrolithic tools, archival resources

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INTRODUCTION

Macrolithic tools made from various types of non-flint rocks are the most durable archaeological artefacts, which survived for thousands of years. Stored in scientific and educational institutions, the majority are accidental discoveries. Archaeological context provides information about the provenance of finds and the relationships with each other and with the environment. Nevertheless, lack of context does not mean that artefacts are beyond archaeological interpretation, because all prehistoric objects were part of a cultural process including need, production and use (see Johanson 2006).

The phenomenon of context-less macrolithic tools is a result of human behaviour both in prehistoric and modern times. From the Neolithic to the Iron Age, hoards of stone and metal tools were deliberately deposited outside the prehistoric settlements, or were parts of burial furnishing (Johanson 2006; van Gijn 2010, 184-186; Furmanek *et al.* 2019, fig. 34). Single objects could have been lost by early farmers during expeditions or field works such as preparing land for cultivation and felling trees. Stone tools, mostly those with cutting edge were reused in prehistoric periods (Szydłowski 2017, 121; Kufel-Diakowska *et al.* 2022, 1624). Examples of recycling also come from historic and modern times, until today. According to the documentation stored in the District Museum in Nysa, a battle-axe of the Corded Ware culture found in the village of Skoroszyce in 1968 was being used by children as a toy before it was donated to the Museum.

Long after the Neolithic, stone axes attracted attention and were the objects of beliefs and superstitions due to the raw material and shape. Between the Middle Ages and the 19th century the phenomenon of “thunderbolts” or “thunderstones” spread throughout Central and Northern Europe (Johanson 2009; Kurasiński 2021). Cross-data that confirm this practice come from ethnographic sources and archaeological excavations. Ground stone tools were discovered in medieval and postmedieval residential houses, strongholds, and agricultural buildings. Apart from the protective function they played a role in folk medicine. Axes were used to treat cattle (Kurasiński 2021) or prevent human diseases (Horoszkiewicz 1950).

Although many archaeologists exclude stray finds from their research, they provide valuable scientific data for micro- (object level) and macro-scale (culture level) investigations. The development of archaeometric and statistical methods of study in archaeology contributed to the extensive data gathering and processing. Stone and metal tools are investigated with the use of microscopic techniques to determine the true role of objects in prehistoric society (Baron *et al.* 2020; Hamon *et al.* 2021). All kinds of context-less artefacts complement landscape and demographic studies (Bergsvik *et al.* 2021). In the case of semi-sedentary or nomadic societies, the distribution of stray finds is important. For example, the habitation range of the Corded Ware Culture in SW Poland, due to a low number of discovered and preserved graves, is recognised mostly by the accidental discoveries of battle axes and pottery fragments (among others, see Chmielewski and Romanow 2015).

In this paper, we focus on the research perspectives of macrolithic stray finds. We show that multifaceted analysis combined with detailed archival research is effective for the reconstruction of the life history and circulation of tools that were essential parts of the economic and religious life of past societies.

ARCHAEOLOGICAL COLLECTIONS FROM SW POLAND

In Lower Silesia and adjacent territories, archaeological collections were assembled in museums starting from the beginning of the 19th century. Owing to local historians or private collectors, they were first enlarged, but then impoverished due to various historical events. Many prehistoric artefacts were lost during World War II. The deposit of 25 Neolithic stone axes from “*Hasenberg*” (Ratnowice) found at the beginning of the 20th century is one of the examples known only from the archival notes. In 1945 Poland inherited considerably reduced but still numerous collections that also included macrolithic tools.

Information about the archival finds gathered in German documentation before 1945 was and still is being meticulously translated and verified. This often resulted in rediscovery of the artefacts and new field research. The largest archaeological surface survey program was performed within the “Archaeological Picture of Poland” project (AZP). It aimed to map as many as possible archaeological sites and settlement points. Archival information was very often the basis of this search. In the course of the AZP program, archaeologists were able to verify the possible areas of settlement in the past. Some of them, unfortunately not the ones from the Neolithic, were then excavated.

For this study, we chose two collections of stone artefacts from the museums in SW Poland: the District Museum in Nysa and the Museum of the Silesian Piasts in Brzeg. The selection criteria were the number of objects within collections, the condition of the artefacts and the degree of access to preserved archives, including museum archives, and articles in German journals (*Jahresberichten des Neisser Kunst- und Altertums-Vereins*; *Altschlesische Blätter*; *Schlesiens Vorzeit in Bild und Schrift: Zeitschrift des Vereins für das Museum schlesischer Altertümer*) and books (e.g., Drescher 1932). Two selected collections are characterized by a large number of stone artefacts, often without a specific context – it had either been forgotten, or information was lost during the tumultuous times of the first half of the 20th century. These artefacts are mainly large tools with cutting edges. The majority were accidental discoveries by searchers-amateur archaeologists, teachers, and doctors (for example, U. Weisser, H. Weisser, W. Radig) and German archaeologists (G. Raschke, E. Drescher) before or during WWII. Recent finds come mainly from surface surveys, “private” collections and rescue investigations during agriculture and construction works.

Museums in Nysa and Brzeg have quite rich collections of stone tools initially documented as Neolithic. The assemblage we included in this paper consists of 97 artefacts from the District Museum in Nysa and 10 from the Museum of the Silesian Piasts in Brzeg

Table 1. Collection of stone tools in the District Museum in Nysa (MNa) and Museum of the Silesian Piast in Brzeg (MPS): basic classification (¹ Zápotočský 1989; ² Włodarczyk 2006; ³ Glob 1945), site (previous site name/numbers in brackets), references abbreviations (AB-AlttschlesischeBlätter, JK-Jahres-Bericht des Kunst- und Altertums-Vereins Neisse, NZ-Neisser Zeitung)

Inv. No. (ID)	Basic Classification	Site	County	Museum Inv. No.	Archival Inv. No.	Chronology	Raw Material	References
308	Shaft-Hole Axe	Siedlec 2	nyski	MNa/A/612	R. 30:550	STbK/L-PC	Metabasite	
309	Axe	Goświnowice 4	nyski	MNa/A/4	2378; 17	STbK/L-PC	Metabasite	
310	Shaft-Hole Axe	Trzeboszowice 2	nyski	MNa/A/406	2906; R.1:20	STbK/L-PC	Metabasite	Dresscher 1932, 33
311	Axe	Govorowice-Tamawa 3	nyski	MNa/A/501	3103; R.21:33	STbK	Metabasite	
312	Shaft-Hole Axe	Prusinowice 10	nyski	MNa/A/677		Neolithic	Amphibolite	
313	Shaft-Hole Axe	Ślupice 3	nyski	MNa/A/659		LBK/STbK	Serpentine	
315	Shaft-Hole Axe	Kępnica 6	nyski	MNa/A/7	2360; 15	STbK/L-PC	Amphibolite	
316	Axe	Radzikowice 48	nyski	MNa/A/17	2378; 29	TRB	Basaltoid	AB 1936, 2: 66
317	Shaft-Hole Axe	Lipniki 5	nyski	MNa/A/559	3040; R.140:32	STbK/L-PC	Metabasite	
318	Shaft-Hole Axe	Maciejowice 29 (1)	nyski	MNa/A/568	R.48:43	STbK/L-PC	Serpentine	
319	Axe	Lipowa 5	nyski	MNa/A/9	2374; 28	Undetermined	Basaltoid	
320	Shaft-Hole Axe	Maciejowice 26	nyski	MNa/A/565	2969; R.842:43; 1842:27	STbK/L-PC	Serpentine	
321	Shaft-Hole Adze	Siestrzeczowice 2	nyski	MNa/A/386	2875; R.58:31	STbK/L-PC	Metabasite	Dresscher 1932, 32
322	Shaft-Hole Axe	Lipniki 4 (1)	nyski	MNa/A/560	2977; R.142:32	STbK/L-PC	Serpentine	
323	Shaft-Hole Adze	Biała Nyska 7	nyski	MNa/A/474		STbK/L-PC	Metabasite	
324	Shaft-Hole Axe	Hajduki Nyskie 1	nyski	MNa/A/299	R.21:43	STbK/L-PC	Serpentine	
325	Shaft-Hole Axe	Piotrowice Nyskie-Krakówkowice nn (Krakówkowice 2)	nyski	MNa/A/318	R.131:35	STbK/L-PC	Serpentine	
326	Shaft-Hole Axe	Otmuchów 2	nyski	MNa/A/593	R.134:29	STbK/L-PC	Amphibolite	Dresscher 1932, 28
327	Shaft-Hole Axe	Nysa-Górna (Średnia) Wiesz 3	nyski	MNa/A/81	3194; 81	STbK/L-PC	Serpentine	JK 1935; 38:56; NZ 8.04.1937
329	Shaft-Hole Axe	Głębinów 12	nyski	MNa/A/224		STbK/L-PC	Basaltoid	
330	Axe	Goświnowice 2 (3)	nyski	MNa/A/295	R.38:27	STbK/L-PC	Serpentine	AB 1941, 4/5: 242

331	Axe	Lipowa 6	nyski	MNa/A/10	2373; 18	STbK/L-PC	Serpentinite	JK 1934, 37: 2, 4
332	Axe	Gierów 2	brzeski	MNa/A/491	R.38:61	LBK/STbK	Metabasite	
333	Battle Axe (B1) ²	Piątkowice nn	nyski	MNa/A/734		CWC	Amphibolite	
334	Shaft-Hole Axe	Regulice nn	nyski	MNa/A/676		STbK/L-PC	Serpentinite	
335	Shaft-Hole Axe	Złotogłowice 21	nyski	MNa/A/23	2367; 8	STbK/L-PC	Metabasite	
336	Shaft-Hole Axe	Kępnicza 5	nyski	MNa/A/6	2362	STbK/L-PC	Amphibolite	
337	Shaft-Hole Axe	Bodzanów 6	nyski	MNa/A/245	2570; R.227(4):29	STbK/L-PC	Metabasite	AB 1929, 6: 115; JK 1932, 36:9
338	Shaft-Hole Axe	Złotogłowice 23	nyski	MNa/A/420	R.41:66	STbK/L-PC	Serpentinite	AB 1933, 1: 22
340	Axe	Jędrzychów 4	nyski	MNa/A/5		STbK/L-PC	Serpentinite	JK 1932, 36: 10; AB 1933, 5: 94
341	Shaft-Hole Axe	Ligota Wielka 6	nyski	MNa/A/545	R.23:36	L-PC	Metabasite	
342	Shaft-Hole Axe	Radzikowice 47	nyski	MNa/A/16	2359; 10	STbK/L-PC	Metabasite	JK 1934, 37: 3
343	Shaft-Hole Axe	Chocebobórz 4	nyski	MNa/A/487	3161; R.61:38	STbK/L-PC	Serpentinite	AB 1938, 5: 198
344	Shaft-Hole Axe	Grądy 3	nyski	MNa/A/508	3110; R.54:43	STbK/L-PC	Metabasite	AB 1938, 5: 198; JK 1941, 43/45: 79
345	Shaft-Hole Axe (R) ¹	Pakosławice 1	nyski	MNa/A/344	R.28:43	TRB	Serpentinite	AB 1941, 1: 69
346	Axe	Ligota Wielka 9	nyski	MNa/A/541	3002; R.433:32	LBK	Metabasite	Dresscher 1932, 24
347	Battle Axe (G1) ²	Maciejowice 30	nyski	MNa/A/569	R.50:43	CWC	Serpentinite	
348	Shaft-Hole Axe	Lipowa 1	brzeski	MNa/A/24	2365	STbK/L-PC	Basaltoid	AB 1935, 3: 82
349	Shaft-Hole Axe (R) ¹	Biskupów-Lączki Nyskie 7	nyski	MNa/A/323	2689; R.41:38	TRB	Sandstone (Greywack)	AB 1941, 3/4: 242
351	Shaft-Hole Axe	Kępnicza 4	nyski	MNa/A/316	2684; R.38:38	STbK/L-PC	Amphibolite	
352	Axe	Węza 9	nyski	MNa/A/21	2379; 25	STbK/L-PC	Serpentinite	JK 1934, 37: 5
353	Chisel	Ścinawa Mała 3	nyski	MNa/A/20	2381; 31	STbK	Metabasite	JK 1934, 37: 5
354	Shaft-Hole Axe	Burgrabice 9	nyski	MNa/A/80	3175; 80	STbK/L-PC	Metabasite	JK 1934, 37: 1; AB 1935, 2: 50
355	Axe	Goworowice 8	nyski	MNa/A/505	R.57:43	STbK/L-PC	Basaltoid	
356	Shaft-Hole Axe	Biechów nn	nyski	MNa/A/1	2357; 36	STbK/L-PC	Amphibolite	
357	Shoe-Last Adze (middle)	Malerzowice Małe 2	nyski	MNa/A/577	3054; R.120:35	LBK	Metabasite	AB 1936, 5: 162

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Inv. No. (ID)	Basic Classification	Site	County	Museum Inv. No.	Archival Inv. No.	Chronology	Raw Material	References
358	Tool preform	Otmuchów nn	nyski	MNa/A/585	R. 191:32	Undetermined	Sandstone	
359	Shaft-Hole Axe	Nowy Świętów nn (Złotogłowice 6)	nyski	MNa/A/417	2891; R.38:36	L-PC	Serpentine	AB 1936, 7: 230
360	Shaft-Hole Axe	Maciejowice 16	nyski	MNa/A/575	3065; R.49:43	STbK/L-PC	Metabasite	
361	Shaft-Hole Axe (R) ¹	Strobiec 2	nyski	MNa/A/395	R.37:107	TRB	Serpentine	JK 1939, 40/42: 98
365	Shaft-Hole Axe	Brzeg 4 (Location unknown)	brzeski	MPŚ A/I:132	III/148; 1623	STbK/L-PC	Serpentine	
366	Shaft-Hole Axe (R) ¹	Obórki 2	brzeski	MPŚ A/I:134	III/150; 1617	TRB	Serpentine	AB 1944, 1: 15
369	Mace (<i>Geröllkeule</i>)	Mikolin 3 (Wronów)	brzeski	MPŚ A/I:129	III/145; 1639	Mesolithic	Sandstone (Quartz)	AB 1931, 3: 290
373	Shaft-Hole Axe (Highly modified form)	Brzeg 20	brzeski	MPŚ A/I:198	III/219	TRB	Gabbro	
375	Axe	Prędocin 2 (Kruszyna)	brzeski	MPŚ A/I:82	III/96; 1645	TRB	Serpentine	AB 1929, 4: 61, 1930, 6: 86, 1934, 4: 305, 1935, 1: 26
376	Axe (<i>Wälzenbeil</i>)	Stobrawa 3	opolski	MPŚ A/I:131	III/147:1663	Mesolithic	Undetermined Igneous Rock	AB 1935, 1: 27
377	Shaft-Hole Axe	Lubsza 15	brzeski	MPŚ A/I:133	III/149; 1647	STbK/L-PC	Amphibolite	
379	Battle Axe (H2) ²	Zięlice 3 (Matujowice)	brzeski	MPŚ A/I:86	III/100; 1626	CWC	Diabase	
381	Axe	Matujowice 2	brzeski	MPŚ A/I:20	III/22; 1644	TRB	Metadiabase	
384	Battle Axe (H2) ²	Brzeg-Brygidki 2	brzeski	MPŚ A/I:25	III/30; 1631	CWC	Undetermined Igneous Rock	
388	Axe	Burgrabice 4	nyski	MNa/A/2	2383	TRB		JK 1934, 37: 1
389	Battle Axe (I) ²	Biechów-Godkowice II	nyski	MNa/A/3	2364; 11	CWC		Drescher 1932, 32

390	Axe	Lipowa 4	nyski	MNa/A/8	2375; 19	TRB		AB 1934, 2: 39; JK 1934, 37: 2, 1935, 38: 56
391	Battle Axe (G2) ²	Nysa 8 (ul. Orliąt Lwowskich)	nyski	MNa/A/13	2368; 13	CWC		
392	Tool preform	Nysa 19	nyski	MNa/A/14	2372; 27	Neolithic		
393	Axe	Przydroże Małe nn	nyski	MNa/A/15	2387; 24	TRB/CWC		
394	Shaft-Hole Axe	Sławniowice 1	nyski	MNa/A/19	2363	STbK/L-PC		JK 1934, 37: 2
395	Battle Axe (H1) ²	Złotogłowice 20	nyski	MNa/A/22	2358; 12	CWC		
398	Battle Axe (B4) ²	Wójcice-Otmuchów 26	nyski	MNa/A/213	2181	CWC		
399	Battle Axe (B1) ²	Wójcice-Otmuchów 26	nyski	MNa/A/217	2183	CWC		
400	Battle Axe (F/H1) ²	Skoroszyce 4	nyski	MNa/A/218	2182	CWC		
401	Shaft-Hole Axe	Dziewiędlice 1	nyski	MNa/A/287	R.32:1930	STbK/L-PC		Drescher 1932, 32
402	Battle Axe (D3) ²	Jegielnica 1	nyski	MNa/A/300	R.5:41	CWC		AB 1942, 3/4: 242
403	Mace	Kamienica 1	nyski	MNa/A/308	R.124:35	Undetermined		
404	Axe	Radzikowice 7	nyski	MNa/A/355	2741; 41:53	STbK		NZ 27.11.1935; Raschke 1941, 17
405	Axe	Sucha Kamienica 1 (11)	nyski	MNa/A/396	R.26:43	TRB/CWC		
406	Axe	Ścinawa Nyska 1	nyski	MNa/A/403a	R.31a:43	TRB		
407	Axe	Ścinawa Nyska 1	nyski	MNa/A/403b	R.31:43	TRB		
408	Handstone	Trzeboszowice 3	nyski	MNa/A/407		Undetermined		Drescher 1932, 33
409	Battle Axe (G1) ²	Włodary 1	nyski	MNa/A/413	2901; R.108:37	CWC		
411	Battle Axe (B2) ²	Ulanowice 10 (Otmuchów nn)	nyski	MNa/A/422		CWC		
412	Tool preform	Nysa 20	nyski	MNa/A/468		Undetermined		
413	Battle Axe (I) ²	Chociebórz 3	nyski	MNa/A/486	3022; R.24:36	CWC		
414	Axe	Goworowice 2	nyski	MNa/A/493	3044; R.19:33	STbK/L-PC		AB 1933, 5: 92
415	Axe	Goworowice 5	nyski	MNa/A/494	3013; R.85:36	TRB/CWC		
416	Battle Axe (I) ²	Goworowice 16	nyski	MNa/A/495	3074; R.52:43	CWC		
417	Axe	Goworowice-Tarnawa 3	nyski	MNa/A/497	2942; R.20:33	TRB/CWC		
418	Shaft-Hole Axe	Goworowice 1	nyski	MNa/A/500		STbK/L-PC		

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Inv. No. (ID)	Basic Classification	Site	County	Museum Inv. No.	Archival Inv. No.	Chronology	Raw Material	References
419	Axe	Goworowice 4	nyski	MNa/A/502	3058; R.132:32	TRB		
420	Axe	Goworowice 6	nyski	MNa/A/504	3051; R.87:35	L-PC		
421	Axe	Goworowice 8	nyski	MNa/A/506	R.53:43	Undetermined		
422	Battle Axe (C1) ²	Grądy 2	nyski	MNa/A/507	R.88:35	CWC		JK 1936, 39: 35
423	Battle Axe (K) ³	Grodków 4	brzeski	MNa/A/510	R.60:43	CWC		
424	Axe	Janowa 1	nyski	MNa/A/514	2024; R.38:92	STbK/L-PC		AB 1938, 5: 98
427	Axe	Lipniki 3	nyski	MNa/A/561	2957; R.141:32	TRB/CWC		
428	Shaft-Hole Axe	Maciejowice 27 (1)	nyski	MNa/A/566	R.30:35	STbK/L-PC		
429	Shaft-Hole Axe	Maciejowice 28	nyski	MNa/A/567	R.51:43	STbK/L-PC		
430	Shaft-Hole Axe	Maciejowice 31	nyski	MNa/A/570		Undetermined		
431	Axe	Mikolajowa 2	brzeski	MNa/A/579	R.6:36	TRB		
432	Battle Axe (D2) ²	Osiek Grodkowski 3	brzeski	MNa/A/583	R.17:39	CWC		Raschke 1941, 20; AB 1939, 4: 165
433	Axe	Goraszowice-Rysowice 4 (Rysowice 1)	nyski	MNa/A/606	R.5:34	TRB		
434	Shaft-Hole Axe	Goraszowice-Rysowice 3	nyski	MNa/A/608a		STbK/L-PC		
435	Shaft-Hole Axe	Goraszowice-Rysowice 3	nyski	MNa/A/608b		STbK		
436	Battle Axe (G2) ²	Starowice 3	nyski	MNa/A/613	R.1:41	CWC		Drescher 1932, 30; AB 1941, 3/4: 241
437	Shaft-Hole Axe	Strzegów 2	brzeski	MNa/A/616	3089; R.41:38	STbK/L-PC		
438	Axe	Wilemowice 2	nyski	MNa/A/627	3041; R.56:43	TRB		AB 1938, 5: 198
439	Battle Axe (R) ¹	Włodary nn	nyski	MNa/A/733		TRB		

(Table 1). We focused thoroughly on the area of two districts – Nysa (n=91) and Brzeg (n=15). One specimen was discovered in neighbouring Opole District. We excluded artefacts from other locations (*e.g.*, Wrocław district) or from “unknown” locations impossible to determine.

The available archaeological materials are only a part of collections gathered before WWII. Following the history of both collections, finds are or were previously stored in other museums, mainly in Racibórz, Bytom, Opole and Wrocław, or even in museums in the Czech Republic and Slovakia. They were moved from one to another at different times, which increased the risk of losing them. Some of them may be still deposited in these institutions without any notifications and marked as “unknown” locations. It is necessary then to cross-reference archival information from all the known places of their deposition to possibly track it back. Many archaeological assemblages were also lost during WWII, either irrevocably destroyed or transported westward to other museums in Germany. We had access to circa 30% of macrolithic artefacts reported by E. Drescher (1932), described as *Steinbeil*, *Steinaxt*, *Pflugschare* or *Steinhacke*. Both in Nysa and Brzeg Museums, much archival information stood the test of time, the same concerns journals and books from before WWII. This enables us to imagine the enormous loss of archaeological material. Nonetheless, after years, it is still possible to connect the artefacts with the archival information. The hoard of 25 stone tools from the village of Maciejowice, Nysa District well-exemplified this possibility (Drescher 1932, 27, fig. 23). Stone adzes from the deposit are described as “lost” in current documentation, but two of them were “discovered” as exhibits in the Archaeological Museum in Wrocław. The artefacts had passed through many hands which resulted in duplication of sometimes erroneous information in further publications and archives. This was the case of an artefact from Nowy Świątów (Germ. *Deutsch Wette* 6). The original German description of the find has not survived. After WWII, it was documented at the Museum in Opole as a find from the village of Złotogłowie. Then, it was transferred to the Museum in Nysa, and the information about the location was duplicated. In the course of searching the old German journals, we were able to re-identify the correct location. Archaeological documentation and publications stored in local and provincial museums before the War were very diligently collected by German researchers. The degree of detail varies. In many cases, only a transfer of the find to the museum is mentioned, in others, the artefacts are richly described, with drawings. With the development of digitization of library collections, access to older German publications is becoming more open to the public.

RESEARCH PROCEDURE

Our research procedure consists of three main steps: identification of the artefact’s location, chronological and taxonomic determination, and a reconstruction of the life-cycle of the objects.

The first step in our procedure was to identify the precise location of the find. We tried to establish a relationship between artefacts and already recognised archaeological context (site). We gathered information from the tool itself (inscriptions and marks), museum inventory cards and registers, and archaeological site records cards (KEZA), which had been created in the course of the AZP program. The latter often contain information that authors or researchers have been able to access, including descriptions in the literature, figures and archival documentation. Armed with data we searched German journals and publications to verify and piece together all the snippets of information. The detailed search enabled us to obtain more information about the origin and the context of the finds, in some cases to re-identify the location of artefacts or correct errors in the accessible documentation.

The second step was to re-identify the stone tools from two collections ($n = 107$), in terms of their chronological and cultural context. They were most often included in the Neolithic sections (80.37%), without any specific, detailed classification (Table 2). In most cases, correct identification was possible based on the characteristic morphometric features of the following parts of the tool: cutting edge, butt (*e.g.*, shape from top, side and front), and body (*e.g.*, cross-section, longitudinal section). The very detailed object analysis enabled us to develop our classification of the macrolithic assemblages from SW Poland. The new division is based also on existing typologies of the stone tools (Geschwendt 1931; Wojciechowski 1981, 57; Chmielewski and Romanow 2015, 44-56) and finds from other areas (Czekaj-Zastawny and Przybyła 2012, 18-24; Machnik 1966, 41-47; Włodarczak 2006, 20-36; Libera and Sobieraj 2016, 411-454) and adjacent countries (Brandt 1967; Šebela 1999; Zápotocký 1989). The largest problem we faced was identifying tool fragments and non-diagnostic, intercultural forms.

Within this step, we conducted spatial analyses performed at an entry level. An open-source Geographic Information System (QGIS version 3.24) was used to investigate the probable settlement range of taxonomic groups of the Neolithic population. We complemented our dataset with information from archival research (including archival records and *Messtischblättern*). We made a compromise between the quality of the acquired data (some of the finds had a general location specified to the level of a town) and the amount of data. We included a total of 681 sites in the maps, grouped into the Neolithic cultures or broadly determined as the Neolithic or the Mesolithic. Kernel Density Estimation (KDE) was used to re-evaluate the settlement patterns. The radius of the centroids in the heat maps was set to 5 km (for all settlement systems) according to a proposed distance in the Neolithic site catchment analysis (see Ullah 2011, Kempf 2020).

Finally, the last step in our procedure was to trace the use-life and circulation of stone tools. We adopted the concept of cultural biography developed by Annelou van Gijn (van Gijn 2010, 11-34). Data from petrographic analysis provided information about the raw material and artefact's cultural provenance. Most of the tools from our collection were unrecognised in terms of the type of rock and possible quarries. It was an important part of the analysis, because, in the Neolithic, people used selected types of rocks for the pro-

duction of edge tools – for example only metabasite in the Linear Pottery Culture and serpentinite not earlier than in post-Linear units (Borowski 2019, 397, 404). The use-wear analysis combined with experimental studies enabled us to examine the life phases of the stone tool's biography. The raw material was identified macroscopically using a Kap-pameter KM-7 and an Olympus SZX9 stereomicroscope (6.3-114×). Traces of manufacture, use and repair were analysed using a Nikon SMZ25 stereomicroscope (3.15-315×) and a Nikon Eclipse LV100 metallographic microscope (50-500×). To collect referential data experimental studies were performed according to the protocol developed by the Institute of Archaeology of the University of Wrocław as an integral part of the research project titled “*Breaking the code of stones. Economic, social and symbolic meaning of the macrolithic stone artefacts of the Neolithic societies (6th-3rd millennia BC) in SW Poland - biographical approach*”.

RESULTS

Chronological identification and spatial analysis

We analysed the collections of artefacts that consist of 107 stone objects, mainly large tools with cutting edges. Most of the tools were made from serpentinite, metabasite and amphibolite, a few from basaltoid. There are also single objects made from gabbro, undetermined igneous rock, greenschist, aplite and erratic sandstone (raw material identification of 60 specimens). In the course of morphometric analysis, we distinguished mace-head, axes, adzes, shaft-hole axes, battle axes and chisels (Figs. 1-3) and classified them into the following taxonomic units: the Linear Pottery culture (LBK), the Stroked Pottery culture and post-Linear cultures (STbK/L-PC), the Funnel Beaker culture (TRB), and the Corded Ware Culture (CWC). Moreover, we determined the chronology of two stone objects from Brzeg District as the Mesolithic (Table 2). According to the analogies from Central Europe one of them belongs to the *Walzenbeil* type of Mesolithic axes (Fig. 1: 1), and the second one is a perforated mace-head (*Geröllkeule*) (Fig. 1: 2).

Table 2. Results of re-evaluation of the Neolithic macrolithic tools

	Undet.	Mesolithic	Neolithic	LBK/ STbK	STbK/ L-P C	TRB	CWC	GAC	Total
Archival (n)	2	0	86	4	8	3	3	1	107
%	1,87%	0,00%	80,37%	3,74%	7,48%	2,80%	2,80%	0,93%	
Re-evaluated (n)	7	2	1	6	49	22	20	0	107
%	6,54%	1,87%	0,93%	5,61%	45,79%	20,56%	18,69%	0,00%	



Fig. 1. Examples of the macrolithic tools from the studied collections from the District Museum in Nysa (MNa) and Museum of the Silesian Piast in Brzeg (MPŚ). 1 – Stobrawa 3 (MPŚ/A/I:376), 2 – Mikolin 3 (MPŚ/A/I: 129), 3 – Malerzowice Małe 2 (MNa/A/557), 4 – Ligota Wielka 9 (MNa/A/541), 5 – Gierów 2 (MNa/A/491), 6 – Goświnowice 4 (MNa/A/4), 7 – Jędrzychów 4 (MNa/A/5), 8 – Siedlec 2 (MNa/A/612), 9 – Biała Nyska 7 (MNa/A/474), 10 – Siostrzechowice 2 (MNa/A/386). Photo Ł. Melski



Fig. 2. Examples of the macrolithic tools from the studied collections from the District Museum in Nysa (MNa). 1 – Biechówn (MNa/A/1), 2 – Trzeboszowice 2 (MNa/A/406), 3 – Maciejowice 16 (MNa/A/575), 4 – Maciejowice 29 (MNa/A/568); 5 – Bodzanów 6 (MNa/A/245), 6 – Burgrabice 9 (MNa/A/80).
Photo Ł. Melski



Fig. 3. Examples of the macrolithic tools from the studied collections from the District Museum in Nysa (MNa) and Museum of the Silesian Piast in Brzeg (MPŚ). 1 – Obórki 2 (MPŚ/A/I:134); 2 – Strobice 2 (MNa/A/395); 3 – Prędocin 2 (MPŚ A/I:82); 4 – Małujowice 2 (MPŚ A/I:20); 5 – Piątkowice nn (MNa/A/734); 6 – Maciejowice 30 (MNa/A/569); 7 – Brzeg-Brygidki 2 (MPŚ/A/I:25); 8 – Zielęcice 3 (MPŚ/A/I:8).
Photo Ł. Melski

We re-identified the chronology of 111 sites (16.3%) from all those marked in the maps (n=681). The re-evaluation included archaeological materials from two collections, archival drawings and archival descriptions. This work had varying degrees of impact on Neolithic cultural groups in the area under study (Fig. 4: A). In the case of the LBK/STbK settlement range, the main cluster located on the border of the Otmuchów Depression and the Niemcza-Strzelin Hills was expanded towards the northwest. The range of the remaining concentrations located on the Wrocław Plain and the Głubczyce Plateau remained the same (Fig. 4: B). We noted significant changes in the settlement range of the STbK/L-PC. Two previously separated concentrations have now been united into one cluster extending over three mesoregions: the Niemcza-Strzelin Hills, the Otmuchów Depression and the Głubczyce Plateau. Additionally, a new cluster was marked in the south, in the Paczków Foreland. Worth noting is the appearance of several sites located to the north, on the Wrocław Plain in the Wrocław Ice Marginal Valley and on the Oleśnica Plain (Fig. 4: C).

The re-evaluation of Neolithic sites changed the main TRB/CWC clusters. In the case of the southern concentration, the previously occupied areas of the Niemcza-Strzelin Hills and the Otmuchów Depression have been combined. As for the northern concentration, a small cluster in the Wrocław Plain joined the concentration in the Wrocław Ice Marginal

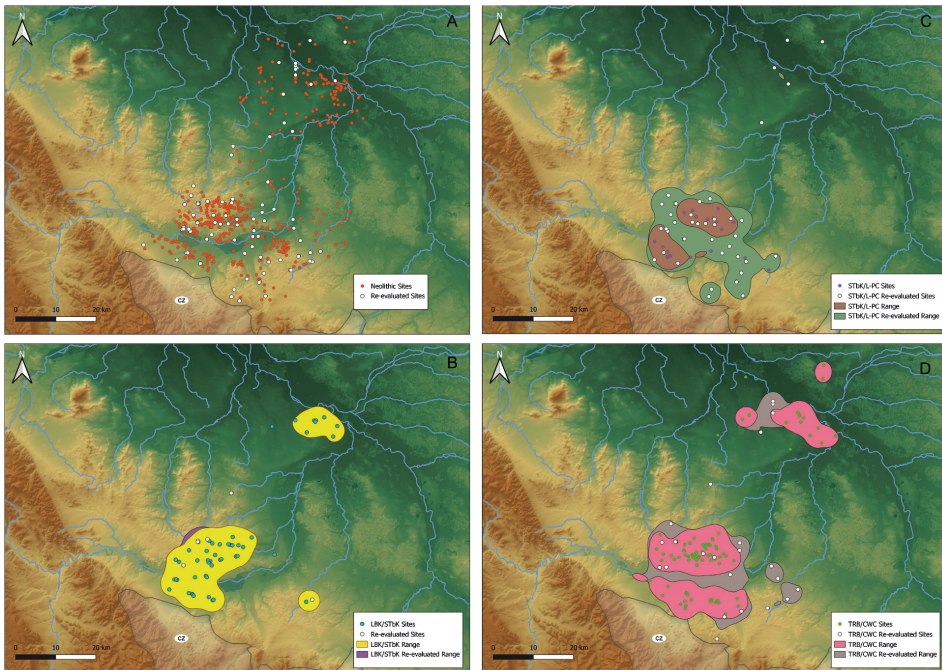


Fig. 4. Settlement range re-evaluation: A – Neolithic sites; B – LBK/STbK sites; C – STbK/L-PC sites; D – TRB/CWC sites. Computer processing by M. Chłofi

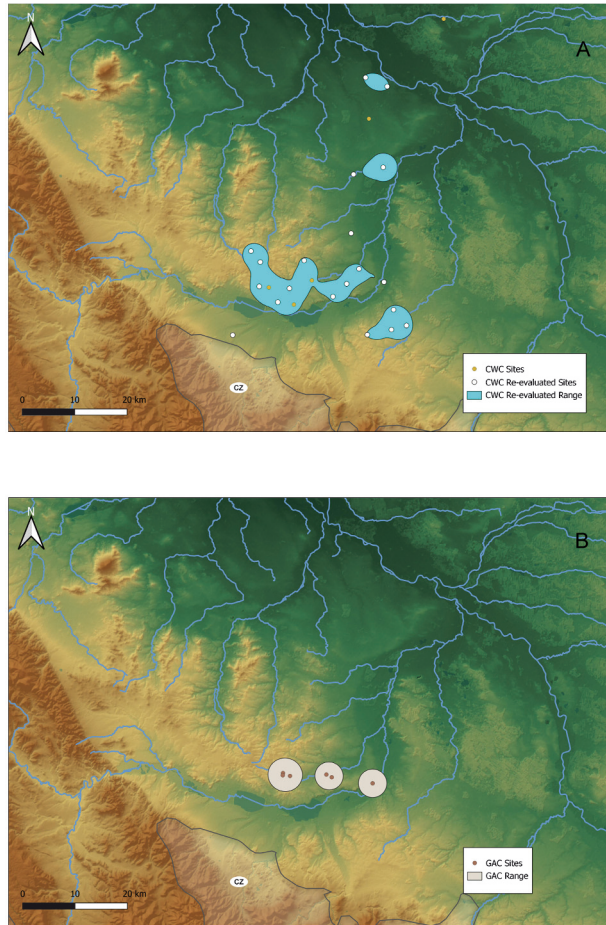


Fig. 5. Settlement range re-evaluation: A – CWC sites; B – GAC sites.
Computer processing by M. Chłoń

Valley. Two new concentrations were identified on the Głubczyce Plateau and on the Niemodlin Plain (Fig. 4: D). More extensive CWC occupation of this area can be proposed after the re-identification of the stray finds; previously, the CWC was recognised only from single accidental discoveries. The largest concentration is recorded at the southeastern border of the Niemcza-Strzelin Hills. Another concentration is located on the border of the Głubczyce Plateau and the Niemodlin Plain. Two smaller ones, on the north, are located on the edge of the Nysa Kłodzka River Valley and on the Wrocław Plain (Fig. 5: A). The range of GAC has not changed. The number of sites was reduced by one. The remaining sites constitute three small neighbouring concentrations in the southern part of the Niemcza-Strzelin Hills and in the Nysa Kłodzka River Valley (Fig. 5: B).

Use-wear analysis

A sample of macrolithic tools was subjected to the use-wear analysis (n=64). The collection included various types of stone tools dated from the Mesolithic to the Neolithic: mace-head, adzes, shaft-hole adzes, axes, shaft-hole axes, battle-axes, chisels and pre-forms. Surface weathering is the most frequent post-depositional modification of the artefacts, which has an influence on the preservation of grinding traces and traces of primary utilisation. Tools have however a large potential for microscopic analysis, and based on traces, we can reconstruct large parts of their lifecycles.

Most of the analysed artefacts belong to a group of stone tools with cutting edge. They display marks of the final phases of manufacturing: coarse flaking, grinding and drilling holes. In the shaping phase, middle-sized flakes were detached from a pre-form blank. The fragments of negatives are preserved mostly on the butt parts and along the edges of the shaft-hole axes from the STbK/L-PC and CWC battle axes. On the latter ones grinding traces are well-developed (Fig. 6: 1, A), also documented on several metabasite axes and shaft-hole axes (Fig. 6: 2, B). We recorded groups of scratches on the sides and butts of tools. The orientation of linear traces varies on the particular side of the tool: parallel and transverse on upper and bottom sides, transverse on lateral sides and mixed on butts. The drilling phase left a set of traces, consisting of concentric lines inside holes, transverse lines on the edges (Fig. 6: 3, D) and steps inside a hole recorded in some cases. The latter proved that the hole was drilled alternately from both sides.

Traces of use are well-preserved on the axes and shaft-hole axes of the LBK and the STbK/L-PC made from metabasite and serpentinite. Cutting edges display rounding, use retouch, including small and large scars and linear traces perpendicularly and diagonally oriented to the working edge (Fig. 6: 4, E-F). Such types of traces correspond with different activities tested experimentally within the project (Kufel-Diakowska *et al.* 2023). We also observed traces parallelly-oriented to the cutting edge, from sharpening or re-sharpening the edge in the course of the use (Fig. 6: 2, C). Parts of tools opposed to the cutting edge also show marks of repair. Tools made from metabasite were exposed to damage because of the laminar structure of the rock. For example, the upper side of the shaft-hole axe from Maciejowice 16, Nysa district was knapped after half of the surface had split.

Modification of macrolithic tools was a frequent practice of curating in prehistoric times. There are examples of broken shaft-hole axes of the STbK/L-PC and battle axes of the CWC. In these cases, a second hole was drilled closer to a cutting edge and the broken part was ground. In the Neolithic, modifications also included a change in the tool's function. The shaft-hole adze from Biała Nyska 7 and shaft-hole axe from Lipniki 4, both in Nysa district are good examples of secondary use in the Neolithic. Apart from use marks on the cutting edge, tools bear traces of hammering or pecking located on their butts (Fig. 6: 6, G). In the case of adzes and axes of Linear and post-Linear traditions, the re-utilisation of butt ends or broken tools was a common phenomenon (Kufel-Diakowska *et al.*



Fig. 6. Traces of production, use and recycling on the macrolithic tools. 1 – Brzeg-Brygidki 2 (MPŚ/A/I:25), 2 – Goświnowice 4 (MNa/A/4), 3 – Brzeg 20 (MPŚ/A/I:198), 4 – Gierów 2 (MNa/A/491), 5 – Otmuchów 2 (MNa/A/593), 6 – Lipniki 4 (MNa/A/560), 7 – Unknown location (MPŚ/S/I:130), A-B – scratches on grinding surface, C – parallel lines from re-sharpening, D – concentric and transverse traces inside a hole, E – use retouch, F – linear traces from use, G – traces from hammering, H – furrows after use of tools as a whetstone. Photo Ł. Melski (5-7), M. Chłoń, B. Kufel-Diakowska, W. Bronowicki A-H.

Drawing N. Lenkow

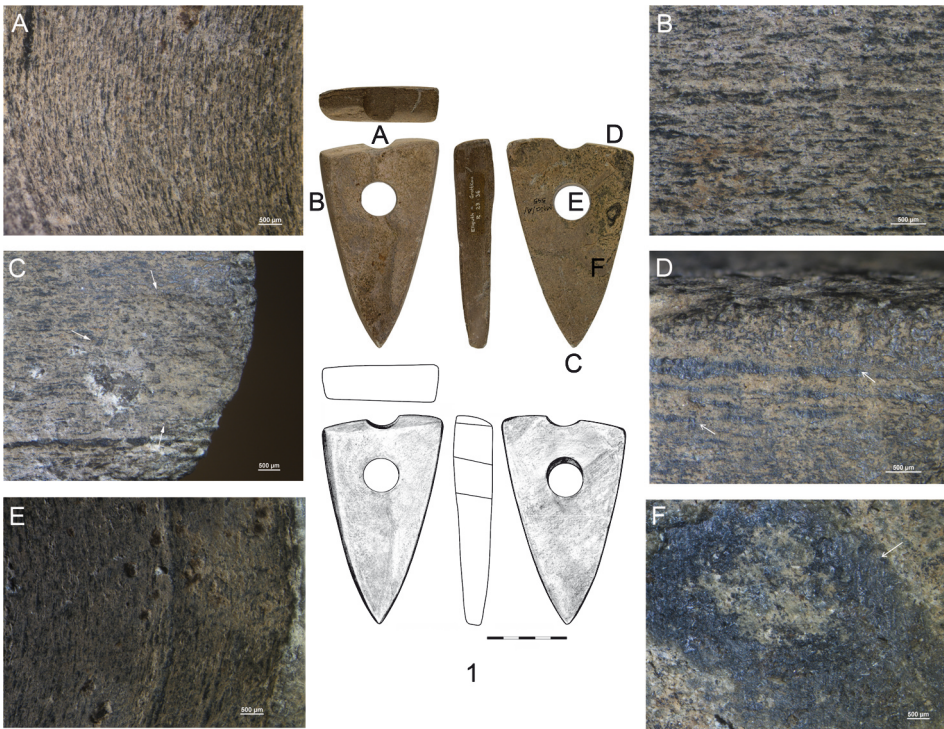


Fig. 7. Traces of production, use and modification on a shaft-hole axe from Ligota Wielka Site 6 (MNA/A/545): A, E – traces of drilling; B, D, F – grinding traces; C – use scar. Photo Ł. Melski (1), M. Chtoń (A-F). Drawing N. Lenkow

2022; 2023). An example of extreme modification is a tool made from metabasite, transformed from a shaft-hole axe to a “handstone” (Fig. 6: 7). Unfortunately, the location of the find was not possible to determine.

Loose finds of stone axes bear traces of modern activity. We observed large edge scars that were not rounded by subsequent use and looked “fresh” (Fig. 6: 5). However, in this case, there are doubts if we are able to match such traces with regular use or if it was accidental damage. More convincing are groups of extensive longitudinal marks, located usually on the lateral sides of thick shaft-hole axes (Fig. 2: 4; 6: H). Lines are deep, have various widths, from narrow to wide, and cover a large part of the surface, suggesting repeatable contact with metal objects. The use of Neolithic tools as whetstones was reported in the German archival documentation. One example of a currently lost stone LBK axe was found by a blacksmith in Goworowice 18 (Germ. *Gauers*) and used as a whetstone 100 years ago. Different types of rocks were re-used for sharpening metal tools, among them soft serpentinite was an eligible rock. A shaft-hole axe from the studied collection – with possible traces of use as a whetstone – was found 7 km away, at the site Maciejowice 29.

The complex result of the multifaceted analysis is illustrated by one of the examples stored in the District Museum in Nysa (Fig. 7: 1). The name of the archival location – “Ellguth: Grottkau” – and artefact number written by a German researcher is visible on one side. *Ellguth* is a German name of present Ligota Wielka in Nysa District. In an archival publication from 1932, Eberhard Drescher (1932) mentions the find of a stone axe at Site no 6, west of the village. This area was densely settled in the Neolithic. Archaeological finds are associated with STbK/L-PC and TRB, assigned on the archival German *Messtischblatt*. The area of the site was positively verified in the current documentation (AZP).

The artefact was made from metabasite from the Bohemian Massif. It underwent many modifications during its use life. According to morphometric and raw-material data, initially, it was a shaft-hole axe associated with the STbK/L-PC. Grinding traces are preserved on the upper and two lateral sides (Fig. 7: B). Drilling traces are preserved inside the original hole (Fig. 7: A). The axe was used for chopping/adzing. This activity produced a use-scar on the cutting edge (Fig. 7: C). Probably in the course of use, the tool broke transversally. Despite the damage, it was not discarded. The broken part was ground (Fig. 7: D), and a second hole was drilled through (Fig. 7: E). Afterwards, the shortened axe was used and broke longitudinally. Again it was not discarded. The split surface was flattened (Fig. 6: F). The new tool was probably in use again and lost in the vicinity of the settlement.

CONCLUSIONS

Multifaceted archaeological analyses combined with the investigations of the archival data and current documentation show that stray finds can generate high-quality data for scientific studies. Accidental discoveries supplement information collected from the excavations. We were able to put macrolithic stone tools into the proper position in the typochronological system, and we linked them to particular settlement episodes.

Traces of use showed that the shape and function of large stone objects changed throughout the life cycle, to fulfil needs or keep the traditions of the people who used them in prehistoric periods. We also discovered the signs of long-lasting circulation of the Neolithic stone tools, which included modifications and the uses of tools in modern times. The ethnographic sources provide information about the long amuletic use of axes, treated as “thunderbolts”. However, such activity did not leave any traces that can be observed with the microscopic methods of study. The bad preservation of the surface only suggests that tools were not underground. Probably, a shaft-hole found in the ruins of a house in Biechów, Nysa district (Fig. 2: 1) was one example of this phenomenon or just a souvenir kept by the residents. Whereas, we noted traces of other uses that correspond with the information from the archival documentation from the beginning of the 20th century. The problem of when exactly the Neolithic shaft-hole axes were used as whetstones required more detailed investigations and experimental studies.

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